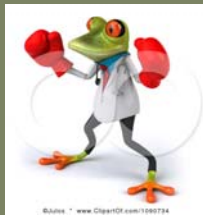


Introduced Competitors in Global Amphibian Populations

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Lecture Structure

- ◉ Introduction
- ◉ Examples of Introduced Competitors
- ◉ Importance



Introduction

- ◉ Habitat degradation
- ◉ Deplete food sources
- ◉ Behavior modifications
- ◉ Ultimately, pushing natives out of their typical home ranges

Cane toads (*Bufo marinus*)

- ◉ Native to Central and South America
- ◉ Introductions:
 - Australia in 1935 to control cane beetle (*Dermolepida albobirtum*) populations
 - Florida
 - Caribbean Island
 - Venezuela
 - Puerto Rico
 - Philippines



Cane toads continued

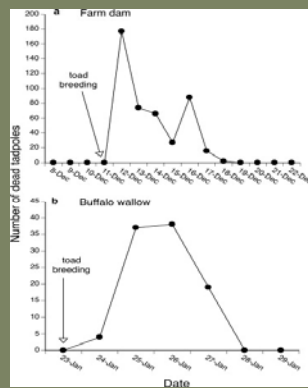
- ◉ Crossland et al. 2008
 - When cane toad eggs were added after Ornate burrowing frog (*Opisthodon ornatus*) tadpoles, cane toads metamorphosed at larger sizes.
 - Toxic toad eggs
 - Frogs more sensitive- no frog metamorphs emerged when the frogs were added after toads.



Cane toads continued

- ◉ Crossland et al. 2008
 - Cane toad breeding activity concurrent with 9 out of 11 unexplained tadpole deaths.
 - 10 species affected
 - Tornier's frog (*Litoria tornieri*)
 - naked tree frog (*Litoria rubella*)
 - Northern laughing frog (*Litoria rothii*)
 - striped rocket frog (*Litoria nasuta*)
 - bumpy rocket frog (*Litoria inermis*)
 - Dahl's aquatic frog (*Litoria dahliei*)
 - Northern dwarf tree frog (*Litoria bicolor*)
 - marbled frog (*Limnodynastes convexiusculus*)
 - long-footed frog (*Cyclorana longipes*)
 - giant frog (*Cyclorana australis*)

Fig. 2. Examples of the time course of tadpole mortality event following toad breeding in (a) a farm dam, and (b) a buffalo wallow during the 2006–2007 wet-season. Arrows show breeding events by cane toads. Crossland et al. 2008



Chytridiomycosis Introduction

- ◉ *Batrachochytrium dendrobatidis* (Bd)
- ◉ Originated in Africa
- ◉ Brought to affected areas via the African clawed frog (*Xenopus laevis*) in 1938 for laboratory testings (Weldon et al. 2004)



Fisher et al. 2009


Ambystoma tigrinum virus (ATV)

- ◉ Jancovich et al. 2001
- ◉ Originally isolated from Sonora tiger salamanders (*Ambystoma tigrinum stebbinsi*) in San Rafael Valley in southern Arizona
- ◉ Ranavirus
- ◉ Potentially introduced by salamander baits



American Bullfrog (*Lithobates catesbeianus*) Introduction

- Introduced into western US between 1900-1940
- Pet trade, food source, fishing bait
- Consume benthic algae (Snow and Witmer 2010)



American Bullfrog Introduction

- Microhabitat usage (Kiesecker and Blaustein 1998)
 - Northern red-legged frog (*Rana aurora*)
 - Retreat and reduce activity levels
 - *Lithobates catesbeianus* tadpoles have high feeding rates compared to *Rana aurora*
 - *L. catesbeianus* tadpoles possibly releasing chemicals that can alter growth of other anurans



American Bullfrog Introduction

- *Potential Mechanisms Underlying the Displacement of Native Red-Legged Frogs by Introduced Bullfrogs*
- Kiesecker, Blaustein, and Miller. 2001

Non-native Earthworms

- Maerz et al. 2008
- Eastern redback salamander (*Plethodon cinereus*)
- Correlation between non-native plant (European and Asian, garlic mustard) and non-native earthworms
- Earthworms reduce leaf litter
 - Decreases macroinvertebrates (food)
 - Decreases shelter



Mosquito Fish

- Depleting food sources (macroinvertebrates)
- Behavior modifications



Crayfish

- Dorn and Wojdak. 2004
- Discussed general implications of crayfish on littoral areas of ponds
- Harassed breeding adults
- Destroyed nest attachment sites (macrophytes)

Hybridization

- Ryan et al. 2009
- Threatened California Tiger Salamander (*Ambystoma californiense*) and introduced Barred Tiger Salamander (*Ambystoma tigrinum mavortium*)
- Barred tiger salamanders from Texas
- Introduced around 1950 by bait dealers into California



Hybridization continued

- Native Pacific Chorus Frogs (*Pseudacris regilla*) larvae and California Newts (*Taricha torosa*) larvae
- Native California Tiger Salamander (*Ambystoma californiense*) larvae
 - Metamorphosis survival and size were reduced and metamorphosis timing was extended
- Aggressive behavior; pushing natives out of home ranges



Significance

- Near impossible to eradicate
- Difficult to control
 - Pet trade
 - Food Source
 - Fish Bait
 - Other
- Unaware of impacts of other introduced species on amphibians
- Limited resources

Literature Cited

Questions?