Hybridization Between Native and Introduced *Rubus* in California and the Pacific Northwest

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**Introduction and Objectives**

Many species of *Rubus* worldwide are invasive, including the aposmotic *R. armeniacus* in Western North America. Given that hybridization frequently contributes to invasiveness in plants, our objectives are to:

- Identify spontaneous hybridization events between native and introduced *Rubus* or among introduced *Rubus* species that could potentially lead to new invasive forms, and
- Determine whether invasive populations are all one clone of *R. armeniacus* or are derived from other species in the European *R. fruticosus* complex.

**Materials and Methods**

- Leaf material for DNA extraction was collected from 592 individuals across California, Oregon, and Washington.
- All individuals were genotyped with eight nuclear microsatellite markers and two chloroplast markers (trnK and ndhF).
- Genetic distances between individuals were calculated based on distances between alleles, using the method of *Bravo et al.* (Mol Ecol 13: 2101) for mixed polyploid systems, implemented in R.
- For 471 individuals with complete data, Principal Coordinate Analysis was used to identify distinct genetic groups and hybrids.

**Rubus native and naturalized to the West Coast, obtained in field collections**

Subgenus *Rubus* (blackberries)

- Sect. *ursinus*: *R. ursinus* (Pacific blackberry, native)
- Sect. *Rubus* (F. *fruticosus* agg.): *R. armeniacus* (Himalayan blackberry, Europe)
- Sect. *lacinatus*: *R. lacinatus* (Coral leaf evergreen blackberry, Europe)
- Sect. *argentii*: *R. umlifolius* (Elm-leaf blackberry, Europe)

Subgenus *Penstevia* (raspberries)

- *R. ucucumis* (blackcap raspberry, native)
- *R. spectabilis* (salmonberry, native)

Subgenus *Anaphalaxis*

- *R. parviflorus* (thimbleberry, native)

Other *Rubus* included in study

- *R. odoratus* – Subgen. Allegheniensis, Eastern North America
- *Loganberry* – *R. ursinus* x *alnus*
- *Boysenberry* – *Loganberry* x *blackberry* x *raspberry*
- *Tayberry* – *Loganberry* x *blackberry* x *raspberry*
- *Marionberry* – *R. armeniacus* x *F. ursinus* x *Loganberry* x *Ottaklieberry*
- *Thornless Marionberry*
- *Chester* – *thornless blackberry*
- *Silver* – *blackberry*

**Conclusions**

- Spontaneous hybridization between the invasive *R. armeniacus* and common native *R. ursinus* occurs rarely.
- *R. armeniacus* in Central and Southern California appears to be of a single clonal lineage, but multiple clones are present in invasive populations in Northern California and the Pacific Northwest, potentially derived from hybridization with *R. lacinatus, R. umlifolius,* and/or other species.
- Hybrid populations that are maternally derived from *R. ursinus* are present in Bidwell Park (BWP) and Coal Oil Point Reserve (COP). These may be hybrids with *R. pensilvanicus* or a species not included in this study.
- *R. ursinus*, which is thought to be an ancient hybrid between a blackberry and raspberry, hybridizes freely with native and cultivated raspberry species.
- Popularly cultivated hybrid *Rubus* has not contributed to invasive populations.

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