



Figure 1. The Powdercap Strangler, *Squamanita paradoxa*, Vancouver Island, British Columbia. These specimens comprise only the seventh collection ever for this extraordinarily rare species in North America. Photo courtesy of Oluna and Adolf Ceska.



Figure 2. *Cystoderma amiathinum*, the Pungent Powdercap. Photo courtesy of Christian Schwarz.

# The paradoxical *Squamanita*, a mycoparasitic symbiont

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...Infinite forms most beautiful and wonderful... Charles Darwin penned these words a century and a half ago when considering what billions of years of evolution had wrought. And this proclamation, despite having an impartial view of Nature—for he never studied the fungi.

The rules of natural selection and speciation become strained when we consider the Fifth Kingdom and probably none is more enigmatic than the paradoxical mushroom *Squamanita*. The genus is comprised of only a few species, all of which are rarely seen. And all species of *Squamanita* are parasites of other mushrooms. But it gets weirder still: the *Squamanita* basidiocarp seems to be a chimera of its tissues and those of its host. The Powdercap Strangler, *S. paradoxa*, demonstrates this visibly (Fig. 1) where the tissues of the host—the Pungent Powdercap, *Cystoderma amiathinum* (Fig. 2)—contribute to the scaly powdery look of the lower half of the stem (actually an elongate gall induced by the parasite). Huh?

Okay, your befuddlement is expected. Mycologists long thought species of *Squamanita* arose from a sort of tuber. In fact, the elongate bulb of tissue at the base of the *Squamanita* stipe in Figure 1 was originally termed a “protocarpic tuber.” Only recently did Redhead et al. (1994) demonstrate that species of *Squamanita* were parasitic on other mushrooms and that the protocarpic tubers were actually the mutated remains, a gall really, of the host’s fruitbody. The term “cecidocarp” has replaced protocarpic tuber to reflect the fact that this tissue is truly a gall. (A gall or cecidium is a manifestation of host tissues, induced by a parasite. Right now is a great time to see plant galls around the home, be they on the fallen leaves of trees, on oak tree branches, on *Euonymus* growing in flower beds, or the goldenrod stalks withering in the vacant lot next door. These plant galls were caused by fungi; bacteria, often *Agrobacterium tumefaciens*; or insects, often flies of the family Cecidomyiidae.)

Along with uncertainty about their physiology, mycologists were never quite sure how to treat them taxonomically. In older field guides *Squamanita* species may be instead be called *Coolia* or *Dissoderma*. They have been lumped within the Agaricaceae and Tricholomataceae (historically the dumping ground for white spored mushrooms that didn’t fit in any other families). Recently, Matheny and Griffith (2010) resolved this once and for all, utilizing DNA sequence analysis and with surprising results. Turns out *Squamanita* is most closely related to *Cystoderma* and *Phaeolepiota*, the latter, another curious and rarely seen group of mushrooms. The findings of

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probably would have preferred a simple alphabetical arrangement of genera.

Included with the book is a DVD containing *MycoKey* (version 3.1, special *Funga Nordica* edition). *MycoKey* is a computer-based (runs on both PC's and Mac's) synoptic key to over 850 genera of macrofungi from throughout Europe, along with over 4000, mostly excellent, color photographs of approximately 2400 representative species. This special version also includes PDF files of the *Funga Nordica* keys, allowing one to tote them on a laptop, rather than as a 5-lb book. I was unable to access the PDF's from inside *MycoKey* (a four-step process), so opted to create a desktop shortcut to the appropriate folder in the program files. The valuable reference section includes more than 17,000 entries. Considering that a license for *MycoKey* costs 40 euros + VAT, its inclusion with *Funga Nordica* makes for a great bargain. And, until the book is reprinted, it provides an option for obtaining the content in digital format (the currently available standalone version 3.2 includes the *Funga Nordica* PDF's, <http://www.mycokokey.com/>).

Inasmuch as it is unlikely we will have a comparable resource available for North America any time soon, *Funga Nordica* should be considered an important item for the library of anyone who attempts to identify a large proportion of the mushrooms (s)he finds here. Hopefully the planned reprint will be completed soon and, when it is finished, perhaps we can convince the editors and authors to similarly revise and update *Nordic Macromycetes Volumes 1 and 3!*

Steve Trudell



### Occupied

Knee deep in bank  
scams & leaf litter

Tendons tensed  
for the truffle tug

A one percenter  
scoops Oregon browns

in cutover Doug fir  
Her nose, his leash

art goodtimes - union of street poets • vincent st. john local / colorado plateau / aztlán  
kuksu brigade (ret.) san francisco

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Matheny and Griffith are surprising when you consider that *Squamanita* species parasitize its close kin, *Cystoderma* and *Phaeolepiota!* Hosts of other *Squamanita* species include less closely related species of Agaricales, such as *Galerina* (*S. contortipes*, the Contorted Strangler), *Hebeloma* (*S. odorata*, the Fragrant Strangler), and reportedly *Amanita* species.

All species of *Squamanita* are extraordinarily rare, though seen in Europe with slightly more frequency than in North America. Occasionally, "large" fruitings of several specimens are found as in a particular episode following heavy rains in Great Britain in 2009 (Kibby, 2009a and b). Probably the best known species in North America is the Powdercap Strangler. The last collection of it (indeed only the seventh from North America!) was by Oluna and Adolf Ceska on Vancouver Island, British Columbia, as part of an ongoing mycological survey there (see Luther, 2011). **WHAT YOU CAN DO:** If you spot one of these enigmatic mushrooms take good notes on habitat and other mushrooms nearby, make every attempt to collect the entire mushroom (including parts underground), dry them thoroughly, and take good photos. Then get them into the hands of a mycologist.

### References Cited

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- Redhead, S.A., J.F. Ammirati, G.R. Walker, L.L. Norvell, and M.B. Puccio. 1994. *Squamanita contortipes*, the Rosetta Stone of a mycoparasitic agaric genus. *Canadian Journal of Botany* 72: 1812-1824. 🍄