

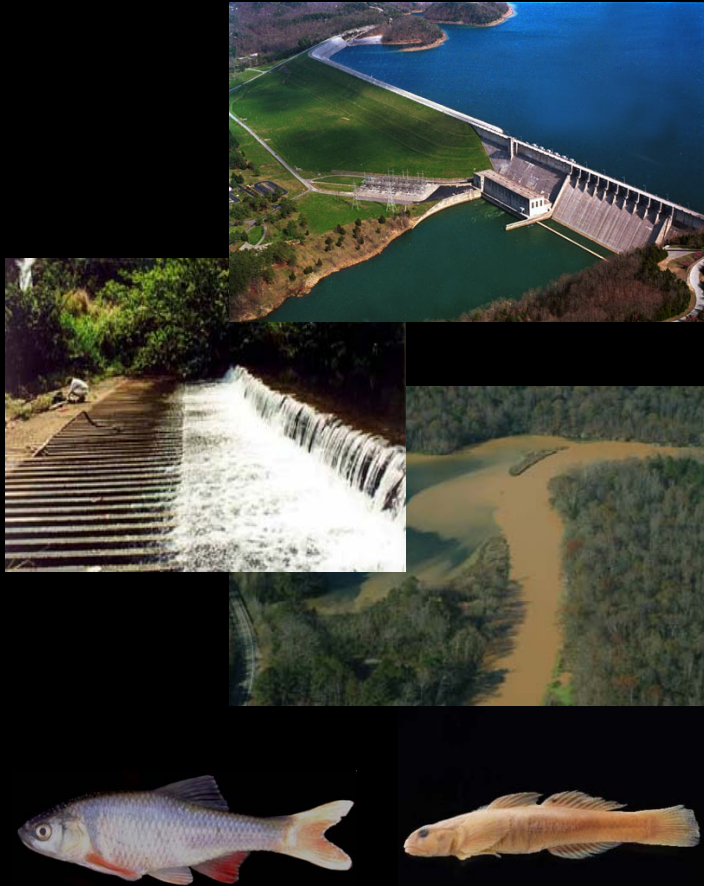
Assessing population and species level effects of environmental contaminants

Michael J. Blum¹

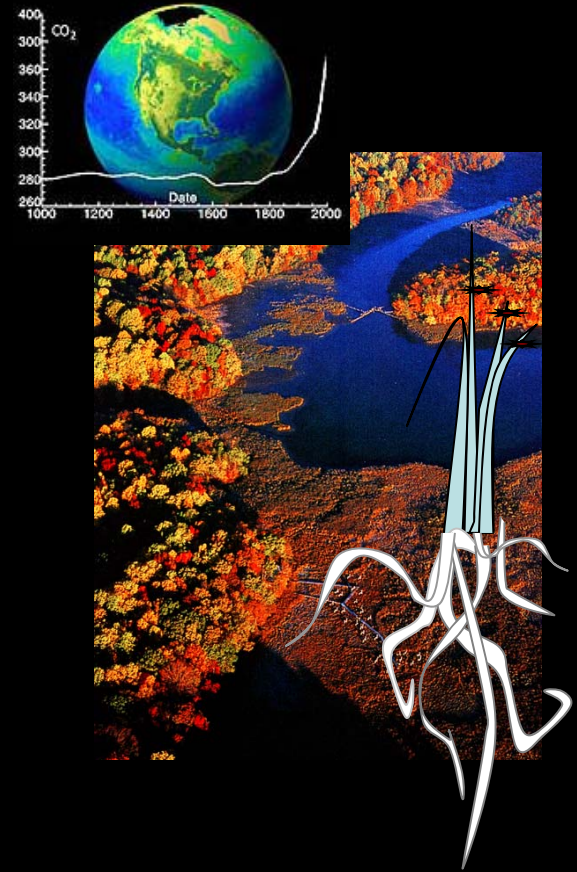
David M. Walters², Brady A. Porter³, Noel M. Burkhead² and Byron J. Freeman⁵



Organismal responses to contemporary environmental change



The influence of land use & water management on fishes



The influence of climate stressors on coastal marshes

Do environmental contaminants diminish population and species integrity?



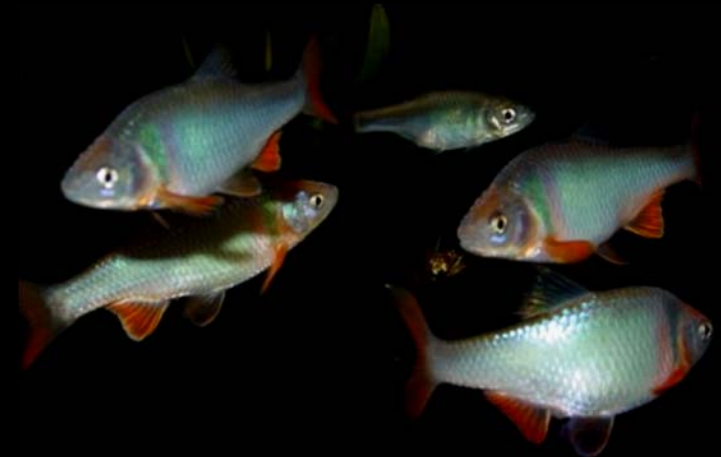
Physical drivers like sedimentation

Chemical drivers like EDCs & heavy metals

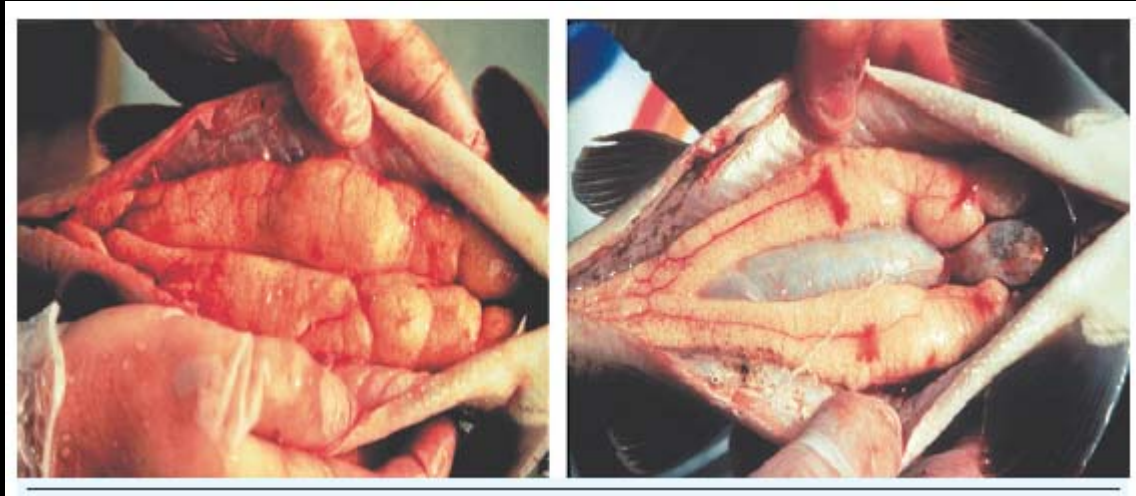
How do individual-level responses emerge at the population and species level?

Do populations & congeners vary in response?

If so, is variation attributable to genetic or environmental factors?



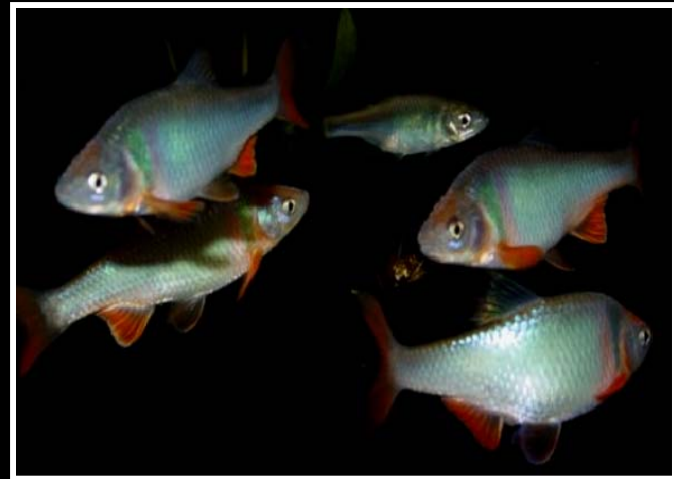
How do individual-level responses emerge at the population and species level?



Reduced ovarian size in white suckers following exposure to Bleached Kraft Mill Effluent

Organismal level effects of exposure:
Induced gene expression (vitellogenin)
Sex modification (intersex individuals)
Behavioral modification

Variation in response?



Population A
Population A



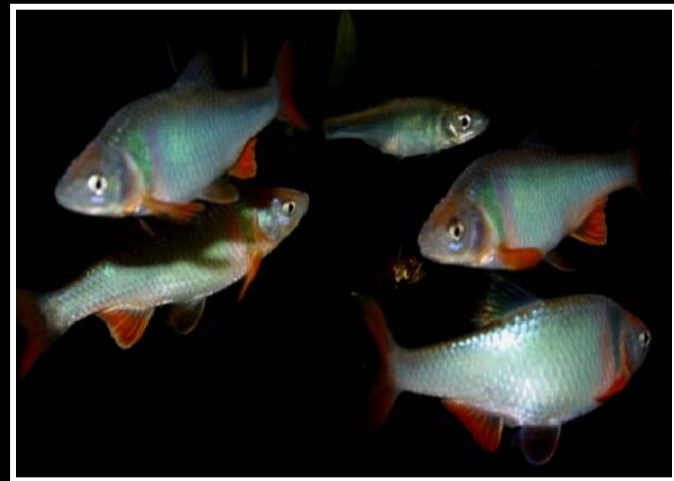
Population B
Population B



Population C
Population C

Responses to exposure may vary across populations and congeners due to differences in susceptibility

Is variation due to genetic or environmental factors?



Population A

Population A



Population B

Population B



Population C

Population C

**Replicate experiments involving multiple populations of two species
Common garden conditions to control environmental variation**

How do individual-level responses emerge at the population and species level?



Prezygotic



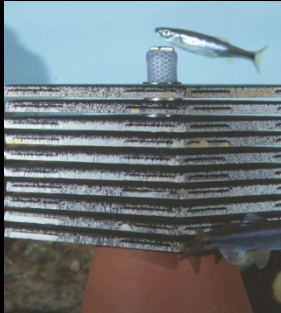
**Post-mating
prezygotic**



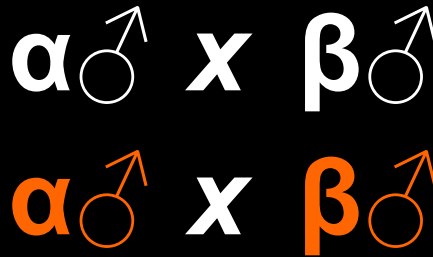
Postzygotic

Estimating the effects of lead exposure on fitness at three stages of reproduction

How do individual-level responses emerge at the population and species level?



Male- Male aggression



Exposed vs. control males



Male courtship of females

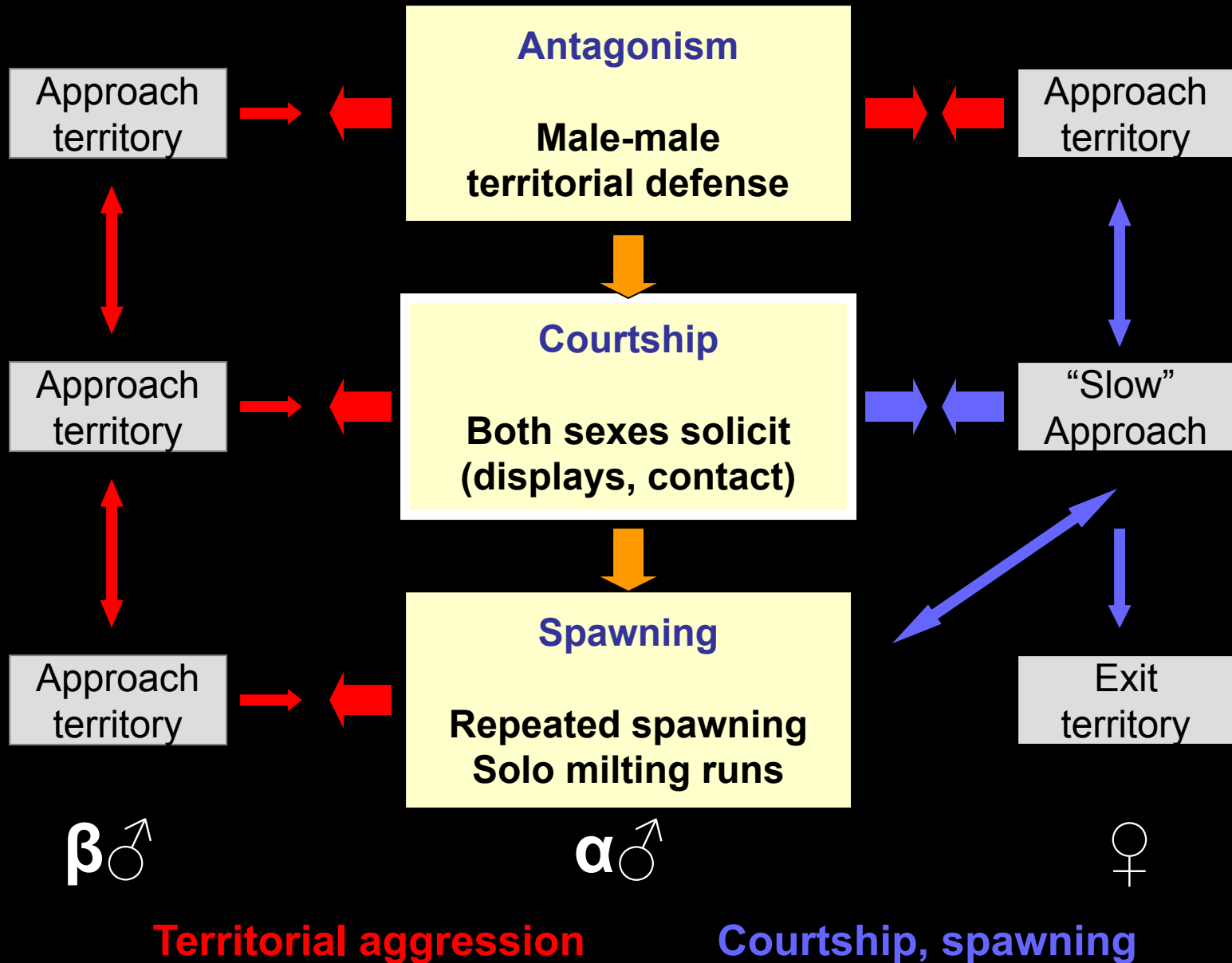


Exposed vs. control males / females

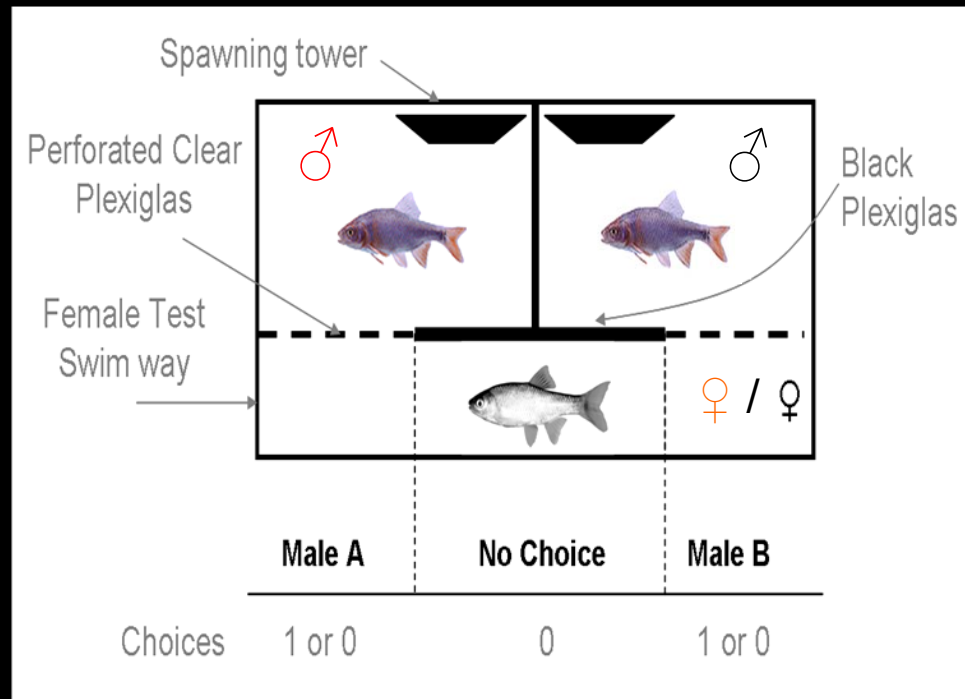


Exposure may impact behavior during spawning

Sorting and establishment of spawning hierarchy



How do individual-level responses emerge at the population and species level?



H_1 : Exposure impacts female preference and male courtship during spawning

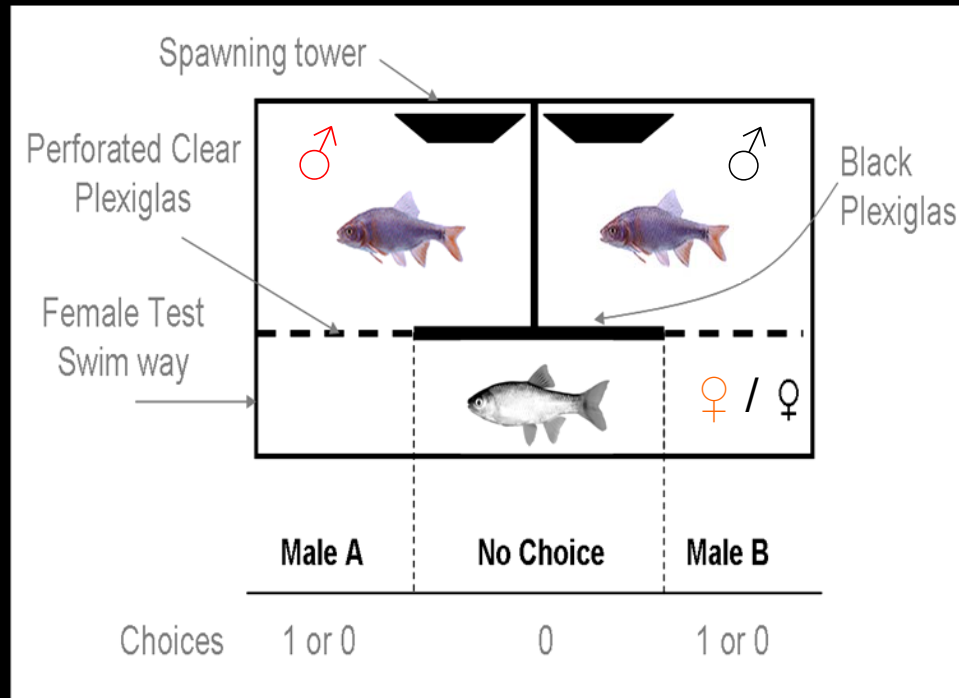
How do individual-level responses emerge at the population and species level?



**Exposures during early development
Individuals being reared to spawning condition**

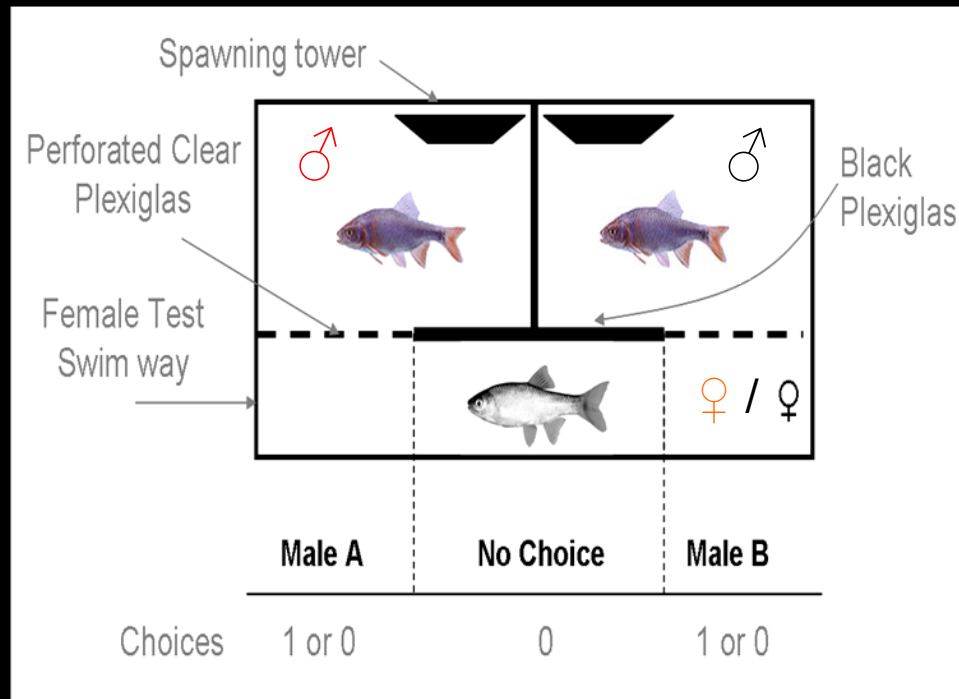
(good things come to those who wait!)

How does behavior regulate individual and species interactions?



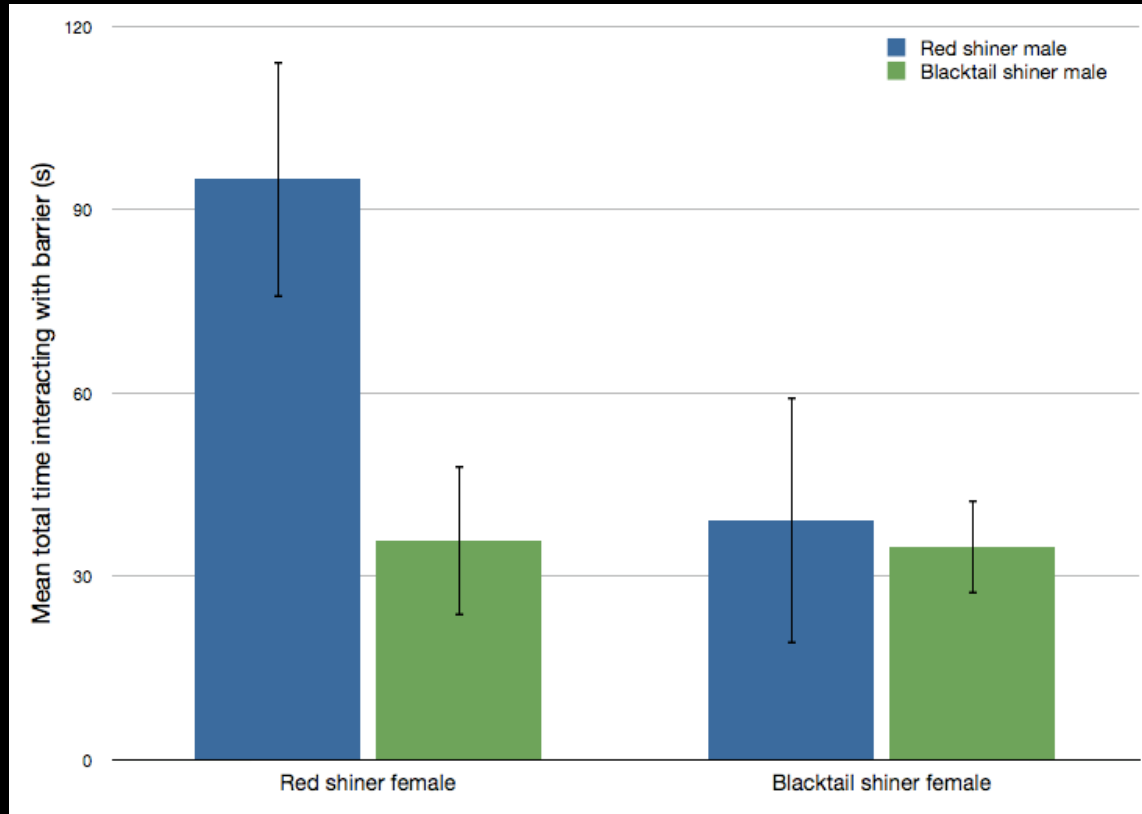
H_1 : Females prefer males that exhibit greater courtship vigor during spawning

How does behavior regulate individual and species interactions?



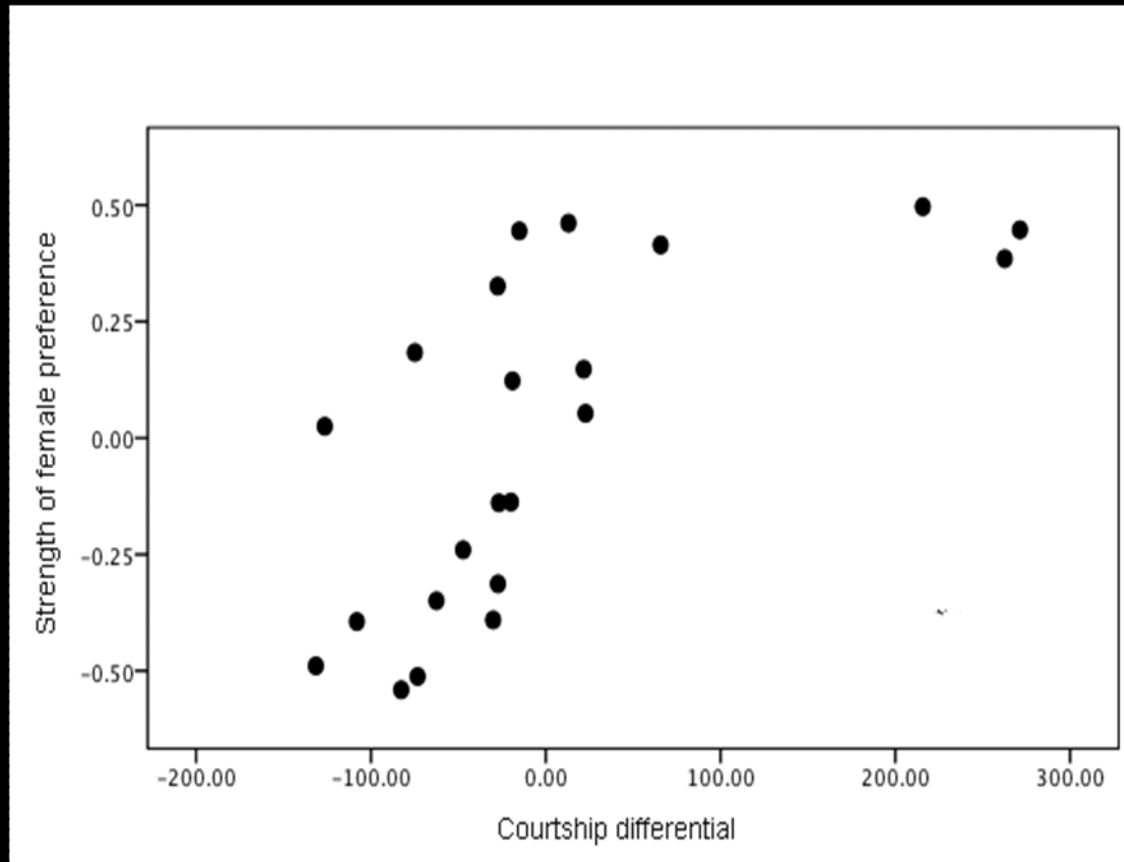
H_1 : Male courtship vigor varies according to species during spawning

How does behavior regulate individual and species interactions?



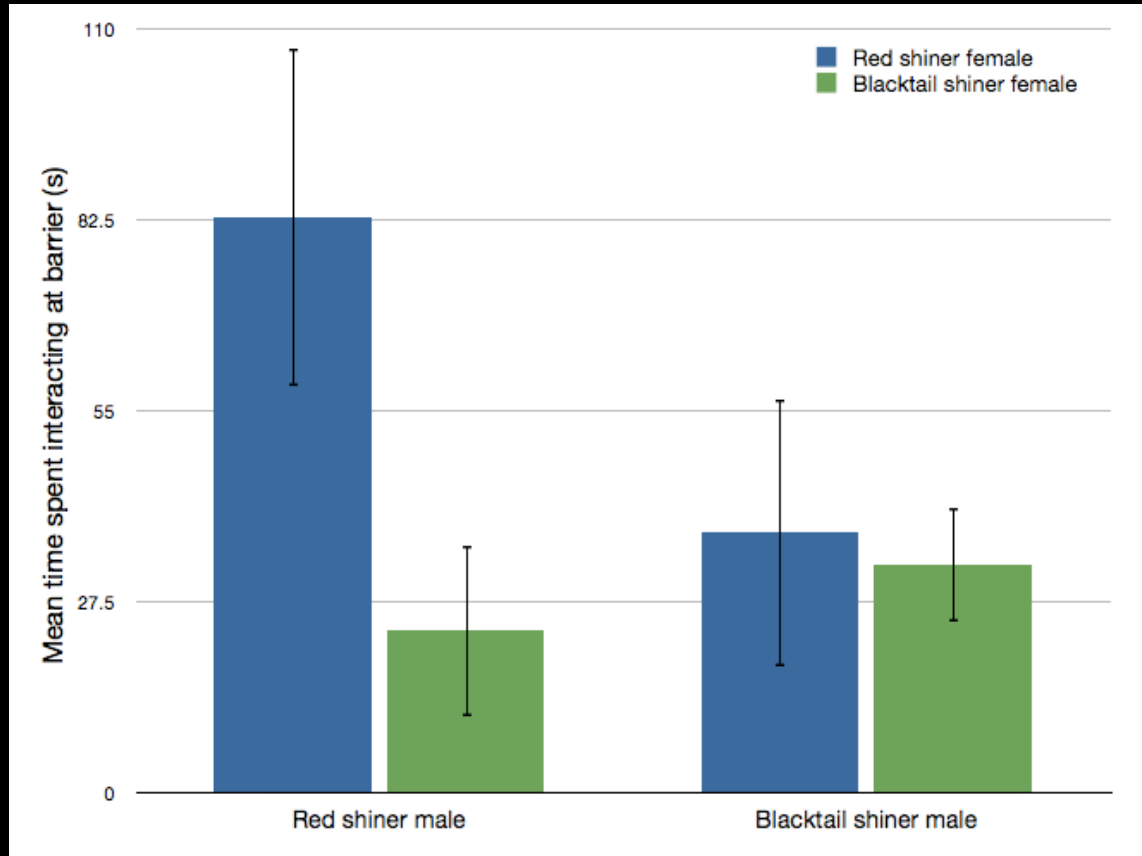
Strength of female preferences vary among congeners

How does behavior regulate individual and species interactions?



Females prefer males that court more vigorously

How does behavior regulate individual and species interactions?



Male courtship vigor and preferences vary among species

Progress to date



Experiments have shown that courtship vigor is pivotal
Experiments have shown that preferences and vigor vary

Individuals being reared to spawning condition
Parallel studies being planned involving adult exposure
Parallel studies being planned involving model species

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