

Reproductive isolation and the maintenance of species boundaries

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EPSO meeting Brussels, 7 April 2009

Reproductive isolation



Reproductive isolation is the result of the action of reproductive barriers.

Reproductive barriers are “biological properties of individuals which prevent the interbreeding of populations that are actually or potentially sympatric” (Mayr 1970).

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Reproductive isolation

Reproductive isolation between most species pairs is due to multiple pre- and postzygotic reproductive barriers

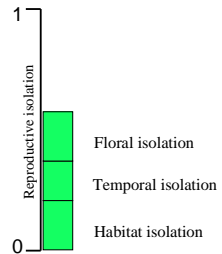


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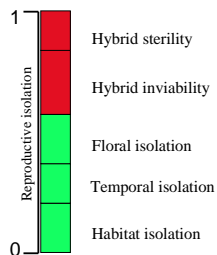


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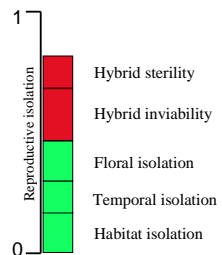
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Reproductive isolation is often **incomplete**



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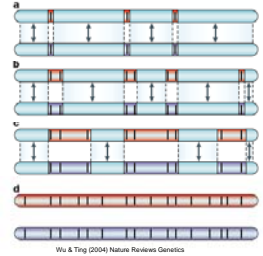
Species

The Biological Species Concept (BSC) states that "species are groups of organisms that are reproductively isolated from other such groups" (Mayr 1942).

In contrast, the "genic view of the process of speciation" emphasizes that species possess "loci of differential adaptation" (Wu 2001).

Species and species boundaries

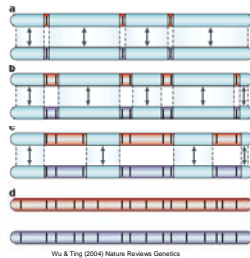
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Species and species boundaries

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Depending on the species concept, species boundaries are closed or open to gene flow in some parts of the genome.

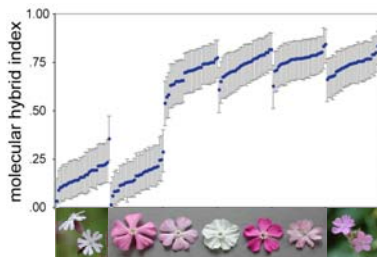


Our study species - *Silene*

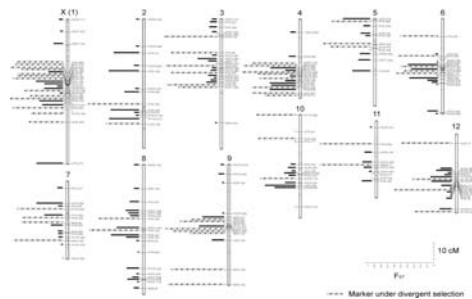


- Silene latifolia* (White Campion)
Silene dioica (Red Campion)
- Short-lived, perennial herbs
 - Overlapping distribution ranges across much of Europe
 - Dioecious & diploid
 - Cross-compatible
 - Hybrids are viable and fertile
 - Hybrid zones occur in nature

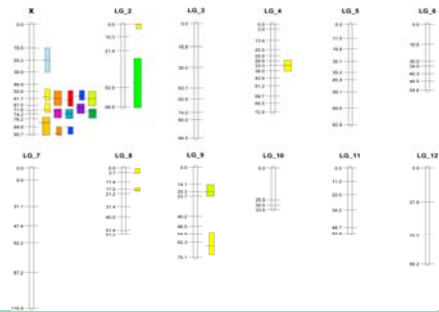
Hybridization and introgression



Population genomics



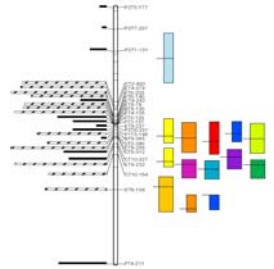
QTL analysis



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Genomic islands of divergence



Genomic area of high interspecific divergence colocalizes with QTLs for species differences in a *Silene* species pair.

Introgression can be substantial elsewhere in the genome and cause **porous genomes**.

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Genomic islands of divergence

Genomic areas of high interspecific divergence have also been found e.g. in

- oaks (Scotti-Saintagne *et al.* 2004)
- palms (Savolainen *et al.* 2006)



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and may be a common phenomenon in species pairs with incomplete reproductive isolation.

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The fact that 'good' species often can exchange genes is of importance in the context of

- plant ecology and evolution
- agriculture: hybridization between crops and wild relatives

Human activities can increase chances for secondary contact between plant species pairs and provide opportunities for hybridization as a consequence of

- increased transfer of species among countries / continents
- land-use changes
- climate change

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Thank you for your attention



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