Letters

BOX TURTLE (*TERRAPENE CAROLINA CAROLINA*) CARAPACE COLOUR DEVELOPMENT

We have long been working on the presentation of our novel findings, on Box Turtle (*Terrapene carolina carolina*) carapace colour development, that serendipitously emerged during our long-term repatriation field studies for this species.

To properly present the phenomenon, we wanted to provide readers with numerous colour images documenting the various aspects of carapacial colour development and changes that we observed (a goal which faced prohibitive paper-publishing costs). But, thanks to Mark Miller (President and special publications editor), the Philadelphia Herpetological Society provided the peer review for our article, and then prepared it for posting as a special publication (#2009_02) of the Society on the web site, to obviate our financial obstacles and enable the work to be easily available to the herpetology community.

Mark has spent many months on the project and we are happy to inform you that, thanks to his kind help and unstinting effort, you can now examine our report {Photo-dependent localized colour development in the Eastern Box Turtle carapace. 2010. William Belzer and Susan Seibert. PHS Special Publication #2009_02 (permanent archive) at http://herpetology.com/belzer2/colorintro.htm. The article can also be accessed from the revelvant "Research link" provided at www.ebtct.org

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Research Abstracts

NEW TAXONOMY FOR *LAMPROPELTIS GETULA* GROUP.

This study presents a systematic revision of the *Lampropeltis getula* group, based on a recent range wide phylogeographic analysis. The study investigated and defined theoretical and operational concepts of species delimitation, and provided full diagnoses based on mitochondrial DNA evidence, ecological niche modelling, morphology, and historical precedence. The study used these advanced techniques to recognise five distinct species, which bear the name of the nominate subspecies found primarily within the range of each phylogeographic lineage: the Eastern lineage (*Lampropeltis getula*, Eastern Kingsnake), the Mississippi lineage (*L. nigra*, Black Kingsnake), the Central lineage (*L. holbrooki*, Speckled Kingsnake), the Desert lineage (*L. splendida*, Desert Kingsnake) and the Western lineage (*L. californiae*, California Kingsnake). Interestingly, all of these taxa had originally been described as distinct species and recognized as such for over 100 years (in the case of *L. californiae*) before being demoted to subspecies level. The study discusses the impact that increasingly detailed genetic information from phylogeographic analyses may have on traditional taxonomy.

Pyron, A.R. & Burbrink, F.T. (2009). Systematics of the Common Kingsnake (*Lampropeltis getula*; Serpentes: Colubridae) and the burden of heritage in taxonomy. *Zootaxa* **2241**, 22-32.

HABITAT FRAGMENTATION AS CAUSE OF LOCAL AMPHIBIAN DECLINE.

Most amphibian species have biphasic life histories and undergo an ontogenetic shift from aquatic to terrestrial habitats. In deforested landscapes, streams and forest fragments are frequently disjunct, jeopardizing the life cycle of forest-associated amphibians with aquatic larvae. In this recent and well documented research the authors tested the impact of “habitat split”, defined as human-induced dissection between habitats, used by different life-history stages of a species on four forest-associated amphibians in a severely fragmented landscape of Brazilian Atlantic Forest.

Amphibians were surveyed in forest fragments with and without streams (referred to as wet and dry fragments), including grass-field matricies. The comparison of capture rates in dry fragments and nearby streams in the matrix allowed evaluation of the number of individuals that engaged in high-risk migrations through nonforested habitats. Adult amphibians moved from dry fragments to matrix streams at the beginning of the rainy season, reproduced, and returned at the end of the breeding period. Juveniles of the year moved to dry fragments along with adults.

These risky reproductive migrations through nonforested habitats that expose individual amphibians to dehydration, predation, and other hazards may cause population declines in dry fragments. Indeed, capture rates were significantly lower in dry fragments compared with wet fragments. Declining amphibians would strongly benefit from investments in the conservation and restoration of riparian vegetation and corridors linking breeding and nonbreeding areas. Becker et al. (2010) is the sort of study that could be replicated in a number of locations. It could well serve as a model example of a habitat degradation study that coupled with micro-climatic change can exhibit the pressures faced by amphibians in pressured landscapes.

Becker, C.G., Fonseca, C.R., Haddad, C.F.B. & Prado, P.I. (2010). Habitat split as a cause of local population declines of amphibians with aquatic larvae. *Cons. Biol.* **24** (1), 287-294.

RED-EYED TREEFROG EMBRYOS USE TWO FEATURES OF RAIN VIBRATIONS TO AVOID EVASIVE HATCHING FALSE ALARMS.

Prey use predator cues to inform defensive decisions. Detecting these cues is often complicated by benign stimuli that resemble and can be mistaken for predators, leading prey to display costly defences incorrectly. One strategy that prey have evolved to reduce these 'false alarms' is to respond only to stimuli with characteristics consistent with predator cues. Decision errors might still be frequent, however, in cases where the probability distributions of benign stimulus properties completely overlap those of predator cues.

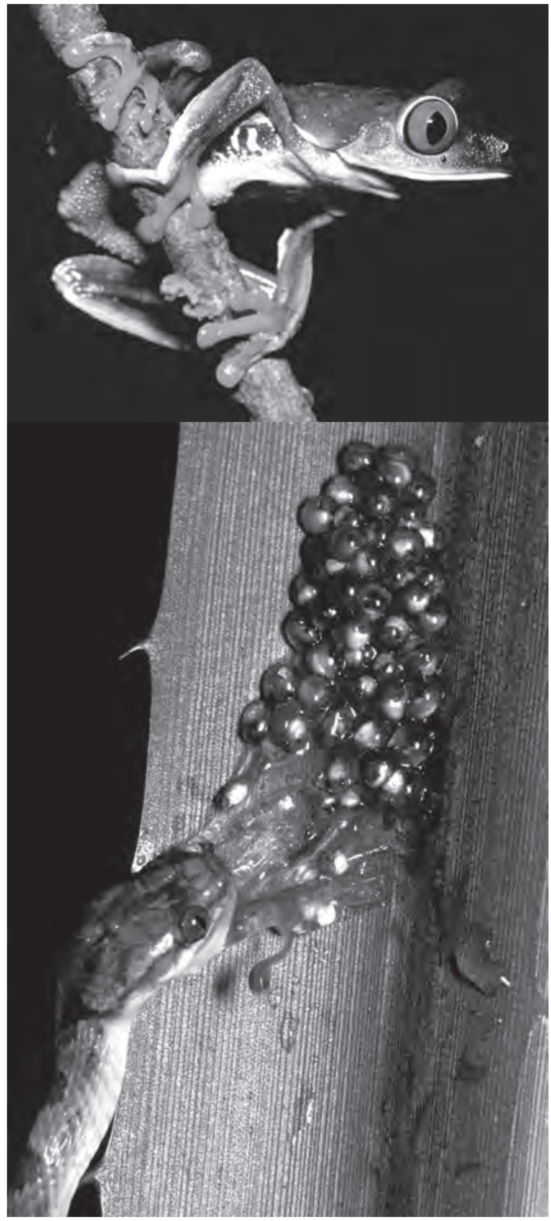

Figure 1. *Agalychnis callidryas* (Top) and snake attack on embryos, triggering hatching (Below). © Michael S. Caldwell.

In such cases, inhibition of defensive responses by characteristic features of benign stimuli could further improve discrimination. Red-eyed Treefrog embryos, *Agalychnis callidryas* (Fig. 1), hatch prematurely to escape egg predators. They detect predators using vibrations generated during attacks. However, common benign disturbances such as rainstorms generate vibrations with property probability distributions that largely overlap those of predators. In this study Michael Caldwell and colleagues used vibration playbacks to test the hypotheses that embryos use two features of rainstorm vibrations not shared by predator attacks, characteristic high frequencies and an initial period of intensity buildup, to avoid hatching in response to this benign stimulus. The escape-hatching response to otherwise stimulatory vibrations is reduced in the presence of either features characteristic of rainstorms. Either *A. callidryas* embryos use rainstorm features to inform their hatching decision or these features alter their perception of predator cues. Identifying likely sources of potential false alarms and comparing their stimulus characteristics to predator cues and prey decision rules will improve our understanding of both the information processing challenges facing prey and the ways they solve them.

Caldwell, M.S., McDaniel, J.G. & Warkentin, K.M. (2009). Is it safe? Red-eyed treefrog embryos assessing predation risk use two features of rain vibrations to avoid false alarms. *Animal Behaviour* **79** (2), 255-260.

METAPOPULATION DYNAMICS AND CLIMATE IMPACTS OF A DECLINING GREAT CRESTED NEWT METAPOPULATION.

Climate can interact with population dynamics in complex ways. In this study Richard Griffiths and colleagues describe how climatic factors influenced the dynamics of an amphibian metapopulation over 12 years through interactions with survival, recruitment and dispersal. Low annual survival of Great Crested Newts (*Triturus cristatus*) was related to mild winters and heavy rainfall, which impacted the metapopulation at a regional level. Consequently, survival varied between years but not between sub-populations. Despite this regional effect, the four sub-populations were largely asynchronous in their dynamics. Three out of the four sub-populations suffered reproductive failure in most years, and recruitment to the metapopulation relied on one source. Variation in recruitment and juvenile dispersal was therefore probably driving asynchrony in population dynamics. At least one sub-population went extinct over the '12 year' period. These trends are consistent with simulations of the system, which predicted that two sub-populations had an extinction risk of >50% if adult survival fell below 30% in combination with low juvenile survival. Intermittent recruitment may therefore only result in population persistence if compensated for by relatively high adult survival. Mild winters may consequently reduce the viability of amphibian metapopulations. In the face of climate change, conservation actions may be needed at the local scale to compensate for reduced adult survival. These would need to include management to enhance recruitment, connectivity and dispersal. Griffiths et al. (2009) study is a good model example of how to gather and apply climate and metapopulation data.

Griffiths, R.A., Sewell, D. & McCrea, R.S. (2009). Dynamics of a declining amphibian metapopulation: survival, dispersal and the impact of climate. *Biol. Cons.* **143**, 485-491.

Figure 1. *Triturus cristatus* (Great Crested Newt). © Gareth Blockley.