



*Rana catesbeiana* die-off near Elkhorn Slough, Santa Cruz, California.

## AMPHIBIAN CHYTRIDIOMYCOSIS:

An Informational Brochure<sup>1</sup>

Recent investigations in Australia, New Zealand, the United Kingdom, Europe, North America, and Central America have repeatedly identified two diseases as the principle causes of the most recent amphibian mortality and population extinctions; **amphibian chytridiomycosis and iridovirus infections.**

Amphibian chytridiomycosis has now been globally documented in 113 amphibian species in Australia, New Zealand, Middle America, South America, and North America, and **iridoviral**

**infections** have been documented in the United Kingdom, the United States, and Canada.

The chytrid fungus causing chytridiomycosis in amphibians, *Batrachochytrium dendrobatidis* (“Bd”), has been detected in California populations of California red-legged frogs (*Rana draytonii*), foothill yellow-legged frogs (*R. boylei*), non-native bullfrogs (*R. catesbeiana*), mountain yellow-legged frogs (*R. muscosa*), Yosemite toads (*Bufo canorus*), Pacific treefrogs (*Hyla regilla*), canyon treefrogs (*H. arenicolor*), Santa Cruz long-toed salamanders (*Ambystoma macrodactylum*), California tiger salamanders (*Ambystoma californiense*), California newts (*Taricha torosa*) and laboratory populations of arroyo toads (*B. californicus*). To date, iridovirus infections have been recorded only in northern red-legged frogs (*R. a. aurora*) from Redwood National Park in northwestern California.

### WHAT WE KNOW SO FAR.

1. Chytrid fungi have been present in the environment for over 400 million years. These fungi are important decomposers of cellulose, chitin and keratin, but have not been previously parasitic on vertebrates.
2. Chytridiomycosis can be fatal.

3. *Batrachochytrium dendrobatidis* uses keratin from the host. Tadpoles have little keratinized tissue other than the mouthparts, and so can appear to be healthy until metamorphosis occurs.
4. The fungus only infects the outer epidermis (*stratum corneum* and *stratum granulosum*) of post-metamorphic anurans.
5. Chytrid fungus has been detected in both lotic and lentic habitats.
6. Disease outbreaks typically occur during the cooler months (Oct-Feb.) and again post-metamorphosis.
7. Most die-off events are non-remarkable (i.e.  $\leq 10$  dead animals observed) in most cases and can therefore be easily missed.

### WHAT WE DON’T KNOW.

1. How the infection kills.
2. How the chytrid persists in the environment.
3. How the fungus moves through the environment.
4. How long this chytrid fungus has been present acting on amphibian populations.

### FIELD OBSERVATIONS

*It is not possible to diagnose this disease in the field. Amphibians must be tested for infection through DNA analysis of tissue or swab samples or through histological examination. Loss of mouthparts in*

<sup>1</sup> © Version F. 2007. G.E. Padgett-Flohr. This brochure has been reviewed by Lee Berger, Joyce Longcore, Rick Speare and the AAHA.

*tadpoles is NOT an indicator of infection for all species. The symptoms described below are also symptoms of other diseases. You may encounter one or more of the following symptoms:*

**\*\*\*\*CLINICAL SIGNS VARY BETWEEN SPECIES.\*\*\*\***

*Morphological Changes*

1. Reddening of ventral skin.
2. Convulsions with extension of hind limbs.
3. Accumulations of sloughed skin over the body.
4. Sloughing of the superficial epidermis of the feet and other areas.
5. Slight roughening of the surface with minute skin tags.
6. Occasional small ulcers or hemorrhage.

*Behavioral Changes*

1. Lethargy
2. Failure to seek shelter.
3. Failure to flee.
4. Loss of righting reflex.
5. Abnormal posture, sitting with hind legs held away from body.

Please pay particular attention in the field to dead or dying amphibians. **If possible and the necessary permits are in order**, please collect the affected animal (freeze or preserve in 70% ethanol), or take a swab sample from the bottoms of the feet and ventral surfaces (store in 70% ethanol) properly label the sample with all pertinent information, include a CNDDDB form filled out and send to:

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3636 Baptist Camp Road,  
Carterville, IL 62918.  
E-Mail: [gpadgettflohr@AOL.com](mailto:gpadgettflohr@AOL.com)

**DECONTAMINATION PROCEDURES and PRECAUTIONARY FIELD TIPS**

1. If possible, keep separate equipment for each watershed you visit.
2. Consider all sites “dirty” unless sampling has shown it to be “clean”.
3. Prior to going in the field decontaminate all equipment using a bleach<sup>2</sup> solution , Quat 128<sup>3</sup> (didecyl dimethyl ammonium chloride), TriGene Viricidal Surface Disinfectant Cleaner or F10 Super Concentrate Disinfectant. For dilutions please visit: [www.ccadc.us](http://www.ccadc.us)- decon protocol.
4. Always work from the “cleanest” site to the “dirtiest” site and **decontaminate between water bodies.**
5. Use disposable gloves (new pair per animal) when handling animals. Keep baggy handy to dispose of gloves, turning gloves inside-out as they are removed. **BE SURE TO MOISTEN**

<sup>2</sup> Granulated swimming pool chlorine is the safest and most easily transported form of bleach. Mix with pond water to make disinfecting solution.

<sup>3</sup> Very effective, less corrosive on equipment. Can be obtained at any local medical supply store. Not effective on whirling disease of fish.

**GLOVES PRIOR TO TOUCHING DELICATE AMPHIBIAN SKIN!**

6. Use new individual baggy for each animal being retained.
7. Decontaminate all equipment before leaving any site. This means **SCRUB** first to remove all clumps of dirt etc., **THEN DISINFECT.**
8. When PIT-tagging or toe-clipping use sterile instruments and disinfect them (ETOH) between frogs. Seal wounds so there is no avenue for infection. Swab wound with 0.1% iodine then seal with medical grade cyanoacrylate.
9. Do not allow disinfectants to contact amphibians.
10. If vehicle has been through creek etc, hose off vehicle, scrub floor and pedals with disinfectant.
11. **WASH YOUR FIELD CLOTHES AFTER EACH VIST.**
12. **Do not translocate amphibians at this time.**



For further information please visit:

[www.ccadc.us](http://www.ccadc.us)  
<http://www.jcu.edu.au/school/phtm/PH TM/frogs/ampdis.htm>