GEMS OF NATURE

FUNGI

A SPECIES GUIDE

PETER ROBERTS & SHELLEY EVANS

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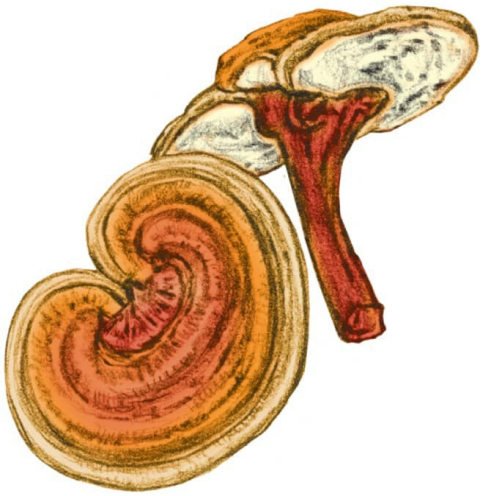

PETER ROBERTS & SHELLEY EVANS

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INTRODUCTION

Colorful, bizarre, mysterious—fungi have evolved an extraordinary range of weird and wonderful shapes and forms in every part of the globe, from the tropics to the poles. Titanic toadstools erupt from termite mounds, evil-smelling stinkhorns attract flies to spread their spores, flamboyantly colored corals emerge in the depths of forests… fungi are hard at work all around us, yet all too often they go unnoticed and unappreciated.

More than 75,000 species of fungi have been described worldwide and the numbers keep growing, year by year. This book dips into the kingdom of the fungi with a carefully chosen selection of 75 different species, each one of interest not just for its appearance, but also for the role it plays in the great chain of life.

Everyone knows that some fungi are edible and that mushrooms are cultivated for food. But did you know that most trees and flowering plants also depend on fungal partners for their nutrition? Or that all the wood in the world is rotted down and recycled by fungi—helping to create the fertile soils that plants need to grow? Or that many of the antibiotics we depend upon today were originally derived from fungi?

Each species featured in this book has its own particular lifestyle and this lifestyle often dictates its form. There are fungi described that look like miniature bird's nests and use raindrops to catapult their spores into the air, fungi that engulf their neighbors to create bizarre hybrid fruitbodies, fungi that attract insects with scarlet tentacles resembling flowers, fungi that protect themselves with leathery arms that open in the rain and close again when dry, fungi that entice foraging sows with the pheromones of wild boars.

Edible fungi are featured, including some of the less familiar species that are now finding their way onto supermarket shelves. Poisonous and hallucinogenic fungi are also here, as well as several that have been found to possess potentially useful properties—particularly in the search for new and better pharmaceuticals.

WHAT ARE FUNGI?

A hundred years or more ago, fungi were thought of as lower plants or cryptogams, on a par with mosses and liverworts. They did not produce flowers and their seeds were very small, but they were still plants of a sort. However, it gradually became clear that fungi had little or nothing to do with plants. They were not made of cellulose, like plants, but of chitin (a substance more usually associated with insects). They did not contain chlorophyll and could not use sunlight to convert carbon dioxide into sugars. As a result, in the 1960s, they were placed in their own grouping—the kingdom Fungi. Curiously, modern DNA research puts the fungi even farther from plants. Fungi are part of the opisthokonts—a group that also includes the animals. It seems animals and fungi once had a common ancestor, some time after plants went their separate way.

Modern systematics, based on analysis of DNA sequences, divides the kingdom Fungi into at least seven different groups or phyla. Although they are all of interest (fungi in the phylum Neocallimastigomycota, for example, live in the stomachs of ruminants, helping to break down plant material), most are microscopic and beyond the scope of this book. All the selected species in this book, therefore, belong either to the Ascomycota or to the Basidiomycota—the two fungal phyla that produce large, visible fruitbodies.

The Ascomycota

The Ascomycota contains at least 40,000 different species worldwide, many of them rather inconspicuous, but including such familiar groups as the morels and truffles, the cup fungi, and most of the lichens, as well as many microscopic molds and yeasts. They all produce their spores within microscopic cells called asci, which typically open under pressure when mature, shooting the spores out into the air currents.

The Basidiomycota

The Basidiomycota contains at least 30,000 different species worldwide and includes many of our most familiar fungi, including all the agarics (mushrooms and toadstools), puffballs and stinkhorns, bracket fungi, chanterelles, club and coral fungi, as well as the plant-parasitic rusts and smuts. All of them produce their spores on the external surface of microscopic cells called basidia (hence their name) and their fruitbodies have evolved in many ingenious ways in order to liberate these spores.

How this book is arranged

In this book, the species have been arranged in a similar way to most practical field guides, with the agarics (gilled mushrooms and toadstools) first, and the boletes or ceps second. Other non-gilled relatives—including chanterelles, brackets, and puffballs—follow in their various groups, while the larger ascomycetes—including the morels and truffles—complete the selection.

How do fungi work?

While animals and plants are made up of cells, fungi are made up of microscopically thin, tubelike hyphae. When they clump together, these hyphae can often be seen as cobwebby threads in damp leaf litter, in compost, or even on the surface of moldy food.

Fungi "eat" by absorbing food through their hyphal walls, mostly in the form of simple sugars and amino acids. If these are not immediately available, they can extract them from more complex substances by secreting enzymes. Animals, including ourselves, use similar enzymes in the stomach to digest food. Fungi do the same—only their digestive system is external.

Finding your way round a mushroom

When we look at a fungus, we are generally looking at a sporocarp—the spore-producing fruitbody that may be called a mushroom, a toadstool, a puffball, and so on. The real fungus—the cobwebby mycelium made up of hyphae—is generally beneath the soil, or spreading through the leaf litter, or running through a fallen log. It is rather as if oak trees grew hidden underground and all we saw were acorns periodically forming on the surface.

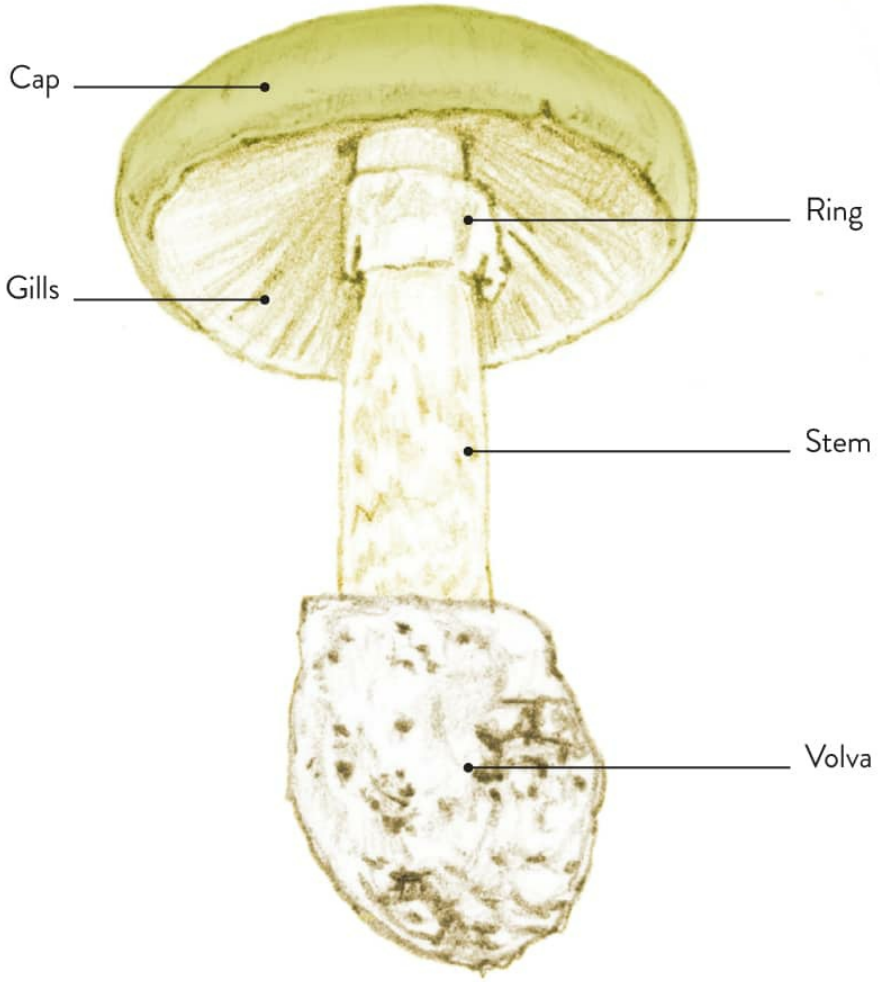
Take the Death Cap (*Amanita phalloides*, see opposite) as a classic example of a fungal fruitbody. It takes several weeks to develop on the mycelium, but once developed it expands quite rapidly from the button stage to maturity. It is this expansion that gave rise to the old idea of mushrooms and toadstools "growing" overnight.

The fruitbody has a distinct stem that lifts the cap and gills off the soil surface, the better to release spores into the air. The spores themselves (the fungal equivalent of seeds) are microscopic and are formed in their millions on the gills, which are covered by the cap. In the Death Cap, the immature gills are protected by a veil (membrane) that ruptures as the cap

expands, leaving a ring on the stem. A second, universal veil encloses the whole fruitbody when young, the remains of which are left as detachable patches on the cap and as a sack-like volva at the stem base.

Other fruitbodies—of bracket fungi, stinkhorns, or morels—vary enormously in shape and in their methods of spore liberation, but the basic spore-bearing principle is the same.

The Parts of a Fungal Fruitbody
Death Cap (*Amanita phalloides*)



PLANT & ANIMAL PARTNERS

Over 90 percent of the world's plant species depend on fungi for their nutrition. The two have evolved side by side and the partnership continues, with fungi and plants together supporting our whole global ecosystem today. Other new fungal partnerships have also evolved—with bacteria, algae, insects, and other animals.

How plants get their nutrition

Fungi are excellent recyclers, producing enzymes that break down complex materials to release their nutrients. They were among the first colonists of dry land and interacted with early, primitive plants. The relationship may have been parasitic at first, but gradually evolved into a symbiotic one. Fungi obtain sugars from their plant partners, and plants take essential nutrients from fungi, principally nitrogen and phosphorus.

The exchange occurs through mycorrhiza ("fungus roots"). In the commonest form, endomycorrhizal fungi live inside a plant's root system. These fungi belong to the phylum Glomeromycota—an unfamiliar group to the majority of fungus enthusiasts, as most can only be seen under a microscope. Far more familiar are ectomycorrhizal associations. Ecto means "external," and in this association the fungi live outside the plants, forming an interface with them by wrapping their hyphae around the roots. Comparatively few plant species are involved, but these include some of our commonest trees—oak, beech, birch, willow, alder, pine, fir, spruce, hemlock, eucalyptus, and southern beech. Their fungal partners include many woodland agarics, boletes, chanterelles, and truffles.

Natural recyclers

One of the reasons why fungi have developed a bad name for themselves —especially in the English-speaking world—is their association with rot and decay. Yet without decay, our whole terrestrial ecosystem would swiftly grind to a halt: we rely on fungi to turn dead plant matter—fallen leaves and stems, branches and trunks—into nutrient-rich humus and soil.

Most fungi are saprotrophs—a term that means "eaters of dead matter."

To rot things down and release the sugars and amino acids upon which they feed, fungi have evolved an array of useful enzymes. Some of these enzymes break down cellulose—the basic substance out of which plants are made.

Wood-rotting—a job for specialists

All plants contain cellulose, but woody plants also contain lignin—the substance that makes wood hard. Wood-rotters are present as small, dormant propagules in living wood, patiently waiting for their particular branch or twig to die. A change in the chemistry signals the end, and the dormant fungi get to work while the dead or dying branch is still on the tree. Most of these fungi are highly specialized, often growing on particular kinds of tree and no other.

When the branch hits the ground, however, the wood-rotting generalists battle over its remains—a struggle in which chemical weapons may be deployed to attack and defend a rich resource. Some species are quick colonizers, but they are replaced by slower, more pugnacious, species, so that a succession of different fungi appears on a fallen branch, as it gradually rots away.

FOOD, FOLKLORE & MEDICINE

Human beings are omnivores, and fungi have undoubtedly formed part of our diet since we first evolved. Cultural peculiarities, however, have led to some nations and communities being mycophiles—lovers of fungi—while others are mycophobic, with a deep distrust of the whole poisonous kingdom. Not surprisingly, this often colors folk beliefs and associations. The use of fungi in traditional medicine follows a similar pattern, but modern scientific medicine has been keen to explore their potential, with the result that many of today's most successful pharmaceuticals are fungus-derived.

Mushroom cultivation

Around one and a half million tons of Cultivated Mushrooms (*Agaricus bisporus*) are produced worldwide each year. But this only accounts for some 40 percent of world cultivation. Other species, including the Shiitake (*Lentinula edodes*) and the Tropical Oyster (*Pleurotus djamor*), together make up the rest, with production and consumption predominantly in eastern Asia, though many of these species are becoming more popular in the west.

The call of the wild

Many edible fungi are collected in the wild on a commercial scale because they are ectomycorrhizal species—those that form an intimate association with trees—and cannot be cultivated away from their hosts. The Saffron Milkcap (*Lactarius deliciosus*) and the Chanterelle (*Cantharellus cibarius*) are among the most sought-after species.

Truffles—the ultimate prize

Truffles (*Tuber* species) are the underground fruitbodies of ectomycorrhizal fungi whose spores are spread by animals attracted by pheromones and other tempting aromas. Some of these tempt humans as well, and species such as *Tuber melanosporum* have long been rare and costly items for European gourmets. In recent years, truffles have been semi-cultivated with varying success in truffières—plantations of trees inoculated with mycelium—but they still remain one of the ultimate luxury

foods.

Magic mushrooms and witches' butter

In mycophilic countries, fungi often played a positive role in folk tales, some hallucinogenic species—such as the Fly Agaric (*Amanita muscaria*)—achieving an almost sacred status among shamans seeking contact with the spirit world. In mycophobic countries, they were regarded with suspicion: the Witches' Butter (*Exidia glandulosa*), similar to the gelatinous Leafy Brain, was one of several fungi whose mysterious appearance could only be explained by witchcraft.

The fungal pharmacy

Fungi have long played a part in traditional medicine—especially in eastern Asia, where species such as the Lingzhi (*Ganoderma sichuanense*) are still highly valued today. In modern western medicine, antibiotics such as penicillin (derived from the mold *Penicillium chrysogenum*), cholesterol-lowering statins (derived from species such as *Aspergillus terreus*), and immunosuppressive cyclosporins (derived from *Tolypocladium inflatum*) are among many clinically proven pharmaceuticals with a fungal origin.

DISTRIBUTION & CONSERVATION

There are few, if any, places on planet Earth where fungi of some kind do not make themselves at home. Even individual species tend to be widespread, at least when compared to animals and plants. But this does not prevent some fungi from being threatened—mainly through habitat loss—making conservation a matter of increasing urgency.

A world of fungi, from pole to pole

No one knows how many different fungi exist, but a widely accepted estimate suggests around 1.5 million species, only a fraction of which are as yet described. These include not only the familiar larger fungi of the temperate zones, but also the less well-investigated fungi of the tropics—plus countless microscopic species. We do not usually think of fungi as marine organisms, but at least 800 species are adapted to life at sea—some being found as deep as the abyssal zone, 2000–3000 fathoms (4000–6000 m) below sea level. Even Antarctica harbors more than 600 known species.

Temperate and tropical fungi

Fungal species often follow ancient distribution patterns that span the continents. In the north temperate zone, many species are found in Europe, northern Asia, and western North America. Curiously, the Great Plains often cut this distribution short, so that eastern North America has a distinctive group of fungi all its own. A pantropical distribution is equally common, though sometimes South America is left out of the circle. In the southern hemisphere, where land masses are more sparse, Australia and New Zealand have many distinctive fungi not found elsewhere.

Fungi of forests and woodlands

When searching for fungi, most enthusiasts head for the woods. It is certainly the habitat that holds the greatest diversity of species, partly because so many fungi are leaf- and wood-rotters, partly because many of the more conspicuous fungi form associations with trees. Oddly, these ectomycorrhizal associations are less common in tropical forests where

fruitbodies may be disappointingly sparse.

Fungi of grasslands, dunes, and deserts

Grasslands, especially when grazed, hold many interesting species, particularly in Europe. Marshes, swamps, and bogs also have distinctive fungi, some associated with wetland trees. Even the drylands—steppes, deserts, and sand dunes—have specialized species.

Threatened habitats and species

Since the presence of a fungus is mainly indicated by its fruitbodies, it is not always easy to tell whether a species is genuinely rare or whether it only produces fruitbodies rarely, and not all the larger fungi produce fruitbodies every year. With lichens (where the whole fungus is always visible), rarity is easier to assess.

At present, it seems that the most vulnerable species are those suffering habitat loss—through the loss of ancient forests, increasing nitrogen levels in agriculture, drainage of wetlands, and other changes in land use. Several countries now include larger fungi on their national "Red Lists" of endangered and threatened species requiring conservation, some even giving them legal protection. More than 200 fungi have recently been placed on the global Red List of the International Union for Conservation of Nature, three of which—the Crimson Waxcap, the Apple Tooth, and the Violet Coral—are featured in this book.

THE
FUNGI

AGARICUS BISPORUS

CULTIVATED MUSHROOM

IMBACH

HEIGHT
Up to 3 in (80 mm)
CAP DIAMETER
Up to 5 in (120 mm)

FAMILY ~ Agaricaceae

DISTRIBUTION ~ North America, Europe, North Africa, Asia; probably introduced in Australia, New Zealand

HABITAT ~ In parks, gardens, roadsides

ASSOCIATION ~ In rich soil and compost, occasionally with conifers

GROWTH FORM ~ On ground, singly or in troops

ABUNDANCE ~ Common

SPORE COLOR ~ Chocolate-brown

EDIBILITY ~ Edible

Agaricus bisporus was first cultivated in France in the seventeenth century. Since then, mushroom-growing has become a worldwide industry producing more than 1.5 million tons per year. In the wild, the species is

usually brown and scaly. A less-common cream form was favored for cultivation until, in the 1920s, a white variant was discovered that has since dominated the market. The original brown form is now sold variously as “portabella,” “crimini,” or “chestnut” mushrooms, all recently invented commercial names. *Agaricus bisporus* contains protein, vitamins, and minerals, but also traces of agaratine, a known carcinogen, although the risk factor is low and on a par with that posed by peanut butter or wine.

The Cultivated Mushroom is a familiar species, but wild forms typically have brown caps, paler toward the margin, with flat feathery scales (more rarely cream and non-scaly). Gills are pinkish at first, becoming chocolate-brown. The stem is white and smooth, with a thickish but not large ring that may be weakly pendulous. The flesh turns pinkish in places when cut.

DISTRIBUTION

AGARICUS TRISULPHURATUS

SCALY TANGERINE MUSHROOM

BERKELEY

HEIGHT
Up to 3 in (75 mm)
CAP DIAMETER
Up to 2 in (50 mm)

FAMILY ~ Agaricaceae
DISTRIBUTION ~ Africa, southern Asia
HABITAT ~ In parks, gardens, roadsides, and woodland
ASSOCIATION ~ In rich soil, compost, and leaf litter
GROWTH FORM ~ On ground
ABUNDANCE ~ Common
SPORE COLOR ~ Chocolate-brown
EDIBILITY ~ Not edible

This splendid-looking species was first described by the noted British

mycologist, the Reverend Miles Joseph Berkeley, based on a collection made by his daughter in Zanzibar. It is now known to be widespread throughout tropical Africa, as well as India and South-Eastern Asia. The Scaly Tangerine Mushroom's unusual, angular spores led it to be placed in the small genus *Cystoagaricus*, but recent DNA research suggests it is a true mushroom (*Agaricus* species).

The Scaly Tangerine Mushroom has a cap that is hemispherical at first, becoming convex to flat. The cap surface is covered in fleecy scales that overhang the margin and are bright yellow-orange to orange. The gills are whitish at first, becoming chocolate-brown. The stem is fleecy-scaly and cap-colored, with a distinct ring.

DISTRIBUTION

AMANITA JACKSONII

AMERICAN SLENDER CAESAR

POMERLEAU

HEIGHT
Up to 6 in (150 mm)
CAP DIAMETER
Up to 5 in (120 mm)

FAMILY ~ Amanitaceae
DISTRIBUTION ~ Eastern North America, Central America
HABITAT ~ In woodland
ASSOCIATION ~ Ectomycorrhizal, with oak and pine
GROWTH FORM ~ On ground
ABUNDANCE ~ Occasional
SPORE COLOR ~ White
EDIBILITY ~ Edible

Amanita jacksonii was originally described from Quebec and is known throughout eastern North America southward into Mexico. It was often referred to as *A. hemibapha* in the past, but this is now considered to be a closely related, but distinct, species. Earlier still, it was thought to be an American form of Caesar's Mushroom (*A. caesarea*), but, as the common name suggests, *A. jacksonii* is a much more slender agaric and is also more brightly colored, especially when young. It has been called the beauty queen of *Amanita* species, not without reason. Like its European counterpart, it is considered a good edible species.

The American Slender Caesar has a brilliant red cap when young, becoming orange then yellow from the margin inward. The expanded cap is smooth, striate at the margin, and often umbonate. The gills are orange-yellow at first, becoming yellow. The stem is yellow, but covered with orange-red, adder-like patterns, and has a pendulous, orange ring. The large, sack-like volva at the stem base is white.

DISTRIBUTION

AMANITA MUSCARIA

FLY AGARIC

(LINNAEUS) LAMARCK

HEIGHT
Up to 8 in (200 mm)
CAP DIAMETER
Up to 12 in (300 mm)

FAMILY ~ Amanitaceae

DISTRIBUTION ~ North America, Europe, North Africa, Central America, northern Asia; introduced in Australia, New Zealand, South Africa, and South America

HABITAT ~ In woodland

ASSOCIATION ~ Ectomycorrhizal, with broadleaf trees, particularly birch, and conifers

GROWTH FORM ~ On ground, singly or in troops

ABUNDANCE ~ Very common

SPORE COLOR ~ White

EDIBILITY ~ Poisonous (hallucinogenic)

A favorite with fairy-tale illustrators, the Fly Agaric has long had a sinister reputation. It was once considered a dangerously poisonous toadstool, fit only for killing flies—hence its English and Latin names (*musca* meaning “a fly”). Although muscarine —a known fungal poison—was first isolated from its fruitbodies, it is only present in very small amounts. Its active poisons are actually muscimol and ibotenic acid, both of which are not only toxic, but hallucinogenic. The Fly Agaric was once used in shamanistic rituals in Lapland and Siberia and has fancifully been claimed as the origin of Father Christmas myths, involving flying reindeers in spirit form and figures dressed in red and white.

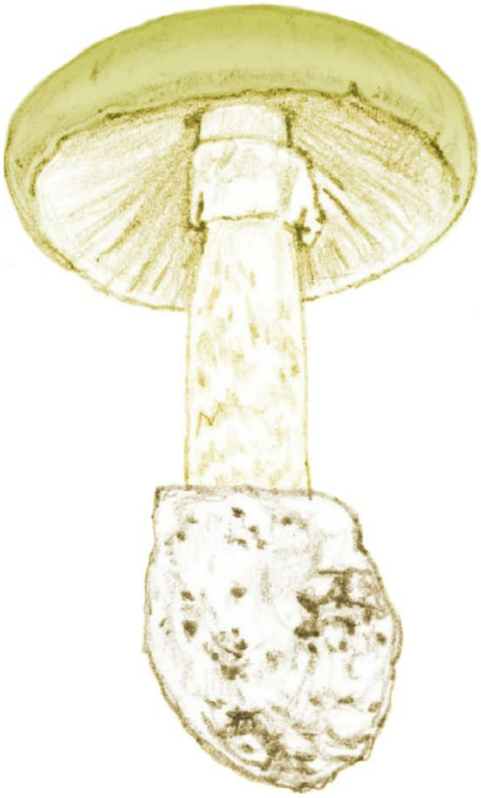
The Fly Agaric has caps that are convex at first, becoming flatter. The surface is smooth, scarlet (rarely orange to yellow), and is dotted with contrasting, small, white, fleecy, separable veil remnants that wash off in rain. The gills are white. The white stem has a conspicuous ring and a large, basal bulb with volval remains around the rim.

DISTRIBUTION

AMANITA PHALLOIDES

DEATH CAP

(FRIES) LINK



HEIGHT
Up to 6 in (150 mm)
CAP DIAMETER
Up to 5 in (125 mm)

FAMILY ~ Amanitaceae

DISTRIBUTION ~ Europe, North Africa, western Asia; introduced in North America, eastern and southern Africa, South America, Australia, New Zealand

HABITAT ~ In woodland

ASSOCIATION ~ Ectomycorrhizal with broadleaf trees, more rarely conifers

GROWTH FORM ~ On ground, singly or in troops or rings

ABUNDANCE ~ Common

SPORE COLOR ~ White

EDIBILITY ~ Poisonous

This is the archetypal poisonous toadstool, probably causing more deaths than any other species. Its shape and color should be distinctive and it also has a sickly-sweet smell, increasing with age, but is still collected by mistake for edible species. Amatoxins and phallotoxins are present, resulting in gastroenteric illness within hours and cell-damage (starting with liver failure) within days. Modern medicine, intensive care treatment, and transplant techniques have reduced fatalities in such poisoning cases to around 20 percent, but this can be no great comfort for victims. The moral is, never eat a wild fungus unless you are absolutely certain you have identified it correctly.

The Death Cap has caps that are convex becoming flat, smooth (sometimes with patches of white veil remains), pale olive to yellowish, silvery gray, or even whitish, typically with radial streaks. The gills are white. The stem is white, often with fine zigzag markings, with a drooping, slightly grooved ring, and a large, white, sack-like volva (sometimes greenish inside) at the swollen base.

DISTRIBUTION

ANTHRACOPHYLLUM MELANOPHYLLUM

CINNABAR FAN BRACKET

(FRIES) PEGLER & T. W. K. YOUNG

HEIGHT
Less than ⅛ in (1 mm)
CAP DIAMETER
Up to 1½ in (35 mm)

FAMILY ~ Marasmiaceae
DISTRIBUTION ~ Eastern and southern Africa, southern Asia
HABITAT ~ In woodland
ASSOCIATION ~ With broadleaf trees
GROWTH FORM ~ On fallen twigs and branches, in troops
ABUNDANCE ~ Locally common
SPORE COLOR ~ White
EDIBILITY ~ Not edible

Anthracophyllum species are widespread in the tropics, subtropics, and the south temperate zone. Like *Crepidotus* species, they grow on twigs and dead stems and have a similar bracket or shell-like shape. All are tough

and leathery, however, becoming hard on drying, and most have deeply colored gills (the Latin *melanophyllum* means “black-gilled”), though their spores are white. They are in the same family as *Marasmius* species, which are equally widespread in the tropics and often as brightly colored.

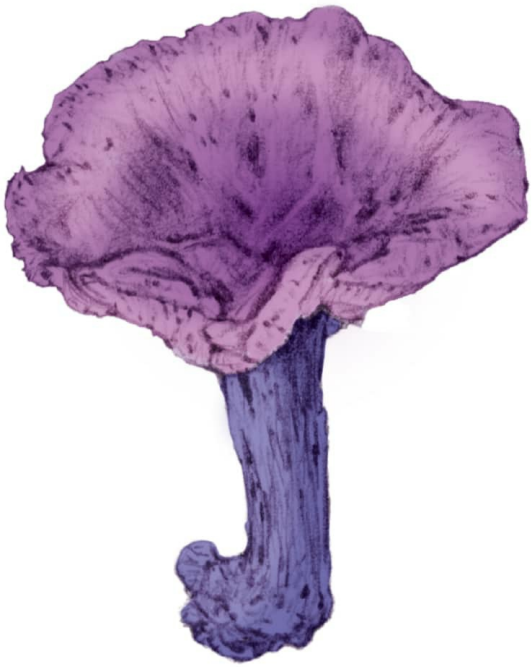
The Cinnabar Fan Bracket forms leathery, shell-shaped fruitbodies that are laterally attached to the wood, sometimes by a rudimentary stem. The caps are furrowed or fluted, pliant at first, then rigid, pinkish red to brick-red, finally dark brown. The gills are widely spaced, bright cinnabar-red, becoming violet to purple-black with age.

DISTRIBUTION

CALOCYBE IONIDES

VIOLET DOMECAP

(BULLIARD) DONK



HEIGHT
Up to 2 in (50 mm)
CAP DIAMETER
Up to 2 in (50 mm)

FAMILY ~ Lyophyllaceae
DISTRIBUTION ~ North America, Europe, northern Asia
HABITAT ~ In calcareous woodland
ASSOCIATION ~ With broadleaf trees and conifers
GROWTH FORM ~ On ground, singly or in small troops or clusters
ABUNDANCE ~ Occasional
SPORE COLOR ~ White
EDIBILITY ~ Edible

The Violet Domecap is an uncommon but widely distributed agaric, rare enough in some European countries to be placed on their national Red Lists of threatened fungal species. When found, the contrast between the violet cap and stem and the cream gills is quite striking. Fruitbodies also

have a distinctly mealy smell and taste. The Violet Domecap grows in calcareous woodlands and appears to be a litter-rotting species. It was originally described and illustrated in 1792 by Jean Baptiste Bulliard, a French mycologist responsible for naming many familiar fungi, including the edible Cep (*Boletus edulis*) and the Common Inkcap (*Coprinopsis atramentaria*).

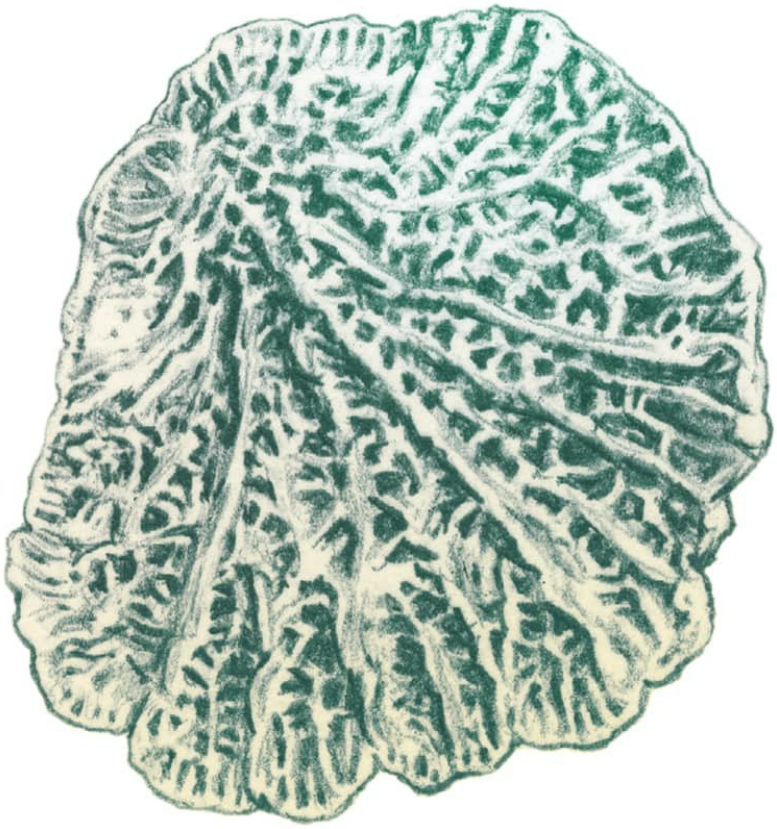
The Violet Domecap has caps that become shallowly convex to flat. The cap surface is smooth, matt, and deep, bright violet to blackish violet, becoming duller or browner when old, the brighter colors often persisting near the margin. The gills are cream and crowded. The stem is smooth and cap-colored or a darker gray-violet.

DISTRIBUTION

CAMPANELLA AERUGINEA

TURQUOISE CAMPANELLA

SINGER



HEIGHT
Less than ⅛ in (2 mm)
CAP DIAMETER
Up to 1½ in (35 mm)

FAMILY ~ Marasmiaceae
DISTRIBUTION ~ South America
HABITAT ~ In woodland
ASSOCIATION ~ With bamboos
GROWTH FORM ~ On dead stems
ABUNDANCE ~ Occasional
SPORE COLOR ~ White
EDIBILITY ~ Not edible

First described from Argentina, the Turquoise Campanella is widespread in South America and usually or always occurs on dead stems of bamboos. It is a relative of *Marasmius* species, but is distinct in having rather gelatinous fruitbodies with unusual, almost pore-like gills on the undersurface. If looked at closely, many agarics have veins or ridges connecting their gills, but in *Campanella* species these connecting veins have become prominent and branched, so that they appear netlike. They also like to grow on dead grass stems (including bamboos), though a few *Campanella* species are found on dead wood.

The Turquoise Campanella forms thin, rather gelatinous caps that are convex at first, becoming flatter. The cap surface is smooth but ridged or fluted, translucently whitish and flushed blue-green. The gills are cap-colored, distant, and strongly interveined so that the undersurface appears almost poroid. A stem is absent, and the caps are directly attached to the surface at one side.

DISTRIBUTION

CHROMOSERA LILACINA

LILAC WAXCAP

(P. KARSTEN) VIZZINI & ERCOLE

HEIGHT
Up to 2 in (50 mm)
CAP DIAMETER
Up to 1½ in (35 mm)

FAMILY ~ Hygrophoraceae
DISTRIBUTION ~ North America, Europe
HABITAT ~ In mossy heathland and marshes
ASSOCIATION ~ With moss and grass
GROWTH FORM ~ On ground, singly or in troops
ABUNDANCE ~ Locally common
SPORE COLOR ~ White
EDIBILITY ~ Not edible

This is one of several waxcap species that are arctic-alpine specialists, at home in Greenland, Alaska, Labrador, northern Scandinavia, and the Cairngorms of Scotland, as well as the Alps. The Lilac Waxcap typically

grows in marshy areas of dwarf-scrub heath, under tussocks of grass, and in snowbeds, sheltering its fruitbodies amongst the moss to protect them from wind and cold. Like the Parrot Waxcap (*Gliophorus psittacinus*), the colors of *Chromosera lilacina* are highly variable and, though lilac to violet are typical of the species, individual fruitbodies may be more yellow to orange-brown.

The Lilac Waxcap has caps that are convex, becoming flat or depressed at the center. The surface is smooth, striate when damp, yellow to orange-brown at first developing lilac to gray-violet tints. The gills are weakly decurrent and cap-colored. The stem is smooth, lilac to yellow or brownish.

DISTRIBUTION

CLITOCYBE ODORA

ANISEED FUNNEL

(BULLIARD) P. KUMMER

HEIGHT
Up to 4 in (100 mm)
CAP DIAMETER
Up to 4 in (100 mm)

FAMILY ~ Tricholomataceae
DISTRIBUTION ~ North America, Europe, North Africa, northern Asia
HABITAT ~ In woodland
ASSOCIATION ~ With broadleaf trees
GROWTH FORM ~ On ground, singly or in scattered troops
ABUNDANCE ~ Common
SPORE COLOR ~ White
EDIBILITY ~ Edible

The pale jade-green colors and strong smell of aniseed are the distinctive characters of the Aniseed Funnel, a common species in woodland leaf

litter. It often occurs singly, but can sometimes appear in large troops. The smell has been analyzed and comes from the volatile compound *p*-anisaldehyde, the dominant aroma produced by the fruitbodies. Not surprisingly, the species, which is edible, has occasionally been collected for its aniseed taste and may have some potential as a source of commercial flavoring products. Many other *Clitocybe* species, however, are poisonous (some even deadly) so as a group they are best avoided.

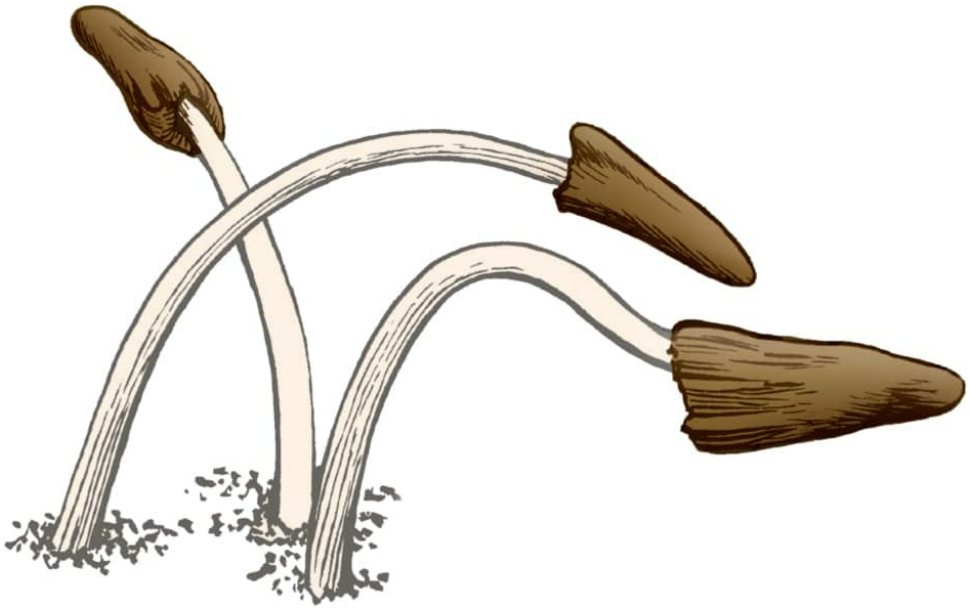
The Aniseed Funnel forms caps that are convex, becoming flat to weakly funnel-shaped. The surface is smooth and pale grayish green, discoloring buff to pale ocher or grayish with age. The gills are cream to pale cap-colored and sometimes decurrent. The stem is cap-colored or paler, often whitish, and felted at the base.

DISTRIBUTION

CONOCYBE DELIQUESCENS

BEANSPROUT FUNGUS

HAUSKNECHT & KRISAI



HEIGHT
Up to 5 in (125 mm)
CAP DIAMETER
Up to 1 in (25 mm)

FAMILY ~ Bolbitiaceae
DISTRIBUTION ~ North America, continental Europe, North Africa
HABITAT ~ In pastures and lawns
ASSOCIATION ~ On manured or enriched grass
GROWTH FORM ~ On ground, singly or in scattered troops
ABUNDANCE ~ Locally common
SPORE COLOR ~ Pale rusty brown
EDIBILITY ~ Not edible

Until recently, this little species was placed in the genus *Gastrocybe* (as *G. lateritia*), since its cap never opens. DNA sequencing shows, however, that it is a *Conocybe* species, albeit a peculiar one. The Beansprout Fungus grows on lawns or in grassland in central North America and central to southern Europe, but is not always noticed since its fruitbodies are

ephemeral and curiously lax. It rarely, if ever, stands upright, and its slimy caps seem close to disintegrating. Research suggests that bacteria may be the cause, possibly in some kind of mutual relationship with the fungus.

The Beansprout Fungus produces caps that are elongated or deeply conical with a wrinkled surface, very slimy, and reddish brown. The gills are cap-colored, irregular, slimy, and quickly disintegrating. The thin, lax stem is smooth and white.

DISTRIBUTION

COPRINOPSIS PICACEA

MAGPIE INKCAP

(BULLIARD) REDHEAD, VILGALYS & MONCALVO

HEIGHT
Up to 12 in (300 mm)
CAP DIAMETER
Up to 3 in (75 mm)

FAMILY ~ Psathyrellaceae
DISTRIBUTION ~ North America, Europe
HABITAT ~ In woodland, occasionally in mulch
ASSOCIATION ~ With broadleaf trees, especially beech
GROWTH FORM ~ On ground, singly or in small troops
ABUNDANCE ~ Occasional
SPORE COLOR ~ Black
EDIBILITY ~ Not edible

The eye-catching, magpie markings of *Coprinopsis picacea* make this one of the easier inkcaps to recognize. It also has a distinctive smell of gas, dung, or mothballs, which research has shown comes from skatole, a curious organic compound used as a fixative in perfumes, but most commonly found in coal tar and feces. The Magpie Inkcap appears to be commonest in European beech woods, typically on calcareous soil, but occasionally occurs elsewhere. In recent years, it has become one of many agarics extending their natural range by colonizing the woodchips used as mulch in flowerbeds.

The Magpie Inkcap produces tall fruitbodies with deeply conical caps. The young cap is covered by a whitish veil that breaks up as it expands, revealing the blackish cap surface below. The gills are whitish at first, blackening with age. Cap and gills gradually deliquesce (turn liquid) from the margin inward. The long, cylindrical stem is white and finely scurfy.

DISTRIBUTION

CORTINARIUS AUSTROVENETUS

GREEN SKINHEAD

CLELAND

HEIGHT
Up to 4 in (100 mm)
CAP DIAMETER
Up to 3 in (75 mm)

FAMILY ~ Cortinariaceae
DISTRIBUTION ~ Australia; introduced in New Zealand
HABITAT ~ In woodland
ASSOCIATION ~ Ectomycorrhizal, with eucalypts
GROWTH FORM ~ On ground, singly or in small troops
ABUNDANCE ~ Occasional
SPORE COLOR ~ Rusty brown
EDIBILITY ~ Probably poisonous

The Green Skinhead is an Australian specialty, forming a mutually

beneficial association with the living roots of eucalyptus trees. It has even been featured on an Australian stamp. The species belongs in the *Dermocybe* section of *Cortinarius* and is sometimes called *Dermocybe austroveneta*. Most of the agarics in this section have orange to red caps, but the Green Skinhead is an unusual exception. Green colors are not so common in fungi and are not related to those found in plants. Isolation of the pigment in the Green Skinhead has shown it to be a previously unknown compound, now called austrovenetin after the fungus.

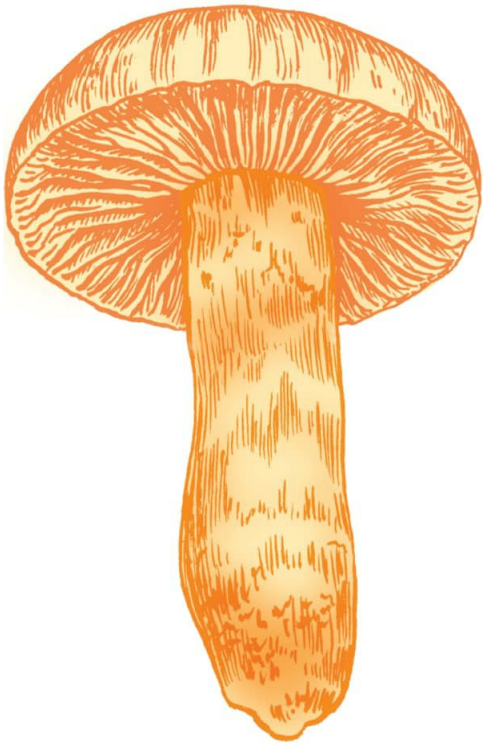
The Green Skinhead has smooth, convex caps that are slightly slimy when damp, emerald to olive-green, darkening toward the center. The gills are greenish yellow at first, becoming orange to rusty brown when mature. The stem is smooth with some cobwebby veil remnants and is cream, often tinted yellow to brownish, becoming orange to reddish at the base.

DISTRIBUTION

CORTINARIUS RUBELLUS

DEADLY WEBCAP

COOKE



HEIGHT
Up to 4 in (100 mm)
CAP DIAMETER
Up to 3 in (75 mm)

FAMILY ~ Cortinariaceae
DISTRIBUTION ~ North America, Europe, northern Asia
HABITAT ~ In woodland
ASSOCIATION ~ Ectomycorrhizal, with conifers
GROWTH FORM ~ On ground, in small troops
ABUNDANCE ~ Occasional
SPORE COLOR ~ Rusty brown
EDIBILITY ~ Poisonous

Cortinarius rubellus, also known as *C. speciossimus* or *C. orellanoides*, is an extremely toxic fungus, responsible for several recent near-fatal

poisonings, including in Scotland and Scandinavia. Along with the related Fool's Webcap (*C. orellanus*), the Deadly Webcap contains a compound called orellanine that can lead to kidney failure if eaten—often after a delay of several days or even weeks. The species occurs with pine, spruce, and other conifers and is widespread in Europe, but less well-known in North America and Asia (where similar toxic *Cortinarius* species may also be present).

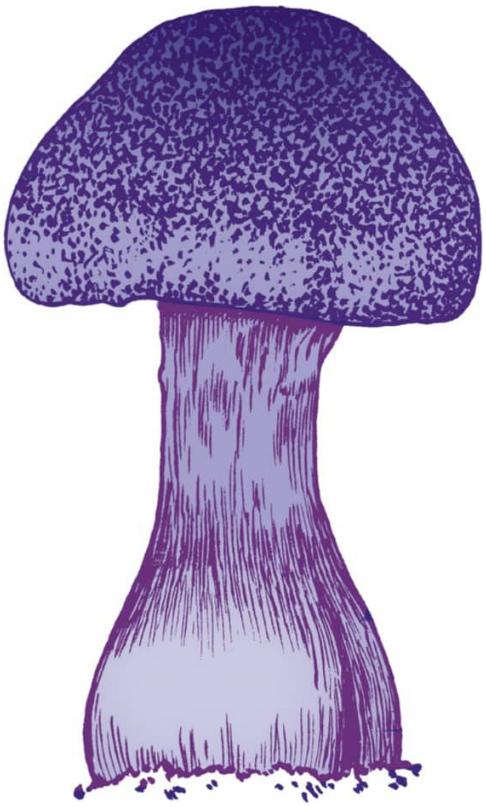
The Deadly Webcap has caps that are conical to convex, becoming umbonate when expanded. The surface is smooth to silky fibrous, tawny to reddish orange. The gills are ocher when young, becoming rusty brown. The stem is dry, cap-colored or paler, with yellowish zigzag patterns of veil remains.

DISTRIBUTION

CORTINARIUS VIOLACEUS

VIOLET WEBCAP

(LINNAEUS) GRAY



HEIGHT
Up to 5 in (125 mm)
CAP DIAMETER
Up to 6 in (150 mm)

FAMILY ~ Cortinariaceae
DISTRIBUTION ~ North America, Europe, northern Asia
HABITAT ~ In woodland
ASSOCIATION ~ Ectomycorrhizal, with broadleaf trees and conifers
GROWTH FORM ~ On ground, in troops
ABUNDANCE ~ Occasional
SPORE COLOR ~ Rusty brown
EDIBILITY ~ Edible

The Violet Webcap is a large, distinctively colored agaric and one of the

simpler *Cortinarius* species to recognize in the field. Its somber violet caps are, however, surprisingly easy to overlook especially when growing in undergrowth. It is a widespread species but not a common one, though when found it often occurs in troops. It sometimes has a faint aroma of cedarwood when fresh. Unlike most webcaps, *C. violaceus* is edible (if sometimes bitter) but is not widely collected for this purpose. Since many webcaps are dangerously poisonous, all are best avoided. The species is also used in dyeing.

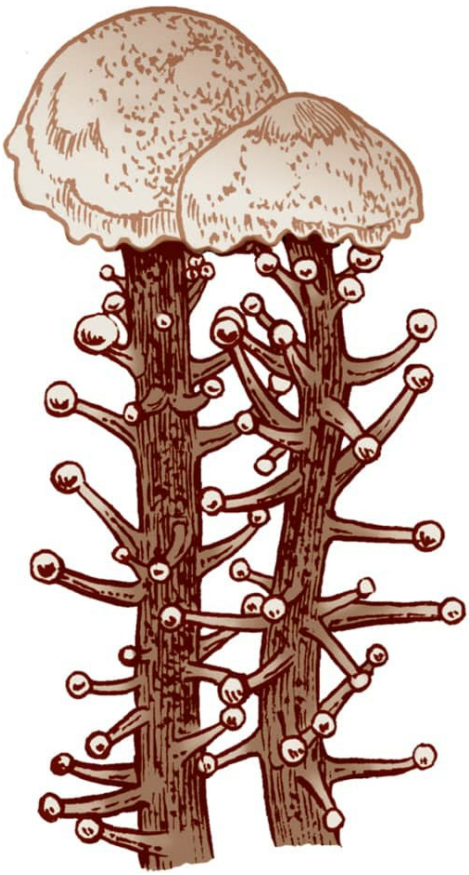
The Violet Webcap has caps that are hemispherical, becoming flat to broadly umbonate. The cap surface is dry, finely velvety to scaly, dark violet becoming violet-gray when old. The gills are cap-colored becoming violet-brown. The stem is pale cap-colored, often with concolorous adder-like markings when young, swollen toward the base.

DISTRIBUTION

DENDROCOLLYBIA RACEMOSA

BRANCHED SHANKLET

(PERSOON) R. H. PETERSEN & REDHEAD



HEIGHT
Up to 3 in (75 mm)
CAP DIAMETER
Up to ½ in (10 mm)

FAMILY ~ Tricholomataceae
DISTRIBUTION ~ Western North America, Europe
HABITAT ~ In woodland
ASSOCIATION ~ With species of *Lactarius* and *Russula*
GROWTH FORM ~ On decayed remains of fruitbodies
ABUNDANCE ~ Occasional
SPORE COLOR ~ White
EDIBILITY ~ Not edible

The Branched Shanklet is small, but quite extraordinary. Its stem bears a series of side branches, each ending in a small knob containing asexual spores—an alternative method of propagation and a feature unique to this species. A further oddity is that the Branched Shanklet grows in the rotten remains of other agarics, specifically brittlegills (*Russula* species) and milkcaps (*Lactarius* species), though these are usually so decayed as to be unrecognizable. Fruitbodies arise from sclerotia, small, hard kernels of fungal tissue that can persist in the soil until the host's fruitbodies eventually reappear.

The Branched Shanklet forms caps that are convex, becoming flat to weakly umbonate. The cap surface is smooth to finely wrinkled, pale gray to gray-brown. The gills are cap-colored. The stem is narrow, smooth, and cap-colored, with numerous short side-branches that terminate in tiny, spherical knobs. The stem arises from a hard, black, spherical sclerotium.

DISTRIBUTION

ENTOLOMA MURRAYI

UNICORN PINKGILL

(BERKELEY & M. A. CURTIS) SACCARDO

HEIGHT
Up to 4 in (100 mm)
CAP DIAMETER
Up to 2 in (50 mm)

FAMILY ~ Entolomataceae

DISTRIBUTION ~ Eastern North America, Central and South America, Eastern Asia

HABITAT ~ In damp woodland

ASSOCIATION ~ With broadleaf trees and conifers

GROWTH FORM ~ On ground, singly or in small groups

ABUNDANCE ~ Common

SPORE COLOR ~ Salmon-pink

EDIBILITY ~ Probably poisonous

The Unicorn Pinkgill was originally collected in New England by Dennis Murray (hence the Latin epithet). It was formally described in 1859 by the Reverends Berkeley and Curtis, who thought it an “extremely pretty species,” which indeed it is. The unusual elongated point at the top of the cap has presumably given it the common name Unicorn or Yellow Unicorn. Murray collected the species “in wet grounds,” and it seems to have a preference for wet woodland areas, where it may be locally common. The closely related Salmon Pinkgill (*Entoloma quadratum*) is poisonous and it seems probable that the Unicorn Pinkgill is equally so.

The Unicorn Pinkgill forms a conical cap, typically with a pointed protrusion at the center. The cap surface is smooth and bright yellow when young, fading to pale buff when old. The gills are pale yellow at first, becoming salmon-pink. The thin stem is cap-colored and smooth.

DISTRIBUTION

GLIOPHORUS PSITTACINUS

PARROT WAXCAP

(SCHAEFFER) HERINK

HEIGHT
Up to 3 in (75 mm)
CAP DIAMETER
Up to 1½ in (40 mm)

FAMILY ~ Hygrophoraceae

DISTRIBUTION ~ North America, Europe, North Africa, Central and South America, northern Asia

HABITAT ~ In pasture, mossy lawns, or woodland

ASSOCIATION ~ With moss and grass

GROWTH FORM ~ On ground, singly or in troops

ABUNDANCE ~ Common

SPORE COLOR ~ White

EDIBILITY ~ Considered edible by some

The Parrot Waxcap is one of the commoner waxcap species, quite often found in older lawns and parkland. Its name is taken from its striking colors, usually starting deep grass-green and later developing shades of yellow and orange—sometimes even pink, lilac, or blue. The green fades in sunlight, but is almost always retained at the top of the stem. In all but the driest weather, fruitbodies are extremely slimy and slippery, so, although said to be edible, they can hardly be pleasant to eat. They were once reported to contain psilocybin, a hallucinogenic compound, but later research has found no evidence for this.

The Parrot Waxcap forms caps that are convex, becoming flat or umbonate. The cap surface is smooth, slimy when damp, typically deep green when young, fading to yellow, less commonly violet, blue-violet, or pink, fading to pinkish. The gills are cap-colored. The stem is smooth, slimy, and cap-colored.

DISTRIBUTION

HYGROCYBE PUNICEA

CRIMSON WAXCAP

(FRIES) P. KUMMER

HEIGHT
Up to 6 in (150 mm)
CAP DIAMETER
Up to 6 in (150 mm)

FAMILY ~ Hygrophoraceae

DISTRIBUTION ~ North America, Europe, northern Asia

HABITAT ~ In pasture and mossy lawns, also reported from woodland

ASSOCIATION ~ With moss and grass

GROWTH FORM ~ On ground, singly or in troops

ABUNDANCE ~ Occasional

SPORE COLOR ~ White

EDIBILITY ~ Edible

This handsome species is probably the largest of the waxcaps and makes a

splendid sight when growing in huge troops, as it sometimes does in favored sites. In Europe at least, it is considered a good indicator for old, waxcap-rich grasslands and is only found in company with eight or more other waxcap species. Since old grasslands are becoming rarer, the Crimson Waxcap has recently been assessed as 'vulnerable' and placed on the Global Red List of Threatened Species. In North America, *Hygrocybe punicea* is typically reported from woodlands—but many such reports and photos refer to a large, scarlet agaric that does not resemble the European Crimson Waxcap and merits further research.

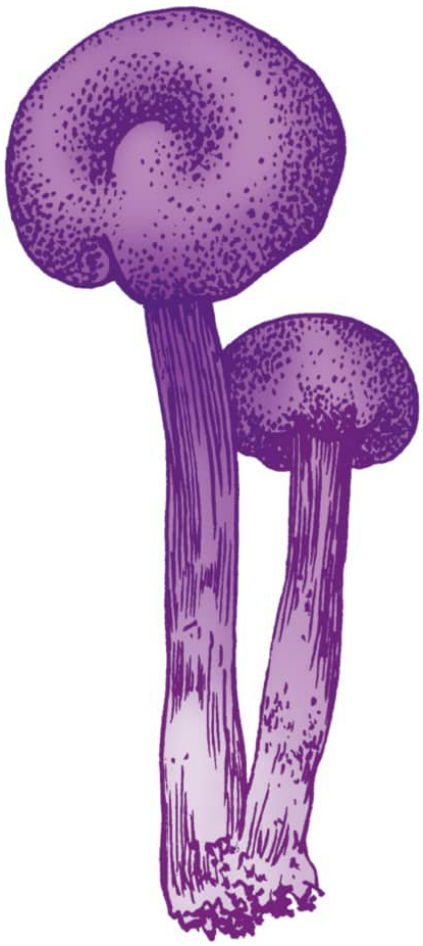
The Crimson Waxcap forms caps that are convex to conical, becoming umbonate to flat and often splitting. The surface is smooth and waxy, dark to blood-red with a thin, yellow margin, the surface often becoming semi-opaque and grayish, the colors fading to ocher-buff. The gills are cap-colored with a yellow edge. The stem is finely fibrous, and dry, streaky orange-red to yellow, whitish at the base.

DISTRIBUTION

LACCARIA AMETHYSTINA

AMETHYST DECEIVER

COOKE



HEIGHT
Up to 3 in (75 mm)
CAP DIAMETER
Up to 2 in (50 mm)

FAMILY ~ Hydnangiaceae

DISTRIBUTION ~ Eastern North America, Europe, Africa, Central and South America, Asia, Australia, New Zealand

HABITAT ~ In woodland

ASSOCIATION ~ Ectomycorrhizal, with broadleaf trees, more rarely with conifers

GROWTH FORM ~ On ground, often in large troops

ABUNDANCE ~ Very common

SPORE COLOR ~ White

EDIBILITY ~ Edible

This is a very common species, with what appears to be an almost worldwide distribution. It is capable of forming ectomycorrhizal associations with a wide range of plants and seems to be a rapid colonizer of plantations and other new sites. Recent research in Japan indicates that the Amethyst Deceiver is very much an ammonia-loving fungus, preferring “enriched” soils, rather like some *Hebeloma* species. It can also grow on contaminated soils, though it often picks up the contaminants—especially arsenic. This may be rather alarming for an edible species, but the levels are harmless (unless the fungus is growing on grossly polluted sites).

The Amethyst Deceiver forms very variable fruitbodies. The caps are convex, expanding with age and becoming wavy to fluted, smooth becoming scurfy when old, violet when fresh and damp, but paler when dry, and buff with age. The gills are distant and violet. The stem is fibrous, cap-colored, but remaining violet at the top.

DISTRIBUTION

LACTARIUS DELICIOSUS

SAFFRON MILKCAP

(LINNAEUS) GRAY

HEIGHT
Up to 3 in (75 mm)
CAP DIAMETER
Up to 5 in (125 mm)

FAMILY ~ Russulaceae
DISTRIBUTION ~ Europe, northern Asia; introduced in Australia
HABITAT ~ In woodland
ASSOCIATION ~ Ectomycorrhizal, with pines
GROWTH FORM ~ On ground
ABUNDANCE ~ Common
SPORE COLOR ~ Cream to pinkish buff
EDIBILITY ~ Edible

As the Latin epithet suggests, the Saffron Milkcap is a much-appreciated edible species and a particular feature of Catalan cuisine, where these agarics are known as *rovellons*. The species is extensively collected for commercial marketing and export. Once eaten, it has the alarming quality of temporarily turning urine red. It grows with pines on neutral and calcareous soils. Molecular research has shown that *Lactarius deliciosus* is a Eurasian fungus, but one or more related (and equally edible) species occur in North America, which have also been called *Lactarius deliciosus*. Currently these American species lack a scientific name.

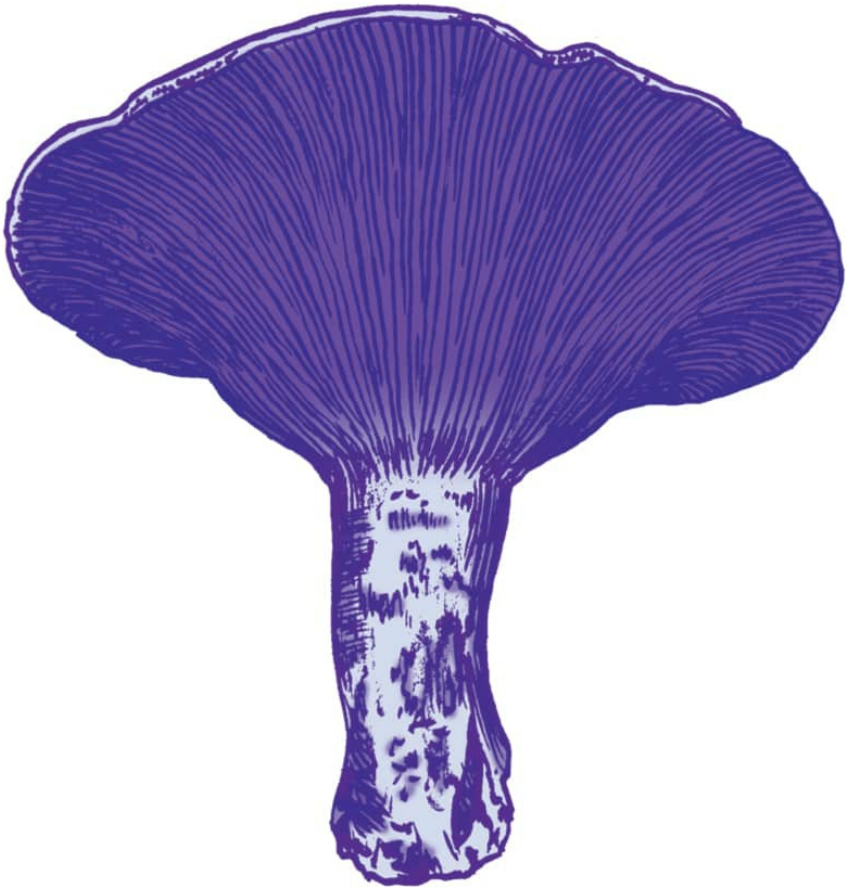
The Saffron Milkcap has caps that are convex, becoming weakly funnel-shaped, smooth, slightly slimy when moist, and salmon with concentric orange spots, bruising grayish green. The decurrent gills are cap-colored. The hollowstem is pale cap-colored, often with orange blotches. The orange flesh exudes a sparse, bright orange latex, slowly turning grayish green.

DISTRIBUTION

LACTARIUS INDIGO

INDIGO MILKCAP

(SCHWEINITZ) FRIES



HEIGHT
Up to 4 in (100 mm)
CAP DIAMETER
Up to 6 in (150 mm)

FAMILY ~ Russulaceae

DISTRIBUTION ~ North America, Central America, South America (Colombia)

HABITAT ~ In woodland

ASSOCIATION ~ Ectomycorrhizal, with pine or oak

GROWTH FORM ~ On ground

ABUNDANCE ~ Occasional

SPORE COLOR ~ White

EDIBILITY ~ Edible

Very few agarics have the deep blue colors of the handsome Indigo Milkcap. It even has bright blue flesh when cut and exudes an equally blue latex. The color comes from an azulene pigment produced by the fungus. Since the species is edible and even sold in markets in Mexico, this makes *Lactarius indigo* one of the few naturally occurring blue foods. The species belongs in the *Deliciosi* section of the milkcaps, but is unusual within the group for associating with oaks and possibly other broadleaf trees, as well as conifers. *Lactarius deliciosus* and its relatives are mostly strict conifer associates.

The Indigo Milkcap has caps that are convex, becoming weakly funnel-shaped, smooth, slightly slimy when moist, and concentrically zoned in shades of silvery gray and blue. The decurrent gills are blue to bluish gray. The stem is cap-colored, often with darker blotches. The flesh is deep blue, exuding a blue latex.

DISTRIBUTION

LACTARIUS TORMINOSUS

WOOLLY MILKCAP

(SCHAEFFER) GRAY

HEIGHT
Up to 3 in (75 mm)
CAP DIAMETER
Up to 5 in (125 mm)

FAMILY ~ Russulaceae
DISTRIBUTION ~ North America, Europe, North Africa, northern Asia
HABITAT ~ In woodland
ASSOCIATION ~ Ectomycorrhizal, with birch
GROWTH FORM ~ On ground, often in small troops
ABUNDANCE ~ Common
SPORE COLOR ~ Cream
EDIBILITY ~ Poisonous (edible after processing)

This is the commonest of several milkcaps that have a conspicuously hairy or woolly margin. The epithet *torminosus* means “griping” and the Woolly

Milkcap is an acridly poisonous species, producing severe stomach upsets if consumed. Surprisingly, therefore, it is not only consumed, but even relished, in Finland, Russia, and other parts of eastern Europe. Typically, the fungus is parboiled twice (with a change of cooking water) to remove most of the toxins and then salted down for winter use, when its peppery taste is valued. In the past, it was said to have been roasted and added to coffee in Norway, though it is not clear why.

The Woolly Milkcap has caps that are convex, becoming funnel-shaped, smooth at the center, but with flattened hairs toward the inrolled, densely hairy margin, pale pink to salmon with slightly darker concentric zones. The gills are white to pale pinkish buff. The stem is whitish to pale cap-colored, smooth but with pinkish spots. The flesh is white.

DISTRIBUTION

LACTOCOLLYBIA AURANTIACA

ORANGE MILKSHANK

SINGER

HEIGHT
Up to 2 in (50 mm)
CAP DIAMETER
Up to 1½ in (40 mm)

FAMILY ~ Marasmiaceae
DISTRIBUTION ~ Central and South America
HABITAT ~ In woodland
ASSOCIATION ~ With broadleaf trees
GROWTH FORM ~ On fallen wood and litter, singly or in troops
ABUNDANCE ~ Occasional
SPORE COLOR ~ White
EDIBILITY ~ Unknown, best avoided

Lactocollybia species are mainly found in the tropics and subtropics,

growing in small troops on dead wood and litter. They are related to temperate *Gymnopus* species, which were formerly placed in the genus *Collybia*. The prefix *lacto* means “milk,” and the fruitbodies contain a latex like that of *Lactarius* species, but not so copious or visible. Most *Lactocollybia* species are white or dull-colored, but the Orange Milkshank is quite eye-catching. A related species (*L. aequatorialis*) is eaten by native peoples in the Amazon rainforest, but the edibility of *L. aurantiaca* is unknown.

The Orange Milkshank forms caps that are convex at first, becoming depressed to shallowly funnel-shaped. The cap surface is velvety to finely scurfy, yellow-orange to orange. The gills are slightly decurrent, whitish to yellowish. The stem is velvety-scurfy and cap-colored.

DISTRIBUTION

INOCYBE CALAMISTRATA

GREENFOOT FIBERCAP

(FRIES) GILLET

HEIGHT
Up to 4 in (100 mm)
CAP DIAMETER
Up to 2 in (50 mm)

FAMILY ~ Inocybaceae

DISTRIBUTION ~ North America, Europe, North Africa, Central America, northern Asia

HABITAT ~ In woodland

ASSOCIATION ~ Ectomycorrhizal, with broadleaf trees and conifers

GROWTH FORM ~ On ground, often in small troops

ABUNDANCE ~ Occasional

SPORE COLOR ~ Brown

EDIBILITY ~ Poisonous

Fibercaps are common, mainly temperate, ectomycorrhizal fungi with perhaps as many as 350 species so far described. All have brown spores and most are poisonous, some dangerously so. They are not easy to distinguish to species, even when examined microscopically, but the Greenfoot Fibercap is an exception, thanks to its scaly fruitbody and to the unusual, blue-green stem base. The color has suggested the presence of the hallucinogenic compound psilocybin, but this is unproven. The species more probably contains the toxic compound muscarine, in common with other fibercaps. Its Latin epithet *calamistrata* means “curled with a curling iron,” which is a reference to the upturned scales.

The Greenfoot Fibercap has caps that are convex to shallowly conical, dark brown, and densely covered with erect, often curled scales. The gills are cap-colored. The stem is scaly and dark brown, but blue-green toward the base. The scales may partly wear away in older specimens. The flesh is whitish and reddens slightly when bruised or cut.

DISTRIBUTION

LENTINULA EDODES

SHIITAKE

(BERKELEY) PEGLER

HEIGHT
Up to 3 in (75 mm)
CAP DIAMETER
Up to 6 in (150 mm)

FAMILY ~ Marasmiaceae

DISTRIBUTION ~ East Asia, Australia, New Zealand

HABITAT ~ In woodland

ASSOCIATION ~ With broadleaf trees, particularly Japanese Chinquapin (or “shii”)

GROWTH FORM ~ On logs and dead branches

ABUNDANCE ~ Occasional

SPORE COLOR ~ White

EDIBILITY ~ Edible

The Shiitake is a well-known edible species that has been semi-cultivated on logs in China since at least the tenth century. In recent years, sawdust-based cultivation methods have resulted in the fungus being grown commercially on a vast scale, not only in China, but around the world. With over 1.5 million tons produced each year, the Shiitake is second only to the Cultivated Mushroom (*Agaricus bisporus*) in popularity and has now become a familiar sight on supermarket shelves. A polysaccharide compound called lentinan has been isolated from fruitbodies, which initial research suggests may have some potential as an antitumor agent.

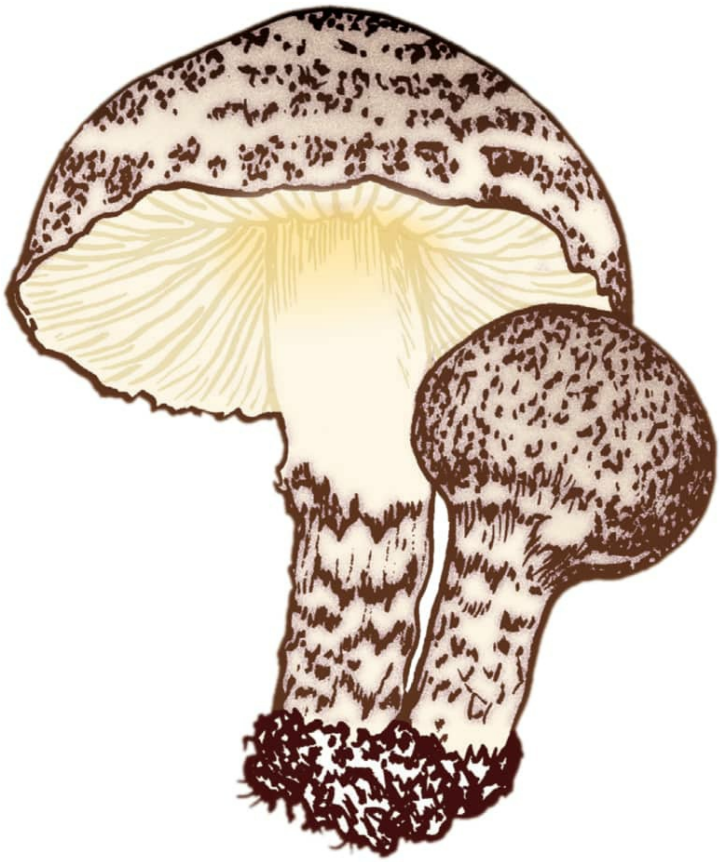
The Shiitake forms hemispherical caps, flattening when expanded, smooth at first but breaking into scales with age, buff to dark purplish gray or brown, with a paler margin that is flecked with white, cobwebby veil remnants when young. The gills are whitish to cream. The stem is pale cap-colored or pinkish buff, fibrous, sometimes with a ring zone, and small, pale to brownish scales below.

DISTRIBUTION

LEPIOTA BRUNNEOINCARNATA

DEADLY DAPPERLING

CHODAT & C. MARTIN



HEIGHT
Up to 3 in (75 mm)
CAP DIAMETER
Up to 2 in (50 mm)

FAMILY ~ Agaricaceae
DISTRIBUTION ~ Europe, northern Asia
HABITAT ~ In woodland, parks, and gardens
ASSOCIATION ~ With broadleaf trees on rich soil
GROWTH FORM ~ On ground, singly or in small groups
ABUNDANCE ~ Occasional
SPORE COLOR ~ White
EDIBILITY ~ Poisonous

The Deadly Dapperling is one of several extremely poisonous species of *Lepiota*, most of which cause problems when consumed in mistake for edible Parasols (*Macrolepiota procera*). Like many *Lepiota* species, *L. brunneoincarnata* prefers a mild climate. It is not uncommon through much of the north temperate zone, but becomes more frequent southward, particularly in the Mediterranean area, which is where most recent hospitalizations and deaths have occurred. The poisons responsible are amatoxins, similar to those found in the Death Cap (*Amanita phalloides*). These cause liver failure and may also affect the kidneys and other organs.

The Deadly Dapperling has convex caps that become flat or umbonate. The cap center is blackish brown to dark red-brown, splitting toward the margin into concentric rings of scales on a whitish to pinkish buff background. The gills are white to cream. The stem is similarly colored, with incomplete rings of small, cap-colored scales below the ring zone.

DISTRIBUTION

LICHENOMPHALIA ALPINA

ALPINE NAVEL

(BRITZELMAYR) REDHEAD ET AL

HEIGHT
Up to 1 in (25 mm)
CAP DIAMETER
Up to 1 in (25 mm)

FAMILY ~ Hygrophoraceae

DISTRIBUTION ~ North America, Europe, South America, arctic Asia, New Zealand

HABITAT ~ In moorland and mountains

ASSOCIATION ~ Lichenized, with algae

GROWTH FORM ~ On ground, in soil and peat

ABUNDANCE ~ Occasional

SPORE COLOR ~ White

EDIBILITY ~ Not edible

Most lichens, such as *Peltigera membranacea*, belong in the Ascomycota and produce fruitbodies that are cup- or disc-shaped, often much smaller and less visible than their encrusting or foliose thalli. The Alpine Navel, however, is a lichen that belongs in the Basidiomycota and produces agaric fruitbodies that are much larger than their rather inconspicuous thalli (which consist of small, grayish green scales found around the base of the fruitbody). As the name *Lichenomphalia alpina* indicates, this brightly colored, little agaric is found mainly in arctic and alpine areas, growing among mosses and other lichens.

The Alpine Navel forms caps that are convex, becoming flat. The cap surface is smooth, with a wavy or scalloped margin, bright yellow to pale yellow. The gills are decurrent, few and distant, and pale yellow. The stem is smooth and pale cap-colored.

DISTRIBUTION

MACROCYSTIDIA CUCUMIS

CUCUMBER CAP

(PERSOON) JOSSERAND

HEIGHT
Up to 3 in (75 mm)
CAP DIAMETER
Up to 2 in (50 mm)

FAMILY ~ Marasmiaceae
DISTRIBUTION ~ North America, Europe, northern Asia
HABITAT ~ In woodland, also in woodchip mulch
ASSOCIATION ~ With broadleaf trees and conifers
GROWTH FORM ~ On ground, singly or in scattered troops
ABUNDANCE ~ Locally common
SPORE COLOR ~ Whitish to pinkish brown
EDIBILITY ~ Not edible

This is a dapper-looking species when fresh, easy to recognize by its rather smart, almost black cap edged with cream. Unfortunately it smells—supposedly of cucumbers, but actually of old herrings. It is common in Europe, less so in North America, but is spreading rapidly thanks to the increased use of woodchip mulch, which the Cucumber Cap relishes. Although it belongs in the mainly white-spored Marasmiaceae, its spores are often pinkish or even deep pinkish brown. A novel compound called cucumin has been isolated from the Cucumber Cap and it has potential antibacterial properties.

The Cucumber Cap forms caps that are conical, becoming flatter. The cap surface is smooth, dark purplish or blackish brown when damp, drying paler, with a contrasting cream margin. The gills are cream to yellowish, becoming pink. The stem is finely velvety; it is cream at the top, becoming yellowish to reddish brown below and black-brown at the base.

DISTRIBUTION

MARASMIUS HAEMATOCEPHALUS

MAUVE PARACHUTE

(MONTAGNE) FRIES

HEIGHT
Up to 2 in (50 mm)
CAP DIAMETER
Up to ½ in (15 mm)

FAMILY ~ Marasmiaceae

DISTRIBUTION ~ Southern North America, Africa, Central and South America, southern Asia, Australia

HABITAT ~ In woodland

ASSOCIATION ~ With broadleaf trees

GROWTH FORM ~ In leaf litter, on fallen leaves

ABUNDANCE ~ Common

SPORE COLOR ~ White

EDIBILITY ~ Not edible

First described from Brazil, the Mauve Parachute is a widely distributed tropical and subtropical species, frequently appearing in swarms on fallen leaf litter. The epithet *haematocephalus* means “blood-red cap,” but the Mauve Parachute is more typically pinkish red to purple, and has an alternative English name of the Pink Bonnet. Brightly colored *Marasmius* species such as this are among the commonest agarics in rainforests, with scores of different species—yellow, orange, red, and purple—often growing together on dead leaves and fallen twigs. The tropics are so rich in these fungi that many new species undoubtedly remain to be discovered and described.

The Mauve Parachute forms small, thin caps that remain convex. The cap surface is smooth but ridged or fluted, pinkish red, mauve, or reddish purple. The gills are distant and white to pinkish, or pale cap-colored. The long, thin stem is smooth, dark red-brown to brown.

DISTRIBUTION

MELANOPHYLLUM EYREI

GREENSPORED DAPPERLING

(MASSEE) SINGER

HEIGHT
Up to 2 in (50 mm)
CAP DIAMETER
Up to 1 in(25 mm)

FAMILY ~ Agaricaceae
DISTRIBUTION ~ Europe, northern Asia
HABITAT ~ In calcareous woodland and scrub
ASSOCIATION ~ With broadleaf trees
GROWTH FORM ~ On ground, singly or in small groups
ABUNDANCE ~ Occasional
SPORE COLOR ~ Bluish green
EDIBILITY ~ Not edible

When first seen, *Melanophyllum eyrei* looks like any other little, dull brown agaric and is easily passed by in the search for something more interesting. If collected, however, the extraordinary, dark green gills are revealed—a unique feature of species in this genus. *Melanophyllum*, meaning "dark-gilled," is closely related to the white-spored genus *Lepiota* and species of both have been given the English name "dapperlings." All of them typically prefer rich, calcareous soils in mild climates. The Greenspored Dapperling was named after the Rev. William Eyre, who first found it in Hampshire, England.

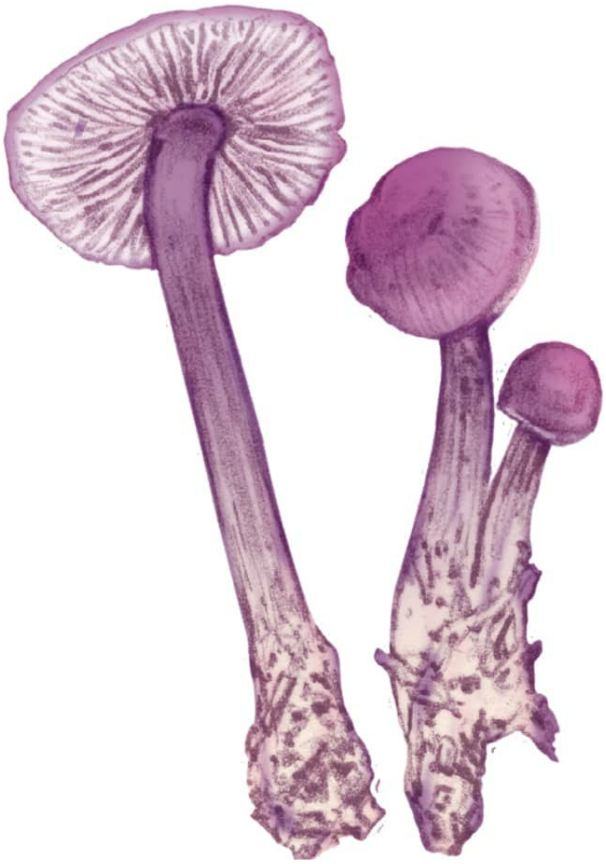
The Greenspored Dapperling forms convex caps, becoming flat or shallowly umbonate. The cap surface is finely granular when young, becoming smooth, cream to buff or yellow-brown, darker at the center, with veil remains at the margin. The gills are gray-green to blue-green. The stem is finely granular to smooth, cap-colored to pale pinkish brown at the base.

DISTRIBUTION

MYCENA PURA

LILAC BONNET

(PERSOON) P. KUMMER



HEIGHT
Up to 3 in (75 mm)
CAP DIAMETER
Up to 2 in (50 mm)

FAMILY ~ Mycenaceae

DISTRIBUTION ~ North America, Europe, North Africa, Central America, northern Asia

HABITAT ~ In woodland

ASSOCIATION ~ With broadleaf trees and conifers

GROWTH FORM ~ On ground and in leaf litter, singly or in troops

ABUNDANCE ~ Very common

SPORE COLOR ~ White

EDIBILITY ~ Probably poisonous, best avoided

Mycena pura might be better called the Occasionally Lilac Bonnet, as it seems to occur in an extraordinary range of colors—from pink to dull yellow. The commonest are lilac, purple, or rose, but no less than 11 different color forms have been recognized. Microscopically these forms look much the same and all have an aroma of radish, but it seems likely that *M. pura* will turn out to be a complex of species once DNA samples are compared. At least some of the fungi called “Lilac Bonnet” contain the toxin muscarine, so, although *M. pura* is considered edible in some countries, it is best avoided.

The Lilac Bonnet forms convex caps, becoming flat to weakly umbonate or depressed. The cap surface is smooth, striate, hygrophanous (changing color with humidity), pink to rose, purple to purple-brown, lilac, violet-gray, rarely dull ocher to bluish or whitish. The gills are whitish to pale pink or lilac. The stem is smooth, hairy at the base, whitish to cap-colored.

DISTRIBUTION

PARALEPISTA FLACCIDA

TAWNY FUNNEL

(SOWERBY) VIZZINI

HEIGHT
Up to 3 in (75 mm)
CAP DIAMETER
Up to 4 in (100 mm)

FAMILY ~ Tricholomataceae
DISTRIBUTION ~ North America, Europe, northern Asia
HABITAT ~ In woodland
ASSOCIATION ~ With broadleaf trees and conifers, in rich soil
GROWTH FORM ~ On ground, in troops or rings
ABUNDANCE ~ Very common
SPORE COLOR ~ Cream
EDIBILITY ~ Edible, though best avoided

The Tawny Funnel is a very common, late-season agaric, often found growing with the Clouded Funnel (*Clitocybe nebularis*). Both fungi are nitrophiles, liking rich soil, and have probably become more common over the last century near farms and towns, thanks to increasing use of fertilizers. *Paralepista flaccida* is variable in color and has also been called *Clitocybe* (or *Lepista*) *inversa* and *C. gilva*. Although edible, it is not highly regarded and can easily be confused with poisonous species. Fruitbodies are also known to accumulate arsenic and cadmium from the soil. An isolate called clitocine has been investigated for antitumor activity.

The Tawny Funnel has fleshy caps that become flat or slightly depressed to deeply funnel-shaped with an inrolled margin. The surface of the cap is smooth, ocher-tan to orange-tan or reddish brown, sometimes flecked with darker spots when old. The crowded gills are deeply decurrent, whitish at first, becoming pale ocher to orange. The stem is whitish to cap-colored.

DISTRIBUTION

PHOLIOTA FLAMMANS

FLAMING SCALYCAP

(BATSCH) P. KUMMER

HEIGHT
Up to 4 in (100 mm)
CAP DIAMETER
Up to 4 in (100 mm)

FAMILY ~ Strophariaceae
DISTRIBUTION ~ North America, Europe, northern Asia
HABITAT ~ In woodland
ASSOCIATION ~ With conifers
GROWTH FORM ~ At base of trunks, on stumps, singly or clustered
ABUNDANCE ~ Common
SPORE COLOR ~ Brown
EDIBILITY ~ Poisonous (to some), best avoided

The vivid colors make the Flaming Scalycap the most eye-catching of *Pholiota* species, so it is perhaps no surprise that fruitbodies are sought after by craft-dyers. The resulting dyes can color yarns and cloth a vibrant lemon-yellow, orange, or a greenish mustard, depending on the methods used. Fruitbodies of the Flaming Scalycap are not so densely clustered as in some other *Pholiota* species, but typically occur singly or in small groups on old stumps and logs. *Pholiota flammans* is a strict conifer associate and is locally common in native conifer forests, but rather less common in plantations.

The Flaming Scalycap forms hemispherical caps that become flat to weakly umbonate. The cap surface is slimy when damp, golden yellow to yellow-orange, with dry, erect, yellow scales. The gills are lemon-yellow becoming rusty brown. The stem is dry, with a fibrous ring when young, cap-colored, and covered in scales that are yellow at first, darkening to tan.

DISTRIBUTION

PLEUROTUS DJAMOR

TROPICAL OYSTER

(RUMPHIUS) BOEDIJN

HEIGHT
Up to ½ in (10 mm)
CAP DIAMETER
Up to 3 in (75 mm)

FAMILY ~ Pleurotaceae

DISTRIBUTION ~ Africa, Central and South America, southern and eastern Asia, Australia, New Zealand

HABITAT ~ In woodland

ASSOCIATION ~ With broadleaf trees

GROWTH FORM ~ On trunks, singly or densely clustered

ABUNDANCE ~ Occasional

SPORE COLOR ~ White

EDIBILITY ~ Edible

Pleurotus djamor is the tropical and subtropical counterpart of the ordinary, temperate Oyster Mushroom (*P. ostreatus*), occasionally found as far north as Japan and as far south as Argentina and New Zealand. Like

the Oyster Mushroom, the Tropical Oyster is a good edible species and is widely cultivated and marketed as the eye-catching and exotic-looking Pink Oyster. This is something of a misnomer, however, since the Tropical Oyster—like its temperate counterpart—is variable in color. In the wild, the fruitbodies are most frequently white, but cultivated strains are usually taken from the less commonly occurring pink color form.

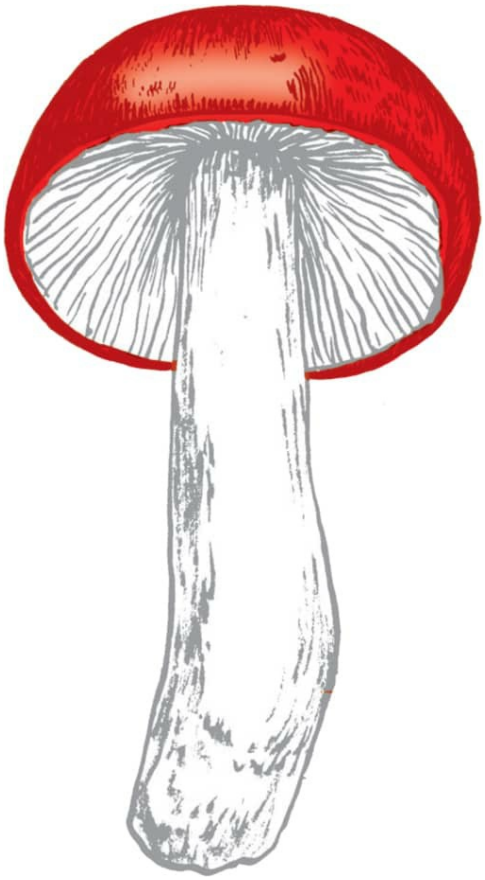
The Tropical Oyster produces shell- or spoon-shaped fruitbodies that are laterally attached to wood. The caps are convex at first, becoming flat to funnel-shaped, smooth, white, or less commonly pinkish to pink. The gills are decurrent, whitish to cap-colored. The stem is lateral, often very short or even absent, smooth, and cap-colored.

DISTRIBUTION

RUSSULA EMETICA

THE SICKENER

(SCHAEFFER) PERSOON



HEIGHT
Up to 4 in (100 mm)
CAP DIAMETER
Up to 4 in (100 mm)

FAMILY ~ Russulaceae

DISTRIBUTION ~ North America, Europe, North Africa, Central America, northern Asia

HABITAT ~ In woodland

ASSOCIATION ~ Ectomycorrhizal, with conifers, especially pine

GROWTH FORM ~ On ground, singly or in troops

ABUNDANCE ~ Common

SPORE COLOR ~ White

EDIBILITY ~ Poisonous (said to be edible after processing)

The Sickener is clearly not a good, edible species. The flesh is hot and acrid and, if consumed, causes gastroenteritic poisoning. Despite this, it used to be widely eaten in eastern Europe, Russia, and elsewhere after boiling (with a change of water) to remove most of the toxins, followed by salting or pickling—the same process used for the equally toxic *Lactarius torminosus*. This was presumably done out of winter necessity, rather than because the result tasted good. It is not recommended. The Sickener is a conifer associate, with a preference for damp or wet woodland. A similar and equally common species grows in beechwoods.

The Sickener has caps that are hemispherical at first, becoming convex to flat, sometimes weakly depressed. The cap surface is smooth, scarlet to bright cherry-red, and peels easily almost to the center. The gills are white to pale cream. The stem is white and smooth to finely and irregularly ridged.

DISTRIBUTION

STROPHARIA RUGOSOANNULATA

WINE CAP

FARLOW

HEIGHT
Up to 8 in (200 mm)
CAP DIAMETER
Up to 12 in (300 mm)

FAMILY ~ Strophariaceae

DISTRIBUTION ~ North America, Europe, South America, northern Asia, Australia, New Zealand

HABITAT ~ In parkland, and gardens, often in woodchip mulch

ASSOCIATION ~ With broadleaf trees or conifers

GROWTH FORM ~ On ground or in woodchips, singly or in troops

ABUNDANCE ~ Locally common

SPORE COLOR ~ Dark purple-brown

EDIBILITY ~ Edible but best avoided

The Wine Cap can grow to an impressive size, and is sometimes known as

the King Stropharia or Garden Giant when grown in North America. The species was first described from rich, cultivated ground in Massachusetts, but its actual origin is unclear since it is nearly always found in gardens, arable fields, or (more recently) in woodchip mulch. In the 1960s, the Wine Cap was promoted as a garden crop in eastern Europe and it has since become a popular mushroom for home-growers (and some commercial growers) elsewhere, although it is said to cause gastroenteritic problems for some people.

The Wine Cap has caps that are convex, becoming flat to broadly umbonate. The cap surface is smooth to finely scaly, wine-red to purple-brown, sometimes yellow-brown (rarely entirely white), with white veil remains at the margin. The gills are pale gray, becoming purple-black. The stem is whitish to ocher, with a conspicuous double ring.

DISTRIBUTION

TERMITOMYCES ROBUSTUS

ROBUST TERMITE-FUNGUS

(BEELI) R. HEIM

HEIGHT
Up to 8 in (200 mm)
CAP DIAMETER
Up to 8 in (200 mm)

FAMILY ~ Lyophyllaceae
DISTRIBUTION ~ Africa, Southeast Asia
HABITAT ~ In scrub, grassland, and woodland
ASSOCIATION ~ With termites
GROWTH FORM ~ On termitaries
ABUNDANCE ~ Common
SPORE COLOR ~ Pale pinkish
EDIBILITY ~ Edible

In the Old World tropics a remarkable association has evolved between certain species of termites and a genus of agarics called *Termitomyces*. The

termites actively “farm” the fungi inside their mounds, using the mycelium to help break down and release nutrients from indigestible woody material. In return, the fungus is provided with its food resource, is protected from competitors, and is actively spread from mound to mound. Fruitbodies—including those of *T. robustus*—appear in the rainy season and are widely collected by local people for food, sometimes on a commercial scale in Southeast Asia.

The Robust Termite-Fungus forms caps that are convex at first, flattening when expanded but sharply umbonate. The surface of the cap is often irregularly ridged or channeled, frequently splitting as it expands, and is ocher-brown to dark brown. The gills are white to pinkish cream. The stem is smooth, whitish to cream, and has a blackish, root-like base.

DISTRIBUTION

TRICHOLOMOPSIS DECORA

PRUNES AND CUSTARD

(FRIES) SINGER

HEIGHT
Up to 4 in (100 mm)
CAP DIAMETER
Up to 3 in (75 mm)

FAMILY ~ Tricholomataceae

DISTRIBUTION ~ North America, Europe, Central America, northern Asia

HABITAT ~ In woodland

ASSOCIATION ~ With conifers

GROWTH FORM ~ On fallen wood, stumps, and sawdust, usually clustered

ABUNDANCE ~ Locally common

SPORE COLOR ~ White

EDIBILITY ~ Not edible, best avoided

This attractive, speckled species is locally common on conifer wood, but in Europe at least tends to prefer montane areas, and is distinctly rare in some lowland countries. It takes its odd English name from its better-known relative, Plums and Custard (*Tricholomopsis rutilans*), which has a plum-red and custard-yellow cap. The cap of *T. decora* is brown and yellow, hence the link to prunes. Despite these culinary references, Prunes and Custard is not a good edible species and is said to have been the cause of a least one severe poisoning case in America. It has an alternative name of the Decorated Mop.

Prunes and Custard forms caps that are convex, becoming flat or depressed at the center. The cap surface is finely scaly, bright yellow to yellow-brown at the center, the small scales slightly darker, yellow-brown. The gills are bright yellow. The stem is smooth and also bright yellow.

DISTRIBUTION

BOLETUS RETICULOCEPS

FISHNET BOLETE

(M. ZANG ET AL) Q. B. WANG & Y. J. YAO

HEIGHT
Up to 5 in (125 mm)
CAP DIAMETER
Up to 5 in (125 mm)

FAMILY ~ Boletaceae
DISTRIBUTION ~ Eastern Asia
HABITAT ~ In woodland and grassland
ASSOCIATION ~ Ectomycorrhizal, with conifers and sedges
GROWTH FORM ~ On ground, singly or in small groups
ABUNDANCE ~ Locally common
SPORE COLOR ~ Brown
EDIBILITY ~ Edible

The Latin epithet *reticuloceps* means “netted head,” but the Fishnet Bolete not only has a raised, netlike surface to the cap, it also has an additional net on the stem. The result is a curious-looking and distinctive bolete. The species was originally described from China and is locally common in

mountain areas such as Yunnan, where it is widely eaten. Unusually, it is said to form an ectomycorrhizal association with some of the sedges found in upland grasslands, as well as with firs and spruce.

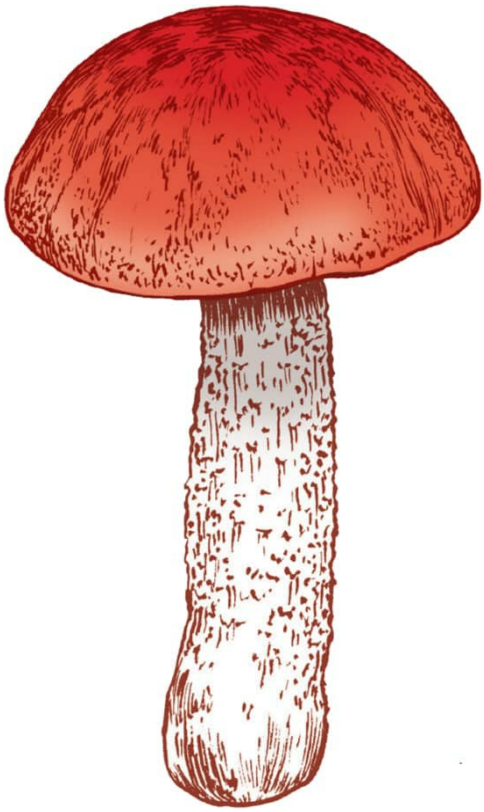
The Fishnet Bolete forms caps that are convex, becoming flatter. The surface of the cap is ocher to brown, covered in fine, granular scales, and deeply veined or ridged, the veins forming a netlike pattern. The pores are whitish, then yellow. The stem is brown, with a whitish, raised network. The flesh is white.

DISTRIBUTION

LECCINUM AURANTIACUM

ORANGE OAK BOLETE

(BULLIARD) GRAY



HEIGHT
Up to 9 in (225 mm)
CAP DIAMETER
Up to 8 in (200 mm)

FAMILY ~ Boletaceae

DISTRIBUTION ~ North America, Europe, Central America, northern Asia

HABITAT ~ In woodland

ASSOCIATION ~ Ectomycorrhizal, with broadleaf trees, particularly oak and poplar

GROWTH FORM ~ On ground, singly or in troops

ABUNDANCE ~ Common

SPORE COLOR ~ Olive-brown

EDIBILITY ~ Edible

Despite its English name, this large and imposing bolete is not restricted to oaks, but also occurs with poplars, or occasionally birches and limes. Until recently it was split into two species, the more orange *Leccinum aurantiacum* with poplars, and the slightly darker *L. quercinum* with oaks —but DNA sequencing has shown them to be identical. The species was originally described from France and is widespread in the northern hemisphere, though its status in North America is uncertain because of confusion with look-alike species. It is considered a good edible bolete and is commercially harvested in eastern Europe and China.

The Orange Oak Bolete forms caps that are hemispherical, becoming convex, the surface smooth, orange to rusty red or brick-red. The pores are whitish, bruising wine-red. The stem is white and scurfy-scaly, the scales whitish, becoming cap-colored to brown. The cut flesh is cream, flushing wine-red to purplish gray, sometimes also bluish in parts.

DISTRIBUTION

RUBROBOLETUS SATANAS

DEVIL'S BOLETE

(LENZ) KUAN ZHAO & ZHU L. YANG

HEIGHT
Up to 6 in (150 mm)
CAP DIAMETER
Up to 12 in (300 mm)

FAMILY ~ Boletaceae

DISTRIBUTION ~ Europe, North Africa

HABITAT ~ In calcareous woodland and parkland

ASSOCIATION ~ Ectomycorrhizal, with broadleaf trees, particularly oak

GROWTH FORM ~ On ground, singly or in small groups

ABUNDANCE ~ Rare

SPORE COLOR ~ Olive-brown

EDIBILITY ~ Poisonous

Harald Othmar Lenz, who first described the species from Germany in 1831, believed he was made ill by vapors from the fruitbodies he was examining. He concluded that *Rubroboletus satanas* was the most poisonous fungus of them all—hence his choice of name. In fact, despite its fearsome reputation, the Devil's Bolete causes nothing worse than gastroenteritic poisoning. Fruitbodies are seldom eaten, since they have a reputation for developing a repulsive, sickly-sweet smell, although it is quite pleasant and spicy when young. The Devil's Bolete is also quite rare and is on the national Red Lists of threatened fungal species in several European countries.

The Devil's Bolete forms caps that are convex, becoming flatter. The cap surface is smooth, whitish flushed with brown or buff. The pores are red to orange, bruising bluish green. The stem is yellow-orange at the top, red below, and buff at the base, typically swollen above the base and with a partial netlike covering. The flesh is white to pale yellow, turning pale blue when cut.

DISTRIBUTION

SUILLUS OCHRACEOROSEUS

ROSY LARCH BOLETE

(SNELL) SINGER

HEIGHT
Up to 5 in (125 mm)
CAP DIAMETER
Up to 10 in (250 mm)

FAMILY ~ Suillaceae
DISTRIBUTION ~ Western North America, Eastern Asia
HABITAT ~ In woodland
ASSOCIATION ~ Ectomycorrhizal, with larch or (in Asia) pine
GROWTH FORM ~ On ground, singly or in troops
ABUNDANCE ~ Occasional
SPORE COLOR ~ Dark red-brown
EDIBILITY ~ Not edible

The Rosy Larch Bolete is an attractively colored fungus, occurring mainly with larch in America's Rocky Mountains and Pacific Northwest, but also reported with pine in China. With its dry, fibrous-scaly cap, it is not

closely related to the slimy, smooth-capped Larch Bolete (*Suillus grevillei*), despite the similarity of the English names. Indeed, *Suillus ochraceoroseus* is distinct enough to have been referred in the past to the separate genera *Boletinus* or *Fuscoboletinus*. Fruitbodies are sometimes said to be edible, but not worth eating because of their bitterness.

The Rosy Larch Bolete forms caps that are convex, becoming flat. The cap surface is fibrous-scaly, bright pink to rose, brick-red with age. The pores are elongated and dark yellow to olive-ocher. The stem is yellowish, sometimes with red-brown stains toward the base. The whitish veil forms a partial ring or persists as tatters at the cap margin. The flesh is yellowish.

DISTRIBUTION

XEROCOMELLUS CHRYSENTERON

RED-CRACKING BOLETE

(BULLIARD) SUTARA

HEIGHT
Up to 4 in (100 mm)
CAP DIAMETER
Up to 5 in (125 mm)

FAMILY ~ Boletaceae

DISTRIBUTION ~ North America, Europe, North Africa, northern Asia, New Zealand

HABITAT ~ In woodland

ASSOCIATION ~ Ectomycorrhizal, with conifers, rarely broadleaf trees

GROWTH FORM ~ On ground, singly or in small groups

ABUNDANCE ~ Common

SPORE COLOR ~ Brown to pink-brown

EDIBILITY ~ Edible

Xerocomellus chrysenteron was once thought to be a widespread and easily recognized species, thanks to its cap skin cracking to reveal reddish flesh below. Recent research, however, has revealed a number of look-alike species some of which may actually be commoner than the true Red-Cracking Bolete. The real species has a preference for conifers, only occasionally occurring with beech and other broadleaf trees. The species is edible, but is said to be tasteless and soggy, so is not esteemed by bolete hunters—unless they are very, very hungry.

The Red-Cracking Bolete forms caps that are convex, becoming flatter. The cap surface is finely velvety, dark to grayish brown, cracking with age and revealing reddish flesh below. The pores are pale yellow-green, bruising bluish. Its stem is smooth, yellow at the top, and dark reddish below. The flesh is pale yellow, reddish immediately below the cap, slowly bluing when cut.

DISTRIBUTION

BONDARZEWIA MESENTERICA

BONDARTSEV'S POLYPORE

(SCHAEFFER) KREISEL

HEIGHT
Up to 12 in (300 mm)
CAP DIAMETER
Up to 10 in (250 mm)

FAMILY ~ Bondarzewiaceae

DISTRIBUTION ~ Western North America, continental Europe, northern Asia

HABITAT ~ In woodland

ASSOCIATION ~ With conifers

GROWTH FORM ~ At base or among roots of living trees

ABUNDANCE ~ Occasional

SPORE COLOR ~ White

EDIBILITY ~ Edible

This large and conspicuous polypore grows at the base of conifers and slowly rots away the heartwood in the butt and roots. It is quite widespread throughout the northern hemisphere, though not known in eastern North America or the British Isles. Microscopically it has very distinctive spores

which show that it is related to gilled agarics in the genera *Russula* and *Lactarius*. It has a pleasantly nutty smell when fresh, and is said to be edible when very young, though the flesh becomes tough and bitter with age. The compound fruitbodies can reach 40 in (1000 mm) in diameter.

Bondartsev's Polypore is a large species that produces one or several fleshy caps on a central or lop-sided, branching stem. Multi-capped specimens can form giant, cabbage-like rosettes. The individual caps are smooth and purplish brown. The pores are cream and decurrent, running right down the stem.

DISTRIBUTION

DAEDALEA QUERCINA

OAK MAZEGILL

(LINNAEUS) PERSOON

THICKNESS
Up to 3 in (75 mm)
CAP DIAMETER
Up to 8 in (200 mm)

FAMILY ~ Fomitopsidaceae

DISTRIBUTION ~ North America, Europe, North Africa, Asia

HABITAT ~ In woodland

ASSOCIATION ~ On broadleaf wood, particularly oak

GROWTH FORM ~ On stumps and logs, singly or in small coalescing groups

ABUNDANCE ~ Common

SPORE COLOR ~ White

EDIBILITY ~ Not edible

The generic name *Daedalea* is taken from the mythical Greek artificer Daedalus, who created the original labyrinth in which the minotaur was kept. His name was appropriately applied to this fungus because of its maze-like, or daedaleoid, pores which have also given it the English names of the Oak Mazegill and Thick-Walled Maze Polypore. In the past, fruitbodies have been used as natural curry-combs for grooming horses and, when set alight, to smoke out bees by beekeepers in England. Nowadays, small dried fruitbodies of *Daedalea quercina*, often brightly dyed, are a frequent component of decorative potpourri mixes.

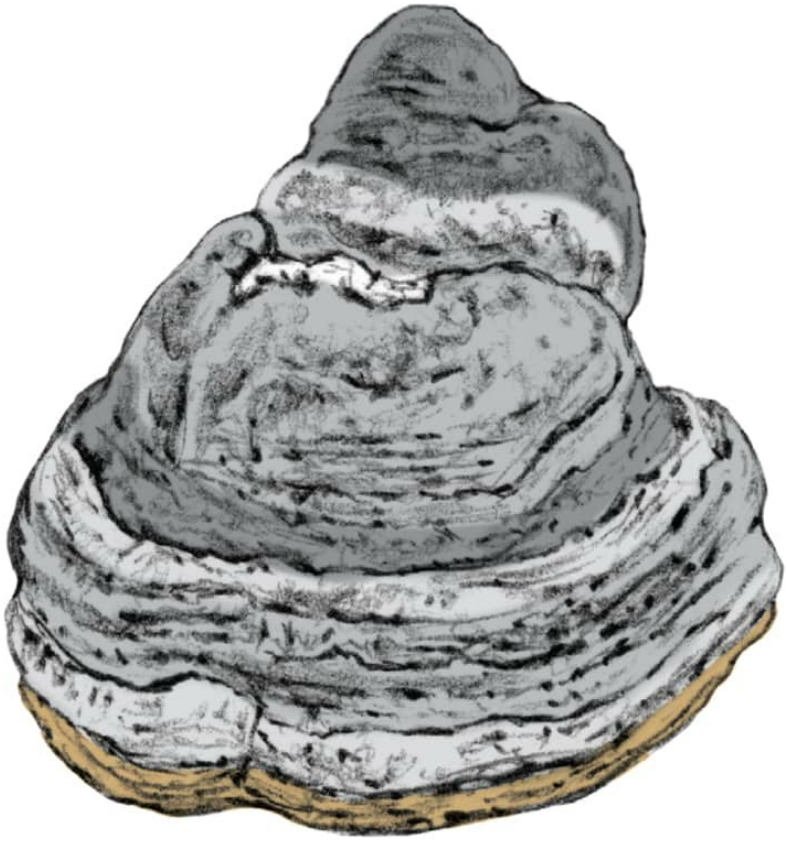
The Oak Mazegill produces corky or woody, perennial brackets. The cap is brownish gray with an ocher margin and is smooth, though developing concentric ridges with each year's new growth. The distinctive maze-like pores are ocher to buff, and are quite thick, up to ⅛ in (3 mm) in width.

DISTRIBUTION

FOMES FOMENTARIUS

HOOF FUNGUS

(LINNAEUS) J. KICKX



THICKNESS
Up to 6 in (150 mm)
CAP DIAMETER
Up to 6 in (150 mm)

FAMILY ~ Polyporaceae
DISTRIBUTION ~ North America, Europe, North Africa, Asia
HABITAT ~ In woodland
ASSOCIATION ~ On broadleaf trees, particularly birch
GROWTH FORM ~ On standing or fallen trunks, singly or scattered
ABUNDANCE ~ Common
SPORE COLOR ~ White
EDIBILITY ~ Not edible

Fomes fomentarius was the main source of amadou, a soft, felty substance made from the fibrous inner flesh of the fungus. Amadou, sometimes impregnated with saltpeter, was once widely used as tinder before the invention of matches. The ancient “Iceman,” found frozen in an Alpine glacier, was carrying pieces of *F. fomentarius* with him, presumably to light fires. Amadou was also used by barber-surgeons as a styptic to stop bleeding. It is still occasionally used today by fly-fishermen for drying flies and (in eastern Europe) for making feltlike traditional hunting hats.

The Hoof Fungus produces hard, woody, perennial fruitbodies that over the years become hoof-shaped. The cap develops a smooth, gray crust, though the growing margin is pale brown. The pores are round and pale brown. The flesh is yellowish brown and fibrous.

DISTRIBUTION

GANODERMA SICHUANENSE

LINGZHI

J. D. ZHAO & X. Q. ZHANG

THICKNESS
Up to 2 in (50 mm)
CAP DIAMETER
Up to 12 in (300 mm)

FAMILY ~ Ganodermataceae

DISTRIBUTION ~ East Asia

HABITAT ~ In woodland

ASSOCIATION ~ Weak parasite of broadleaf trees, especially oak, chestnut, and plum

GROWTH FORM ~ Singly or in groups on living and dead, standing, or fallen wood

ABUNDANCE ~ Occasional

SPORE COLOR ~ Brown

EDIBILITY ~ Not edible

The Lingzhi, known as Reishi in Japan and celebrated in China as the

Mushroom of Immortality, is widely used in traditional oriental medicine. It is claimed to be effective against a wide range of illnesses, especially liver diseases, and is believed to prolong life. The Lingzhi is too hard and bitter to be edible fresh, but is commonly taken dried as a tea or as a distinctive wine. Only in the last 20 years has it been possible to cultivate it commercially with a technique pioneered in Japan using plum tree sawdust. The industry is now thought to be worth more than $2.5 billion a year. Until recently Lingzhi was confused with the similar-looking Lacquered Bracket (*Ganoderma lucidum*) from Europe, but DNA sequencing has now shown them to be separate species

The Lingzhi is an attractive, reddish brown bracket with a hard, grooved, varnish-like cap. It often arises from a similarly colored, erect, off-center stalk up to 10 in (250 mm) high. As it ages, it can become dark purple-brown to blackish. The underside has tiny circular white pores, which mature to brown and darken on bruising.

DISTRIBUTION

LAETIPORUS SULPHUREUS

CHICKEN OF THE WOODS

(BULLIARD) MURRILL

THICKNESS
Up to 1 in (25 mm)
CAP DIAMETER
Up to 20 in (500 mm)

FAMILY ~ Fomitopsidaceae

DISTRIBUTION ~ Eastern North America, Europe, Africa, Asia

HABITAT ~ In woodland

ASSOCIATION ~ On broadleaf trees, more rarely conifers, particularly yew

GROWTH FORM ~ On trunks and stumps of living or dead trees

ABUNDANCE ~ Very common

SPORE COLOR ~ White

EDIBILITY ~ Widely eaten when young, but toxic to some people; best avoided

Common and widely distributed, *Laetiporus sulphureus* is a wood-rotting species, producing a brown or cubic butt rot that can hollow out a trunk and sometimes cause its collapse. It is particularly common on oak, but also occurs on a range of other trees. It has been given the curious name of the Chicken of the Woods because it is widely considered a good edible species, and the cooked flesh of young specimens resembles chicken. Unfortunately, however, it causes rapid-onset nausea and vomiting in some people, possibly as an allergic reaction. It has an alternative English name of Sulfur Shelf.

The Chicken of the Woods typically forms overlapping clusters of annual fruitbodies. When young they are soft, orange-yellow, and rounded, but expand to become yellow and plate-like in maturity, with small yellow pores on the undersurface. They fade to buff with age, when they become crumbly and then disintegrate.

DISTRIBUTION

CERIOPORUS SQUAMOSUS

DRYAD'S SADDLE

(HUDSON) QUÉLET

THICKNESS
Up to 2 in (50 mm)
CAP DIAMETER
Up to 18 in (450 mm)

FAMILY ~ Polyporaceae

DISTRIBUTION ~ Eastern North America, Europe, Africa, Asia

HABITAT ~ In woodland

ASSOCIATION ~ With broadleaf trees

GROWTH FORM ~ On trunks or fallen wood, singly or in overlapping groups

ABUNDANCE ~ Common

SPORE COLOR ~ White

EDIBILITY ~ Edible

Cerioporus squamosus takes its common names of the Dryad's Saddle and the Pheasant-back Polypore from its saddle-shaped appearance,

supposedly fit for a wood nymph, and its striking markings resembling pheasant feathers. Although reported as a good edible species when young, it should be well-cooked as it contains lectins, natural insecticides that, if uncooked, can cause gastric upset. Like the Birch Polypore (*Piptoporus betulinus*), the Dryad's Saddle was traditionally dried in strips and used as a sharpening strop for cut-throat razors. More recently it has been used in craft paper-making. Its metabolites have been shown to absorb iron from solution, making it of potential use in heavy metal bioremediation.

The Dryad's Saddle is a large, kidney-shaped bracket with dark, blackish to reddish brown, concentric, feathery scales on a cream to yellowish ocher background. The white honeycomb-like pores run down the stem, which is usually off-center, and short, tough, and stout with a blackish base. The flesh is soft and whitish when young, with a sweetish, mealy smell.

DISTRIBUTION

PYCNOPORUS SANGUINEUS

BLOOD-RED BRACKET

(LINNAEUS) MURRILL

THICKNESS
Up to ¼ in (5 mm)
CAP DIAMETER
Up to 3 in (80 mm)

FAMILY ~ Polyporaceae

DISTRIBUTION ~ Southern North America, Africa, Central and South America, Asia, Australia, New Zealand

HABITAT ~ In woodland

ASSOCIATION ~ On broadleaf wood

GROWTH FORM ~ On fallen branches and logs

ABUNDANCE ~ Very common

SPORE COLOR ~ White

EDIBILITY ~ Not edible

This striking species is one of the commonest, and certainly one of the

most conspicuous, brackets in the tropics and subtropics. It seems able to grow on exposed fallen wood, despite high temperatures and desiccation. In West Africa the species was traditionally used to create orange and brown dyes, but nowadays the Blood-Red Bracket has been widely tested as a source of metabolites to do just the opposite—break down and remove dyes. The fungus has also been used in traditional medicine and modern research has confirmed that cinnabarin, a compound it produces, has some potentially useful antibacterial and antiviral properties.

The Blood-Red Bracket produces leathery to woody, annual fruitbodies that are bright orange-red at first, gradually deepening to blood-red. The caps are smooth, the small pores similarly colored to the cap.

DISTRIBUTION

TRAMETES VERSICOLOR

TURKEYTAIL

(LINNAEUS) LLOYD

THICKNESS
Up to ½ in (10 mm)
CAP DIAMETER
Up to 1½ in (40 mm)

FAMILY ~ Polyporaceae

DISTRIBUTION ~ North America, Europe, Africa, Central and South America, Antarctic islands, Asia, Australia, New Zealand

HABITAT ~ In woodland

ASSOCIATION ~ On broadleaf trees, rarely conifers

GROWTH FORM ~ On stumps, branches, and logs, and worked timber

ABUNDANCE ~ Very common

SPORE COLOR ~ White

EDIBILITY ~ Not edible

This is probably the most common and widespread species of bracket fungus in the world. Fruitbodies are always markedly zoned and have been

given their English name from a fancied resemblance to a wild turkey's tail. Recent research has shown that enzymes produced by *Trametes versicolor* to rot wood are also extremely effective in breaking down long-lasting colors in artificial dyes. This may mean it has a future role as a natural bioremediation agent, helping clear up chemical pollution. In East Asia, extracts of the Turkeytail—sometimes taken as a tea—have also been promoted for their supposed health benefits.

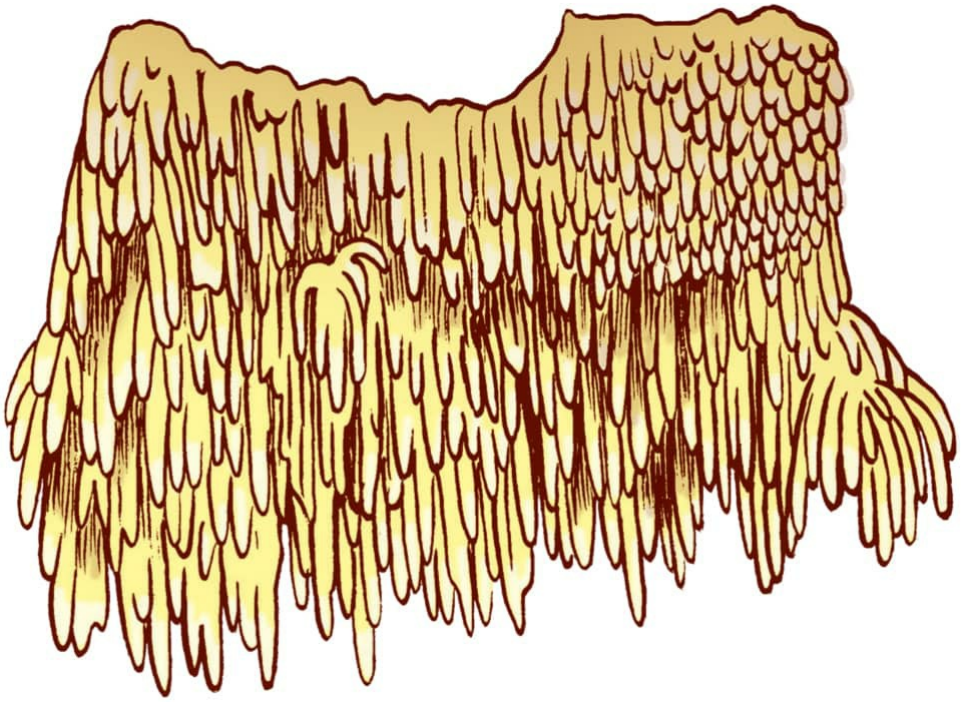
The Turkeytail produces fruitbodies in tiers and clusters, sometimes in rosettes if growing on the upper surfaces of stumps and logs. Individual caps are leathery but thin, concentrically zoned, the zones velvety or smooth, in various shades of gray, brown, slate, dark red, orange, olive, and buff, with a whitish margin. The pores are small and cream to pale gray.

DISTRIBUTION

SARCODONTIA CROCEA

APPLE TOOTH

(SCHWEINITZ) KOTLABA



HEIGHT
Up to ½ in (15 mm)
DIAMETER
Up to 4 in (100 mm)

FAMILY ~ Meruliaceae
DISTRIBUTION ~ North America, Europe, northern Asia
HABITAT ~ In orchards, gardens, and woodland
ASSOCIATION ~ On apples, more rarely other broadleaf trees
GROWTH FORM ~ On trunks and branches
ABUNDANCE ~ Rare
SPORE COLOR ~ White
EDIBILITY ~ Not edible

The Apple Tooth used to be fairly common on old apple trees in orchards, but since most of these old orchards have been felled, it has now become increasingly rare. Indeed it has recently been assessed as 'vulnerable'

throughout its range and placed on the Global Red List of Threatened Species. It causes a rot of dead heartwood that eventually hollows out the tree, but does not kill it. When young and fresh, the Apple Tooth is said to smell of pineapple, though the smell becomes rather sickly with age and is then often described as unpleasant.

The Apple Tooth forms fruitbodies that are effused, but typically grow in cracks and crevices and then appear lumpy and irregular. The surface is partly covered in waxy, conical spines, but may also have non-spiny sterile areas and a wide margin. When young, the fruitbodies are yellow, but often discolor reddish with age.

DISTRIBUTION

TERANA COERULEA

COBALT CRUST

(LAMBOTTE) KUNTZE

THICKNESS
Les than ⅛ in (2 mm)
DIAMETER
Up to 8 in (200 mm)

FAMILY ~ Phanerochaetaceae

DISTRIBUTION ~ North America, Europe, Africa, Central and South America, Asia, Australia, New Zealand

HABITAT ~ In woodland

ASSOCIATION ~ On broadleaf wood, more rarely conifers

GROWTH FORM ~ On fallen twigs, branches, logs, and stumps

ABUNDANCE ~ Locally common

SPORE COLOR ~ White

EDIBILITY ~ Not edible

This attractive species is one of the few patch-forming fungi that can be confidently identified in the field, thanks to its eye-catching color. It seems to be a litter fungus, forming fruitbodies over the undersides of fallen wood and branches, but often spreading over surrounding leaf litter and mosses. The Cobalt Crust occurs throughout the tropics and subtropics, well into the temperate zone. In Europe it has a westerly distribution and

seems to prefer mild, damp climates. The fungus produces a metabolite called cortalcerone that has been shown to have antibiotic properties.

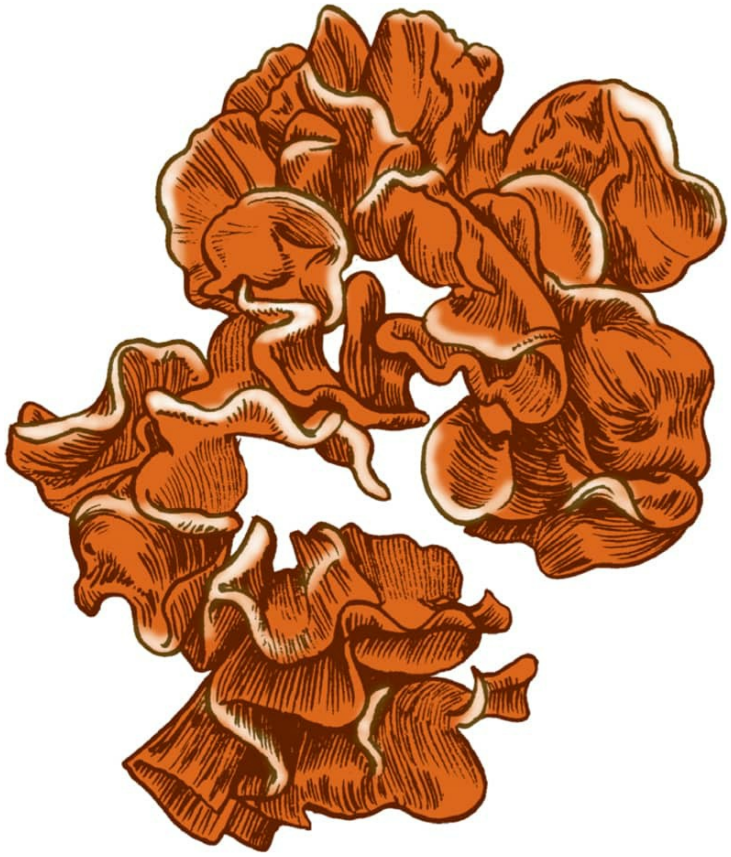
The Cobalt Crust produces effused fruitbodies that are smooth to shallowly warty, soft, and velvety. Young fruitbodies are small and almost circular, but quickly amalgamate to produce large, irregular sheets. Fresh, actively growing specimens are bright, deep blue with white, cottony margins, but older fruitbodies may become a duller gray-blue, though often still bright near the margins.

DISTRIBUTION

PHAEOTREMELLA FOLIACEA

LEAFY BRAIN

(PERSOON) WEDIN, J. C. ZAMORA & MILLANES



HEIGHT
Up to 4 in (100 mm)
CAP DIAMETER
Up to 8 in (200 mm)

FAMILY ~ Tremellaceae

DISTRIBUTION ~ North America, Europe

HABITAT ~ In woodland

ASSOCIATION ~ Parasitic on *Stereum sanguinolentum* on conifer wood

GROWTH FORM ~ On dead trunks, branches, and logs

ABUNDANCE ~ Common

SPORE COLOR ~ White

EDIBILITY ~ Edible

This is one of the largest and most conspicuous jelly fungi, often producing mounds of seaweedlike growth on stumps and logs. It is a parasite of bracket-like *Stereum* fungi, though unlike *Tremella aurantia* and *T. encephala* it does not parasitize the fruitbodies of its host but the host hyphae hidden in the wood. Often the Leafy Brain—also known as the Jelly Leaf—can be found fruiting on the top of a branch, while the *Stereum* is fruiting on the underside. Similar species, including *Phaeotremella fimbriata* and *P. frondosa*, occur on broadleaf wood.

The Leafy Brain has brown to purplish or blackish brown, gelatinous fruitbodies that are seaweedlike, producing a mass of thin to thickish fronds and folds. When fresh, these may be erect, but when old, or in dry weather, they become lax.

DISTRIBUTION

AURISCALPIUM VULGARE

EARPICK FUNGUS

GRAY

HEIGHT
Up to 1 in (25 mm)
CAP DIAMETER
Up to 1 in (25 mm)

FAMILY ~ Auriscalpiaceae
DISTRIBUTION ~ North America, Europe, Central America, Asia
HABITAT ~ In conifer woodland
ASSOCIATION ~ Mainly with pine, occasionally spruce
GROWTH FORM ~ On fallen or buried cones
ABUNDANCE ~ Very common
SPORE COLOR ~ White
EDIBILITY ~ Not edible

Careful search in any conifer woodland is likely to reveal this small but distinctive species, which, although it may appear to grow directly on the ground, has a specialized habitat niche as a wood-rotter of fallen and buried cones or cone debris. Several fruiting bodies can sometimes be found growing from one cone, and unlike many fungal species it can be found throughout the year. Its common name derives from its similarity in appearance to the right-angled device used by ancient Romans as an ear scraper. In the north temperate zone it is the sole known representative of the genus.

The Earpick Fungus has a small, irregular, reddish brown, kidney-shaped cap with a velvety to smooth texture, and a tall, dark, lateral stem bristling with tiny hairs. It has short, pale grayish, pointed spines up to ⅛ in (3 mm) long beneath the cap, and the whole fungus is quite rigid, tough, and leathery. The flesh is pale and mild-tasting without a particular smell.

DISTRIBUTION

CANTHARELLUS CIBARIUS

CHANTERELLE

FRIES

HEIGHT
Up to 4 in (100 mm)
CAP DIAMETER
Up to 5 in (125 mm)

FAMILY ~ Cantharellaceae

DISTRIBUTION ~ North America, Europe, Africa, Central America, northern Asia

HABITAT ~ In woodland

ASSOCIATION ~ Ectomycorrhizal with broadleaf trees and conifers

GROWTH FORM ~ On ground, in troops

ABUNDANCE ~ Common

SPORE COLOR ~ White

EDIBILITY ~ Edible

The Chanterelle, also known as the Golden Chanterelle, is one of the best-known and most highly prized edible fungi. Fortunately it is a common

species, since it is collected on a commercial scale in many northern countries and exported worldwide. All *Cantharellus* and *Craterellus* species are collectively known as chanterelles, so other species are sometimes marketed under this name. There is even a thriving trade in collecting African species, such as the reddish *Cantharellus miniatescens*, for export to European markets. In North America, several species previously thought to be *C. cibarius* are now known to be distinct—but all are equally edible.

The Chanterelle has caps that are convex at first, becoming depressed or funnel-shaped. The cap surface is smooth, with a wavy or lobed margin, egg-yolk-yellow to ocher. The undersurface has thick, decurrent, gill-like ridges that are cap-colored. The stem is smooth and cap-colored, but sometimes whitish at the base.

DISTRIBUTION

CLAVULINOPSIS FUSIFORMIS

GOLDEN SPINDLES

(SOWERBY) CORNER

HEIGHT
Up to 5 in (120 mm)
DIAMETER
Up to ¼ in (5 mm)

FAMILY ~ Clavariaceae
DISTRIBUTION ~ North America, Europe, northern Asia
HABITAT ~ In grassland, more rarely woodland
ASSOCIATION ~ With moss and grass
GROWTH FORM ~ On ground, often in scattered troops
ABUNDANCE ~ Common
SPORE COLOR ~ White
EDIBILITY ~ Not edible

A large cluster of Golden Spindles is an eye-catching sight on a dull day in fall. The species is related to White and Smoky Spindles (*Clavaria fragilis* and *C. fumosa*). Like them, it is a saprotroph, an organism that lives on dead and decaying matter, in this case the leaf litter of woodlands or the thatch and moss of grasslands. Golden Spindles was originally described and illustrated by the English botanist and mycologist James Sowerby, who found it “not very rare” on Hampstead Heath in London in the 1790s. It probably still grows there today.

Golden Spindles has smooth, tubular or often somewhat flattened, unbranched fruitbodies with pointed tips. They normally grow gregariously in large clusters, and are bright orange-yellow when fresh.

DISTRIBUTION

CLAVARIA ZOLLINGERI

VIOLET CORAL

LÉVEILLE

HEIGHT
Up to 4 in (100 mm)
DIAMETER
Up to 2½ in (60 mm)

FAMILY ~ Clavariaceae
DISTRIBUTION ~ North America, Europe, Asia, Australia, New Zealand
HABITAT ~ In grassland and woodland
ASSOCIATION ~ Often with mosses in grass and leaf litter
GROWTH FORM ~ On ground, singly or in small groups
ABUNDANCE ~ Occasional
SPORE COLOR ~ White
EDIBILITY ~ Not edible

Most of the larger coral-shaped fungi belong to the brown-spored genus *Ramaria*, but this fine-looking species is white-spored and actually belongs with the club fungi, despite its densely branched shape. In Britain and Europe it is typically found in old, unimproved pasture and lawns, often in the same area as waxcaps (*Hygrocybe* species), and is generally uncommon. Indeed, the Violet Coral has recently been assessed as 'vulnerable' and placed on the Global Red List of Threatened Species. It has also been suggested that specimens from America and Australasia, where it occurs in woodland, may represent similar-looking but distinct species.

The Violet Coral forms fruitbodies that are repeatedly branched, with each branch being rounded to somewhat flattened, slightly wrinkled, and very brittle. The base of the main stem may be whitish, but otherwise the whole fruitbody is bright violet to purple, though older specimens may fade considerably, becoming first gray and then eventually paling to a sordid yellowish white.

DISTRIBUTION

PHYSALACRIA INFLATA

BLADDER STALKS

(SCHWEINITZ) PECK

HEIGHT
Up to ¾ in (20 mm)
CAP DIAMETER
Up to ½ in (12 mm)

FAMILY ~ Physalacriaceae
DISTRIBUTION ~ North America
HABITAT ~ In woodland
ASSOCIATION ~ On broadleaf wood
GROWTH FORM ~ On fallen branches and logs, sometimes in leaf litter
ABUNDANCE ~ Locally common
SPORE COLOR ~ White
EDIBILITY ~ Not edible

Physalacria inflata has been described as looking like a miniature balloon on a stick, and its peculiar shape has meant that its relationships to other fungi have long been debated. Many mycologists suggested it belonged with the club and coral fungi, others with the gilled agarics. Now

molecular research has clearly shown that the latter is true and that Bladder Stalks is most closely related to gilled agarics such as the Porcelain Fungus (*Oudemansiella mucida*) and the Wrinkled Peach (*Rhodotus palmatus*).

Bladder Stalks produces clusters or swarms of small fruitbodies on rotten wood or leaf litter. Each fruitbody consists of a smooth to somewhat wrinkled, white to cream, bladderlike head that is typically ball-shaped, but easily dented, collapsing and flattening with age. The stems are slender, smooth, and white to cream.

DISTRIBUTION

ASTRAEUS HYGROMETRICUS

BAROMETER EARTHSTAR

(PERSOON) MORGAN

HEIGHT
Up to 2 in (50 mm)
DIAMETER
Up to 4 in (100 mm)

FAMILY ~ Diplocystidiaceae

DISTRIBUTION ~ North America, Europe, Africa, Central and South America, Asia, Australia

HABITAT ~ In woodland

ASSOCIATION ~ Ectomycorrhizal, with broadleaf trees and conifers

GROWTH FORM ~ On ground, singly or in troops

ABUNDANCE ~ Common

SPORE COLOR ~ Brown

EDIBILITY ~ Not edible

Despite its English name and its appearance, the Barometer Earthstar is not actually an earthstar, being completely unrelated to the true earthstars in the genus *Geastrum*. It is a curious case of parallel evolution. Both groups of fungi have developed the same method of dispersing their spores—using the pressure of falling raindrops to puff them out through the hole in the fruitbody top. The Barometer Earthstar has developed the additional ability to extend its leathery "arms" in wet weather (ready for the raindrops) and fold them back over the fruitbody for protection when it is dry.

The Barometer Earthstar produces fruitbodies that are spherical at first. At maturity the thick outer skin splits and (if the weather is damp) peels back to form 6–12 rays or arms, revealing the puffball-like spore sack at the center. The rays are strongly hygroscopic and in dry weather curl back over the spore sack.

DISTRIBUTION

LYCOPERDON PERLATUM

COMMON PUFFBALL

PERSOON

HEIGHT
Up to 3 in (80 mm)
DIAMETER
Up to 2 in (50 mm)

FAMILY ~ Agaricaceae
DISTRIBUTION ~ North America, Europe, northern Asia
HABITAT ~ In woodland
ASSOCIATION ~ With broadleaf trees or conifers
GROWTH FORM ~ On ground, singly, in small clusters, or in troops
ABUNDANCE ~ Very common
SPORE COLOR ~ Brown
EDIBILITY ~ Edible when young

The Common Puffball or Devil's Snuff Box is edible when young, though care should be taken not to confuse them with poisonous earthballs. In the past, they were valued as styptics to staunch wounds and treat burns, as

tinder for lighting fires, and as a means of smoking out and stupefying bees. Some indigenous cultures, however, treated puffballs with caution, since their spores were thought to cause blindness. Local names included Blindman's Bellows and No-Eyes. The spores can irritate the eyes and nose and, if inhaled in quantity, may even cause an allergic reaction in the lungs called lycoperdonosis.

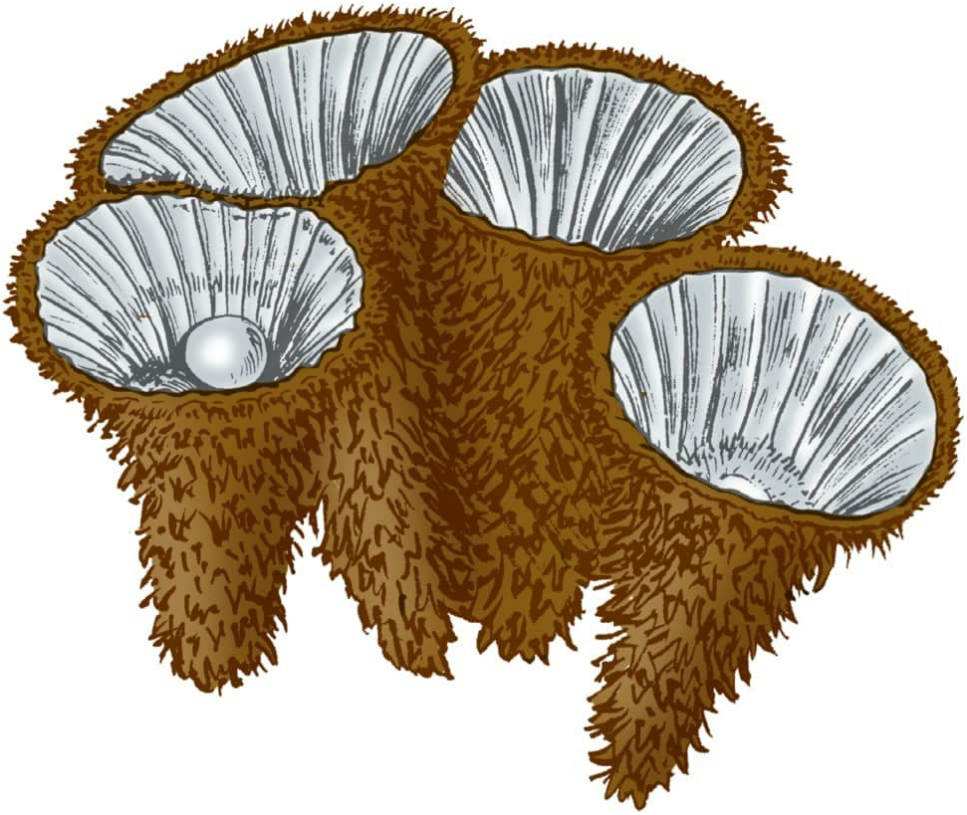
The Common Puffball is a familiar woodland species, whitish to cream at first, and powdered with granular, conical spines or warts. With age it becomes browner, and the spines are shed to leave a netlike pattern on the surface. At maturity, a round hole forms at the apex of the fruitbody allowing the brown spores to puff out.

DISTRIBUTION

CYATHUS STRIATUS

FLUTED BIRD'S NEST

(HUDSON) PERSOON



HEIGHT
Up to ½ in (15 mm)
DIAMETER
Up to ¼ in (8 mm)

FAMILY ~ Agaricaceae

DISTRIBUTION ~ North America, Europe, Central and South America, Asia, New Zealand

HABITAT ~ In damp woodland, shady gardens, and woodchip mulch

ASSOCIATION ~ On rotten, often mossy, wood or plant debris

GROWTH FORM ~ In small or large groups

ABUNDANCE ~ Common

SPORE COLOR ~ White

EDIBILITY ~ Not edible

The Fluted Bird's Nest—also known as the Splash Cup—prefers mossy, fallen branches in damp, shady areas, whereas the equally common Field Bird's Nest (*Cyathus olla*) prefers open ground. Their resemblance to miniature bird's nests is remarkable, but local names also include Fairy Goblets and Pixies' Purses, with the peridioles seen as coins instead of eggs. In Scotland, finding them on the way to work was once considered a lucky omen. They may also bring good fortune in medicine. Antibiotics called striatins have been isolated from *Cyathus striatus*, as well as an extract that appears to have potential as a cancer therapeutic.

The Fluted Bird's Nest forms fruitbodies that at first look like a tiny, shaggy, brown goblet with a smooth, whitish top. This top surface ruptures at maturity to reveal the gray, egglike peridioles below. The inner surfaces of the goblet are fluted and silvery gray.

DISTRIBUTION

CLATHRUS ARCHERI

DEVIL'S FINGERS

(BERKELEY) DRING

HEIGHT
Up to 2½ in (60 mm)
DIAMETER
Up to 8 in (200 mm)

FAMILY ~ Phallaceae

DISTRIBUTION ~ Australia, New Zealand, Africa; naturalized in Europe and western North America (California)

HABITAT ~ In woodland and gardens

ASSOCIATION ~ On rich soil or very decayed woody remains

GROWTH FORM ~ On ground, singly or in groups

ABUNDANCE ~ Occasional

SPORE COLOR ~ Olive-brown

EDIBILITY ~ Edible (in "egg" stage)

Originally described from Tasmania, Devil's Fingers—or the Octopus Stinkhorn—is said to have been shipped into continental Europe with straw for ANZAC cavalry during World War I. More prosaically, the fungus has also been introduced with exotic garden plants, and has now become widely naturalized in southern Britain and, more recently, in California. The inner parts of the tentacle-like arms are covered in a sweet, but fetid, olive-brown slime that attracts flies, which subsequently distribute the spores. As a fly attractant, it may therefore be no coincidence that the fruitbody itself resembles some grotesque, carrionlike flower.

Devil's Fingers has fruitbodies that emerge from a gelatinous, white "egg" similar to those of stinkhorns, but slightly smaller and often formed in clusters. The remains persist at the base of the short stem. The spore-bearing part of the fruitbody has 4–8 radiating "arms," variously colored pink to red.

DISTRIBUTION

PHALLUS IMPUDICUS

COMMON STINKHORN

LINNAEUS

HEIGHT
Up to 8 in (200 mm)
DIAMETER
Up to 1½ in (40 mm)

FAMILY ~ Phallaceae
DISTRIBUTION ~ North America, Europe, northern Asia
HABITAT ~ In woodland and gardens
ASSOCIATION ~ In rich soil and very rotten woody material
GROWTH FORM ~ Singly or in troops
ABUNDANCE ~ Common
SPORE COLOR ~ Olive-brown
EDIBILITY ~ Edible (in “egg” stage)

Not surprisingly, this phallic fungus (*impudicus* means “shameless”) has attracted a wealth of folklore. In Europe the immature fruitbody was locally known as “devil’s egg” or “witch’s egg,” while the mature fungus was called “Satan’s member.” The fungus was believed to have aphrodisiac qualities. In Victorian England, the illustrator Beatrix Potter “could not find courage to draw it,” while Charles Darwin’s daughter Etty collected and burnt all the stinkhorns she could find, lest they corrupt the morals of her maidservants. The species is actually edible in its “egg” stage, is said to have a pleasant nutty flavor, and in Germany was once used to flavor sausages.

The Common Stinkhorn produces fruitbodies from a gelatinous, white “egg” that remains at the base of the stem. The stem is white, hollow, and spongy. The fertile head is corrugated and covered in an olive-brown, sweet, and sickly smelling spore slime when fresh. Occasional specimens may produce a short netlike veil, hanging from the base of the fertile head.

DISTRIBUTION

BULGARIA INQUINANS

BLACK BULGAR

(PERSOON) FRIES

HEIGHT
Up to ½ in (15 mm)
DIAMETER
Up to 1½ in (40 mm)

FAMILY ~ Bulgariaceae

DISTRIBUTION ~ North America, Europe, Asia

HABITAT ~ In woodland

ASSOCIATION ~ With broadleaf trees, particularly oak

GROWTH FORM ~ On dead limbs and recently fallen logs and branches

ABUNDANCE ~ Common

SPORE COLOR ~ Black

EDIBILITY ~ Not edible

The Black Bulgar—or the Poor Man's Liquorice as it is also known—is often found growing in large quantities on recently fallen trunks and limbs of oaks. It seems probable that the fungus is an endophyte, meaning that it exists in some form in the wood of the living tree. It bides its time, waiting for a bough to break, and when this eventually happens it is ready to become the first colonizer of the newly dead wood. It produces abundant blackish brown spores that can stain the hands and will leave an impressive spore print if fruitbodies are left overnight on white paper. Not unsurprisingly it has been used to produce a blackish natural dye.

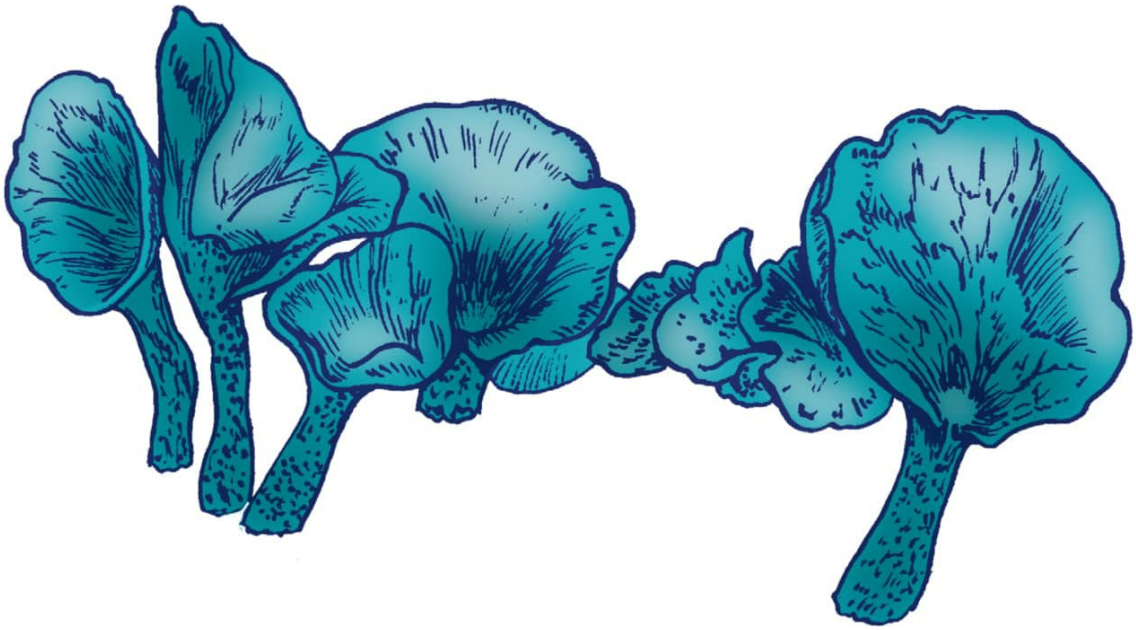
The Black Bulgar forms densely gelatinous, rubbery fruitbodies in clusters or large troops. Each fruitbody is shaped like a button or an inverted cone. The outer surface is scurfy and brownish to blackish brown. The inner surface is smooth and black with a distinct, often inrolled margin that may make the fruitbody look cup-shaped. With age, the fruitbodies expand and become flatter.

DISTRIBUTION

CHLOROCIBORIA AERUGINASCENS

GREEN ELFCUP

(NYLANDER) KANOUSE EX C. S. RAMAMURTHI ET AL



HEIGHT
Up to ⅜ in (8 mm)
=DIAMETER
Up to ¼ in (5 mm)

FAMILY ~ Dermateaceae
DISTRIBUTION ~ North America, Europe, Asia, Australia
HABITAT ~ In woodland
ASSOCIATION ~ On rotten broadleaf wood, especially oak
GROWTH FORM ~ On fallen branches and woody fragments
ABUNDANCE ~ Common
SPORE COLOR ~ White
EDIBILITY ~ Not edible

The Green Elfcup is a common and widespread species, remarkable not so much for its deep blue-green fruitbodies but for its ability to stain the wood that it grows on the same color—it is also known as the Green Stain Fungus. This stained wood can frequently be found in woodland, even though fruitbodies may not always be present. Oak is a favorite substrate

for the Green Elfcup and pieces of this “green oak” were once collected in England and used in Tunbridge Ware, a popular form of decorative marquetry featuring inlaid woods of different colors. It was earlier used for the same purpose in Italy, providing blue-green inlays for Renaissance intarsia paneling.

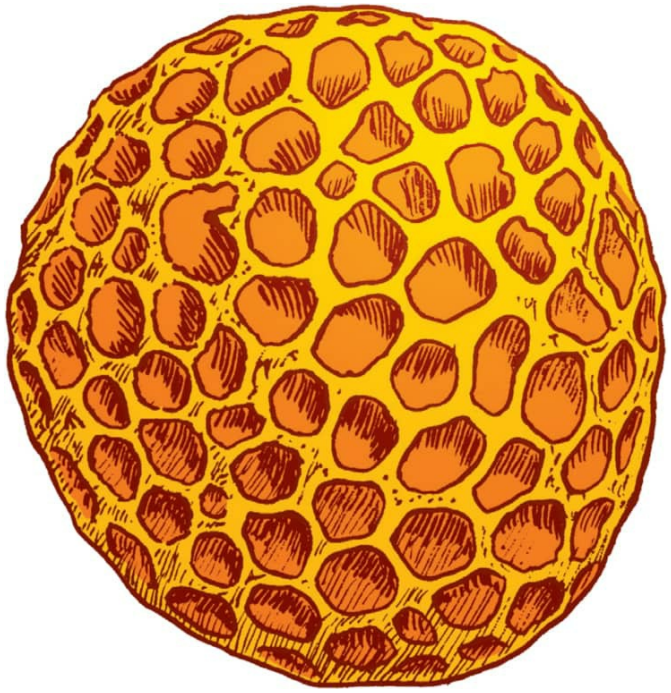
The Green Elfcup produces thin, shallowly cup-shaped, turquoise (blue-green) fruitbodies in small troops or clusters. The cups are normally stalked, but the stalk is not always central and may be attached to the side. With age, the cups become flat and irregularly disc-shaped, curling up in dry weather, and eventually develop discolored, pale yellowish patches.

DISTRIBUTION

CYTTARIA DARWINII

DARWIN'S GOLFBALL FUNGUS

BERKELEY



HEIGHT
Up to 2 in (50 mm)
DIAMETER
Up to 2 in (50 mm)

FAMILY ~ Cyttariaceae
DISTRIBUTION ~ Southern South America
HABITAT ~ In woodland
ASSOCIATION ~ On southern beech
GROWTH FORM ~ On trunks and attached branches, in clusters
ABUNDANCE ~ Occasional
SPORE COLOR ~ White
EDIBILITY ~ Edible

Charles Darwin collected specimens of this species in 1832 when visiting Tierra del Fuego on the voyage of the *Beagle*. They were examined and named in his honor by the Rev. Miles Berkeley, the leading British

mycologist of his day, and are still preserved in the herbarium at Kew Gardens in the UK. Darwin noted that the local indigenous people ate the fungus raw as a staple item of food, the Spanish name for it being *Pan del Indio* (Indian Bread). *Cyttaria darwinii* and related species continue to be eaten and sold at markets today, though the fruitbodies are typically turned into pickles.

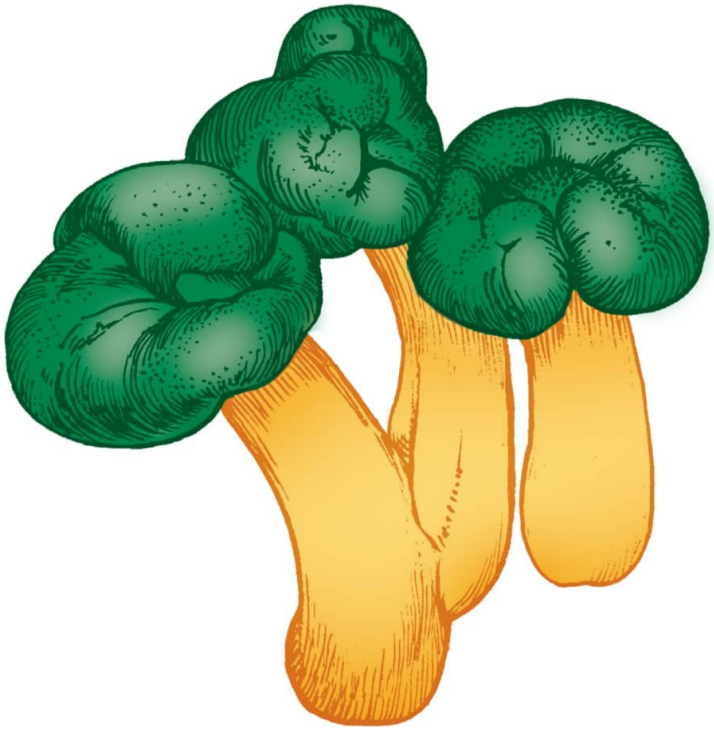
The Darwin's Golfball Fungus produces fruitbodies which are golfball-like, smooth and pallid at first, becoming pale yellow with a pitted honeycomb-like surface when mature. They are sticky when cut. The fruitbodies grow in clusters on trees, often associated with large, gall-like conks in the wood. When fully mature, the fruitbodies fall to the ground.

DISTRIBUTION

LEOTIA LUBRICA

GREENCAP JELLYBABY

(SCOPOLI) PERSOON



HEIGHT
Up to 3 in (75 mm)
DIAMETER
Up to 1 in (25 mm)

FAMILY ~ Leotiaceae
DISTRIBUTION ~ North America, Central America
HABITAT ~ In woodland
ASSOCIATION ~ With broadleaf trees and conifers
GROWTH FORM ~ On soil and leaf litter, often in clusters or troops
ABUNDANCE ~ Common
SPORE COLOR ~ White
EDIBILITY ~ Not edible

This is an attractive, two-tone color form of the more widespread, yellowish Jellybaby, with a cap that can be a striking shade of jade or

malachite-green. It is common in North America, where it grows in groups or clusters in woodland litter or occasionally on very rotten wood. A few texts suggest it is edible (and it is certainly not known to be poisonous), but it seems improbable that anyone would ever willingly collect and eat such a small, slimy, gelatinous fungus.

The Greencap Jellybaby forms gelatinous fruitbodies with a distinct head and stalk. The head is sticky or slimy when damp, cartilaginous-gelatinous, often lobed or irregular, and olive to deep green. The stem is gelatinous, finely scurfy, and whitish to yellowish or buff, sometimes with small green dots.

DISTRIBUTION

MICROSTOMA PROTRACTUM

ROSY GOBLET

(FRIES) KANOUSE

HEIGHT
Up to 1½ in (40 mm)
DIAMETER
Up to 1 in (25 mm)

FAMILY ~ Sarcoscyphaceae
DISTRIBUTION ~ North America, Europe, northern Asia
HABITAT ~ In woodland
ASSOCIATION ~ With broadleaf trees
GROWTH FORM ~ On or alongside rotten, sometimes buried, wood
ABUNDANCE ~ Rare
SPORE COLOR ~ White
EDIBILITY ~ Not edible

This is a spring-fruiting fungus, with the typically bright colors that are often found in the family Sarcoscyphaceae. It appears to be primarily an alpine-arctic species and typically grows in calcareous woodland. It is rare throughout much of its range, but becomes somewhat more frequent in the far north. The Rosy Goblet was collected in Scotland in the nineteenth century, but has not been seen in the British Isles since then and is presumed to be locally extinct. In several European countries it is of conservation concern and has been placed on their Red Lists of endangered fungal species.

The Rosy Goblet produces clusters of long-stalked, cup-shaped fruitbodies. The stalk is slender, whitish, and finely downy. The cup is ball-shaped at first, with a small opening at the top. With age, the cup expands and eventually becomes almost disc-shaped with a ragged margin. The inner surface is smooth and bright orange-red to scarlet, the outer surface paler.

DISTRIBUTION

MORCHELLA ESCULENTA

MOREL

(LINNAEUS) PERSOON

HEIGHT
Up to 12 in (300 mm)
DIAMETER
Up to 6 in (150 mm)

FAMILY ~ Morchellaceae

DISTRIBUTION ~ North America, Europe, North Africa, Central and South America, northern Asia, New Zealand

HABITAT ~ In calcareous woodland and scrub

ASSOCIATION ~ Possibly ectomycorrhizal, with broadleaf trees

GROWTH FORM ~ In soil or leaf litter, often in troops

ABUNDANCE ~ Locally common

SPORE COLOR ~ Cream

EDIBILITY ~ Edible (if cooked)

The Morel (or Yellow Morel) is another classic edible species—commercially collected and marketed all over the world. As with the Black Morel (*Morchella elata*), it appears to represent a species complex, DNA research showing that at least three genetically distinct species (*M. esculenta, M. crassipes,* and *M. spongiola*) occur in central Europe, though distinguishing them by sight may be difficult, if not impossible. Fruitbodies typically appear in spring and have a preference for calcareous soil—including dunes (which makes cleaning the honeycomb fruitbodies a nightmare)—and slightly disturbed sites.

The Morel forms fruitbodies with a typically pale brownish, fertile head and whitish stem. The head is honeycomb-like or pitted in shades of ocher, honey-brown, or yellowish brown (or more rarely grayish brown), and is often, but not always, rounded at the top. It is attached to the stem (not loose), which is whitish to pale ocher, finely scurfy, and smooth to wrinkled.

DISTRIBUTION

TUBER MELANOSPORUM

BLACK TRUFFLE

VITTADINI

HEIGHT
Up to 4 in (100 mm)
DIAMETER
Up to 4 in (100 mm)

FAMILY ~ Tuberaceae

DISTRIBUTION ~ Continental Europe. Cultivated in North America, southern Africa, Australia, New Zealand

HABITAT ~ In woodland or scrub

ASSOCIATION ~ Ectomycorrhizal, with broadleaf trees, particularly oak and hazel

GROWTH FORM ~ In soil or leaf litter

ABUNDANCE ~ Rare

SPORE COLOR ~ Brown

EDIBILITY ~ Edible

The Black Truffle—or Truffe du Périgord—is one of the most highly esteemed culinary species, especially valued in French cuisine for its aroma and flavor. It has been semi-cultivated in France for centuries, with groves of trees planted in suitable places and impregnated with truffle mycelium. With luck, after some years, these *truffières* produced valuable crops. Today, young saplings (principally oak and hazel) are routinely inoculated with truffle mycelium and the cultivation of the Black Truffle has spread around the globe. The scent is close to boar pheromone, which is why sows were once used to hunt truffles, though separating sow and truffle was always a problem.

The Black Truffle forms subterranean fruitbodies that are spherical to irregularly lobed. The surface is almost crustlike, dark gray to black, and covered in polygonal warts. The inner flesh is purplish black with whitish marbling.

DISTRIBUTION

HYPOMYCES LACTIFLUORUM

LOBSTER FUNGUS

(SCHWEINITZ) TULASNE & C. TULASNE

THICKNESS
Less than ⅛ in (0.5 mm)
DIAMETER
(of individual fruitbody)
Less than ⅛ in (0.5 mm)

FAMILY ~ Hypocreaceae
DISTRIBUTION ~ North America, Central America
HABITAT ~ In woodland
ASSOCIATION ~ Parasitizing *Russula* and *Lactarius* species
GROWTH FORM ~ Covering host fruitbodies
ABUNDANCE ~ Common
SPORE COLOR ~ White
EDIBILITY ~ Edible

The brightly colored Lobster Fungus is a strange-looking object that is actually produced by one fungus, *Hypomyces lactifluorum*, completely engulfing the fruitbody of another. The hosts are species of *Lactarius* and *Russula*, particularly *L. piperatus* and *R. brevipes*. Even more remarkable is that the Lobster Fungus, both parasite and host, is eaten and widely relished in North America, where there is a commercial trade in the species. It is claimed that it actually tastes like lobster. There is, however, no certainty that the host species is always edible, and older fruitbodies may be infected with bacteria.

The Lobster Fungus covers all surfaces of its host fruitbody with a sterile, bright orange stroma in which the tiny, individual fruitbodies develop. These are half-immersed, but resemble small, raised pimples when examined under a magnifying lens. The color of the stroma becomes darker with age. The gills of the host are reduced to no more than furrows by the Lobster Fungus.

DISTRIBUTION

XYLARIA POLYMORPHA

DEAD MAN'S FINGERS

(PERSOON) GREVILLE

HEIGHT
Up to 4 in (100 mm)
DIAMETER
Up to 1 in (25 mm)

FAMILY ~ Xylariaceae
DISTRIBUTION ~ North America, Europe, Asia
HABITAT ~ In woodland
ASSOCIATION ~ On broadleaf wood
GROWTH FORM ~ On rotten, often buried, wood, in clusters
ABUNDANCE ~ Very common
SPORE COLOR ~ Black
EDIBILITY ~ Not edible

When growing in clusters, especially from buried wood, *Xylaria polymorpha* is aptly, if gruesomely, named, Dead Man's Fingers. Each finger is in fact a sterile stroma of fungal tissue in which multiple, tiny, individual fruitbodies are formed. If a finger is cut in half, these individual fruitbodies can be seen as little, black, toothlike pits or indentations in the surface crust. A few smaller *Xylaria* species have specialized habitats, such as *X. oxyacanthae* on fallen hawthorn berries, or *X. carpophila* on fallen beech cupules. *Xylaria polymorpha*, however, grows on a wide range of broadleaf wood and is consequently a common and widespread species.

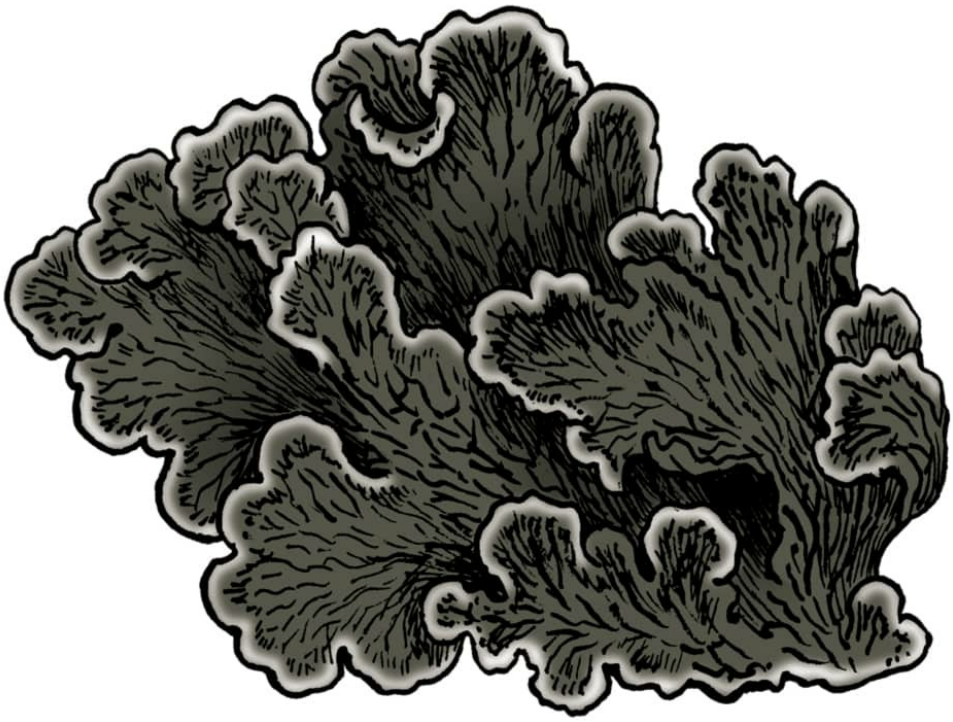
Dead Man's Fingers produces black, club-shaped fruitbodies with short, cylindrical stems. The outer surface is hard and appears to be smooth and matt, but under a magnifying lens is finely granular and wrinkled, with shallow raised warts when mature. When cut, the flesh is white and tough, the outer surface showing as a thin, black crust with toothlike indentations.

DISTRIBUTION

PELTIGERA MEMBRANACEA

MEMBRANOUS DOG-LICHEN

(ACHARIUS) NYLANDER



THICKNESS
Up to ¼ in (5 mm)
DIAMETER
Up to 10 in (250 mm)

FAMILY ~ Peltigeraceae
DISTRIBUTION ~ North America, Europe, Asia, Australia
HABITAT ~ On ground, trees, or rocks
ASSOCIATION ~ Lichenized, with cyanobacteria
GROWTH FORM ~ In groups
ABUNDANCE ~ Common
SPORE COLOR ~ White
EDIBILITY ~ Not edible

Large leafy lichens are sometimes found growing in mossy turf, even in garden lawns, and *Peltigera membranacea* is one of the commonest species in this habitat. Like all the dog-lichens, as well as the jelly lichens

(*Collema* species), it forms a partnership not with an alga, but with a cyanobacterium. *Peltigera* species do not swell up in wet weather as much as some jelly lichens, but the Membranous Dog-Lichen does change from pale gray to brown and become more rubbery. It probably grows among mosses because they tend to retain the moisture that the cyanobacteria need to function.

The Membranous Dog-Lichen forms thalli of large, leaflike lobes that partly curl up when dry. The upper surface is brown when wet, and pale gray when dry, and veined or undulating. The undersurface is whitish to pale brown, with conspicuous, hairlike rhizines. Fruitbodies are common and are smooth, elliptical, and reddish brown, typically arising from the margins of the lobes.

DISTRIBUTION

GLOSSARY

Ascomycete
Any fungus belonging to the phylum Ascomycota.

Basidiomycete
Any fungus belonging to the phylum Basidiomycota.

Basidium (**pl. basidia**)
A microscopic cell on which spores are formed externally, typical of agarics and other species in the Basidiomycota.

Bioremediation
The removal of environmental pollutants using living organisms.

Calcareous
Containing chalk or lime.

Cartilaginous
Like cartilage, gristly.

Concolorous
Of the same color.

Conk
(in American English) A fruitbody of a bracket fungus; (generally) a swollen canker on a living tree produced by a wood-rotting fungus.

Decurrent
(of gills, pores, etc.) running down the stem.

Depressed
(of a cap) With a central depression or dip.

Ectomycorrhizal
Forming mycorrhiza in which the hyphae of the fungal partner form a sheath around the root cells of the plant partner.

Effused
Flat, spread out or skinlike.

Endomycorrhizal
Forming mycorrhiza in which the hyphae of the fungal partner penetrate the root cells of the plant partner.

Endophyte
A fungus (or other organism) that lives within the tissues of a plant.

Epithet
(or **species epithet**) The second word in the scientific name of a species (e.g. "*bisporus*" in "*Agaricus bisporus*")

Foliose
(of lichens) With leaflike lobes.

Fruitbody
A sporocarp; the spore-bearing organ of a fungus (e.g. a mushroom).

Gills
Lamellae; a spore-bearing surface composed of thin blades, such as those below the cap of a cultivated mushroom.

Hygrophanous
(of caps) Changing color and becoming somewhat translucent when damp.

Hygroscopic
Absorbing moisture (and bending or twisting as a result).

Hypha (**pl. hyphae**)
A microscopic filament out of which fungi (apart from yeasts) are composed; the fungal equivalent of plant and animal cells.

Metabolites
Chemical compounds naturally produced by fungi and other organisms.

Montane
Upland; a vegetation zone (often damp and cool) below "subalpine."

Mycelium (**pl. mycelia**)
A mass of interconnected hyphae that together form the living fungus from which fruitbodies arise; called "spawn" by mushroom cultivators.

Mycologist

One who studies fungi.

Mycorrhiza
A mutually beneficial, symbiotic association between fungal hyphae and plant roots, whereby the fungus supplies nutrients to the plant and the plant supplies carbohydrates to the fungus.

Nitrophile
A nitrogen-loving organism (growing in enriched or manured soil).

Peridiole
A packet of spores.

Phalloid
Resembling or related to the stinkhorns (e.g. *Phallus impudicus*).

Polypore
Alternative name for a bracket fungus.

Poroid
Having a spore-bearing surface made up of pores.

Propagule
Any part of a fungus that can propagate itself when detached (such as a spore or a sclerotium).

Red List
An agreed list of species (local, national, or international) that are under threat and are of conservation concern.

Ring
An annulus; remains of a partial veil forming a ring around the stem of some agarics and other fungi.

Ring zone
A ringlike area of scales or other veil fragments around the stem of some agarics and other fungi.

Rust
A plant disease caused by microscopic “rust fungi,” often leaving rusty-brown lesions on stems and leaves.

Saprotroph
An organism that feeds on dead matter (e.g. fallen leaves or branches).

Sclerotium (**pl. sclerotia**)
A hardened pellet or ball of hyphae, usually serving as a propagule.

Scurfy
(of a cap or stem) Having the surface roughened by small scales.

Smut
A plant disease caused by microscopic "smut fungi," often producing powdery, chocolate-brown spores.

Species complex
A group of closely related but genetically distinct species that may look so similar to each other that they are difficult or impossible to distinguish by sight.

Sporocarp
Technical name for a fungal fruitbody.

Striate
(of cap margins) Finely striped.

Stroma
Sterile fungal tissue on or in which fruitbodies are formed.

Thallus (**pl. thalli**)
Mycelium, particularly of a lichen where the mycelium is exposed and may be crustlike or frondlike.

Umbonate
(of caps) Having a central boss or bump.

Veil
A thin, protective covering to a developing fruitbody or (if a partial veil) to its spore-producing surface; the veil typically breaks apart when the fruitbody expands, leaving fragments or scales behind, sometimes a volva or ring.

Volva

Remains of a veil, leaving a sack-like or baggy receptacle at the base of the stem of some agarics.

RESOURCES

The books and websites listed below are just a selection of the many resources currently available to those with an interest in the larger fungi.

GENERAL INTEREST

Bessette, A.R. & Bessette A.E. *The Rainbow Beneath my Feet: A Mushroom Dyer's Field Guide*. Syracuse, NY: Syracuse University Press, 2001.

Gilbert, O. *New Naturalist: Lichens.* London: HarperCollins, 2000.

Hall, I.R. et al. *Edible and Poisonous Mushrooms of the World*. Portland, OR: Timber Press, 2003.

Harding, P. *Mushroom Miscellany*. London: HarperCollins, 2008.

Money, N. *Mr. Bloomfield's Orchard*. New York: Oxford University Press, 2002.

Purvis, W. *Lichens*. London: Natural History Museum; Washington: Smithsonian, 2007.

Spooner, B. & Roberts, P. *New Naturalist: Fungi*. London: HarperCollins, 2005.

Stamets, P. *Growing Gourmet and Medicinal Mushrooms* (3rd edn). Berkeley, CA: Ten Speed Press, 2000.

REGIONAL FIELD GUIDES

North America

Barron, G. *Mushrooms of Ontario and Eastern Canada* (3rd edn). Edmonton: Lone Pine, 1999.

Bessette, A.E., Bessette, A.B., & Fischer, D.W. *Mushrooms of Northeastern North America*. Syracuse, NY: Syracuse University Press, 1997.

Brodo, I.M., Sharnoff, S.D., & Sharnoff, S. *Lichens of North America*. New Haven, CN: Yale University Press, 2001.

Desjardin, D.E., Wood, M.G., & Stevens, F.A. *California Mushrooms*. Portland, OR: Timber Press, 2014.

Hemmes, D.E. & Desjardin, D.E. *Mushrooms of Hawai'i*. Berkeley, CA: Ten Speed Press, 2002.

Huffman, D.M. et al. *Mushrooms and other Fungi of the Midcontinental United States* (2nd edn). Iowa City, IA: University Iowa Press, 2008.

Metzler, S. & Metzler, V. *Texas Mushrooms*. Austin, TX: University Texas Press, 1992.

Phillips, R. *Mushrooms of North America*. Boston, MA: Little, Brown & Co., 1991.

Roody, W.C. *Mushrooms of West Virginia and the Central Appalachians*. Lexington, KY: Kentucky University Press, 2003.

Trudell, S. & Ammirati, J. 2009. *Mushrooms of the Pacific Northwest*. Portland, OR: Timber Press, 2009.

British Isles & Europe

Dobson, F.S. *Lichens: An Illustrated Guide to the British and Irish Species* (5th edn). Slough: Richmond Publishing, 2005.

Evans, S. & Kibby, G. *Pocket Nature: Fungi*. London: Dorling Kindersley, 2004.

Kibby, G. *Mushrooms and Toadstools of Britain & Europe, Vols 1 & 2*. London: Kibby, 2017, 2020.

Laessoe, T. & Petersen, J.H. *Fungi of Temperate Europe Vols 1 & 2*. Princeton, NJ: Princeton University Press, 2019.

Australia & New Zealand

Fuhrer, B. *A Field Companion to Australian Fungi*. Melbourne: Bloomings Books, 2001.

Ridley, G.S. & Horne, D. *A Photographic Guide to Mushrooms and other Fungi of New Zealand*. Auckland: New Holland, 2007.

Young, A.M. *A Field Guide to the Fungi of Australia*. Sydney: UNSW Press, 2004.

Southern Africa

Gryzenhout, M. *Pocket Guide: Mushrooms of South Africa*. Struik, Cape Town: Struik, 2010.

Central & South America

Gamundi, I. & Horak, E. *Fungi of the Andean-Patagonian Forests*. Buenos Aires: Vazquez Mazzini, 2007.

Mata, M. *Costa Rica Mushrooms Vol. 1*. INBio, Santo Domingo de Heredia: INBio, 2003.

Mata, M., Halling, R., & Mueller, G.M. *Costa Rica Macrofungi Vol. 2*. Santo Domingo de Heredia, INBio, 2003.

SOME USEFUL WEBSITES

The following web sites offer valuable information and several feature excellent photographs of fungi that may be helpful for identification.

British Mycological Society

www.britmycolsoc.org.uk/

Cybertruffle and Cyberliber—wide range of information about fungi

www.cybertruffle.org.uk/eng/index.htm

European Mycological Association—includes contacts for local societies worldwide

www.euromould.org

Fungimap (Australia)

fungimap.org.au

The Global Fungal Red List Initiative—data and photos on threatened fungi worldwide

iucn.ekoo.se/en/iucn/welcome

Index Fungorum—a freely searchable on-line database

www.indexfungorum.org/Names/Names.asp

Landcare Research (New Zealand) — Virtual Mycota

virtualmycota.landcareresearch.co.nz/webforms/vM_home.aspx

MushroomExpert—keys, photos, information (North America)

mushroomexpert.com

Mycokey—keys, photos, information (Europe)

www.mycokey.com

North American Mycological Association

www.namyco.org

State of the World’s Fungi—wide-ranging information on new discoveries, global diversity, useful fungi, and pathogens

stateoftheworldsfungi.org

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ACKNOWLEDGMENTS

The scientific names of fungi have largely been based on the freely searchable, on-line database Index Fungorum (www.indexfungorum.org/).

English names, where appropriate, have been derived from “English names for fungi” (www.britmycolsoc.org.uk/library/english-names) or have been sourced from regional guides and on-line references.

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Peter Roberts was a senior mycologist at the Royal Botanic Gardens, Kew, UK. He is the coauthor of *New Naturalist: Fungi*, *Checklist of the British and Irish Basidiomycota*, and *British Chanterelles and Tooth Fungi*. He has been on the editorial boards of *Field Mycology*, *Mycological Progress*, *Czech Mycology*, and *Persoonia*.

Shelley Evans was conservation officer for the British Mycological Society for ten years and has been on the executive committee of the European Council for the Conservation of Fungi and the IUCN world specialist group for fungi. She is coauthor of *Pocket Nature: Fungi* and the author of numerous survey reports on British fungi. She has also been on the editorial board of the journal *Field Mycology*.

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