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# Evolution of sexually dimorphic flower production under sexual, fertility, and viability selection

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## ABSTRACT

**Question:** How do different patterns of selection and constraint promote the evolution of sexually dimorphic flower production?

**Mathematical methods:** Simulation modelling. Key sets of assumptions are applied to individuals in the population and we determine whether alleles causing sexually dimorphic flower production can spread to fixation from a sexually monomorphic state.

**Key assumptions:** We model the evolution of sexually dimorphic flower production starting from a sexually monomorphic dioecious state (separate male and female plants that produce the same number of flowers) under different interactions of sexual, fecundity, and viability selection. Flower number and flower size trade off. Pollinator preferences are based on total flower production per plant.

**Predictions:** The relationship between flower size and pollen or ovule production critically determines whether sexual dimorphism can evolve from a monomorphic state. Fecundity selection can temper and sometimes reverse the evolution of sexual dimorphism predicted through sexual selection (i.e. pollinator preferences) alone.

*Keywords*: dioecious, flower number, life-history trade-off, model, sexual dimorphism.

## INTRODUCTION

Although most flowering plants are hermaphroditic, gender specialization has repeatedly evolved across a number of angiosperm families. Nearly 6% of all known angiosperms are dioecious, with separate male and female individuals (Renner and Ricklefs, 1995). Dioecious species necessarily exhibit differences between the sexes with respect to primary sex characteristics (e.g. anthers and ovaries), and this separation of reproductive functions is thought to have evolved as a mechanism to promote outcrossing as well as a response to sex-differential allocation to reproduction (Charlesworth and Charlesworth, 1978; Thompson and Barrett, 1981; Charnov, 1982; Thompson and Brunet, 1990; Seger and Eckhart, 1996).

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