

Life history traits of Florida's nonnative fishes and implications for risk assessment

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Hui et al. 2020

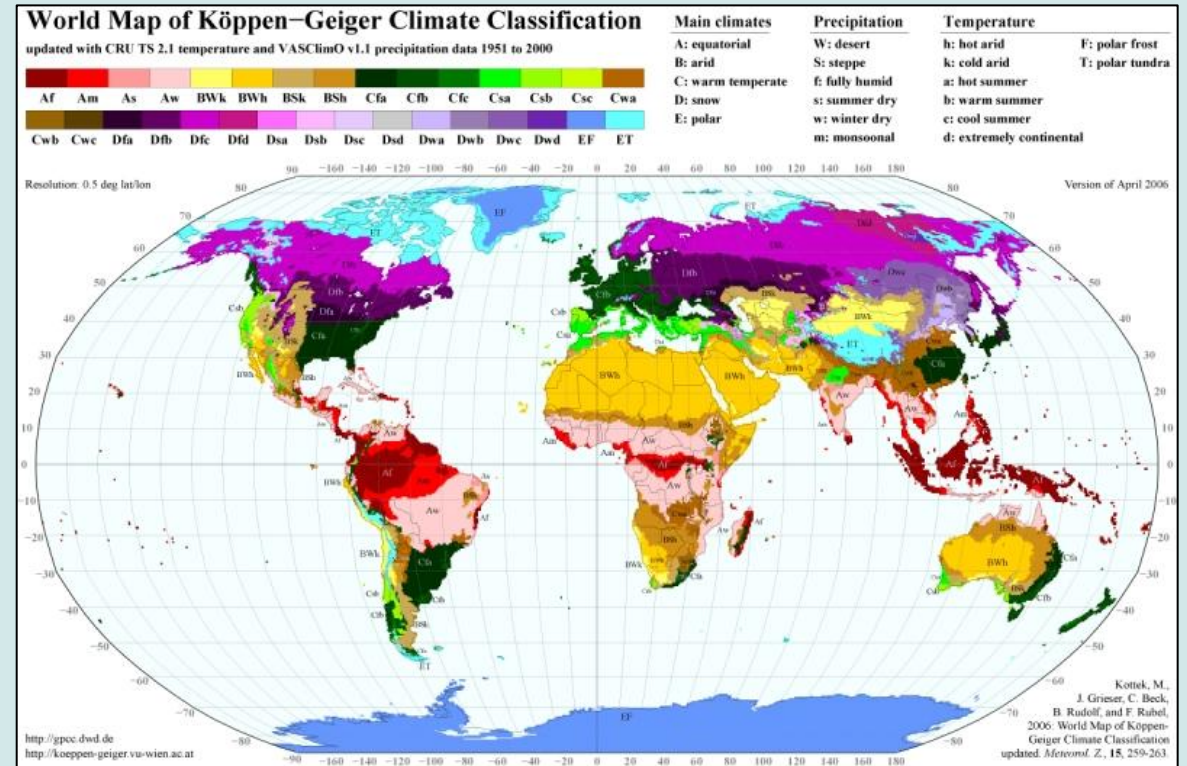
Life History Theory

- Tradeoffs: balancing growth, reproduction, and survival
- What do those investments say about a species' environment?
- Can we predict invasion success by matching a species life history traits to the habitat of the target region?



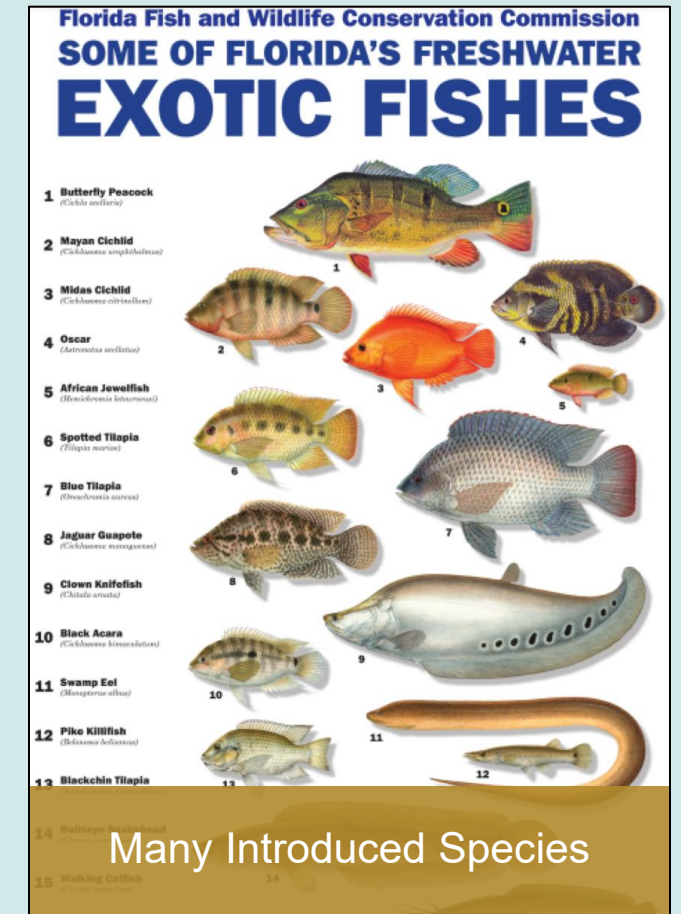
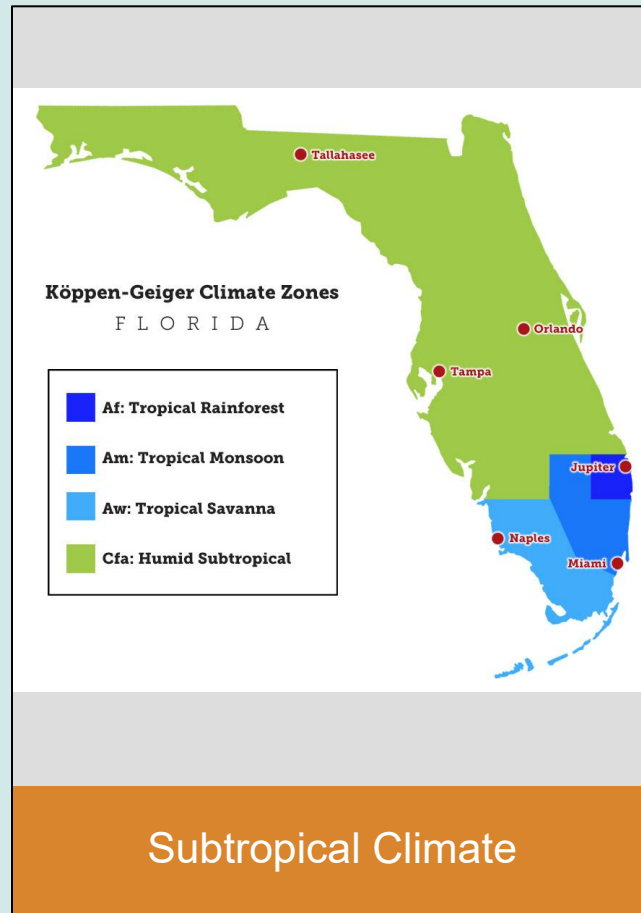
Use of life history traits in risk assessment

- No consistent predictors of invasion success
- Identifying traits that facilitate invasion is top priority
- Life history traits still important regionally
- Several quantitative studies – all in temperate to cold regions
 - Great Lakes
 - California
 - Mediterranean



Many risk assessments focus exclusively on climate match and history of invasion (e.g., ERSS)

Why trait-based risk assessment for Florida?



Three life history endpoint strategies in fish

- **Modification of r- vs. K-selection**



Periodic



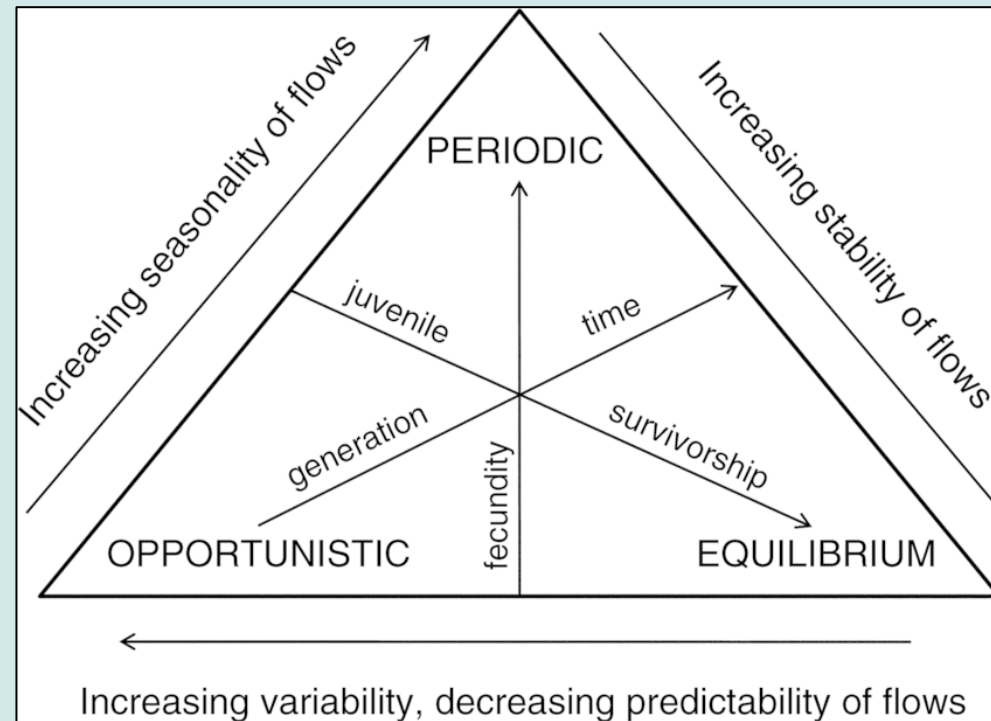
Equilibrium



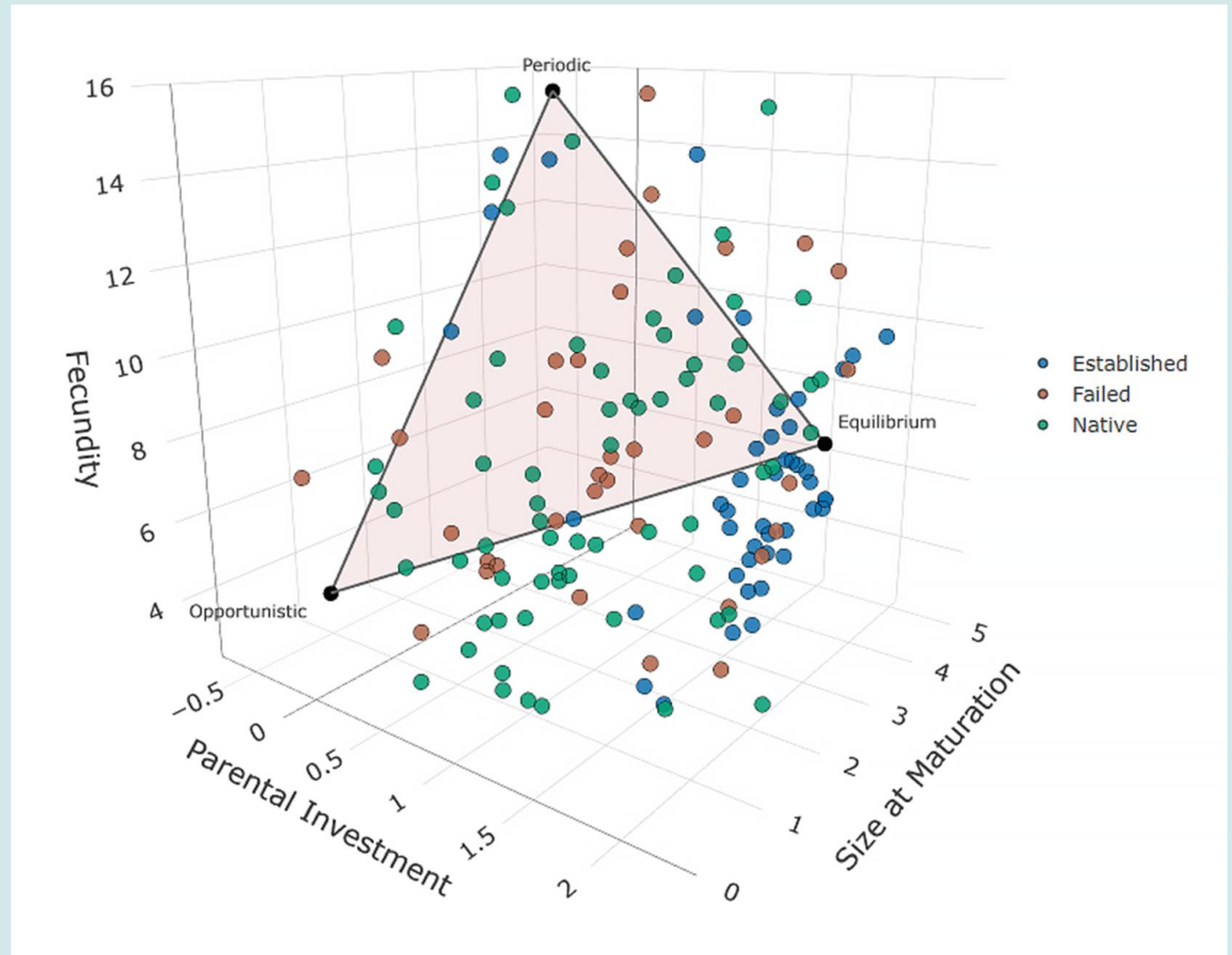
Opportunistic

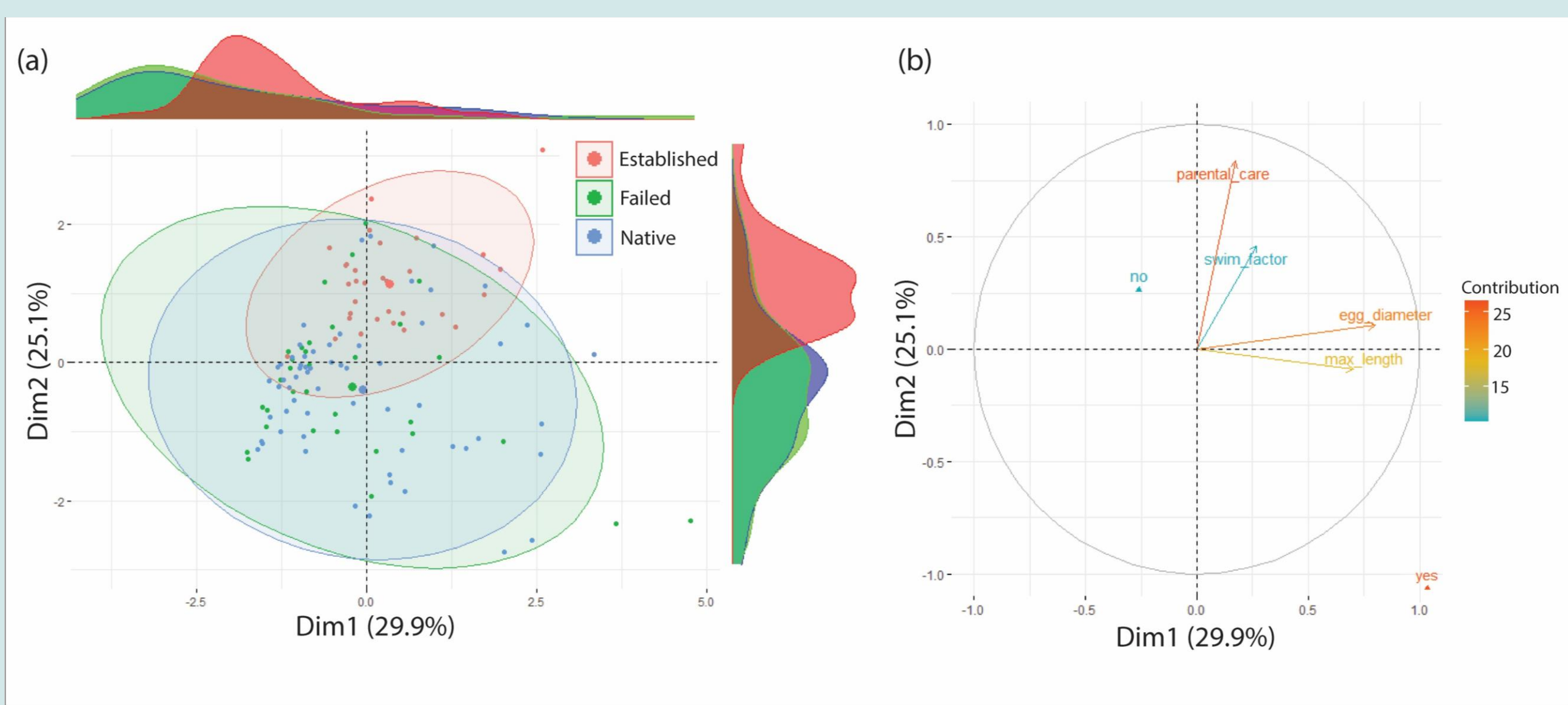


*Figure adapted from
Winemiller (2005)*



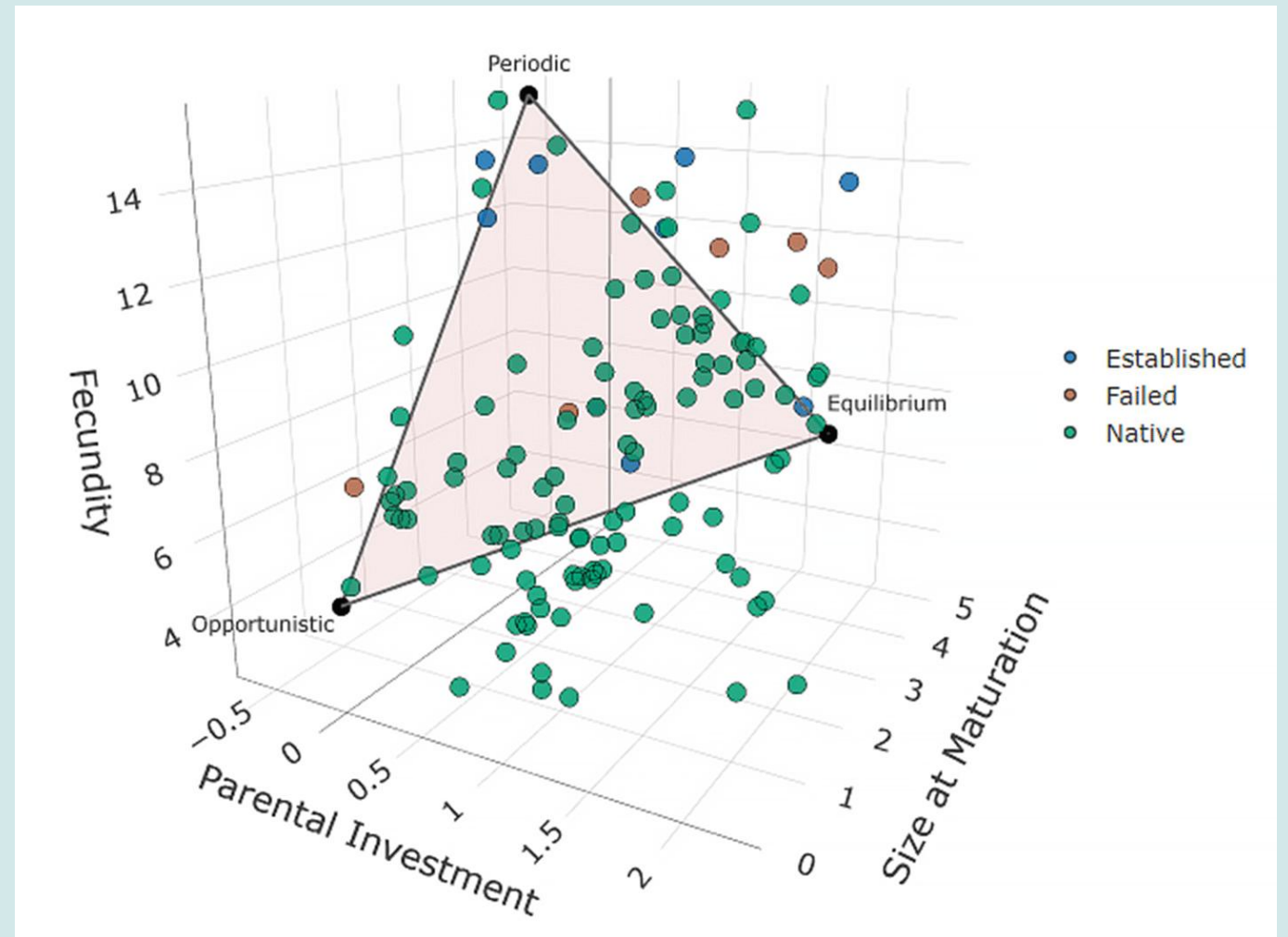
Identify and contrast
the life history
strategies of native
and nonnative fish
species in
**Peninsular
Florida**



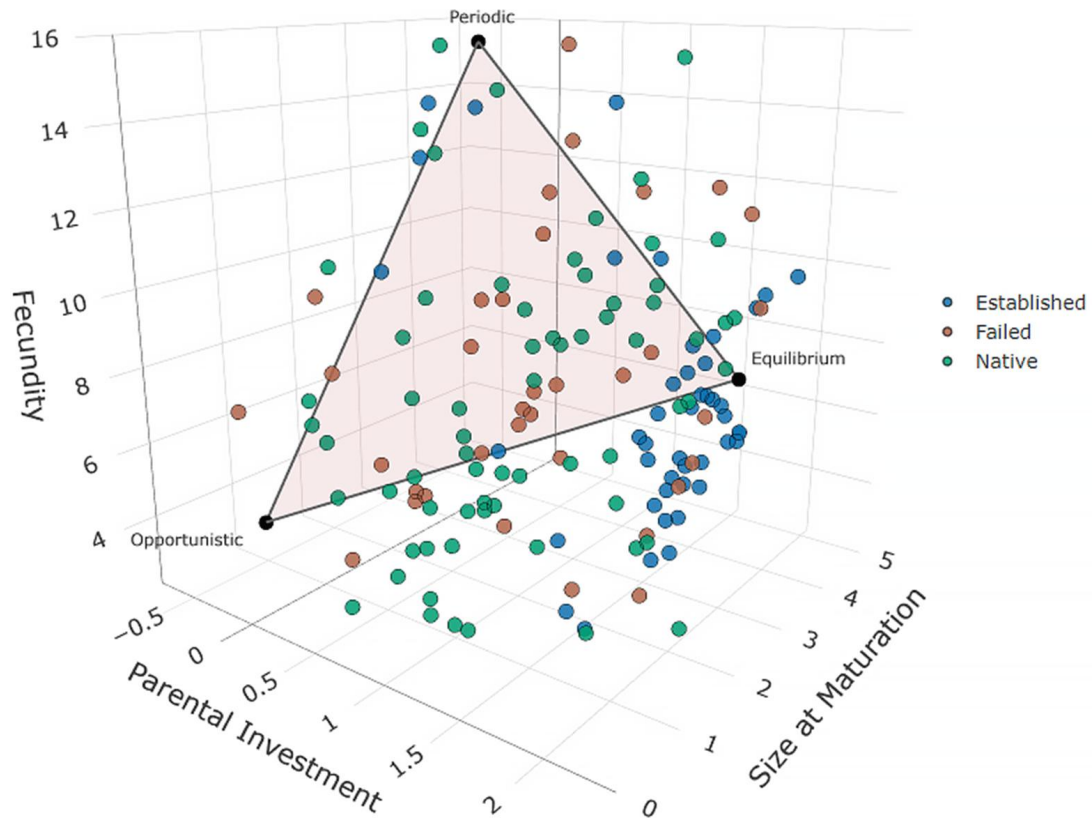


Ordination plots resulting from Factor Analysis of five trait variables for 125 fish species. Variables “yes” and “no” correspond to fluvial dependence, which is categorical

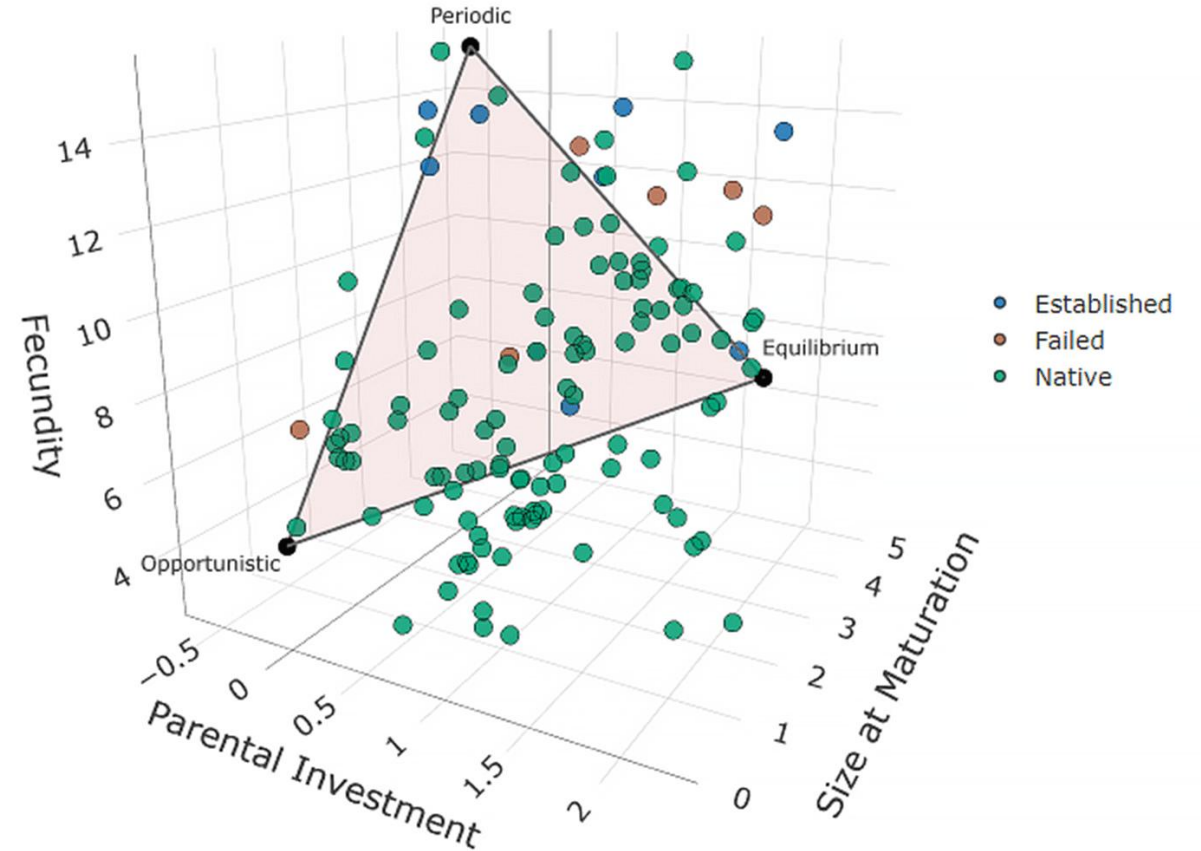
Identify and contrast the life history strategies of native and nonnative fish species in **The Panhandle of Florida**



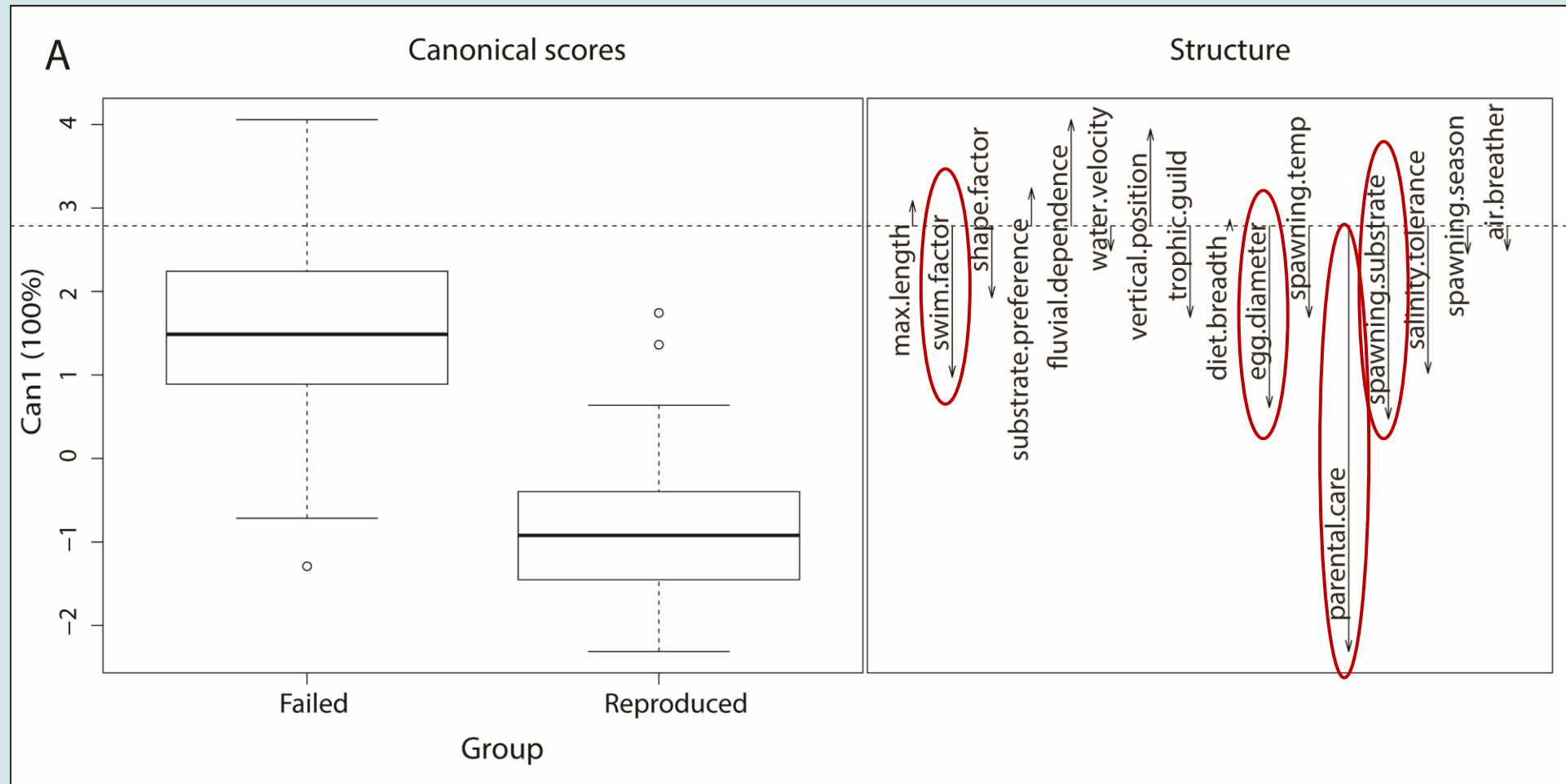
Peninsular Florida



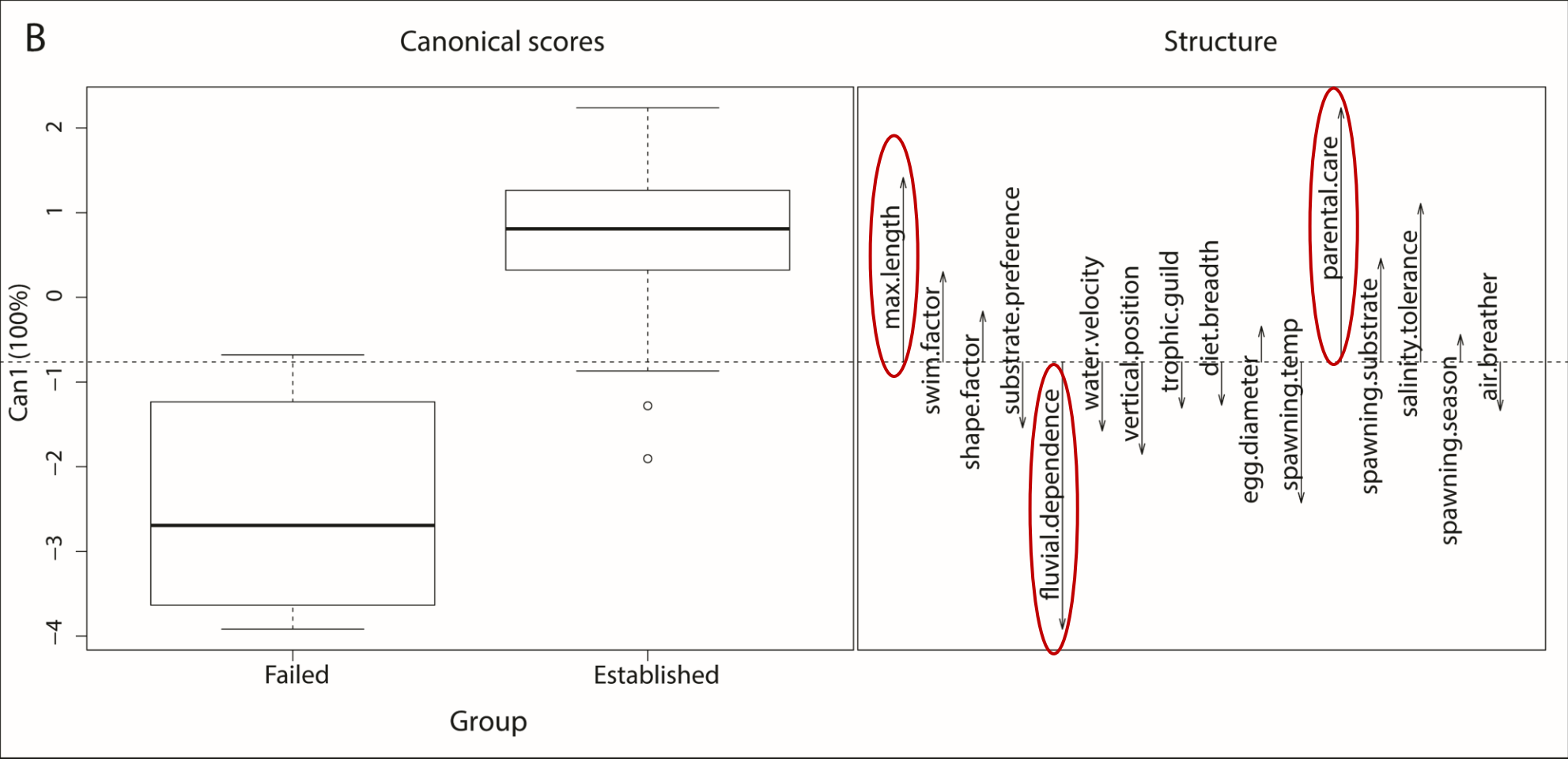
The Panhandle of Florida



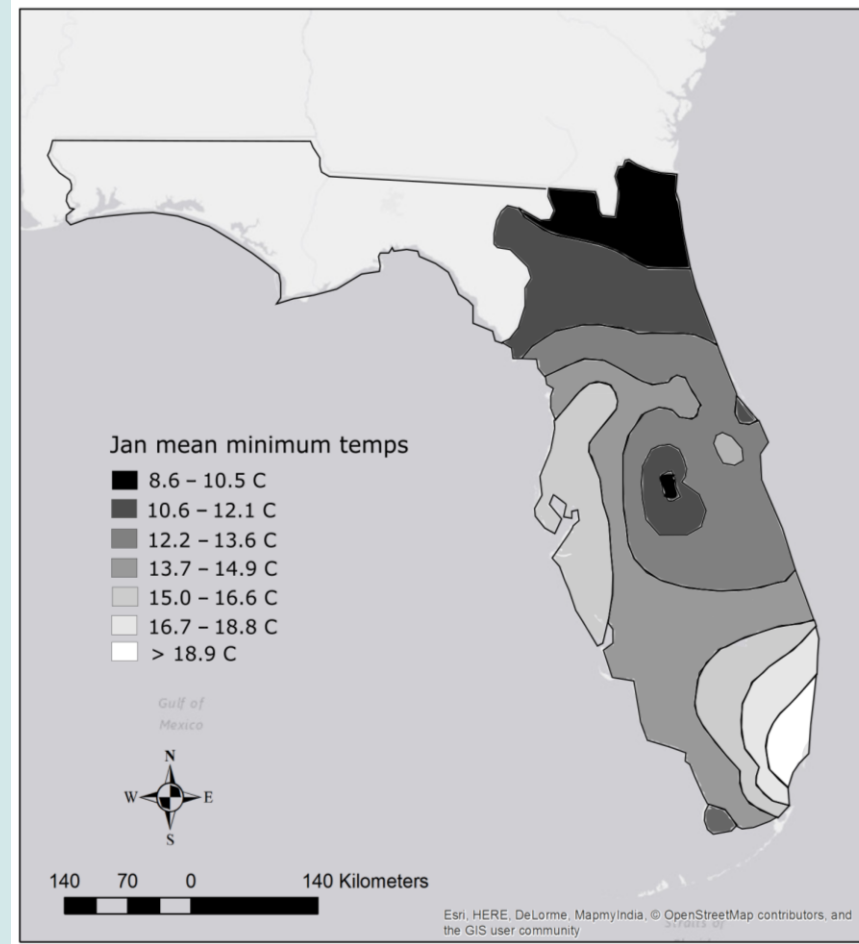
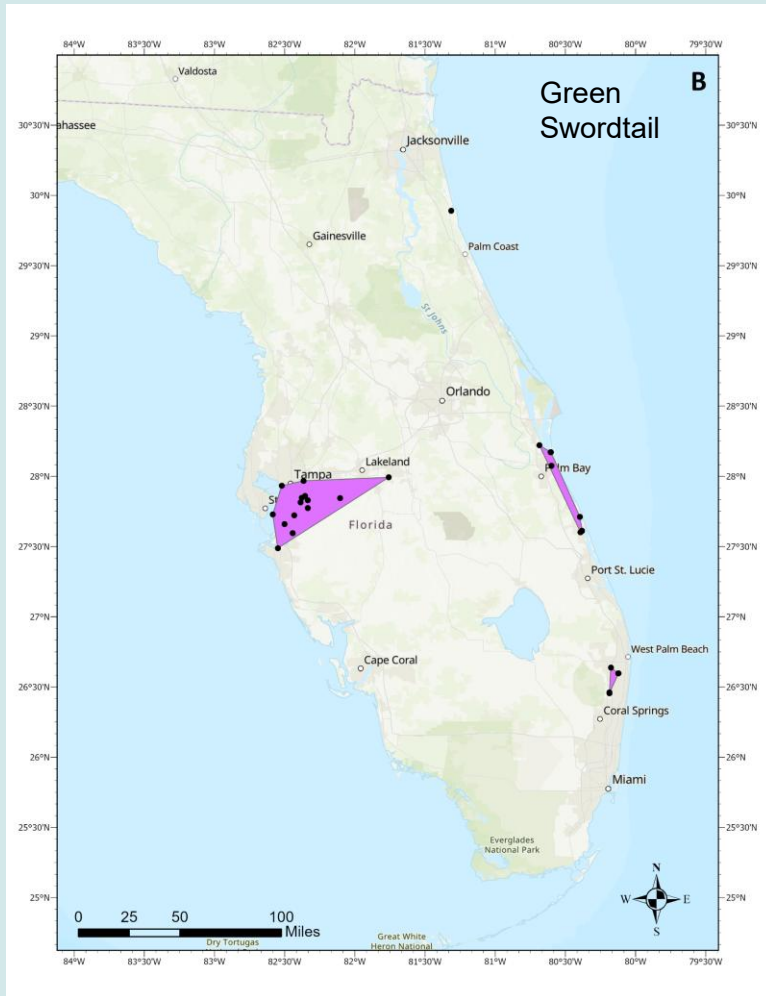
What traits differentiate nonnative species that failed to reproduce from those that were successful in peninsular Florida?



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Calculating Spread



- Calculated area occupied
- Calculated potential range based on thermal tolerance
- Percentage of potential range occupied / # years since introduction

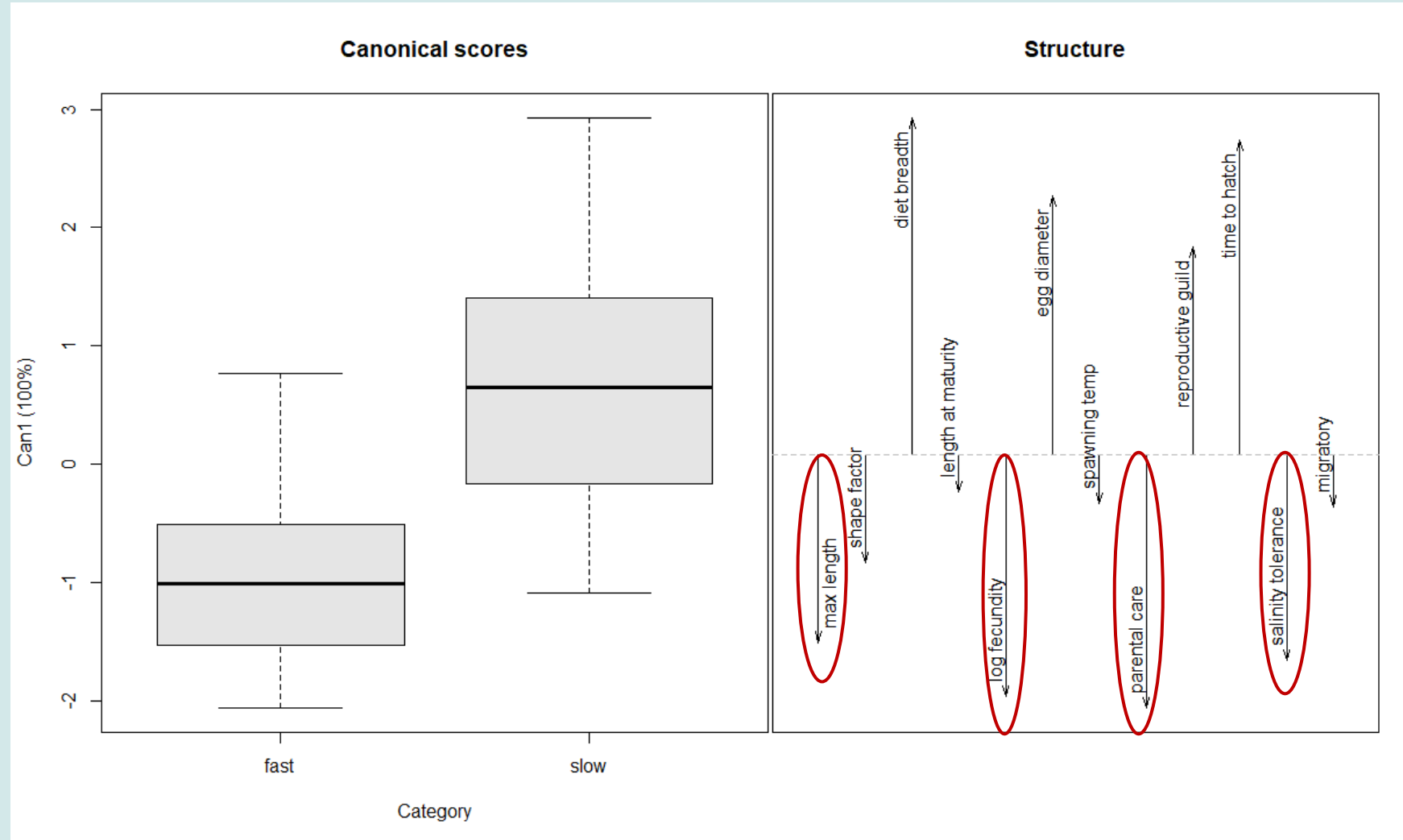
What traits differentiate fast from slow spreading nonnatives in peninsular Florida?

Fastest Spreaders:

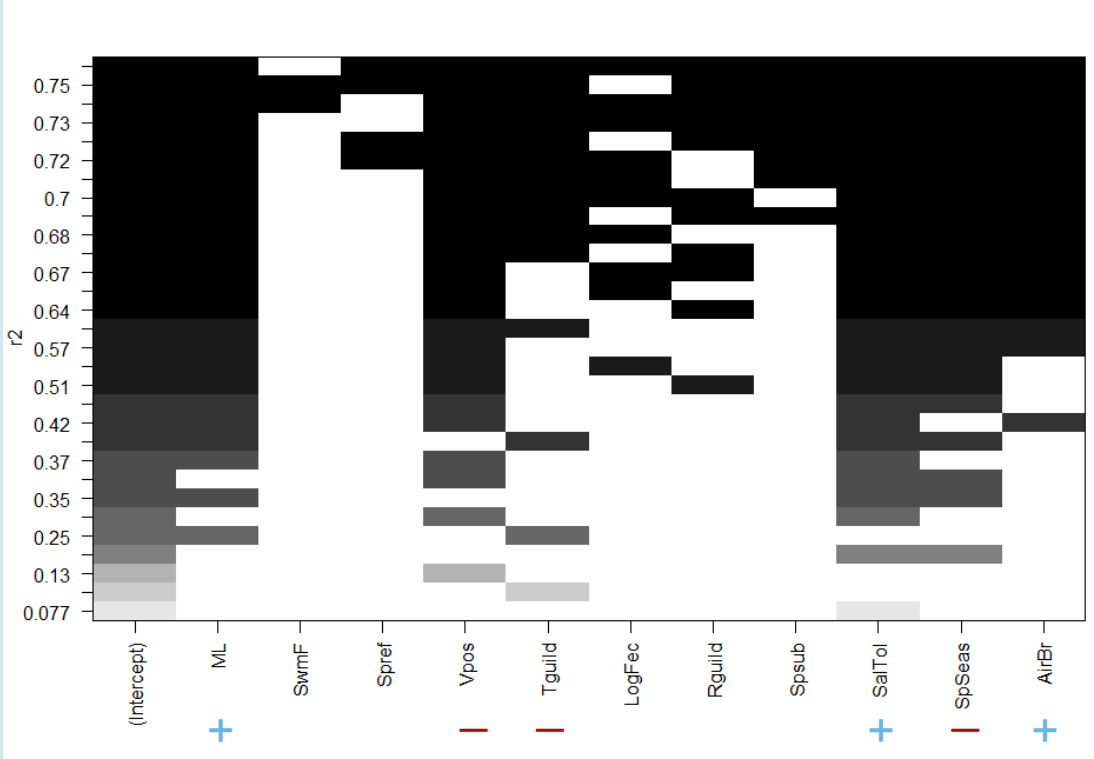
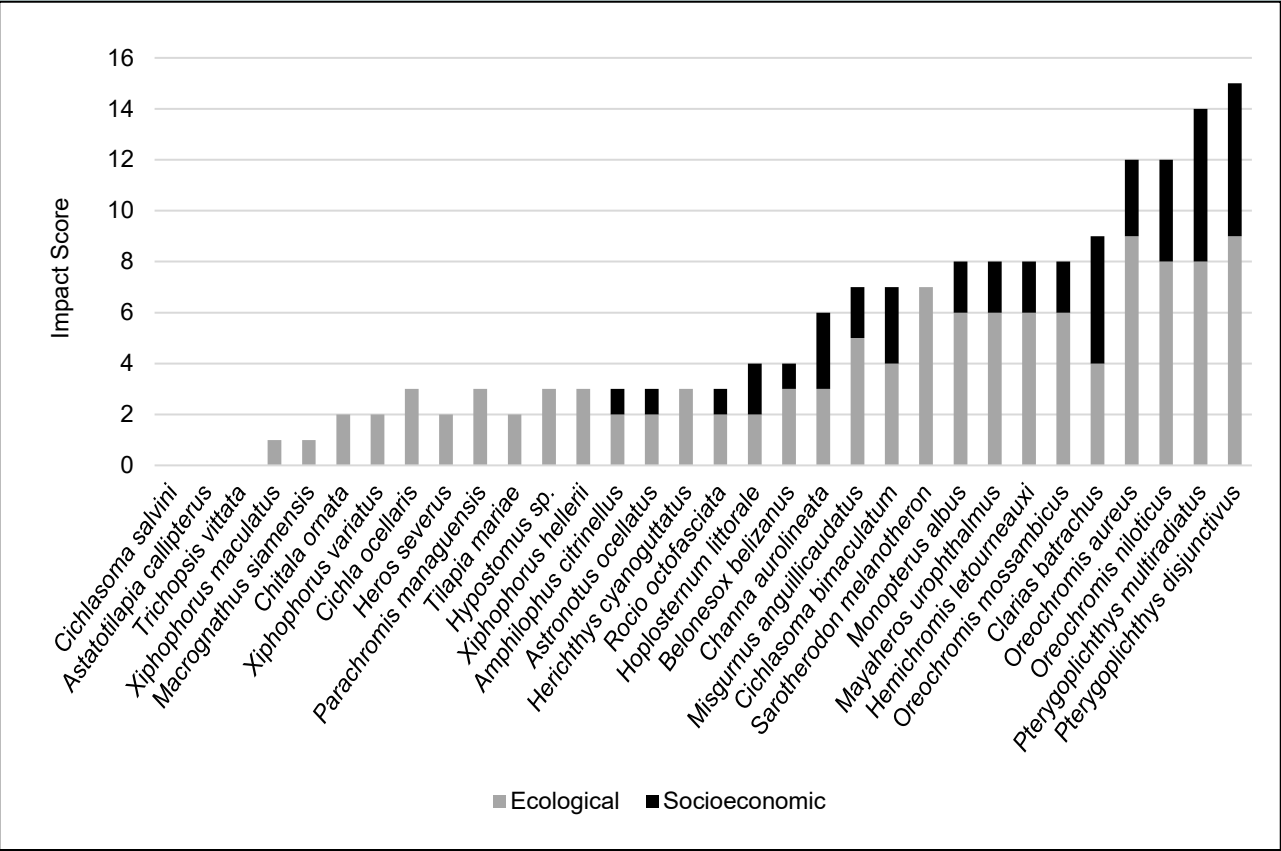
- (1) *Hoplosternum littorale*
- (2) *Pterygoplichthys* sp.
- (3) *Clarias batrachus*
- (4) *Mayaheros urophthalmus*

Slowest Spreaders:

- (1) *Trichopsis vittata*
- (2) *Astatotilapia calliptera*
- (3) *Xiphophorus maculatus*
- (4) *Xiphophorus variatus*



What traits are predictive of impacts?



Implications for Risk Assessment

- Risk = probability of event x consequences of event
- Risk Screening vs. Risk Assessment vs. Risk Analysis
- Trait-based screening may be useful regionally
 - Parental care, larger body size, no fluvial dependence predictive of establishment
 - Fast spreaders also larger-bodied, more fecund, with greater parental care and salinity tolerance compared to slow spreaders
 - More impactful species have larger body sizes, tend to be benthic, with a narrower trophic guild, salinity tolerance, and air breathing abilities

**Ecological Risk Screening
Summaries**



AS-ISK — Aquatic Species Invasiveness Screening Kit

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2. Florida Agricultural Experiment Station
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