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Phylogeny and diversity of Boletaceae in China, a review

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Purpose: Species in the family Boletaceae are economically and ecologically important. Nearly all of the species in the family are ectomycorrhizal partners forming symbiotic associations with higher plants of more than ten families. Boletaceae are very rich in species, diverse in morphology, and complicated in anatomy and relationships among genera. As a result, Boletaceae have been regarded as one of the most difficult fungal groups for taxonomists.

Methods: We have collected and analyzed over 2800 specimens of Boletaceae from the northern hemisphere, representing about 400 species (ca. 40% of the known species) belonging to more than 60 genera (nearly all the known genera) within the family. We employed integrated and inter-disciplinary approaches, including macro- and micro-morphological characterizations, ultrastructural investigations of basidiospores, and molecular phylogenetic analyses of multigene nucleotide sequences and partially microsatellite genotyping.

Results and Conclusions: Our studies elucidated the higher-level phylogenetic relationships of Boletaceae and proposed a new higher-level classification for the family. Seventeen new genera and 115 new species have been documented and published by Chinese mycologists based on morphological and molecular criteria since 2011. The evolutionary history of *Boletus reticuloceps* in correlation with its adaptation to historical climate fluctuations, ecological differentiations and physical barriers as well as plant hosts was analyzed. The studies provided deep insights into species diversity, phylogeny, and co-evolution of boletes with their host plants.