Praeter Naturam

Beyond Nature

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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
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 focus of scientific research and ecological art: 1996-current: *Amphibians as ‘bio-indicator’ species*
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)*
possible causes: “missing limbs”
1. Chemical pollution
2. Parasitic infection
3. Selective Predation
4. Some combinations of factors
Experimental (laboratory controlled) simulations with anuran larvae and varied **predators**
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
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 to 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 (1864) *R. temporario* 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
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
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
Comafosca node d’art i pensament a Alella, Barcelona, 2007
Thank you