



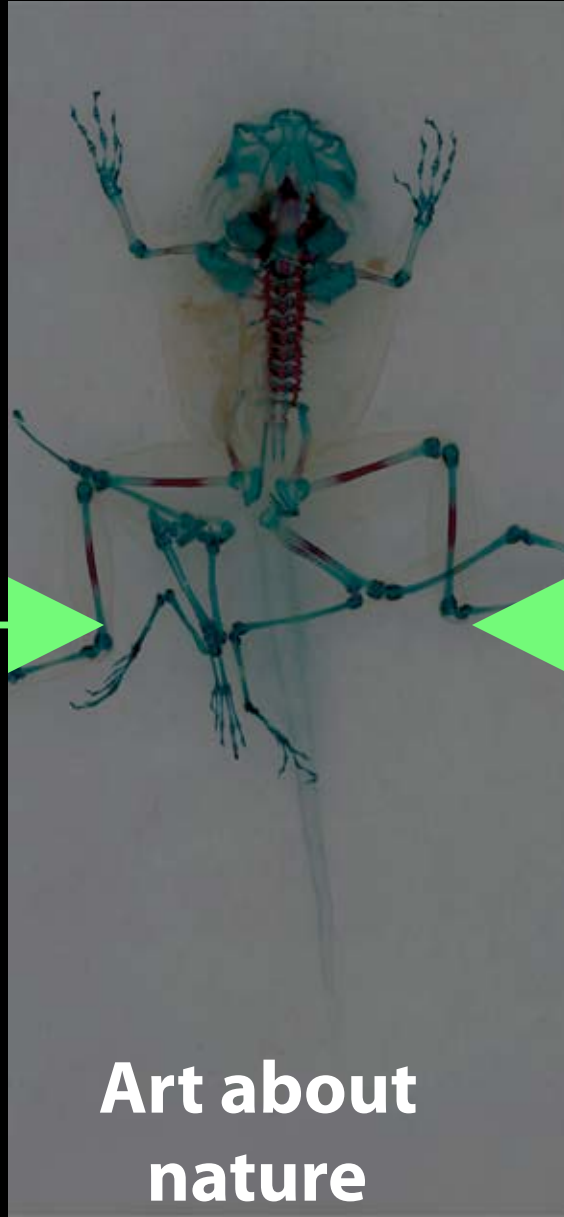
**Praeter Naturam**

***Beyond Nature***

**Brandon Ballengée**

**RCN AIM-UP!, 22 February 2012**

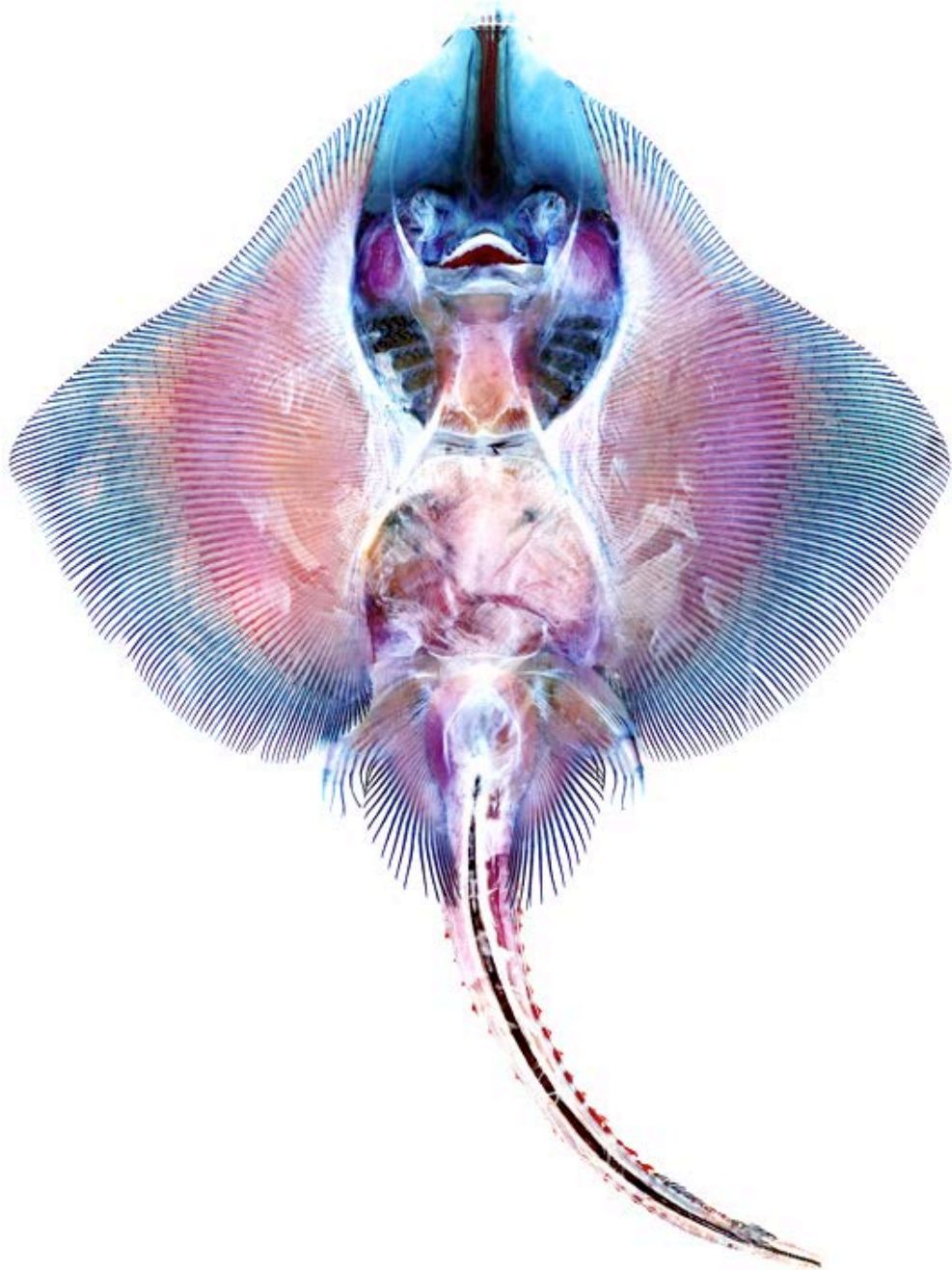
# Biological Research



# Art about nature

# Environmental Programs/ Eco-system Activism





*Clearnose skate, Raja eglanteria*  
2001/03, 60 in by 48 in  
Unique archival chromogenic print  
mounted on Plexiglas



**“Breathing Space for the Hudson”  
WaveHill Glendor Gallery, NYC, 2004**



***“RIP Passenger Pigeon”***  
**2006. Extinct early 20th Century.**  
**Historic altered Audubon print**





**Yorkshire Sculpture Park  
Wakefield, England  
Black ultra-violet/ White Blue Halogen  
3.1 by 8 meters Each per wall  
June-October 2008**



**Sculpture in the Parklands, Lough Boora, Ireland  
Black ultra-violet, 2 by 30 meters Each per wall, June-October 2010**





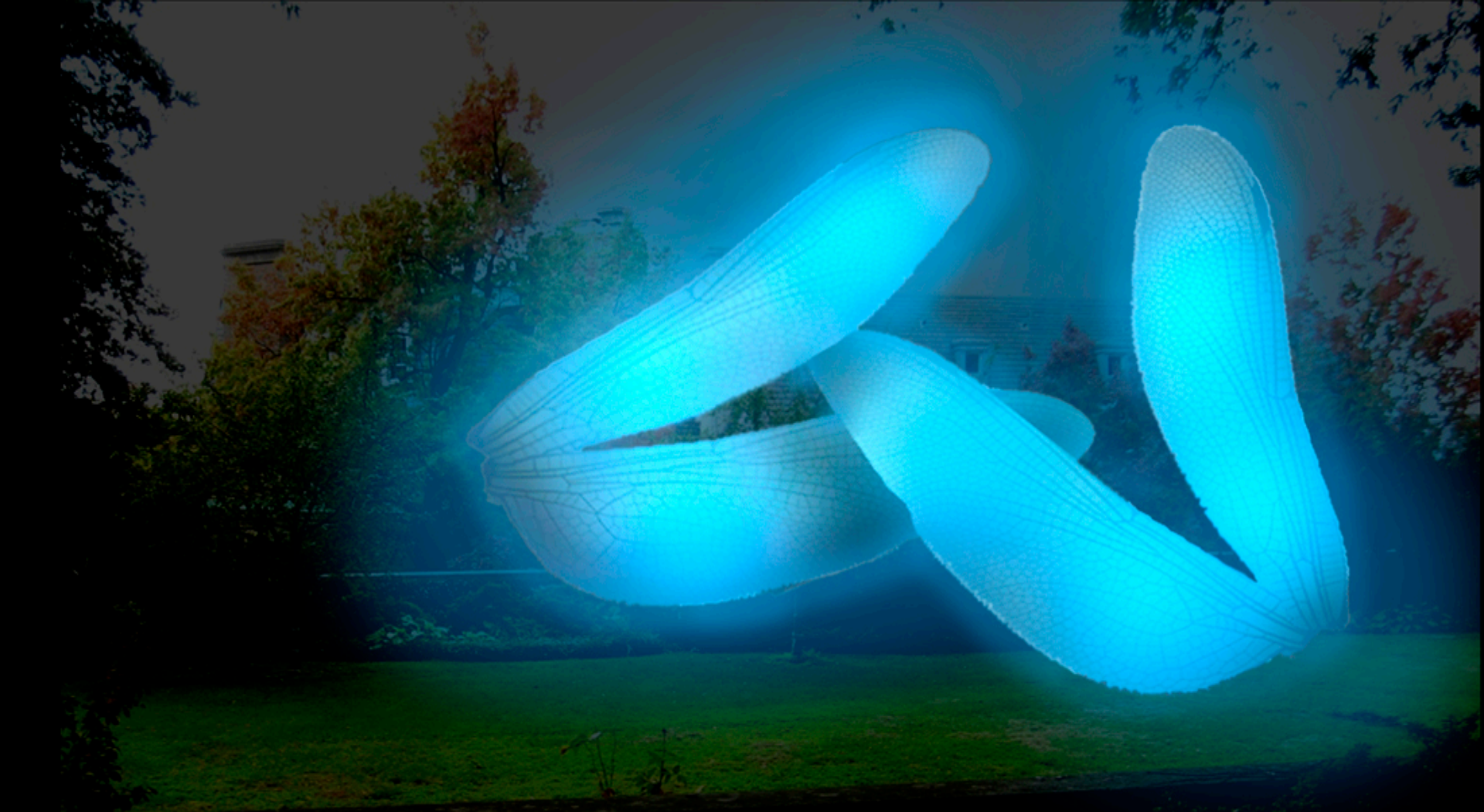
**SelectCity Shopping Center, Saket, New Delhi, Island  
Black ultra-violet/ white halogen, 3 by 3 meters Each per unit, native plants, March  
2011**



**KHOJ International Artist's Organization Studies, New Delhi, India  
Black ultra-violet, room size 3 by 3 by 5 meters, March 2011**



**Inspired by the microscopic scales on moth wings.  
Lafayette College, Easton, PA, USA Black ultra-violet, each unit 1 by 8 meters,  
July 2011**



***2012 Washington DC Variation  
Smithsonian National Zoological Park***

# Public and educational programs experiential enviro-ed curriculum/ workshops



**Insect Summer School  
New Orleans, LA, August 2011**

**Insect Festival @ [space]  
London, England  
September 30, 2007  
Commissioned by the Arts  
Catalyst**



**Primary focus of scientific research and ecological art: 1996-current:  
*Amphibians as 'bio-indicator' species***

**Of the known 6,500+ species,  
almost 1/3 of them are already  
gone or are declining.**



**Amphibian deformities have been  
reported in six continents and  
appears to be increasing**

## **Primary biological research questions:**

- 1. What are the proximate causes (underlying mechanisms) for amp deformities among naturally occurring populations?**
- 2. Are higher than “normal” levels of abnormalities and injuries diagnostic of environmental decline?**
- 3. Are malformations increasing and what does this mean?**



## **Research methods:**

- 1. Comparative wetland surveys of amphibian populations at sites deemed as “pristine” versus those “degraded”**
- 2. Scoring varied age-classes of anurans (frogs and toads) for obvious injuries and deformities**
- 3. Experimental (laboratory controlled) simulations with anuran larvae**
- 4. Analysis of preserved specimens from natural history collections**



**Examining amphibians from agriculturally polluted study site in Southern Quebec, Canada.  
Photograph 2009 by Marie-Chantale Desrosiers**

## Types of Hind limb Deformities

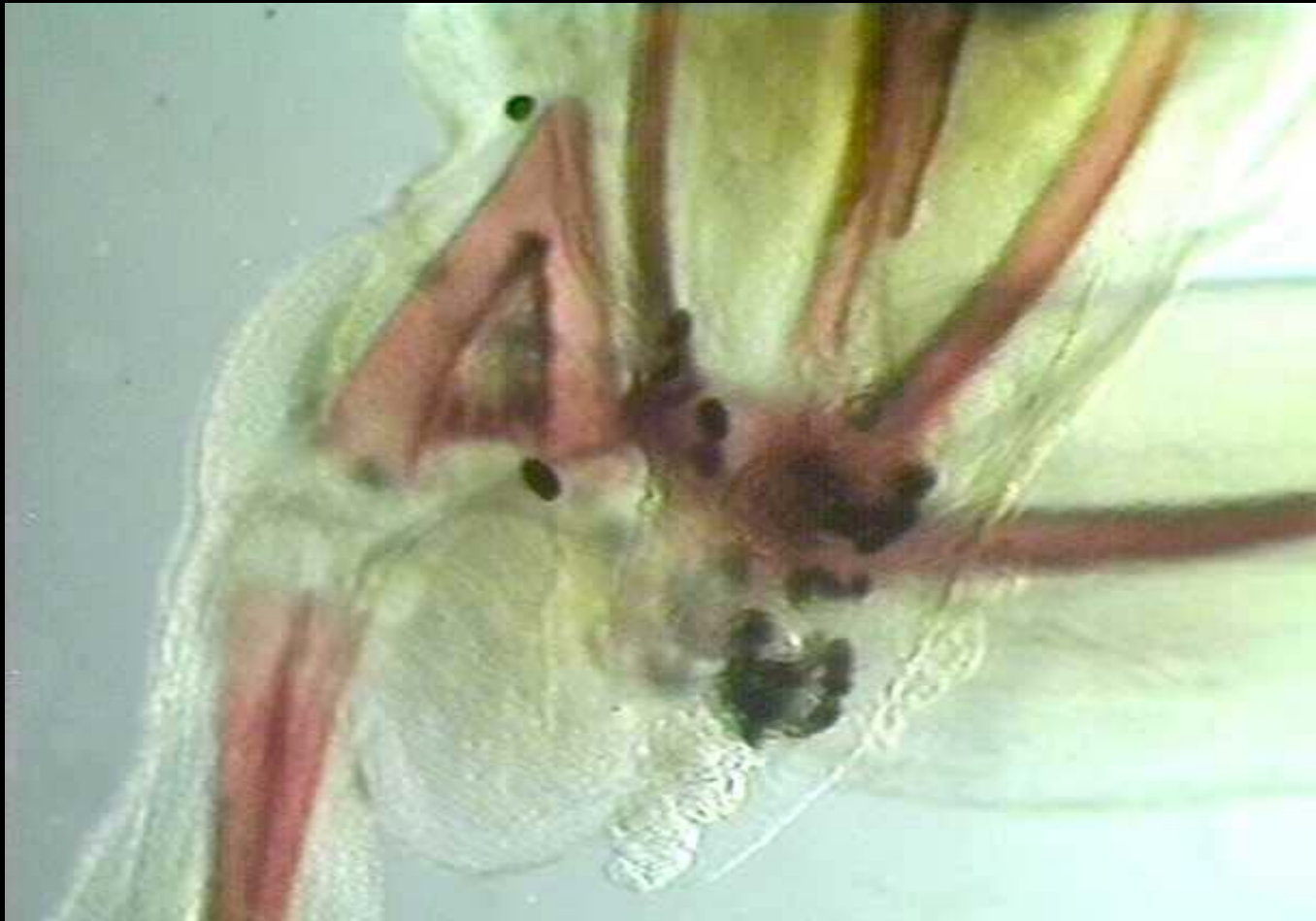
1. **“Extra”** limbs- rarely occurring and mostly reported in Western United States.
2. **“Missing”** limbs- The vast majority and occur throughout North America and internationally.

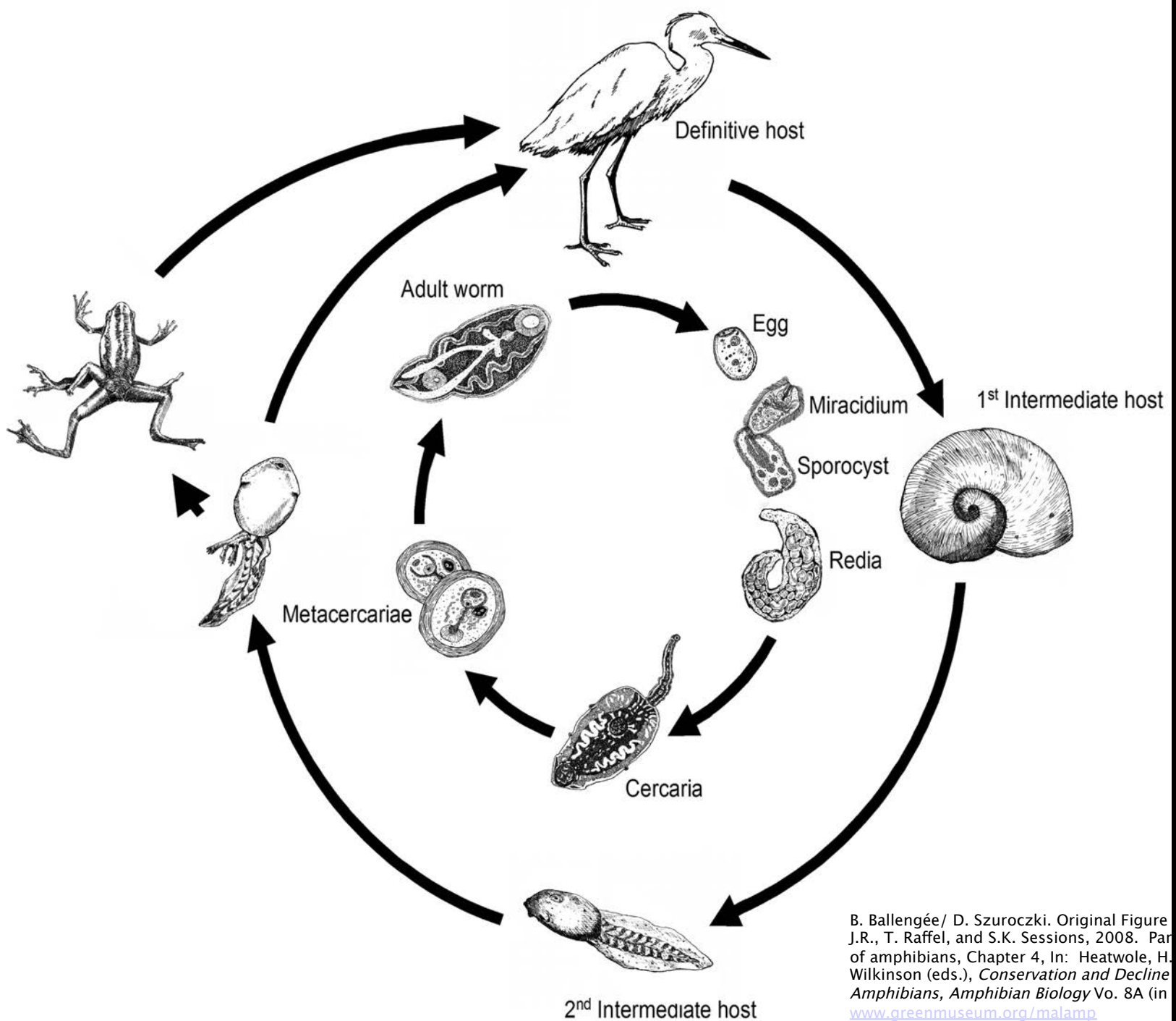


Established proximate cause: “extra limbs”

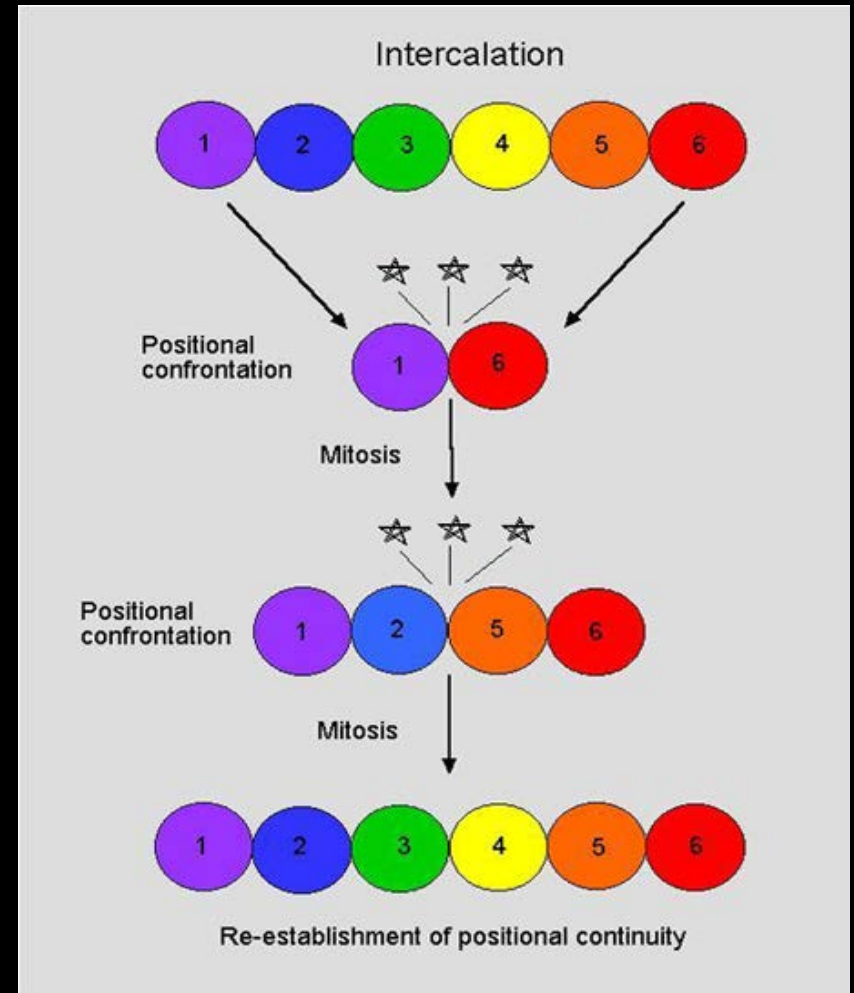
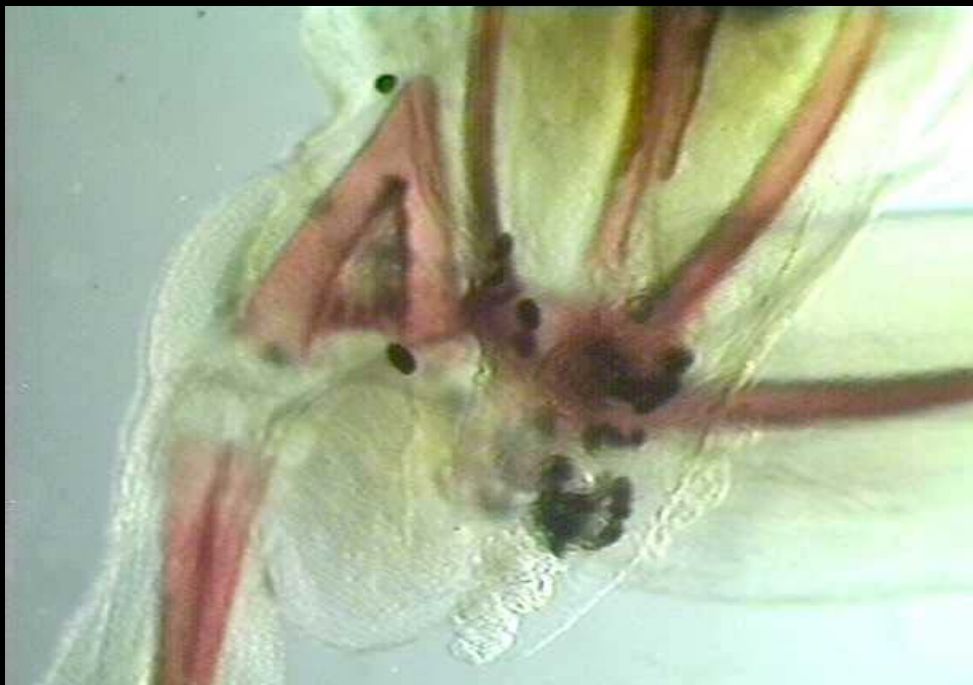
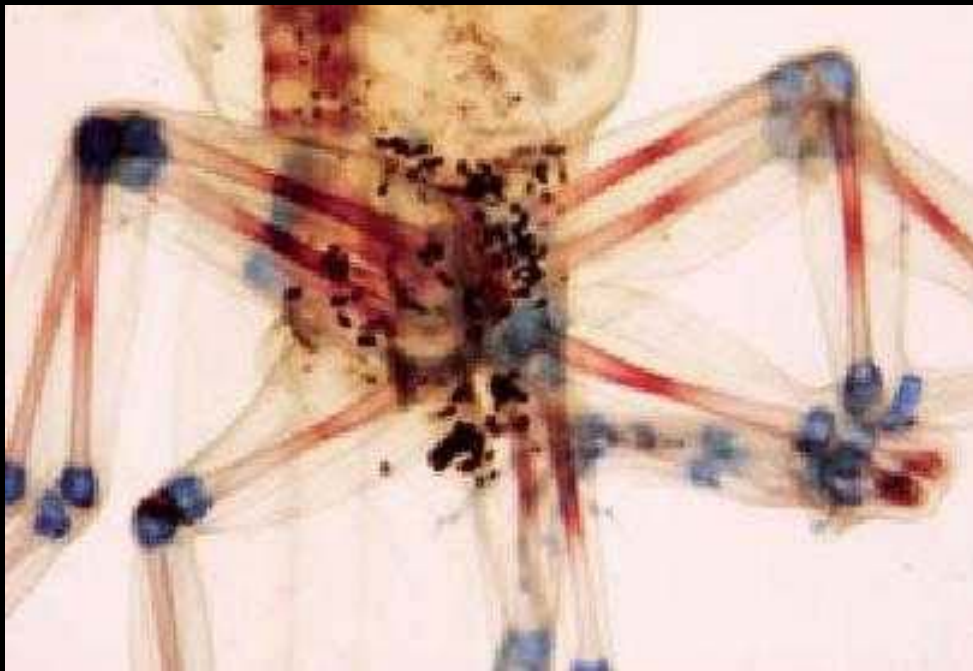
***Emerging disease:***

Parasitic infection by trematode  
(*Ribeiroia ondatrae*)





B. Ballengée/ D. Szuroczki. Original Figure J.R., T. Raffel, and S.K. Sessions, 2008. Part of amphibians, Chapter 4, In: Heatwole, H. Wilkinson (eds.), *Conservation and Decline Amphibians, Amphibian Biology* Vo. 8A (in [www.greenmuseum.org/malamp](http://www.greenmuseum.org/malamp))



**Images and diagram**  
**Copyright Stanley K. Sessions from**  
[http://info.hartwick.edu/biology/def\\_frogs](http://info.hartwick.edu/biology/def_frogs)

possible causes: “missing limbs”

1. Chemical pollution

2. Parasitic infection

**3. *Selective Predation***

4. 4. Some combinations of factors





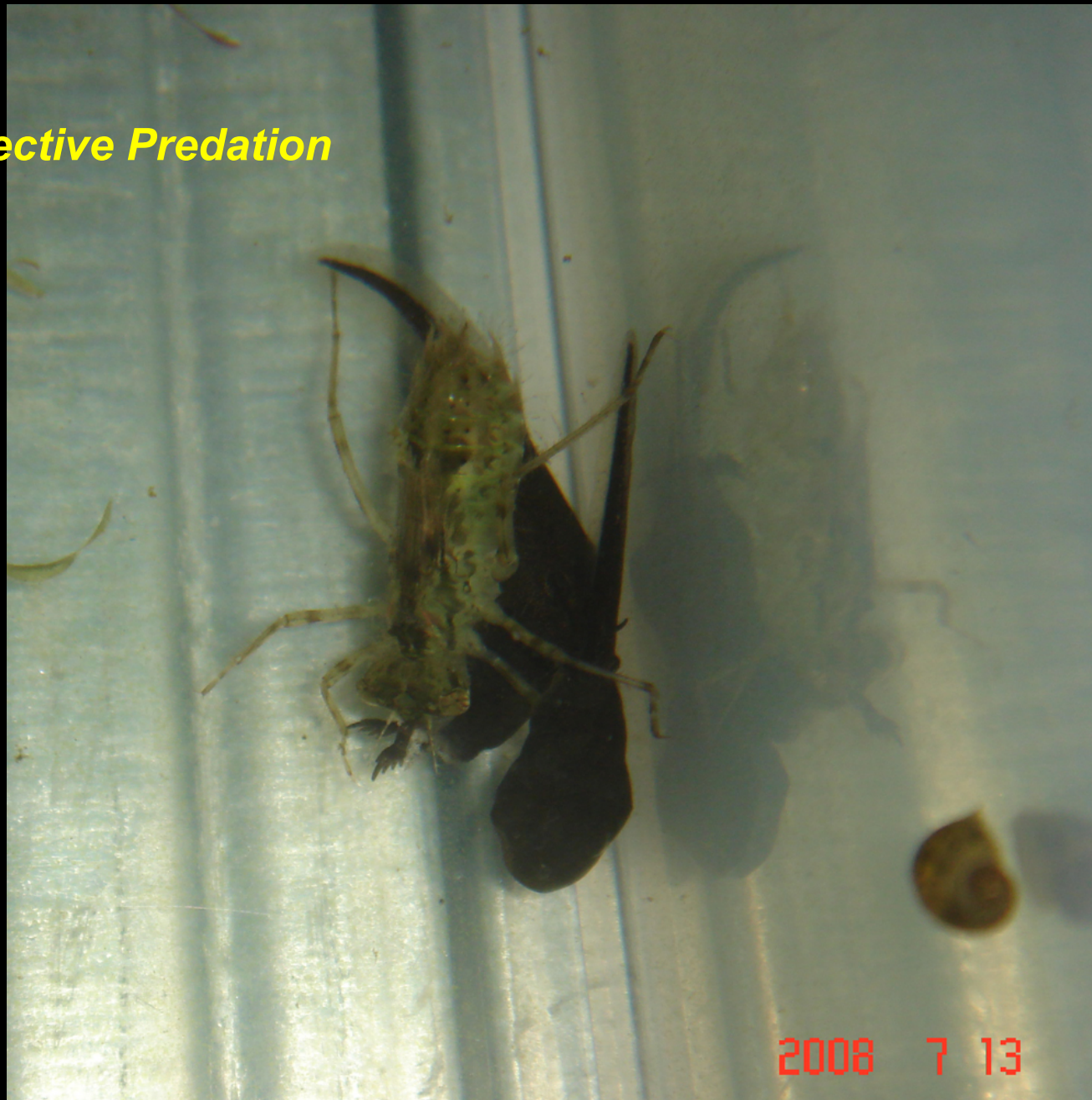
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Experimental (laboratory controlled) simulations with anuran larvae and varied **predators**



**Selective Predation**



## **Selective Predation**



Figure 6. Selective predation by dragonfly nymph on a toad tadpole resulting in amputation of the right hind limb; a: immediately after attack; b: same tadpole 10 days after attack. Right hind limb area has completely healed, resulting in a permanent limb loss.



Figure 4. Deformed hind limbs in wild-caught *B. bufo* tadpoles (top row) compared with hind limb deformities in tadpoles ((bottom row) induced by selective predation by captive dragonfly nymphs. Note protruding bone in the tadpoles second from left end in each row.

*Anax species nymph with Greenfrog tadpole*  
*From laboratory simulations*  
*Summer 2009*



**Selective Predation**

***Selective Predation***



**Hind-limb removed by Green darner dragonfly nymph in Green frog tadpole in 2009 experimental simulations.**



**Green darner dragonfly nymph induced deformed metamorphic Green frog with no obvious signs of prior injury such as of scaring from 2009 experimental simulation. Traumas incurred to tadpoles can often be masked by the healing ability of amphibians (Sessions & Ballengée, 2010).**



**Detail of severely deformed hind-limb from metamorphic Green frog from 2009 experimental simulations. Note extra digits on abnormal limb suggesting cellular intercalation (Sessions & Ballengée, 2010).**



*Selective Predation*



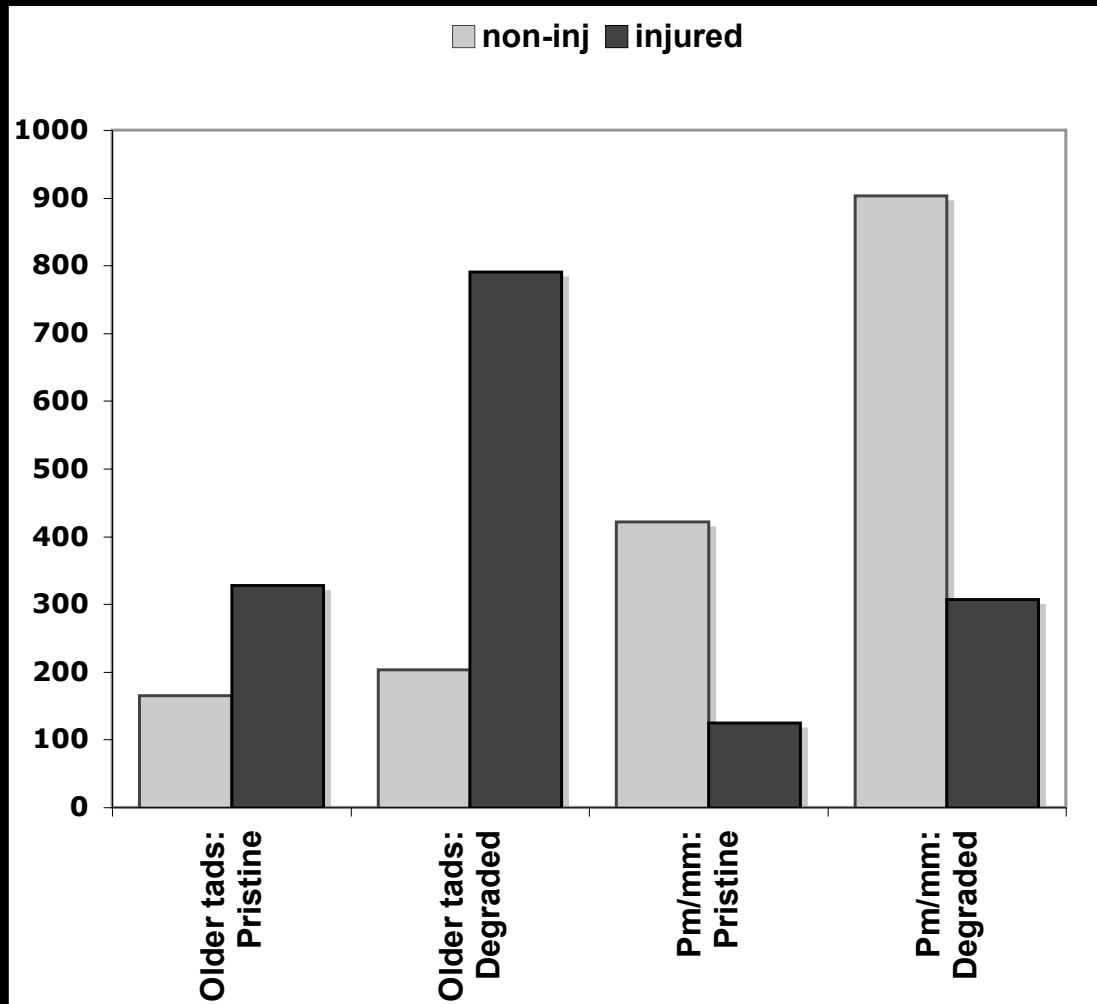
**Woodfrog tadpole predatory injury from larval dragonfly. Ballengée & Green, 2010**



**Range of permanent  
'missing limb'  
Deformities in peri-  
metamorphic  
Woodfrogs from  
Odonate  
experiments**

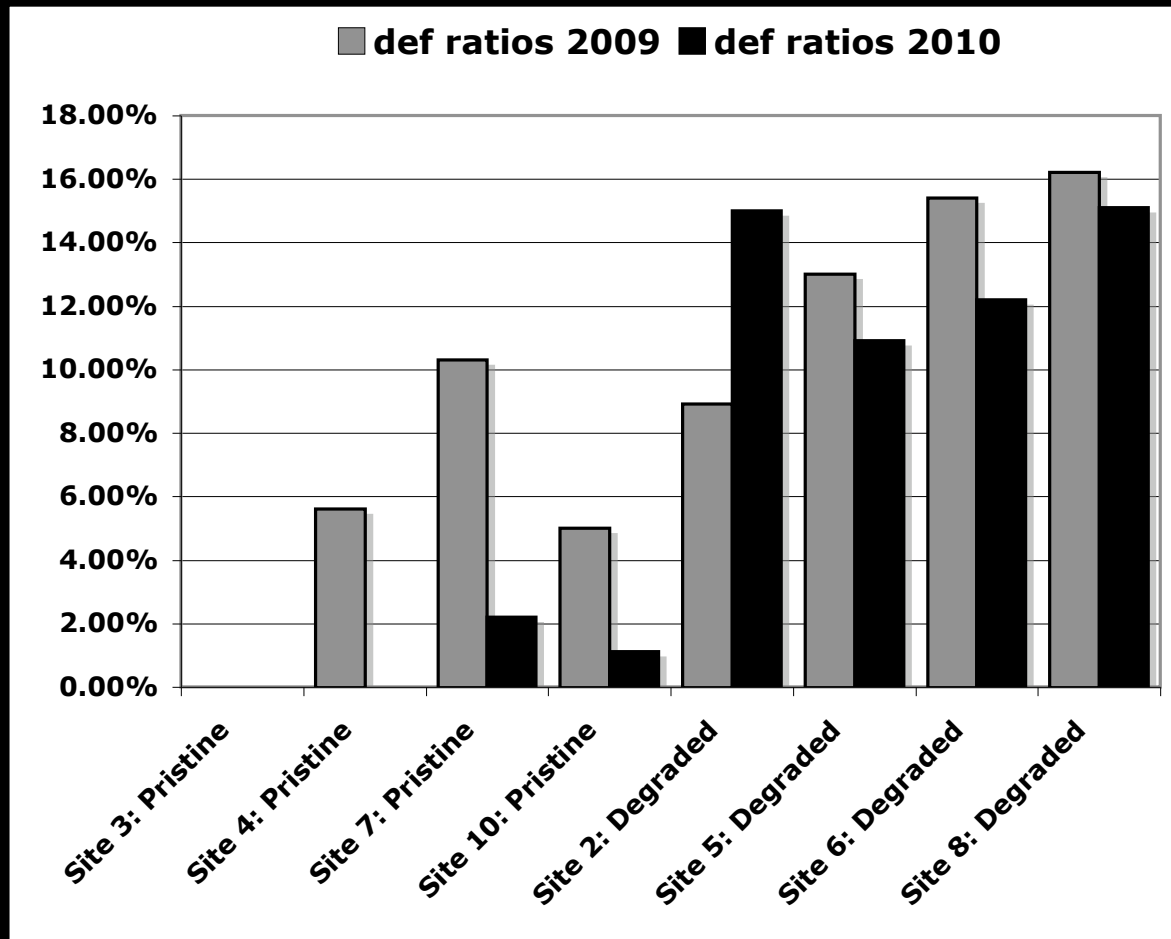


**2009 volunteer “Frog Team” members and myself examining amphibians from agriculturally polluted study site in Southern Quebec, Canada. Photograph 2009 by Marie-Chantale Desrosiers**



## Frequency of tadpole injury increases as environmental quality of wetland declines: from Ballengée & Green, 2011

During the 2009/10 field seasons, 20.3% of 991 total older Green frog tadpoles at “degraded” wetlands showed no obvious signs of injury compared with 33.5% out of 493 found at wetlands characterized as “Pristine”. Likewise, 74.6% of 1,210 examined peri-metamorphic/metamorphic total Green frogs were found with no injuries at “Degraded” wetlands compared with 77.2% of 545 examined from wetlands that were more pristine.



## Frequency of deformities among young frogs increases as environmental quality of wetland declines: from Ballengée & Green, 2011

2009/2010 Ratios of deformities among peri-metamorphic/ metamorphic Green frogs ( $n=1,748$ ) at all field sites. Sites 3, 4, 7, and 10 were characterized as “Pristine” compared sites 2, 5, 6, and 9 characterized as “Degraded”. Overall 2009/10 deformity ratios among sampled frogs at ‘pristine’ sites was 5.2% (slightly higher than the suggested baseline of less than 5%) compared to 13.1% at ‘degraded’ sites.

## **Analysis of Museum Specimens**

Preserved anuran larvae from varied natural history collections have been analyzed for hind limb deformities and injury. The proportions of injured/ deformed to "normal" preserved specimens will be utilized to perform a large statistical analysis of the prevalence of limb deformities among historic versus contemporary frequencies.



Historic (1937) *R. catesbeiana* tadpole with missing digits and partial limb truncation, The Fields Museum, Chicago, Illinois. Photographed October 2008



**Historic (1864) *R. temporaria* tadpole with limb truncation, Turin Museum of Natural History, Italy. Photographed July 2010**

## **Art & Ecological Activism Components:**

- 1. *Eco-Actions*: Participatory “citizen science” public ecological surveys**
- 2. Public BioArt Laboratories: functioning temporary research centers with volunteer involvement**
- 3. Ecological Art Installations: environmentally themed exhibitions**



***Eco-Actions***= Public participation in preliminary and primary field research/ experiential environmental field-trips



June 2008, Yorkshire Sculpture Park, England



**Yorkshire Sculpture Park, England *Eco-Action* from 2006-08 Malamp UK studies.  
Photograph 2008 by Jonty Wilde**



**Piedmont, Italy *Eco-Action* from 2010 Malamp IT studies. Photograph 2010 by Orietta Brombin**



Lough Boora, Ireland *Eco-Action* from 2010 Common frog/ *Rana temporaria* studies.  
Photograph 2010 by Kevin O'Dwyer

# Public Bio-Art Laboratory

Summer 2008, Yorkshire Sculpture Park, Wakefield, England

Open discussion and public participation experimental simulations-  
volunteers assisted to set-up and monitor throughout summer





2008 Public BioArt Laboratory, Yorkshire Sculpture Park, Wakefield, England. Photograph by Brandon Ballengée\_

# Public Bio-Art Laboratory: Summer 2009, SAT, Montréal



Open lab day at the 2009 Public BioArt Laboratory, La Société des arts technologiques [SAT], Montréal, Canada.  
Photograph by Francis Pineau\_



**DFA 83, Karkinos**  
**In scientific collaboration with**  
**Stanley K. Sessions. MALAMP**  
**titles in collaboration with the**  
**poet KuyDelair**  
**2001/07**

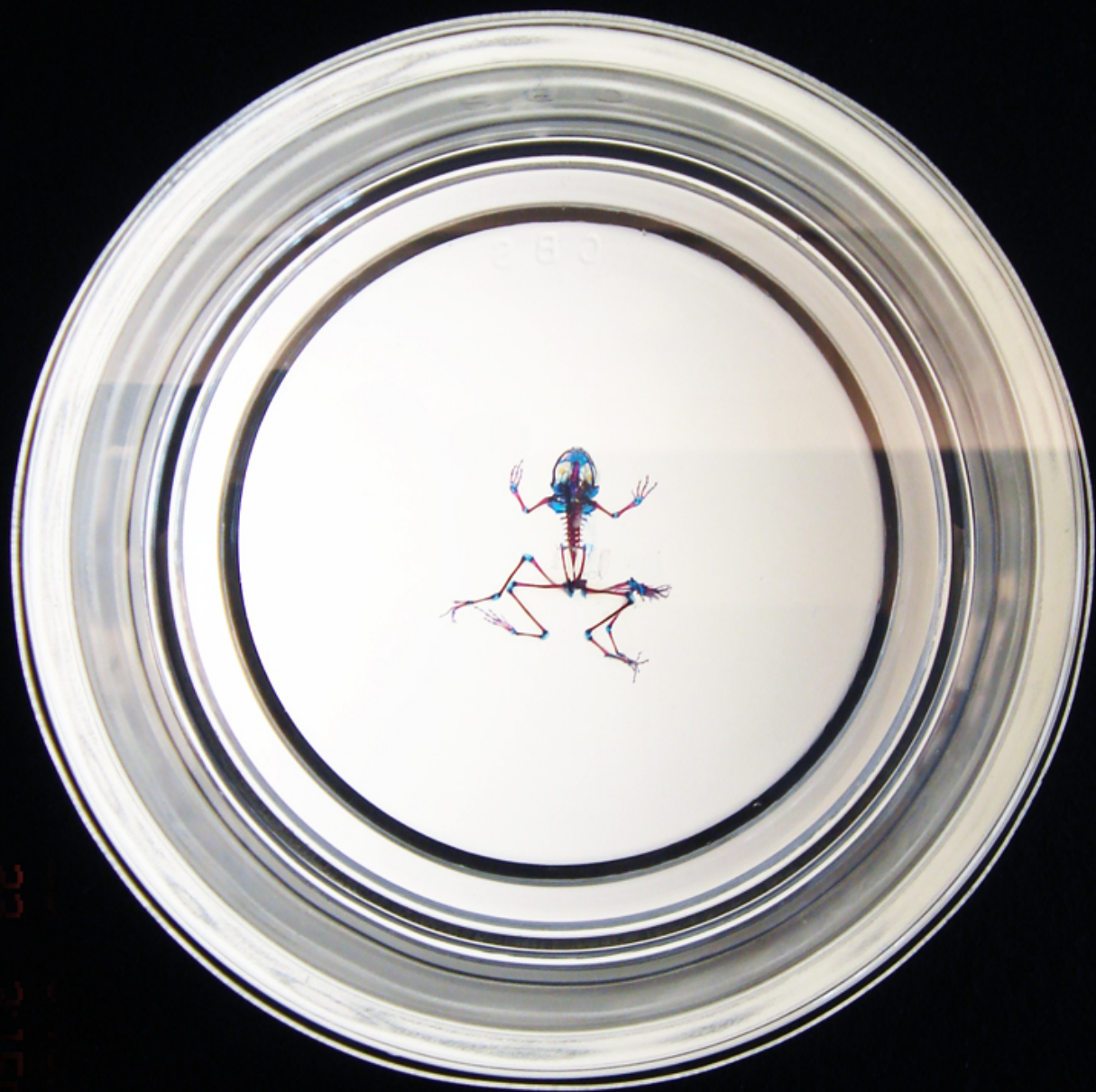




DFA 23, Khárôn  
2001/07



**Comafosca node d' art i pensament a Alella, Barcelona, 2007**



23 015



Gallery 400, Chicago, fall 2008



The Royal Institution of Great Britain, London. March 2010



**Parco Arte Vivente, Centro d'Arte Contemporanea, Torino, Italy, 2010**



**Parco Arte Vivente, Centro d'Arte Contemporanea, Torino, Italy, 2010**

The background features a repeating pattern of dark, teardrop-shaped silhouettes, possibly representing seeds or small leaves, scattered across a light, off-white background. The silhouettes are oriented in various directions, creating a sense of movement and depth.

***Thank you***