

A MONOGRAPH OF THE COMMON INDIANA SPECIES OF HYPOXYLON.

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It is the purpose of this paper not to present an exhaustive treatise on the genus *Hypoxylon*, but to give a brief account of the habit and habitat of these fungi as the writer has observed them, together with a key to the species which have been collected in this State. Descriptions of the species covered by the key have also been included.

The *Hypoxylons*, like most other fungi, have a vegetation phase which grows hidden in the substratum, and a fruiting phase which grows on the surface of the host for the purpose of facilitating the dissemination of the spores. The essential part of this fruiting body consists of from one to many perithecia which contain the spore-bearing asci. The perithecia are usually aggregated in clusters and imbedded in a carbonaceous crust known as a stroma. The stroma is more or less conspicuous and varies greatly in form and size. Sometimes it may take the form of a broadly effused crust several inches or even many feet in extent; again it may be a globose, subglobose, or hemispherical structure varying in size from a single perithecium approximately 1 mm. in diameter, to a large stroma 1 to 2 cm. in diameter and containing numerous perithecia. The perithecia are usually arranged peripherally in a single, regular or irregular layer. Sometimes, however, they are crowded into several more or less irregular layers, so that the spore-bearing layer of the stroma may be several times the thickness of a single perithecium. The stromata are usually of a carbonaceous nature, but sometimes they are woody or corky-fibrous. The color of the substance is generally dark-brown or black; while that of the surface exhibits a range from whitish or gray, through various shades of red, ferruginous and purple, to black.

Without exception, the species of this genus are saprophytic and live upon the dead trunks, branches and rotten wood of various kinds of trees. They prefer the shade and moisture of the woods and are seldom found in the open where they would be exposed to direct sunlight for a large part of the day. Certain species, however, are sometimes found around the edge of woodlands where they are not shaded at all times. This is es-

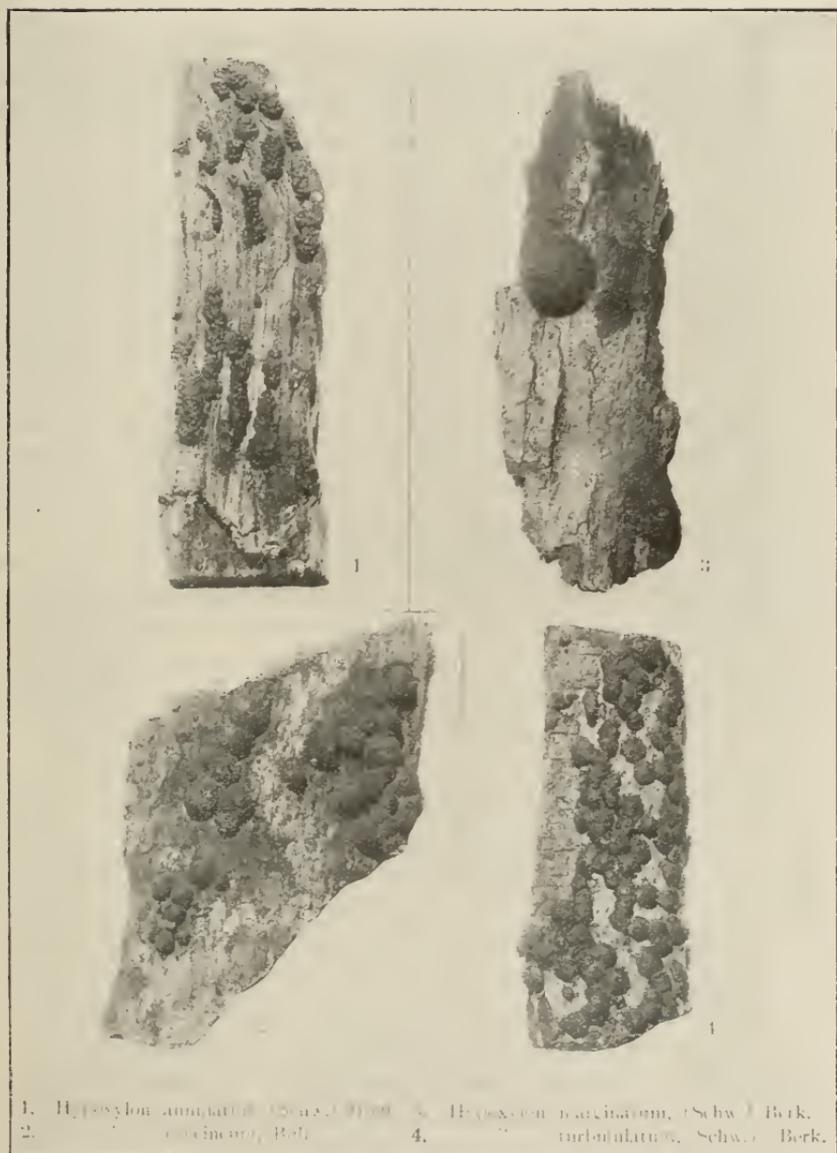
pecially true during rainy seasons. Some species are found upon the dead bark of trees and branches which are not in an advanced stage of decay. Others are usually found upon decorticated wood which is still sound. Still others seem to prefer wood which is very rotten. Occasionally a species is found which seems to flourish equally well under any or all of these conditions. Especially is this true of certain species which grow in great profusion both on sound bark and decorticated wood.

It is thus evident from the very nature of this group of fungous plants that they are of very little, if any, economic importance. Since they are not parasitic, they never cause the death of living plants, and, although true to fungous nature, they aid in the decay of timber already dead, yet, because of the fact that they thrive only in the forest, they are not destructive of timber which has been promptly removed to its proper place of use. The chief interest, then, which attaches to them is a scientific one. Most species of *Hypoxylon* are large and conspicuous in comparison with most other genera of *Pyrenomycetes*, and therefore they attract the attention of the collector. It is perhaps this characteristic more than any other which makes them interesting to the student of fungi.

The *Hypoxylo*ns develop late in the season, passing through the conidial stage during the summer or early autumn. The perfect stage follows the conidial and arrives at maturity sometime during the fall or early winter. The time for collecting mature specimens, then, is during the late autumn or early winter. They persist throughout the winter, however, and may be collected in good condition until the warm weather of spring comes, when they begin to disintegrate rapidly.

In attempting to make a key to the species of *Hypoxylon* a great difficulty is encountered. Perhaps there are few genera of fungi, or even of any group of plants, which offer more difficulty along this line than the genus under consideration. In the first place the genus itself is not set off from all other genera by distinct and unmistakable characters. For example, it would take an expert to distinguish with accuracy between some species of *Nummularia* and certain of the *Hypoxylo*ns. This lack of reliable marks of identity is even more evident when it comes to distinguishing between the various species of *Hypoxylon*.

Most investigators who have worked with this genus have attempted to divide it into groups of doubtful extent on the basis of the form and

1. *Hypoxylon annulatum* (Desmaz.) O. Sacc.2. " " *cinereum*, Roll.3. *Hypoxylon marginatum*, (Schw.) Berk.4. " " *turbolulatum*, (Schw.) Berk.

color of the stroma. But this is not entirely satisfactory, because these characters are not at all constant in a great many species. Specimens of a certain species may be found at one time which show the effused form in a very marked degree. Again specimens of the same species may grow in a globose or hemispherical form with scarcely a sign of the effused nature. Similarly the color of the same species may vary greatly under different conditions of growth and with increasing age.

In any given species perhaps the spore measurements are the most constant of any of the characters, and even these vary within certain limits. But the differences between the spore measurements of all the various species are not of wide enough range to be of any great advantage in throwing them into groups which would be usable in a key. It is true that there are a few species here and there which might be thrown out upon the basis of spore size, but the great majority of them range so

- nearly together that it is not feasible to attempt a key upon this basis.

Since it has been our final purpose to make a key which could be used chiefly in the field without the use of the microscope, we have deemed it best to follow, for the most part, the example of former writers. Therefore the more evident, although more superficial and unstable characters have been employed, and the key has been based to a large extent upon the form and external color of the stroma. Although in a few of the ultimate divisions spore measurements have been used, it is hoped that in most cases the student will be able to locate any of the species covered by this key, by means of the naked eye, aided, perhaps, only by the hand lens.

Perhaps not the least valuable aid in identifying species may be found in the accompanying figures. When working with objects which are of such a uniformly dark appearance and which show such little contrast between stroma and substratum as do most of the Hypoxylons, it is no easy task to produce photographs which show their form and external appearance to good advantage. The figures appended are from photographs which were taken near a west window with the rays of the afternoon sun falling directly upon the specimens. It is the experience of the writer that this gives more contrast and makes the stromata and the perithecia stand out more prominently in the photograph than is the case when the exposure is made in diffused light.

Sixteen species have been collected thus far and the key has been made to fit the specimens at hand without regard to any others.

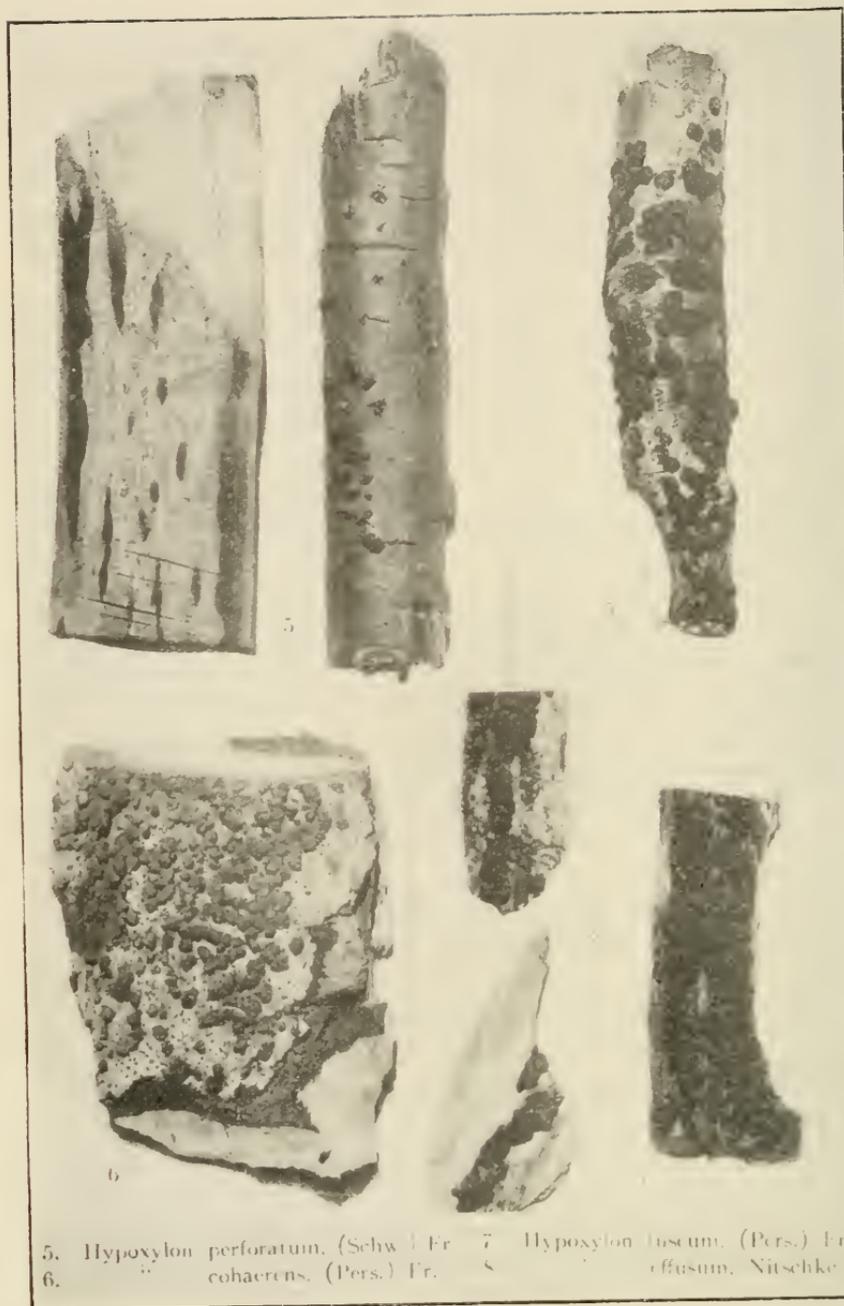
The descriptions of species have been taken to a great extent from the original descriptions and comments appended thereto, as given in "North American Pyrenomycetes" by Ellis and Everhart. In nearly all cases, however, the writer has made some changes, and in some instances the whole description has been rewritten to suit the specimens at hand. All measurements of asci and spores are original. Where the measurements given by Ellis and Everhart differ, their figures are given in parentheses. In some cases the measurements given by Saccardo are included also.

The identification of all species covered by this paper has been verified by Dr. Charles H. Peck, State Botanist of New York, who was kind enough to examine all our specimens. In a few cases the species was determined by him. I take this opportunity to express my thanks for his assistance in this work.

I am also indebted to Prof. J. M. Van Hook, of Indiana University, for material placed at my disposal, and for aid and advice in formulating this paper.

KEY TO SPECIES.

- I. Stroma large, irregular, thrown into folds or ridges, spores 8 microns long or less.....1. *H. Petersii*.
- II. Stroma more or less effused.
 - A. Stroma broadly effused.
 1. Externally colored whitish or gray.
 - a. Smooth, whitish, dotted with black ostiola.....2. *H. atropunctatum*.
 2. Externally colored not whitish or gray.
 - a. Perithecia 2/3-1 mm. long, spores 11-13 microns long.....3. *H. atropurpureum*.
 - b. Perithecia 1/2 mm. long, spores 9-11 microns long.....4. *H. rubiginosum*.
 - B. Stroma variously effused or confluent, usually in small areas.
 1. Externally colored not black.
 - a. Surface of stroma bright purple, ostiola not white-margined, spores 12-15 microns long.....5. *H. fuscopurpureum*.
 - b. Surface of stroma brown or slightly purplish, ostiola white-margined, spores 8-11 microns long.....*6. *H. perforatum*.



2. Externally colored black.
- a. Stroma scant, composed of large perithecia which are almost solitary, or confluent in variously shaped, thin-crusts patches.
.....7. *H. effusum*.
 - b. Stroma thick or thin, in more or less effused patches 1/2 to 1 or 2 cm. long and wide. (Some very convex forms might be mistakenly placed under III.).....8. *H. multiformic*.
- III. Stroma globose or subglobose.
- A. Externally colored not black.
 1. Stroma globose.
 - a. Substance of stroma concentrically-zoned, radiate-fibrous, spores 8 microns long or less.....9. *H. Howeanum*.
 - b. Substance of stroma homogeneous, spores more than 8 microns long.10. *H. coccinum*.
 - c. Substance of stroma scant, perforate or granular, ostiola white-margined.*6. *H. perforatum*.
 2. Stroma depressed-pulvinate or rounded, surface dark purple.
.....11. *H. fuscum*.
 - B. Externally colored black.
 1. Perithecia annulate-truncate.
 - a. Stroma large, with the small (.5 mm.) perithecia deeply and evenly sunk in the substance of the stroma so that scarcely more than the disk projects, giving a rounded, even appearance.....12. *H. marginatum*.
 - b. Stroma of medium size and irregular from the large (2/3-1 mm.), prominent perithecia, many of which project one half their length beyond the surface of the stroma.....
.....13. *H. annulatum*.
 2. Perithecia not annulate-truncate.
 - a. Stroma scant, perithecia large, solitary or confluent in small, elongated areas in grooves of the bark.....
.....14. *H. sassafras*.
 - b. Stroma roughly subglobose, composed of a few loosely-aggregated perithecia (Usually not over 15 or 20 in a

* *H. perforatum* is sometimes found with the effused form of stroma, and again with a subglobose or hemispherical stroma. In order that the student may not be at a loss to know where to place it in case he should have only the one or the other form, the key has been arranged so that this species will run under either the effused or the globose group.

- stroma).15. *H. cohaerens*.
 c. Stroma flattened above, turbinate narrowed below, bearing numerous (usually over 25), not very prominent perithecia.16. *H. turbinulatum*.

DESCRIPTIONS.

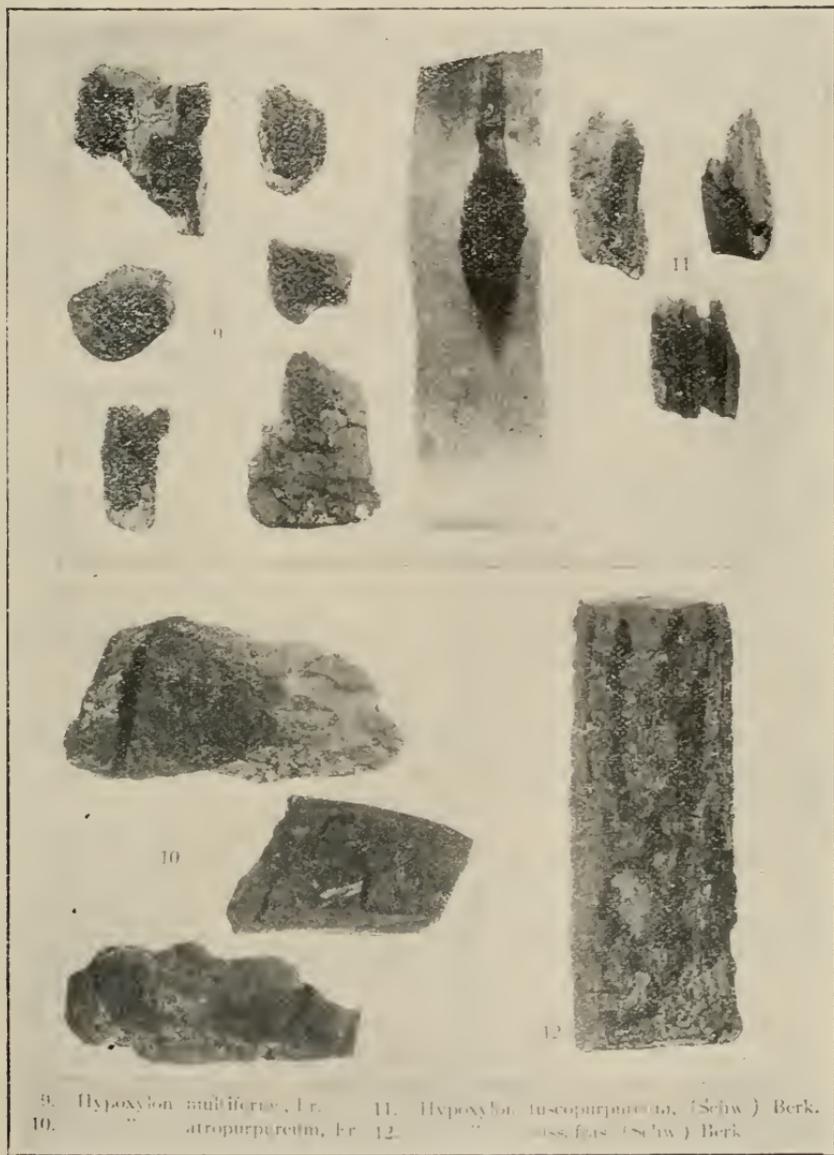
The following descriptions are adapted mainly from "North American Pyrenomycetes" by Ellis and Everhart.

HYPOXYLON, *Bulliard*.

Stroma of carbonaceous or woody-corky consistence, dark-brown or black within, externally ranging from almost white through shades of red, brown or purple, to black, free from the first or erumpent-superficial, sometimes more or less sunk in the wood, globose, subglobose, or more or less effused and crustaceous, at first covered by a conidial growth, finally bare. Perithecia peripheral in a single layer or sometimes in several layers concentrically or irregularly arranged, globose, ovate or oblong, coriaceous or corneo-coriaceous, sunk in a stroma, but generally with the upper part more or less projecting, with a papilliform or umbilicate ostiolum. Asci cylindrical, 8-spored. Spores uniseriate, elliptical or fusoid, inequilateral or curved, continuous, brown.

1. *H. Petersii*, B. & C.

Stroma large, 2.5-6 cm. long, 2.5-4 cm. wide, .75-1.5 cm. thick, ranging in shape from almost circular to oblong or elliptical, convex above, sometimes even, often raised into a few large folds or ridges which usually extend crosswise but occasionally lengthwise of the stroma, centrally attached with a spreading margin free at the sides. In the elliptical forms the attachment extends lengthwise almost from end to end. The surface sometimes exhibits deep cracks. The stroma is covered at first with a thick, leathery, membranaceous veil which soon disappears except around the margin where there persists a leather-colored strip of irregular width which becomes narrower and darker-colored with age. Substance corky, slightly fibrous, brown, upper spore-bearing part blackish-brown, slightly carbonaceous. Perithecia subglobose or sub-elongated, .5-.75 mm. long, with necks ending in papilliform ostiola, arranged in several layers, which in places are so crowded that the layers are not distinct. The entire spore-bearing stratum averages about 5 mm. in thickness. Asci cylin-



dricul, 60-75 x 5 microns, spore-bearing part 35-40 x 5 microns. Spores uniseriate or sub-biseriate above, elliptical, rather narrow, brown, 7-8 x 3-4 microns.

On rotten log of *Quercus*, Huckleberry Woods, near Bloomington, Indiana.

2. *H. atropunctatum*, (Schw.) Cke.

Sphaeria atropunctata, Schw.

Anthostoma atropunctatum, Sacc.

Hypoxyton atropunctatum, Cke.

Stroma very broadly effused, forming a thin (.75-1 mm.), smooth, whitish or gray crust which is flush with the surface of the surrounding bark, irregularly dotted with the black ostiola, usually surrounded by a black, sterile margin or circumscribing line, substance hard and rigid, black inside. Perithecia in a single layer, not crowded, ovate, about .5 mm. high, sometimes reaching almost to the base of the stroma. Asci abruptly contracted below into a short, stipitate base, 175-220 x 15-17 microns, spore-bearing part 160-180 x 15-17 microns. Spores acutely elliptical or almond shaped, dark, 22-30 x 11-14 microns (E. & E.—Asci 150 x 10-12 microns. Spores 25-30 x 10-12 microns.) (Sacc.—Spores 25-30 x 8-9 microns.)

On *Fagus* and *Quercus*, vicinity of Bloomington, Ind. Also in Orange County, Indiana.

This species often extends in broad expanses for many feet along dead, standing tree trunks. It is easily overlooked on beech because of its similarity in color to the bark, but is readily identified by its black-punctate character.

3. *H. atropurpureum*, Fr.

Spharia atropurpurea, Fr.

Stroma broadly effused, varying greatly in extent, sometimes 1-2 cm. wide and 5-10 cm. long, occasionally continuous or interruptedly continuous for two or three feet in strips 1-3 cm. wide; 1-2 mm. thick; brown or purple, changing to dark-purple or almost black; margin of stroma rounded and distinct; surface papillate from the slightly prominent perithecia which are .66-1 mm. high, oblong or obovate, and are closely packed in a single layer. Spores ovate, subacute at each end, opaque, 9-13 x 4.5-6 microns. No asci were present in our specimens. (E. & E.—Asci, spore-bearing part, 50-60 x 7-8 microns. Spores 10-14 x 5-6 microns.)

On *Carya* and *Fagus*, vicinity of Bloomington, Ind. Also reported on bark of *Tilia* and other trees.

This species was found growing on the smooth surface of a hickory log from which the bark had been removed by man apparently one or two years previous to the finding of the specimen. The wood was slightly decayed. The stroma was extensively effused in a strip which was approximately one inch wide, entirely continuous for one foot and almost continuous for three feet in length.

This species is distinguished (in our specimens) from *H. rubiginosum* by its larger and more prominent perithecia.

4. *H. rubiginosum*, (Pers.) Fr.

Sphaeria rubiginosa, Pers.

Hypoxyton rubiginosum, Fr.

Stroma broadly effused, occasionally found, however, in small patches a few millimeters or a few centimeters across; rusty-red or brown, finally black, sometimes with a distinct purple tint; .75-1.5 mm. thick and adhering closely to the substratum, the lower part consisting of the altered wood so that it is sometimes difficult to distinguish between stroma and substratum; at first even and sterile but finally distinctly mammillose from the small (.5 mm.) perithecia which generally appear at first separate in the center and spread outwardly, becoming closely packed in a single layer. Asci 105-130 x 5-6 microns, spore-bearing part 70-80 x 5-6 microns. Spores 9-11 x 4.5-5.5 microns. (E. & E.—Asci, spore-bearing part 60 x 6 microns. Spores 10 x 4.5 microns.)

On decorticated *Liriodendron*, Borden, Ind. Also on *Ulmus*, Bloomington, Ind. Reported on *Acer*, *Quercus*, *Fagus* and other deciduous trees. Seems to be very common.

This species is difficult to distinguish from *H. atropurpureum*, but has smaller perithecia and slightly smaller spores. It may also be confused with *H. fuscopurpureum*, but the latter (in our specimens) has larger spores and a more elegantly purple surface.

5. *H. fuscopurpureum*, (Schw.) Berk.

Sphaeria fuscopurpurea, Schw.

Hypoxyton fuscopurpureum, Berk.

"Variously effused, margin generally sterile, outer crust rather hard, black and shining within, surface elegantly purple, regularly granulose from the subjacent perithecia which are oblong-ovate, polystichous, numer-

ous, small, immersed in the shining black stroma, staining the wood or bark around it black, inseparably adnate, extending for an inch or more in length and preferring depressions in the surface of the wood. See Cooke Grev. XI, p. 124, the sporidia are 14 x 7 microns. The specimen in Rav. F. Am. 653, on bark of ash, seaboard of South Carolina, has sporidia 9-11 x 4.5-6 microns, and looks more like a smooth form of *H. rubiginosum*."

The above is quoted verbatim from the description as given in Ellis and Everhart's work. The specimens at hand are rather meagre. Our measurements are: Asci 120 x 9-10 microns, spore-bearing part 85 x 9-10 microns. Spores 12-15 x 6-7 microns.

On rotten wood of Liriodendron, Bloomington, Ind.

To distinguish from *H. rubiginosum*, see under description of the latter. It may also be confused with *H. atropurpureum*, but has a more elegantly purple surface and slightly larger spores.

6. *H. perforatum*, (Schw.) Fr.

Sphaeria perforata, Schw.

Stroma superficial, effused, tubercular-convex or depressed-hemispherical (2-4 mm.), often interruptedly confluent for several centimeters in narrow (2-4 mm.) strips, dirty-brown, dark, or purplish rust-color, dotted with the minute, white-margined, punctiform ostiola. Perithecia submonostichous, globose, small (.25-.33 mm.), lying near the surface of the stroma, crowded, mostly not distinctly prominent. Asci 85-110 x 7-8 microns, spore-bearing part 60-70 x 7-8 microns. Spores 8-11 x 4-6 microns. (E. & E.—Spores 10-14 x 5-7 microns.)

On Ulmus, Fraxinus, Rhus and Sassafras, vicinity of Bloomington, Indiana. Also reported on Quercus.

I have frequently found this species with the hemispherical or tubercular-convex form of stroma. When found in this form alone, it is not at all probable that the collector would think of placing it in the effused group. (See note immediately following the key.)

7. *H. effusum*, Nitschke.

Stroma superficial, thin, forming black, crust-like patches of various shapes and sizes, 3-4 mm. across, or often confluently seriate, 3-4 cm. or more long by .5-1 cm. wide. Perithecia in a single layer, rather large (the central cavity being about .33-.5 mm. in diameter), prominent, but usually flattened above, sometimes with a central papilla much as in *H. annu-*

lutum, but not so distinctly annulate-depressed. Asci 90-110 x 5-6 microns, spore-bearing part 55-65 x 5-6 microns. Spores ovate-oblong, pale brown, 8-10 x 3-4.5 microns. (E. & E.—Spores 9-10.5 x 3.5 microns.)

On decorticated Ulmus, near site of university reservoir, Bloomington, Indiana.

The stroma in this species is very scant. The perithecia are sparingly fused or confluent so that there is not much substance aside from that comprised in the perithecia themselves.

8. *H. multiforme*, Fr.

Sphaeria multiformis, Fr.

Sphaeria peltata, DC.

Sphaeria rubiformis, Pers.

Hypoxyylon granulolum, Bull.

Stroma erumpent and often margined by the ruptured bark, of various shapes, at first rounded, then spreading and becoming somewhat flattened above, dull rusty-red, finally black and smooth. Perithecia irregularly monostichous, rather large (1 mm.), globose, distinctly prominent, with papilliform ostiola. Asci cylindrical, on long pedicels, 95-110 x 6-7 microns, spore bearing part 60-70 x 6-7 microns. Spores 9-12 x 4.5-6 microns. (E. & E.—Spores 9-10.5 x 3.5 microns.)

On Fagus, Ulmus and Juglans, vicinity of Bloomington, Ind. Also reported on Betula (where the stroma is usually transversely elongated), Alnus, Sorbus, Quercus and Castanea.

Specimen No. 2193 in the herbarium at Indiana University seems to be the most typical one in our collection. Several other specimens in the same herbarium were identified by Dr. Peck as depressed forms. They have somewhat smaller perithecia.

9. *H. Howcianum*, Pk.

Stroma globose or depressed-globose, 5-15 mm. across; surface brick-red or sometimes orange colored or slightly olivaceous, becoming darker, almost smooth but densely punctuate with the minute, black ostiola; substance of a shining blue-black or brown-black color and showing a radiate-fibrous structure, usually with from one to three or more faint, concentric zones. Perithecia ovate, .25-.75 mm. high, peripheral in a single layer, with scarcely more than the minute ostiola projecting. Asci 75-90 x 4-5 microns, spore-bearing part 50-60 x 4-5 microns. Spores 7-8 x 3-4 microns. (E. & E.—Asci, spore-bearing part 45-50 x 5 microns. Spores 6-7 x 3-3.5 microns.)

On *Acer* and *Fagus*, vicinity of Bloomington, Indiana.

This species is distinguished from *H. coccineum* by the radiate-fibrous, concentric-zoned structure of the stroma, which is lacking in the latter, and also by its much smaller spores.

Specimen No. 2245 in the Indiana University Herbarium is a peculiar form, having a thin orange-colored or brick-red crust which peels off easily, and shows only a few scattered perithecia. This is perhaps an immature specimen.

10. *H. coccineum*, Bull.

Sphaeria fragiformis, Pers.

Sphaeria rubra, Willd.

Sphaeria lycoperdoides, Weigel.

Sphaeria radians, Tode.

Sphaeria tuberculosa, Sow.

Sphaeria bicolor, DC.

Sphaeria lateritia, DC.

Lycoperdon pisiforme, Sow.

Lycoperdon variolosum, Lih.

Stromatosphaeria fragiformis, Grev.

Stroma globose or subglobose, erumpent, turning the bark dark in streaks for a short distance around, then superficial, completely hiding the scar where it broke through the outer bark, deep brick-red when mature, often paler when young, sometimes turning darker with age after maturity, 2-10 mm. in diameter; interior homogeneous and of an even sooty or gray-black color; surface evenly mammillose from the slightly projecting perithecia; finally solitary or joined together in tufts of two, three, or more. Perithecia peripheral in a single layer, subglobose or ovate, slightly prominent, crowded, .33-.5 mm. in diameter. Asci 115-140 x 6-8 microns, spore-bearing part 70-90 x 6-8 microns. Spores black, often 2-guttulate, 10-14 x 5-7 microns. (E. & E.—Spores 10-12 x 4-5 microns.)

On bark of dead *Fagus*, vicinity of Bloomington, Indiana. Also reported on other trees such as *Quercus*, *Salix* and *Betula*. This is one of our most common species.

11. *H. fuscum*, (Pers.) Fr.

Sphaeria fusca, Pers.

Sphaeria fragiformis, Hoff.

Sphaeria confluens, Willd.

Sphaeria tuberculosa, Bolt.



Sphaeria castorea, Tode.

Sphaeria coryli, DC.

Sphaeria glomerata, DC.

Hypoxyton fuscum, Fr.

Stroma erumpent, then superficial, generally 1-4 mm. in diameter, solitary or subconnate, depressed-pulvinate or hemispherical, dark purplish-brown or purplish-red, finally almost black, somewhat uneven from the slightly projecting, small (.5 mm.) perithecia which are closely packed, irregularly monostichous, subglobose, with minute mammilliform ostiola. Asci 95-110 x 7-8 microns, spore-bearing part 80-90 x 7-8 microns. Spores 10-12 x 5-6 microns. (E. & E.—Spores 11-14 x 5-6 microns.) (Saccardo.—Spores 12-16 x 5-7 microns.)

On dead *Ulmus*, *Acer* and *Ostrya*, vicinity of Bloomington, Indiana. Also reported on *Alnus*, *Betula*, *Corylus*, *Fagus* and other deciduous trees.

This species sometimes grows with a few of the perithecia in the center of the stroma projecting farther than the remainder, forming a kind of papilla and giving the entire stroma the appearance of a much flattened volcanic cone.

12. *H. marginatum*, (Schw.) Berk.

Sphaeria marginata, Schw.

Sphaeria durissima, Schw.

Sphaeria truncata, Schw.

Hypoxyton durissimum, Cke.

Hypoxyton marginatum, Berk.

Stroma pulvinate or hemispherical, 3 mm. to 2 cm. across or by confluence more than that, ranging up to 6 or 7 mm. in thickness; black when mature; surface slightly roughened by the projecting perithecia with their papilliform ostiola. Perithecia ovate, monostichous, peripheral, about .5 mm. in diameter, with black ostiola which arise from the center of a small, flat, circular disk or depression which, however, does not appear in the earlier stage of growth. Asci 75-100 x 5-7 microns, spore-bearing part 55-75 x 5-7. Spores 7-9 x 3.5-5 microns. (E. & E.—Asci 75-80 x 6-7 microns. Spores 7-9 x 3-3.5 microns.)

On bark and wood of *Quercus*, vicinity of Bloomington, Indiana.

This species has the annulate-truncate perithecia similar to *H. annulatum*, but is distinguished from that species by its smaller and less prominent perithecia, and by its larger stroma. (See under description of *H. annulatum*.)

13. *H. annulatum*, (Schw.) Mont.

Sphaeria annulata, Schw.

Hypoxyton annulatum, Mont.

Stroma hemispheric-tuberculiform, about 2-5 mm. across, or irregularly effused and interruptedly confluent-tuberculose, brownish-black or purplish-black. Perithecia subglobose, irregularly monostichous, large (.75-1 mm.), with from one fourth to one half of the upper part free, finally annulate-truncate above, with the black, papilliform ostiola in the center of the truncate disk. Asci 90-125 x 6-7 microns, spore-bearing part 65-80 x 6-7 microns. Spores 8-9 x 4-5 microns. (E. & E.—Spores 7-9 x 3.5 microns.)

Common on bark and wood of *Quercus*, vicinity of Bloomington, Indiana.

This species is readily distinguished from *H. marginatum* (which also has the annulate-truncate perithecia) by its usually smaller stroma, which is very irregular on account of the larger, rounded and prominent perithecia, while the stroma of the latter species is even and regular.

14. *H. sassafras*, (Schw.) Berk.

Sphaeria sassafras, Schw.

Hypoxyton sassafras, Berk.

Stroma scant; perithecia large (1-1.5 mm.), the internal cavity nearly 1 mm. in diameter, occurring either singly or aggregated in clusters of 3-8 or more, standing in elongated areas mostly in grooves of the bark, sometimes flattened or compressed by mutual pressure, with their bases united in a thin stroma of a dirty brownish-black, and with one half or more of their upper part free, sub-truncate above, with a minute, papilliform ostiolum. Asci 110-150 x 4-5 microns, spore-bearing part 65-75 x 4-5 microns. Spores 7-9 x 3-4 microns.

On dead fallen *Sassafras*, vicinity of Bloomington, Indiana. Also reported on *Lindera*, where the perithecia may be more evenly scattered over the matrix.

I found this species growing in great abundance on dead saplings in a thicket of *Sassafras* about four miles east of Bloomington, Indiana. In some cases the whole trunk of the tree was thickly covered with the fungus. It seems to prefer cracks and grooves in the bark, and thus grows in long, interrupted strips, which are parallel with the trunk, and in most cases a single perithecium wide.

15. *H. cohaerens*, (Pers.) Fr.

Sphaeria cohaerens, Pers.

Stroma erumpent-superficial, irregularly subglobose or depressed-hemispherical, usually about 2-4 mm. in diameter, gregarious or crowded, often confluent, at first dirty brown, becoming black or nearly black. Perithecia irregularly monostichous, usually 5 to 15 or 20 in a stroma, large (.75-1 mm.), with papilliform ostiola. Sometimes the perithecia are distinctly prominent, forming an irregular stroma composed of a few, large, rounded perithecia loosely joined together. Asci 100-150 x 6-7 microns, spore-bearing part 65-90 x 6-7 microns. Spores 8-12 x 3.5-5.5 microns.

Common on bark of *Fagus*, near Bloomington, Indiana.

Some forms of this species slightly resemble *H. annulatum*, from which it is distinguished by the absence of the annulate-truncate disk on the perithecia. Other forms resemble *H. turbinulatum*, but the latter usually has less prominently projecting perithecia, with more prominent ostiola, a larger number of perithecia in a stroma, and is more turbinate-narrowed below.

16. *H. turbinulatum*, (Schw.) Berk.

Sphaeria turbinulata, Schw.

Stroma turbinate-pulvinate, 2-6 mm. in diameter, subconfluent, but with the stromata nearly always distinct, at first brown, then black. The stromata are arranged in a seriate manner so as to bear some resemblance to Hebrew letters, and are sometimes seated on a black crust which over-spreads the bark. Perithecia large, scattered through the entire stroma, with small, scattered, but conspicuous ostiola which are the most prominent part of the perithecia above the surface of the stroma. Asci 120-140 x 5-6 microns, spore-bearing part 70-80 x 5-6 microns. Spores 9-11 x 3.5-5 microns. (E. & E.—Spec. in Herb. Schw., Spores 8-10 x 3.5-4.5 microns.)

On dead bark of *Fagus*, neighborhood of Bloomington, Indiana.

To distinguish this species from *H. cohaerens*, see under description of the latter.

All figures in this paper are practically natural size.

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