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Systematics of California's critically endangered *Lupinus nipomensis*

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Introduction

Lupinus nipomensis (Nipomo lupine) is an endangered species facing vulnerability to extinction from invasive species, habitat fragmentation, and variable rainfall and temperature. In Munz's 1963, *The California Flora*, Nipomo lupine was determined to be a divergent population of Bajada lupine (*Lupinus concinnus*), creating uncertainty about the species resolution and hindering conservation efforts. The Nipomo lupine has never been sequenced, and its phylogenetic position is not known.

We hypothesize that phylogenetic analysis of *Lupinus nipomensis* will reveal a clearly defined species with a separate lineage from other clades, particularly *Lupinus concinnus*.



Fig. 1 *Lupinus nipomensis* (CCH2)



Fig. 2 *Lupinus nipomensis* (Calflora)

Methodology

We analyzed the chloroplast *trnG-trnS* spacer and *trnL* intron of three *Lupinus nipomensis* accessions sourced from fresh and herbarium cultivated specimens (grown from wild-collected seeds). Resulting sequences were added to the lupin DNA data matrix of Drummond (2008).

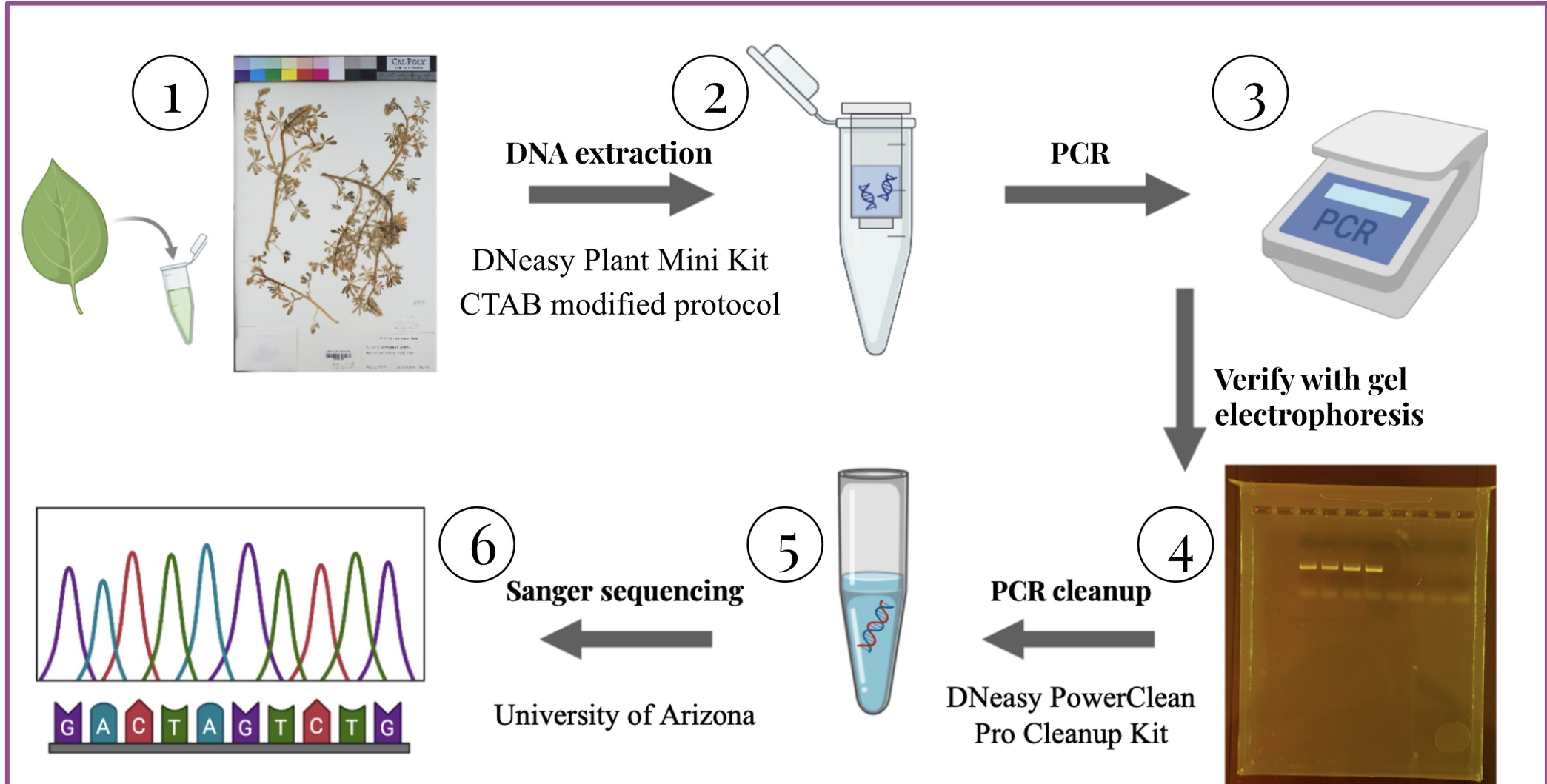


Fig. 3 DNA extraction, amplification, and sequencing methods.

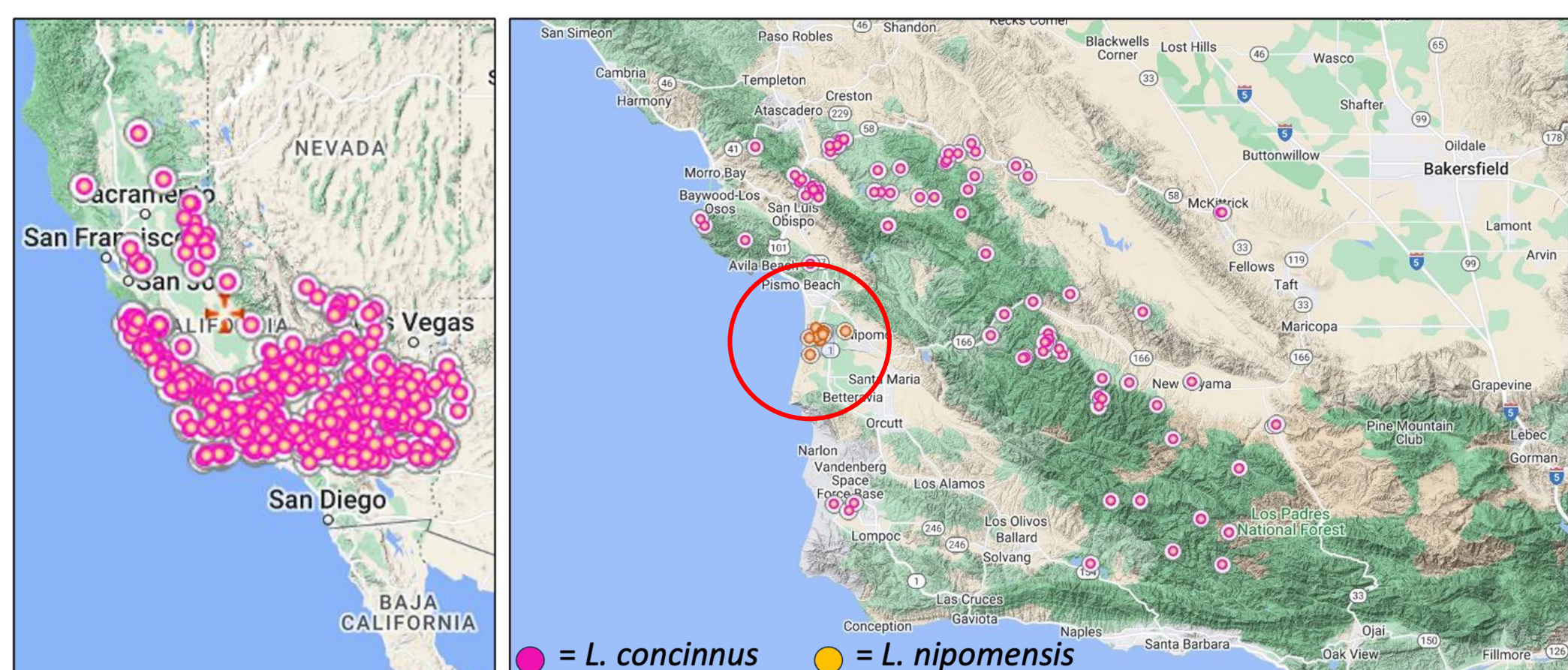


Fig. 4 Range of Bajada (pink) and Nipomo (orange) lupine (Calflora).

Results

The three accessions of *Lupinus nipomensis* were resolved in a clade with parsimony BS of 100. Maximum parsimony analysis with simple indel coding generated 15,244 most parsimonious trees across 67 taxa, 677 characters, with 493 constant characters (72.8%) and 101 parsimony informative (14.9%).

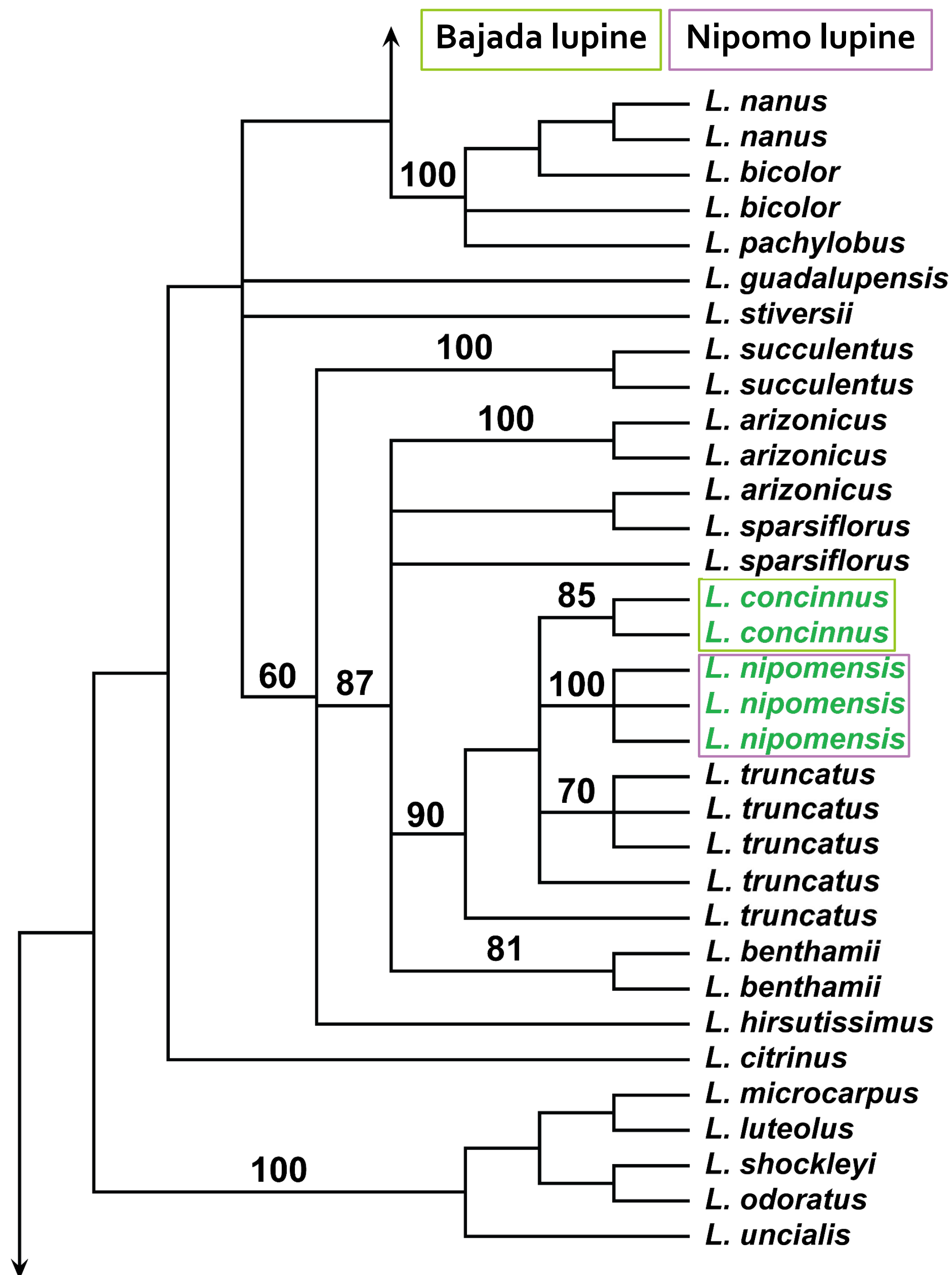


Fig. 5 Maximum parsimony cladogram (bootstrap values above the branches)

Conclusion

Phylogenetic evidence with strict consensus based on *trnG-trnS* and *trnL* intron supports *Lupinus nipomensis* as a "good species," a plant taxon that is clearly distinct, easily recognizable, and consistently separated from its closest relatives (Bajada lupine).

Acknowledgements

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CalFlora. (2025), Drummond, C. S. (2008), *Molecular Phylogenetics and Evolution*. Munz, P. A. (1959), *A California flora*. Sholars, T. (2012). *Lupinus nipomensis* (Nipomo lupine) 5-year review: summary and evaluation.



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