

A record of *Amanita muscaria* (L.) Lam. (Basidiomycetes: Amanitaceae) from Wentworth Falls, New South Wales, Australia with a review of some literature on the ecology of the species within Australia

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Abstract: Four fruiting bodies of the almost cosmopolitan fungus *Amanita muscaria* (L.) Lam. (Basidiomycetes: Amanitaceae), were collected from a small *Pinus radiata* D. Don (Pinaceae) plantation at Wentworth Falls, New South Wales, Australia on 12 July 2006. No other fruiting bodies were obtained within the pine plantation and none were obtained from adjacent Sydney Sandstone Ridgetop Woodland dominated by *Eucalyptus piperita* Sm. (Myrtaceae). A review of some papers dealing with this fungus in Australia is provided and some of these papers are briefly discussed.

Introduction

Amanita muscaria (L.) Lam. (Amanitaceae) is one of the most easily recognisable of all basidiomycete mushrooms in the fruiting (sporophore) stage and is mostly associated overseas with the roots of trees belonging to such genera as *Quercus* (Fagaceae), *Betula* (Betulaceae), *Cupressus* (Cupressaceae), *Pinus* (Pinaceae) and many other trees, including *Nothofagus* (Fagaceae) in New Zealand (Stevenson, 1962; McKenzie *et al.*, 2000). The species is ectomycorrhizal (e.g. Malajczuk *et al.*, 1981, 1984; Newton, 1992; Nehls *et al.*, 2001) with hardwoods and conifers; growing alone or gregariously, and sometimes in fairy rings. Coniferophyta and other primitive trees are the main hosts and in Australia this fungus has been mostly associated with *Pinus* plantations (e.g. Chu-Chou, 1979, 1980; Dunstan *et al.*, 1998; Sawyer *et al.*, 2001, 2003) although it is now invading native plant communities (e.g. Horan *et al.*, 1988; Ratkowsky & Gates, 2002, 2005).

Amanita muscaria var. *muscaria* is probably the most famous of all toxic mushrooms. It is vernacularly known as the Fly Agaric, because if you crush some in a saucer of milk, this will attract flies, which usually become stupefied and drown (viz. an early insect control method around the house, before Mortein and Baygon!). The active poisonous ingredients of the fungus are muscimol and ibotenic acid (e.g. Krogsgaard-Larsen *et al.*, 1981; Gennaro *et al.*, 1997; Michelot & Melendez-Howell, 2003). *Amanita muscaria sensu lato* has a wide geographic distribution, occurring in Europe, Asia, Africa, Australia, New Zealand, and North, Central and South America (e.g. Oda *et al.*, 2004; Geml *et al.*, 2006). *Amanita muscaria* has been confirmed from Australia since the 1940s (see May & Wood, 1997).

Observations

On 12 July 2006 I collected four fruiting bodies of *A. muscaria* from the deep leaf litter at the bases of two

mature *Pinus radiata* D. Don (Pinaceae) trees, growing in an old mini-plantation on private land at Wentworth Falls, Blue Mountains, New South Wales. The only other fungi detected within the area were several specimens of a buff-brown *Boletus* sp. No other fruiting bodies of *A. muscaria* were found. In a nearby Sydney Sandstone Ridgetop Woodland, no fungal species were found, despite extensive searches over the next few days during similar weather conditions (viz. cool, cloudy, with a few sunny periods, slight breeze, 15-18 degrees Celsius, light rain the previous night). The vegetation of the *Pinus* area is depauperate in biodiversity and is mostly comprised of introduced species and includes the following taxa (* = introduced species): **Cedrus atlantica* (Pinaceae), **Cupressus* sp., **Chamaecyparis lawsoniana* (Cupressaceae), **Rubus fruticosus*, **Cotoneaster glaucophyllus*, **Pyracantha* sp. hybrid (Rosaceae), **Lonicera japonica* (Caprifoliaceae), **Eragrostis curvula* (Poaceae), **Ficus* sp. (Moraceae), *Pittosporum undulatum* (Pittosporaceae) and several others. The area has contained a dwelling which burnt down over 30 years ago and the pine trees had presumably been planted in association with this habitation.

Discussion

In over 40 years of bushwalking in most States of Australia and in many overseas countries, this is the first time I have ever noticed this species of fungus. The northern range of *A. muscaria* in Australia is Sydney and the Blue Mountains region and it has been more extensively found in southern New South Wales, Victoria, Tasmania and south-eastern South Australia (May & Wood, 1997), presumably reflecting climatic conditions similar to other distributions of the species in the northern Hemisphere (viz. temperate to arctic zones in boreal forests). In more recent times the fungus has started to invade native habitats such as wet and dry sclerophyll forests (e.g. Horan *et al.*, 1988; Johnston & Buchanan, 1998; Ratkowsky & Gates, 2002, 2005), though there was no indication of its presence within the Sydney Sandstone Ridgetop Woodland community adjacent to the old *Pinus radiata* plantation at Wentworth Falls. Ratkowsky & Gates (2005) found *A. muscaria* at 10 sites in southern Tasmania where it was also found to be rare (viz. it was encountered in less than 15% of the total number of visits to those sites). These sites encompassed wet forests, a dry sclerophyll forest and a cleared area. The fungus appears to be more common in *Pinus* plantations where up to 10 genotypes may occur (Sawyer *et al.*, 2001). The presence of common genotypes of *A. muscaria* at three sites investigated by Sawyer *et al.* (2001) indicates that they were introduced as vegetative inoculi when *Pinus* seedlings were planted and have persisted for 30-35 years in the soil. Since the *Pinus radiata* trees at the Wentworth Falls site are in the main at least 40-50 years old, it would be interesting to determine if the fungus has persisted there for this amount of time as well.

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