Assessing population and species level effects of environmental contaminants

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Organismal responses to contemporary environmental change

The influence of climate stressors on coastal marshes

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?

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

Reduced ovarian size in white suckers following exposure to Bleached Kraft Mill Effluent
Responses to exposure may vary across populations and congeners due to differences in susceptibility.

Variation in response?
Is variation due to genetic or environmental factors?

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?

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

- Prezygotic
- Post-mating prezygotic
- Postzygotic
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

- **Antagonism**
  - Male-male territorial defense

- **Courtship**
  - Both sexes solicit (displays, contact)

- **Spawning**
  - Repeated spawning
    - Solo milting runs

**Approach territory**

- **Territorial aggression**
  - Male-male territorial defense

- **Courtship, spawning**

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

H₁: 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?

H₁: 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
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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