

X. moravicus, unplaced in any of them. Subsequent molecular work (see below) has borne out his treatment in every particular - *Xerocomus* certainly hadn't been a 'single entity'. To the confusion of all, one common species, previously a part of *Boletus chrysenteron*, was moved in recent years to *X. rubellus* in Courtecuisse & Duhem (1995), then became *B. declivitatum* in Watling & Hills (2005) and in the checklist, *X. communis* in Hills (2008) and *Funga Nordica*, and is now *Xerocomellus engelii* for Sutara (named in honour of Heinz Engel who had earlier given it yet another name *B. quercinus*, but only provisionally).

Three recent multigene studies have now revealed a ± consistent and increasingly sharply focussed bolete phylogeny: Binder & Hibbett (2006), Nuhn *et al.* (2013) and Wu *et al.* (2014), the first treating *Boletales* as a whole, the second *Boletineae* (i.e. *Boletaceae* plus its nearest neighbour *Paxillaceae*) and the third just *Boletaceae*. This last, the inspiration for these notes, is at first sight alarming. It amalgamates previous findings with numerous oriental and southern hemisphere bolete sequences from 192 specimens in all, currently assigned to 39 published genera.

The results show 59 clades mostly sufficiently distinct in their DNA to suggest generic rank, 25 of these new but (for the time being!) left unnamed. The good news is that these 59 clades aren't just one big mess; almost all can be assigned to one or other of a few major groups given sub-family status. It is this sharpening up of the higher levels of classification that is the most notable step forward. There emerges an objective grouping of the *Boletaceae* that shows some signs of permanence beyond the whims of future taxonomists, and this I now summarise in a British context.

Among the British *Boletaceae* there are firstly a few small basal (i.e. early-diverging) genera, mostly non-ectomycorrhizal(!) and secondly four distinct groups of more typical genera all ectomycorrhizal.

Basal Boletaceae

1. *Buchwaldoboletus* appears at the very base of the *Boletaceae* tree, with one species saprotrophic on conifer sawdust and rotten wood and the other apparently parasitic on *Phaeolus schweinitzii*.
2. *Chalciporus* is sister to *Buchwaldoboletus*.

C. piperatus is often associated with *Amanita muscaria* (which it has followed onto *Nothofagus* in Australia) and thus not always ectomycorrhizal.

- 2a. *Rubinoboletus* is for many a synonym of *Chalciporus*, but I have seen no suggestion that it is other than ectomycorrhizal, so it may deserve to stay in a separate genus.
3. *Pseudoboletus* (for *P. parasiticus*) is rather distant from any other known genus of *Boletaceae* and a long way from *Xerocomus*.

Group 1 (*Boletoideae*)

1. *Boletus* sensu stricto, i.e. *Boletus edulis*, type species of the genus, and its fellow 'Edules'.
2. *Boletus badius* – but no further *Boletus* species
3. *Porphyrellus*
4. *Tylopilus*
5. *Xerocomellus* – type species *X. chrysenteron*, and containing most of the outwardly similar species. But *X. rubellus* and the much renamed *X. engelii* belong in a distinct sister clade not as yet given a generic name.
6. *Strobilomyces* – possibly in this group.

Group 2 (*Xerocomoideae*)

结果显示, 在DNA方面有59个大多数足够清晰的属级支系, 其中25个为新支系。……好就好在这59个支系并非大杂烩, 几乎所有支系都可以置于几个亚科级的主要类群中。正是这一界限分明的较高等级的分类是最为值得称道的进展。known *B. fragrans*, often grouped with these two, appears to be still unsequenced and hence as yet unplaced.]

4. *Aureoboletus* — *A. cramesinus* (type) and *A. moravicus* (a recent combination for *X. moravicus*, formerly *Boletus leonis*)

Group 3 (*Leccinoideae*)

1. *Leccinum*
2. *Octaviania* - for *O. asterosperma* (hypogeous, rare?)
3. *Leccinellum* – for *L. crocipodium* and *L. pseudoscabrum*

[There is quite a good case for reducing all three to a single genus, but while *Octaviania* is treated as distinct then strictly *Leccinellum* should be also, as its two species are both closer to *Octaviania* than to *Leccinum*.]