

THE QUEENSLAND MYCOLOGIST



Bulletin of
The Queensland Mycological Society Inc.

The Queensland Mycologist is issued quarterly. Members are invited to submit articles for publication to the editor. The deadline for contributions for the next issue is 1 November 2007.

Please ensure that the Secretary (fungiqlld@yahoo.com.au) always has your current email address. If you are on the mailing list but do not wish to receive future issues, please contact the Secretary to have your name removed from the email address list.

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QMS CALENDAR

Meetings are held in the Bailey Room at the Herbarium, Mt Coot-tha, commencing at 7pm on the second Tuesday of the month, unless otherwise scheduled. Field trips are scheduled for the Saturday preceding the monthly meeting.

QMS Field Trip: 8 September, 2007: Maroochy Botanic Gardens. Leader Patrick Leonard (07) 5456 4135. Note 1000 start.

QMS General Meeting: 11 September, 2007: Address "Fungi That Eat Insects" address by Diana Leemon (07) 3362 9575.

QMS Field Trip: 6 October, 2007: Main Range NP, Cunningham's Gap. Leader Diana Leemon.

QMS General Meeting: 9 October, 2007: TBA

QMS Field Trip: 10 November, 2007: Linda Garrett Park, Mapleton. Leaders Lin Fairlie & Gretchen Evans Ph (07) 5435 8038.

QMS General Meeting: 13 November, 2007: "Wood Rotting Fungi" address by Lesley Francis.

QMS Field Trip: 8 December, 2007: TBA.

QMS General Meeting: 11 December, 2007: TBA.

ACTING PRESIDENT'S REPORT

From Diana Leemon

As acting president I would like to thank Nigel Fechner for the enormous amount of time that he has put into QMS to help get it up and running in the last 18 months. However, I appreciate that Nigel has needed to step back for a while because of the demands on his time. Hopefully Nigel will return to the presidency sometime in the future when he has fewer pressing commitments. Nigel has accepted the role as honorary scientific advisor to the QMS committee, so will still be making an important contribution to QMS though with fewer time commitments.

I would like to thank everybody who sold chocolates recently, so far about \$500 has been raised with more money yet to come in. The committee should be able to make plans for how the chocolate money will be spent at the next meeting. I would like to give thanks for a number of donations recently received. Noreen and Ray Baxter performed an important community service in running the "grog shop" at the recent Fungimap conference and split the proceeds between Fungimap and QMS, we received \$109.15 (drinking red wine can be very healthy for QMS). Fungimap also sent a cheque to QMS for \$309 from a conference levy. John Wrench did such a great job promoting QMS when selling chocolates that the Bengu who runs Gallery B donated \$20. If you are in the area you must visit the gallery, which you access through the Newmarket Hardware store. Karalyn recently received a donation of mycology books to QMS from the family of Jenny Caruthers.

The microscopes bought with the funding granted by SEQ catchments finally arrived. QMS now has a MOTIC compound microscope and a MOTIC dissecting microscope plus a digital camera that will attach to either of the microscopes. The camera can be hooked up to a data projector through a laptop computer, this will make it easy for workshop demonstrations. SEQ catchments granted the money so that QMS could purchase microscopes to support workshops to skill members in fungal ID. Three second hand Leica compound microscopes were also bought from the University of Queensland School of Integrative Biology (from the section that was the old Zoology department).

We are currently planning to run at least 2 workshops in the next few months. There will be a session on microscopy (apparently by me) built into both workshops. At least one workshop will be held at the north coast and will incorporate sessions on fungal ID (by Patrick and Michael). One of the microscope workshops will be held on the north side of Brisbane on October 20. If interested please e-mail either me or Secretary Michael so that we can inform you as soon as more details are available.

QMS is moving closer to having an operational website at www.qms.asn.au. Many thanks to Cassie and Steve for doing the initial website work and to Rachel who has taken over to get the last bits together.

At the last general meeting Jutta mentioned the forgotten flora posters and CDs created by the Royal Botanical Gardens in Victoria. I bought a set of these about a year ago, they are frightfully fungally fantastic (excuse the English). For anyone interested go to www.rbg.vic.gov.au click on "research and conservation" (buttons across the top of the page). Then click on "scientific publications" – then "forgotten flora". You can view the posters here, and download an order form. Another 2 interesting fungal resources that might be of interest (I bought them a year or so ago) from Knowledge Books & Software based in Brighton ph 3869 0994 or 1800 773 353 – "101 Forest Fungi of eastern Australia" – this one by Dr Tony Young and "Key to Common Microscopic Fungi" - couldn't see the author on this one. The second CD is an acquired taste for those like me who get excited by the mouldy food in their lunch box or fridge.

QMS FIELD TRIP PROGRAMME

Please note: If the meeting date is changed then so will the field trip date. If you are unsure of a field trip date, or have nominated for a field trip and cannot attend please contact the field trip leader.

Jon Atkinson Ph 3861 1738, mobile 04 0242 6699 (email buildingbistro@hotmail.com) is the QMS Committee member responsible for the Field Trip programme. Anyone interested in putting a Field Trip on the programme or wanting information about trips please contact Jon at 0402426699 or email buildingbistro@hotmail.com.

8 September, 2007: Maroochy Botanic Garden (Map Ref: UBD Sunshine Coast 77 N17): Leader Patrick Leonard email patbrenda.leonard@bigpond.com or Ph 5456 4135 Mobile 0403 592956. Participants on this field trip will **meet at 1000** to allow travel time from Brisbane. The walk will follow a formed, level track and is expected to last about 2 hours 30 minutes. Bring morning tea and a picnic lunch. The Maroochy Botanic Garden is a bushland site with both wet areas and dry sclerophyll forest. It has proved to be a rich site for Boletales, as well as a number of other mycorrhizal species. As fruiting is very weather dependant Patrick will check the area the day before the trip – if there are no fungi fruiting, the field trip will be switched to Buderim Forest park, a rainforest site 10 minutes drive away.

6 October, 2007: Main Range National Park, Cunningham's Gap: Leader Diana Leemon Ph 3362 9575 (AH) 3202 8809 Mobile: 0400 895 081; email diana.leemon@dpi.qld.gov.au. The track is formed but undulating, so requires a reasonable level of fitness. Participants are to **meet in the Car Park at Cunningham's Gap (top of range) at 9:15 am**. This is a one and a half hour drive (approx.) from the Brisbane CBD. Field time will be approximately 2 hours. It is suggested that participants pack morning tea and lunch. However, lunch could be bought from one of the cafes at Aratula on the way back to Brisbane.

10 November, 2007: Linda Garrett Park, Mapleton (Sunshine Coast hinterland): Leaders Gretchen Evans and Lin Fairlie Ph 5453 8038, Mobile: 04 0077 2602 or email linfair@bigpond.com. The terrain will be level and along a normal walking track. **The meeting place will be the Mapleton Pub Car Park at 0900**. Drive time is approximately two hours from Brisbane. After meeting there will be a short drive along Obi Rd, which is unsealed, for about one kilometre, then turn right into Delicia Rd to the starting point at Linda Garrett Park (wet sclerophyll bushland). Field time will be approximately 3 hours, including travel time from Brisbane, this trip will take most of the day, so it is suggested that participants bring morning tea and lunch.

8 December, 2007: No proposal has been received yet, but a possible location is the Botanic Gardens at Redcliffe. For further information contact Jon Atkinson at 0402426699 or email buildingbistro@hotmail.com.

FIELD TRIP REPORTS

The **7 July field trip** was led by Ken Cowell and Floss Wainwright, with seven persons attending. The very dry conditions, and the fact that Kalinga North had just been covered with fresh mulch, meant a last minute change in venue to Chermerside Hills.

Twelve different species were seen during the morning, with repeated sightings of both *Pycnoporus coccineus* and a *Cortinarius sp.* Also seen were *Cortinarius archeri*, *Panus fasciatus*, *Omphalotus nidiformis*, a very juvenile *Amanita* possibly *ochrophalloides*, a white film on wood, possibly the start of an *Irpex*, a young bracket on wood, and a small group of puff balls.

On **11 August, 2007** Klaus Querengasser led a small group of six on the field trip through his property at Boonah. His description of the terrain was accurate, the off track walk followed the ridge line for quite a distance then dropped down a steep slope to the creek where everyone enjoyed lunch in the shade. The return was via the dry creek bed for about 1.5 km with a final fairly steep ascent over a scree slope to the cars.

At least twelve different fungi were seen. The first, a very dehydrated specimen of *Pycnoporus coccineus*, then Jon Atkinson's eagle eye spotted a patch of fairly mature *Cyathus stercoreus* on dry cow dung. On closer inspection many of the cow pats hosted similar colonies, some may have been a different fungus but were too dehydrated to differentiate. Another cow pat bore several small yellowish brown pins which bore some similarity to *Leotia*. Then Jon Atkinson made another discovery of a hard, light coloured, roundish ball growing out of a termite mound. The embedded area was exposed with a lot of hard work – this specimen resembled a *Pisolithus*. Down towards the creek there was a log bearing four different very dehydrated species: a gilled bracket, possibly *Lentinellus* sp; a pored bracket, a ?*Phellinus* sp; and the first *Schizophyllum commune*. Later beside the creek bed a fallen log hosted a large number of *Schizophyllum commune*, even with fresh growth on the underside of the log.

Other sightings of interest were a green ?slime mould on rocks in the shady gully; a rose robin and a dingo pup.

FUNGI IN FOCUS: *Panus fasciatus*

Panus fasciatus

These fungi were seen in the Chermide Hills during the July Field Trip. The brown caps to 50mm in diameter, are convex then maturing to deeply funnel shaped (infundibular), with decurrent brown gills, that are often forked. The caps and stems (stipes) are very hairy. This cluster of five were growing on piece of dead wood – probably an *Allocasuarina*.

It is a Fungimap target species.



Photograph by Ray Baxter

THE QMS/IBISCA PROJECT REPORT

Correspondence was drafted for the QMS Committee to send to the Minister for the Environment regarding the presence of *Favolaschia calocera* in Lamington NP; and to Dr R Kitching, seeking reimbursement of some of the project costs. To date no replies have been received.

The survey report has been finalised. Formal copies were given to the Secretary for circulation to Dr R Kitching (IBISCA Project), the Queensland Herbarium, the Minister for the Environment and Multiculturalism, the Executive Director of Environmental Protection Agency; South East Queensland Catchments, and Fungimap.

Comprehensive scientific data, based on taxonomic studies of specimens collected, remains dependent on the time available to the experienced taxonomic mycologist.

FUNGIMAP 2007 CONFERENCE REPORT

by Noreen Baxter

The Fungimap 2007 Conference, was held from Thursday, 31 May to Tuesday, 5 June 2007 at Bornhoffen PCYC Camp, Natural Bridge, Queensland. The QMS Committee allocated time at the meeting on 14 August for participants to report on the "Fungimap Experience". Summaries of reports are included on page 6.

As one who has been privileged to attend all four Fungimap conferences, the standout feature continued to be the infectious enthusiasm of the professional mycologists who so willingly shared their knowledge with everyone. Each conference has been like a whirlwind of mycological knowledge and experience with the professionals at the vortex drawing all comers into the core.

The conference format was:

- Friday a full day of talks, ending with the keynote address after dinner;
- Saturday and Sunday morning local forays, led by experienced mycologists;
- Saturday and Sunday afternoon eleven different workshops were conducted;
- Monday a full day foray to Binna Burra.

The Friday talks, given by specialists in the specific topics covered, were excellent. The speakers were:

- Roy Halling, from New York Botanic Gardens; David Orlovich (NZ); Ian Hood (NZ), all internationals;
- Tom May (RBG Melbourne); Katrina Syme (WA); Paul George (Vic); Karl Vernes (NSW) from interstate; and
- Tony Young; Mike Hall; Ceri Pearce; and Evelin Tiralongo from Queensland.

The keynote address "The Lamington National Park and its Macrofungi" was delivered by Dr Tony Young. He concluded with a recital of bush poetry by Banjo Patterson and C. J. Dennis.

Fungimap President, Tom May, advised that the most commonly reported Fungimap target species are *Oudemansiella radicata*, followed by *Amanita xanthocephala*, *Omphalotus nidiformis* then *Mycena interrupta*. He described how the 25,000 target species distribution records match the available Herbarium distribution data. An Australian virtual herbarium, of all data-based specimens in Australia, has been established and can be accessed at www.rbg.vic.gov.au/avh/.

The Saturday forays went to rainforests at Natural Bridge; the Numinbah Environmental Education Centre; Quamby Falls Lodge, where the owners Normajean and Ian Gaskin guided the forays; and to Burnbrae where the truffle finders found one or two possibly unidentified species, the owners, June and Gordon French, were away and missed the excitement.

Sunday most of the foragers visited Eucalypt forests where, due to the extended drought, few fungi were found so some teams adjourned to more productive sites. (Rain drenched the Numinbah valley on the Tuesday and Wednesday after the conference.)

Each day the collections were reviewed by Tom May, then displayed with relevant information so everyone could study and learn about each specimen.

The hardest decision to make at the conference was which two workshops to attend as most participants wanted to attend every workshop. The workshop leaders were Roy Halling (2); Paul George & Ian Bell (2); Ian Hood; Karl Vernes; Tom May; Teresa Lebel; Tom May & Helen Rommelaar; Nigel Fechner; and Pam Catchside.

On Monday everyone travelled to Binna Burra for more forays.

Monday evening the Trivia night commenced with the Fungimap Choir, directed by Helen Rommelaar, singing the Fungimap Song. This was a truly magnificent performance. Later, each table composed and read a limerick (or three) – the standard was so good that every table deserved to win that competition! Copies of the limericks are available from rbaxn@acr.net.au.

Current scientific identification methodology has resulted in some fungi classification changes. This should not deter anyone from continuing to identify macrofungi based on reliable photographic sources, good descriptions and the use of dichotomous keys. Funkey, a computer programme for identification of fungi by selecting characteristics is under development by Tom May.

Finally, this was another truly wonderful Fungimap Conference, a credit to Fungimap, the speakers, and participants who made it such a great success.

Registrants to the conference came from all states Queensland, WA and Victoria were very well represented. Early planning is for the 2009 Fungimap Conference to be held in NSW – probably in the New England area.

FUNGIMAP CONFERENCE REPORTS BY PARTICIPANTS

Addresses given at the QMS meeting 14 August

All QMS members who had attended the Fungimap Conference were invited to address the August QMS meeting on their Fungimap Conference experience. Ken Cowell, Patrick Leonard and Jutta Godwin each gave a short address.

Ken Cowell spoke about how much he had enjoyed the whole experience briefly covering the conference venue, speakers and programme. He found the two workshops he attended, “Introduction to Cup Fungi” and “Photographing Fungi with a Digital Camera”, both enjoyable and educational. His talk was supported by the excellent photographs he had taken on the forays. At the conference he found the display of foray specimens with identifying information particularly interesting. Ken concluded by saying what a positive experience it had been for him, and that he hoped he would be able to attend the next conference.

Patrick Leonard explained how he had been studying fungi for about 15 years and had been involved in forays and conferences in the UK and NZ. He found the Fungimap Conference a different and special experience – he just wished that he had been able to attend such a conference when he first started as so much information suitable for all knowledge levels from beginners to the more experienced fungi followers was given during the conference. The two workshops he attended were “The Pileipellis” and “Curation Down Under”, he found both informative and educational. During his presentation Patrick showed photographs taken during the conference by Ian Bell, one of the co-presenters of the Photography workshop. Patrick was impressed by the detailed presentation of the foray specimens that appeared on display so rapidly after each foray. Patrick concluded by saying what a wonderful experience he found the conference, he commented particularly on how approachable all the international and Australian mycologists were and how well these experts interacted with all the conference participants. He recommended attending the next Fungimap Conference to everyone regardless of their fungal knowledge level, as the programme catered for everyone from beginner upwards.

Jutta Godwin was the final speaker. While she commented favourably on conference, she was disappointed in the content and presentation in one of the workshops she attended. However, she

found the “Funk! Fungi” workshop, which discussed ways of developing educational programmes for kids, students and adults very interesting. Jutta showed some of the power point presentation she has been developing incorporating the ideas discussed in the workshop.

Copies of Fungimap Newsletters, the Conference Programme and some of the photographs from the fungi exhibition were available for members to view.

SUMMARY OF QMS MEETINGS

At the AGM on 6th June, 2007 Jutta Godwin, Susanne Nelles and Ray Baxter retired from the Committee. Nigel Fechner, Rachel Griffith, and Karalyn Herse were re-elected, along with Diana Leemon (Vice President), Michael Powell (Secretary), Jon Atkinson and Klaus Querengasser. The efforts of the 2006 Committee members to get QMS up and running have been appreciated by all the members and we look forward to the new Committee carrying on the good work.

After the election of Office Bearers Teresa Lebel and Roy Halling each gave an address to the meeting. Both speakers were in Brisbane following the Fungimap Conference.

General Meeting 10 July: Diana Leemon reported that she had obtained a grant from SEQ Catchments for the purchase of two “Motic” Microscopes, and a digital camera. Similar microscopes were loaned by Motic for the Fungimap Conference and proved to be extremely useful. Also six QMS members had attended the Motic demonstration of the capabilities of the equipment at DPI on 4th July. These will be extremely helpful teaching tools for QMS – our thanks to Diana for obtaining this grant – preparing the grant application required a considerable amount of time.

The evening concluded with a thought provoking address by Nigel Fechner on “Conservation of Fungi”. It was particularly interesting to hear that Nigel had attended a two day conference on “Biodiversity” at which there was no mention of fungi until late on the last afternoon when he presented his paper. If people attending a biodiversity conference are so unaware of fungi no wonder the general public are even more so!!

General Meeting 14 August: This meeting was chaired by Diana Leemon who advised members that, due to his heavy work, study and family commitments Nigel Fechner had submitted his resignation as President and Committee member of QMS. Members were aware that the responsibilities of the President in establishing the Society and the QMS projects undertaken last year had added an enormous workload to Nigel’s already busy schedule. Diana thanked Nigel for his work in establishing QMS and expressed the appreciation of the Committee and members for the commitment, time and effort that Nigel had given to QMS. Nigel will continue to be the Scientific Adviser to the Committee and QMS.

In brief, the rest of the meeting covered:

The minutes of the previous meeting which had been circulated to members by email, a brief report on matters arising from the minutes was given.

- James Hansen accepted the role of organising the supper roster for future meetings.
- Klaus Querengasser and Jon Atkinson reported on the Boonah Field Trip and showed some photos.
- Fungimap Conference Reports by Ken Cowell, Patrick Leonard and Jutta Godwin were delivered, these are summarised on page 6.

MUSHROOMS FOR BREAKFAST - FUNGI AS A FOOD SOURCE FOR INSECTS

This address was given to the QMS General Meeting 8 May, 2007 by Dr Chris Burwell

Fungi provide a source of food and habitat for many insects. Several groups, particularly many beetles, are fungal specialists and in several cases highly specialised symbiotic relationships between insects and fungi have evolved. A very wide range of fungal groups and fungal tissues may be utilised as food. Other insects, especially saprophagous species that feed on decaying organic material, are more loosely associated with fungi and may be found elsewhere. In addition, predatory and parasitic insects that attack fungivorous species are often closely associated with particular fungi. I will only discuss a few examples of insect-fungal relationships here, mostly concentrating on obligate fungal feeders. For those interested in reading more, I recommend an extensive review by John Lawrence and Richard Milner (1996) published in the *Fungi of Australia* series.

Order Hemiptera - True Bugs

The majority of sucking bugs are plant feeders or less commonly predators, but feeding on fungi has been reported for a few groups.

Flat Bugs (Family Aradidae)

Aradid bugs are one group of Hemiptera that are definitely mycetophagous. Most Australian species are found associated with dead wood although in the northern hemisphere some species can be found on the fruiting bodies of wood rot fungi. Aradids have extremely long stylets that they use to deeply penetrate wood and tap into and suck the fluids from fungal hyphae. When not in the use, the stylets are coiled within sacs in the head capsule. In Australia, species from drier habitats are often subcortical, being found beneath the loose bark of dead trees. In moist rainforests they are usually found on the outside of slowly decaying bark, particularly on the underside of branches and logs on the forest floor. Australia has a diverse fauna of aradids from rainforests, including many wingless species (Monteith 1997). Aradids lead a relatively sedentary lifestyle and as a result 'colonies' of many individuals (including adults and nymphs of various ages) often build up beneath bark or suitable logs.

Order Diptera - Flies

Many families of flies include fungal feeders, particularly within the 'Nematocera' and Cyclorrhapha. Most groups are associated with softer, wetter fungi, particularly mushrooms and toadstools. The larvae of many species are only facultatively associated with fungi but a few families contain numerous truly mycetophagous species. I'll only discuss one of the more charismatic genera of true fungal feeders.

Tapeigaster species (Family Heleomyzidae)

Mushrooms collectors in southern Australia may be familiar with flies of the genus *Tapeigaster*. There are eleven species of *Tapeigaster* restricted to the wetter areas of temperate Australia, including the south-west corner of Western Australia and Tasmania. They are moderately large (housefly to blowfly sized or sometimes larger) brownish or orange coloured flies. *Tapeigaster* males are often seen perching on the fruiting bodies of agaric mushrooms and other fungi. They take up a position on the cap of the mushroom and defend it from rival males looking to muscle in on their territory. Apparently the males are so focussed on their defence that they often remain in place even when the mushroom is picked. *Tapeigaster* females have been observed flying beneath the mushroom cap where they are intercepted and mounted by the males. Not surprisingly, the larvae feed on the fungal tissue and at least five species of *Tapeigaster* have been reared from the fruiting bodies of agaric and bolete mushrooms and puffballs (McAlpine & Kent 1982).

Order Coleoptera - Beetles

Many beetle species are associated with fungi. Numerous families have at least some representatives that feed on fungi, and a number of families are almost exclusively fungivorous. Unlike flies, many beetles are associated with the drier, tougher, more persistent fruiting bodies of wood-rot fungi.

Dung Beetles (Family Scarabaeidae: Scarabaeinae)

The true dung beetles (Scarabaeinae) are a specialised group of scarab beetles that use dung, particularly mammal dung, as a food source for their larval stages. Around the world, some species of dung beetles are able to use alternative food sources (other than dung) for their larvae. Some can use rotten fruit or carrion, and Australian species of *Cephalodesmius* are able to 'manufacture' a dung-like material from fallen leaves, flowers and fruits (Monteith & Storey 1981).

Another alternative food source is mushrooms. The adults of several species of dung beetles are attracted to mushrooms. Australia has nearly 400 native dung beetle species and compared with elsewhere in the world, we have a relatively high proportion, around 10%, that are attracted to fungi. However, many of these species are also attracted to dung and probably use dung as the larval food. Using mushrooms as food for the larvae is much rarer, and has been documented for only two species in the world, one from Mexico and the other from Australia. The Australian species is *Onthophagus dunningi* (Fig. 1) that is found along the east coast from Townsville, Queensland to Victoria. It belongs to a group of five closely related species (the *dunningi*-group). All five species probably use mushrooms as the larval food, but only the biology of *dunningi* has been investigated.

The remarkable biology of *O. dunningi* was elucidated by George Bornemissa (Bornemissa 1971) who was instrumental in the introduction of African dung beetles into Australia. *Onthophagus dunningi* can use a number of different species of 'mushroom' including agarics and boletes, but in coastal areas the extremely toxic *Amanita verna* (although there is dispute whether this species occurs in Australia) is preferred. The adult beetles, both males and females penetrate the bulb of the mushroom beneath the soil. Up to 14 beetles have been found in a single mushroom and 6 to 8 beetles per mushroom are common. The adult beetles feed on the mushroom, shredding the mushroom tissue from the inside, burrowing up the stem and hollowing out the cap. Mating also occurs within the mushroom. Pairs of male and female beetles then work together to provision a nest. The female beetle burrows into the soil beneath the mushroom and the male passes her pieces of shredded mushroom tissue that she fashions into brood balls and lays an egg within. The brood ball is placed inside a chamber in the burrow. Each completed nest consists of 2-6 brood balls. The eggs hatch and the developing beetle larva feeds on the brood ball. Bornemissa also tested whether the developing larva could also feed on dung. He found that the larvae could not complete its development on dung and it seems that this species only uses mushrooms as a larval food source.

Pleasing Fungus Beetles (Family Erotylidae)

Erotylid beetles are probably all fungal feeders, both as adults and larvae. A number of species are commonly encountered feeding on mushrooms and bracket fungi in south-eastern Queensland. Most species are aposematically coloured with bright patterns of red or yellow and black. Fruiting bodies of *Laetiporus portentosus*, a large corky bracket occasionally found on living eucalypts becomes quickly riddled with holes through the action of erotylid larvae.

Darkling Beetles (Family Tenebrionidae)

Many species of tenebrionids are associated with dead wood, but members of four tribes (Bolitophagini, Toxicini, Scaphidemini and Diaperini) have become specialised to feed on the tough fruiting bodies of bracket and shelf fungi. One of the largest species (about 1cm in length) is the bolitophagine *Byrsax macleayi*, a species found in montane rainforests in south-eastern Queensland and northern New South Wales. Adults can sometimes be found beneath large

perennial brackets of *Ganoderma* growing on dead tree stumps and fallen logs. The head of the male is armed with an impressive pair of elongate horns and both sexes have some of the most powerful chemical odours of any tenebrionids that I have encountered.

Species of *Platydemia* (Diaperini) are common inhabitants of tough, dark-coloured bracket fungi on dead wood in south-eastern Queensland. Their presence in a bracket is often indicated by a cottonwool-like mass of dark, tangled filaments that are in fact elongate strings of faecal material produced by the larvae.

Minute Tree-fungus beetles (Family Ciidae) and their parasitoids (*Astichus* spp. - Eulophidae)

These are the beetles and wasps that originally piqued my interest in insect-fungal interactions and I'll discuss them in some detail. Ciid beetles are fungus feeders both as adults and larvae, the vast majority of them tunnelling in and feeding internally on the persistent fruiting bodies of wood-rotting fungi, primarily those of the order Aphyllophorales, the polypore or bracket fungi. Their small size makes them inconspicuous (0.5 - 7 mm in length with most 3-5 mm), but they are among the commonest, most diverse and abundant groups of beetles found in bracket fungi. Worldwide there are at least 1000 species of ciids. In mainland Australia there are about 120 known species, of which only 12 are described (John Lawrence pers. comm.). Most ciids are cylindrical, brown or black (but with some patterned) and vary from smooth to highly setose. The males usually have various horns or projections on the head and/or the pronotum and in some genera they have enlarged mandibles (Fig. 2). Males of at least some species use this armature to fight with each other in tunnels within the fungi they inhabit.

A cross section through the fruiting body of a polypore or bracket fungus usually reveals two distinct layers. The upper layer or context tissue is sterile while the lower layer is the reproductive, spore producing tissue referred to as the hymenium. In most polypores the hymenium consists of many vertical tubes so that the ventral surface of the fruiting body is covered with many pores, mostly very small, but sometimes quite large. However in some groups the pores are modified and the ventral surface may consist of many small spines or it may be maze-like or produced into gills like those of a mushroom. Most polypores are annual, but others are perennial with new layers of pores produced each year.

Ciids generally colonise a fruiting body once it has already shed its spores and sometimes long after the fungus dies (Fig. 3). In relatively arid environments ciids are capable of feeding in very old and dry fruiting bodies. Adult and larval feeding is generally restricted to the sterile context tissue, although the pore layers may be consumed in heavily infested brackets.

Particular species of ciid beetles tend to feed on a limited range of fungal species (oligophagous), although some have much broader host ranges than others. Previous work on the host preferences of ciid beetles from the northern hemisphere have found that the hosts of a particular beetle species generally fall within one of a small number of broad fungal groups (Paviour-Smith 1960, 1969; Lawrence 1973). For example the fruiting bodies of Hymenochaetaceae (eg. *Phellinus*), the paler trametoid polypores (eg. *Trametes* and *Lenzites*) and the conks of *Ganoderma* or *Fomes* show little overlap in their ciid beetle faunas. Whether the same pattern of host preference groups applies to the Australian fauna is yet to be demonstrated, however, collections of ciids from a large number and variety of fungal hosts are available. Dr. John Lawrence has accumulated a large number of specimens with fungal host data and in recent years I have collected ciids from over 350 samples of macrofungi.

Minute wasps of the genus *Astichus* (Chalcidoidea: Eulophidae) are mostly parasitoids of larval ciid beetles and are frequently reared from infested fruiting bodies of polypores. Species of *Astichus* are particularly charismatic wasps; most have strikingly patterned wings and bodies that are alternately striped with metallic green and purple (Fig. 4). They are rare in entomological

collections because they are only occasionally captured using general collecting techniques for microhymenoptera such as sweeping and malaise traps. In spite of the fact that two PhD students studying and collecting microhymenoptera (Ian Naumann and myself) had passed through the entomology department at the University of Queensland, the insect collection there (UQIC) contained only a single specimen of *Astichus*; which was collected by neither of us. However, since collecting polypores, I have reared literally thousands of specimens and to date I know of at least 15 Australian species, three times the number currently described.

Species of *Astichus* more-or-less fall into two groups that correspond to the subgenera *Closteromphale* and *Astichus*. Species of *Closteromphale* (Fig. 4 left) are generally stouter with shorter legs and antennae and less boldly patterned wings. These species appear to spend most of their time within the fungal fruiting body and probably attack the ciid beetle larvae within their own feeding tunnels. Species of *Astichus* sensu stricto (Fig. 4 right) are more elongate with longer legs and antennae and have more clearly demarcated wing patterns. Females of these species appear to attack the ciid larvae and oviposit from the outer surface of the fungal fruiting body.

Establishing which species of ciids are attacked by species of *Astichus* can be problematic as two or more species of beetle are frequently found inhabiting the same fruiting body. However, particular species of *Astichus* do appear to be associated with broad groups of fungal hosts in much the same way as their beetle hosts. A number of species are most commonly reared from the paler tramatoid genera while at least two are almost always associated with very woody species of *Phellinus* in the Hymenochaetaceae. However, one particularly common, described species, *Astichus bilineatus*, has been reared from a very wide variety of hosts from across several groups of bracket and shelf fungi.

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Figures and Captions are included on the following pages.

Figures and Captions



Figure 1. A male *Onthophagus dunningi*, one of only two species of dung beetles proven to use mushrooms as a food source for their larvae.



Figure 2. Examples of New Caledonian species of ciid beetles showing some of the variety in coloration and head and pronotal armature found in the family. The beetle on the far right is a species of *Octotemnus*, a genus in which males often have enlarged mandibles.



Figure 3. Two examples of polypore fruiting bodies showing the entry holes made by colonising ciid beetles. On the left is a species of *Pycnoporus* (bright orange in life). On the right is a species of *Lenzites*, a genus of polypores in which the typical poroid ventral surface of the fruiting body (not visible here) is replaced with a gill-like arrangement.

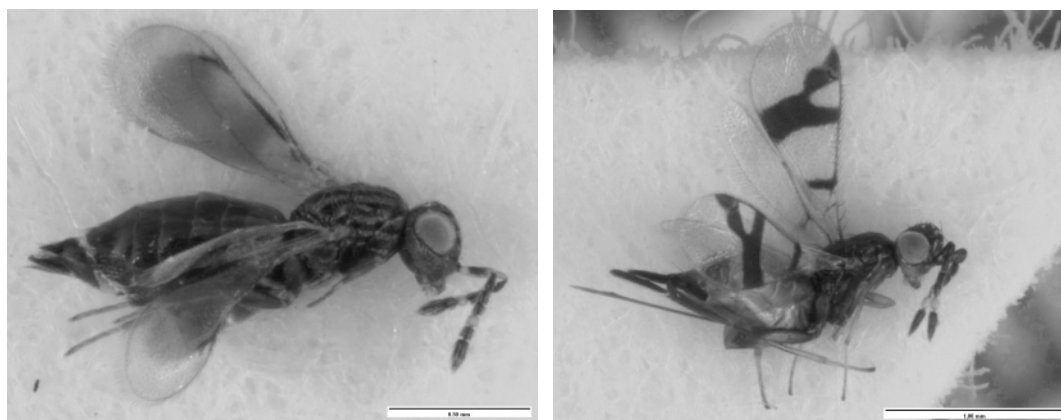


Figure 4. Two species of *Astichus* commonly reared from bracket fungi in Brisbane. On the left is *Astichus bilineatus* (scale bar 0.5 mm), a member of the subgenus *Closteromphale* that occurs in a wide variety of polypore species. On the right is an undescribed species of *Astichus* sensu stricto (scale bar 1 mm) that is mainly associated with paler trametoid polypores.

To assist those in attendance at meetings, notes on the addresses given are included in issues of the Queensland Mycologist. However, the notes never do justice to the topic as they do not reflect the enthusiasm of the speaker or cover the questions and discussions that were raised on the topic. So remember, where possible it is far better to attend the meetings, get the information first hand and participate in the invaluable information sharing opportunity.

Growing Rice Straw Mushrooms

by Paul William submitted by Sheryl Backhouse

Note from Sheryl Backhouse: One of the edibles I found interesting in Cambodia was what they call Rice Straw Mushrooms which are grown above ground but nowhere could I find the exact science so I called on Paul William who lives in San Francisco who knows his fungi and the following is what he sent me:

To summarize the bible of mushroom cultivation, "Growing Gourmet and Medicinal Mushrooms" by Paul Stamets, the Paddy Straw Mushroom (*Volvariella volvacea*) are prodigiously fast-growing and thrives at 75-95 F. (24-35 C.) and dies below 45/7 (F/C) degrees. It is growable outdoors, using simple, low-tech methods (in contrast to most other mushrooms). The time from inoculation to fruiting is "awesomely fast", giving competitors (mould) little opportunity to flourish. After the rice harvest, farmers mulch their rice straw into mounds and inoculate with commercial spawn.

Substrates for Fruiting: "Straw, preferably rice, hardwood sawdusts. Wheat straw also supports fruitings, although not nearly as well as supplemented composted rice straw. One study showed that the best supplement for wheat straw is wheat bran (5%) and/or cotton hulls (10%). The pH optimum for fruiting falls between 7.5 and 8. This mushroom can be grown on uncomposted straw-based substrates, although yields are substantially improved if the substrate is "fermented" or short-cycle composted. If the rice straw is composted with supplements for 4-5 days, pasteurized and inoculated, yields can be maximized. The heat generated within the composting straw/cottonseed hull mass accelerates the growth of the thermophilic and heat-tolerant *Volvariella volvacea*.

Soaked straw is thrown into a tapering, trapezoid-shaped, open top and bottom, plywood form. Soaked cottonseed hulls are thrown around the outer inside edge of the frame, and then inoculated with grain spawn. Additional layers of straw/cottonseed hulls are layered down inside the wooden form in the same fashion. After 4-6 layers, the frame is lifted off. The mounds may be covered with plastic, or with heavy layers of straw which is kept moist. In as short as 7 days, mushrooms form. A plastic tunnel can help to maintain humidity and warmth."

The most comprehensive English book on the cultivation of this mushroom is by S.T. Chang, published in 1972 entitled "The Chinese Mushroom (*Volvariella volvacea*): Morphology, Cytology, Genetics, Nutrition and Cultivation".

Update from Tom May, an expert I (Sheryl Backhouse) rang who works at the Botanical Gardens in Melbourne: "It has been found recently in lawns in Darwin and was written up in 2006 in Australian Mycologist Volume 25 Part 2 page 65.

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