



Speciation in Western North America: *Lomatium* as an Example of Diversification and Convergent Evolution

Edgar M. Sosa¹, Lauren Polito², Mckayla Stevens², Donald H. Mansfield², and James F. Smith¹
¹Boise State University, Department of Biological Sciences; ²College of Idaho, Department of Biology



Background

- Species delimitations and understanding the processes that drive speciation are essential to nearly all aspects of human endeavor.
- Determining species boundaries traditionally used morphology.
- Phylogenetic analyses based on DNA sequence data provide a means to resolve species boundaries, as well as test regarding the evolutionary processes.
- Recent phylogenetic analyses of *Lomatium* and related genera have demonstrated that many of the morphological characters used to delimit taxa have arisen multiple times and that most taxa are para- or polyphyletic.
- The several sub specific taxa of *L. triternatum* have not been recovered as monophyletic and *L. grayi* has a widespread habitat distribution that may indicate cryptic speciation.

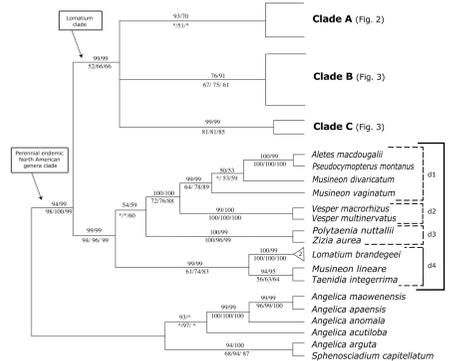


Figure 1: George et al's phylogenetic analysis. My work expanded on clade B.

Objectives

Here we examine one of the clades recovered in the *Lomatium* group of taxa that includes *Lomatium triternatum* and *L. grayi* with increased sampling of individuals in these two species, close relatives, and with increased data sampling.



Methods

- Taxon sampling based on George et al. 2014
- Sequenced ITS, *rpl32-trnL*, *rps16* intron
- Added ETS, *trnD-T*, *rpl32-ndhF* spacer, *psbA - trnH* spacer
- Maximum parsimony, maximum likelihood, Bayesian inference
- Support for clades: MP, ML bootstrap, BI posterior probabilities

Results

- Lomatium grayi* monophyletic and distinct from Adams County populations
- Lomatium triternatum* var. *platycarpum* monophyletic and distinct from all other sub-specific taxa of *L. triternatum*
- The remainder of *Lomatium triternatum*, *L. packardiae*, *L. tamanitchii*, *L. thompsonii*, *L. attenuatum* recovered as a phylogenetic complex
- Lomatium triternatum* var. *anomalum*, *L. packardiae*, and *L. tamanitchii*, are not recovered as monophyletic

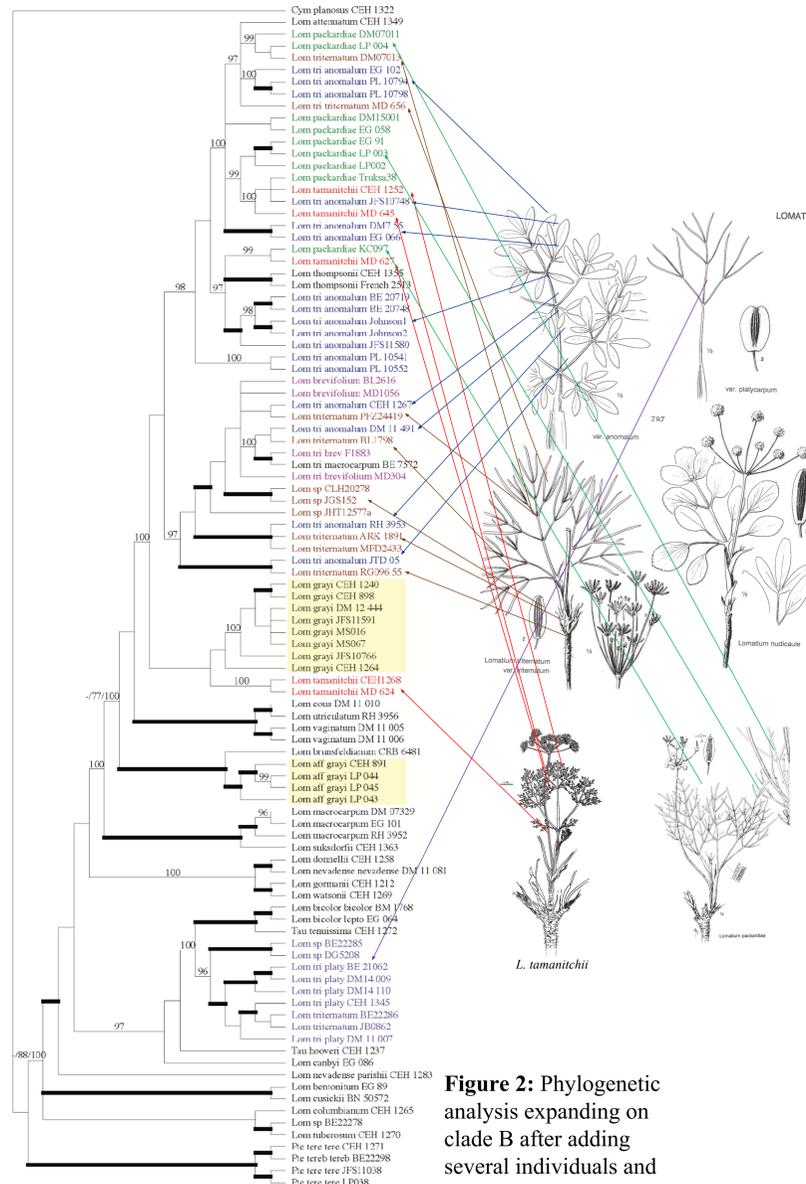


Figure 2: Phylogenetic analysis expanding on clade B after adding several individuals and gene regions.

Conclusions/Discussions

- Despite occupying many habitat types *Lomatium grayi* is a distinct species
- Populations from Adams county resembling *L. grayi* are distinct from the latter species and may represent an undescribed taxon
- Lomatium triternatum* variety *platycarpum* is distinct from the remainder of *L. triternatum* and should be elevated to the rank of species
- Relationships among other varieties of *L. triternatum*, *L. packardiae*, *L. tamanitchii*, remain unclear despite additional data, and morphological characters that readily separate these taxa
 - Could be the result of incomplete lineage sorting and a recent diversification
 - Potentially interspecific gene flow



L. triternatum, variety *triternatum*



L. bicolor



L. thompsonii



L. packardiae

Literature Cited

George, E. E., D. H. Mansfield, J. F. Smith, R. L. Hartman, S. R. Downie, and C. E. Hinchliff. 2014. Phylogenetic analysis reveals multiple cases of morphological parallelism and taxonomic polyphyly in *Lomatium* (Apiaceae). *Systematic Botany* 39: 662-674.

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