

**BIOGRAPHICAL SKETCH**

Provide the following information for the Senior/key personnel and other significant contributors.  
Follow this format for each person. DO NOT EXCEED FIVE PAGES.

NAME: Greenbaum, Eli B.

eRA COMMONS USER NAME (credential, e.g., agency login):

POSITION TITLE: Associate Professor

EDUCATION/TRAINING (Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)

INSTITUTION AND LOCATION	DEGREE (if applicable)	Completion Date MM/YYYY	FIELD OF STUDY
Binghamton University	B.S.	05/96	Biological Sciences
University of Louisiana at Monroe	M.S.	05/98	Biology
University of Kansas	Ph.D.	05/06	Ecology/Evo Biology
Villanova University- Postdoctoral Research Fellowship		08/08	Phylogenetics

**NOTE: The Biographical Sketch may not exceed five pages. Follow the formats and instructions below.**

**A. Personal Statement**

The rapidly emerging field of molecular systematics is central to my research program, because it allows me to utilize phylogenies to test biogeographic hypotheses within a statistical and evolutionary framework. Other related biological phenomena can be addressed with my systematic focus, including morphological and behavioral character evolution, species boundaries, and identification of ancient, unique lineages that are in need of conservation. My research interests are equally divided among examination of specimens in collections, laboratory investigations, and fieldwork. An amalgamation of these approaches will bridge traditional morphological taxonomy with molecular data, and utilize behavioral and ecological observations made in the field.

2015. Portillo\*, F., **E. Greenbaum**, M. Menegon, C. Kusamba, and J. M. Dehling. Phylogeography and species boundaries of *Leptopelis* (Anura: Arthroleptidae) from the Albertine Rift. *Molecular Phylogenetics and Evolution* 82:75–86. Available online 5 October 2014: <http://www.sciencedirect.com/science/article/pii/S1055790314003443>
2014. Leaché, A. D., P. Wagner, C. W. Linkem, W. Böhme, T. J. Papenfuss, R. Chong, B. R. Lavin\*\*, A. M. Bauer, S. Nielsen\*, **E. Greenbaum**, M. -O. Rödel, A. Schmitz, M. LeBreton, I. Ineich, L. Chirio, E. A. Eniang, S. Baha El Din, A. R. Lemmon, and F. T. Burbrink. A hybrid phylogenetic-phylogenomic approach for species tree estimation in African *Agama* lizards with applications to biogeography, character evolution, and diversification. *Molecular Phylogenetics and Evolution* 79:215–230.
2014. Portillo, F., and **E. Greenbaum**. A new species of the *Leptopelis modestus* complex (Anura: Arthroleptidae) from the Albertine Rift of Central Africa. *Journal of Herpetology* 48:394–406.
2014. Heinicke, M. P., Juan D. Daza, **E. Greenbaum**, T. R. Jackman, and A. M. Bauer. Phylogeny, taxonomy, and biogeography of a circum-Indian Ocean clade of leaf-toed geckos (Reptilia: Gekkota), with a description of two new genera. *Systematics and Biodiversity* 12:23–42.

## B. Positions and Honors

2013–present. Associate Professor, Dept. of Biological Sciences, University of Texas at El Paso.

2008–2013. Assistant Professor, Dept. of Biological Sciences, University of Texas at El Paso.

2006–2008. Postdoctoral Research Fellow, Dept. of Biology, Villanova University, Villanova, PA.

2012. Recommendation for article of special significance by Faculty of 1000 for “Repeated origin and loss of adhesive toepads in geckos.” <http://f1000.com/717950006>

2006. Honors Dissertation Defense, The University of Kansas.

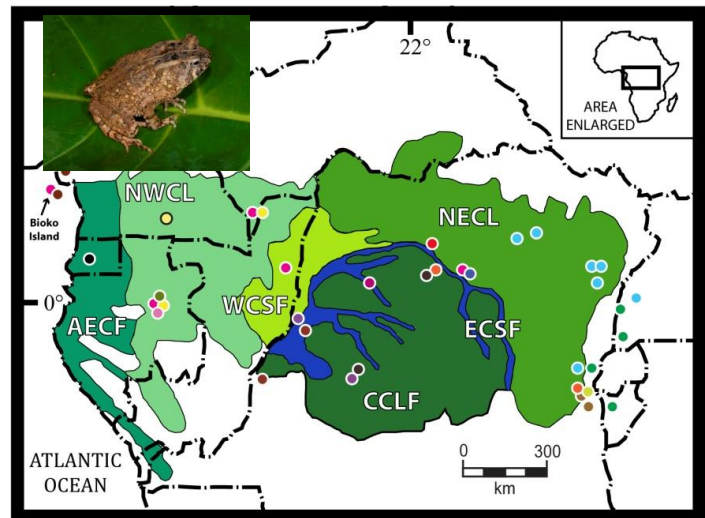
## C. Contribution to Science

**How, when and why did different vertebrate groups radiate in Central Africa?** My main focus over the last eight years has been my independent research program in Democratic Republic of the Congo (DRC) in Central Africa, where the biodiversity is arguably the most poorly known in any terrestrial region of the world. Since 2007, I have been working with Congolese scientists at the Centre de Recherche en Sciences Naturelles in DRC, and in 2014 I expanded my collaborations to Makerere University in Uganda. I have amassed the largest genetic resource (i.e., tissue holdings) for two major Central African vertebrate groups (amphibians and reptiles) in the world. With this unique resource, I have studied patterns and processes of species-level

diversification by focusing on the evolutionary and biogeographic histories of several different amphibian and reptile taxa from Central Africa. Statistical tests of phylogenetic-tree topologies and population genetics analyses can be used to test predictions of the montane speciation hypothesis (i.e., minimal endemism and speciation in the lowlands) and riverine barrier hypothesis (i.e., vicariance and gene flow is affected by major rivers, including the Congo).

At right I provide an example of a major ongoing phylogenetic study of the three known species of Central African *Amietophrynus* toads to demonstrate the surprising level of cryptic speciation in the Congo Basin. These data (ca. 4,000 base pairs of the 12S–16S mitochondrial genes, POMC, CXCR-4, and RAG1 nuclear genes) are based on hundreds of samples of toads from across Central Africa, which are analyzed with widely accepted maximum likelihood (RaxML) and Bayesian Inference (MrBayes) optimality criteria.

As with similar analyses my lab is conducting on other herpetological taxa, the results demonstrate that amphibian diversity in Central Africa is underestimated by a factor of at least five, suggesting the conservation importance of the Congo Basin is much greater than currently appreciated. My results do not support the predictions of either the montane speciation or riverine barrier hypotheses in most cases. I have used two approaches (mutation rates for well-studied genes and fossil-based calibrations) in the program BEAST to estimate the timing of these Central African radiations, and multiple analyses suggest global cooling in the Miocene (ca. 8–12 million years ago) precipitated major changes in vegetation with concomitant bursts of speciation in isolated forest refugia. These estimates are substantially older than recently published studies of mammals that are focused on ecological models during the Pleistocene.



the Congo Basin. Colored circles represent different species. White abbreviations refer to ecoregions (e.g., Eastern Congolian Swamp Forest) of the Congo Basin. Map modified from Burgess et al. 2004. *Terrestrial Ecoregions of Africa and Madagascar: A Conservation Assessment*.

2015. Portillo\*, F., **E. Greenbaum**, M. Menegon, C. Kusamba, and J. M. Dehling. Phylogeography and species boundaries of *Leptopelis* (Anura: Arthroleptidae) from the Albertine Rift. *Molecular Phylogenetics and Evolution* 82:75–86. Available online 5 October 2014: <http://www.sciencedirect.com/science/article/pii/S1055790314003443>
2013. **Greenbaum, E.**, U. Sinsch, E. Lehr, F. Valdez\*\*, and C. Kusamba. Phylogeography of the reed frog *Hyperolius castaneus* (Anura: Hyperoliidae) from the Albertine Rift of Central Africa: Implications for taxonomy, biogeography and conservation. *Zootaxa* 3731:473–494.
2012. **Greenbaum, E.**, and C. Kusamba. Conservation implications following the rediscovery of four frog species from the Itombwe Natural Reserve, eastern Democratic Republic of the Congo. *Herpetological Review* 43:253–259.
2011. **Greenbaum, E.**, C. O. Villanueva, C. Kusamba, M. M. Aristote and W. R. Branch. A molecular phylogeny of Equatorial African Lacertidae, with the description of a new genus and species from eastern Democratic Republic of the Congo. *Zoological Journal of the Linnean Society* 163:913–942.

URL to publication list on My Bibliography:

<http://www.ncbi.nlm.nih.gov/sites/myncbi/1RWlayhoM6nAj/bibliography/40615211/public/?sort=date&direction=ascending>

#### D. Research Support

2014. Institute for Museum and Library Services, Museums for America Program, \$150,000. Natural History Collection Stewardship for the 21st Century at the University of Texas at El Paso. PI. Resubmission. (pending)
2014. NSF Research Experience for Undergraduates Supplement, \$13,146. REU Supplement – Collaborative Research: Biotic Inventory of the Amphibians, Reptiles and Associated Parasites of the Central African Lowland Forests. PI. (pending)
2012. NSF Biodiversity: Discovery & Analysis Program, \$366,846. Collaborative Research: Biotic Inventory of the Amphibians, Reptiles and Associated Parasites of the Central African Lowland Forests. PI. DEB-1145459.
2008. UTEP University Research Institute, \$5,000. Evolutionary Relationships of African Toads Inferred From Multiple Genes, With Emphasis on the Genus *Bufo* (Amphibia: Bufonidae).
2008. National Geographic Research and Exploration Grant (no. 8556-08), \$18,522. Conservation Assessment of Endangered Amphibians of the Itombwe Highlands, Democratic Republic of Congo.