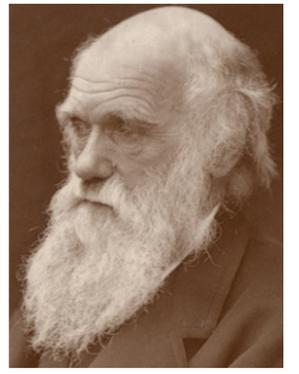




Reproductive isolation with different ecologies



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Concept It is parsimonious to assume that speciation is adaptation to an environment with multiple ecological niches. Generically, ecology prefers discrete species; reproductive isolation is advantageous, because of the generic presence of a fitness valley between them. In this vein this poster presents two studies:

Model A: Speciation along a resource gradient, splitting of a multilocus population.

Model B: Role of spatial structure: Is there a fundamental difference between resource- and habitat-segregation?

Model A (with Ulf Dieckmann)

Modified from: Dieckmann & Doebeli (1999)

Aim: deeper understanding of transition from single population into a pair of isolated populations

Novelty: High locus number & population size, nearer to the infinitesimal limit

Ecology: 1D resource axis, Lotka-Volterra competition

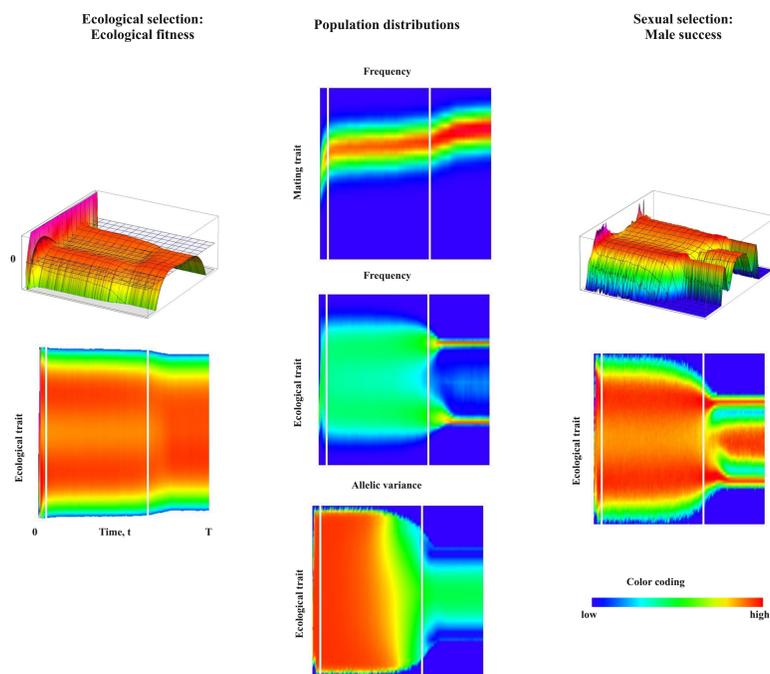
Evolving traits: ecological & mating

Genetics: multilocus (64 & 32) biallelic, additive, free recombination

Isolation: The mating trait controls assortativity with respect to the ecological trait

Three-phase transition to complete isolation

(with platikurtic carrying capacity and Gaussian competition kernel)



Three phases:

- (1) Fast increase of variance, mismatch remains because of the platikurticity.
- (2) Slow transition to bimodality; allelic variance is eroded selectively.
- (3) Fast completion of isolation via runaway sexual selection.

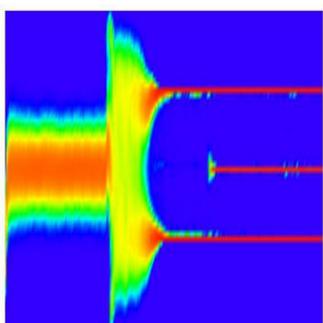
Why the 2nd phase is so slow?

Emergence of isolation requires elimination of allelic variance.

Speed of selective change of variance goes to zero with increasing locus number.

Sudden transition to isolation

(with Gaussian carrying capacity and competition kernel)



No mismatch after adjustment of variance. Enlarged-variance state is metastable. Sudden transition after random waiting time. Isolation is finished up by sexual runaway.

(Different parameter values, than above.)

Model B (with Benjamin Márkus & Kristóf Törkenczy)

Preliminaries: Pennings et al. (2008); Szilágyi & Meszéna (2009)

Aim: The minimal model of adaptive speciation, in which functional and spatial segregation is considered on equal footing.

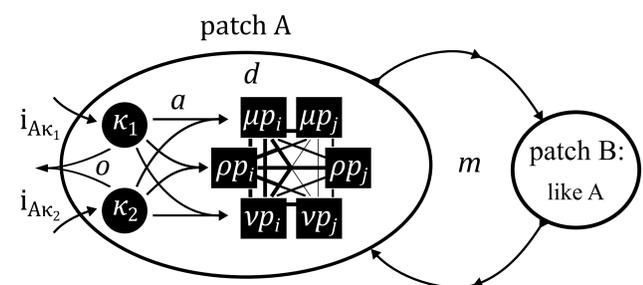
Rationale: Sympatric & allopatric speciation is traditionally considered essentially different; spatiality and resource use usually modelled in an incomparable way.

Ecology: 2 habitats, 2 resources in each, mechanistic modelling

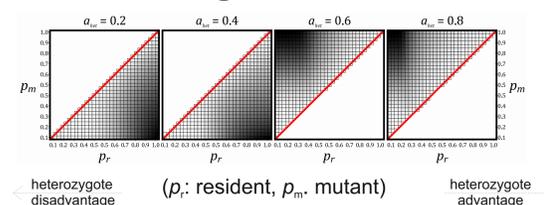
Genetics: ecological trait: 1 biallelic locus; mating trait: maternally inherited continuous

Isolation: The mating trait controls assortativity with respect to the ecological trait

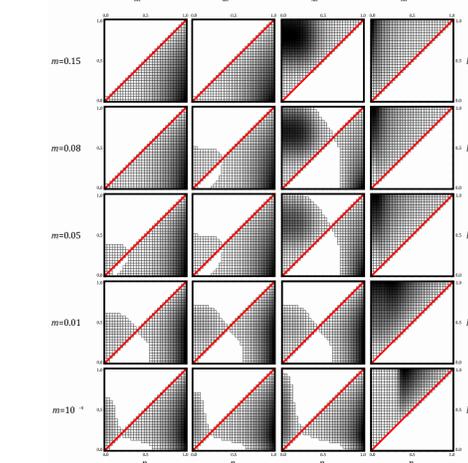
Model scheme



PIPs for mating trait



Pure resource segregation
Heterozyte inferiority:
selection for isolation
Migration is irrelevant



Pure habitat segregation
Decreasing migration
affects outcome.

Does reduced migration help
emergence of reproductive isolation?

YES & NO: mixed effect

Conclusion

Earlier work established that ecology promotes discretization: continuous coexistence is non-generic. An exact mathematical notion of ecological niche was developed; functional, spatial and temporal segregation was distinguished, as different, but analogous.

(A) We studied discretization (emergence of reproductive isolation) along a resource gradient. Discretization is found to be a quite generic outcome - often after a long transition with partial isolation.

(B) We compared speciation based on spatial and resource segregation. They are different, but comparable.

Literature

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