Figure 1. The "rhino horn" chaga measuring 30 inches long and 36 inches in girth growing out from an old wound on birch in the North Woods of Minnesota. This massive chaga may be the largest living chaga in North America.

Old Growth Fungi and the Rhino Horn Chaga

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An old growth forest is the place to find old growth fungi. For decades I have been monitoring the growth of one of the largest sterile conks of chaga I have ever encountered. I call it the rhino horn chaga (Fig.1). It occurs on a very old birch tree at the University of Minnesota Cloquet Forestry Center which is an educational and research forest in the North Woods of Minnesota. Chaga is the common name for the thick-walled fungal mycelium that grows out from old wounds on trees colonized by *Inonotus obliquus*, a white rot fungus. Chaga has a long history of being collected and used in traditional medicine and has become a favorite of mushroom collectors. It is most commonly used to make a medicinal tea that is high in antioxidants. As this fungus grows on the tree, it causes an internal attack of the wood. After substantial decay has taken place, it produces mycelia that accumulate at openings such as wounds and cracks on the tree.

Chaga is often mischaracterized as a fruiting body but it is a mass of sterile mycelium that functions to keep wounds open allowing the fungus to continue to grow inside the tree. As the thick mycelium of *Inonotus obliquus* grows out of the tree in a compact mass, it produces pressure pads from the edges of the chaga that prevent the tree from closing the wound and compartmentalizing the defect. This fungal canker-rot and the tree duel it out. Every time the pressure pads break into the defenses of the tree, a defense response occurs producing discolored reaction wood inside the tree. Over time this pioneer colonizing decay fungus breaks down the internal chemical and morphological barriers produced by the tree as a defense and the fungus attacks and decays the wood. This results in zones of discolored wood that gradually get replaced by decayed wood as the fungus continues to grow. When you see chaga on a tree, there is usually a very large column of unseen decay associated with it (Fig. 2). As the decay process progresses, the wood structure becomes weakened and strength properties of the wood are compromised. During storms, these trees fail and since the decay is greatest higher up on the tree where old branch wounds occur (likely the entrance sites for the fungus), a broken tree trunk is often left standing. Sometime later, the bark starts to loosen on these standing broken trees and it is here just under the bark where the true fruiting body of *Inonotus obliquus* is produced. This is often not seen unless you rip off the old bark near the location of the chaga (Fig. 3).

> "Revealed: The Record-Setting Colossal Mushrooms of the World"

A previous name for this fungus was *Poria obliqua* and fungi of this type produce a typical flat poroid surface under the old bark as it splits off. A special issue on chaga appeared in FUNGI magazine (volume 5:3) a few years ago, providing a comprehensive set of articles on all aspects of chaga. However, examples of large champion-sized chaga have not been documented. In most cases, trees fail before the chaga can get gigantic in size and once trees die, the chaga stops growing. The rhino horn chaga (Fig. 1) is big, measuring slightly over 30 inches long. It is also enormously thick, 36 inches in circumference at its widest point near its base. Over the years it has curled upwards, resembling a rhinoceros horn and the growing tip now contacts the tree trunk so its length is not likely going to continue to grow but its girth should keep expanding. It is by far the largest chaga I have ever seen and raises the question if this is the largest in North America? An internet search revealed a few large chaga that had been harvested and likely ground into powder. One of these was 42 inches in circumference but it was not as long as the chaga being reported here. Are there other sightings of huge chaga and do they challenge the size of the rhino horn chaga?

There have been reports of other large polypores and several are rare and endangered fungi. In the Pacific Northwest, fruiting bodies of agarikon, *Laricifomes* (*Fomitopsis*) *officinalis*, can be up to 3 feet long and 100+ years old (Fig. 4) and the noble polypore *Bridgeoporus nobilissimus*, can also produce huge fruiting bodies. One collection made by Jacob Hisey in Lewis County, Washington in 1946 measured 57 x 34 inches and weighed 300 pounds. A portion of the sporophore is in the Charles Gardner Shaw mycological herbarium at Washington State University with original correspondence from the collector indicating it took 4 men and a mule to carry the sporophore out of the forest.

An even bigger polypore and

Figure 2. A cross-section of a harvested birch tree with chaga showing the mass of thick-walled fungal mycelium growing out from a wound (dark area). The fungus produces pressure on the tree growth that is trying to close the wound (top of photo) and has penetrated it causing a new zone of discoloration and decay. The growth of chaga stops wound closure, starts a new infections, and keeps the wound open which facilitates more internal tree decay.

considered the largest polypore ever found, is *Phellinus* (*Fomitipora*) *ellipsoidea* growing in China. This monster of a polypore was discovered by Professor Yu-Cheng Dai from Beijing Forestry University in an old growth forest on Hainan Island (Fig. 5). It has a *Poria*-like fruiting body that was found all along the undersurface of a very large fallen tree. This polypore broke all records by producing a long flat fruiting body that was nearly 36 feet long (1085 cm) and estimated to weigh 900 to 1,100 pounds (400 to 500 kg).

During an expedition to old growth forests in Bhutan, I found several large polypores. One of these polypores, found in a mountain village, is still a bit of a mystery. It had been harvested by an herbalist and was being sold in a market. It appears to be another champion polypore but remains an unidentified species of a *Fomes* or *Fomitopsis* (Fig. 6).

There are likely more examples to be found but old growth forests of the world are continually being threatened and these unique habitats are being lost at an alarming rate. Old growth forests (Fig. 7) need protection to preserve the many plant, fungi, and other organisms found there. This is especially true for large old growth polypores. Examples of these spectacular fungi are becoming very rare and these fungi and the habitats they are found in must be protected. If you have the opportunity to visit one of these special forests, keep a look out for more examples of colossal sized fungi, maybe you may even find a rival to the rhino horn chaga. In addition to the possibility of finding giant sporophores, you can be guaranteed to encounter a phenomenal array of diverse fungi flourishing in their natural habitat.

Acknowledgments

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Figure 3. Fruiting bodies of *Inonotus obliquus* occur after the tree dies. At sites where chaga is produced, the bark splits off and a pore layer is formed on the tree under the loosened bark. The above photo shows the pore layer forming beneath the bark that has been removed just under the chaga. This poria-like fruiting body (bottom photo) is a flat layer of fungal tissue producing pores that may be several feet long. The pores produce basidia and basidiospores for reproduction. Photos courtesy of Martin King.

Figure 4. A massive fruiting body of agarikon, *Laricifomes* (*Fomitopsis*) *officinalis*, collected in the early 1900s and currently in the Washington State University teaching / herbarium collection. Photo by the late Jack Rogers, who was a mycologist at WSU.

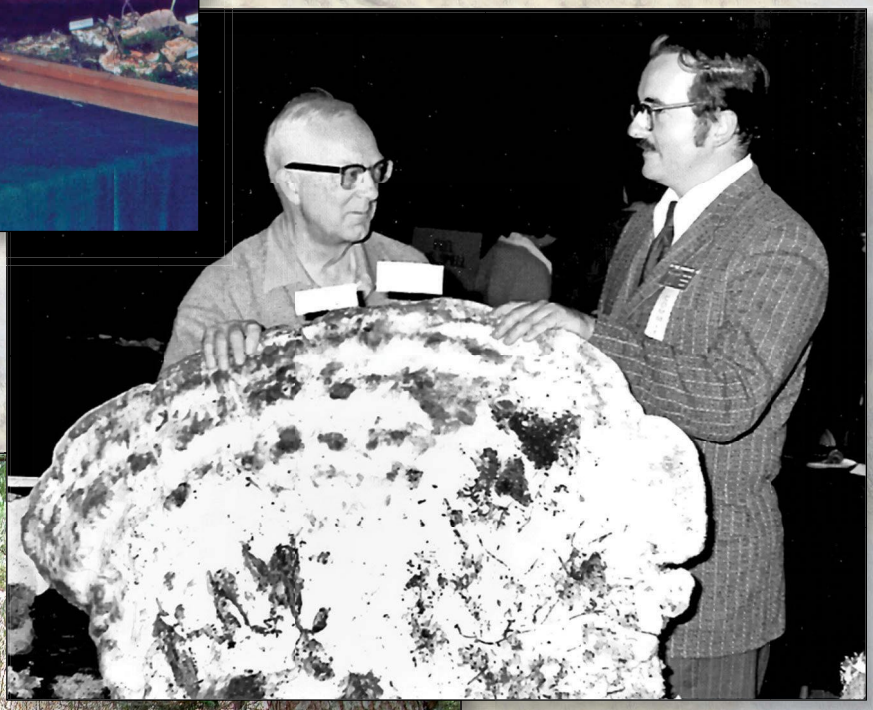
Figure 5. A photo showing part of the largest polypore found to date produced by *Phellinus* (*Fomitiporia*) *ellipsoideus* on the undersurface of a huge fallen tree in an old growth forest located at Hainan Island. Found by Professor Yu-Cheng Dai, Beijing Forestry University, the sporophore is a flat polypore extending 36 feet and estimated to weigh about ½ ton. The flat poroid fruiting body is somewhat similar to the sporophore produced by *Inonotus obliquus*. Photo courtesy of Yu-Cheng Dai.

Figure 6. The author holding a very old polypore from an old growth forest in Bhutan. This was harvested by an herbalist and being sold in a mountain village market. The species is unknown and molecular studies are underway to identify it.

Figure 7. A protected old growth forest in Minnesota called "The Lost 40" is designated as a State of Minnesota Science and Natural Area. This 40-acre section of forest was never logged and is one of the few old growth forests left in Minnesota. These special habitats are important to the existence of many diverse types of fungi.

More, More, More... COLOSSAL MUSHROOMS!

← *Bridgeoporus nobilissimus* 1978 by Seattle nature photographer Joy Spurr, sent to me by Patrice Benson, Faye Melson of Seattle pictured.



↑ *Bridgeoporus nobilissimus* 1978 by Seattle nature photographer Joy Spurr, sent to me by Patrice Benson, Daniel E. Stuntz and Fred Van de Bogart pictured.

← *Bridgeoporus nobilissimus* and Paul Stamets photo by James Gouin.