Abiotic Stressors: an overview of introduced stressors and their interactions

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What is an abiotic stressor??
A non-naturally occurring factor that causes stress in an organism.

Habitat modification...
• Probably THE leading hypothesis for amphibian declines
• Somewhat of an umbrella term
• What are some types of habitat modifications?
Habitat modification…

- Urbanization is associated with reduced amphibian species richness. Why? 
  - Decreased upland habitat
  - Decreased breeding habitat (streams in this case)
  - Modified versions of both habitats (e.g., monocultures)
  - Increased traffic
  - Increased runoff
  - Pollution

Barrett et al. 2010; Biol Conserv

Habitat modification…

- Light pollution can affect activity patterns of amphibians
  - Primarily nocturnal movers reduce activity during light period
  - Example: Plethodon cinereus

Perry et al. 2008; Urban Herpetol

Habitat modification…

- Roads can cause many problems for amphibians
  - Fragment habitat (including migration corridors)
  - Feral domestic or agricultural impact on amphibians
  - Temp. migration species and explosive breeders
  - Altered hydrology (from increased drainage flows)
  - Pollution (road salt, petroleum distillates, PAH’s from coal tar sealants, etc.)

Long Point, Ontario
Corby, England
Paynes Prairie, Florida
Karraker et al. 2008; Ecol Appl
Habitat modification...

- Cultivation affects species composition, morphometrics, demographics, etc.

- Can also affect individual parameters of fitness
  - Intersex in Rhinella marina

Harvesting wild amphibians

- Wild amphibians are harvested for:
  - Food
  - Bait
  - Pet trade
  - Medicinal use

Pollution

- Persistent Organic Pollutants (e.g., PAHs, PBDEs, OCs)

http://osp.mans.edu.eg/environmental/Ch5f.htm
Pollution

- A LOT of variability in effects from various pollutants
  - Variability holds within and between species
  - Ex: copper sulfate in *Epidalea calamita* (natterjack toad)

- Effects do not always involve mortality
  - Ex. PAH’s in *Notophthalmus viridescens*

- Sublethal carbaryl
  - Reduced activity and lower sprint distance
    - Why?...
Case Study:

Environmental Toxicology

FACORS INFLUENCING THE TOXICITY OF HEADLINED® FUNGICIDES TO TERRESTRIAL STAGE TOADS


Laboratory toxicity studies suggest amphibians may be at risk from pyraclostrobin-based fungicides...
Soil Exposure

Anaxyrus cognatus

Dietary Exposure

Anaxyrus cognatus

Soil Dry to Constant Mass

Monitored Soil
Toads will avoid contact with substrate when osmotically unfavorable...
Mean Percent Mortality (±SE)

<table>
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<tr>
<th>Time Post-Spray (h)</th>
<th>Control</th>
<th>0.76</th>
<th>1.52</th>
<th>3.04</th>
<th>6.08</th>
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<table>
<thead>
<tr>
<th>Concentration (µg/cm²)</th>
<th>25%</th>
<th>50%</th>
<th>≥75%</th>
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<tbody>
<tr>
<td>Xanthion 6 fl oz/A</td>
<td>&lt;25%</td>
<td>1.1 µg pyr</td>
<td>1.94 µg pyr</td>
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Mid-May

Early June

Mid-July

Early August
References