FROGLOG

IUCN/SSC Declining Amphibian Populations Task Force

March 1995 No 12

Amphibians and Climate Change

Observations made over 17 consecutive years at two widely separated amphibian breeding sites in southern England suggest that some species may be responding to climate change by altering their breeding cycle times. At one locality the dates of first spawning by the rare natterjack toad *(Bufo calamita)* have altered such that by 1994 eggs were laid an average of two weeks earlier than was occurring in 1977. At another site populations of the introduced edible frog *(Rana esculenta)* also spawned progressively earlier over the same period, this time with an overall difference of nearly three weeks. Both of these species are on the northerly edges of their biogeographical ranges in Britain, and there is also evidence that after some 150 years of relatively unsuccessful edible frog introductions into Britain the animal has, within the past decade, suddenly begun to expand its range in the country. By contrast the widespread common frog, *Rana temporaria,* has not changed its spawning time over the 17 years of observations at the second site.

Also striking has been the migratory behaviour of newts *(Triturus* species) at site 2. All three native species *(T. vulgaris, T. helveticus* and *T. cristatus)* use the ponds, and all have changed in similar fashion over the past 17 years. The pools are cleared of vegetation every autumn, and inspected nightly to record first arrivals; these have become earlier by an astonishing 5-7 weeks since 1977, changing progressively from February to December. These are of course only vanguard animals and the bulk of the population has not responded so dramatically, but there has been a shift in the month of peak numbers in the ponds from April in the early l980s to March by the mid 1990s.

All of these changes correlate strongly with mean temperatures in the months immediately prior to spawning or migration, and these temperatures have themselves shown steady increases over the past 17 years, averaging >0.1 °C per year. It seems likely that individuals within these amphibian populations are responding rapidly, by behavioural plasticity, to warming trends in winter and early spring temperatures. If these trends are sustained by continued global warming this may be followed by adaptive changes at the population level and thus further significant shifts in breeding seasons. There is as yet little hard information about the effects of climate change on wildlife; amphibians may provide valuable clues because monitoring changes in breeding and migration behaviour is relatively straightforward and could be pursued at a range of sites around the world.

A summary of these data have been published in *Nature* 374: 16 March 1995, p 219.

Trevor J. C. Beebee
Biochemistry Laboratory, School of Biol. Sciences, University of Sussex, Falmer, Brighton BN1 9QG, UK.

Marking Amphibians by Toe-clipping: A Response to Halliday

In spite of the fact that concern has been expressed from both within and beyond the herpetological community, that toe-clipping causes mortality in amphibians, there is a paucity of direct evidence indicating that this is the case. Moreover, the effects of alternative marking techniques on amphibian mortality may also be unquantified.

The study most often cited as evincing a causal relationship between toe-clipping and amphibian mortality was conducted by Clarke (1972). In a mark-recapture study, Clarke correlated the number of toes clipped (1-8) from an individual toad with recapture rates. The correlation 'indicates' that the more toes you clip, the less likely you are to recapture the animal. The author, and many others, take this as evidence that the 'missing' toads had died as a result of the toe clipping. However, two alternative hypotheses were not investigated and cannot be ruled out: 1) the 'missing' toads may not have died, but could have disappeared from the study site (this may or may not have been due to the stress of marking) and 2) mortality, if it occurred, may have occurred for a reason other than toe-clipping. Clarke conducted his study on a golf course; a landscape in which mowing and biocide application are likely to be common causes of mortality for toads. The impact of these factors may be area-specific. Those who use toe-clipping often begin with the codes that require the fewest clipped toes and sequentially work their way to the maximum number of clipped toes. This procedure can result in one-toe clipped amphibians being spatially distant from multi-toe clipped individuals. These sub-populations may be subject to quite different mortality pressures. Clarke gives no indication that he attempted to randomize his marking procedure and, therefore, control for an area effect. There may well be a correlation between the number of toes clipped and mortality, but it is not clear from this study.

The second publication cited by Halliday, Golay & Durrer (1994), does show that toe-clipping of natterjack toads can lead to metastatic infection and necrosis, sometimes involving the entire limb. These results certainly warrant concern regarding the marking procedure, especially for species of threatened status. It is remarkable, however, that since the introduction of toe-clipping by Bogert in 1947, so few studies have noted an adverse impact of the procedure on amphibians. Golay and Durrer's findings may represent a widespread phenomenon; the paucity of corroborative reports may stem from

Arntzen, J. & Teunis, S. (1993) A six year study on the population dynamics of the crested newt *Triturus cristatus* following the colonization of a newly created pond. The Herpetological Journal 3: 99-110.

Fasola, M., Barbieri, F. & Canova, L. (1993) Test of an electronic individual tag for newts. The Herpetological Journal 3: 149-150.

Keck, M. B. (1994) Test for detrimental effects of pit tags in neonatal snakes. Copeia 1994: 226-228.

Kuhn, J. (1994) Methoden der Anuren-Markierung für Freilandstudien: Übersicht - Knie-Ringetiketten - Erfahrungen mit der Phalangenamputation. Zeitschrift für Feldherpetologie 1: 177-192.

Amphibian Meetings in Austria, September 1994

During September of last year, two meetings were held in Austria which were attended by many of Europe's amphibian researchers. The first was the 6th meeting of the TRITURUS group, organised by Robert Schabetsberger. These meetings, held every two years, are an informal gathering of researchers interested in any aspect of the biology of the European newts. Collectively, we cover all the *Triturus* species and subspecies, and we have representatives in every country of Europe and Scandinavia, as well as Turkey and several countries of the former USSR. It was agreed during the meeting that we should exploit the existence of the TRITURUS network to gather data on the current status of all taxa in the genus and make this information available to the DAPTF. Work on this project is proceeding.

The second meeting, a Workshop on the Population Biology of Amphibians was hosted in Vienna by Walter Hödl and Günter Gollmann. Much of the meeting focused on a long-term study of amphibians on the Danube Island close to the centre of Vienna, an artificial habitat that has been studied by the Vienna group since 1986. The focus of the study is a pond that has been surrounded by a permanent drift fence and which supports breeding populations of eleven amphibian species. In 1994 three new ponds were created on the island and the natural colonisation of these ponds is being monitored. All species have shown quite marked fluctuations in numbers over the 8-year study period, with a number showing marked declines, while others have remained stable.

There was general agreement that, in the past, the emphasis of amphibian population studies in Europe has been almost exclusively focused on aquatic populations and that there is an urgent need for more data to be collected on the terrestrial phase of the life cycle; for many species, 90% of growth takes place on land and we have very little idea what determines variation in growth and survival on land. While the aim of the meeting was to discuss a number of general aspects of amphibian ecology, such as methodology and the analysis of genetic patterns, much discussion focused on the results and possible future developments of the Danube Island study. There was general agreement that a good drift fence does yield an enormous amount of valuable data, but a number of people raised the possibility that it may also influence the demographic processes that it is intended to measure. In particular, a very effective drift-fence may impede the outward movement of small metamorphs and so reduce recruitment to a population. Changes in the numbers of animals recorded during the Danube Island study may thus reflect variation in the various species' ability to negotiate the drift fence, rather than more general environmental effects on their numbers. One speaker reported anecdotal observations that anurans arriving at a fenced pond may be deflected to another breeding site. Perhaps the answer to these problems is to not build drift fences with the intention of intercepting all animals, but rather to sample the population, allowing a number of animals, particularly the younger ones, to pass unimpeded.

The meeting also discussed the relative merits of various marking techniques, such as toe-clipping, pit-tagging and the use of colour patterns, and we saw a demonstration of the use of pit-tags with the crested newt *Triturus dobrogicus*.

Anyone wanting to know more about the Danube Island project should contact Walter Hödl or Günter Gollmann: Institut für Zoologie, University of Vienna, Althanstrasse 14, A-1090 Wien, Austria.

Tim Halliday

Rana arvalis Populations and Radioactive Pollution

Investigations of amphibians from different parts of a radioactive trace in the eastern Urals, from 1992-93, showed a predominance of *Rana arvalis* on polluted land. These populations were typified by a high ratio of females to males, and a high ratio of the striped morph of this species. Large metamorphs and small adult size were observed, which may reflect more rapid growth and early onset of sexual maturity.

Increases in abnormalities at the morphological, cytological and chromosomal level were recorded in juveniles and adults. Frogs tended to have elevated metabolic rates and changes in the liver and spleen. Fertility was reduced and eggs were smaller than normal; higher embryo mortality and decreases in energy storage and tolerance were also observed.

Phenotypic, physiological and genetic differences between populations on the radioactive trace and other animals may be partly a response to conditions of radioactive pollution and partly a demonstration of the ability of *Rana arvalis* to adapt to reproduce in an unusual environment.

This research was supported by the Russian Fund of Fundamental Investigations (#93-04-7888).

Vladimir Vershinin, O.A. Pyastolova & E.A. Trubetskaya.
Institute of Plant & Animal Ecology, Uralian Branch of the Russian Academy of Science, Ul.8 Marta, 202, Ekaterinburg 620219, RUSSIA

News from Sri Lanka

The Chairman of the IUCN Reptiles and Amphibians Specialist Group for South Asia, Dr. Indraneil Das, gave a public lecture on 'An Action Plan for the Conservation of the South Asian Herpetofauna' at the University of Ceylon (Sri Lanka), Peradeniya on 7 December 1994. This was also the occasion for the launch of the Journal LYRIOCEPHALUS (see below).

Faunal inventories are underway in a number of protected areas in Sri Lanka and these would necessarily include the study of amphibian populations.

The anthropogenic threat to amphibian taxa and numbers comes from habitat destruction, consequent to an increase in urbanisation and industrial expansion. The effect of the use of pesticides in agricultural activities, though not clearly quantified, may be a source of danger. Another possible cause for some alarm is the increase in tourist traffic (both local and foreign tourists within the country - areas hitherto inaccessible or visited in modest volume now see much larger numbers. This is an aspect worthy of further investigation. Another investigation underway is a survey of the use of amphibian taxa for biological/medical studies in schools and universities of Sri Lanka.