SPECIES FACT SHEET

Common Names: Noble Polypore, Fuzzy Pizza, Fuzzy Sandozi
Scientific Name: *Bridgeoporus nobilissimus (= Oxyporus nobilissimus)*

Kingdom: Eumycota
Phylum: Dikaryomycota
Subphylum: Basidiomycotina
Class: Holobasidiomycetes
Order: Polyporales
Family: Polyporaceae
Genus: *Bridgeoporus*
Species: *nobilissimus*

Technical Description: The fungus *Bridgeoporus* (=*Oxyporus*) *nobilissimus* (W.B. Cooke) Volk, Burdsall & Ammirati is a perennial polypore, endemic to Washington and Oregon, that produces large basidiomata on the root crowns and trunks of living trees, snags, and stumps. Synonyms for basidiomata are fruiting bodies, sporocarps, or conks.

The polypore initially was named *Oxyporus nobilissimus* by W.B. Cooke (1949), but Burdsall et al. (1996) reclassified it as *Bridgeoporus nobilissimus* because species of *Oxysporus* have true cystidia arising from the subhymenium (fertile spore-producing surface) whereas *B. nobilissimus* has pseudocystidia (Redberg et al. 2003).

The fruiting body is characterized by a fibrous pileal surface with cracks and crevices from which vascular plants (e.g., *Oxalis* sp. and pteridophytes) and bryophytes often grow epiphytically (Redberg et al. 2003). The pileal surface is covered with a dense mat of white mycelial fibers in young basidiomata (fruiting bodies), often somewhat agglutinated (adhering like gluten or glue) at the tips, which become darker with age, reaching several mm in length. These fibers often are green, due to epimycotic associations with several species of algae, including *Coccomyxa* sp. and *Charicium* species (Burdsall et al. 1996). *B. nobilissimus* lacks clamp connections at the septa and has a monomitic hyphal system with pseudocystidia arising from the trama (hymenial tissue). The spores are 5.5-6.5 x 3.5-4.5 µm, broadly ovoid, hyaline, smooth, thin-walled, and inamyloid. The round pores are stratified with a layer of sterile tissue 2-3 mm thick between successive annual pore layers.

Perennial sporocarps (conks) can attain a weight of 130 kg (Burdsall et al. 1996) with the largest recorded conk 75 cm x 101 cm x 51 cm in size. This massive polypore often hosts epiphytic associations with algae, lichens, and mosses (Burdsall et al. 1996, Hibler and O'Dell 1998, Redberg et al. 2003, Cowden 2002). Due to its large size, fuzzy, pileal surface, and perennial

persistence, *B. nobilissimus* is easily detected in the field (Hibler and O'Dell 1998, Cowden 2002).

Hibler and O'Dell (1997) described three general shapes for the fruiting bodies of *B. nobilissimus*, depending largely on their location on the host: (a) hoof-shaped and shelf-like conks found on the sides of hosts, (b) short, oblong-topped conks with tapering pore surfaces found on the main roots of the host, and (c) centrally substipitate (conical) conks located on the tops of stumps. Cowden (2002) expanded the descriptive morphology to four shapes: (a) shelved, (b) conical, (c) "button"/round, and (d) vertical. Of the conks observed in her study, 77% (n=62) of the 81 were shelved, 10% (n=8) conical, 11% (n=9) round, and 2% (n=2) vertical. Forty-five of the 60 dominant conks were shelved. Shelved conks were usually large and had algal growth and litterfall accumulation on the upper (pileal) surface of the sporocarp, and were found on trees, snags, and stumps. Seven dominant conks were conical. These conks only fruited on top of stumps and had algal growth and litterfall on the upper (pileal) surface of the sporocarp. Conical conks were characterized by a long stem, observed protruding from deep within the stump center. Six dominant rounded conks were observed, characterized as small conks with an active pileal surface but not acting as a secondary host to algae or mosses. These conks did not appear to have an active hymenium (fertile surface). Vertical conks were very rare, observed fruiting on only two stump hosts in Oregon. Characterized by a vertical growth pattern from the stump top downward, vertical conks were creamy beige in color and had no algal growth or litter present. To Cowden's list can be added a fifth descriptive conk shape or type, dead, in which the conk displays visible signs of deterioration/decline (T. Fennell, pers. comm., 2007). Recognizing conks in a deteriorated state is equally important when attempting to determine the presence of *B. nobilissimus* within a survey area. See photos for comparison of conk shapes.

Life History: The life history of *B. nobilissimus* is poorly understood. The hyphae/mycelia (vegetative stage) of a polypore may grow for a considerable span of time as the fungus accumulates resources to form its large fruiting bodies (Gilbertson and Ryvarden 1986). Like most macrofungi, *B. nobilissimus* is only identifiable in its reproductive stage (i.e., by its fruiting body). Hyphae/mycelia in wood or soil can only be identified using molecular techniques: species-specific polymerase chain reaction (PCR) primers (Redberg et al. 2003).

B. nobilissimus consistently has been associated with brown rot (a type of wood decay)(Burdsall et al. 1996), in which lignin is not appreciably degraded (Boddy and Watkinson 1995); however, the true rot characteristics of *B. nobilissimus* remain unresolved because efforts to culture it have been unsuccessful to date (Redberg et al. 2003). *B. nobilissimus* might cause a white rot and the brown rot observed in the association may be due to another species, possibly

Fomitopsis (Redberg et al. 2003). *B. nobilissimus* is probably a brown or white rot, but whether it is a saprobe, pathogen, or possibly a commensal or mutualistic endophyte to noble fir is not known (Redberg et al. 2003). Fungi can switch lifestyles depending on host genotype and environmental conditions, so it is possible for *B. nobilissimus* to be all of the above at different times (R. Rodriguez, pers. communication, 2007). Also, there may be other biological associations besides the one between the fungus and its tree host that are important: e.g., bacteria may be symbiotic with the fungus or involved in its life history, nutrient supplementation may come from algae associated with conks, or the fungus may be mycorrhizal (R. Rodriguez, pers. communication, 2007). It is unclear what drives *B. nobilissimus* to establish and produce conks.

Range, Distribution, and Abundance: Olympic Mountains and western Cascade Range from northwest Washington (Olympic and Mt. Baker-Snoqualmie National Forests) to central western Oregon (Willamette National Forest) at elevations of 300-1,300 meters (1,000 to 4,300 feet) with one known site in the Oregon Coast Range (Mary's Peak, Siuslaw National Forest) (Redberg et al. 2003, Cowden 2002). As of April 2007, 104 sites (locations) of *B. nobilissimus* are known in the Pacific Northwest, the majority of them on the Cascade Resource Area of the BLM Salem District in Clackamas, Marion, and Linn counties, which appears to be the "epicenter" of the species' distribution.

Habitat Associations: Fruiting bodies occur on large, dying and dead noble fir and Pacific silver fir in late-successional old-growth forests and on remnant stumps and snags in young and mature second-growth forests in the Pacific silver fir and western hemlock zones in western Washington and Oregon (Cowden 2002, Redberg et al. 2003). Known hosts for *B. nobilissimus* are limited to noble fir and Pacific silver fir, but potentially may include other true firs (*Abies grandis*, *Abies magnifica* var. *shastensis*, *Abies concolor*) and western hemlock (Cowden 2002; Redberg et al. 2003; J. Trappe, pers. communication, 2007; D. Shaw, pers. communication, 2007). Fruiting bodies have been found, for the most part, on large stumps but occasionally on snags and live trees too.

The species has been reported most commonly on large-diameter (at least 1 m) *Abies procera* (noble fir), infrequently on *Abies amabilis* (Pacific silver fir), and possibly on *Tsuga heterophylla* (western hemlock), typically fruiting within 1 m of the ground (Redberg et al 2003). Unlike many polypores, *B. nobilissimus* has not been observed on downed logs or any form of dead wood that lacked roots or some connection to a root system (Cowden 2002). Fruiting bodies were reported growing from the upturned root system/crown of one windthrown tree with intact roots (J. Ammirati, pers. communication, 1997, reported in Redberg et al. 2003). On the Mt. Hood National Forest, a once vital conk died within several years after its host was uprooted by a fallen tree (Cowden 2002). The fact that *B. nobilissimus* is only known to fruit on hosts connected to a root

system is evidence that root systems are a quintessential part of the organism's persistence, implying that *B. nobilissimus* is similar ecologically to butt rots such as annosus root rot (*Heterobasidion annosum*) and dyer's polypore (*Phaeolus schweinitzii)* (Cowden 2002).

Threats: (1) Extirpation of known and unknown sites by logging, fire, or other disturbance. (2) Forest practices that result in loss of large-diameter noble fir and Pacific silver fir trees and biological legacy structures (large-diameter stumps and snags) in managed forests. Many sporocarps of *B. nobilissimus* have been observed in various states of decline (Hibler and O'Dell 1997; M.Cowden, pers. communication, 2002; T. Fennell, pers. communication, 2007; A. Smith, pers. communication, 2007). The health and population dynamics of *B. nobilissimus* and its sporocarps across the species' range are unknown. Lack of habitat for the species (i.e., large noble fir and Pacific silver fir trees and biological legacy structures) will most likely limit conservation efforts.

Conservation Considerations: Conserve large noble and Pacific silver fir trees, snags, and stumps in managed forests. Manage young stands with a significant component of noble fir to promote large-diameter trees that could support *B. nobilissimus* in the future. *B. nobilissimus* was placed on the Oregon Natural Heritage Program's endangered species list in 1995, making it one of the first fungi to be listed by any private or public agency in the United States. The Forest Ecosystem Management Assessment Team (FEMAT) Report 1993 (p. IV 86-89) stated the need for collecting information on old-growth associated fungi of the Pacific Northwest. It specifically noted that a long-term study of *B. nobilissimus* should be initiated and include information on distance and effectiveness of spore dispersal. Currently, *B. nobilissimus* is on the Regional Forester's Sensitive Species List (Region 6, Pacific Northwest) and is Sensitive under the BLM Special Status Species program.

Further research on *B. nobilissimus* is needed to address basic questions about its biology and ecology, about which we still know very little. To complement ongoing field surveys for *B. nobilissimus* conks, the U.S. Forest Service (Region 6) and Bureau of Land Management (WA and OR) are collaborating with researchers to explore and expand the possibilities of detecting the presence of *B. nobilissimus* in forests through taking wood and soil samples in the field and then analyzing them back in the lab using molecular techniques (PCR primers) to detect the *B. nobilissimus* genome.

ATTACHMENTS:

(1) **List of Pertinent References/Literature/Pertinent or knowledgeable contacts**
(2) **Map of Range and Distribution**
(3) **Photos of the 5 shapes/types of *Bridgeoporus nobilissimus* conks**
(4) **Photos of "difficult to see" conks**
(5) **Photos of habitat**
(6) **Management Considerations**
(7) **Annotated Bibliography**

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