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Variation of the Cytosolic Phosphoglucose Isomerase Gene in Andean Polystichum (Dryopteridaceae)

Abstract:

Cytosolic phosphoglucose isomerase (*pgiC*) is an enzyme essential to the glycolysis pathway found universally in eukaryotes. Variability of *pgiC* often results in allozyme polymorphism, which on occasion has been found to be thermally selected for, particularly in arthropods. Little work on *pgiC* has been conducted in plants, especially ferns. Andean species of the genus *Polystichum* provide an excellent study group for assessing the role of selection for temperature optima in the selection of *pgiC* allozymes in plants, as the species grow in a wide range of elevations there. Sequence data was collected for 70% of the genic DNA for *pgiC* in eight species of Andean *Polystichum*. Maximum parsimony and Bayesian inference were used to analyze the complete aligned data set of 3376 characters; separate analyses were run for the entire gene region, the exons, and the introns. All variable characters were set to infer a phylogeny of the entire gene region, for exons alone, and introns alone. These phylogenies were compared to a previously established chloroplast based phylogeny for this group. Across the entire dataset only 148 characters were variable. Of these 56 were informative; most of the informative characters united sister accessions, whereas very few supported deeper phylogenetic relationships. A total of seven amino acid substitutions occurred across the eight species sampled, five of which were informative. Variation occurring in both the introns and exons of *pgiC* are likely the result of phylogenetic history rather than temperature based selection due to a congruence of both the intron and exon based phylogenies. *PgiC* sequence data also provided

evidence that the species *Polystichum polyphyllum* is a progenitor of the two Central American polyploids *P. orbiculatum* and *P. talamancanum*.