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Phylogenetic relationships in *Nothofagus* : The role of Antarctic fossil leaves

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The *Nothofagus* (southern beech) has a rich fossil record and a number of living species distributed exclusively in the Southern Hemisphere. Many attempts have been made to clarify the phylogenetic relationships in *Nothofagus* but only a few works have included fossil specimens in a phylogenetic framework for a more accurate resolution. Fossil leaves play an important role in deciphering of the evolutionary processes and are a necessary complement in phylogenetic studies. Fossils of *Nothofagus* have been found in sediments of Antarctica, Australia, New Zealand, New Caledonia, Papua New Guinea, and South America. Here, we performed a phylogenetic analysis including fossils from these areas and examined the character evolution, especially those referred to the morphology of the leaf. Fossil leaves from Antarctica were revised and included in the analysis for the first time. Our results support the monophyly of the four currently recognized subgenera, and novel relationships between extinct and living taxa are discussed. Morphological features of fossil leaves were expressed differently, especially in the teeth shape, size, and secondary venation pattern, when compared to the extant taxa probably related to past climate conditions. The most ancient leaves were recorded in the Upper Cretaceous of Antarctica and placed in subgenera *Lophozonia* and *Fuscospora*. *Brassospora* and *Nothofagus* are younger clades with distinctive plesiomorphic leaf morphological features. The morphological leaf characters proposed herein, and the inclusion of a considerable number of fossils in our analysis allowed us to provide a study of the evolutionary history of *Nothofagus* with more precise resolution.

Key words: Nothofagaceae, *Nothofagus* , fossil, living, evolution, Cretaceous, Antarctica.

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