

Genetic identity and phylogenetic relationships of invasive brooms in California

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Background

The horticultural industry introduces and distributes large numbers of non-native plants into new areas and is a pathway for plant invasions. Horticulturally-introduced invaders are often difficult to identify due to hybridization among ornamental cultivars and naturalized populations. Intra- and inter-specific hybrid identification is critical for invasive species management. This is especially true for biological control programs because incorrect identification of hybrids can lead to ineffective biocontrol and/or searches for biocontrol agents outside of native ranges.

Objectives

Overall Goal: Elucidate the identity and origins of invasive brooms in California

Specific Objectives:

1. Identify which species are being sold by the horticultural industry and which species comprise invasive populations
2. Determine whether hybridization between ornamental cultivars, species, and populations in natural areas has occurred

Results

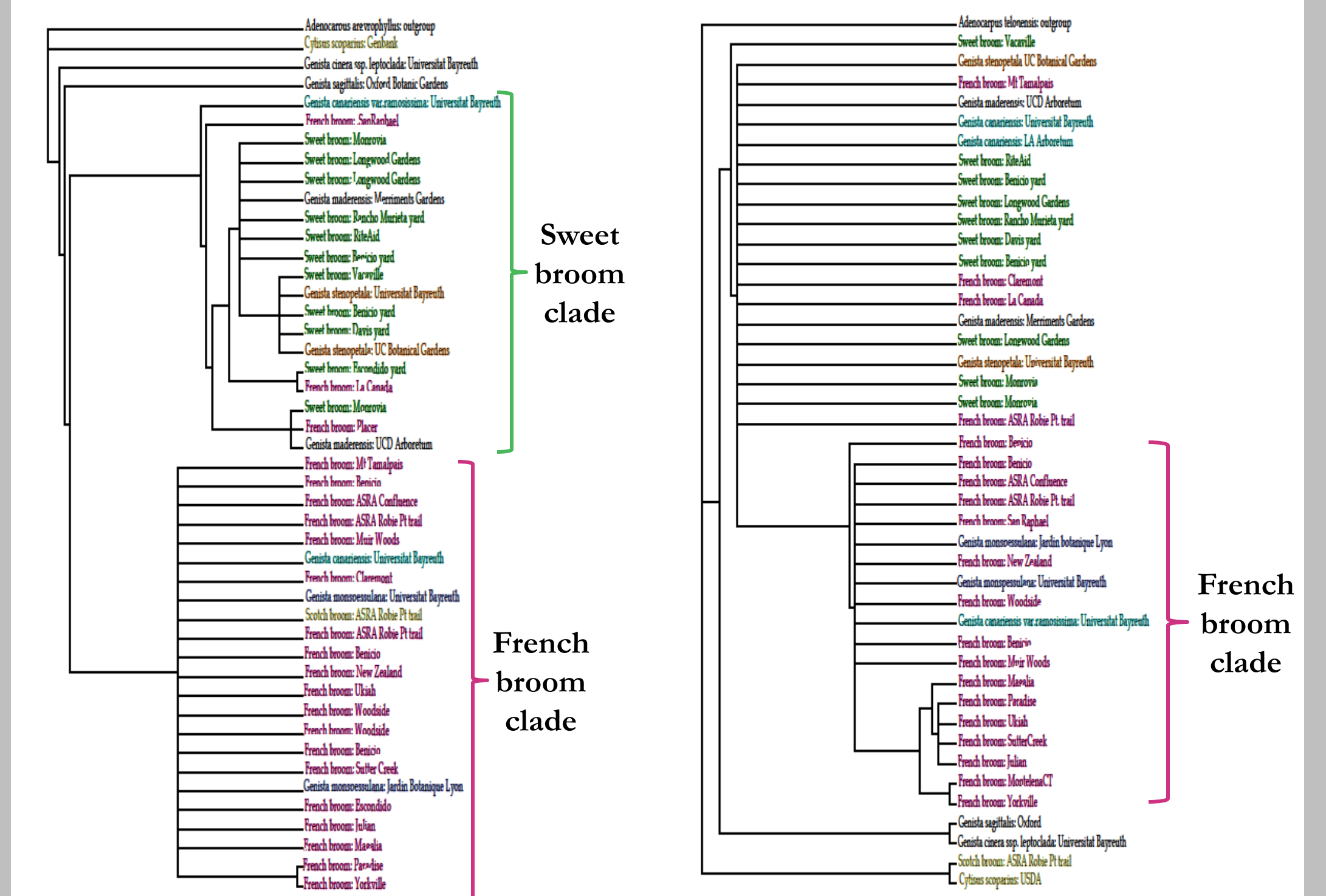


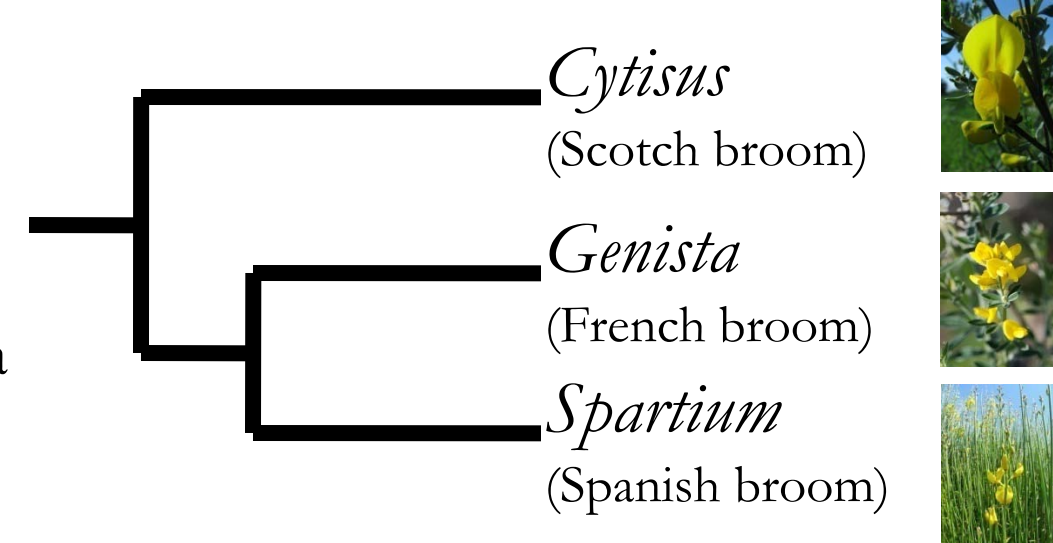
Fig 2. ETS 50% majority rule Maximum Parsimony tree

Fig 3. *tRNA-leu* 50% majority rule Maximum Parsimony tree

Study System: Brooms

Taxonomy:

- Legumes in the tribe Genisteae (~450 species)
- Invasive brooms belong to genera *Cytisus*, *Genista*, and *Spartium*



French broom: *Genista monspessulana*

- Native Range: Mediterranean Region
- Introduction to CA: initial introduction ~1850 in San Francisco
- Current distribution: 23 counties in CA

Sweet broom: *Genista racemosa*

- Ornamental plant currently available in CA
- Putative close relative of French broom
 - Morphological similarities
- Sold under a variety of scientific names
 - Including: *Cytisus spachianus*, *Genista stenopetala* ssp. *spachiana*, and *Genista canariensis*



Materials and Methods

Overview:

Phylogenetic analyses of nuclear and chloroplast DNA sequence data were used to determine relationships of invasive and ornamental brooms to each other and to brooms from the native range.

Sampling:

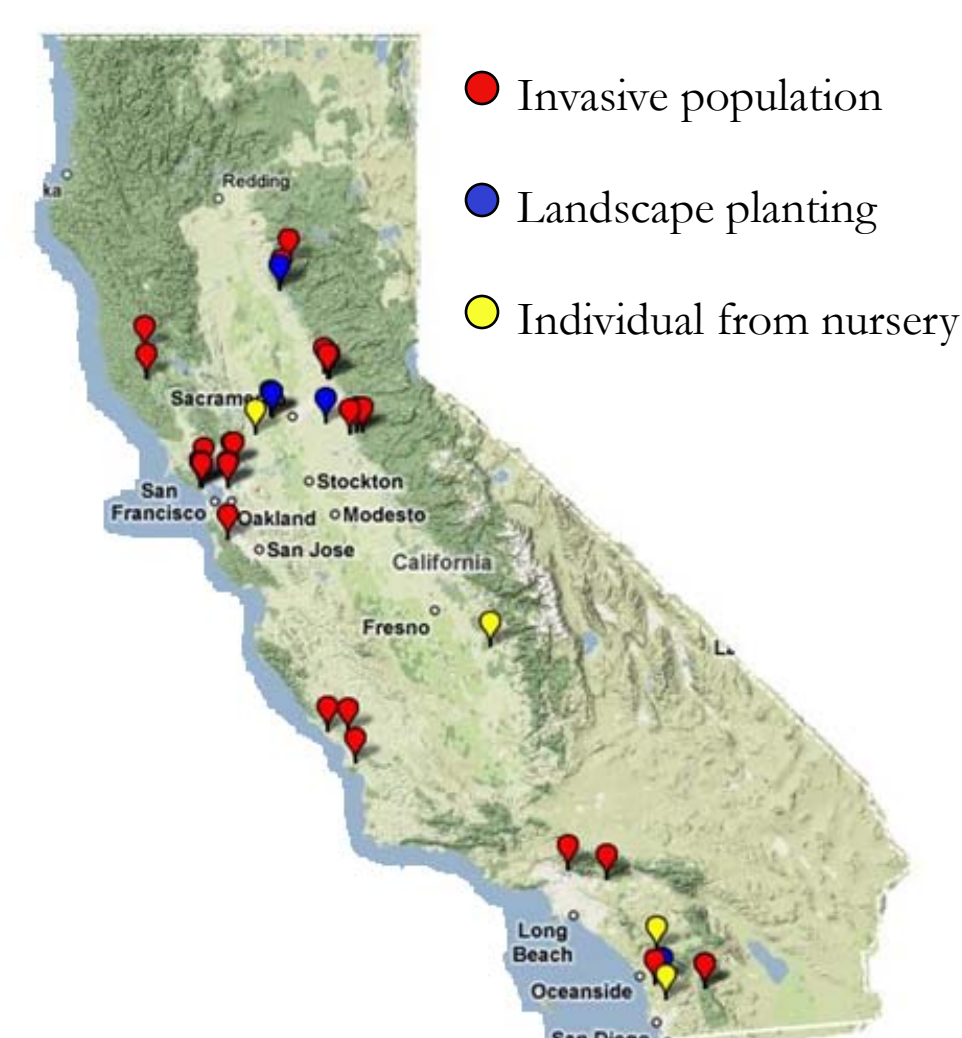


Fig 1. French broom and sweet broom collection locations.

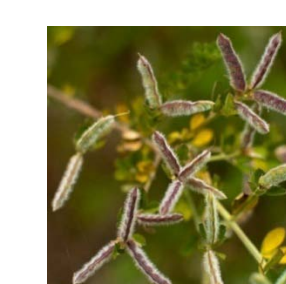
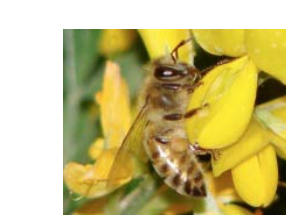
- 23 invasive brooms from throughout CA
- 6 landscape plantings
- 6 plants from horticultural industry
- Samples from botanical gardens and arboreta worldwide

Molecular Tools:

- PCR amplification and DNA sequencing:
- nuclear ETS region
 - chloroplast *tRNA-leu* region

Phylogenetic Analyses:

Maximum parsimony tree constructed using PAUP*



Predictions

1. The current taxonomic status of ornamental and invasive brooms in CA is confused.
 - Multiple species are being sold as “sweet broom”
 - Invasive French broom populations are comprised of multiple closely related species
2. Hybridization occurs between invasive French broom and ornamental sweet broom.
3. Sweet broom individuals are present in invasive populations, particularly in urban invasions

Conclusions:

1. Most of the invasive French broom in CA is either *G. monspessulana*, *G. canariensis*, or a hybrid between the two
2. Ornamental sweet broom most likely contributes directly or via hybridization to invasive broom populations
3. Hybridization between French and Scotch broom can occur in natural populations