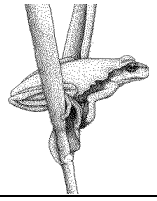
 ISSN 1026-0269

FROGLOG

Newsletter of the IUCN /SSC Amphibian Specialist Group (ASG)

December 2006, Number 78



Impacts of clearcutting on amphibians after 20 years of forest re-establishment

By: Don R. Church, Henry M. Wilbur and Larissa Bailey

The long-term impacts of forestry practices on amphibian populations remain uncertain. Several studies in eastern North America have previously shown that clearcutting of upland forests results in a reduction in the number of pond-breeding amphibians that migrate to breeding sites. However, in general, deciduous forests of eastern North America are considered relatively resilient to logging. A remaining question therefore is how amphibian populations respond to forest reestablishment – a process that is underway in over 100 million hectares in eastern North America alone.

We explored this question in an amphibian assemblage that utilizes a system of natural sinkhole ponds within the George Washington and Jefferson National Forest in Virginia, USA. Between September 1999 and August 2004, we monitored populations of 18 pond-breeding amphibian species at 3 ponds, each approximately 330 meters in circumference, using drift fences, with pitfall traps at 10 meter intervals that completely encircled each pond. Two types of matrix – a clearcut that was logged in 1989 (hereafter referred to as clearcut) and forest that has not been logged since the early 1900's (hereafter referred to as forest), surround each pond in similar proportions. We compared the per-pitfall trap counts of each amphibian species entering ponds from clearcut versus forest habitats across years. Of the 149,756 amphibians that were captured and included in our analysis, 17 of 18 species at all ponds in all years migrated to ponds in significantly smaller numbers from the clearcut habitats than from the forest habitats associated with each pond. The one exception was the spring peeper, *Hyla crucifer*, which was caught in significantly larger numbers entering from the clearcut habitat at each pond. These results raised the question: Why exactly do fewer amphibians migrate to ponds from clearcut habitats after 20 years of forest reestablishment? The answer to this question has important implications for how amphibian populations should be managed in landscapes where forestry is practiced. Competing hypotheses include:

1) Low counts of animals may simply reflect historical effects of initial tree harvesting on demographic parameters (i.e., populations in clearcuts have not yet rebounded from mortality, reduced reproduction, or habitat biased movements that occurred 20 years ago).

2) Survival, annual breeding probability or fecundity remains reduced in clearcuts.

3) Animals avoid clearcuts via their movements even after partial forest reestablishment.

4) Combination of above factors.

We have begun to address these competing hypotheses with a capture-recapture study of marbled salamander (*Ambystoma opacum*) populations that are associated with each pond. We used photos of natural markings on the dorsal surface of *A.opacum* to reconstruct capture histories of individuals. Computer assisted pattern-matching software developed specifically for *A. opacum* by Lex Hiby of Conservation Research Ltd. (Cambridge, UK) drastically reduced the number of photo comparisons that needed to be made by eye. Individuals had overall high fidelity to their point of entry to and exit from a pond within and across years.

Using recently developed multi-state mark-recapture methods (Bailey *et al*., 2004) and multimodel inference (Burnham & Anderson, 2002) we found that survival probabilities within both breeding and non-breeding seasons varied among years, populations, and between habitats. Annual survival probabilities ranged from nearly 1 to 0.25 in females and from nearly 1 to 0.48 for males. One consistency in survival probabilities among populations was that both female and male salamanders experienced dramatic mortality during the non-breeding season in a drought year (2001-2002). Interestingly, a previous analysis (Church *et al*., i*n press*) revealed that the sympatric tiger salamander (*Ambystoma tigrinum*) did not incur high mortality during the non-breeding season of the drought year suggesting that these species differ in their vulnerability to dry conditions or in what microhabitats they utilize in the upland habitats. Unexpectedly, habitat differences in survival were overall not consistent across time or among populations. Survival probabilities varied such that probabilities were sometimes lower and sometimes higher in clearcut habitats. This finding indicates that survival is influenced by complex interactions among habitat variables, populations and climate.

Breeding probabilities varied among populations and were found to be Markovian (dependent on whether or not an individual bred in the previous year), ranging from 0.22 to 0.52 for animals that had bred the previous year and from 0.63 to 0.86 for animals that had skipped breeding for at least one year. Breeding probabilities also differed between clearcut and forest habitats within each population – they were lower for animals entering ponds from clearcuts at two populations by more than 30% but higher at the third population by 29%.

Movement probabilities among the 3 populations were low (<0.001-0.08). In contrast, movements between forest and clearcut habitats within populations were often high and heavily biased towards leaving clearcuts in favour of forest habitat in two populations but marginally in favour of clearcuts in the same population where clearcut animals had higher breeding probabilities.

The reasons for these differences in clearcut effects among populations remains unclear but may be due to different geologies underlying the clearcuts areas. Differences in alluvial rubble in the landscape are known to influence local hydrology of ponds (nearby ponds fill and dry on very different schedules) and may also create differences in the quality of habitats for the subterranean lifestyle of marbled salamanders. Overall, our results so far indicate that forest clearcutting can have major impacts on some demographic parameters even after 20 years but that other landscape features may override these effects under certain conditions. A complete answer to the question of whether these differences in demography account for the differences in abundances in animals between habitats awaits population projections.

References:

Bailey, L. L., W .L. Kendall, D. R. Church & H. M. Wilbur. (2004). Estimating survival and breeding probabilities for pond-breeding amphibians using multi-state models. Ecology **85**:2456-2466.

Burnham, K. P., and D. R. Anderson. (2002). Model selection and multimodel inference: a practical information-theoretic approach. 2nd Edition. Springer-Verlag, New York, New York, USA. 488 pp.

Church, D.R., L.L. Bailey, H.M. Wilbur, W.L. Kendall &J.E. Hines. Iteroparity in the variable environment of the salamander *Ambystoma tigrinum*. Ecology (*in press*).

For further information please contact Don Church at: *dchurch@conservation.org*

The Mexican Axolotl (*Ambystoma mexicanum*)

By Luis Zambrano

The Mexican axolotl (*Ambystoma mexicanum)* is endemic to the Mexican high plateau and has a recent evolutionary history (less than 10 thousand years). For centuries it inhabited the large wetlands that used to occupy most of the Mexican Valley. Today, its distribution has been reduced to only two remaining water bodies: Xochimilco and Chalco. Both systems have been under pressure from human activities. Chalco was dry for many years reducing water as a result of a reduced water table, leaving only a few small ponds for the species to survive in. Fortunately, in recent years this small water system has been growing due to a lake restoration programme to avoid dust storms and axolotls have been seen. Xochimilco has been under pressure as a source of water since the Aztecs first settled in the area in XIII AC. Today, Xochimilco receives water from a water treatment plant instead of natural springs and suffers from domestic sewage. In addition, increased tourist activity is poorly regulated and adds further pollution. Introduced species of carp and tilapia (which are now considered pests) are a further threat creating erosion problems on banks, by their feeding and reproduction behaviour changing the trophic web structure, and reducing spatial heterogeneity.

The environmental problems in Xochimilco are considered to have reduced axolotl populations. In six years (from 1998 to 2004), axolotl density has reduced from 0.006-org/ m^2 to 0.001-org/ m^2 (Zambrano *et al.,* 2004). This reduction could also be related to its own population dynamics. As egg production is quite high (more than one thousand eggs are laid by healthy females), it suffers from elevated mortality within the first year. These factors have caused some prominent fluctuations in axolotl population dynamics over the years. These fluctuations produce high population declines in some years, but also large increments in others, causing low extinction probabilities. However, extinction probabilities can rise up to 100% in the next 50 years if the mortality rate of eggs and larva increases to less than 5% (Zambrano *et al., submitted)*.

Reductions in egg and larvae survival rates are related to the female's capacity to lay eggs. Studies have shown that axolotls have particular preferences for laying eggs on plants that help to create more spatial heterogeneity (Martinez, 2007). Plants that provide shadows and holes where eggs and larvae can hide and find food are preferred, suggesting that females search for places where their eggs will have better survival rates. However, pollution and bank erosion have decreased the number of suitable locations and structures for laying eggs. This results in the possibility of reduced reproduction rates.

Another threat which has been increasing in the last few years is the biomass of introduced carp and tilapia - 80 times higher than the biomass of native organisms within Xochimilco: carp eat axolotl eggs, while tilapia prefer to eat recently hatched axolotl larvae. Therefore, the risk of predation of axolotl eggs and larvae by these two exotic species is high and has been increased by the reduction of the spatial heterogeneity where axolotls can hide from their predators. These introduced species may also affect adult survival. The large amount of carp and tilapia has modified the trophic

web and with this, the type of food that axolotls normally eat.

Axolotls are visual predators and hunt small fish and insects, but as the tilapia and carp are competing for the same resources, research shows that the axolotl has switched its feeding habits to include small chironomids and algae (Valiente-Riveros, 2006). Apparently, this has produced smaller axolotls with possibly reduced survival capacity. Studies reflect this in the reduction of axolotl distributions within Xochimilco (Contreras, 2006).

Not all the channels, lakes and wetlands that comprise the Xochimilco water system are suitable habitat for the axolotl. It seems that they can only survive in channels and lakes with particular characteristics, such as higher transparency, higher salinity concentrations and less abundance of exotic species. Currently, from the 180 km of channels which comprise the system, there are only about five areas with a longitude smaller than 10 km that seem suitable for permanent axolotl populations.

The future of the axolotl's survival in the wild is uncertain. However, this organism has suffered from human activities for centuries and has always managed to survive. This has given a little hope for many researchers that are now involved in studying the axolotl in order to ensure its conservation within its own environment. The group is called GIAX (The Axolotl Research Group-Xochimilco) and has been formed by researchers from different academic and governmental institutions of Mexico such as the Institute of Biology-UNAM, Centro de Investigaciones Biologicas y Acuicolas de Cuemanco (CIBAC), UAM-Xochimilco, Chapultepec Zoo, CONABIO and international organizations such as The Durrell Institute for Conservation and Ecology (DICE), The (former) Declining Amphibian Populations Task Force and The IUCN/SSC Amphibian Specialist Group (ASG). With the help of local people, GIAX continues to generate information to create better policies for axolotl conservation. Using both scientific and local knowledge, this group has created new programmes for environmental education. To date, more people are getting involved in the project and local authorities are generating new concerns for conservation, which we hope will result in improved conservation action for the Mexican axolotl and its habitat.

References:

Contreras, R. E. A. V. (2006). Distribución potencial del Ambystoma mexicanun en los canales de la zona chinampera de Xochimilco. Tesis de Licenciatura en Biología. UNAM-México pp. 49

Martínez, A. I. 2007. Sitios de reproducción del ajolote (*Ambystoma mexicanum*). Tesis de Licenciatura en Biología, UNAM-México. In preparation.

Valiente-Riveros, E. (2006). Efecto de las especies introducidas en Xochimilco para la rehabilitación del habitat del ajolote (*Ambystoma mexicanum*). Tesis de Maestría en Restauración. UNAM-México. pp.

Zambrano, L. V. H. Reynoso and G. Herrera. (2004). Abundancia y estructura poblacional del ajolote (*Ambystoma mexicanum*) en los sistemas dulceacuícolas de Xochimilco y Chalco. Informe de la CONABIO. AS004. México.

Zambrano, L, G. Herrera, E. Prado and V. H. Reynoso. A population matrix model and PVA for the management of *Ambystoma mexicanum*) (*Submitted*).

For further information please contact: Luis Zambrano at: *zambrano@ibiologia.unam.mx or* visit the GIAX web page: *http://ajolote.ibiologia.unam.mx/*

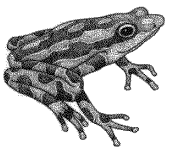
DAPTF Seed Grants

Recipients of Seed Grants from the former DAPTF are generally expected to publish the results of their projects in refereed journals, or as articles in *Froglog*. The following papers report work supported by previous DAPTF Seed Grants:

Gower, D. J., Oommen, O. V. & Wilkinson, M. (2006). Marking amphibians with alpha numeric fluorescent tags: caecilians lead the way. *Herpetol. Re.:* **37:** 302. (*d.gower@nhm.ac.uk*)

Werner, J. K., Heinz, G. & Lichtenberg, J. (2006) The status of two northern leopard frog populations in western Montana. *Herpetol. Rev.* **37:** 325-330. (*jkw@ronan.net*)

Tim Halliday



The 12th a meeting of the African Amphibian Working Group (AAWG)

By Mark-Oliver Rödel, Johannes Penner, S. Gilles Armel Nago and Brice Sinsin

The 12th meeting of the African Amphibian Working Group (AAWG) was held from the 14-17 of August 2006 at Abomey, Benin, West Africa. After the meeting, most participants joined an Amphibian Workshop in the Pendjari National Park from 19-22 August.

The AAWG is a loosely connected (no official association) group of people interested in all kinds of research concerning African amphibians and is open to everyone. The meeting is held at irregular intervals, mostly every 2-4 year, at varying places. The last meeting took place from 19-21 April 2002 in Watamu, Kenya and was, apart from South Africa, the first in a sub-Saharan African country. This year's meeting was the first in West Africa and was organized by us with the financial support of the former Declining Amphibian Populations Task Force (DAPTF), The German Herpetological Society (DGHT), Christina Richards and the Biodiversity Monitoring Transect Analysis in Africa (BIOTA).

Africa can still be regarded as a continent that is very much neglected, in terms of herpetological research, compared to regions such as South America. In addition, most research on African amphibians has been conducted by European, American and South African researchers. Therefore, the specific aim of this meeting was to support and enhance the herpetological capacity of students originating

from tropical African countries. We raised funds to partially cover travel and conference costs and offered a post-conference workshop in the savannah region of the Pendjari National Park, northern Benin.

The participants comprised researchers and graduate students from ten countries: Benin, Cameroon, Germany, Ivory Coast, Kenya, Netherlands, Nigeria, South Africa, Switzerland and the United States of America. The conference was held in Abomey, the old capital of the formerly famous West African kingdom of Dahomey, and covered topics including: the outcome of faunistic surveys, taxonomic and phylogenetic investigations, human influence on amphibians by habitat conversion and degradation, conservation of amphibian communities as well as of particular species, amphibian diversity, macro-ecology and distribution, amphibian decline and chytrid fungus, amphibian parasites and nutrition (of frogs and human frog consumption). The participants also gained a valuable first impression of the diversity of West African frogs throughout a conference field trip to the semi-deciduous Lama forest and the permanently inundated Lokoli forest.

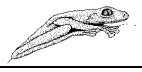
The Pendjari workshop covered topics and activities including: an introduction to West African savannah amphibians through various field trips; the collecting and preserving of frogs to establish voucher and reference collections; tissue sampling for genetic investigations; swabbing frogs for chytridiomycosis and checking tadpoles for respective symptoms; collecting and processing acoustic data, collecting and processing frog parasites; the collecting of qualitative and quantitative field data (adults and tadpoles); and collecting abiotic data (e.g. temperature) for ecological studies.

We believe the conference was a great success as more than half of the participants were graduate students, mostly coming from West and East African countries. Its success also provides hope that this still neglected continent will in the future produce autochthonous herpetologists and thus catch up with other tropical regions of the world.

We are especially grateful to the above listed donors, without their support this conference would not have been possible; to all senior herpetologists who successfully motivated the students throughout the conference and workshop and were willing to dedicate their limited time for teaching; to the University Abomey-Calavi for the support with various technical equipment and local knowledge and the Pendjari Park Project for allowing housing and field trips in the Pendjari area.

A Mertensiella volume (published by the German Herpetological Society) will be devoted to the conference contributions, but will be also open for other papers on African and Malagasy amphibians. For more details please contact M.-O. Rödel or check the webpage mentioned below. The next AAWG meeting will be held in 2008 in Tanzania. Kim Howell, Charles Msuya, and Wilirk Ngalason will be arranging this meeting that very probably will take place in Arusha.

For further information please contact*: roedel@biozentrum.uni-wuerzburg.de* or online at: *http://www.biozentrum.uni-wuerzburg.de/amphibien_workshop0.html*



Froglog Shorts

Helping toads across the road

European toads (*Bufo bufo*) die in huge numbers on Europe's roads and motorways; it is estimated that a toad has only a 5% chance of crossing a motorway alive. A beautifully-produced DVD, *Vida de Sapo*, examines this problem and describes the measures taken by a group in Spain to reduce toad mortality on one stretch of road. The commentary is in Spanish and English. The DVD is available from: Oficina de Medio Ambiente, Universidade de Vigo, Campus Universitario, 36310 Vigo, Spain.

Tim Halliday

Frogs and Other Amphibians

Photography: Paul Starosta
Text: Teddy Moncuit

From tiny, exquisitely coloured frogs to immense toads, the creatures featured in this book represent some of nature's most remarkable examples of decoration, self-defence, and adaptability. However, more than just a visual showcase for nature's genius, the introductory and accompanying texts also bring to light the frighteningly delicate balance in which the survival of all amphibians hangs. This book serves to highlight both the beauty and often-extraordinary abilities of these creatures, and their tragic plight.

Job Announcement

Executive Officer, Amphibian Specialist Group (ASG)

The Amphibian Specialist Group (ASG) is seeking a conservation leader who can take on the global amphibian decline within the broader context of the biodiversity crisis. The ASG, a unit of the IUCN Species Survival Commission, strives to conserve biological diversity by stimulating, developing, and executing practical programs to study, save, restore, and manage amphibians and their habitats around the world. The ASG is taking IUCN's Specialist Group model to the next level of effectiveness through the establishment of a Secretariat that will serve as a dynamic hub to coordinate a global web of stakeholders and to leverage the intellectual, institutional, and financial capacity towards shared, strategic amphibian conservation goals. The Executive Officer will be responsible for coordinating the activities of the ASG to ensure a unified, strategic and sustainable approach to global amphibian conservation, effecting policy change and communicating the work of the ASG to raise the profile of amphibian issues in the public arena. For further details please see the full job announcement: *http://www.parcplace.org/2006-03-24CI.htm*

***FROGLOG* is the bi-monthly newsletter of the IUCN / SSC Amphibian Specialist Group**