Mantella baroni by Franco Andreone

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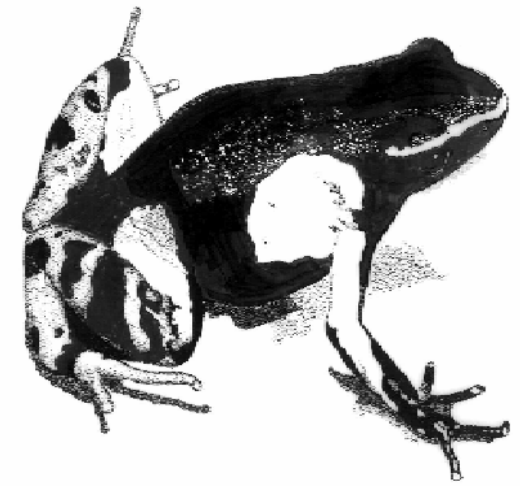

FROGLOG

Newsletter of the Declining Amphibian Populations Task Force

June 2004, Number 63.

Status of Three Species of Toads in North-western Mexico

By Georgina Santos Barrera & Jesus Pacheco Rodríguez
DAPTF Seed Grant holders 2003

Since 1992, the Instituto de Ecologia of the University of Mexico (UNAM) has been conducting ecological studies in the most important prairie dog (*Cynomys ludovicianus*) colonies in North America, these are located in the Municipality of Janos, Chihuahua, Mexico. With the intent of demonstrating the ecological role of the prairie dogs as a key species for the maintenance of vertebrate diversity in the region, we initiated a study of the amphibians and reptiles occurring in the area; these organisms consistently use the prairie dogs' burrows as refugia. Unfortunately, there was no opportunity to evaluate the status of the 7 species of amphibian inhabiting the grasslands over almost 8 years of study. This was mainly because of the severe drought that affected all north-western Mexico for almost 15 years. In recent times, rainfall has increased and populations of some species of amphibian have clearly recuperated whilst others have completely disappeared from the area.

We surveyed three species of toads of the genus *Bufo*: *B. debilis* from the grasslands at Janos municipality, located 50 km south of the U.S. border (UTM's 0749533 N; 3417384 W); *B. mexicanus*, a Mexican endemic occurring in the mountains in north-western Chihuahua (UTM's 0769036 N; 0333659 W) with a few disjunt populations in Durango, (Gergus, 1998); and *B. retiformis* from central Sonora, (UTM's 0474196 N; 32011572 W). Our first main goal was to determine the conservation status of these three species in Mexico and to identify the main ecological factors affecting their survivorship in the arid lands where they live.

We focused our study on the populations of *B. debilis* and *B mexicanus* in north western Chihuahua because of the lack of population data concerning the reproductive biology and conservation of these species in Mexico. The Janos area can be considered as a well-preserved region of grasslands and microphylous shrubland. The study of *B. debilis* population status is part of a larger project developed by the University of Mexico (UNAM) in which the whole herpetological community is being monitoring. *B. debilis* dwells in burrows beneath the soil for about 10 months a year in this region. *B. mexicanus* inhabits banks along the Rio Piedras Verdes in the Sierra Madre Occidental. Finally, populations of *B. retiformis* in Mexico have been previously found in the surroundings of Hermosillo, Sonora, mainly along the road from Hermosillo to Bahía Kino west of the city, and in western Altar (UTM's 0416612 N; 3397717 W). Vegetation in the area is mainly composed of mesquites and sahuaro forests, including a few patches of desert grasslands.

A series of field surveys were conducted in several selected localities during the rainy and dry seasons from June through August of 2002 and August of 2003. Six temporary breeding ponds for *B. debilis* were identified in an area of about 50 km^2. During the breeding season, occurring only after heavy rainfall, each pond was inspected during daytime and then visited during the night to assess breeding aggregations. Populations of *B. mexicanus* were assessed by visual encounter transects using flash-lights along the banks of the Río Piedras Verdes, searching under rocks, logs and low vegetation and into the soil at a 20-30 cm depth.

Individuals were identified in the field and we collected only egg masses and/or larvae to identify species after metamorphosis in the laboratory. In the summer of 2002, we recorded the total number of calling males, surrounding females, amplectant pairs, clutch size, presence of larvae and number of transformed individuals in the ponds. The presence of other species of amphibians and reptiles (as potential predators) was also recorded and identified. We surveyed all sites in two consecutive summer seasons; 2002 was notoriously better for amphibians than 2003.

In Janos Municipality, the rainy season in 2003 was extremely erratic with important thunderstorms delayed until the beginning of August. As a consequence, we detected the presence of only three of the six temporary pools recorded in 2002; two of them still contained water but no individuals of *B. debilis*. The largest single pool for *B. debilis* contained several anuran species such as *B. cognatus*, *B. woodhousei*, *Scaphiopus couchii* and *S. hammondi*. On July 29th 2002 at our breeding site 1, we counted 28 *B. debilis* adult males and 8 females along the pool perimeter (about 110 m X 100 m). At this site, the dominant species was *Scaphiopus hammondi* with 56 males calling in the pool. Partitioning of the breeding pond is quite interesting: *S. hammondi* calls at the pool border, *B. debilis* calls from just 1 - 1.5 m into the pool and *B. cognatus* and *B. woodhousei* call from completely within the pool. The

presence of colubrid snakes was confirmed; an adult *Thamnophis marcianus* swallowed three adult *S. hammondi* and one *B. debilis* in 80 minutes. A juvenile *Hererodon nasicus* was found at the pool border the morning after.

Clutch size in *Bufo debilis* is small with an average of 25 eggs/clutch. No other rainfall refilled the pools and, in the main site, depth changed from 19 cm to 12 cm within three days; after that no other breeding explosion occurred. Finally, at site 5 (sized 10 X 5 m) which was already dried, we observed only recently transformed individuals of *B. debilis*; a concentration of about 5000 metamorphs were found under ground plates with thousands migrating from the pool border into small holes in the soil. As far as we know, this is one of the most important habitats for *Bufo debilis*. Populations in San Luis Potosi and Zacatecas are apparently smaller, as was demonstrated by Torres Cervantes (2003) who recorded only 16 individuals in 5 years of study.

Bufo mexicanus breeds in permanent, moderate rivers and streams with small to medium beaches where they remain under soft sand at depths of 20-30 cm. Three different localities were sampled along the Río Piedras Verdes. We observed important populations mainly at Ignacio Zaragoza town. Transects along the river accounted for an average density of 15 individuals per 1 km in this locality. We consider that this is a healthy population since individuals of different ages were recorded, although we were unable to see tadpoles. This probably means that the reproductive season occurred several weeks before. At the southern locality (Colonia Pacheco) we recorded an average of eight calling males/1 km along the river.

Concerning *Bufo retiformis* (Sonoran Green Toad), we visited fourteen localities in two summer seasons with no success. Like many other desert amphibians, *Bufo retiformis* has explosive breeding activity coinciding with the first thunderstorms of the season; such ecological requirements restrict its activity to a few days per year (Sullivan et al., 1996). Supposedly, it is possible to find individuals after thunderstorms that form pools and fill small dams and cattle tanks (Savage, 1954; Sullivan et al., 1996). The drought is probably responsible for the lower abundance of amphibians and reptiles in the field. Sullivan et al. (2000) stressed the importance of climatic conditions for the activity of the Sonoran green toad in Arizona.

We consider that the intent to remove *Bufo retiformis* from CITES Appendix II is premature. The main argument is the presence of apparently healthy and stable populations in Arizona, but precise data on Mexican populations does not exist and this represents the main range of the species. The most common localities for this species are located around Hermosillo City. The last record of a Mexican individual of *Bufo retiformis* is from 1985. At present, these localities are seriously transformed and disturbed. At the irrigation systems we corroborated the presence of other anuran species such as *Bufo alvarius*, *Bufo mazatlanensis*, *Spea multiplicata* and *Rana sp*. Contrary to Hulse's (1978), assumption that agricultural lands may constitute a more suitable habitat for *Bufo retiformis*, we observed that this is not the case for Mexican populations in Sonora. The cause could be in part because dams and wells have dried and getting water in these areas is extremely difficult. Local people commented about the changes in rainfall regimes in the last decades but there are no studies relating these changes to the absence of *B. retiformis* in its historical range.

The results presented here can be considered as preliminary. We plan to continue with the monitoring of populations of these three species (and other amphibians in north-western Mexico) in order to evaluate the role of climate warming and its effects on the distribution and abundance of amphibians in the grasslands and temperate forests. In addition, we want to know if other factors such as disease are of any importance in the disappearance of *B. retiformis* in Mexico. It is possible that other factors like climate and/or habitat alteration can act in synergism with diseases and pollution to reduce the populations of some species of amphibians.

Acknowledgements

We are grateful to our Chihuahuan team, Hugo Rivas, Rurik List and Juan Cruzado for field assistance. Several facilities were provided by Gerardo Ceballos, Laboratorio de Conservación y Manejo de Vertebrados (UNAM). Initial support for this study was provided by DGAPA-UNAM and a DAPTF seed grant (2002).

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Ranids to the Rescue!

By Jerry Lea & Luca Luiselli

A recent article (Thomas et al., 2004) reports that we are currently witnessing the sixth major extinction event in Earth's history, and that the reasons for this catastrophe are in no small part anthropogenic. Moreover, we know that amphibians are declining globally as we destroy and pollute their habitats. Yet, despite this gloomy outlook, there is good news to report (at least in a few cases!). That is to say, natural selection always fashions winners and losers, and our studies on amphibians in southern Nigeria (West Africa) have shown that many anuran species do in fact benefit from habitat alteration and, although some other species may lose out, overall species diversity may be maintained or even increase. The most highly adaptable species appear to belong to the Ranidae, and one of the reasons for their success is undoubtedly their ability to utilise multiple habitat types according to prevailing environmental conditions (Lea et al., 2003; 2004).

Our group has been studying the community composition of species rich anuran assemblages in West African rainforests (especially in Nigeria) over the last ten years. We have been particularly interested in the effects of environmental damage resulting from the activities of the petrochemical industries (Luiselli & Lea, 2004). Recently, we revisited areas that have seen at least a tenfold reduction in forest habitat over the past 20 to 40 years, and we compared current community composition with that prior to this massive habitat disturbance. In so doing, we have been able to map out species successions that parallel this environmental change. We have found that in both lowland and montane forest habitats the forest specialists (e.g. *Ptychadena aequiplicata, Chiromantis rufescens, Acanthixalus spinosus, Hyperolius sylvaticus, Werneria mertensi, Woltersdorffina parvipalmata, Cardioglossa* spp. etc.) have been replaced by more generalist species, or those preferring disturbed habitats, and these species now dominate (e.g. *Hoplobatrachus occipitalis, Ptychadena mascareniensis, P. bibroni, P. oxyrhynchus, Phrynobatrachus latifrons, P. aelleni, P. werneri, Bufo maculatus* etc.). In both environments, species richness has at least been maintained (1960s: 12 spp. from 9 genera; 2002: 12 spp. from 10 genera - Lea et al. 2004), but in the lowland case species richness has risen quite noticeably (1982: 11 spp. from 8 genera; 2002: 16 spp. from 9 genera - Lea et al. 2003). This maintenance/ increase in species richness may be as a result of an increased diversity of microenvironments in the new 'bushland' and secondary forest mosaic compared to the pristine forest (i.e. 'spatial heterogeneity hypothesis': Pianka 1966; Barbault 1991). Nowadays, the most successful species in both the lowland (riparian) and montane environments are members of the Ranidae, especially *Ptychadena* and *Phrynobatrachus* spp. It appears that this group of anurans has a wide range of adaptations and life-history characteristics (e.g. generalist feeding habits; egg guarding behaviour; within-season clutch partitioning; large terrestrial component and rapid development of tadpoles; high fecundity; high mobility and wide habitat tolerances) that enable them to switch between a variety of habitats depending upon prevailing conditions.

Indeed, the success of the Ranidae is so remarkable that it is possible to find seven congeners (*Ptychadena* spp.) within one 5km radius at a lowland site (see Lea et al. 2003). Given this, we were intrigued to know how these extremely similar species could persist in such close proximity. Another facet of our work has therefore been to investigate the mechanisms that help to maintain species richness within these communities despite the potential for heavy inter-specific competition. We have discovered that these mechanisms include a remarkable degree of food resource partitioning between very similar and closely related ranid species (*Ptychadena*), one of which is obviously a generalist feeder and the other is more of a specialist (Eniang et al. 2003).

Overall, our results show that forest destruction in Nigeria does not necessarily lead to a reduction in species diversity, but that there can be a successional change in species composition with generalists (esp. Ranidae) becoming more species rich at the expense of the forest specialists. The species that are nowadays the most successful include those that are highly mobile, have wide habitat tolerances and are opportunistic (e.g. *Ptychadena* and *Phrynobatrachus*); these species cope well with changing landscapes.

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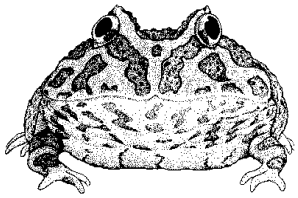
Effects of Habitat Loss and Fragmentation on Anurans in Espinal Eco-region, Argentina: a GIS approach



By Paola Peltzer, G. Bock, R. Tardivo & R. Lajmanovich

Espinal Eco-region of Argentina offers favorable conditions for the existence and the distribution of many species of amphibians. This region comprises three sub-areas: north (south of Corrientes and north of Entre Ríos Provinces), center (west of Entre Ríos and center of Santa Fe Provinces), and south (center of Córdoba, south of San Luis, east of La Pampa and south of Buenos Aires Provinces). Low forests of xeromorphic woody species and savannas alternating with grasslands dominate this natural region. It has, however, been reduced to a small fraction of the original. About 0.2% of its original cover remains as intact forest due mainly to forest conversion for agricultural activities, grazing and setting up of settlements. Although these human disturbances alter the abundance and diversity of amphibians in a wide variety of habitats, there is a paucity of information regarding the response of amphibians to habitat modification by human activities in Espinal forests.

We studied the evidence for changes in anuran species composition caused by habitat fragmentation in the centre areas of Espinal Eco-region. Our hypothesis was that anuran species diversity would be negatively affected by fragmentation and would be strongly influenced by fragment characteristics. In this report, we present the

preliminary results of a long-term study on the responses of the anuran community to habitat loss and fragmentation in the center part of the Espinal Eco-region-Argentina, using a Geographic Information System (GIS) and the integration of this tool with remote sensing and GPS technologies. Anuran calling and nocturnal site searches were used as a measure of relative abundance, diversity and species richness of amphibians in the studied area. The location of these surveys were then digitized and compared to multiple landscape variables. These variables came from digital Floor Atlas of Argentina and land-cover datasets (natural vegetation, urbanization, agriculture, wet floor, hydrology). Using these coverages, we questioned how patch diversity, forests, agriculture, and urban areas affected amphibians and the management implications of these results. Moreover, on the local and regional scale we compared anuran composition and changes in diversity patterns along vegetational, climatological and disturbance gradients.

The most consistent result of this study was that all anurans have negative association with the presence of human dominated ecosystems, principally agriculture and urbanization. Sites with remnants of Espinal forest presented greater species richness. The 23 recorded amphibian species can be affected by local habitat factors such as reduction in pond size and depth, shore vegetation richness, level of disturbance and air temperatures. Moreover, species appear to vary with respect to regional factors such as connectedness between forest remnants, massive deforestation, agricultural activities (principally soy mono-cultivation), total annual rainfall and average temperatures.

Although these results are preliminary, it is evident that habitat modification by human activities in the area studied has resulted in impoverishment of the anuran diversity. This report should address the practical applications of employing remote sensing data to monitor the habitat loss and fragmentation and the effects on anuran composition of Espinal Eco-region. A fundamental concern is the establishment of effective tools and techniques for monitoring and assessing these vertebrates at a regional and local scale. Finally, the results of our study provide the first quali-quantitative data of habitat alteration and influences on the anuran composition of Espinal Eco-region, based on a GIS approach.

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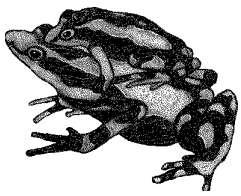
DAPTF Rapid Response Fund

The DAPTF has awarded a grant to Jennifer Sheridan (UC San Diego) to investigate her observation of frog mortality, possibly due to chytrid infection, in Thailand. If confirmed, this will be the first record of the chytrid in Asia.



Reports on DAPTF Seed Grants

Recipients of DAPTF Seed Grants are generally expected to publish the results of their projects in refereed journals, or as articles in *Froglog*. They are also required to send us reports, so that their results can be made available to DAPTF members. Below is a list of reports that we have received recently. Anyone wanting a copy of a report should contact the author in the first instance; we can supply copies if you cannot reach the author.

Lisa Belden et al. (2002) Hormonal and immunological effects of stress in amphibians.
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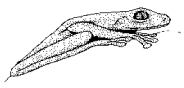

Froglog Shorts

New Chair of the DAPTF Captive Breeding Working Group: We have appointed Kevin Buley as the Chair of the DAPTF's Captive Breeding Working Group. Kevin is Curator of Lower Vertebrates and Invertebrates at Chester Zoological Gardens, UK. Previously he was Head of Herpetology at the Durrell Wildlife Conservation Trust, Jersey (Channel Isles), where he was involved in a number of captive breeding and reintroduction programmes involving amphibians.

The DAPTF, under Kevin's leadership, is compiling a database of amphibian captive breeding and reintroduction projects and is developing a set of guidelines for such work.
Tim Halliday

At **http://www.morphologynet.org/** find interactive, dissectable images and 3D amphibian morphology animations. Site created and maintained by the Morphological Informatics Group University of Missouri at Rolla.

The journal **AMPHIBIAN AND REPTILE CONSERVATION** is now available online at PubMed Central: **www.pubmedcentral.nih.gov/** ARC is now open-access and there are no barriers (no registration, costs, etc.) to getting the articles online.

Micro-chipping the growling grass frog at Victoria's Open Range Zoo, Werribee, Australia:
http://www.heraldsun.news.com.au/common/story_page/0,5478,9479614%255E24331,00.html

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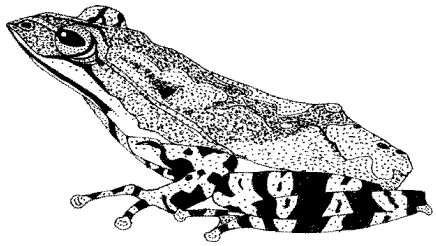

FROGLOG is the bi-monthly newsletter of the Declining Amphibian Populations Task Force. *Articles on any subject relevant to the understanding of amphibian declines should be sent to:*
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