

How does a pathogen transfer between species?

"When parasites are cointroduced with coevolved hosts and encounter closely related host species that evolved without the parasite... It follows that extinction of the latter is a possible outcome."

--Cunningham, et al.

Malaria and avian pox in birds

Rinderpest in ungulates

Sylvatic plague in prairie dogs and ferrets

White-nose syndrome in cave bats



Captive Breeding in Zoos

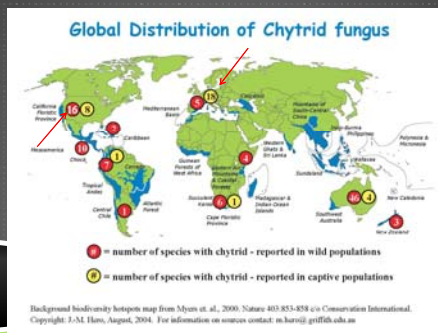
- ▶ Animals from different parts of the world are kept in close vicinities
- ▶ Ingestion of contaminated food
- ▶ Impacts:
 - ▶ geographically or taxonomically
 - ▶ Obvious or insidious
 - ▶ Severe or subtle
 - ▶ Short-lived or long lasting
- ▶ **Should species that are known to be infected be reintroduced into the wild?**

Chytridiomycosis

- ▶ *Batrachochytrium dendrobatidis* (Bd)
- ▶ Found in the Central America, North America, South America, New Zealand, Australia, and Europe



Expansion of Chytrid Fungus



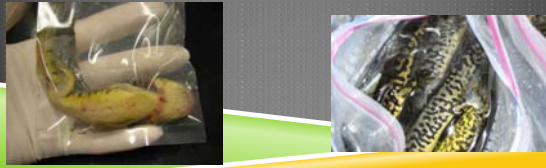
Ranavirus

- ▶ *Rana temporaria*
- ▶ *Rana catesbeiana*



Bait Trade

- ▶ Tiger salamanders used to catch prized fish
 - ▶ largemouth bass and channel catfish
- ▶ "waterdogs"
- ▶ Anglers returned left overs to the water



Transfer of Tiger Salamanders

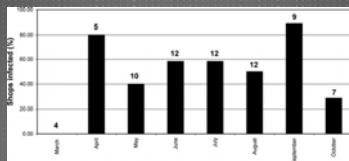
- ▶ Salamanders moving southwest
- ▶ All collected from wild
- ▶ "waterdogs" returned into the wild after being housed in infected shop



Picco and Collins

Tiger Salamanders in Bait Trade

- ▶ Percentage of bait shops in Arizona infected with ranavirus
- ▶ 85% of shops sold at least 1 infected salamander



Picco and Collins

"I am trying to determine if there is an interest out there to ship live waterdogs for Bass bait. I have access to the Waterdogs, and we also run a **Fedex** ship center as part of our business, so I have the means to get them to your home.


For anyone not familiar with a Waterdog, they are considered by many to be the best Bass bait on the planet. Waterdogs are immature Tiger Salamanders, living underwater and breathing through gills. They are generally 5 to 7 inches in length and have been known to catch Big Bass.

We could ship them in lots of **2 to 4 dozen**, with a price around 2.50-3.50 per Waterdog, 2nd Day Air shipping included. Please reply if this is something that interests you. I could use some input in making a decision whether or not to take the time and energy required to make this a **viable business**"

--Guy from bass fishing thread

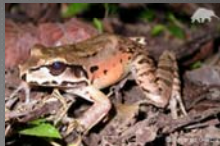
Chytridiomycosis Victim

- ▶ Gastric brooding frog
- ▶ Believed to have been driven to extinction by chytrid



Chytridiomycosis Victim

- ▶ Dominican Mountain chicken (*Leptodactylus fallax*)
- ▶ Critically endangered; declined 80% in one decade
- ▶ Declined by 70% within 1.5 years



References

- ▶ "Amphibian Disease" (On-line), Evolutionarily Distinct and Globally Endangered. Accessed April 12, 2013 at http://www.edgeofexistence.org/amphibian_conservation/diseases.php
- ▶ "Any Interest in Live Waterdogs? Page 2 – BassFishin.com Forums" (On-line), BassFishin.com. Accessed April 12, 2013 at <http://www.bassfishin.com/bassfishingforums/showthread.php?t=5323&page=2>
- ▶ Cunningham, A. A., et al. 2003. Pathogen Pollution: defining a parasitological threat to biodiversity conservation. *The Journal of the American Society of Parasitologists*, 578-583.
- ▶ Picco, Angela M., and James P. Collins. 2008. Amphibian Commerce as a Likely Source of Pathogen Pollution. *Conservation Biology* (6): 1582-9.
- ▶ Ueno, Yumi et al. 2008. Ranavirus Outbreak in North American Bullfrogs, Japan. *Emerging Infectious Diseases* (7): 1146-47

Food for Thought

- ▶ 25 million live amphibians imported to U.S.
- ▶ Over 70% are caught in the wild
- ▶ 6 million bullfrogs imported from farms in South African countries for U.S. restaurant trade
 - ▶ Poor disease surveillance
- ▶ Guidelines for surveillance and quarantine controls by IUCN

- ▶ It's a frog-eat-frog world...



- ▶ But not soon enough