

FROGLOG

Newsletter of the IUCN/SSC Declining Amphibian Populations Task Force

November 1997, Number 24.



The DAPTF
in Prague

By Tim Halliday
DAPTF International Director

During the Third World Congress of Herpetology, held in Prague during August, a symposium reviewed recent studies of the geography and causes of amphibian declines. Seven speakers reported on amphibian declines in particular parts of the world: Stanley Rand (Panama), Stan Orchard (Canada), Kåre Fog (Denmark), Pim Arntzen (France), Mike Tyler (Australia), Kurt Grossenbacher (Switzerland) and Gary Fellers (California). A striking feature of these talks was how much more historical data on amphibian abundance are available in Europe than in other parts of the world; Kåre Fog's data for Denmark go back to 1900. Six speakers addressed specific causes of amphibian declines: Cindy Carey (UV-B, two talks), Mo Donnelly (Climate Change), Christine Bishop (Chemical Contaminants), Andrew Cunningham (Infectious Disease), Richard Griffiths (Introduced Predators) and Tyrone Hayes (Endocrine Disruptors). Two of these talks pointed the way forward; Donnelly sought to predict the effects of global warming on neotropical amphibians and Tyler introduced the new Action Plan for Australian frogs.

Overall, the symposium presented a depressing picture of the ubiquity of amphibian declines and of the awesome task that we face in seeking to identify their causes. From an excellent series of talks, four important points emerged. First, despite much research, controversy surrounds some aspects of the declining amphibian populations phenomenon. Cindy Carey took on the daunting task of reviewing the many studies of the effects of UV-B on

amphibians and the different results that these have yielded. She emphasised the importance of considering the synergistic effects of UV-B with other causal factors, such as disease.

Secondly, disease outbreaks, like that reported in Panama by Karen Lips, are a 'hot' topic at the moment. As a result of the symposium, Rod Mast of Conservation International has quickly organised a meeting of amphibian disease specialists to examine animals collected in South America, Central America and Australia and to determine if the same organism is responsible for disease outbreaks in these widely-separated parts of the world. This meeting was held in October and we await the outcome with interest.

Thirdly, it is clear that the DAPTF has an enormous amount to do in terms of investigating the role of chemical contaminants. Bishop suggested that there has been too much emphasis on lab studies, and that there is an urgent need for field studies of chemical contaminants. She emphasised that nothing is known about the effects on wildlife of many widely-used chemicals. Some chemicals can have very long-lasting effects; Hayes reported that in northwest USA, females of the western toad *Bufo boreas*, a species that has declined markedly in recent years, are passing detectable quantities of a toxic derivative of DDT to their eggs, even though DDT has not been used in the USA since 1972. DDT is currently being used in Africa and Hayes reported on its disruptive effect on the development of anurans in parts of Kenya near to areas where it has been applied to crops. The fact that chemical contaminants can affect amphibians far from where they are used was also revealed in Fellers' talk about California.

The fourth point relates to the fact that, up to now, herpetologists have had to respond to DAP events after they have occurred. We would stand a much better chance of being

able to understand their causes if we could detect them at a much earlier stage. Recent work by Ross Alford in Australia suggests one way that this might be done. He reported a study in which he showed that the degree of fluctuating asymmetry (random variation in the size of paired structures on the left and right side of the body) increases in the limbs of frogs as their population size declines.

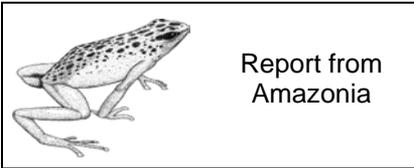


World
Congress
Resolution

The following resolution was passed at the Third World Congress of Herpetology in Prague, August 5, 1997, addressed to the DAPTF Board and Symposiasts in the "Declining Amphibian Populations: Geography and Possible Causes" symposium.

In the light of ever-increasing evidence that populations and species of amphibians in many parts of the world are experiencing declines and even disappearances, and believing that these phenomena have relevance for our understanding of local, regional and possibly even global environmental processes, be it resolved that the Third World Congress of Herpetology, convened in Prague, Czech Republic, in August 1997, commends the Task Force on Declining Amphibian Populations for its activities, urges it to continue and extend its efforts, and endorses its support by both governmental and non-governmental organizations and individuals throughout the world.

The resolution has been distributed to the World Bank, appropriate agencies of the United Nations, major international and national conservation research bodies and potential sponsoring organizations.



Report from Amazonia

By William E. Magnusson
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Trying to obtain data on the status of Brazilian Amazonian amphibians has been frustrating. None of the 8 specialists working in the area have been able to indicate species considered to be at risk. There are a number of potential reasons for this. The area is enormous and there are few resident herpetologists. Two of these have recently relocated, and another has died.

The two localities which herpetologists have been frequenting over the last 15 years, Reserva Adolpho Ducke and the INPA PDBFF reserves, are only 90 km apart and the only species that may have become extinct in one of these reserves (*Hyla boans* in Reserva Ducke) remains common in surrounding areas. There is potential for resurveys of areas studied by Jan Caldwell, Claude Gascon, Tereza Cristina Avila-Pires and Marinus Hoogmoed. However, present plans are to extend the number of areas surveyed to get a better picture of the distribution of biodiversity rather than carry out population monitoring.

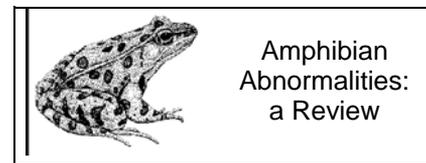
The DAPTF meeting in Santiago, Chile emphasized the difference in perceived threats in high-altitude and lowland areas. High-altitude biologists regard loss of species as the major threat to biodiversity. Lowland biologists are more worried about habitat loss, which still affects a small proportion of the Amazon basin. It will be necessary to focus on (1) limited areas or (2) susceptible species if we are going to make progress in Amazonia in the near future.

(1) The only truly high-altitude area in the Brazilian Amazon is the Pico de Neblina on the Venezuelan border. The area is remote and difficult to access physically, politically and bureaucratically. It has no base-line herpetological inventories. Therefore, it would seem more efficient to concentrate on similar highland areas on the Venezuelan border; many of the Venezuelan tepuis were surveyed with helicopters by Stefan Gorzula and colleagues in the 1980s. Rather than start a major project on the Pico da Neblina in Brazil, it may be better to

consult with the Venezuelan DAPTF to determine the feasibility of repeating the Tepui surveys.

(2) Jean-Marc Hero in Australia has uncovered strong relationships for Australian frogs comparing morphological and demographic characters between declining and non-declining species. I spent a week reviewing his data, and it appears that similar relationships apply for species from middle America and southern Brazil. Marc is currently evaluating the general applicability of his data, and we are hoping to be able to construct a list of potentially vulnerable Amazonian species on which to concentrate, based on their biological characteristics. It should be possible to accomplish this by the use of museum specimens

By using these two approaches, we hope to be able considerably to increase the effectiveness of the DAPTF Working Group for Brazilian Amazonia. In such a large, difficult area, the traditional approach of large-scale surveys is likely to produce few useful results.



Amphibian Abnormalities: a Review

By Jamie K. Reaser and Pieter T. Johnson

Ever since a group of school children caught malformed northern leopard frogs (*Rana pipiens*) at a pond in Minnesota in August of 1995, the issue of "deformed frogs" has been at the forefront of the media's attention and a frequent topic of debate within amphibian-concerned discussion groups. Alarming reports often suggest that the occurrence of abnormal amphibians (particularly frogs) is (1) a recent phenomenon, (2) widespread in distribution, (3) an indication that environmental quality is poor, and (4) an early warning of threats to human health. Here we (a) critically review these issues and (b) draw upon our own research experience to suggest guidelines, justification, and points of caution for the evaluation of amphibian abnormalities.

Abnormalities in amphibians [e.g., extra ("supernumerary") or missing limbs and/or digits, missing eyes, incorrectly positioned appendages etc.] are not new, and have been reported in the literature for more than two centuries. While some accounts report seemingly isolated incidences involving only a few individuals, others document sub/population-wide disturbances

impacting numerous animals of multiple species.

Although the frequency of abnormal amphibian accounts has increased in the last few years, this trend is not unusual. Published reports of amphibian abnormalities have fluctuated in frequency since 1700. Furthermore, the observation does not necessarily indicate that abnormalities are occurring more often now than they did prior to 1995. The reasons for this are multiple: (1) More surveys, more observations. Concern that amphibians are declining has prompted an increasing number of amphibian surveys, and thus the frequency of encountering abnormal amphibians is likely higher; (2) More attention, more reports. Because amphibians are touted as good indicators of environmental health, people feel that seemingly unusual observations concerning amphibians warrant report. In addition, the media has adopted abnormal amphibians as a sensational story item, providing an avenue for individuals and organizations who report abnormalities to draw focus to their general programs; and (3) More herpetologists in cyberspace. Online newsgroups and meetings have dramatically enhanced the transfer of information in time and across space. Reports released on the web have stimulated a flurry of interest and activity worldwide before data are even put to press.

Caveats aside, there are a handful of multi-year accounts of amphibians that suggest that, in at least these instances, abnormality phenomena may be unusual and recent (e.g., Hoppe 1996). Unfortunately, long-term studies of amphibian population dynamics are rare and most voucher collections are not sufficient (due to biased sampling effort and paucity of replicated multi-stage series) to determine the "background levels" of abnormalities needed to enable historical versus contemporary comparisons.

Since 1740, amphibian abnormalities have been reported in 24 of the United States, as well as two provinces of Canada, Peru, England, Germany, Japan, India, and South Australia. Thirty-three amphibian species have apparently been involved. In the United States, it is interesting to note that the southwest is not represented by accounts of abnormalities and that the majority of reports fall within a broad band across the mid-northern United States. This pattern suggests that the causative factors are limited to, or more frequently found within this region. However, we cannot discount the possibility that search effort and the

likelihood of reporting are also higher, although there is no obvious reason why this should be so.

A wide variety of factors have been implicated as causative agents of amphibian abnormalities, including parasite infestation, toxin contamination (e.g., biocides, heavy metals, acidification), predation, UV-B radiation, radioactive salts, ground-level ozone, excessive heating of eggs, cosmic rays and reformulated gasoline. Of these, only the parasite, toxin, predation, and UV-B hypotheses have supportive evidence. Sessions and Ruth (1990) isolated encysted trematodes from Pacific tree frogs (*Hyla regilla*) with supernumerary limbs and found that *Xenopus* could be induced to develop such abnormalities when a resin ball (meant to mimic an encysted trematode) was inserted in a tadpole's region of limb bud development. Many toxins are known to have mutagenic effects on amphibians when administered in the laboratory (Harfenist et al. 1989). Ouellet (1997) found high incidences of abnormalities in three species of frogs from agricultural sites exposed to toxins. We have observed incidences of injury due to failed predation attempts and/or livestock trampling in *Rana luteiventris*, *Bufo boreas* and *Hyla regilla*, resulting in completely and/or partially missing limbs. Such injuries might lead to the development of supernumerary limbs/digits if cellular errors occur during regeneration (Brandt 1940, Dearlove and Dresden 1976). In laboratory experiments, Blaustein and colleagues have found that UV-B radiation can induce abnormalities in developing tadpoles (A. Blaustein pers. comm.).

Whether or not the presence of abnormal amphibians indicates "poor quality" habitat largely depends on the causative factor(s) involved. Toxins and increased levels of UV-B are suspected to pose a risk to many natural ecosystems. Parasite infestation and predation are natural phenomena, but they can be influenced by anthropogenic habitat alteration. The trematode identified by Sessions and Ruth (1990) depends on a snail as its intermediate host. Snail populations may boom under eutrophic conditions associated with poor water quality; and in urban areas, numbers of predators such as raccoons, skunks, dogs, and cats are often elevated, possibly with a profound negative influence on prey populations.

Of the suspected causative agents, only toxins and UV-B can directly impact human health. Increased parasitism and predation do, however, have the potential to

detrimentally affect a wide variety of wildlife and disrupt community structure. Stressed organisms and disrupted systems may be more vulnerable to disease outbreaks that could impact human health. Thus, any factor causing mass abnormalities in amphibians warrants concern.

Diagnosis of the mechanisms driving amphibian abnormalities has been hindered because: (1) most data are anecdotal and disorganized in space and time; (2) until recently, there has been little attempt to standardize amphibian surveys and thus data are often not comparable; (3) herpetologists are not adequately trained to investigate the proposed multi-factorial causes of amphibian abnormalities, nor are they typically encouraged to work with colleagues from other disciplines; (4) funding currently available for extensive field surveys and laboratory-based diagnostic work is less than sufficient; and (5) what funding is available, tends to be directed towards the most high profile factors, regardless of whether or not they are the most likely causative agents. Diagnosis is further complicated because there may be a time lag between the presence of a factor and evidence of abnormalities. Multiple factors may act in concert; teasing apart their relationships is rarely a simple matter.

Investigators' adherence to the following guidelines will increase our capacity to evaluate amphibian abnormality phenomena: Design studies to address the null hypothesis that abnormalities are typical and natural. Use a clinical approach to identify the factors relevant for experimental investigation. The signature and frequency of abnormalities provide important clues as to their origin, and evaluation of these features should be the first step considered in hypothesis testing. Execute standardized (thus repeatable and comparable) experiments and sampling procedures. Make detailed protocols accessible. For monitoring purposes, document and describe study locations and procedures. Deposit representative stage-based series of voucher specimens in well curated, accessible collections.

Are amphibian abnormalities a factor in the worldwide decline of amphibians? At a local scale, abnormalities may contribute to the decline of sub/populations, but they are unlikely to explain the disappearance of species worldwide. Nonetheless, the issue of amphibian abnormalities is rightly poised within the discussion of amphibian declines for the following reasons: (1) Abnormalities have the potential to result in high levels of mortality. We

have not observed adults with supernumerary limbs at sites where the metamorphs have been greatly impacted for several years. Sessions and Ruth (1990) found that surviving adults had only minor abnormalities, and constituted 3-5% of the adult population the following year. Although we don't know if the observed abnormalities decrease recruitment, since mortality of tadpoles and metamorphs may always be high, abnormalities certainly increase the probability that recruitment will be low. (2) Unraveling of the amphibian abnormality phenomenon will likely assist us in understanding the "background noises" associated with amphibian population dynamics, and thus strengthen our ability to tease out anthropogenic factors and the mechanisms by which they operate. (3) The issue of amphibian abnormalities is drawing the attention of the public and government officials to amphibians in general. People will not conserve what they do not know. (4) If the causative agents are anthropogenic in origin, we have further justification for targeting amphibians as indicators of environmental condition and thus more reason to believe that amphibian declines are an indication of ecosystem deterioration. (5) Abnormalities have been shown to impact some species of declining amphibians (e.g., *Rana muscosa*, *R. luteiventris*, *R. aurora*, *R. pretiosa*, *R. boyleii*, *Bufo boreas boreas*, *Ambystoma tigrinum*, and *A. macrodactylum*).

As the study of abnormal amphibians continues to intensify and more regional efforts are undertaken to evaluate the distribution of the phenomenon, a few words of caution are warranted. The activities of field workers have as much potential to contribute to the problem, as they do to the solution. If the causative agents of abnormalities include disease and parasites, then surveyors who do not sterilize boots and collecting equipment between sites may unwittingly act as vectors. Furthermore, the trampling of habitat by large amateur workforces, and even professionals conducting repeated site visits, has the potential to threaten sensitive aquatic environments.

We strongly suspect that no single factor is the sole agent of amphibian abnormalities. Rather, findings will indicate the involvement of a variety of both natural and anthropogenic factors across multiple scales.

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Dead Anurans in Nicaraguan Crater Lake: In July 1997 a tourist to the Isla de Ometepe reported having observed numerous dead anurans lying on the shore of one of the crater lakes. The Isla de Ometepe with its two volcanos, Concepcion (1610m) and Maderas (1394m) is situated in the Lago de Nicaragua, in southwestern Nicaragua. No further information is available at this time.

The 4th Annual Meeting of the Southwestern United States Working

Group of the DAPTF will take place on Thursday & Friday January 8th-9th 1998 at The Phoenix Zoo. *For further information contact:* Mike Demlong (Tel: 602-273-1341 ext.7624) or Mike Sredl (Tel: 602-789-3515).

Albanian frogs are being exported in large numbers to satisfy demand from the gourmet dinner tables of France, reports The Globe and Mail (Canada). A company called Albfrog aims to export up to three tonnes of frogs per day. Albanian frogs are particularly prized for their flavour, but it is hard to see how the export of such large quantities can be maintained for very long. The recent unrest in Albania is unlikely to improve the situation. France apparently banned the commercial collection of its own frogs in 1976!

Announcing the North American Reporting Center for Amphibian Malformations (NARCAM):

www.npsc.nbs.gov/narcam

Tel: 1-800-238-9801

Please report malformed amphibians or general amphibian survey results to this Web site or toll-free number (good for both the USA and Canada).

Visit the new terrestrial salamander monitoring program site: <http://www.im.nbs.gov/sally/> For full details on the program's aims and/or participation, contact the program coordinator, Dan Lantz:

DLantz@minn.net

The new DAPTF Bermuda Working Group is jointly Co-Chaired by: Toni Daniels, "Daniella", Apartment #1, #14 Southcourt Avenue, Paget East, PG 06, BERMUDA and Don W. Linzey, Department of Biology, Wytheville Community College, 1000 East Main St., Wytheville, VA 24382, USA.

A symposium on *Amphibians and Reptiles of Tropical Forests: Biodiversity and Conservation* is planned in Hanoi, Vietnam for June 1999. *To be kept informed about registration etc., please contact:* Prof. Cao Van Sung, Institute of Ecology and Biological Resources, Nghiado, Vietnam.

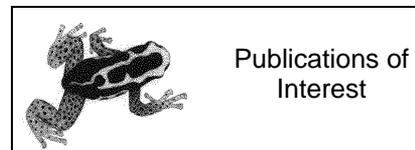
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DONATIONS: The Geraldine R. Dodge Foundation has awarded the Task Force \$25,000 to support central office activities. In addition to this award, we gratefully acknowledge receipt of the following donations from 1 August through 30 September 1997.

Organizations: Greater Cincinnati Herpetological Society. **Individual**

Donors: Rebecca A. Cole; Benjamin C. Hammett; Ryan McCue; Karen B. Menczer; Charles V. Quinn.



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Both above volumes are published in Spanish. Volume 1 contains alphabetical listings of herpetologists working on the Latinamerican herpetofauna, as well as listings by country of residence and scientific activity. Volume 2 is a compilation of the work presented at the Congress. For further information or to place an order contact: The Editor, Ecologia Animal B, Facultad de Ciencias, Universidad de Los Andes, Merida, VENEZUELA 5101.

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Fax: 58 74 401286

clae@ciens.ula.ve

Roedel, M.-O. (1996) *Amphibien der westafrikanischen savanne*. Edition Chimaira, Frankfurt am Main. (283pp., 255 monochrome drawings and 8 colour plates. In German with English and French summaries. ISBN 3-930612-06-2)



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FROGLOG is the newsletter of the Declining Amphibian Populations Task Force. Partial funding for FROGLOG is provided by donation from: Frog's Leap

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