Ecological inference from functional traits

ECCB 2018 Workshop

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What are functional traits?

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Soft and hard traits

Functional traits lie on a continuum from "soft" to "hard"[2]

- **Soft**: Easily measured but distal to vital rates
- **Hard**: Indicative of physiology and directly associated with vital rates

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Insect soft and hard traits:

Vital rate	**Soft trait**	**Hard trait**
Survival	Ovigeny index	Lifespan
Growth	Body size	Ingestion rate
Fecundity	Abdominal mass	Egg load

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Functional traits in community ecology

Measure community parameter values experimentally[3]

- Species' intrinsic growth rates (r)
- Species' interaction coefficients (α_{ij})

Use r and α_{ij} to calculate niche overlap (ρ) and average fitness difference between species i and j (κ_j/κ_i)

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Predict community dynamics from functional traits

- Correlate multi-dimensional functional trait values with ρ and κ_j/κ_i)
- Correlate response trait values with effect traits

Use knowledge of functional traits and community dynamics to inform conservation goals.

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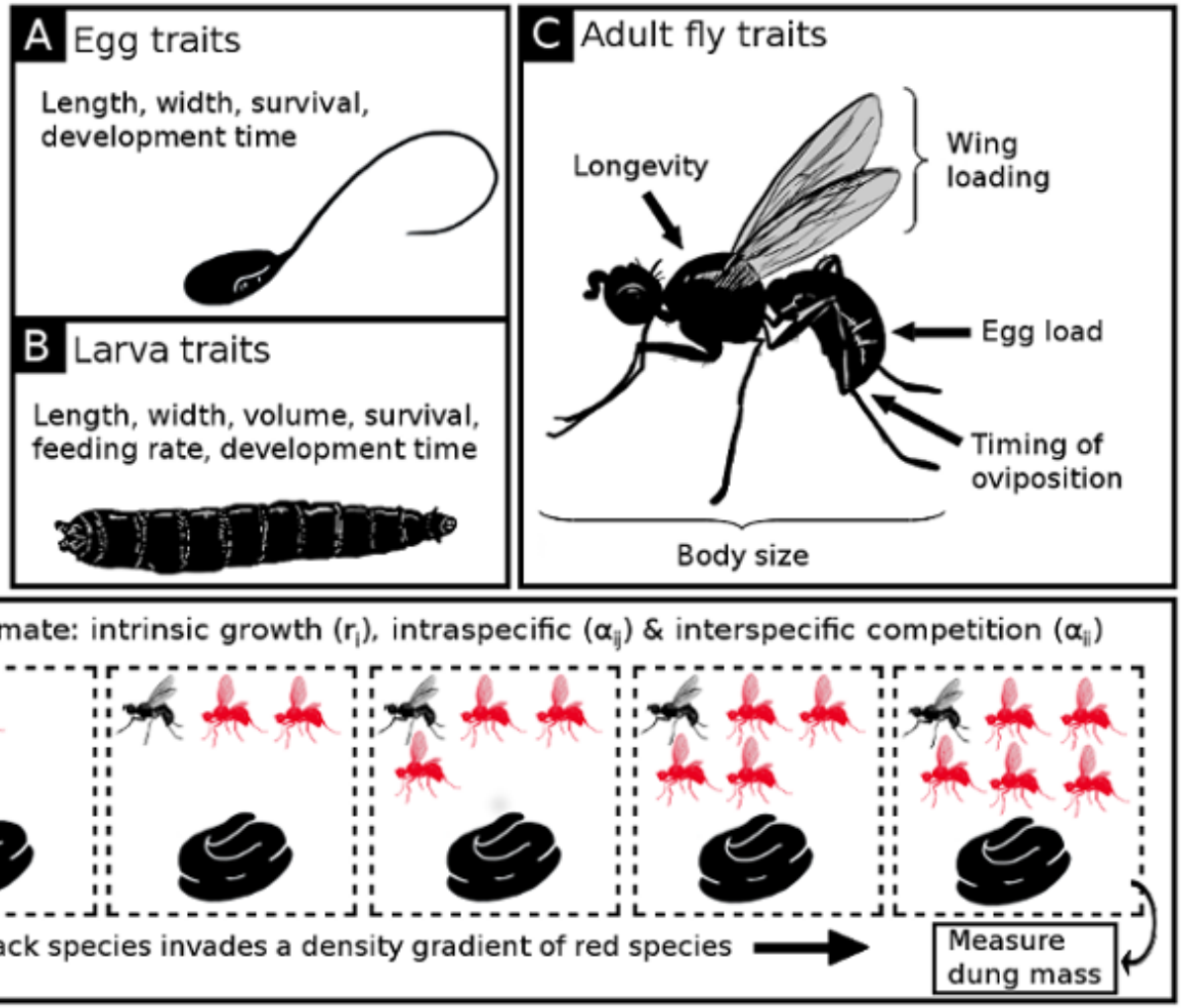
Key objectives

- Quantify stabilising niche and average fitness differences between 10 species of Sepsidae
- Predict species distributions from multiple dimensions of fly traits
- Predict dung decomposition from fly traits and species composition



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Key definitions

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Niche overlap and competition

Definition of niche overlap (ρ) and stabilising niche difference ($1-\rho$)[3]:

$$(1-\rho) = 1 - \sqrt{\frac{\alpha_{ij}\alpha_{ji}}{\alpha_{jj}\alpha_{ii}}}$$

Definition of average fitness difference between species i and j (κ_j/κ_i):

$$\frac{\kappa_j}{\kappa_i} = \frac{r_j}{r_i}\sqrt{\frac{\alpha_{ij}\alpha_{ii}}{\alpha_{jj}\alpha_{ji}}}$$

Note in the above that, by definition, $\kappa_j > \kappa_i$.

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