

Paragyrodon Sphaerosporus: A Mid-western Endemic?

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FOLLOWERS of life in Lake Wobegon know that one is not supposed to stand out. So it is with midwestern mushrooms. However, a few mushroom species are considered endemic to Minnesota, Wisconsin, and Michigan, though the midwest cannot be called a biodiversity hotspot. The bolete *Paragyrodon sphaerosporus* is considered to belong to this select group of mid-western endemics.

So it was a surprise when this species turned up at the 2005 Colorado Mycological Society's Mushroom Fair in Denver, in mid August. Colorado includes part of the Rocky Mountains and has high plains in the eastern part. The whole state, but especially the mountains, differs in geology, climate, and natural vegetation from the quintessential midwestern states of Minnesota, Wisconsin, and Michigan (Flora of North America Editorial Committee, 1993).

One of us (Becky) collected three specimens of the bolete in Custer County at 8400 ft. on the east side of the Sangre de Cristo Mountains, near Hillside. They were found on a lawn in a garden setting, with a scrub oak nine ft. away and a white fir nearby. The fruitbody she brought to the fair, was still young, and a firm, rubbery veil completely covered the pores; it could almost have been a conk. Cutting it open was a revelation, as the shallow and irregular pores and the brown discolouring juicy flesh became visible. Now we could also see how truly thick its veil was, and how tenacious.

This well-developed veil is one of the key

characters of the species and was noted by Peck in 1885 when he made the original description. The other distinctive character, which he also noted, is the roundish shape of the spores (he gave the species its name on their account). Most bolete species have elongate, penguin-shaped spores.

Paragyrodon sphaerosporus is one of those baffling and anomalous species that has traveled from one genus to another. It was originally described in *Boletus*, transferred first to *IXOCOMUS* because of the sticky cap surface, then to *Suillus* by several authors (e.g. Smith and Thiers 1964 and 1971), and spent a short period in *Gyrodon*. Finally, Singer considered it too special to be placed with other species and erected its very own genus *Paragyrodon* (Singer 1940, 1942). Molecular studies have shed some light and shown that it is indeed neither a *Boletus* nor a *Suillus* species, and its closest relative is *Paxillus involutus* (Binder and Bresinsky, 2002). When you know that, you can say, yes, it does look a bit like *Paxillus*: the weird brown colors on the cap, the juiciness, the discoloration, the shape of the spores. Sure! This close relationship also raises warning signals: do not eat, do not eat! *Paxillus involutus* is one of a few species for which people can become more and more allergic till a threshold is crossed, and death is the result.

The Herbarium of Fungi at Denver Botanic Gardens contains a second Colorado collection which was brought to the mushroom fair in 1981 from Colorado Springs (El Paso Co.), where it was found under Gambel oak. A third collection, preserved in the herbarium of the New York Botanical Garden, came from a cemetery in Denver but is without a date. Interestingly, the Denver Botanic Gardens are on a site where there used to be a cemetery . . .

A combined web and literature search fills in the distribution. Most collections originate in the southern counties of Michigan (website #2 in particular); Wisconsin and Minnesota have a small-to-moderate number of collections (websites #1-#6), and the species has been found a

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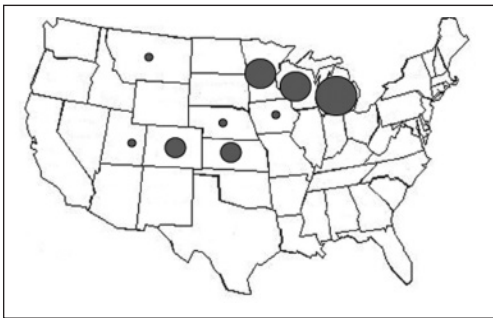
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few times in Kansas and Nebraska and once each in Iowa, Utah, and Montana (website #1; Peck 1889). As we have said, in Colorado it is known from three places. There is a reference to a possible find in Québec (Pomerleau 1980, but see Bessette et al., 2000), but nobody there has seen it recently, and its occurrence in the province is highly suspect (Yves Lamoureux, pers. comm.).

The high number of collections from Michigan, especially from in and around Ann Arbor, has a simple explanation—the presence of mycologists. Fruitbodies regularly appeared in the yard of a neighbor of A. H. Smith and elsewhere nearby when he and Harry Thiers were working on a monograph of *Suillus* and the boleti of Michigan (Smith and Thiers 1964, 1971). However, the collections from Michigan in the herbarium at Ann Arbor span a long period, from 1907 to 1975.

For Wisconsin, the state where Peck's specimen originated, Neuman (1914) stated, "specimens are collected every year at Madison, and they have also been found at Lake Wingra, Horicon, and Blue Mounds. One specimen was found at Horicon, growing in rich soil on the banks of the Rock river, in July 1899, and another was found by F. E. McKenna near Blanchardville. The species is apparently common in the state." It was found in the LaCrosse area during the 2005 NAMA foray (P. Leacock, pers. comm.). How common it is nowadays in Wisconsin and Michigan is a guess.

The 14 Minnesota collections in the Fungal collection of the University of Minnesota herbarium (website #5; David McLaughlin pers. comm.) are much more recent than those in Ann Arbor, dating from 1979 to 2001, and originate from



Distribution of *Paragyrodon sphaerosporus* in North America by state, based on literature and herbarium web sites; the size of the dot is an indication for the number of collections (see text).

six different counties. The habitat data are interesting—some collections come from oak or mixed oak forests with *Quercus rubra* and *Q. ellipsoidea*, one collection was found in a mixed hardwood forest with cottonwoods as the main tree species.

The guide book to Kansas mushrooms (Horn et al., 1993) does not treat the species, though several collections from the state in the 1970s are preserved in the herbaria at Ann Arbor and New York (websites #1 and 2). Recent collections are known from Utah (1983), Colorado (1981 and 2005), Minnesota (2001) and Wisconsin (2005).

The known distribution suggests that the species may also occur in northern Illinois, Indiana, and Ohio, and that it is more common in Iowa than might appear from the one record we could find (Peck 1889), but these are suggestions. *Paragyrodon* would be a great candidate for a nationwide recording project!

The fungus is a typical summer fruiter, so the time to look for it is from June till the beginning of October. The one in Colorado kept fruiting till the first weekend in October 2005.

Most collections have been made under or in the neighborhood of oaks—for Michigan, Wisconsin, and Minnesota, White oak, *Quercus alba*, is the name that crops up (but see above for more about the Minnesota collections); for Colorado it is Gambel oak, *Quercus gambelii*. Peck (1889) stated that the species grew on sandy soils and in low ravines; Smith and Thiers (1964) commented that it grew in suburban areas of Ann Arbor where the oaks had been left standing when the rest of the forest had been cleared to make way for housing.

If the host tree were the determining factor for the distribution of the species, we would expect it in many other states. White oak is found throughout the eastern states, from Minnesota and Nebraska southwards and eastwards (website #7). But, to take one example, there are no records of *Paragyrodon* from Illinois, although white oak is present in all counties (website #7). Gambel oak is found in South Dakota, Wyoming, Nevada, Colorado, Arizona, New Mexico, Texas and Oklahoma, but Colorado is the only one of these states for which there are records of the bolete (website #8).

It is clear that *Paragyrodon sphaerosporus* is a species found with several oak species and that it



Paragyrodon sphaerosporus from Hillside, CO, preserved in the Denver Botanic Gardens mycological herbarium (photo by John Lennie).

has a limited distribution in the central and more northerly states of the U.S.A., together with a few western outliers. It is not clear from the data available on line and in the literature what factors determine the distribution. The main ones are likely to be climate, soil characters, vegetation, and host presence, with weather as a short-term factor for fruitbody production. Aren't we lucky that mushroom species always seem to have a mystery to lure us on!

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WEBSITES

- <http://sciweb.nybg.org/science2/hcol/fungi/index.asp>—International Plant Science Center, virtual herbarium. database of indexed fungal specimens at the New York Botanical Garden.
- <http://herbarium.lsa.umich.edu/website/databases.html>—databases at the herbarium of the University of Michigan at Ann Arbor.
- www.nysm.nysed.gov/mycology—The N.Y. State Museum Mycological Collections Herbarium NYS.
- www.fieldmuseum.org/nama—the NAMA voucher NAMA voucher collection project.
- <http://fungi.umn.edu>—Univ. of Minnesota Herbarium Fungal Collection of the Bell Museum of Natural History.
- www.mushroomexpert.com/paragyrodon_sphaerosporus.html—Michael Kuo's web site with a description of *Paragyrodon sphaerosporus*.
- http://plants.usda.gov/cgi_bin/topics.cgi?earl=plant_profile.cgi&symbol=QUAL for distribution of *Quercus alba*.
- http://plants.usda.gov/cgi_bin/topics.cgi?earl=plant_profile.cgi&symbol=QUGA for distribution of *Quercus gambelii*.

