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# Chapter 1

## The rise of wild mushrooming in Australia

### A fungal awakening

Deep in the bush, tiers of luminous ghost mushrooms adorn an old stump. On a busy urban street, lawyer's wigs push through the disturbed soil of a newly constructed roundabout. And in the blistering sands of the Australian desert, a black powderpuff stands tall, despite the extreme heat. Although fungi are often overlooked, there are few environments they have not managed to colonise. The production of sporophores (spore-producing structures such as mushrooms) and the dispersal of spores characterise fungi as some of the oldest and most widespread organisms. With their myriad colours and forms, fungi captivate and enchant, provide delicious food, and occasionally, send the feckless forager to the grave. Welcome to the Kingdom Fungi.



Roaming the autumn forests in search of fungi is an increasingly popular Australian pastime. While fungi have mostly been the domain of naturalists and scientists, a growing band of foragers is discovering the delights of wild edible fungi. Humans foraged for wild foods until cultivation and agriculture became the way of life for most people. Foraged fungi provide subsistence food and cherished delicacies, psychotropics and pharmaceuticals. In developing countries, they help alleviate hunger and poverty. In the developed world, they are consumed mostly as a gourmet speciality. While many countries have long traditions of eating wild edible fungi, this is less common in English-speaking countries, including colonial and post-colonial Australia.

Australia's food industry is rapidly evolving. The movement of people and food across the world has seen new food cultures emerge and revived old ones. The 'foodie phenomenon' is flourishing. A growing do-it-yourself culture has contributed to a resurgence of foraging as a way to source local, seasonal and unadulterated food. Gastronomy is omnipresent on all media platforms. Chefs increasingly use foraged fungi, now a selling point of many high-end restaurants.

Stories about the edibility of fungi have appeared in Australian newspapers since the 1830s. However, in the last three decades the 'food and lifestyle' sections of weekend newspapers have embraced wild edible fungi with newfound zeal. Since the publication of Richard Mabey's *Food for Free* in 1972, numerous European and American books on foraging have been published. The now global Slow Food movement advocates foraged food as an alternative to industrialised agriculture. For some people, foraging for fungi and other

◀ *Macrolepiota clelandii* (Australian parasol) – a mushroom whose name and edibility has been clarified in recent decades.

foods is part of the drive towards self-sufficiency, paralleling guerrilla gardeners who grow food in neglected public spaces. For others, the return to foraging recognises the value of Indigenous ecological knowledge. While tasty, fungi are low in fat and carbohydrates. They offer relatively few kilojoules and little nutritional value relative to the labour required to collect them. For many in the Western world, wild edible fungi provide more than flavour and texture, with the 'foraging experience' itself being richly symbolic.

Australia is a fungal paradise. About 5000 species of larger fungi (those with visible sporophores) have been described across the continent and this number is increasing. Although the significance and distribution of Australian fungi are becoming better understood, little is known about their edibility outside Indigenous communities. In contrast, fungi are widely used by other cultures across continental Europe (particularly in Slavic countries), Russia and in some African, South-east Asian and South American (especially the Venezuelan Amazon) regions. Despite the lack of widespread knowledge about the edibility of most native Australian fungi, the edibility of a handful of exotic species that grow in Australia is well established. However, edibility and palatability are not the same thing and while most species are not inherently poisonous, many are too rare, small, tough or tasteless to consider eating. This book helps the reader differentiate the desirable from the deadly.

### **Slow mushrooming**

Learning to identify fungi accurately takes time. Central to the philosophy of this book is our recommendation that foragers take a slow and judicious approach: a 'fungal apprenticeship' of sorts. Building comprehensive knowledge reduces both poisoning risk and environmental harm. This begins with understanding the ecological significance of fungi in the context of their environments. Fungi are not isolated entities but live in close association with other organisms and their habitats. Being able to recognise, for example, the plant species or habitat types with which a particular fungus associates is essential to accurate fungus identification.

This is the first guidebook to provide comprehensive information about the edibility of fungi found in Australia. The timing is significant as it reflects both a growing mycological knowledge and the groundswell of interest in foraging for wild food. This book could not have been written sooner. Writing about fungi in Australia is not just a matter of transferring knowledge from elsewhere but allowing local knowledge of Australian fungi to develop, as new understanding about their life histories, taxonomy and distribution emerges.

This book differs from other Australian fungus field guides in that it focuses on a small group of edible fungi (and their toxic lookalike species). Additionally, a handful of species with 'emerging knowledge' regarding their edibility, as well as a selection of cultivated species are discussed. Unlike most field guides that contain up to several hundred species, this book urges readers to concentrate on learning fewer species thoroughly, rather than many species superficially. After all, it is better to leave an edible species uneaten than mistakenly consume a toxic one.

Identifying fungi grows from direct experience in the field and astute observation over time. Only by taking time can one become familiar with the important diagnostic features

and extent of variation that can occur within a single species. These differences occur depending on the developmental stage of the sporophore; where and in what it is growing; as well as differing exposure to wind, rain and sun.

### Fungus, sporophore, mushroom or toadstool?

As with any specialised field, particular terms and concepts are necessary to describe fungi. While we have tried to avoid jargon as much as possible, technical accuracy is important to enable readers to cross-reference information with other texts and sources. Various terms for fungi are explained in the information box below and the Glossary.

Scientific names are the internationally accepted standard, but vernacular names (common names) make fungi more accessible to wider audiences. Whether one chooses to use scientific or vernacular names, what matters most is that the species referred to is clear. We refer to each species by the currently accepted scientific name and the most commonly used vernacular name appropriate to the Australian context of this book. Keep in mind that the majority of fungi in Australia do not have vernacular names, but some have several, which can differ across regions. Because names change over time and place, we have also included synonyms (earlier scientific names) and other vernacular names in use. See Chapter 6 for further discussion of names. Conventions for names are explained in the information box on the following page.

#### Terms for fungi

- *Fungus* (pl. *fungi*) refers to the entire organism, including its mycelium and reproductive structures.
- *Mycelium* (pl. *mycelia*) is the matrix of threadlike branching fungal cells known individually as a hypha (pl. *hyphae*) that constitute the feeding body.
- The word *mushroom* commonly refers to a 'cap-and-stalk' style reproductive structure of a fungus. However, the reproductive structures of fungi also have other forms, such as puffballs, discs, cups and corals. Hence, we use the more inclusive term *sporophore* to refer to all the various forms of reproductive structures (often inappropriately called *fruiting bodies*).
- The word *toadstool* once referred to poisonous mushrooms but is now seldom used.
- *Mycota* (all the fungi of an area) is the fungal equivalent of fauna and flora. Some authors use the term *funga* in this context.
- The word *foraging* refers to searching for fungi of scientific interest whereas *foraging* specifies searching for edible species.

## Conventions for names of fungi

- The book follows the scientific convention of italicising scientific names (with the first letter of the genus capitalised) and using lower case for vernacular names (except when they contain a proper noun). The genus name is usually abbreviated when it appears more than once. For example, *Agaricus campestris* is written in full on first mention and abbreviated to *A. campestris* on subsequent mentions in nearby text. Further species within an aforementioned genus also appear in the abbreviated form, e.g. *A. xanthodermus*.
- The abbreviation, 'spp.' means more than one species within a genus, e.g. *Suillus* spp. could refer to *S. granulatus* and *S. luteus*.
- Vernacular and scientific names are used in different ways throughout the book to maximise readability and scientific accuracy. Generally, on first mention of a species within a chapter, both scientific and vernacular names are given (except where there is no vernacular name). On repeated mentions of a species, only the scientific name is used. In Chapter 8, only scientific names are used to simplify the text. In the recipes in Chapter 10, vernacular names are mostly used.

## Ecological foraging

Our starting point in developing this guide to wild edible fungi is their ecology and conservation. Sustainable foraging hinges on foragers' appreciation of the ecological significance of fungi and potential impacts of their harvesting. This book has been researched over many years and in conversation with a range of experts who know and understand fungi, including mycologists, naturalists and conservationists, foragers and chefs, toxicologists and toxinologists. All have brought their expertise to the discussion, enabling the best possibilities for fungi and their environments to thrive. Not everyone agrees that foraging is a good thing, usually because of conservation concerns. However, foraging is increasing in Australia regardless of whether one agrees with it or not. Hence, we endeavour to unite foraging and conservation by recognising common ground and potential reciprocal benefits, while anticipating issues that could arise from foraging.

Fungi are sensitive organisms. Like animals and plants, they are vulnerable to habitat disturbance. Some countries have environmental and social problems due to insensitive and exploitative harvesting of wild edible fungi. Most European countries have fungi on Red Lists (inventories of the conservation status of species) because of their elevated extinction risk. This has resulted from large-scale effects of agriculture, forestry, urbanisation and subsequent climate change that reduce the quality and extent of habitat but foraging also has effects. Foraging and fungal conservation, however, are not necessarily mutually exclusive. As fungus conservationists, we take conservation concerns seriously. Informed and responsible collection offers the best chance for both fungal conservation and fruitful foraging. The aim is to avert the chance of Australia following a similar path to other countries, where over-harvesting has divided cultures, caused environmental damage and

threatened fungi, resulting in regulation of fungus harvesting. Given the vastness of the Australian continent and the scarce resources allocated to conservation, regulation is unlikely to be effective in the Australian context. The onus is therefore on the individual to forage conscientiously and responsibly. Australia has the opportunity to learn from the oversights of other countries and ensure safe and enjoyable foraging practices align with the ongoing survival of Australia's unique mycota.

### Australian knowledge of edible fungi

While Australians, especially those in rural areas, have picked field mushrooms for generations, mushrooming is more typically associated with continental European and other immigrant cultures. Today in Australia, foraging is usually driven by curiosity and the desire for new culinary experiences rather than necessity. The thrill of the 'hunt' is deeply primal and foraging also provides the opportunity to discover old traditions and new terrains.

Australia's geographical isolation and varied environments, climates and conditions have produced a diverse and particular mycota, among the most diverse in the world. Most Australian fungi are yet to be scientifically named and described. In the absence of records of Indigenous practice, the edibility of most species is unknown. Hence, wild mushrooming is different in Australia compared to Europe, because there are different fungi and more species. There is also little cultural tradition of eating fungi among most post-colonial Australians. This means fungi have not been part of inherited knowledge, education or general awareness in the same way as in continental Europe. Long histories of cultural interest in fungi in continental Europe stimulated their scientific research. This led to the founding of mycological societies and gave rise to resources such as field guides. Australia is in an early phase of discovery, but it is an exciting transitional time with many possibilities to learn both from Indigenous knowledge and from elsewhere.

Many books on fungi describe how they have been eaten for thousands of years in places such as Chile, China, ancient Greece and Rome. Less often discussed is that Indigenous Australians could have been among the first people to eat fungi. However, the oral transfer of knowledge between generations means fungus consumption is virtually undocumented in written records. We incorporate what is known about Indigenous Australians' use of fungi in published literature throughout the book. Although fungi are less commonly associated with deserts than forests, most of the scant knowledge about Indigenous Australians' use of fungi refers to desert species, particularly desert truffles (at least seven species are known, including *Elderia arenivaga* and *Mycoclelandia bulundari*). In temperate regions, early European settlers, most notably James Backhouse, documented Indigenous Australians' use of edible fungi such as *Laccocephalum mylittae* (native bread), *Fistulina hepatica* (beefsteak fungus) and *Cyttaria gunnii* (beech orange). Fungi are also used for their medicinal qualities and other purposes. The spores of *Podaxis pistillaris* (black powderpuff), for example, are used to darken the white whiskers of Indigenous Australian men and to repel flies. *Trametes coccinea* (scarlet bracket) is known for its antibiotic qualities for curing sores and mouth ulcers. Other species such as *Laetiporus portentosus* (white punk) were used as tinder and to

carry fire. As with indigenous cultures all over the world, some Aboriginal and Torres Strait Islander groups avoided fungi. There were those who made use of their utilitarian values and those who abstained because of cultural beliefs.

Australian field naturalists have long been interested in fungi. For example, the Field Naturalists Club of Victoria (FNCV) has held fungus forays since its founding in 1880 and has had a separate fungus group since 2004. Active fungal studies groups exist in most Australian states and territories. Many hold forays to help members improve their identification skills and to collect information about species distribution. Nationally, Fungimap is a non-government organisation that promotes public interest in fungi and contributes to conservation policy development. Reports from the FNCV journal *The Victorian Naturalist* in the nineteenth century reveal that field naturalists also collected fungi as food. However, the focus of fungal studies groups in Australia today is the scientific study of fungi, with none providing information on the edibility of fungi. Public interest in fungi has grown since the 1980s and stimulated the production of fungus field guides, but edibility is mentioned only in the rare exception.

### Humans and fungi cross continents

Fungi, along with animals and plants, have been accidentally and deliberately introduced to Australia, especially since the first European settlers. This has probably happened in northern Australia for thousands of years as part of trading relations between Indigenous Australians and Indo-Pacific Islanders. However, few early European explorers and settlers either noticed or paid attention to fungi. Those who did sent them to Europe for identification, as there was no recognised mycological expertise in Australia. By the time they made the long journey by sea to Europe, specimens were usually in poor condition, often desiccated or ravaged by insects. Hence, it would have been challenging for European mycologists to make accurate identifications. Most of the early describing and naming of fungi was based on general morphology (form) and comparison with known European species. Not only names but knowledge about edibility was 'transferred' to the Australian fungi they identified. Expertise has grown in Australia since the first local mycologists began making observations on fresh specimens in the 1880s. In recent decades, scientists have developed new techniques for classifying fungi that rely less on morphology and place more weight on genetic evidence. Consequently, Australian species previously thought to be the same as European ones have been found to be different and given new names accordingly. The edibility of these species, previously thought to be the same as the European species, remains uncertain. Knowledge about the edibility of Australian fungi (other than Indigenous knowledge) is therefore only starting to emerge.

Following the Second World War, successive waves of European migrants brought new knowledge about edible fungi to Australia. While this knowledge is valuable, poisoning risk also increases when both people and fungi switch continents. Species differ across continents but can appear superficially similar and identifications can therefore be easily confused. Around one-quarter of the current Australian population was born in other countries, and nearly half of all Australians have at least one parent who was born elsewhere. Migrants are

especially prone to poisoning because of the mismatch between foraged species in their countries of origin and the greater number and different variety of species found in Australia. A prime example is the confusion between the edible *Volvariella volvacea* (paddy straw mushroom), widely cultivated in Asia, and the toxic *Amanita phalloides* (deathcap), a mushroom introduced to Australia. This latter species is responsible for most fatalities from eating mushrooms worldwide. Given its lethality, it is one of the most important species every forager should learn to identify.

The most commonly foraged edible mushroom in Australia is probably the field mushroom (strictly *Agaricus campestris*, but this vernacular name in practice is applied to other species such as *A. arvensis* and *A. bitorquis*). However, changes in both agricultural practices and the built environment have resulted in different environmental conditions. The new conditions have favoured the toxic lookalike species, *A. xanthodermus* (yellow stainer), which has subsequently become more prevalent. Many foragers are not able to differentiate field mushrooms from yellow stainers, suggested by the fact that yellow stainers cause the majority of poisonings in southern Australia. While not lethal like the deathcap, this species can produce unpleasant gastrointestinal symptoms. This confusion reinforces the importance of learning not just the characteristics of edible fungi but also those of their toxic lookalike species. Given the uncertainties associated with the identification of field mushrooms and the lack of knowledge about the edibility of most Australian native species, other more easily recognisable species such as the introduced *Lactarius deliciosus* (saffron milkcap) and *Suillus luteus* (slippery jack) are becoming popular alternatives.

Foraging is an immensely enjoyable and low-risk activity for those who take a precautionary approach. It takes time and attention to develop the level of skill to make definitive identifications. Each species profiled in the book is comprehensively described and illustrated to give the reader an impression of the range of morphological variability (differences in shape, texture and general appearance) and colours that can occur within a species, along with the variation at different developmental stages. Foragers also need to know when to look as well as the types of habitats and associated vegetation where particular fungi are likely to be found.

Detailed profiles of toxic and edible mushrooms are provided in Chapters 8 and 9. Selecting the species to profile for this book was a long process of deliberation. Many considerations were taken into account including well-established edibility; palatability; ease of identification; the minimal chance of confusion with toxic lookalike species; and relative abundance. Further edible species are described in lesser detail along with information about commercially available species. Safely identifying edible fungi also means being able to recognise similar-looking toxic species and these are discussed alongside their edible counterparts, as well as in Chapter 8, which is dedicated to toxic fungi. The book concludes with advice on the preparation, preservation and cooking of fungi. A handful of generous mycophiles have contributed their favourite mushroom recipes for you to try. We hope the book provides a useful starting point for a long life of safe and pleasurable foraging.