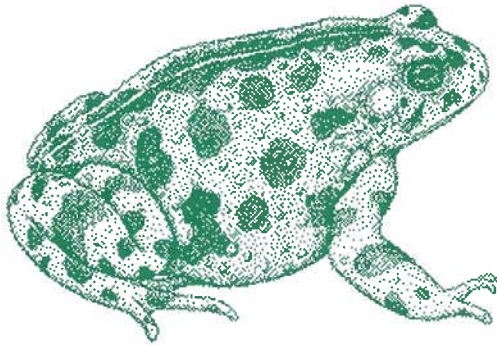


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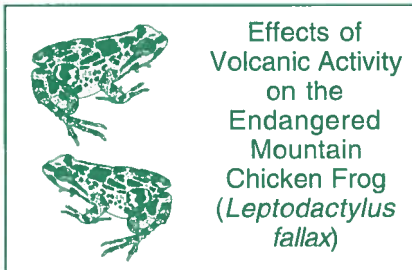


Bufo boreas

FROGLOG

Newsletter of the Declining Amphibian
Populations Task Force

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Effects of
Volcanic Activity
on the
Endangered
Mountain
Chicken Frog
(*Leptodactylus
fallax*)

By Jennifer C. Daltry and
Gerard Gray

The Caribbean island of Montserrat hit the world's headlines in July 1995 when the Soufriere Hills volcano unexpectedly ended its 350-year dormancy. Only 102 km² in area, no part of this UK Overseas Territory has escaped the volcano's effects. At least 22 Montserratians have died, and thousands more have been forced to emigrate.

Less widely known is the fact that this small island is also home to a number of rare and endemic species, including the endangered mountain chicken (*Leptodactylus fallax*), one of the world's largest frogs, with a maximum snout-vent length (SVL) of 210mm. The mountain chicken originally inhabited at least five major islands in the Lesser Antilles. Due to a combination of hunting, habitat loss and the introduction of alien predators, however, it is now confined to Dominica (where it is still heavily hunted) and Montserrat.

The Montserrat Forestry and Environment Division (FED) is currently implementing a monitoring programme to determine whether *L. fallax* is being significantly affected by the ongoing volcanic activity. Started in January 1998, and developed in partnership with Fauna and Flora International (FFI), the programme entails regular re-appraisals of the species' distribution range, abundance, physical health and reproductive success. To the best of our knowledge, this is the first such long-term study of the impact of volcanic pollution on an amphibian

population.

Eighteen 200-metre line transects have been established throughout remaining *L. fallax* habitat at various elevations and of varying proximity to the volcano and accessibility to hunters. Every few months, each transect is systematically subjected to visual and aural encounter surveys at night by teams of trained FED rangers, and every frog captured is sexed, weighed, measured and examined for signs of external damage. The biotic and abiotic characteristics (including environmental pH) of each transect are assessed. To monitor changes in distribution range, the FED rangers also conduct frequent spot-searches throughout Montserrat for mountain chickens. Findings from this new monitoring programme are being compared to a 3-month study by FFI herpetologists, conducted shortly before the volcanic activity began.

The species distribution range on Montserrat has fallen to less than 17km² in area. At least 10% of the species' original (1995) habitat in Montserrat has been destroyed by scorching pyroclastic flows, and all other areas have been impacted by acid rain (recorded pH levels as low as 2.0) and volcanic ash fall-out (up to several kg/m²/day). The ash contains at least 5% cristobalite, a component of toxic silica known to cause the lung disease silicosis in mammals, and the Soufriere volcano also releases toxic gases (predominantly HCl, SO₂ and HF) and potentially harmful trace metals. Nevertheless, *L. fallax* is still patchily abundant in the moist forest of the Centre Hills, and numbers seen in some valleys compare favourably with 1995 sightings. Even during the dry season, when frog activity is normally at its lowest, as many as 32 individuals were seen along one 200-metre transect.

In the first assessment in January 1998, a total of 117 *L. fallax* were captured and examined by FED staff and an FFI herpetologist.

Although frequently coated in volcanic ash, all were extremely plump and in excellent condition, with no external evidence of damage or disease. By contrast, there is epidermal disease and tooth decay among recently examined wild and feral mammals in Montserrat, as well as skin and lung infections among humans. A number of invertebrate taxa have become scarce, but crickets, the main prey of *L. fallax*, are still abundant.

Ironically, the volcanic crisis might have actually benefited the frogs in one important aspect. Until recently, as many as 50 frogs were killed daily for consumption by local people and tourists. Since the onset of volcanic activity, however, the tourism industry has slumped and the resident human population has dropped to around 3,000, mostly confined to the far north of the island. The hunting pressure from humans has therefore been reduced significantly.

Many male mountain chickens were heard calling during the last breeding season, presumably signifying a willingness to breed. The key question, however, is whether *L. fallax* eggs and larvae can survive in the volcano-polluted environment. This is hard to answer, because development to metamorphosis occurs in a foam nest at the bottom of a deep and well-concealed burrow. Newly metamorphosed froglets found during the FFI study in 1995, however, were killed by an early ash fall (*Froglog* No 15, December 1995). A few sub-adults were seen in early 1998, but none were smaller than 100 mm SVL and they represented fewer than 6% of all sightings, a considerably lower proportion than recorded in a sample of 371 *L. fallax* collected in Dominica by Brooks (1982: *Biotropica* 14). The mean SVL of the Dominica and Montserrat samples were 99.7mm and 165.1mm respectively. This is highly suggestive of a reduction in fecundity

or juvenile survivorship in Montserrat in recent years.

In conclusion, the Montserratian population of *L. fallax* is enduring the current volcanic phase more successfully than one might expect, but a significant part of its range has already been lost and future eruptions could destroy more. There are also indications that reproduction has been suppressed in the increasingly toxic, acidified environment. It is not known how many more years the volcanic activity will continue, or how long the island's soils and vegetation will take to recover. It is therefore crucial that the FED monitoring programme is sustained to ensure that this globally important population does not become extirpated. If there is evidence that Montserrat's *L. fallax* population is in terminal decline, the FED will consider establishing a number of frogs in captivity off-island. The Durrell Wildlife Conservation Trust (previously Jersey Wildlife Preservation Trust) has offered to lead the captive breeding feasibility study.

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Amphibian Breeding and Climate Change

The often precise causal relationship between climate variables, such as temperature and rainfall, and the breeding activity of amphibians means that there is potential to use breeding dates as an index of climate change. In the UK, Beebee (1997) has reported that some species, notably three newt (*Triturus*) species, are now breeding several weeks earlier in the year than they were 20 years ago. A new study, of the common toad (*Bufo bufo*) has not found such a trend, but has found a strong correlation between average temperature prior to breeding and breeding date in this species (Reading 1998). One possible explanation is that annual variation in temperature at Reading's site, in southern Britain, is so great that any underlying trend is not yet apparent. Another, as suggested by Reading, is that toads do not respond only to temperature, but also to daylength.

What is evident from both pieces of work is that the British amphibian species studied all adapt to changes in climatic conditions by breeding

earlier following warm winters than cold ones. The prevalence of early spawning, reported by both authors, during the 1990s compared with the 1980s does not, however, provide evidence for long-term climate change. For that, longer data sets are required.

We would be interested in hearing from anyone who has data on changes in amphibian breeding dates in relation to climate.

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Ohio Working Group Meeting Report

By Jeffrey G. Davis

The Ohio Working Group of the DAPTF met at the Toledo Zoo on February 20, 1999. Sixteen papers ranging from amphibian status and distribution to physiological responses to cold temperatures were presented to 161 guests. Five papers were given on Ohio species of concern including northern leopard frogs, eastern spadefoot toads and Blanchard's cricket frogs. The preparation of books on Ohio's Frogs and Toads and Ohio's Reptiles was also announced at the meeting. Dr. Paul M. Daniel, Miami University (Ohio) was honoured for his contributions to herpetology. Dr. Daniel was among nineteen herpetologists who, 42 years ago, at a meeting at the Toledo Zoo, founded the Ohio Herpetological Society. That Society grew into the Society for the Study of Amphibians and Reptiles.

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Amphibian Disease Website

From Lee Berger

We have produced a web site devoted to amphibian disease, especially disease associated with population declines:

<http://www.jcu.edu.au/school/phtm/PHTM/frogs/ampdis.htm>

Although in its infancy, the site contains general information on the chytrid fungus, a bibliography with over 400 references on amphibian

declines and disease, a list of people with expertise in frog disease, instructions on how to collect skin and toes to test for the chytrid, how to collect frogs for pathology, how to prevent transmission of amphibian pathogens between locations, as well as a monthly diagnostic quiz with great prizes.

The site contains current information on the chytrid fungus including unpublished material, in particular host and locality records. We aim to keep this up to date with data on new outbreaks, and results from the latest research. This will enable management decisions to be made based on all information available. We plan to make this site more comprehensive and international, and would like to use it to collate information on amphibian diseases that have been generated by herpetologists around the world.

If you have data to contribute, please email it to Rick Speare (Richard.Speare@jcu.edu.au) and it will be included with acknowledgements of the source.
Contact: Lee Berger, CSIRO Australian Animal Health Laboratory, Ryrie St., Geelong, VIC 4811, AUSTRALIA; Rick Speare, School of Public Health and Tropical Medicine, James Cook University, Townsville, Qld 4811, AUSTRALIA.



The UK Pool Frog Species Action Plan

By Tony Gent

The UK has traditionally been regarded as having only six native species of amphibian, three of which are anurans. Other species are known to have been introduced and some have become established. Some of these translocations are known to date back to early last century. Against this background the pool frog, *Rana lessonae*, has long been considered an introduction and records of the species in Britain, dating back to the late 18th Century, have usually been regarded as the consequence of human agency.

In the early 1990s, however, we began to challenge this accepted wisdom. Some 'British' pool frogs looked and appeared to behave differently from those found in Belgium and France (from where many of the known introductions had come) and the records of the species predated any documented release. Other anecdotal evidence exists, such as the acquisition of local names for the species by the turn of the 19th Century. There was also the possibility that the two sites known to have had pool frogs at that time were

both found on the edge of former fenland areas (which had been significantly affected by agricultural improvements in the 16th and 17th Centuries), which suggested that these could be remnants of a native population rather than two unconnected introductions. One of these sites was lost in the mid-1800s to fen drainage.

The possibility of native status meant that we needed to determine what conservation action was appropriate for what was clearly a very threatened species in Britain. An action plan was produced and a programme of work financed by English Nature and Anglian Water Services Ltd. was initiated. This involved 'remedial' conservation work; surveying to see if the species was still present and whether there was scope for captive breeding. The main thrust of the work was the investigation of native status. This question had been discussed in the literature ever since the 1850s, in fact almost as soon as the identity of the species had been confirmed. However we felt that it was important to firm up on the evidence, one way or the other, to determine what conservation action was necessary. This has required a range of study methods, with no single approach likely to yield a definitive answer, including genetic study, analysis of calls (a bioacoustic study), zooarchaeology and further literature research. Much of the work calls for comparisons between 'British' material (museum specimens of animals and sound recordings of the wild population made in the 1970s and 1980s) and that from elsewhere in Europe. We still need further genetic material, sound recordings and skeletal material from reference collections throughout the European range. We intend to publish our conclusions in April 2000.

Unfortunately, just as we started to look at this issue, the one surviving 'native' population had dwindled to very low numbers and is now possibly extinct. While an assessment of its former status as a native species or not is important for determining what (if any) conservation action is needed, the project also raises other questions about amphibian declines. While one population was known to be lost at a time when its fen habitat was drained (and this could explain the general decline of the species if it ever was more widely distributed in England) such gross habitat change does not appear to have happened at the remaining site (which is a nature reserve with protected status). It is possible that one or more of the following factors may be implicated: tree and scrub growth or altered grazing regimes, collection, the

recent arrival of geese or the introduction of fish and the presence of grass snakes. Or perhaps some other, more subtle factors have been at work? It is possible that the metapopulation became too fragmented and, even though the ponds remain, there was simply an insufficient exchange of animals for the population to survive. Alternatively, atmospheric pollution may have had some significant effect on the breeding potential of the species. We do not know the answer to this as yet but we need to address the cause of the decline before any reintroductions can be considered to the former site.

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Appeal for Pool Frog Samples

If *Rana lessonae* does turn out to be native to Britain, urgent conservation measures will be required. For this study, largely based on comparative population genetics, we need samples (for RAPD and microsatellite DNA analyses) from as wide a range of sites as possible in mainland Europe. We would therefore be grateful for any such samples (toes or larvae), ideally from more than 20 individuals in each place. The tissues should be preserved immediately in 70-100% ethanol, and can be posted in this condition. Sample tubes can be supplied on request, and all helpers will be kept informed about the results. It is of course often difficult to distinguish between *Rana lessonae* and *R. esculenta*, and in mixed populations (as most are) it would be best to choose ponds where *lessonae* are thought to dominate. Mixed samples are OK (we can identify them by DNA analysis) but only the *lessonae* ones will be useful to us.

It is important to comply with your national legislation if you are considering contributing samples to this project as the pool frog is a protected species in many countries.

Please send samples, or requests for further information, to: Dr T.J.C. Beebee, School of Biological Sciences, University of Sussex, Falmer, Brighton BN1 9QG, UK.

t.j.c.beebee@sussex.ac.uk

For details on contributing recordings to help with the bioacoustics work, please contact: Julia Wycherley, 31 The Crossways, Merstham, Surrey RH1 3NA, UK.

101515.1650@compuserve.com



Froglog Shorts

DONATIONS We gratefully acknowledge receipt of the following donations from 1 January through 28 February 1999. **Organizations:** Desert Fishes Council, Detroit Zoological Society, Earth Images (Nancy Cannon), IMSA Fund for Advancement of Education, Marwell Zoological Park, National Zoological Park (Smithsonian) Library, Northern Ohio Association of Herpetologists, Rhode Island Zoological Society, San Antonio Zoological Society, Tulsa Zoological Park, University of Aarhus Library, Ward's Natural Science Establishment Inc., Wildlife Conservation Society (Bronx Zoo), San Francisco Bay Area Chapter of The Wildlife Society, Zoologischer Garten, Köln. **Individuals:** Kraig Adler, Lewis Anderson, Jim Andrews, James & Susan Arrigoni, Ronald Beiswenger, Gale Belinky, Bill Belzer, Kirby Biggs, Matthew Brandley, Robert Brooks, Janalee Caldwell, Charles Carpenter, Charlotte Corkran, Paul Daniel, Kevin de Queiroz, Mac Donofrio, Sharon Emerson, Andrea English, Evan C. Evans, James Fowler, Jerry Gampper, Rose Grant, P. A. Greenberg, Michelle Grigore, Gregory Gruener, Ralph Grundel, Suzanne Gunderman, Carol Hall, John Hall, Judy Hancock, James Hanken, Janet Hardin, Kurt Henkel, Stanley Hillman, Eugene Holmes, Rene Honegger, Moira Hope, Peter Hovingh, Roberto Ibáñez D., Karen L. Jacobs, Elliot Jacobson, Jett, Robin Jung, Lee Kats, Jacqueline Lakocy, John H. Larsen, Charlotte LaTier, Harold Laughlin, Charles Leavell, Thomas Lovejoy, Ronald Marlow, Ernst Meyer, Edward & Judith Moll, Allan Muth, Alan Nebeker, Robert & Edith Nelson, Marilyn Ort, William Parker, Lona & Allen T. Pierce, Dwight Platt, James Platz, Harvey Pough, Charles V. Quinn, Alan Resetar, Dave Rich, Christina Richards, R. Burns Ross, Rodolfo Ruibal, Barbara & Alan Savitzky, Andrew Sheldon, Susan Sindt, Hobart Smith, Michael Sredl, Glenn Stewart, Margaret Stewart, Robert Storm, Edward Styskel, Merrill Tawse, Susan Tressler, Roger Waldman, Peter Warny, Robert B. Willey.

Resolution on Amphibian Declines At their meeting in July 1998, three herpetological societies, the American Society of Ichthyologists and Herpetologists, the Herpetologists' League and the Society for the Study of Amphibians and Reptiles, adopted a resolution expressing concern about amphibian declines and calling for an

interdisciplinary and collaborative research programme to determine their causes. Copies of the resolution are available from the DAPTF Office.

Puerto Rican frogs cause trouble in Maui. Accidentally introduced species of all kinds have wrought havoc among the endemic wildlife of the Hawaiian archipelago. A recent amphibian introduction to Maui has caused just such a stir. It appears that a number of coqui frogs (*Eleutherodactylus coqui*) were accidentally introduced into the gardens of hotels, carried there on shrubs and trees. Their numbers have increased to such an extent that hotel guests are complaining about the noise of their choruses. Faced by this threat to their tourist industry, and to their endemic fauna the Hawaiian authorities are looking for ways to control the coqui frog populations.

A visual artist in the San Francisco area has developed an exhibit of artworks on the theme of vanishing frogs and toads. The artwork consists of sculpture of fabric, plaster and rubber and many paintings. Most of the work can be hung on the wall. She is looking for places to show this work. Any suggestions can be forwarded to: kerry@cwia.com

Wildlife Links - Request for Proposals The National Fish and Wildlife Foundation, through a cooperative agreement with the United States Golf Association, requests preproposals for projects that address wildlife conservation needs on golf courses. Areas of interest include: analysis of management and design techniques for increasing biodiversity on golf courses; research to determine if certain habitat characteristics result in wildlife corridors or barriers on golf courses; preparation of management guidelines for specific species or species suites; programmes to monitor the success of wildlife habitat conservation programs on golf courses; and the effects of golfer and maintenance activities on wildlife. All projects must address issues of direct management concern to the golf industry and should provide management recommendations applicable on at least a regional basis. In addition, proposals should indicate that golf courses have been contacted and will be formal project partners. Request should not exceed \$25,000 per year, yet multi-year funding is possible. The deadline for preproposals is Friday, July 16, 1999. Applicants will be notified by the end of July if a full proposal is requested. Full proposals will be due by September 14, 1999, with funding available in February of 2000. For

preproposal guidelines, please visit the NFWF website: www.nfwf.org or contact Katie Distler, NFWF, via email: distler@nfwf.org

An eleven-year-old frog fan (Allyse Tree) and her father have built a web site dedicated to frogs and everyone who loves frogs or wants to learn more about them. As frog information and articles are entered on the site they can quickly be reviewed and posted on the site almost immediately. Both the article section and encyclopedia are equipped with their own search engines. The site also contains a frog forum where questions and information on frogs can be posted to a bulletin board.

Part of the site is the lily pad frog store, which contains everything from frog jewellery to puzzles and plush frogs. "**Frogz.net**" is proud to donate a percentage of all sales from the store to the DAPTF. Our goal is to preserve these beautiful creatures for future generations to enjoy. The site also contains information on DAPTF and how donations can be made to help their research. In the future, games, on line coloring books, a teacher activity center and many other fun areas will be added to the site as well as many links to other great frog sites. We greatly appreciate everyone sharing their feedback and information to help the frog super center grow into the premiere educational and awareness site about our amphibian friends. We can be reached at info@frogs.net or directly through the web site at www.frogz.net



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