SPRING MORELS AND FALSE MORELS OF MIDCONTINENTAL U.S.

Donald M. Huffman[1] and Lois H. Tiffany[2]

[1]Biology Department,
Central College
Pella, IA 50219,
Email: huffmand@central.edu

[2]Botany Department
Iowa State University
Ames, IA 50010
Email: tiffanyl@isu.edu

ABSTRACT: The sponge mushrooms (morels and false morels) are among the early spring arrivals throughout most of the Northern Hemisphere. Most college and university biology teachers in the mid-continent and adjacent regions are familiar with these fungi, but without mycological training are unable to identify most of them with any degree of confidence. Some of these species are choice edibles; whereas, others possess different degrees of toxicity. Thirteen of the more common species of these sponge mushrooms are described and discussed. These fungi are recommended to undergraduate biology teachers for use as an introduction to taxonomic keys and the traditional and modern concepts of species. Photographs illustrate the distinctions between edible and toxic mushrooms. A taxonomic key and descriptions of the species are provided.

KEYWORDS: fungi, morel, false morel, mushrooms, taxonomic key, toxic

INTRODUCTION

Many of us know and have collected morels and related fungi for instructional and/or culinary use, but few of us feel confident about species distinctions, edibility, and distribution of many of these "sponge mushrooms." Even though morels can now be grown from spawn and commercial morels are available on the market, those of us who consider ourselves "shroomers" continue our forays in search of the harbingers of spring considered by many to be choice edible fungi. To be able to identity these fungi, it is necessary to have some basic information to avoid the poisoning associated with some of the false morels.

Morels frequently occur in a variety of habitats, many of these following disturbances such as road cuts, excavations, deer trails, orchards, sand bars of rivers and burned over areas. Many persons report an increased frequency of *Morchella esculenta* in the vicinity of elm trees destroyed by fire or disease. In the Northwest mountains, forest fires are commonly followed by massive fruiting of *M. elata*. The authors have collected morels from coal mine spoil banks, lawns, compost piles, wooded paths, and bike and hiking trails. Our vote for the most unusual habitat includes the floor of a storage shed and a wet carpet in an unfinished basement. Certainly the most common habitats are in deciduous and mixed woods and forest plantations.

Reports abound of phenological associations with morel and false morel fruiting. Many of us have heard the conventional wisdom that morel season occurs when white oak leaves are the size of a squirrel's ear, or when mayapple or spring beauty flower. As expected, seasonality of morels varies in different geographic areas. The season begins in late February in the southern part of the Mid-continent, from about late March to mid-June in the Midwest, and later in the summer in higher elevations and the northern tier of states.

Phenological factors are important but obviously associated with other factors such as soil type, slope orientation, etc. Now that the regime used to cultivate morels is known, it is evident that a most important factor is the formation of sclerotia from mycelia. Sclerotial formation is mandatory for the initiation of the fruiting process in the field and in laboratory culture. The precise factors underlying sclerotial formation are only partially understood (Volk, 1991). It has been suggested that morel mycelia are established as a secondary mycorrhizal partner with other mycorrhizal fungi on tree roots.

There are several field guides and publications listed in the references, which provide general information about species distribution. Most do not provide comprehensive prevalence and specific distribution information. The 10-year survey of morels and false morels in Iowa (Tiffany et. al, 1998) is one of the more useful and dependable sources of species description, seasonal occurrence, and habitat of the common sponge mushrooms; it also includes identifying photographs. We have developed the present taxonomic key using field characteristics as a dependable means of species determination. We have included only 13 species of sponge mushroom, but these are the most frequently encountered ones in the ACUBE regional habitats. We have omitted some species that are fall season species because these are not usually confused with morels and false morels encountered in the spring season.

All species of true morels are in the genus *Morchella* and are characterized by a head (or cap) with pits completely surrounded by distinct ridges supported by a hollow stalk. The head is attached along its whole length or just at its upper portion to the stalk (fig. 1). False morels in the genera *Gyromitra*, *Helvella*, and *Verpa* have a variably wrinkled, undulated to saddle-shaped head, which lacks well defined pits with distinct surrounding ridges. The stalks of false morels are not hollow, but are stuffed with cottony or solid tissue (fig. 2). The heads of false morels in the genus *Verpa* are attached only at the tip of the stalk (fig. 2a). This distinguishing feature is easily determined by cutting the fruiting body longitudinally. Heads of the false morels of the genus *Gyromitra* are lobed, wrinkled or saddle-shaped (fig. 2b).

Figure 1. *External and internal structure of true morels of the genus Morcella.*

Figure 2. *False Morels. 2a (on left) illustrates the genus Verpa. Note the stalk is not hollow and the cap is attached only at the tip of the stalk. 2b (on right) illustrates the genus Gyromitra. Note the head is lobed, wrinkled or saddle-shaped.*

KEY TO THE SPONGE MUSHROOMS

1a.	Head or cap characterized by pits completely surrounded by distinct ridges supported by a hollow stalk (fig. 1)	2
1b.	Head not possessing distinct pores but possessing wrinkles and stalk is filled with cottony or solid tissue (fig. 2)	7
2a.	Head of the fruiting body attached about half way up in the interior of a short, conical cap (fig. 3)	*Morchella semilibera*
2b.	Elongated head attached directly to the stalk	3
3a.	Pits radially oriented on a brown to black head	4
3b.	Yellow to light brown pits arranged in an irregular pattern on the head	5
4a.	Spindle-shaped, thin, gray to black head less than one inch wide at the base with white to gray pits (fig. 4)	*Morchella angusticeps*
4b.	Tapering head with a 2 to 3 inch base, brown to black and 2-4 inches long (fig. 5)	*Morchella elata*
5a.	Head cylindric to conic, 2-3 cm long and 1-2 cm wide with cream-white ridges surrounding brownish pits (fig. 6)	*Morchella deliciosa*
5b.	Head larger than 3 cm long and 2 cm wide, ridges and pits both yellow-brown	6
6a.	Head 3-9 cm long and 2-5 cm wide, grayish to yellow brown with the ridges lighter than the pits (fig. 7)	*Morchella esculenta*
6b.	Head 5-18 cm long, 2-8 cm wide, ridges and pits yellow-brown with the pits producing a sponge-like appearance, stalk is 6-13 com long and 3-6 cm wide pale to cream with reddish stains at the base (fig. 8)	*Morchella crassipes*
7a.	Head bell-shaped, smooth or with shallow ridge-furrow system, stalk attached at very tip of cap, interior of stalk loosely packed with cottony material	8
7b.	Head lobed, wrinkled or saddle-shaped	9
8a.	Head bell-shaped, 2 cm long and 1-3 cm wide, short in relation to stalk and attached only at tip, brown in color (fig. 9)	*Verpa conica*
8b.	Head conical to bell-shaped, 2-5 cm long and 2-4 cm wide, with longitudinal ridges, pits tan-brown with darker ridges, stalk 6-12 cm long and 1-2.5 cm wide attached to the interior tip of head (fig. 10)	*Verpa bohemica*

9a.	Head wrinkled and lobed, brain-like in structure, tan to dark reddish-brown, turning dark brown or red in old age.	10
9b.	Head wrinkled and irregularly; lobed, chocolate brown to red-brown	11
10a.	Head 4-15 cm wide, deeply wrinkled yellow-brown to tan and dark reddish brown in old age, stalk 5-10 cm long and about the same width (fig. 11)	*Gyromitra gigas*
10b.	Head less deeply wrinkled, often rounded and convoluted, red-brown at all ages (fig. 12)	*Gyromitra caroliniana*
11a .	Head saddle-shaped, sometimes with additional lobes, creamy to dark red-brown	12
11b.	Head 3-11 cm broad, irregularly round lobes, usually reddish brown but yellow-brown in some forms (fig. 13)	*Gyromitra esculenta*
12a.	Head 7.5-15 cm broad irregularly lobed to saddle shaped, reddish to dark brown (fig. 14)	*Gyromitra fastigiata*
12b.	Head distinctly saddle-shaped, 0.5 cm long and 3 cm wide, attached to end of stalk, white to medium gray (fig. 15)	*Helvella elastica*

SPECIES DESCRIPTIONS

Morchella semilibera. (fig. 3). Common name, **Half-Free Morel** or **Snake's Head**. Head is 2-4 cm long, 1.5-3 cm wide, bell shaped or conic, yellowish when young to brownish or olive brown at maturity. It is free from the stalk for about half its length; its pits are longer than broad reaching a diameter of 4-10mm with its ridges well developed. Stalk is 6-15 cm long and 2-3 cm wide somewhat enlarged at the base, white to yellow, often irregular and granulose to mealy and hollow. Asci are 250 x 20-25 um and cylindrical and contain 8 elliptical ascospores 24-34 x 15-21 um, hyaline to lightly colored which produce a light yellow spore print. Not a favorite of some people but it is edible. Some people have gastrointestinal disturbances after eating this morel, but this can be said for most morels.

Morchella angusticeps. (fig. 4). Common name, **Black Morel.** Head is 2-9 cm long, 1.5-5 cm wide, narrowly conic to broader conic in age, spongy, its pits are elongate and brownish gray to grayish black with its ridges dark brown to black. Stalk is 1.5-6 cm long and 0.5-3 cm wide, whitish to creamy to pinkish tan and mealy on the surface and hollow. Asci are 200-300 x 16-22 um and contain 8 elliptical ascospores 21-24 x 12-14 um which produce a cream spore print. Considered edible and choice by some, but mild poisonings have been reported.

Morchella elata. (fig. 5). Common name, **Black Morel**. Head is 5-10 cm long, 2-5 cm wide, ovoid to conical and even sharply conical in mature specimens and dark brown to black with vertical, elongate pits. The stalk is 4-10 cm long and 1.5-5 cm wide, often swollen at the base, white to yellowish, roughly granular on the surface and hollow. Asci are 200-300 x 15-22 um and contain 8 elliptical ascospores 24-28 x 12-14 um which produce a cream spore sprint. Considered edible, but there are reports of gastrointestinal upset when eaten in quantity.

Morchella deliciosa (fig. 6). Common name, **Gray Morel** or **White Morel**. Head is 2-3 cm long, 1.0-2 cm wide, cylindrical to conic with a blunt apex; its pits are elongate and grayish to black within with the ridges regularly anastomising and whitish to gray. The stalk is 2-4 cm long and 1-2 cm wide, color whitish to cream and hollow. Asci are 200 x 12-15 um and contain 8 cylindrical, hyaline ascospores 20-24 x 10-12 um, which produce a light yellow spore print; paraphyses are numerous, lightly colored and enlarged at the apex. Considered a choice edible. Some think it is merely an early form of *M. esculenta*.

Morchella esculenta (fig. 7). Common name, **Sponge Mushroom** or **Yellow Morel**. Head is 3-9 cm long, 2-5 cm wide, subglobose to elongate; its pits are irregularly arranged to radially elongate and grayish to yellow brown with the ridges paler. Stalk is 4-6 cm long and 1.5-3 cm wide usually not more than 2/3 that of the head; it is slightly larger at the base, longitudinally depressed in places, dry to granulose on the surface, cream to white and hollow. Asci are 220-230 x 18-22 um, cylindrical and operculate and contain 8 smooth, elliptical, hyaline ascospores 20-25 x 12-16 um, which produce a light yellow spore print; paraphyses are numerous, faintly colored and enlarged above. The most common of the edible and choice morels; some have had gastrointestinal upset from this species.

Morchella crassipes (fig. 8). Common name, **Thick-Footed Morel** or **Bigfoot**. Head is 5-18 cm long, 4-8 cm wide, subconical; its pits are somewhat rounded to irregularly elongate, grayish becoming tan with age with the ridges pallid to cream or darker with age. Stalk is 6-13 cm long and 3-6 cm wide, massive and often columnar to folded at the base, pale to cream with reddish stains at the base with age and hollow. Asci are 225-235 x 18-22 um, cylindrical containing 8 elliptical ascospores 20-22 x 12-14 um which produce a cream spore print. Individual fruiting bodies of this sponge mushroom have been reported in excess of 4 pounds. It is edible and choice, but like the other morels there have been reports of gastrointestinal upset.

Verpa conica (fig. 9). Common name, **Thimble Cap**. Head is 2 cm long, 1-3 cm wide, subconical to bell shaped, brown with white underneath, smooth or with faint furrows near the margin and attached only at the interior top of the head. Stalk is 5-11 cm long and 1-1.5 cm wide tapering upward, smooth to granular exterior, white to cream and loosely stuffed becoming hollow with age. Asci are 350 x 23 um, cylindrical containing 8 elliptical, smooth, hyaline ascospores 20-26 x 12-15 um, which produce a light yellow spore print; paraphyses are numerous and gradually clavate. Edibility unknown, but may be toxic.

Verpa bohemica (fig. 10). Common name, **Early Morel.** Head is 2-5 cm long, 2-4 cm wide, conical to bell shaped, folded into longitudinal ridges that anastomose frequently, yellow-brown to brown or darker and attached only at the interior top of head. Stalk is 6-12 cm long and 1-2.5 cm wide, tapering upward, smooth to wrinkled exterior, white to cream and loosely stuffed becoming hollow with age. Asci are 250-350 x 25-27 um, containing 8 elliptical, smooth, hyaline to yellowish ascospores 60-80 x 15-18 um, which produce a yellow spore print; paraphyses are numerous and enlarged to 7- 8 um in diameter at apex. Some people eat this species, but it may cause gastrointestinal upset and lack or coordination if eaten in quantity. We cannot recommend it.

Gyromitra gigas (fig. 11). Common name, **Snowbank Fungus** or **Snowbank False Morel**. Head is 4-15 cm in diameter, convoluted and almost brain-like on the surface, yellow brown to tan becoming dark reddish brown with age. Stalk is 5-10 cm long and about the same width, surface whitish, ribbed or wrinkled with the interior multichanneled or folded. Asci about 250 x 24-26 um cylindrical containing 8 elliptical, smooth to finely warted ascospores with short projections at each end. We cannot recommend this as an edible fungus.

Gyromitra caroliniana (fig. 12). Common name, **Big Red**. Head is 10-20 cm broad, 5-25 cm high, deeply wrinkled and convoluted to rounded, and light reddish brown to darker brown with age. Stalk is 8-10 cm long and 3-5 cm wide, furrowed, enlarged at the base and white to cream. Asci are 25-30 x 12-14 um containing 8 elliptical, hyaline finely warted ascospores 25 x 13 um with one to several short apiculi at the ends and containing at least 2 large oil drops produce a light yellow spore print; paraphyses are numerous, and pigmented. There are common in southern states, in southern Iowa and upper Midwest. They are widely eaten, but some specimens have moderate levels of the toxic compound Monomethylhydrazine (MMH), which makes it somewhat risky to consider this species as edible.

Gyromitra esculenta (fig. 13). Common name, **False Morel**. Head 3-11 cm across, convoluted, lobed, irregularly rounded, and reddish brown or darker, yellow brown in some forms. Stalk 2-3 long and 1.5-4 cm in diameter, equal in diameter or expanded at base, smooth or faintly grooved, pale pinkish-white and stuffed becoming hollow in chambers when mature. Asci about 250 x 25 um, cylindrical containing 8 ellipsoid, smooth ascospores 18-22 x 9-13 um containing 2 or more oil drops and producing a yellow-tan spore print. Contains large amounts of MMH; they are considered toxic and even deadly poisonous by some individuals.

Gyromitra fastigiata (fig. 14). Common name, **Beefsteak False Morel** or **Rooster's Comb**. Head is 5-12 cm broad and high, irregularly lobed to vaguely saddle-shaped, and reddish to dark brown becoming darker with age. Stalk is 6-9 cm long and 2-5 cm wide, slightly enlarged at the base, white, ribbed or fluted, sometimes with anatomizing ridges and usually loosely stuffed. Asci are about 250 x 25 um containing 8 elliptical ascospores 28-30 x 12-15 um with sculptured wall with fine warts or faint reticulations, containing two to three large oil drops at maturity and producing a light yellow spore print; paraphyses are numerous, pigmented, and enlarged at the apex. This species has been interpreted as *Gyromitra brunnea* in its American form. It probably occurs only east of the Rocky Mountains. This species while eaten by some individuals may cause very severe gastrointestinal upset in other. It contains the toxic compound MMH; a known carcinogen when eaten over a number of years.

Helvella elastica (fig. 15). Common name, **Saddle Fungus** or **Gray Saddle**. Head is distinctly saddle-shaped, 0.5-5 cm long and 3 cm wide, 2-3 lobed, centrally attached to the stalk, whitish to medium gray or gray tan and drying darker with age. Stalk is 5-10 cm long and 3-10 mm wide, cylindrical, smooth and white to yellowish. Asci are about 220 x 22 um containing 8 elliptical, smooth, hyaline ascospores 18-20 x 10-13 um each containing one large oil drop; paraphyses are numerous, and clavate to occasionally branched. Edibility unknown.

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