

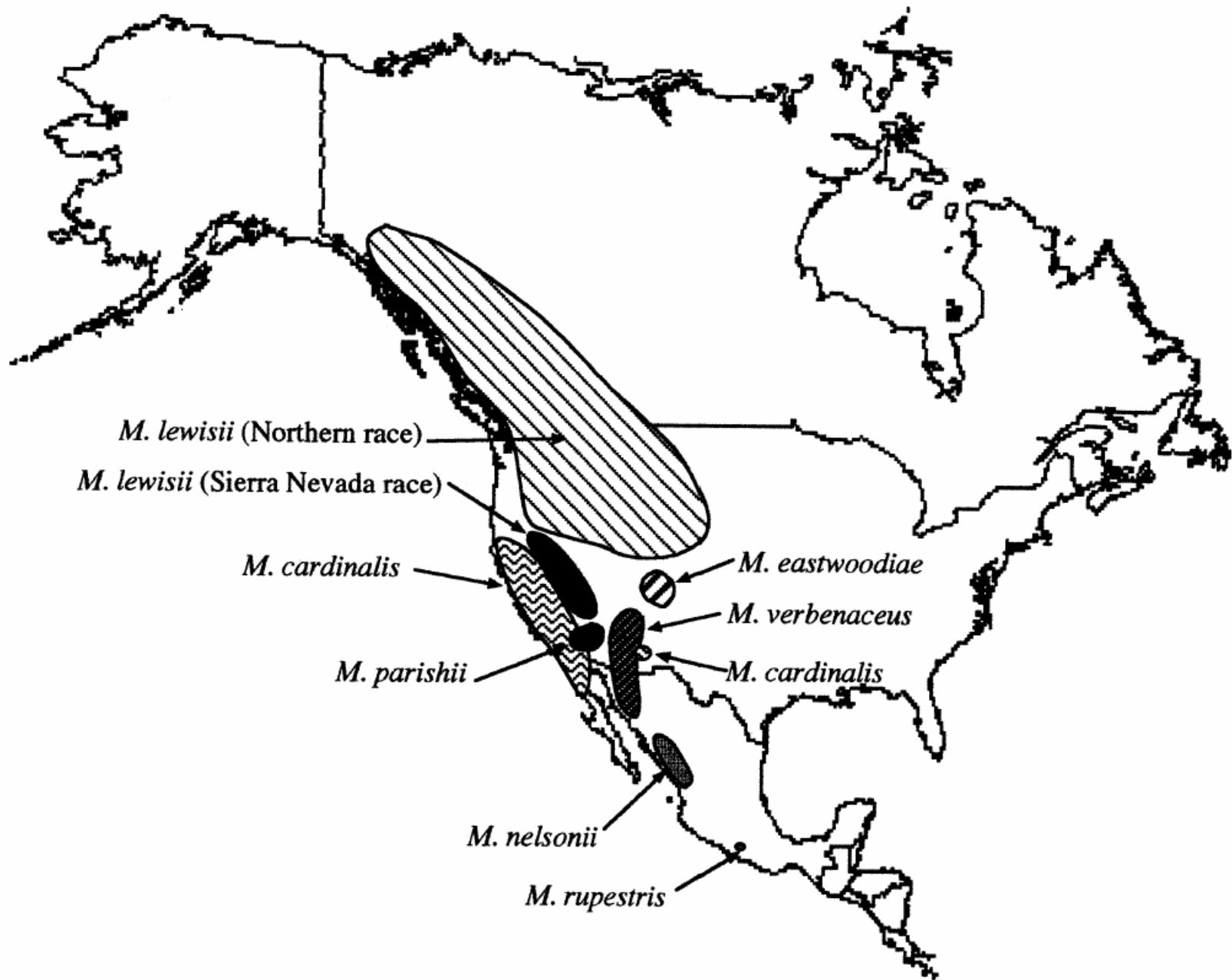
Genetics of Speciation in Monkeyflowers

M. lewisii

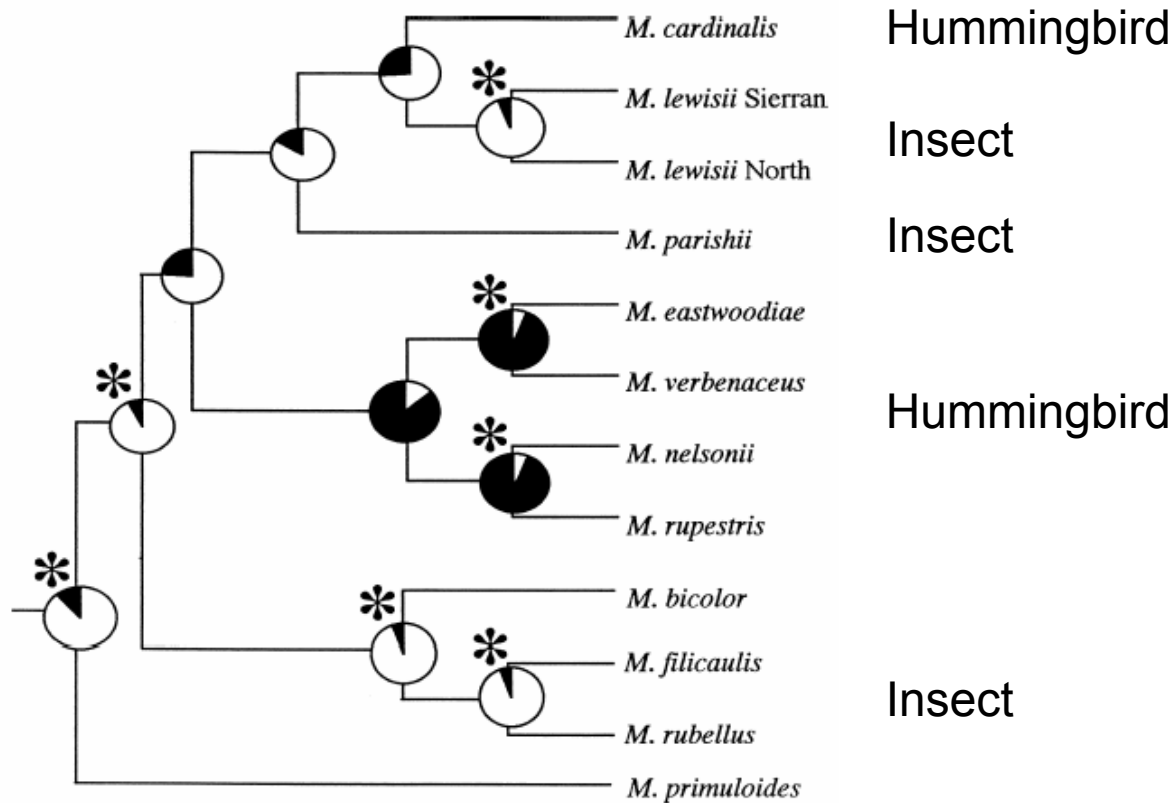


M. cardinalis





M lewisii and *M cardinalis* are sister species, and their ancestor was most likely pollinated by insects



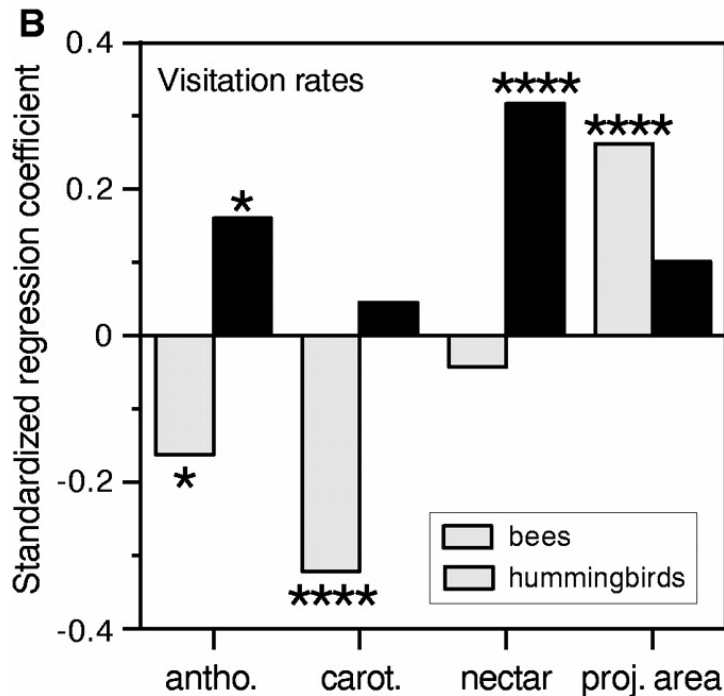
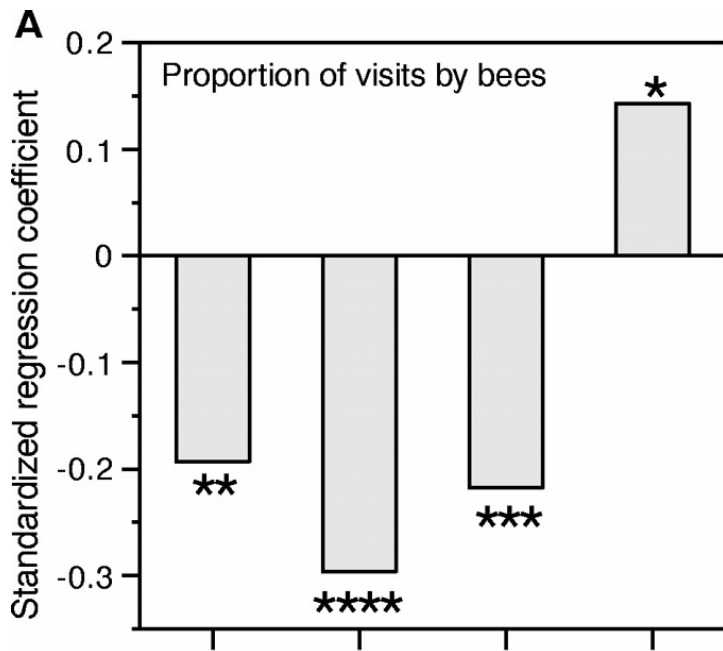


M. lewisii, F₁ Hybrid, *M. cardinalis*

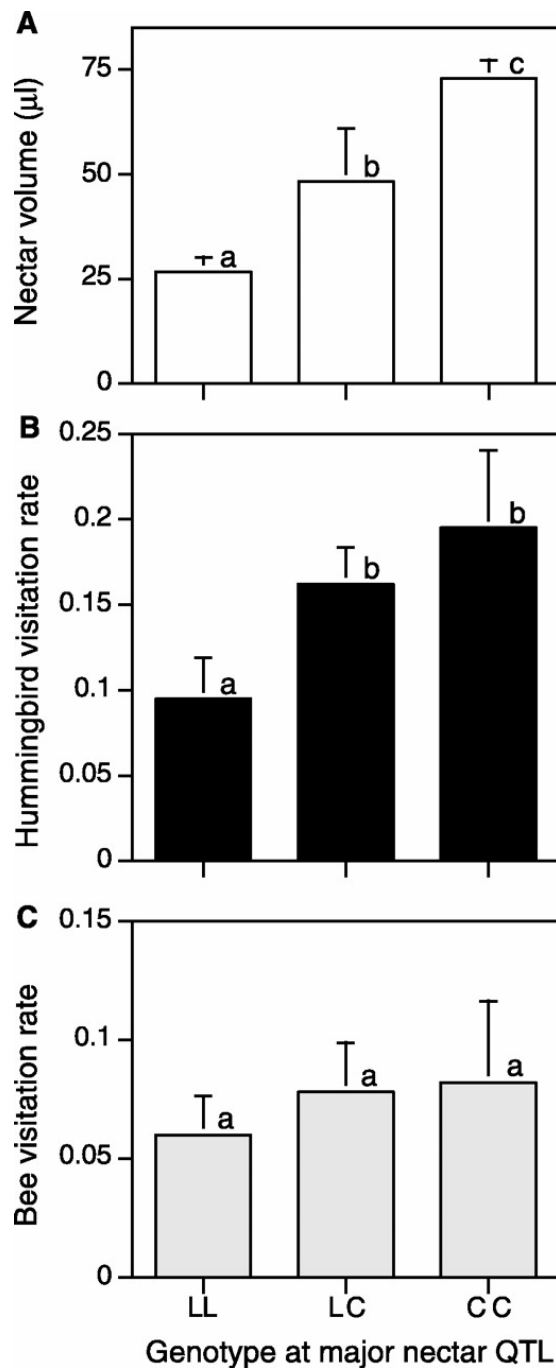


F₂ Hybrids

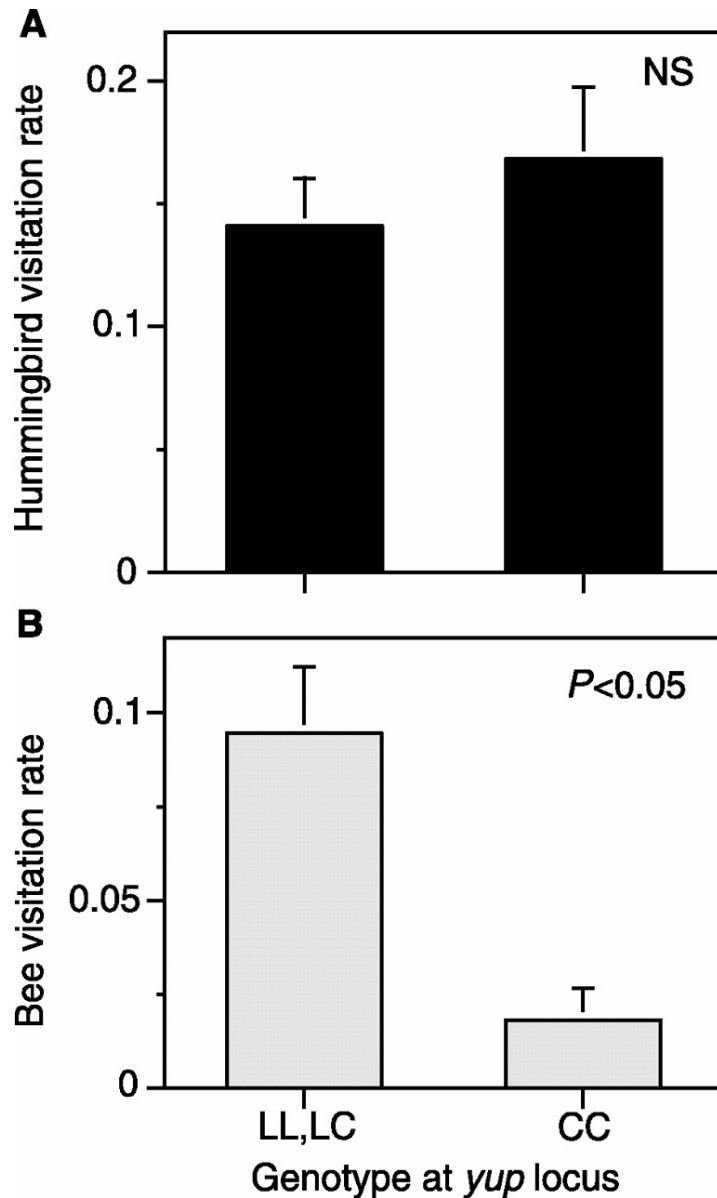




- The species differ in 4 floral genes or QTLs
- Bees prefer large flowers and avoid flowers with carotenoids
- Hummingbirds prefer large nectar loads



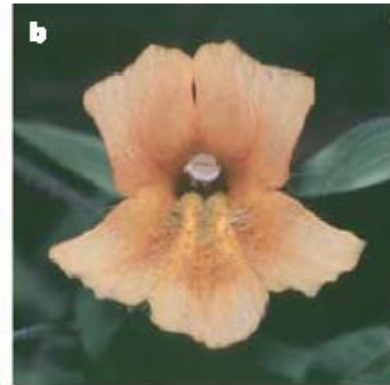
- Relative nectar volumes: $C > H > L$
- Strong hummingbird preference for high nectar volume
- Weak, nonsignificant bee preference for high nectar volume



- Hummingbirds show a weak, nonsignificant preference for the *M. cardinalis yup* genotype.
- Bees show a strong preference for the *M. lewisii yup* genotypes

Switching Yup (carotenoid) alleles between species through NILs

Wild type *M. lewisii*



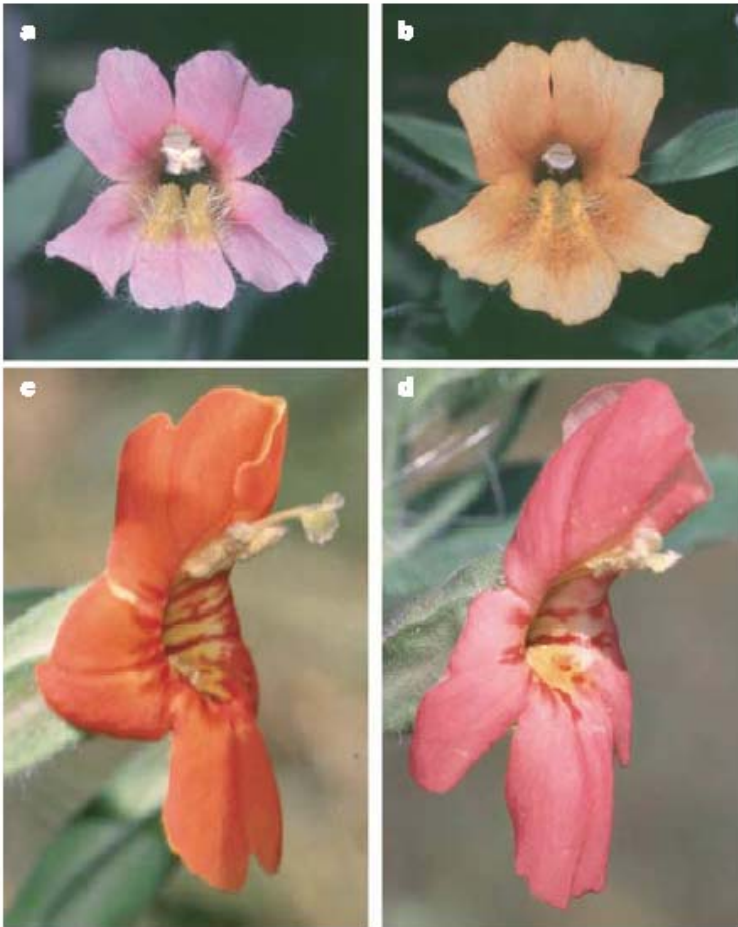
M. lewisii with
M. cardinalis Yup
alleles

Wild type
M. cardinalis



M. cardinalis with
M. lewisii Yup alleles

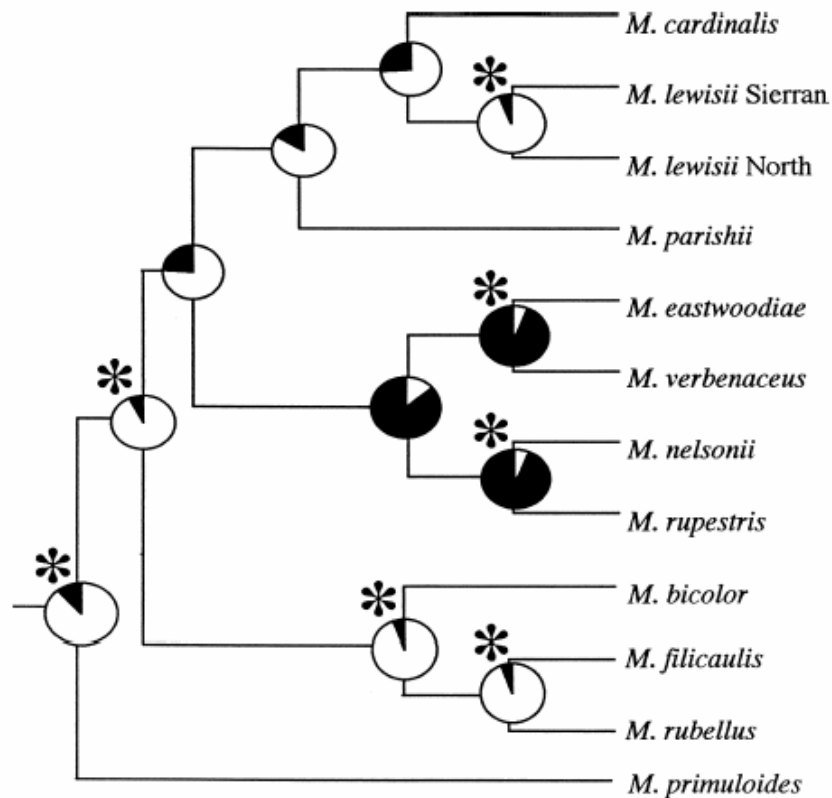
Effects of Yup Genotype and Genetic Background on Pollinator Visits



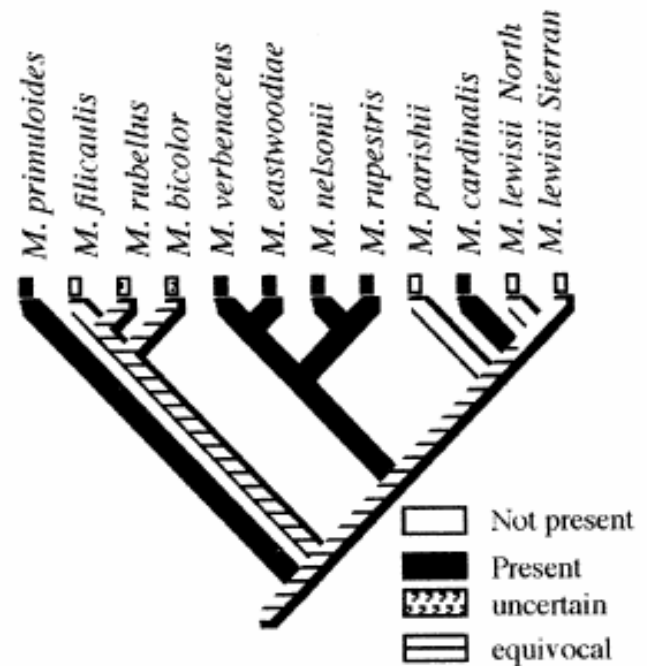
M. lewisii with *M. cardinalis* Yup alleles had a 68 fold increase in hummingbird visits and a 7 fold decrease in bumblebee visits.

M. cardinalis with *M. lewisii* Yup alleles had a 74 fold increase in bumblebee visits but no decrease in hummingbird visits

Carotenoids evolved independently twice in concert with the evolution of hummingbird pollination



Carotenoids in Upper Petal



Reproductive Isolation

- Hybrids are ~50% less fit than the 2 parent species
 - Seed set
 - Germination rate
 - Pollen viability
 - Seed mass
- Total isolation is about ~99%
 - Premating isolation (pollinators) ~97%