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SSAR 50th Anniversary Year

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SOCIETY FOR THE STUDY OF AMPHIBIANS AND REPTILES

www.ssarherps.org

The Society for the Study of Amphibians and Reptiles, the largest international herpetological society, is a not-for-profit organization established to advance research, conservation, and education concerning amphibians and reptiles. Founded in 1958, SSAR is widely recognized today as having the most diverse society-sponsored program of services and publications for herpetologists. Membership is open to anyone with an interest in herpetology—professionals and serious amateurs alike—who wish to join with us to advance the goals of the Society.

All members of the SSAR are entitled to vote by mail ballot for Society officers, which allows overseas members to participate in determining the Society's activities; also, many international members attend the annual meetings and serve on editorial boards and committees.

ANNUAL DUES AND SUBSCRIPTIONS: Annual membership dues for the year 2007 in the Society for the Study of Amphibians and Reptiles are as follows: **REGULAR** membership US$60 (Student $30)—includes *Journal of Herpetology* and *Herpetological Review*; **PLENARY** membership US$80 (Student $45)—includes *JH*, *HR*, and annual subscription to the *Catalogue of American Amphibians and Reptiles*; **INSTITUTIONAL SUBSCRIPTION** $125—includes JH and HR. Additional fee for airmail postage outside USA $35 for one year. Additional membership categories available on the SSAR webpage: http://www.ssarherps.org/pages/membership.html.

All members and institutions receive the Society's primary technical publication, the *Journal of Herpetology,* and its news-journal, *Herpetological Review*; both are published four times per year. Members also receive pre-publication discounts on other Society publications, which are advertised in *Herpetological Review*.

Payment must be made in USA funds, payable to "SSAR," or by International Money Order, or with VISA or MasterCard (account number and expiration date must be provided). Payment should be sent to: Breck Bartholomew, SSAR Membership Office, P.O. Box 58517, Salt Lake City, Utah 84158, USA. Fax: (801) 453-0489; e-mail: ssar@herplit.com.

Future Annual Meetings

2007 — Saint Louis, Missouri, 11–16 July (with ASIH, HL)
2008 — Montreal, Canada (with ASIH, HL)
2009 — Portland, Oregon (with ASIH, HL)

About Our Cover: *Diporiphora winneckei*

Agamid lizards, popularly known as dragons, are strongly visually-cued. They have alert, upright postures, and most species seek elevated perches from which they adopt a sit-and-wait ambush style of prey capture.

The family is widespread throughout the Old World, from Australia and New Guinea to Asia, Africa, the Middle East, and southern Europe. Australia is home to 71 described species. The 14 species of *Diporiphora* make up Australia's second largest agamid genus. While dragons are distributed across the continent, with highest diversity in central and western deserts, *Diporiphora* is most numerous across northern Australia, particularly in semi-arid north-western tropical savannahs where the ground cover is dominated by spinifex (*Triodia* spp.).

Diporiphora are relatively poorly known. Little ecological work has been undertaken and the group is sorely in need of taxonomic review. The most recent systematic studies were in the 1970s and the most comprehensive of these dealt only with Western Australia and the Northern Territory (Storr 1974. Records of the Western Australian Museum 3[2]:121–146). Identification of species can be problematic and a number of unresolved taxa are known to occur in eastern Australia.

For the most part, *Diporiphora* species are outwardly similar in appearance, being relatively slender and small (maximum SVL for most species is 60–80 mm), lacking the elaborate spines, crests, and dewlaps that typify many agamids. Most are patterned with a pair of pale dorsal stripes overlaying a series of short dark cross-bands. This is ideal cryptic coloration for terrestrial to semi-arboreal dragons that dwell among grasses and low shrubs. Many dragons can accelerate to rapid, often bipedal sprints when pursued, but *Diporiphora* tend to be less swift, generally scuttling on all four limbs to the nearest cover.

The Canegrass Dragon (*Diporiphora winneckei*), depicted on our cover, is notable for its extremely slender, almost emaciated-looking build and the smooth, silky white ventral surface boldly striped with grey (males) or yellow (females). Breeding males develop a red flush on the flanks. *D. winneckei* has the broadest distribution of the genus, spanning the vast central and western sand-ridge deserts. Its habitat comprises interdunes and lower slopes vegetated with spinifex or canegrass (*Zygochloa*) and generally bare dune crests.

This *D. winneckei* is basking atop a hummock of spinifex, one of Australia's most herpetologically significant grasses. Wherever spinifex grows it supports a high diversity of lizard species including many endemics. When inactive or pursued, the lizard takes refuge within the matrix of slender, tough, needle-sharp spines.

D. winneckei is one of the most heat-tolerant Australian lizards, with specimens caught on the tops vegetation at midday having body temperatures of 42–46°C (Greer 1989. Biology and Evolution of Australian Lizards. Surrey Beatty & Sons, Sydney). This is above the lethal thermal limit for most species.

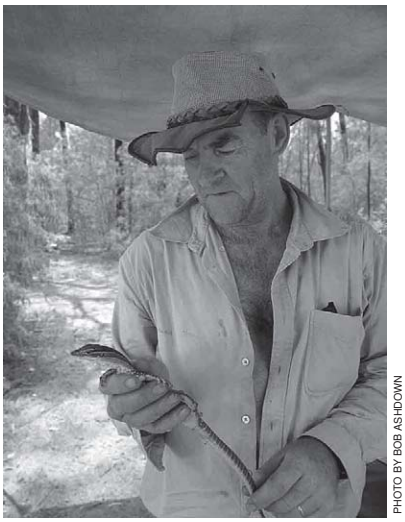

PHOTO BY BOB ASHDOWN

Our cover lizard was photographed by Australian herpetologist **Steve Wilson**, at Windorah in southwestern Queensland. Steve used Provia 100 ISO slide film and an Olympus OM2n camera with a 50mm macro lens, using natural daylight. Steve has written a number of field guides to reptiles of Australia and his home state of Queensland. His most recent book, a reptile book for children, is designed to instill a sense of wonder into the next generation. It was published in late 2006. His next project is a popular guide to the natural history of Australian lizards.

SSAR BUSINESS

Open Letter to Membership

SSAR will celebrate its 50th Anniversary in 2007. Special activities will take place during the Joint Meeting of Ichthyologists and Herpetologists (JMIH) in St. Louis, 11–16 July. The major events associated with SSAR's Anniversary are scheduled for 13 July. These events feature a symposium organized by Jonathan Losos entitled "Herpetology in the Age of Genomics." Jim Murphy and Kraig Adler will be the Masters of Ceremonies for a special SSAR Banquet that evening. The SSAR/HL auction will follow the banquet. And, of course, everyone is invited to attend the Business meeting on July 15. A link to registration on our website (http:www.ssarherps.org) will be available in January. Registration can be for the entire meeting or only for the day of the SSAR celebration.

—Roy McDiarmid, SSAR President
—Robin Andrews, SSAR Immediate Past President

NEWSNOTES

6th World Congress of Herpetology Call for Symposium Proposals

On behalf of the 6th World Congress of Herpetology Organizing Committee, we would like to invite colleagues to organize and propose symposia. Proposals should state clearly that the symposium organizer is ready to assume the organization of the symposium. Proposal submissions will be open until 30 September 2007 and should include the following items:

1) A symposium title; 2) The full name of the organizer or chair of the proposed symposium; 3) Institutional affiliation of the organizer and contacts (full address, e-mail, phone, and FAX numbers; 4) A brief text (200 words) explaining the goal of the symposium; 5) A list of potential speakers and their topics.

Presentations should be of 20 minutes duration for each participant (this time should include time for questions and discussions). If the Symposium organizer has compelling reasons for other time allotments, the symposium organizer must make his/her case with the Organizing Committee for an alternate scheme of time allotments that would allow for time coordination with the other symposia being held simultaneously.

Organizers should inform symposium participants to prepare their presentations in Power Point for PC.

Below are the names and contact of the members the Symposium Committee of the 6th World Congress of Herpetology; please send your proposal to one of the following:

Dr. Carlos Frederico D. Rocha (Head of Symposium Committee) (Rio de Janeiro, Brazil); e-mail: cfdrocha@uerj.br

Dr. Claudia Keller (Manaus, Brazil); e-mail: keller@inpa.gov.br

Dr Jean-Marc Hero (Queensland, Australia); e-mail: m.hero@griffith.edu.au

A New Book to Celebrate SSAR's 50th Anniversary

Contributions to the History of Herpetology

Volume 2 by Kraig Adler, John S. Applegarth, and Ronald Altig

From the reviews of volume 1, published in September 1989:

"Of absorbing interest." —Alwyne Wheeler (Archives of Natural History).

"Here is a portrait gallery that to browse will delay your next paper in progress!" —Joseph Ewan (Taxon).

"An important original contribution to the history of herpetology . . . exacting and exhaustive scholarship, and an unmistakable touch of class." —Hobart M. Smith (Herpetological Review).

This book consists of three sections, each worldwide in coverage. **The first and longest section, by Kraig Adler**, is a series of completely new biographies of the leading contributors to herpetology beginning with the author of the first book on the subject, Nicolò Leoniceno (1428–1524). The accounts have a portrait, signature, and references for further interest. These feature 285 herpetologists and also include information about their colleagues and students and many other persons. The comprehensive index encompasses volumes 1 and 2 and covers nearly 1,400 individuals.

Among the biographies included in volume 2 are these:

• Authorities on venomous snakes and antivenoms—Brazil, Calmette, Charas, Fayrer, Fontana, Mitchell, and Noguchi.

• Bartram, Bocourt, Cantor, Catesby, David, the Grandidiers, Pallas, Rüppell, the Sarasins, Swinhoe, and others who explored then-unknown continents.

• The classifiers, Blainville, Brongniart, Oppel, and Ray.

• Aldrovandi, Bogert, Brongersma, Dickerson, Lichtenstein, McCoy, Wettstein and others who built great museum collections.

• The anatomists, Gadow, Gegenbaur, Hyrtl, Lebedkina, Leydig, Rathke, Severino, Tyson, and Wiedersheim.

• The artistic team of Sowerby and Lear.

• Experts on diseases and cures, Elkan and Reichenbach-Klinke.

• Schmalhausen, Szarski, Williams, and other evolutionists.

• Popular writers, among them Behler, Bellairs, the Conants, Hopley, the Mintons, Oliver, Rose, Topsell, and Worrell.

Coverage is global: Africa (El-Toubi, FitzSimons, Power), Asia (Chang, Đào, Gasperetti, Gharpurey, Hoofien, Hora, Hu, Kirtisinghe, Makino, Namiye, Tweedie), Australia (Fry, Lucas, Macleay, Storr), Europe (Ahl, Boscá, Cherchi, Cott, Dely, Eiselt, Flower, Gmelin, Guibé, Guichenot, Hediger, Hellmich, Hillenius, Lataste, Mocquard, Morescalchi, Rasmussen, Špinar), North America (Auffenberg, Barton, the Brimleys, Burt, Cagle, De Kay, Estes, Gorham, Hallowell, Lowe, Mosauer, Neill, Perkins, Schwartz, Slevin, Strecker, Yarrow), and Central and South America (Álvarez del Toro, Carvalho, Freiberg, Gomes, the Iherings, Laurent, Orcés, Orejas Miranda, Picado, Rand, Vellard).

Also included are experts on taxonomic groups such as salamanders (Brame, Green, Rusconi, Twitty, the Wilders, Wolterstorff, Wurffbain), turtles (Caldesi, Hay, Schweigger, Wermuth), and snakes (Fukada, Mell, Saint Girons, Slowinski, Stull, Underwood). The book contains an additional 150 biographies.

The second section, by John S. Applegarth, is an index of 3,603 authors in taxonomic herpetology. This alphabetical list includes the full names, dates, countries of residence, and orders of taxa for everyone who has proposed a new taxon (genus or below, within the living families) or has had a taxon named in their honor. This is a unique resource for zoologists, historians, and librarians. In less than two decades (since the 1989 edition), the number of persons covered has increased by nearly 50 percent.

The third section, by Ronald Altig, is a listing of herpetologists giving the names of their doctoral university, their major professor, and the date of their degree. This extensive revision is three times longer than the 1989 edition. The information is arranged in such a manner that the academic lineages can be followed from generation to generation, both forward and backward in time. 3,810 names are included and fully indexed.






Specifications: 400 pages (8.5 × 11 inches or 21.5 × 28 cm), bound in library-grade cloth. Color frontispiece, 269 portraits. ISBN 978–0–916984–71–7. To be published July 2007. • **Regular Price:** $65. • **Special Price to SSAR Members** (if ordered *before November 2007*): $50. • **Shipping Costs:** USA address, add $4; non-USA add $9. • **Orders to:** SSAR Publications Secretary, P.O. Box 58517, Salt Lake City, Utah 84158–0517, USA (*telephone and fax*: 801–562–2660; *e-mail*: ssar@herplit.com). • **Payment:** Make checks payable to "SSAR." Non-USA orders must be paid in USA funds using a check drawn on an American bank or by International Money Order. Books may be charged to American Express, Discover, MasterCard or VISA (please give account number and expiration date). • **SSAR Membership and Other Publications:** Membership information and a complete list of society publications can be obtained from the Publications Secretary at the address given above or at www.ssarherps.org.

Dr. Martin Whiting (Johannesburg, South Africa); e-mail: martin@gecko.wits.ac.za

Dr. Miguel Trefaut Rodrigues (São Paulo, Brazil); e-mail: mturodri@usp.br

Dr. Richard Griffiths (Kent, England); e-mail: R.A.Griffiths@kent.ac.uk

Dr. Ronald Heyer (Washington, D.C., USA); e-mail: HEYERR@si.edu

More information and details about the meeting may be found on the WCH web page:

http://www.worldcongressofherpetology.org/index.php?section=11

Herpetologists Honored for Contribution to Conservation

The Florida Chapter of The Wildlife Society (FLTWS) has announced the winners of the first annual Paul Moler Herpetological Conservation Award. The recipients, Mark Bailey, Kurt Buhlmann, Jeff Holmes, and Joe Mitchell, were selected for producing the new Partners for Amphibian and Reptile Conservation publication, "Habitat Management Guidelines for Amphibians and Reptiles of the Southeastern United States." Featuring detailed, yet easy-to-understand ideas and methods to help landowners improve the conservation value of their land, the book has received excellent reviews from land managers and conservation professionals across the region. The Guidelines effectively cover the wide variety of habitats and herpetofauna (amphibians, turtles, reptiles, and crocodilians) present in the southeastern United States, both with text and exquisite photography. The book is available to the public and can be ordered at http://www.parcplace.org/

The conservation award was presented during this year's annual meeting of the FLTWS, 11–13 April 2007, in St. Petersburg, Florida. The award was established in honor of one of Florida's preeminent herpetologists, Paul Moler, who retired in 2006 after 29 years of service with the Florida Fish and Wildlife Conservation Commission. "I am especially gratified to see this first Herpetological Conservation Award go to the authors of PARC's outstanding southeastern Habitat Management Guidelines," Moler said upon hearing the announcement. The FLTWS is made up of over 300 wildlife professionals dedicated to sustainable management of wildlife resources and their habitats in Florida. For more information on the society or this year's meeting, visit: http://www.fltws.org/.

MEETINGS

Meetings Calendar

Meeting announcement information should be sent directly to the Editor (rwh13@csufresno.edu) well in advance of the event.

20–23 June 2007—31st International Herpetological Symposium, Toronto, Canada. Information: http://www.kingsnake.com/ihs/.

11–16 July 2007—50th Annual Meeting, Society for the Study of Amphibians and Reptiles; 87th Annual Meeting, American Society of Ichthyologists and Herpetologists; 65th Annual Meeting, The Herpetologists' League. St. Louis, Missouri, USA. Information: http://www.dce.ksu.edu/jointmeeting/.

25–29 July 2007—5th Annual Symposium on Conservation Biology of Tortoises and Freshwater Turtles, Joint Annual Meeting of the IUCN Turtle Survival Alliance and the Tortoise and Freshwater Turtle Specialist Group. Atlanta, Georgia, USA. Information: http://www.turtlesurvival.org/.

3–6 August 2007—5th Conference on the Biology of Plethodontid Salamanders: Symposium in Honor of David B. Wake. Instituto de Biologia, UNAM and ECOSUR, San Cristobal de la Casas, Chiapas, México. Information: http://www.ibiologia.unam.mx/barra/congresos/salamandra/salamandra.html.

20–22 August 2007—Northeast Partners in Amphibian and Reptile Conservation (NEPARC) meeting, University of Virginia's Mountain Lake Biological Station. Meeting information, including registration and agenda are now available on the NEPARC website: www.pwrc.usgs.gov/neparc/Meetings/index.htm.

3–7 September 2007—Venom Week 2007. Tucson, Arizona, USA. Information: http://www.ocme.arizona.edu.

11–14 October 2007—29th Annual Meeting of the Gopher Tortoise Council, Milton, Florida, USA. Information: http://www.gophertortoisecouncil.org/.

2–4 November 2007—34th Annual Meeting, Kansas Herpetological Society, Topeka Zoo, Topeka, Kansas, USA. Information: http://www.cnah.org/khsAnnualMeetingInfo.html.

CURRENT RESEARCH

The purpose of **Current Research** is to present brief summaries and citations for selected papers from journals other than those published by the American Society of Ichthyologists and Herpetologists, The Herpetologists' League, and the Society for the Study of Amphibians and Reptiles. Limited space prohibits comprehensive coverage of the literature, but an effort will be made to cover a variety of taxa and topics. To ensure that the coverage is as broad and current as possible, authors are invited to send reprints to the Current Research section editors, **Michele Johnson** or **Josh Hale**; postal and e-mail addresses may be found on the inside front cover.

The current contents of various herpetological journals and other publications can be found at: http://www.herplit.com/contents.

Phylogenomics Of Reptiles

Our understanding of amniote genome evolution is based solely on chicken-mammal comparisons, but without large scale genomic data from phylogenetically intermediate taxa (i.e., nonavian reptiles) we cannot interpret the evolution of genome diversity in this group. Therefore, the authors used a BAC- (Bacterial Artificial Chromosome) and plasmid-end sequencing approach to characterize the genomes of three reptilian lineages: American Alligator (*Alligator mississippiensis*), Painted Turtle (*Chrysemys picta*), and Bahamian Green Anole (*Anolis smaragdinus*). The resulting data

show that, unlike the chicken, reptilian genomes are dominated by diverse, mammal-like transposable elements and simple sequence repeats (SSRs). Substantial differences exist among the reptilian genomes, as the *Anolis* genome displays higher SSR frequencies and lower GC content than the turtle and alligator genomes, which are characterized by distinctive CR1 (Chicken Repeat 1)-like long interspersed elements (LINEs) and fewer A-T rich SSRs. Additionally, all three reptiles have frequent tandem duplications that do not occur in chickens or mammals. The authors also found that DNA "words" evolve several orders of magnitude slower in reptiles than in mammals. They conclude that the ancestral amniote genome likely had a diversity of repetitive elements that were lost sequentially in reptilian and bird lineages.

Shedlock, A. M., C. W. Botka, S. Zhao, J. Shetty, T. Zhang, J. S. Liu, P. J. Deschavanne, and S. V. Edwards. 2007. Phylogenomics of nonavian reptiles and the structure of the ancestral anmiote genome. PNAS 104:2767–2772.

Correspondence to: Andrew M. Shedlock, Department of Organismic and Evolutionary Biology, Museum of Comparative Zoology, Harvard University, 26 Oxford Street, Cambridge, Massachusetts, 02138, USA; e-mail: shedlock@oeb.harvard.edu.

New Courtship Pheromone in Salamanders

Courtship pheromones are male chemical signals that affect female mating receptivity. Among vertebrates, these pheromones are known only in salamanders, and are most extensively studied in plethodontid salamanders. Courtship pheromones in plethodontids are delivered when a male brings his submandibular (mental) gland in contact with a female, transferring a multiprotein secretion from the gland. A single protein (PRF, plethodontid receptivity factor) from this secretion has been previously shown to increase female receptivity in *Plethodon shermani*, the Red-legged Salamander. In this study, the authors examined a second protein that, together with PRF, comprise 85% of the mental gland extract. They collected *P. shermani* adults from North Carolina, USA, removed the mental gland from males, and extracted the protein of interest from the gland secretions. In subsequent staged encounters between females and deglanded males (N = 32), females in 16 pairs were treated with the protein extract, and females in the other 16 pairs were treated with a saline control. While insemination success did not differ between the groups, treatment with the protein unexpectedly decreased female receptivity, as treatment prolonged the "persuasion" stage of courtship. The authors named this new pheromone, which acts in opposition to PRF, PMF (plethodontid modulating factor). They suggest that PMF may calm females, thereby facilitating the receptive effects of PRF, as the combined effect of both proteins increases female receptivity.

Houck, L. D., C. A. Palmer, R. A. Watts, S. J. Arnold, P. W. Feldhoff, and R. C. Feldhoff. 2007. A new vertebrate courtship pheromone, PMF, affects female receptivity in a terrestrial salamander. Animal Behaviour 73:315–320.

Correspondence to: L. D. Houck, Department of Zoology, Oregon State University, 3029 Cordley Hall, Corvallis, Oregon 97331-2914, USA; e-mail: houckl@onid.orst.edu.

Snakes Sequester Toxic Compounds from Prey, Provision Offspring with Toxins

The Asian snake *Rhabdophis tigrinus* exhibits geographic variation in its use of nuchal glands in antipredatory behavior; in toad-free regions the snakes display the nuchal glands much less often than in regions where toads are potential prey items. The nuchal glands contain cardiotonic steroids called bufadienolides, which are major components of toad skin secretions. To determine whether variation in toad availability correlates with variation in bufadienolides in *R. tigrinus*, the authors compared the glandular fluid from snakes in toad-free (n=3), toad-rich (n=4), and toad-present (n=15) localities using proton NMR spectroscopy; as expected, snakes in regions where toads were available prey had higher toxin concentrations in their nuchal glands. The authors also conducted feeding experiments that confirmed that bufadienolides are sequestered from ingested toads.

Further, they found that offspring of dams from three mothers with no bufadienolides contained none of these toxins in their nuchal glands, while offspring of one dam with a high toxin concentration possessed bufadienolides immediately upon hatching, demonstrating that *R. tigrinus* can maternally provision their offspring with these defensive compounds.

Hutchinson, D. A., A. Mori, A. H. Savitzky, G. M. Burghardt, X. Wu, J. Meinwald, and F. C. Schroeder. 2007. Dietary sequestration of defensive steroids in nuchal glands of the Asian snake *Rhabdophis tigrinus*. PNAS 104:2265–2270.

Correspondence to: Deborah A. Hutchinson, Department of Biological Sciences, Old Dominion University, Norfolk, Virginia 23529, USA; e-mail: dhutchin@odu.edu.

Sexual Size and Shape Dimorphism in *Podarcis* Lizards

Differing selective pressures acting on males and females can result in sexual dimorphisms (SD), but SD may decrease when similar species co-occur to decrease intersexual competition in the presence of interspecific competition. The authors investigated SD in two closely-related, ecologically similar lizard species, *Podarcis bocagei* and *P. carbonelli*, in northwestern Portugal in both allopatry (*P. bocagei*: 55 males, 48 females; *P. carbonelli*: 53 males, 46 females) and in sympatry (*P. bocagei*: 42 males, 24 females; *P. carbonelli*: 52 males, 44 females). For each adult specimen, they measured 10 biometric characters for use in multivariate (size) analyses and digitized 46 landmarks for geometric morphometric (shape) analyses. They found that males of both species are larger than females, and that females have longer trunks. Their results also showed that patterns of size SD were not modified in sympatry; the differences between males and females are consistent when the species co-occur, although there is some evidence for an increase in male head size for both species when in sympatry. Shape analyses further explored changes in head shape SD. These observations suggest that morphological differences between the two species are not due to interspecific competition in sympatry, but are likely the result of sexual and natural selection.

KALIONTZOPOULOU, A., M. A. CARRETERO, AND G. A. LLORENTE. 2007. Multivariate and geometric morphometrics in the analysis of sexual dimorphism variation in *Podarcis* lizards. Journal of Morphology 268:152–165.

Correspondence to: Antigoni Kaliontzopoulou, CIBIO, Centro de Investigação em Biodiversidade e Recursos Genéticos, Campus Agrário de Vairão, 4485-661 Vairão, Portugal; e-mail: antigoni@mail.icav.up.pt.

Phylogeography of the California Newt

Divergence among lineages can be strongly influenced by geological change. In this study, the authors used mtDNA sequences and allozyme variation to examine genetic differentiation of the two subspecies of the California newt, *Taricha torosa*, in light of the geological history of the California coast and the Sierra Nevada mountains. They sampled 23 populations (198 individuals), from which they determined allozymic variation at 45 loci, and from 37 populations (62 individuals) they sequenced fragments of up to 778 bp of the cytochrome *b* gene. Standard phylogenetic analyses using either mtDNA or allozyme data supported the monophyly of *T. torosa* and of both subspecies [*T. t. torosa* (which occurs throughout coastal California and the southern Sierra Nevada) and *T. t. sierra* (which occurs in the central and northern Sierra Nevada)], and demonstrated geographic structure within these groups. Using a molecular clock, the authors estimated that the subspecies diverged from one another 7-13 Mya. To examine genetic differentiation at more shallow time depths, they used population genetic methods and inferred that the phylogeographic history of the species is complex, including allopatric divergence, isolation by distance, and range expansions. Although mtDNA and allozyme data for *T. t. torosa* were discordant at the boundary of the coastal-southern clades, they developed a biogeographic scenario that explains the different patterns of the two datasets. By using multiple genetic marker types, the authors were able to refine their phylogeographic interpretation for this species, and they encourage the use of multiple marker types in future work.

KUCHTA, S. R. AND A. TAN. 2006. Lineage diversification on an evolving landscape: phylogeography of the California newt, *Taricha torosa* (Caudata: Salamandridae). Biological Journal of the Linnean Society 89:213–239.

Correspondence to: Shawn R. Kuchta, University of California, Santa Cruz, Department of Ecology and Evolution, Earth & Marine Sciences, Room A316, Santa Cruz, California 95064, USA; e-mail: skuchta@biology.ucsc.edu.

Rattlesnake Responses to Prolonged Starvation

Snakes can tolerate periods of starvation of two years or more, yet few studies of starvation physiology have examined reptiles or amphibians. To address this taxonomic gap, the author investigated the physiological and biochemical responses to prolonged starvation in *Crotalus atrox*, the Western Diamondback Rattlesnake, a species that occurs in environments that experience periods of severe food limitation. Sixteen wild-caught, subadult rattlesnakes were fed and acclimated in the laboratory and then assigned to one of four treatments (0, 56, 112, or 168 days of starvation). At the end of each treatment period, snakes were euthanized and analyzed for blood and tissue content. During fasting, snakes experienced decreased plasma glucose but increased ketone bodies, although with continued fasting ketone levels recovered to non-fasting levels. Relative body composition changed dramatically during starvation, with snakes relying mostly on lipid stores for fasting energetic demands. Further, fasting snakes appeared able to prevent essential fatty acids from oxidation, but essential and non-essential amino acids were used indiscriminately during starvation. Finally, the author suggests that changing excreted nitrogen profiles could be used to noninvasively monitor the nutritional status of natural populations.

MCCUE, M. D. 2007. Western diamondback rattlesnakes demonstrate physiological and biochemical strategies for tolerating prolonged starvation. Physiological and Biochemical Zoology 80:25–34.

Correspondence to: Marshall D. McCue, Department of Biological Sciences, University of Arkansas, 601 Science Engineering, Fayetteville, Arkansas 72701, USA; e-mail: mmccue@uark.edu.

Frog Phylogeny Informs Study of Island Colonization

Amphibians are thought to be poor dispersers, and as a salt-intolerant group, they are typically absent from oceanic islands that have never been connected to a mainland. Three volcanic islands in the Gulf of Guinea off the coast of West Africa, however, have seven endemic amphibian species (six frogs, one caecilian). To explore island endemism and colonization, the authors combined molecular genetic techniques with data on ocean currents and salinity and atmospheric circulation to explore the origins of the endemic frog *Ptychadena newtoni*. They sequenced the mitochondrial 16S rDNA gene from 30 specimens in the genus *Ptychadena,* and to increase resolution within the *P. mascareniensis* complex (of which *P. newtoni* is a member), fragments of cytochrome *b* and cytochrome oxidase subunit I genes were also sequenced from species in this complex. Using maximum likelihood techniques, *P. newtoni* was found to be a distinct species endemic to the island São Tomé, showing strong divergence from its closest relatives. This species is deeply nested within the *P. mascareniensis* clade. The authors propose that the most likely colonization mechanism for these frogs (and other endemics of the Gulf of Guinea islands) involved a synergy of rafting, favorable surface currents, and reduced surface salinity. They suggest that amphibian distributions may not be determined predominantly by vicariance, and that this common assumption should be reconsidered.

MEASEY, G. J., M. VENCES, R. C. DREWES, Y. CHIARI, M. MELO, AND B. BOURLES. 2007. Freshwater paths across the ocean: molecular phylogeny of the frog *Ptychadena newtoni* gives insights into amphibian colonization of oceanic islands. Journal of Biogeography 34:7–20.

Correspondence to: G. John Measey, Laboratory of Animal Ecology, Department of Biology, University of Antwerp, B-2610 Antwerp, Belgium; e-mail: john@measey.com.

Tuatara Body Condition Declines Over 50+ Years of Monitoring

Long-term monitoring is vitally important for conservation efforts, particularly for long-lived species such as the Tuatara (*Sphenodon punctatus*). Using a dataset that spans 54 years, the authors examined how long a Tuatara population must be monitored before significant long-term trends become evident. They calculated a body condition index [log(mass) versus log(snout-vent length)] for all adults marked on Stephens Island between 1949 and 2003 (1888 individuals). Results showed that body condition has substantially declined since 1949 for both sexes (although rainfall remained constant during the sampling period), but that a consistent pattern of decline is evident only after >22 years of data. To investigate seasonal trends in body condition, a separate morphological dataset was collected from 201 Stephens Island Tuatara in 2004–2005 during November, January, March, and May. They found that male body condition was significantly higher than that of females and that seasonal variation in body condition existed, but found no correlation of condition with monthly temperature or rainfall. The authors suggest that the long-term decline in body condition may be the result of a density dependent response to resource competition from increasing population size.

Moore, J. A., J. M. Hoare, C. H. Daugherty, and N. J. Nelson. 2007. Waiting reveals waning weight: monitoring over 54 years shows a decline in body condition of a long-lived reptile (tuatara, *Sphenodon punctatus*). Biological Conservation 135:181–188.

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Heterospecific Eavesdropping in Frogs

Many animal behaviors can provide "public" information to unintended recipients, information which may be useful for different kinds of audiences. Multi-species frog choruses provide an example of such a case: calls are typically interpreted as competition for mates within a species, but if calling behavior indicates the presence of predators, heterospecifics could also use information from the chorus regarding predation risk. The authors tested whether Panamanian túngara frogs (*Physalaemus pustulosus*) use heterospecific calls to assess predation risk by observing male frog responses to one of four treatments after exposure to conspecific calls and the appearance of a potential predator (N = 10 per treatment): silence, a conspecifc call, a heterospecific call of an allopatric congener (*P. enesefae*), or a heterospecific call of a sympatric frog species (*Leptodactylus labialis*). They predicted that if sympatric calls are an indication of predation risk, túngara frogs should respond to the stimuli in the following order of decreasing intensity: conspecific, *L. labialis*, *P. enesefae*, silence. Results showed that call rate and chuck frequency decreased in this order, while call latency (time after stimulus before calling resumed) increased in this order, supporting their prediction and demonstrating that túngara frogs can distinguish between informative and uninformative heterospecific calls. The authors suggest that participating in mixed-species choruses may allow males to reduce their predation risk without increasing mate competition. These choruses also provide an opportunity to further study emergent group behavior.

Phelps, S. M., A. S. Rand, and M. J. Ryan. 2007. The mixed-species chorus as public information: túngara frogs eavesdrop on a heterospecific. Behavioral Ecology 18:108–114.

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Thermoregulatory Mechanism in Reptiles

To effectively thermoregulate, ectothermic animals must be able to sense both environmental and internal temperatures. Although thermoregulatory behavior is vitally important for maintaining cellular functions, the mechanisms that allow heat sensing are unknown. Recently, heat-sensitive transient receptor potential ion channels (TRPs) were discovered in *Drosophila* and mammals, and they may be suitable temperature sensors in reptiles as well. The authors demonstrated the presence of TRPs in reptiles and tested the hypothesis that TRP genes control reptilian thermoregulation. They sequenced a region of the heat sensing TRPV1 gene from three reptilian species [a crocodile (*Crocodylus porosus*), a skink (*Pseudemoia entrecasteauxii*), and an agamid (*Amphibolurus muricatus*)] and combined this data with existing sequence data to find that the reptilian TRPV1 sequences have a unique insertion of two amino acids, forming a well-supported clade sister to mammalian TRPV1. Using real-time PCR, they determined that TRPV1 and TRPM8 are expressed in heart, liver, and surface muscle tissues in the crocodile, and therefore have the potential to sense both internal and external temperatures. Inhibiting these genes in crocodiles (N = 7) led to dramatically altered thermoregulatory behavior, as the animals stopped their typical shuttling between basking and diving in cooler water. These results describe the proximate mechanism for temperature sensing in reptiles.

Seebacher, F. and S. A. Murray. 2007. Transient receptor potential ion channels control thermoregulatory behaviour in reptiles. PLoS ONE 2:e281.

Correspondence to: Frank Seebacher, School of Biological Sciences, University of Sydney, Sydney, Australia; e-mail: fseebach@bio.usyd.edu.au.

OBITUARIES

Herpetological Review, 2007, 38(2), 135–138.

Hymen Marx (1925–2007)

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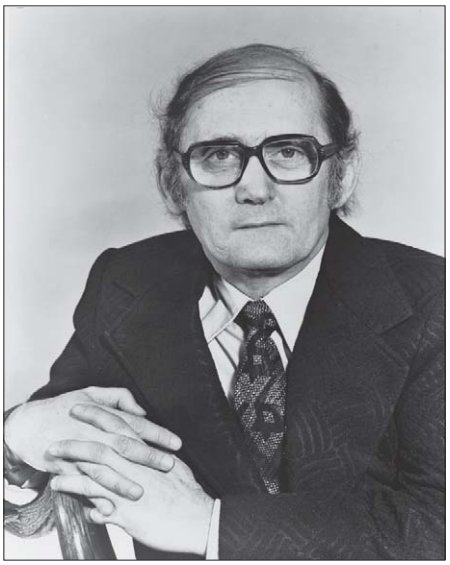

Hymen Marx. Formal portrait taken in 1978. Courtesy of the Field Museum of Natural History (Neg. No. GN82890).

Hymen Marx, Curator Emeritus at the Field Museum of Natural History in Chicago, Illinois, died on 25 January 2007 in Sun City, Arizona. During his 42 years at the Field Museum, Hy contributed much to the field of herpetology through his own research and through his unique, lively, and supportive personality.

Hymen "Hy" Marx, was born 27 June 1925, in Chicago, Illinois. He lived in the Chicago area until his move to Arizona in the early 1990's. His father, Phillip Marx, was a butcher and his mother, Minnie Serota Marx, was a homemaker. Hy had one sister, Molly, born 17 October 1921. Hy was drafted into the U.S. Air Force in 1943. He served as a radar mechanic and was stationed in the UK where he worked on a ground crew of the 8th Air Force maintaining the radar systems of the famous "Flying Fortresses." Like so many others, Hy went back to school in 1945 under the G.I. Bill and graduated in 1949 from Roosevelt University with a B.S. degree and a major in biology. That marked the end of Hy's formal education, and from then on he depended on his colleagues and his own intellectual curiosity to fuel his career development. In Hy's case and to his great credit, that was enough. While in school, Hy met Audrey Elaine Greene and they married in 1950. Hy and Audrey had two children, Michael Phillip Marx and Nancy Lynn Marx Ruesch. Nancy and her husband, David, now have three lovely teenage daughters, Melissa, Stephanie and Devyn who fondly remember their grandpa.

In 1948, while he was a student at Roosevelt University, Hy began volunteering in the Division of Amphibians and Reptiles, working as an assistant to Karl P. Schmidt. Hy referred to Clifford H. Pope and "K. P." Schmidt as his "academic papas." Hy joined the Division in 1950 as its first full-time assistant. For the next ten years, he served as "Collection Manager" and managed the collection through significant growth and reorganization including a major move from the third floor to the ground floor in 1952–53. This period of intensive collection growth was marked by the arrival, in 1954, of 35 five-gallon milk cans containing 77,000 frogs and toads that were sent by the Institut des Parcs Nationaux de Congo Belge to Karl Schmidt for identification. This huge shipment almost matched the number of specimens (85,000) in the entire collection at the time and a significant number of these specimens were deposited at the Field (Bauer 1954). This period was also marked by the Division's single most significant purchase, that of the Edward Harrison Taylor collection of 35,000 specimens, which was accessioned beginning in 1959. That collection, which is extensively cited in the herpetological literature, includes many type specimens, caecilians and skeletons. Its geographic strengths include Mexico, Costa Rica, Liberia, Sri Lanka, and Thailand. During these ten years, Hy also published 16 papers which led to his promotion to the curatorial ranks. He was promoted to full curator in 1973.

For roughly 40 years, Hy's career at Field Museum overlapped with that of Robert (Bob) F. Inger. Hy and Bob collaborated on several publications but the most notable was their monograph on the snakes of the colubrid genus *Calamaria* (Inger and Marx 1965). This monograph embraced many of the newest methods and approaches of that time and it remains a landmark work on this group of snakes today.

In addition, Marx's research interests also included the herpetofauna of Egypt, the systematics and zoogeography of the vipers, the phyletics of morphological characters, the application of phyletic character analysis to convergent snake species, and the application of Sharrock and Felsenstein's combinatorial method to phylogenetic studies. To facilitate his NSF supported collaborative research with George Rabb, over 500 snake skulls were removed from preserved specimens and prepared for character analysis studies. These skulls, comprising over 235 genera, form a subset of the osteology collection that is well used by researchers. This work resulted in their "50 characters volume" (Marx and Rabb 1972) that is still of great practical use to students of the biology and systematics of squamates.

Following this time, one of us (HKV), had the privilege of collaborating with George Rabb and Hy on a project involving character analysis (Marx et al. 1977). During the two years that we worked on this project the three of us had many stimulating and heated discussions. Those readers who knew Hy will understand us when we say that Hy provided us with plenty of aggravation and entertainment. He often referred to his two co-workers, not as his esteemed collaborators, but rather as his "close enemies."

Hy's research interests were varied but the subject that interested him most was the evolution of the venomous snakes of the family Viperidae. But Hy did not fit any stereotype of a dusty, dry museum curator—if you met Hy, even briefly, you immediately learned that he was exceptionally gregarious! This was true in both his personal and professional life. In his professional life, this took the form that most of us call collaborations, but Hy referred to it as "sharing our sandbox." He was fun to collaborate with but this activity was not for the weak of heart! He was sharp, witty, insightful, and prone to wander far off the subject. It was entirely

Federico Medem and Hymen Marx (right) examining South American crocodile skulls at the Field Museum in 1954. Courtesy of the Field Museum of Natural History (Neg. No. Z86441).

possible to begin with a lively discussion of the shape of the dentary bone in the Gaboon Viper, *Bitis gabonica,* and then find yourself listening to Hy giving you a review of "Sleeper," Woody Allen's latest movie at the time. This was vintage Hy Marx. No collaborator could expect to not be a victim at some point of one of Hy's practical jokes. That was the cost of doing business. Karel Liem, Henry Bryant Bigelow Professor of Ichthyology at Harvard University and George Rabb, now President Emeritus of the Chicago Zoological Society, and several others know this only too well!

Hy contributed greatly to the academic and administrative life at Field Museum. He served as the Head of the Division of Amphibians and Reptiles from 1970–79 and from 1985–1990, and over the years he served on more than 20 Museum committees. Hy fully understood the importance of encouraging young people in their interests and for that reason, he was an active contributor to Members' Nights at the Museum when it opens its doors for members to view the work that goes on "behind the scenes." Hy also had many unofficial roles at the Museum and he served as a sort of social guru to staff throughout the Museum. In this regard, Hy referred to himself as a "social butterfly" and enjoyed organizing both intellectual discussions on character analysis as well as recruiting teams and scheduling times for doubles tennis matches.

During Hy's four decades of service at Field Museum he also served on the Committee on Evolutionary Biology at the University of Chicago. In this capacity, he did not teach formal classes but rather he informally guided both master's and doctoral degree students in their research programs. On this, one of us (HKV) can speak from first hand experience. Hy helped me choose a Ph.D. research topic on sea snakes that has shaped my entire professional career. He freely gave his time and expertise to help many young visiting scientists prosper in their special fields of study. One of the "official" activities of visiting researchers and students was to visit Hy's office and kibitz about their research. For this we are all very grateful to him!

Hy was not a man to try to impress others by putting on airs of self-importance. No, he was equally friendly to the Museum's housekeeping staff and the top administrators of the Field Museum and other lofty institutions. He was not impressed with administrative rank and academic credentials and he applied uniquely Marxian methods to make this evident, as, for example, in his assignment of nicknames. No one received much respect and no one could hide!! For example, Robert K. Johnson, Chairman of the Zoology Department, was "Bunky" or "El Bunko Grande," James P. Bacon, Curator of Reptiles, San Diego Zoo, was "Bakey," and George Rabb, Director of the Brookfield Zoo, was "Georgy Porgy." Of course, behind each of these nicknames was an endearing story that showed how Hy paid attention to the human beings that he lived and worked with. We were individual people, not Directors, Curators, and Chairmen. In the end, that is why so many at the Field Museum and in the field of herpetology counted Hy Marx as a close friend, a great colleague, and a real human being. Hy Marx was truly one of a kind, absolutely unique, an amazing rare bird, and irreplaceable. All of our lives have been immensely enriched by knowing Hy Marx and we will miss him greatly.

Hy Marx, Impish Innovator

I first met Hy in 1972, during a visit the Field Museum to examine preserved coral snakes for my thesis research. Over the ensuing decades I came to know him as a friend and important, if under appreciated, player in the late twentieth century rise of snake biology. Hy was a committed curator, obsessed with facilitating the use and long-term welfare of museum specimens, as well as a shrewd, smart, and decent man. He was also insatiably curious about everything and everyone, and often extraordinarily funny.

We became friends at a time when research on snakes, which had figured in some of Hy's first publications, was reaching critical mass. By the early 1970's Henry Fitch's Kansas natural history monographs were stacking up and Rick Shine had begun doctoral studies of Australian snake natural history; Carl Gans was churning out papers on reptilian functional morphology and Gor-

don Burghardt's first publications were revealing the rich texture of snake behavior. By the early 1980s the Hennigian revolution in systematics had inspired a paradigm shift in evolutionary studies, from largely hand-waving about such topics as adaptive novelties and historical effects on community structure to the now-routine use of explicit analytic frameworks. Fulfilling the promise of historical evolutionary approaches to snake ecology requires phylogenetics, and beginning in 1965, thanks to a pioneering collaboration, we got it in spades.

With George B. Rabb and Karl F. Liem, Hy wrote a series of papers that set the stage for the integrative studies of snake biology that have flourished over the past three decades. It began when George called him out to Brookfield Zoo to see a live *Eristicophis*, and their attempts to better understand that strange creature led to an exceptionally interesting paper on the evolution and biogeography of viperines. Next they teamed up with Karl F. Liem for an anatomical study of the enigmatic "pitless pitviper," *Azemiops feae*, known then from 11 specimens, one of which Hy found in a large jar of uncatalogued frogs in his own collection! A truly ambitious survey by Marx and Rabb of 50 characters in 500 snakes appeared in 1972, followed by several more synthetic papers in *Evolution* and other prestigious journals.

Hy was short in stature and big in personality. My visits to the Field Museum typically encompassed several predictable stages. Upon arrival I'd be summoned to his office, whereupon he'd demand to know why I was there (regardless of the appropriate letter I'd always sent in advance, inevitably in plain sight on his desk), then launch into a merciless combo of inquiry and gossip. I'd catch my breath, tease Hy about his "ridiculous comb-over," and ask about the latest phylogeny for colubroids; he'd harangue me about the palatine teeth of *Pythonodipsas* and brag about some rare taxon he'd secured from a foreign colleague, all of it punctuated with "Hey putz, now watch this!" and "You're outta your mind!" After a half hour or so he'd unroll the latest computer output, swear me to secrecy, and after a spirited discussion admonish me to quit loafing and get to work. Once on a particularly hot summer's day I encountered Hy in his office, shirtless and watering several large potted plants. After growling a rude nickname and giving me a hug, he propped back in a chair, clasped his hands behind his head with a big grin, and said "Come on in, the water's fine!" The guy made his mark and we miss him.

—Harry W. Greene, Department of Ecology and Evolutionary Biology, Cornell University

Hymen Marx: in Tribute to a Loveable Rascal

Hy Marx was a truly unique person—in more ways than one. Always the practical joker and goof-off, he did have a serious streak**,** but it was well hidden. Hy enjoyed life and his carefree attitude was refreshing. He had a genuinely charming smile with a glint in his eyes, rather like a leprechaun. He also was one screw loose from being a nutcake, but that didn't bother him in the least; he reveled in being wacky and crazy. Hy had a different perspective on life than most people and he just had a good time in whatever he did. He poked fun at everyone, regardless of rank or importance, including himself as often as not. Hy had three passions that I know of: viperid snakes, Gilbert & Sullivan, and tennis.

Upon his retirement, I referred to him as the "fourth, funniest, and ever-youngest of the Marx brothers." And I pointed out that he paradoxically combined "the traits of a ruthless, savage killer (as on the tennis court where he showed no mercy) with those of a wonderfully likable and charming fellow with a heart of gold." I also pointed out that when he retired the museum could put him on exhibit and charge special admission if they wanted to increase their revenue.

The summer I spent at the Field Museum on a Dee Fellowship I was privileged to be able to sleep in the Division's lab. Hy was the first person I saw each morning. I had convinced him that his back needed adjustment. One morning after I adjusted him, he fell on the floor, screaming and clutching his lower back as if in great pain, "You broke my back!" Then he jumped up and started laughing like crazy—he really had me fooled. Another time he came into the museum limping, holding one leg an inch shorter than the other—again blaming it on me.

Hy was a man of few words when it came to answering correspondence. My first letter from him consisted of two lines with the salutation and signature twice as long as the letter; the next letter was three lines long. I discovered early on that the easiest way to get information out of Hy regarding FMNH holdings was to mail a pre-addressed and stamped postcard with the questions written out, leaving blank spaces for him to fill in. And presto! Back came the awaited answers in the filled in spaces.

Hy made it clear from the beginning that he refused to take the time to look at, read, or critique any of my manuscripts. He only liked to see the final publication! But I got even with him once. Because of my fondness for Hy, I dedicated my first snake species after him, a Philippine blind snake (*Typhlops marxi*). I hoped to keep this hidden from him and have it be a surprise upon publication. However, due to several problems, I was forced to send Hy a draft of the paper for his review. The cat was out of the bag and he was forced to help me with the manuscript, which he actually did. He began his letter with "I am pleased to hear from you and your written lunacy" and ended it with "Flattery will get you everywhere."

When I presented Hy with a list of rare snakes that I wanted to dissect for my project he went hysterical with lamentations and anguish at the thought of me opening up his precious (and often unique) specimens. Every rare snake I wanted to look at was like an act of pulling teeth. He even swore to track me down and kill me if I didn't publish the acquired data within five years.

There is no doubt that Hy Marx is dearly missed by everyone who knew him. His playful good humor dispensed so freely during his life continues in the smiles that cheer us in remembering him. He was certainly one in a million!

—Van Wallach, Museum of Comparative Zoology, Harvard University

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ZOO VIEW

Three New Books

American zoos and aquariums have been, and remain, enmeshed in the political system in which they reside. Just like the menageries of the past, zoos today are shaped by politics. Instead of monarchs cementing political alliances or demonstrating their military power by controlling animal collections, we now have interest groups, attorneys, city councils, congressmen, bureaucrats, and citizens debating the exhibition of animals. At the most fundamental level, the struggles at zoos and aquariums are over who gets to control the fates of the animals. In the microcosm of the zoo we see interest group politics played out as various organizations struggle to translate the wishes of their constituents into a coherent position on the public display of animals. The changing animal enclosures frequently noticed by the visitors, such as elaborate new immersion exhibits, mask much deeper political changes that have happened within zoological parks and aquariums in the United States. It is questionable, for example, whether the very animals exhibited in zoos today would have been there without the political protection afforded by the AZA.

— Jesse Donahue and Erik Trump

The American Association of Zoological Parks and Aquariums (AAZPA) was founded in 1924. Seventy years later, the name was changed to the American Zoo and Aquarium Association (AZA). Some of the organizational purposes of AZA are (1) to promote discussions and cooperation among zoo and aquarium professionals; (2) to set high standards for its accredited member institutions, now over 200; (3) and to support *in situ* and *ex situ* conservation initiatives.

In their book, *The Politics of Zoos. Exotic Animals and Their Protectors* (Northern Illinois University Press, DeKalb, Illinois, 2006; ISBN-0-87580-364-4 [cloth]; ISBN-0-87580-613-9 [paperback]), Jesse Donahue and Erik Trump describe the political environment surrounding zoos and aquariums from the 1960s to the present and the role of AZA and its leaders in interacting with federal regulatory agencies, animal rights activists, and other interested parties. This is a particularly relevant book for me as a zoo professional. My career started in the mid-1960s and I watched firsthand as zoo workers tried to address new challenges in the face of criticism on many fronts as described in this useful history. The book elaborates on the sad reality that many of us are concerned but traumatized by the enormity of the problem of disappearing biodiversity. We continue to struggle to find suitable niches, both within our institutions and in the broader conservation and academic community. If we are able to do so more effectively, the final beneficiaries will be the plants and animals entrusted to our care. I recommend this book without reservation.

David Barker and I worked together at the Dallas Zoo for many years. During our time together, he began to take courses in photography at one of the local colleges. It was clear from the beginning that Dave had a superb artist's eye and special skill for photographing herps. In my view, his images are some of the finest ever put on film. If you doubt my statement, pick up a copy of *Pythons of the World, Volume II. Ball Pythons. The History, Natural History, Care and Breeding* (VPI Library, Boerne TX, 2006; ISBN: 0-9785411-0-3), produced by Dave and his wife Tracy Barker. This book is the most impressive treatment of a single python species ever produced. Although ball pythons have become a mainstay in the herpetocultural trade, I had no idea that they came in so many color morphs, often affixed with a colorful name such as "Jester," "Jaguar," "Killer-bee," "Dreamsicle," "Phantom-lesser-lucy," "Wanna-bee," "Fireball," "Ghost/Pastel," "Sandblast," "Scratchoff," "Zipper," and "Dirty-Joe," to name but a few of the 200 or so identified color phases. Many of these variations are beautifully pictured. The Barker book is much more than a handsome coffee-table tome, for it is filled with information on snake biology, natural history, and suggestions for captive maintenance. The book is a useful primer chock-full of recommendations for keeping captive snakes of other species as well. The book is of the highest quality—beautifully bound, first-class paper quality, and even the shipping box is impressive. No pythonophile should even consider living without this book in hand. A review of this book was published recently by Michael Burger (2007. Herpetol. Rev. 38:118–119). Notably, the book has just been named "Best Animal Book of 2006" by the Independent Publishers Awards.

The San Diego Zoo has a long history of publishing herpetological observations. Laurence M. Klauber was the first curator of reptiles in the 1920s, consulting curator beginning in 1931, and served on the Board of Trustees from 1943 to 1968 (Fig. 1). Between 1931 and 1955, C. B. "Si" Perkins was the head of the reptile collection and was in charge of the project to build a new reptile house, which stands to this day (Figs. 2, 3). When Klauber wrote *Rattlesnakes: Their Habits, Life Histories, and Influence on Mankind*, he referred to "Si" and Charles E. Shaw, his curatorial successor, repeatedly in his opus as many behavioral observations in that book were made at the Zoo with these two men. Klauber named the leaf-nosed snake, *Phyllorhynchus decurtatus perkinsi,* after Perkins. In turn, Perkins published several compilations in *Copeia* on longevity of amphibians and reptiles in cap-

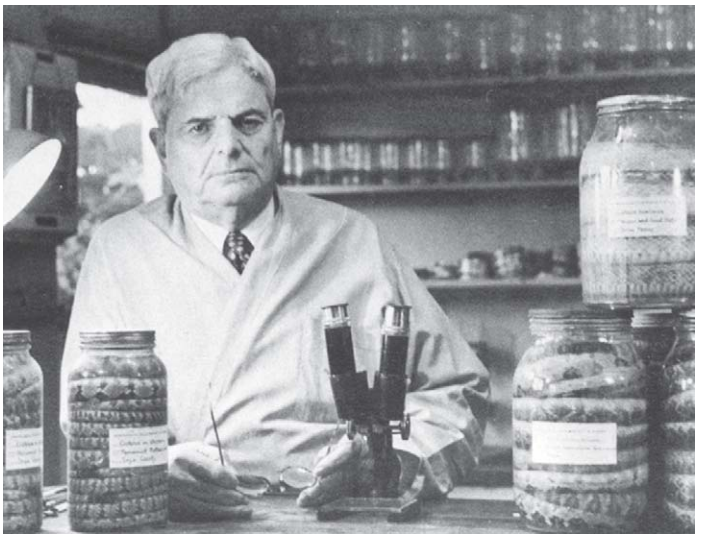

Fig. 1. Laurence M. Klauber. Photograph provided by Kraig Adler.

FIG. 2. C. B. "Si" Perkins (right). Credit: San Diego Zoological Society Archives.

tivity, notes on captive-bred snakes, incubation and hatching of snake eggs, frequency of shedding in injured snakes, and hybrid rattlesnakes.

Shaw published papers on chuckwallas, eggs and young of some African, United States, and Mexican lizards and other reptiles, longevity of snakes in North American collections, and husbandry of sea snakes (Fig. 4). Based on observations at the Zoo, he documented reproduction in the Cuban and Rhinoceros Iguanas, and Galápagos Tortoise. His studies on the male combat "dance" of some crotaline snakes, American colubrid snakes, and additional remarks on combat in other colubrid and elapid snakes serve as classic behavioral reports. He wrote many articles in the zoo publication *ZOONOOZ*. In 1974, Shaw and Sheldon Campbell, a Zoo board member and later president, published the book *Snakes of the American West*.

Some 80 years after Klauber began his stint at the Zoo, Jeffrey M. Lemm from San Diego Zoo's Conservation and Research for Endangered Species (CRES) carries on the strong tradition in herpetology with his new book, *Field Guide to Amphibians and Reptiles of the San Diego Region* (University of California Press, Berkeley and Los Angeles, 2006; ISBN-13: 978-0-24573 [cloth]; ISBN-13-0-520-24574 [paperback]; 326 pp., 197 color photographs; 72 range maps; taxonomic key by Jay Savage). In the Preface, Lemm acknowledges the contributions of Klauber, Perkins,

FIG. 3. Photograph taken in 1935 of C. B. Perkins (left) with Sheldon Campbell (middle) and Charles Shaw (right) holding several snakes. Credit: San Diego Zoological Society Archives.

and Shaw. His book is filled with useful information about geology and climate, geologic history, major habitats, animal diversity, problems and conservation, species accounts, amphibian chytridiomycosis, snakebite and venom, and glossary. This field guide deserves a place on the bookshelf.

Lemm identifies two anuran taxa of special concern: Califor-

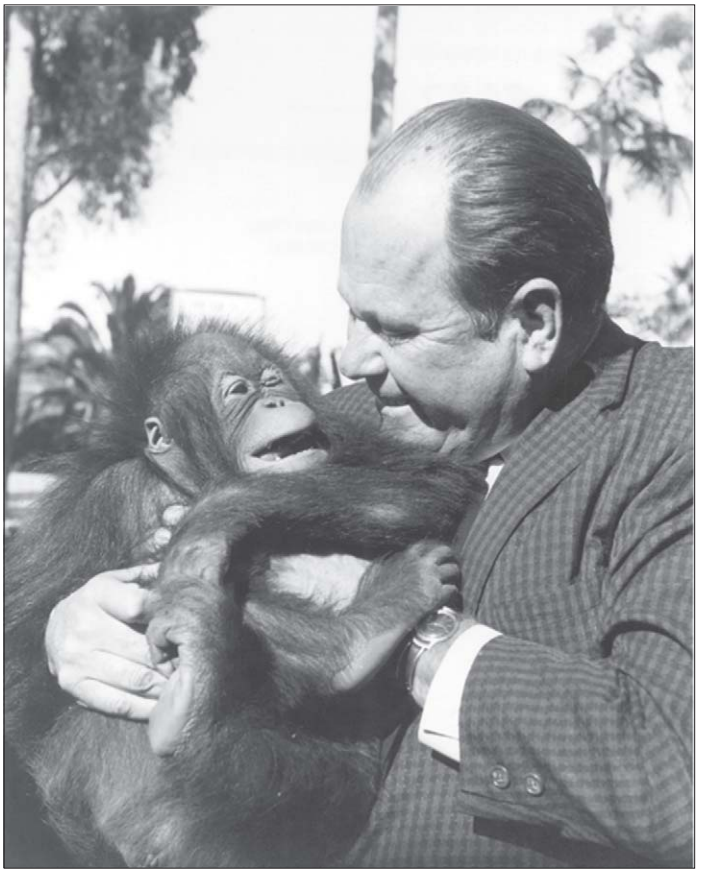

FIG. 4. Charles E. Shaw and "Maggie" in 1964. Credit: San Diego Zoological Society Archives.

nia Red-Legged Frogs (*Rana draytonii*) which have probably been extirpated in San Diego County, and the seriously endangered California Arroyo Toad (*Bufo californicus*). In the following article, zoo personnel at the Santa Barbara Zoo have developed a multi-faceted initiative of field surveys and educational programs to address the plight of these amphibians.

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— James B. Murphy, Section Editor

Herpetological Review, 2007, 38(2), 141–142.

Anuran Conservation through Collaborations: Santa Barbara Zoo Teams up with the U.S. Forest Service

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There are more than 200 accredited members of the Association of Zoos and Aquariums (AZA) dedicated to wildlife conservation through education and research. In fact, participating in field research has become an important activity of accredited zoos and aquariums (e.g., see Herrmann and Herrmann 2002; Zippel 2002). The Santa Barbara Zoo (the Zoo) is a comparatively young zoo that opened in 1963 and was first accredited by the AZA in 1981. The Zoo is dedicated to the preservation, conservation, and enhancement of the natural world and its living treasures through education, research, and recreation.

Beautifully situated on 30 acres of land in Santa Barbara, California, the Zoo overlooks the Pacific Ocean out to the Channel Islands to the south and the chaparral-covered slopes of the Santa Ynez Mountains to the north. Although the Zoo has a modest animal collection of about 600 specimens, we play an active and important role in field research, collaborating with various agencies on several conservation projects with one devoted to native amphibian conservation. Through a partnership between the Zoo and the United States Forest Service (USFS), Zoo staff currently survey streams in the Los Padres National Forest (LPNF) for California Red-legged Frog (*Rana draytonii*) and Arroyo Toad (*Bufo californicus*) egg masses and larvae. Both *R. draytonii* and *B. californicus* inhabit portions of LPNF in Santa Barbara County, California and are of critical conservation concern.

Prior to Bullfrog (*Rana catesbeiana*) introduction (Storer 1922), *R. draytonii* was the most abundant (Jennings and Hayes 1994) and largest (Storer 1925) of the ranid frogs occurring on the west coast. *Rana draytonii* has disappeared from approximately 75% of its known historical range and is listed as a federally threatened species (USFWS 1996). Habitat loss, exotic predators, off-road vehicle use, and dam and reservoir construction currently threaten *R. draytonii* populations. Although higher numbers of *R. draytonii* occur between Marin County and Santa Barbara (Jennings and Hayes 1994), an area that includes our study sites (Upper and Middle Santa Ynez in LPNF), these populations are still threatened by introduced predators, particularly Bullfrogs (Moyle 1973) and Mosquitofish (Hayes and Jennings 1986).

Bufo californicus has disappeared from 76% of its known historical range (Jennings and Hayes 1994) and in 1994 was listed as a federally endangered species (USFWS 1994). Being that the primary cause for declining *B. californicus* numbers is habitat loss, management recommendations for this species include greater habitat protection, and some recreational areas of LPNF are closed to visitors during the *B. californicus* breeding season (V. Hubbartt, pers. comm.). Exotic predators, however, still negatively affect the aquatic life stages of both *R. draytonii* (Jennings and Hayes

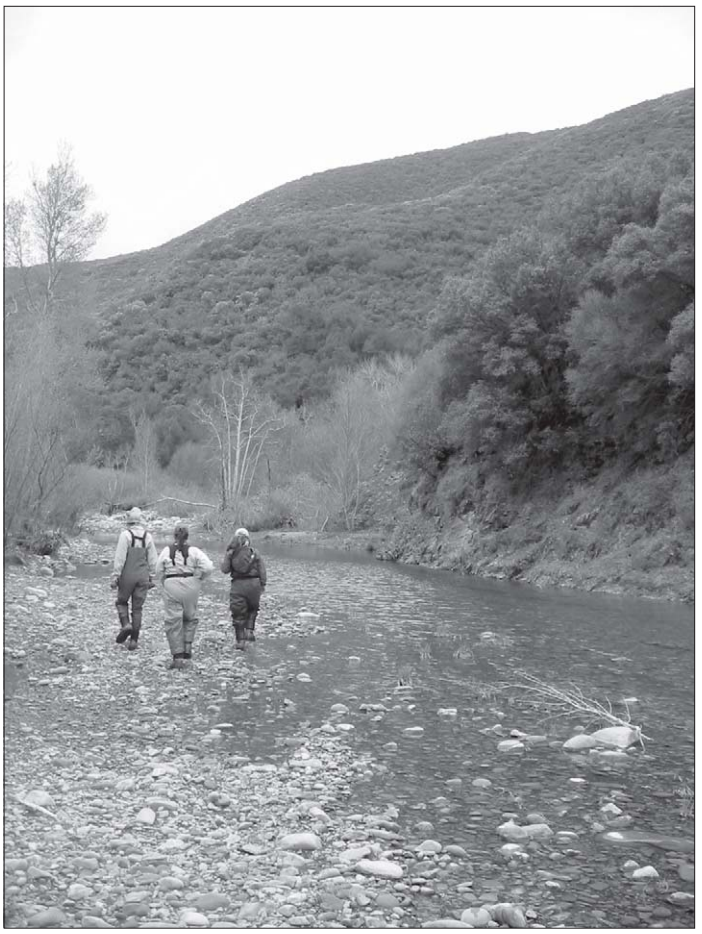

FIG. 1. A stream in the Santa Ynez River Valley, Santa Barbara County, California used as breeding grounds by California Red-legged Frogs (*Rana draytonii*) and Arroyo Toads (*Bufo californicus*).

FIG. 2. A California Red-legged Frog egg mass.

FIG. 3. C. Drew Foster and Estelle Sandhaus place an exclosure around a California Red-legged Frog egg mass in the Upper Santa Ynez Valley, Santa Barbara County, California.

1994; Kiesecker and Blaustein 1997; Lawler et al. 1999) and *B. californicus* (Jennings and Hayes 1994; Sweet 1993).

Because both anuran species are more vulnerable during their aquatic stages (e.g., to aquatic predators, chemicals from runoff, rising waters, etc.), the Zoo, in cooperation with the USFS, is examining population numbers in this phase and attempting to reduce larval predation by exotic aquatic predators. In suitable breeding areas, transects are established and regularly monitored during the breeding season. When egg masses are located, we quantify the developmental stage of the eggs and record the date, time, water depth, geographic coordinates (to allow for future monitoring of individual egg masses), and water and air temperature. Additionally, exclosures constructed of metal mesh formed into a cone shape are placed around egg masses to prevent aquatic predators from consuming them. This practice appears to be effective (we have observed egg masses placed in exclosures undergoing complete development), but will be evaluated further beginning in Spring 2007. We will also further examine the role of exotic aquatic predators.

In addition to playing an active role in *B. californicus* and *R. draytonii* conservation through research, the Zoo is promoting native herpetofaunal conservation through public education. Because of the Zoo's close proximity to LPNF, frequent day trips to the sites can be accommodated, and fieldwork participants can disseminate the conservation message to Zoo visitors through keeper talks and presentations. Additionally, the Education and Guest Services Departments are able to convey these messages on signage throughout the Zoo and newsletters that reach over 15,000 households per mailing. The Zoo also has an agreement with the USFS to create an exhibit featuring native reptiles and amphibians of LPNF. This exhibit will be part of a themed area of the Zoo dedicated to celebrating and promoting stewardship of our local wildlife. We estimate that as many as 450,000 visitors annually will learn about local herpetofaunal conservation by attending this exhibit. Communication is an essential component in raising community awareness of local conservation needs, and the Zoo's role as a center of conservation, education, research, and recreation affords us a unique opportunity to reach a large number of individuals.

Acknowledgments.—We are extremely grateful for the opportunity to participate in *Bufo californicus* and *Rana draytonii* conservation efforts, and wish to thank Richard Block (CEO/Zoo Director), Nancy McToldridge (Chief Operating Officer), and Sheri Horiszny (Assistant Director of Animal Programs), all of the Santa Barbara Zoo, Valerie Hubbartt (Resource Assistant/Wildlife Biologist) of the LPNF Santa Barbara Ranger District, and Jamie Uyehara (Specialist for SoCal Listed Species) of the LPNF Supervisor's Office for these opportunities.

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LETTERS TO THE EDITOR

Herpetological Review, 2007, 38(2), 143.

Standard Language (Insert Language of Choice) Names Versus Common Names

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Caramaschi et al. (2005) recently published an excellent paper on providing "common" names to species of frogs in the genus *Leptodactylus*. They are to be commended for this and for their logic on why it is important to devise these names. Their criteria for determining these names are models to be followed.

However, I have a single comment that I hope will be informative and useful. In the North American amphibian and reptile names publications (Crother et al. 2000, 2003), notice that we never use "common name" and it is for specific reasons. First, what is common about them? These are unique appellations that are simply non-binomial and non-Linnaean. In the North American list they are called Standard English names. We did not presume to tell Spanish or German or Chinese, etc. what they should call the taxa in their language. Caramaschi et al. gave a beautiful example when they translated from the Portuguese or Spanish to an English name. They made a Standard English name, not a common name. They also make Standard Spanish and Standard Portuguese names and this should be wholeheartedly applauded and supported. These are not Spanish or Portuguese common names in any sense. I hope workers providing non-binomial non-Linnaean species names will consider that these are not common names, but Standard Language names.

It is important to provide these names, I just hope we can agree that they are not common.

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ARTICLES

Herpetological Review, 2007, 38(2), 143–145.

Effects of Toe-Clipping on the Survival and Growth of *Hyla squirella*

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Toe-clipping is a widely used and cost-effective method for marking amphibians for ecological studies, but recent research has suggested that toe-clipping may cause adverse impacts on amphibian health and behavior. Several studies have documented decreased growth or recapture rates in toe-clipped animals (Davis and Ovaska 2001; McCarthy and Parris 2004). Other studies have noted inflammation and necrosis of clipped toes, suggesting this method may adversely affect mobility and survivorship (Davis and Ovaska 2001; Golay and Durrer 1994; Lemckert 1996). Recently, McCarthy and Parris (2004) questioned the ethics of toe-clipping based on findings that recapture rates in four studies decreased linearly with the number of toes removed.

One important assumption of mark-recapture studies is the mark has no influence on the survival or recapture probability of an animal (Donnelly and Guyer 1994). Thus, any direct or indirect impact of toe-clipping, such as negative effects on growth, health, or behavior may bias results unless those effects are known and can be accounted for during data analysis (Donnelly and Guyer 1994). Unfortunately, study results conflict over the existence and degree of such effects. Instances where toe-clipping did not affect survivorship or growth were documented by Ott and Scott (1999) for *Ambystoma opacum* and by Van Gelder and Strijbosch (1996) for *Bufo bufo*. However, the magnitude and cause of adverse impacts are difficult to quantify in the field and have not conclusively been addressed under controlled settings.

In a laboratory study, we evaluated the impact of toe-clipping on growth and survivorship of Squirrel Treefrogs (*Hyla squirella*). Conducting the study in a controlled setting allowed us to separate direct effects of toe removal on survivorship and growth due to physiological stress and wound infection, from possible indirect effects such as behavioral avoidance of capture locations and decreased foraging success or increased predation due to impaired mobility.

Methods.—Sixty-two adult *H. squirella* were collected in Baker County, Georgia, USA (31°13'16.88"N, 84°28'37.81"W) during November 2004 and maintained in the lab until sufficient numbers were gathered for the study. On 2 December 2004, frogs were weighed (± 0.01 g) and the snout-vent length (SVL; ± 0.1 cm) was

measured. To ensure that size at capture did not bias the results, frogs were sorted by body mass into small (N = 22, mean = 1.44 g, range = 1.10–1.86 g), medium (N = 20, mean = 2.22 g, range = 2.01–2.53 g) and large (N = 20, mean = 2.82 g, range = 2.59–3.21 g) size groups, and individuals within each size group were randomly assigned to one of two treatments (control or toe-clipped) using PROC SURVEYSELECT in SAS version 8.2 (SAS Institute Inc. 2001, Cary, North Carolina, USA). Each size group was equally represented in each treatment.

Animals in the toe-clipped treatment were marked by complete excision of the third toe on the left front foot and the fourth toe on the right rear foot with scissors sterilized in 95% ethanol. This mark corresponded to a mark of 72 under the Hero (1989) marking scheme. All wounds from toe removals were sprayed immediately with Bactine®, as recommended by Martin and Hong (1991). Animals in the control group were not toe-clipped or marked in any way. All animals were housed individually in 15 × 15 × 6 cm plastic Tupperware® containers on a substrate of moist paper towels. Frogs within the same size group were offered the same number and size of crickets 2–3 times a week. Crickets were dusted biweekly with Herpcare Cricket Dust®, which served as a vitamin supplement. All containers were maintained at a temperature of ca. 20ºC, and a 12:12 L: D photoperiod was maintained with full spectrum 60-watt incandescent bulbs hung 1 m above the containers. Individuals from each treatment were measured and weighed and their toes were examined monthly for signs of inflammation for five months. Survivorship of frogs from each group was also recorded. The sex of each frog was determined at the end of the study when secondary sexual characteristics (distended vocal sacs in males) were expressed with the onset of the breeding season.

Repeated measures analysis of variance was used to compare changes in SVL and mass among treatment groups using size group as a blocking variable. To test for any influence of sex on growth response variables, a separate repeated measures analysis of variance was used to compare SVL and mass among the sexes with size group as a blocking variable. Frogs with missing data (two escapes, and one death) were not included in the analysis. Analyses were conducted using the GLM procedure with a repeated statement in SAS version 8.2 (SAS Institute Inc. 2001, Cary, North Carolina, USA). This procedure produces both univariate and multivariate (Manova) tests for the effects of the treatments and time on the response variable.

Results.—One toe-clipped animal died of unknown causes during the fourth month, and two control animals escaped. Inflammation of clipped toes was recorded in nine animals (29%) during the first month and in two animals (6.5%) during the second month of the experiment. However, the wounds of all animals healed after 2 months, and no instances of tissue necrosis were observed.

Mean mass (t_{57} = -0.12, p = 0.91) and SVL (t_{57} = 0.28, p = 0.78) did not differ between treatment groups at the start of the experiment. Treatment had no effect on SVL ($F_{1, 55}$ = 0.00, p = 0.95) or mass ($F_{1, 55}$ = 0.10, p = 0.75), and there was no treatment by time interaction for either response variable (in both univariate and multivariate tests) (Figs. 1 and 2). However, both mass and SVL varied over time (mass: Wilk's lambda = 0.16, $F_{5, 51}$ = 52.63, p < 0.0001, univariate $F_{5, 275}$ = 40.91, G-G adjusted p < 0.0001; SVL: Wilk's lambda = 0.33, $F_{5, 51}$ = 20.60, p < 0.0001, univariate $F_{5, 275}$ = 29.07, G-G adjusted p < 0.0001). Neither SVL nor mass was significantly different between the sexes (SVL: $F_{1, 55}$ = 0.16, p = 0.69; Mass: $F_{1, 55}$ = 0.00, p = 0.98), and the sex by time interaction was not significant in any test.

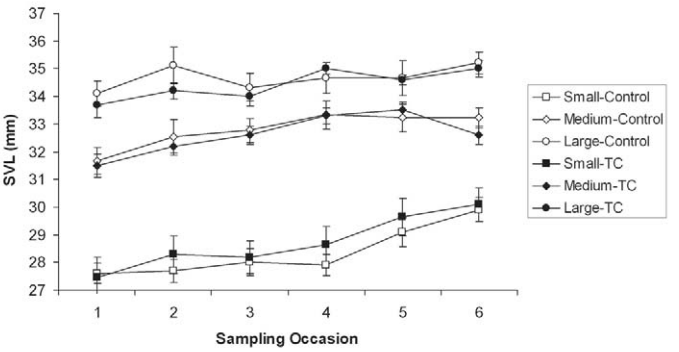

FIG. 1. Mean (± SE) SVL of toe-clipped (TC) and control frogs within different size groups sampled at 1 month intervals from December 2004 – May 2005. The 1 mm decrease between sampling events 5 and 6 for the medium sized toe-clipped group was due to measurement error.

Discussion.—Toe-clipping did not significantly affect the short-term growth or survivorship of *H. squirella* in this experiment. Our results are similar to those of Davis and Ovaska (2001) who examined the survivorship and growth of toe-clipped *Plethodon vehiculum* under laboratory conditions and to those of Ott and Scott (1999) who found no effects of toe-clipping on *Ambystoma opacum* maintained in small outdoor enclosures. Van Gelder and Strijbosch (1996) similarly found no differences in food consumption or mass between toe-clipped and unmarked *Bufo bufo* kept in small outdoor vivaria. Taken together these studies provide no evidence for a direct negative effect of toe-clipping on the health and growth of amphibians when they are provided ample food and maintained in a controlled, predator-free environment.

However, several studies conducted in field situations have demonstrated that amphibians marked by toe-clipping are recaptured less often than individuals marked by other methods, and that return rates are negatively related to the number of toes removed (Davis and Ovaska 2001; McCarthy and Parris 2004). In light of the laboratory studies, these observations suggest two possible

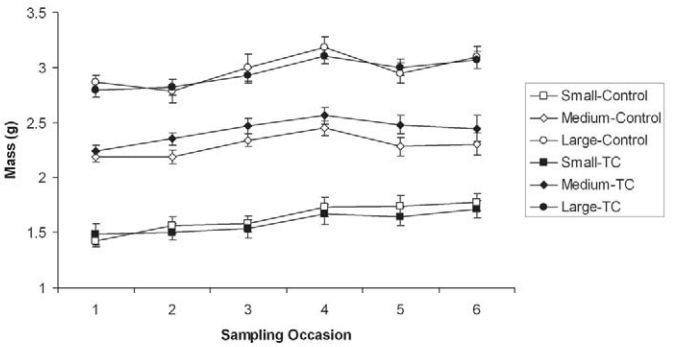

FIG. 2. Mean (± SE) mass of toe-clipped (TC) and control frogs within different size groups sampled at 1 month intervals from December 2004 – May 2005.

hypotheses: 1) toe-clipping may have an indirect negative effect on survival through increased predation and/or decreased foraging ability due to decreased mobility, 2) toe-clipping may affect amphibian behavior causing individuals to avoid capture locations. Evidence exists for both hypotheses. In a field experiment, Davis and Ovaska (2001) found that daily weight gain of *P. vehiculum* was significantly lower in toe-clipped animals than in unmarked individuals. However, they noted that both marked and unmarked *P. vehiculum* were consistently found under the same cover objects where they were initially captured. In contrast, Castellano and Giacoma (1993) found a negative correlation between the number of toes clipped and the number of days male *Bufo bufo* spent at a breeding pond. Similarly, Lemckert (1996) noted that 25% of newly toe-clipped *Crinia signifera* caught immigrating into a breeding pond left the pond within 1–3 days of marking, a behavior never observed in returning, previously marked individuals.

One consideration when gauging the impacts of toe-clipping is that individual species may be affected to different degrees and through varying combinations of mechanisms. Species with different feeding strategies, habits (e.g., arboreal vs. fossorial), antipredator behaviors, or habitat relationships may be differentially affected by the removal of one or more toes. Species also may vary in degree of susceptibility to stress or infection. For example, Lemckert (1996) found only rare incidences of infection in toe-clipped *C. signifera* but an almost 100 % infection rate in *Uperoleia laevigata*. Thus, marking by toe-clipping may be an effective, non-disruptive technique for some species but not for others.

The ethics of toe-clipping were recently questioned when McCarthy and Parris (2004) found that return rates of several frog species decreased linearly with the number of toes removed. Their study provides clear evidence that toe-clipping induces a negative effect on either the survivorship or the behavior of frogs. However, all available marking methods for amphibians involve the handling of animals and/or invasive procedures (see Donnelly et al. 1994), and it is likely that all marking methods induce some negative effect on the marked animals. In order to assess the ethics of toe-clipping and to determine the least disruptive marking method, the nature of the negative effects of toe removal should be fully understood. For instance, a marking method that results in a decrease in return rates due to behavioral avoidance of the capture site would be preferable to a method that results in a decrease due to mortality, particularly in the case of a rare or protected species. Unfortunately, few studies have compared the effects of toe-clipping to other marking methods (see Davis and Ovaska 2001) and the effects of other marking procedures on amphibian health and behavior are poorly known.

It should be emphasized that this study had several limitations, which should be carefully considered when interpreting the relevance of our results to the practice of toe-clipping in field studies. First and foremost, this was a laboratory study in which frogs were maintained in small enclosures in a predator-free, constant environment with an abundant and easily accessible food supply. This study could therefore not measure negative effects on the climbing ability and general mobility of the treefrog *Hyla squirella* or assess any influence of toe removal on behavior. However, given the importance of the adhesive toe discs of treefrogs in climbing and movement, it is likely that toe-clipping does have a negative effect on the mobility of this species. In addition, it is possible that our study animals healed at a different rate than they would have in the wild where a wider range of thermal environments, food items, and opportunities for infection exist. Secondly, all excision wounds in this experiment were treated with antiseptic, which may not be a common practice in most field studies. Our results may therefore represent an underestimate of the negative impacts of toe-clipping on growth and survivorship compared to field studies where antiseptic is not used. However, despite the limitations of this study, we believe our results add to a growing body of evidence that suggests that the negative impacts of toe-clipping observed in field studies are related to factors other than direct health effects.

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Herpetological Review, 2007, 38(2), 146–150.

Observations of Boreal Toads (*Bufo boreas boreas*) and *Batrachochytrium dendrobatidis* in South-Central Wyoming and North-Central Colorado

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Boreal Toads (*Bufo boreas boreas*) are found throughout much of the western United States, and were historically viewed as common. Presently, this taxon is considered a species of concern in some western states (Maxell et al. 2003; McGee et al. 2002) and populations in the southern Rocky Mountains have decreased to the extent that they have been considered for listing under the Endangered Species Act (U.S. Fish and Wildlife Service 2005). Although a causal link has not been established, rapid declines in Boreal Toad populations have been associated with the presence of the chytrid fungus *Batrachochytrium dendrobatidis* (hereafter *Bd*) in northern Colorado (Muths et al. 2003; Scherer et al. 2005) and *Bd* has been implicated in the mass mortality of several other species of amphibians (Quellett et al. 2005; Rachowicz et al. 2006).

Accurately monitoring trends in Boreal Toad abundance and distribution is difficult partly because population surveys often rely on qualitative observations at or near breeding areas (Loeffler 2001). Temporal variation in habitat availability (Bartelt et al. 2004), explosive breeding behavior (Olson et al. 1986), periodic recruitment failures (Olson 1992), high turnover in the use of breeding areas (Trenham et al. 2003), and difficulty in detecting breeding assemblages (Hammerson 1999) may lead to substantial fluctuations in actual and perceived toad abundance (Corn et al. 2005; Heyer et al. 1994; Wente et al. 2005). Consequently, alternative methods for detecting the presence and relative abundance of Boreal Toads would be useful. Recently, researchers in Montana studying the summer movements of stream fishes coincidentally captured large numbers of downstream-drifting Boreal Toads in hoop nets (Adams et al. 2005). Subsequent netting directed at assessing in-stream movements by Boreal Toads detected them in many previously unsampled basins (M. Young and D. Schmetterling, unpubl. data). If use of streams by Boreal Toads is geographically widespread and temporally consistent, the installation of upstream-facing hoop nets may increase the options for sampling toad populations (cf. Heyer et al. 1994; Willson and Dorcas 2004).

Substantial testing for *Bd* in amphibians has been done at historical and current Boreal Toad breeding locations in Colorado, Utah, and Montana (Muths et al. 2003; Boreal Toad Conservation Team, unpubl. data), but only limited sampling has been done in Wyoming. Testing for *Bd* in amphibians in Wyoming began in earnest around 2000 in the Laramie River basin, with additional testing in portions of the Green River drainage in 2002 and more recent sampling in other portions of the state (W. Turner, Wyoming Game and Fish Department, pers. comm.). Determining the distribution of *Bd* is critical to identifying Boreal Toad populations at risk of declines from infection and to locating populations free from disease that might be used for reintroductions elsewhere, as well as describing its prevalence in amphibians in areas where boreal toads are no longer extant but other amphibians may be at risk.

Our study had three objectives: 1) determine whether hoop-net sampling could detect the presence of Boreal Toads in streams on the Medicine Bow-Routt National Forests of south-central Wyoming and north-central Colorado; 2) compare the relative efficiencies of visual encounter surveys and in-stream, hoop-net sampling for detecting Boreal Toads; and 3) assess the prevalence of *Bd* among amphibians detected by this sampling, by targeted breeding site surveys not evaluated as part of this study, or found incidentally in this region in 2004 and 2005.

Methods.—Hoop nets were placed in first- to third-order streams across the Medicine Bow-Routt National Forests during July and August 2004 and 2005 (Fig. 1). In 2004 and 2005, we hoop-net sampled streams adjacent to, or connected by the stream network to locations known to recently have Boreal Toads (based on breeding season or summer visual encounter surveys not associated with this study, N = 19). Of the 13 locations in which Boreal Toads had been observed or known to breed since 1996, the 11 with the most readily accessible streams were subsequently sampled with hoop nets at sites 0.1–8.0 km from the breeding or observation locations. Also in both years, we sampled randomly selected streams (N = 46) if their basins supported potential amphibian breeding habitats (lakes, ponds, or wetlands, usually in the vicinity of the stream and upstream from net locations). Individual streams were hoop-net sampled in only one year. The average elevation at net sites was 2657 m (range 2260–3014 m) and channel low-flow wetted widths averaged 3.3 m (range 0.3–11.6 m). Dominant stream substrate varied from small gravel to rubble and boulder. Willows (*Salix* spp.), Aspen (*Populus tremuloides*), and occasionally conifers dominated most riparian areas.

We installed hoop nets in 1–6 sites at least 1 km apart within each stream, depending on stream length and access. Each hoop net was 1.4 m long, had four 38-cm hoops, two leads 1–4 m long, and a single throat with a 5.0–7.5 cm opening, and was constructed of Delta heavy 44, 6.3-mm nylon mesh (Miller Net Company, Memphis, Tennessee). Costs per net averaged US $165. Nets were set in the channel thalweg and affixed to rebar driven into the stream bottom or banks. The opening of each net faced upstream and the leads were angled slightly upstream to direct downstream-drifting toads into the net. On average nets intercepted 1.2 m (range 0.4–1.8 m) of the wetted width of the channel. Nets were partially submerged such that the throat was underwater and the upper portion of the leads, first hoop, and cod end were above the stream surface to intercept toads drifting near the surface and to provide a resting area for captured toads.

Nets were installed as flows declined in summer and were monitored daily over the 9-d interval they occupied each site. This interval was chosen because probability of capture of at least one

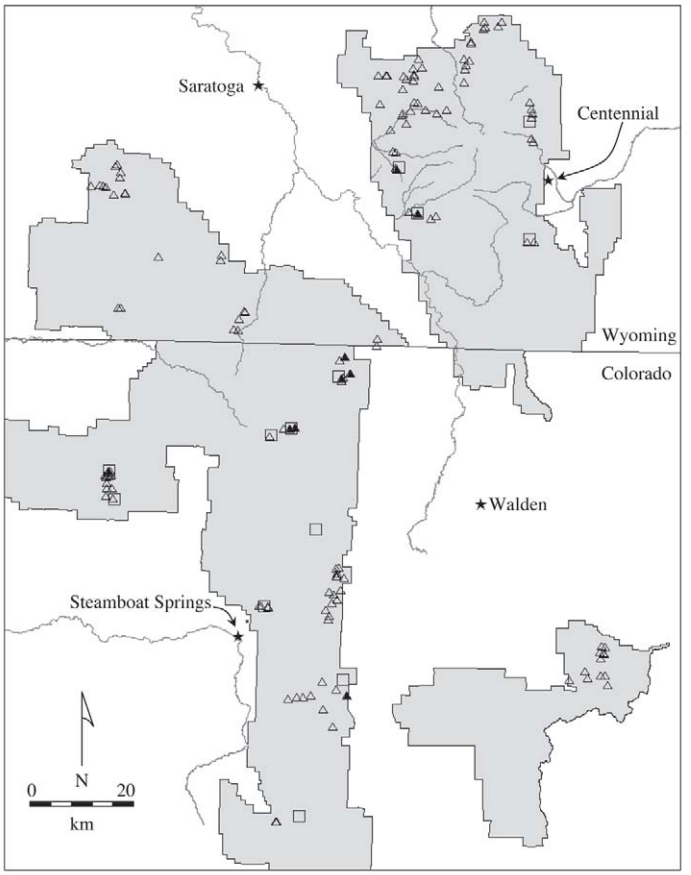

FIG. 1. Locations of sites monitored with hoop nets in 2004 and 2005 and locations of recent breeding areas on the Medicine Bow-Routt National Forests (shaded area). Filled triangles = sites where Boreal Toads were captured in hoop nets in 2004 and 2005 (N = 9); open triangles = sites without captures in hoop nets in 2004 and 2005 (N = 136); and open squares = breeding locations or sites with observations since 1996 (N = 13).

boreal toad exceeded 76% with this sampling intensity during midsummer in Montana streams (M. Young and D. Schmetterling, unpubl. data). Occasionally this period was shortened if nets incurred damage or Beaver (*Castor canadensis*) activity inundated or clogged them.

Upon capture, all toads were weighed (±1 g) and measured (snout–vent length, ±1 mm). Toads were sexed by inspecting the inner toes on the front legs for roughened nuptial patches and by attempting to induce them to vocalize by applying gentle pressure behind the front legs. Boreal Toads < 55 mm were considered to be juveniles (Hammerson 1999; Nussbaum et al. 1983) unless they vocalized or possessed nuptial pads. All toads > 55 mm were marked with a passive integrated transponder (PIT) tag inserted underneath the skin along the dorsal midline and posterior to the parotoid gland (Camper and Dixon 1988). An outside rear toe was clipped at the first joint and sealed with surgical cement to provide a secondary mark. All toads of this size were also checked for marks to identify previously captured individuals. After handling, toads were released downstream from the capture site.

We also conducted visual encounter surveys (Heyer et al. 1994) by making a sinuous traverse of the riparian areas along each side of the channel (including inspection of the stream) near net sites. These traverses extended 1 km upstream or until valley walls constrained the channel and effectively eliminated low-gradient, near-channel habitats. Most riparian surveys were completed up to a month prior to net installation when the probability of detecting breeding adults or egg masses was higher. Each Boreal Toad observed during these surveys was measured and marked, as previously described, and its location noted. Finally, the time necessary to complete hoop-net sampling and visual encounter surveys was recorded for work conducted in Wyoming.

Most live and dead amphibians captured in hoop nets and visual encounter surveys, as well as those found during monitoring of known amphibian breeding areas or located opportunistically, were tested for *Bd*. In general, handling procedures followed Livo (2004). For live animals, we sampled for *Bd* by obtaining skin swabs and conducting genetic analyses because this method is less injurious and yields rates of detection comparable to those of more intrusive sampling when tested on known *Bd*-positive individuals (Livo 2004). We used scissors to remove toes or ventral skin patches from dead animals (N = 3). Samples were submitted to a laboratory (Pisces Molecular, Boulder, Colorado) for detection of fungal DNA using a PCR assay.

Results.—In 2004 and 2005, we sampled for 1267 trap-days at

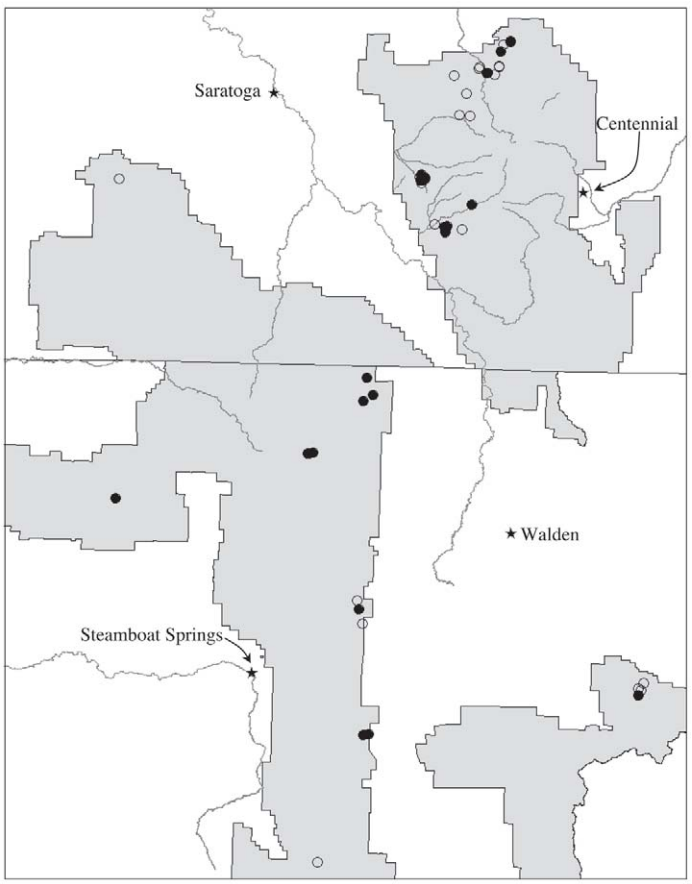

FIG. 2. Locations of amphibian samples from five species that were tested for *Batrachochytrium dendrobatidis* (*Bd*) in 2004 and 2005 on the Medicine Bow-Routt National Forests (shaded area). Filled circles = *Bd* detected (N = 20 sites, 81 individuals) and open circles = *Bd* not detected (N = 19 sites, 105 individuals). Note that not all amphibians captured were tested.

145 net sites on 65 streams on the Medicine Bow-Routt National Forests (Fig. 1). At or near nine net sites on eight streams—Beaver Creek, S. Fk. Big Creek, N. Fk. Elk River, Grizzly Creek, Torso Creek, and Twisty Creek in Colorado and Barrett Creek and Sourdough Creek in Wyoming—we captured 40 toads (6 males, 8 females, and 26 juveniles), of which 37 were first caught in hoop nets and 3 during visual encounter surveys. We caught 1–6 toads over the 9-d netting interval in seven of these streams, and 20 juvenile toads in Torso Creek. Marked toads were recaptured on five occasions; all recaptures were within 3 d of the initial marking. Four of these were made adjacent to the stream in the vicinity of the hoop nets where the toads were initially captured, and one marked toad was recaptured in the same net where it was first caught. All toads found in hoop nets were alive with one exception (this toad tested positive for *Bd*), and it is unknown whether this animal was already dead at the time of capture. All toads observed during visual surveys were alive.

Although hoop nets produced more captures than did visual encounter surveys (and visual encounter surveys only detected toads in those locations adjacent to net sites producing captures), other measures of sampling efficiency suggested some shortcomings of using hoop nets. Hoop-net sampling resulted in captures of boreal toads near only 6 of 11 locations with relatively recent (since 1996) observations of Boreal Toads or toad breeding areas, although Boreal Toads may have been absent from some of these locations by the time hoop-net sampling was conducted; toads were captured near all locations with observations since 2000. Mean distance from known breeding areas to net sites with captures was 1.1 km (range 0.1–4.2 km). Also, Western Chorus Frogs (*Pseudacris triseriata*) were the only other amphibians captured in hoop nets (N = 5), whereas Northern Leopard Frogs (*Rana pipiens*) and Wood Frogs (*Rana sylvatica*) also were observed (but not counted) during visual encounter surveys. On average, it required 4.5 h for a crew of two people to monitor 10–15 nets, depending on road conditions and the distance between sites. Days on which traps were installed required an additional 6 h. Visual encounter surveys required approximately 1 h for two people to examine 1.6 ha.

Amphibians infected with *Bd* were present in many portions of the study area. Of the 186 amphibians sampled at 39 locations in 2004 and 2005, 81 individuals from 20 locations were positive for *Bd* (Fig. 2). Overall, 54 of 102 Boreal Toads tested positive for the presence of *Bd* and 14 of 16 locations with Boreal Toads that were tested (including eight sites where toads were detected with hoop nets or visual encounter surveys) were positive. Also, 21 of 54 Western Chorus Frogs, 3 of 5 Northern Leopard Frogs, and 3 of 24 Wood Frogs were positive for *Bd*; the lone Tiger Salamander (*Ambystoma tigrinum*) tested negative.

Discussion.—Although earlier studies gave anecdotal (Carpenter 1954) or indirect (Campbell 1970) evidence of stream use by Boreal Toads in Colorado and Wyoming, our study confirms their presence in streams in this region (cf. Muths et al. 2001), and suggests that stream-related movements by Boreal Toads might not be restricted to populations in the northern Rocky Mountains. However, not all locations that support populations of Boreal Toads have perennial streams (e.g., northeastern Utah; Thompson et al. 2004), thus their use of such habitats might be regarded as somewhat opportunistic.

The 37 Boreal Toads captured in nine hoop nets were far fewer than those detected in western Montana watersheds using a similar sampling regimen. For example, in brief late summer sampling in 2001 and 2002 in three western Montana streams, Adams et al. (2005) made over 250 captures of Boreal Toads in hoop nets, and additional in-stream trapping in this area during portions of two subsequent summers produced 497 captures of Boreal Toads from 16 of 21 streams sampled (M. Young and D. Schmetterling, unpubl. data). These regional differences in captures are consistent with the perception of widespread and rapid declines of this species in the southern portion of its range (Carey et al. 2005; Corn et al. 2005). Nevertheless, the actual distribution of Boreal Toads is probably greater than that determined from in-stream trapping, but how much greater is uncertain because the probability of detection using this method is unknown and the design we employed did not permit an evaluation of detection probabilities (sensu MacKenzie et al. 2002).

All captures of Boreal Toads in nets were associated with areas with recent (since 2000) observations (cf. Wente et al. 2005), but only 9 of 20 nets in these streams captured toads. As part of our field protocol, we concentrated sampling downstream from known or potential breeding areas based on the assumption that Boreal Toads would disperse in this direction following breeding. However, in the two instances in which we set a net upstream from an existing breeding area, both captured Boreal Toads. It might be more likely that individuals disperse after breeding via terrestrial movements (Bartelt et al. 2004), perhaps farther up in a basin, or that non-breeding individuals might have used the stream channel above breeding areas. Comprehensive investigations of the pre- and post-breeding movements of sexually mature Boreal Toads and of non-breeding individuals are necessary to resolve this uncertainty.

In-stream sampling in summer was more effective for detecting the presence of Boreal Toads than roughly concurrent visual encounter surveys in the same basin. This might be because Boreal Toads are cryptic and are difficult to locate outside the breeding season (Hammerson 1999; Keinath and McGee 2005) when they are largely nocturnal (Gregory 2000; Hailman 1984; M. Young and D. Schmetterling, unpubl. data). However, visual encounter surveys appeared to require less time to complete, and were more effective for detecting the entire suite of amphibians present in this region. Although hoop nets can be checked in 5 min and installed in 15 min by experienced individuals (M. Young, pers. obs.), much of the effort associated with hoop-net surveys is related to the spatial distribution of hoop nets, which in this study required traveling on average 75 km on unimproved forest roads each day. Moreover, we caution that because hoop-net sampling did not consistently detect Boreal Toads near all locations where they were known to be breeding in recent years, it cannot be considered a replacement for targeted surveys of breeding areas.

In-stream trapping revealed some aspects of these populations that might have been overlooked by other techniques. For example, we inferred that Boreal Toad recruitment was successful in 2004 in the Torso Creek watershed, based on captures of juveniles that metamorphosed the previous summer. Their presence may be a more reliable indicator of reproductive success than observations of egg masses, tadpoles, or recently metamorphosed toads, given the potentially high rates of mortality of each of these life stages

(Biek et al. 2002; Carey et al. 2005). Furthermore, sex ratios were much closer to unity than typically observed at breeding areas (Olson et al. 1986; Thompson 2004).

Based on our sampling, *Bd* appears to be widely distributed throughout south-central Wyoming and north-central Colorado (51% of sites tested), and was present in the majority (53%) of Boreal Toads that were tested. Positive samples were collected from the Elkhead Mountains, Park Range, Never Summer Mountains, and Sierra Madre in Colorado and from the Medicine Bow Mountains in Wyoming. We did not detect *Bd* in samples from the Wyoming portion of the Sierra Madre, but owing to the rarity of samples of amphibians from there, this is not conclusive evidence that *Bd* is absent. Because these locations were not previously sampled for *Bd*, it is not possible to determine if its prevalence is a recent phenomenon. Nevertheless, the putative arrival of *Bd* in central Colorado coincided with a rapid decline in Boreal Toads (Corn et al. 2005), and similar circumstances might explain the apparent current rarity of Boreal Toads in the study area. Also, the presence of *Bd* at many locations and among most Boreal Toad populations suggests that, should reintroductions of Boreal Toads be attempted, ensuring that breeding areas remain disease-free might prove problematic.

In summary, we established that Boreal Toads of the southern Rocky Mountain populations may use streams in mid-summer and can be captured by using upstream-facing hoop nets. This approach was more successful at detecting Boreal Toads than were visual encounter surveys in the same area. However, the failure to capture Boreal Toads in all nets near locations suspected to support breeding populations indicates that stream-based netting alone is inadequate for assessing their status, and might better serve as a complement to targeted breeding area surveys or for the detection of toads in previously unrecognized locations. Finally, the limited number of captures of Boreal Toads, and of captures only in association with locations where this species had recently been observed, is consistent with the perceived large-scale reductions in distribution and abundance of Boreal Toads in this region and that this apparent decline might be associated with the high prevalence of *Bd* among Boreal Toads and other amphibians in this area.

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Breeding Ponds Colonized by Striped Newts after 10 or More Years

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Many amphibian populations are thought to be structured as metapopulations across a landscape (but see Smith and Green 2005), particularly those species breeding in isolated temporary ponds (e.g., Gill 1978, Hecnar and M'Closkey 1996, Skelly 2001). In terms of Levins' (1969) classic metapopulation concept, isolated wetlands could serve as demes or subpopulations in a larger metapopulation context. This also includes the uplands surrounding isolated wetlands for those species that migrate between upland refuges and isolated breeding sites. Because of variable hydroperiods or presence of predators (e.g., some fishes), certain ponds may be subject to prolonged periods without sufficient hydroperiod to allow metamorphosis (e.g., Semlitsch et al. 1996), whereas others may persist through time and allow the production of metamorphs to maintain populations (sources). A prolonged period of metamorphic failure could lead to a local extinction event. Should conditions change, sites from which populations had been extirpated might be recolonized via dispersal of individuals from source populations. This dynamic interplay of occupancy, colonization and local extirpation thus produces a mosaic of occupation scenarios at any point in time. As Marsh and Trenham (2001) point out, however, this model is somewhat simplistic since there are many variables which affect landscape occupancy by pond-breeding amphibians, including various deterministic factors, the distribution of terrestrial habitats, and the isolation of the pond "patches."

Despite the general acceptance of the metapopulation model, few studies have demonstrated amphibian colonization of a former breeding site after a long absence (see Taylor et al. 2006 for a possible example involving *Eurycea quadridigitata* after 8 years) or colonization of previously unsuitable sites. Here, we report on the colonization of aquatic breeding sites by the Striped Newt (*Notophthalmus perstriatus*) in north-central Florida after a period of 10 years or more with no water, or under previously unsuitable conditions, and suggest that Striped Newts may form metapopulations. Metapopulation dynamics have important implications for the conservation and management of this imperiled species (Dodd et al. 2005). For example, for Striped Newts to persist as metapopulations it is crucial to protect a suite of wetlands with a diversity of hydroperiods and to properly manage uplands to facilitate dispersal among ponds.

For five years, Breezeway Pond on the Ordway-Swisher Biological Station, Putnam County, Florida was monitored five days per week using an encircling drift fence-pitfall trap sampling procedure (see Dodd 1992 for details of this study). Hydroperiod was monitored daily. From 1985 to 1990, > 2500 Striped Newts were marked as they entered and exited the 0.16 ha pond. During the latter half of the study (1988 - 1990), a prolonged drought affected north-central Florida (Franz 1991) and Breezeway Pond went dry on 23 December 1988. Captures of Striped Newts declined accordingly, from 744 in 1987 to 16 in 1990 (Dodd 1993). After October 1990, Breezeway Pond was periodically checked for the next 10 years, especially after substantial rain events, to monitor its hydroperiod. It did not refill until January 1998. During this period the pitfall traps were closed and the drift fence was opened in numerous places to allow animals to move freely in the dry pond basin. On 8 May 1998, a larval Striped Newt was collected from the pond (UF 133756). Despite rigorous dip-net sampling of the pond, which was less than 0.1 hectares in extent at the time, only four larval newts were captured. Although we cannot be sure, this could indicate that very few adults, which migrate to Breezeway Pond in the winter (Dodd 1993), recolonized the pond.

Smith Lake is a 7.55 ha clear-water lake located 350 m N of

Breezeway Pond. It had been stocked with fish when the station was a private hunt club (prior to 1980). In 1983, fish surveys documented the presence of *Etheostoma fusiforme, Gambusia holbrooki, Lepomis macrochirus,* and *Micropterus salmoides* (R. Franz, pers. comm.). During aquatic surveys prior to 1990, no Striped Newts were collected in the lake, which was not surprising since Striped Newts do not inhabit ponds with predatory fishes (Dodd et al. 2005). However, a small isolated wetland (Smith Lake Pond #1, ca. 425 m east of Smith Lake) had Striped Newts on 9 April 1993 (UF 91485). Smith Lake dried on 29 May 1990 because of a severe drought that affected many lakes and wetlands on and near the Ordway-Swisher Biological Station (Franz 1991) and remained dry for several years before refilling. No fishes have been found in the lake since it dried completely in the early 1990s. Striped Newts were collected from Smith Lake for the first time on 1 February 1997 (UF 133789), again on 2 November 1997 (UF 125759), and most recently on 20 April 2005 (no voucher collected).

A similar situation occurred at a neighboring wetland, Blue Pond (0.71 ha basin), on the Ordway-Swisher Biological Station. Prior to the mid-1980s, when the Station was in private ownership, Blue Pond was a popular fishing site. In the spring of 1985, approximately 100 largemouth bass were caught in Blue Pond (S. Scaife pers. commun.). Blue Pond dried completely in 1989 during the same severe drought that caused Smith Lake and Breezeway Pond to dry. No fish have been found in Blue Pond since the drought. Striped newts were first documented in Blue Pond on 9 February 1997 (UF 128031), and most recently on 11 November 2006 (no voucher taken). They have been documented in Blue Pond numerous times during the interim between these dates. Because Striped Newts only breed in fishless ponds, and thus to our knowledge did not occur in Blue Pond prior to the drought, this is another example of colonization of previously unsuitable habitat by the species.

Salamanders are known to colonize breeding sites after the extinction of predatory fish. Funk and Dunlap (1999) conducted surveys for introduced trout and native Long-toed Salamander larvae in high elevation lakes in 1978 and again in 1997/1998. They found evidence to suggest that Long-toed Salamanders were able to colonize lakes in which trout went extinct. This is similar to our findings with Striped Newts at the Ordway-Swisher Biological Station. Population estimates at known Striped Newt breeding ponds on the biological station vary. Dodd (1993) documented 2521 individuals over a 62.5 month period (1985–1990) at Breezeway Pond. During a two-year period (1996–1998), Johnson (2002) counted 8127 Striped Newts entering and exiting One Shot Pond. However, Johnson (unpubl. data) only found 32 individuals at neighboring Fox Pond during a 270-day period from Nov 1997 to Aug 1998. Drift fences encircled both of these ponds. Despite herpetologists working on the biological station for the past 25 years and sampling many of the station's wetlands, this was the first time Striped Newts were documented in Fox Pond and thus may represent a colonization or recolonization event. Fox Pond is very isolated from other wetlands and likely never supported predatory fishes naturally.

Striped Newts have been found in 12 ponds on the Ordway-Swisher Biological Station, all of which have dried for varying lengths of time during the last three decades. The larger wetlands (Smith Lake, Blue Pond, Clear Pond) and two deep but small ponds (Berry, One-Shot) have the longest hydroperiods, but even at these locations drought may completely eliminate or severely limit the duration and timing of suitable conditions for Striped Newt breeding. At such times, Striped Newts may attempt to disperse to other wetlands if available. Striped Newts have been found terrestrially 700 m from the nearest possible breeding site (Dodd 1996), and an inter-pond movement of ca. 685 m (movement of a marked newt from One Shot Pond to Fox Pond) was recorded on the Ordway-Swisher Biological Station (Johnson 2003). Johnson (2003) suggested that 16% of a Striped Newt breeding population may migrate > 500 m from non-breeding terrestrial habitats to reach an isolated breeding pond. Although they have the ability to migrate hundreds of meters into upland habitats, there appears to be strong philopatry to natal breeding ponds, and inter-pond dispersal is a relatively rare event. This supports our supposition that Striped Newts form metapopulations because it means that recruitment is more likely to come from within a patch (e.g., breeding pond and surrounding uplands) rather than via immigration from nearby patches (Harrison and Taylor 1997).

Understanding the synchrony of local population dynamics is important for differentiating between patchy populations and true metapopulations (Harrison and Taylor 1997; Hecnar and M'Closkey 1996). Unfortunately, details of the synchrony of pond occupancy (e.g., extinction and recolonization rates) by Striped Newts across all potential breeding ponds on the Ordway-Swisher Biological Station are unknown. Long-term studies among multiple patches (ponds) are required to collect such data. Nonetheless, we believe our data support the hypothesis that Striped Newts on the station persist as a metapopulation. Because of environmental stochasticity (e.g., drought, predator colonization), local extinctions are likely over time for Striped Newt breeding ponds on the station. Variation in pond hydroperiods leads to variation in the synchrony of extinction events.

The source of the individuals that recolonized Breezeway Pond after 10 years, as well as the source of animals that colonized Smith Lake and Blue Pond following the drought, remains unknown. They likely originated from another breeding pond as part of a metapopulation at the Ordway-Swisher Biological Station, as suggested above. Alternatively, it is possible that in some situations individual Striped Newts may wait out short-term droughts in terrestrial refugia. Eastern Red-spotted Newts (*N. viridescens*) may live > 8 years (Forester and Lykens 1991; Gill 1985), although attempts to age Striped Newts have been unsuccessful (G. Zug, pers. comm.). A single individual *N. perstriatus* from the Ordway-Swisher Biological Station has been kept in captivity since 1991, a period of 15 years (L. LaClaire, pers. comm.). Thus, it is possible that wild Striped Newts are long lived.

Like *N. viridescens* (Gill 1978), *N. perstriatus* seems to fulfill the criteria (patchy occupancy through time of a series of breeding ponds in close proximity; periodic extinction and recolonization due to stochastic environmental fluctuation; potential for long distance dispersal; inter-pond movement) for having a metapopulation structure. Surveys for this declining species need to take into consideration the extent to which individuals and populations are dispersed across a landscape over time. What appears to be an unoccupied or unsuitable site during a short-term survey may be an important location for metapopulation dynamics during optimal

environmental conditions.

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The Diets of Three Sympatric Barred River Frogs (Anura: Myobatrachidae) from Southeastern Australia

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There are five species of large (7–10 cm) ground-dwelling myobatrachid frogs of the genus *Mixophyes* found along the coast and adjacent ranges of eastern Australia (Cogger 2000). This genus is of some conservation interest because three species (*M. balbus, M. iteratus,* and *M. fleayi*) have had major declines in numbers and ranges in recent years, presumably due to the chytrid fungus, *Batrachochytrium dendrobatoides*, and habitat loss (Ehmann 1997; Hines et al 1999). Advancing knowledge of their basic biology is imperative for their long-term conservation.

The diet of the *Mixophyes* has been poorly documented. Cogger (2000) notes that they generally feed on "insects and smaller frogs." However, the only specific published report of any kind is Wotherspoon's (1980) note of Leaf Green Tree Frogs (*Litoria phyllochroa*) in the stomach of a *M. fasciolatus*. We document the gut contents of three of the species of barred river frogs (*M. balbus, M. fasciolatus,* and *M. iteratus*) to determine if there is any obvious dietary specialization that might be of importance in the declines of *M. balbus* and *M. iteratus*.

Preserved specimens from each of the three species were obtained from the collections of the Australian Museum, Melbourne Museum, and the Australian Wildlife Collection. These specimens come from a wide range of sites and span more than 100 years in time. Each specimen was sexed and the contents of the gut cavity removed and placed into a separate specimen tube along with the corresponding museum identification number. Each was examined later in order to identify the number of food items present and, as far as possible, the identity of the prey items. Where an item could be clearly distinguished, it was identified to the family level for insects and order for the other items. Initially, we attempted to estimate the volumes of each food item, but the inconsistent nature of digestion made useful comparisons impossible and this approach was abandoned. Individuals were assigned a sex based on obvious secondary or internal sexual characteristics and were considered sub-adults if less than 5 cm snout–urostyle length (SUL) and showed no distinct sex.

We described diet composition, but did not attempt statistical data analysis because of the small number of individuals containing food items. Furthermore, exploratory analysis (using Principle Component Analysis and Analysis of Variance) revealed that the gut contents of a few individuals with much larger numbers of prey strongly influenced any statistical testing, confounding the

TABLE 1. Prey items from the stomachs of 52 *Mixophyes iteratus*, from southeastern Australia.

Prey Group	Females	Males	Sub-adult	Total
Insects				
Blattodea	0	0	0	0
Coleoptera	5	1	0	6
Coleoptera larva	1	0	0	1
Dermaptera	0	0	0	0
Hemiptera	0	0	1	1
Lepidoptera	0	0	0	0
Orthoptera	1	1	0	2
Trichoptera	0	0	0	0
Unidentified Insect	5	4	0	9
Total Insects	12	6	1	19
Non-Insects				
Arachnid	2	0	0	2
Amphipod	3	0	0	3
Anuran	2	0	0	2
Centipede	4	0	0	4
Gastropod	2	0	0	2
Millipede	0	1	0	1
Nematode	1	0	0	1
Skink	2	0	0	2
Total Non-Insects	16	1	0	17
Total Items	28	7	1	36
No. frogs with item	6	5	1	12
No. empty stomachs	12	18	10	40

analysis interpretation.

Each species ate a broad range of food items that included various invertebrate groups such as spiders, centipedes, and snails (Tables 1–3). Insects dominated the diets: *Mixophyes balbus,* 25/30 = 83%; *M. fasciolatus,* 34/44 = 77%; and *M. iteratus,* 19/36 = 53%. *Mixophyes iteratus* ate a greater range of non-insect items with eight non-insect groups being recorded, whereas both *M. balbus* and *M. fasciolatus* each included only three non-insect groups. Spiders were the most prevalent non-insect eaten (12/32 non-insect items = 37%). Overall, 105 of the 110 (98%) dietary items were invertebrates. Of the remaining dietary items, the *M. iteratus* sample included two frogs. One could not be identified, but the other was a stream-breeding species, the Tusked Frog, *Adelotus brevis*. Additionally, small skinks were found in the diet of both *M. iteratus* and *M. balbus*.

The dietary samples for the three *Mixophyes* species suggest that there was no particular dietary specialization. This is in keeping with the limited available information on Australian frogs which indicates that most species are dietary generalists and that larger species have varied and broad diets (Barker et al. 1995; Tyler 1994). All three species of *Mixophyes* are reasonably large frogs (*M. iteratus* females reach up to 12 cm SUL; *M. balbus* and *M. fasciolatus* reach 7–10 cm SUL; Cogger 2000) that likely attempt to eat any potential prey items they encounter when foraging. If anything, smaller prey items such as collembolans, amphipods, ants, or termites appeared to be relatively rare within the guts of the sampled specimens. These have been found to be important prey items for smaller (and often sympatric) species of Australian myobatrachid frogs (Cappo 1986; MacNally 1983), but relatively small invertebrates may not be worth the effort of capture by the large adult barred river frogs. Sub-adults of all three *Mixophyes* species may eat these smaller prey items, however we sampled few frogs of less than 5 cm SUL.

Mixophyes iteratus appeared to have a wider prey base and ate relatively fewer insects than the other two species in our sample. Insects form the major part of the diets of nearly all Australian frog species on which we have information (Tyler 1994). The fact that this is such a large-bodied species may allow it to take larger non-insect prey such as centipedes and frogs as well as large "king" crickets (up to 7 cm long; F. Lemckert, pers. obs.), and typically it is the larger frogs in Australia that are recorded eating large prey items (e.g., *Litoria raniformis*: Fleay 1935; *Litoria caerulea*: Tyler 1994).

Dietary difference may originate from frog habitat preferences. While *M. iteratus* breeds in streams (Barker et al. 1995; Cogger 2000), it appears to be relatively restricted to riparian areas in wetter forest types (Lemckert and Brassil 2000). The stream-breeding *M. balbus* and, particularly, the pond-breeding *M. fasciolatus* for-

TABLE 2. Prey items from the stomachs of 62 *Mixophyes balbus*, from south-eastern Australia.

Prey Group	Female	Male	Others	Total
Blattodea	2	3	0	5
Coleoptera	0	2	0	2
Coleoptera larva	0	0	1	1
Dermaptera	0	0	0	0
Hemiptera	0	0	1	1
Lepidoptera	0	2	0	2
Orthoptera	2	3	1	6
Trichoptera	0	1	0	1
Unidentified Insect	1	4	2	7
Total Insects	5	15	5	25
Amphipod	0	0	0	0
Anuran	0	0	0	0
Arachnid	0	2	0	2
Centipede	0	0	0	0
Gastropod	2	0	0	2
Nematode	0	0	0	0
Millipede	0	0	0	0
Skink	1	0	0	1
Total Non-Insects	3	2	0	5
Total Items	8	17	5	30
No. frogs with item	5	7	4	16
No. empty stomachs	12	22	12	46

TABLE 3. Prey items from the stomachs of 73 *Mixophyes fasciolatus*, from southeastern Australia.

Prey Group	Female	Male	Others	Total
Blattodea	1	0	1	2
Coleoptera	3	2	1	6
Coleoptera larva	0	0	0	0
Dermaptera	0	0	3	3
Hemiptera	0	0	0	0
Lepidoptera	0	0	0	0
Orthoptera	7	6	4	17
Trichoptera	0	0	0	0
Unidentified Insect	1	3	2	6
Total Insects	12	11	11	34
Amphipod	0	0	0	0
Anuran	0	0	0	0
Arachnid	4	4	0	8
Centipede	1	0	0	1
Gastropod	0	0	1	1
Nematode	0	0	0	0
Millipede	0	0	0	0
Skink	0	0	0	0
Total Non-Insects	5	4	1	10
Total Items	17	15	12	44
No. with item	9	6	9	24
Empty	14	22	13	49

age in drier forest away from the riparian zone (Lemckert and Morse 1999). Nematodes, amphipods, and gastropods would generally prefer moister environments and are likely to be more prevalent in riparian areas so *M. balbus* and *M. fasciolatus* may not encounter the riparian-associated wider prey base of *M. iteratus*. The partial dominance of crickets in the diet of *M. fasciolatus* might be explained by its greater occurrence in drier forest areas. However, there is not enough evidence on the distribution of crickets in these forest environments to know if this is the case or whether they preferentially target crickets in the diet.

The dietary intake from this study suggests it is unlikely that a decline in specific prey items has played a significant role in the declines of *M. iteratus* and *M. balbus*. They do not have obvious specializations on particular prey groups that could lead to impacts on populations if specific prey bases declined. The diets of the sub-adults may be more specialized and so affected by disturbances and should be explored further, although the limited data we obtained suggested that the diets of these smaller individuals were as broad as the adults.

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Natural History Notes on *Crotalus tancitarensis* (Serpentes: Viperidae)

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The Tancítaro Cross-banded Mountain Rattlesnake, *Crotalus tancitarensis,* is only known to inhabit the upper elevations of the volcano known as Cerro Tancítaro in Michoacán, México. The species was recently described from three specimens by Alvarado-Díaz and Campbell (2004), who placed it in the *Crotalus intermedius* species group of Mexican montane rattlesnakes, which also includes *C. intermedius*, *C. pricei*, and *C. transversus* (Murphy et al. 2002). This report provides information on nine additional individuals of *C. tancitarensis* with respect to variation in scalation and color pattern, and also on parturition dates, litter size, neonate characters, and food acceptance in captivity.

Methods

All snakes were collected approximately 800 m N of the type locality at Los Portales, Michoacán, México, at 3220 m elevation (coordinates 19°24'13"N, 102°19'45"W) on Cerro Tancítaro. The site is a steep, south-facing slope about 70 × 250 m, covered by grass, herbs, and rocks. The site is bordered to the north by a 3 m high rock wall, to the south by a deep cliff and to the east and west by pine-fir forest, which is the dominant plant formation in the area. Cerro Tancítaro (max. elev. 3900 m) is located in the western portion of the Transverse Volcanic Cordillera. Above 3000 m, the mean annual temperature ranges from 5–12°C, with an average annual rainfall of 1500 mm. Most rain falls from June to October after a 5–6 month dry season (García et al. 2002).

One adult female and two juvenile females were collected on 19 July 2003 between 1400 and 1530 h when the air temperature was 23°C. Another adult female was caught on 29 October 2005 at 1345 h when the air temperature was 19°C. Palpation indicated that the second female was gravid, so it was held in the laboratory until after giving birth to four live and one stillborn neonates on 21 March 2006. All individuals eventually either died or were euthanized and were later deposited in the herpetological collection, Instituto de Investigaciones sobre los Recursos Naturales, Universidad Michoacana de San Nicolás de Hidalgo (INIRENA).

The non-gravid adult female collected in July 2003 (INIRENA 421) was active and the juveniles (INIRENA 414, 423) were coiled under stones. The juveniles were euthanized and preserved immediately after capture. The female was maintained live in a glass vivarium (L50 × W26 × H30 cm) in a laboratory building located at an elevation of 2000 m until she died on 23 November 2006. Ambient temperatures were maintained between 16 and 24°C (mean = 21°C) and laboratory windows provided a natural photoperiod. Room temperature readings were taken every day with a mercury thermometer to the nearest 1°C at 1000 and 1600 h. Basking spots were provided from 1100 to 1500 h, at temperatures between 27 and 30°C, using 50 W incandescent spot-light bulbs. Food acceptance was evaluated by presenting various kinds and life stages of live invertebrates and vertebrates to the adult female INIRENA 421. If food items were not consumed, after 2 h in the case of vertebrates and 24 h for invertebrates, the items were removed from the cage.

The gravid female (INIRENA 560) was found inactive under a stone. The snake was maintained live for five months under the same conditions as described above, until parturition. Of the five neonates (INIRENA 570–575, 3 females and 2 males), the four live ones were maintained in captivity within the same glass terrarium for 60 days. They were maintained at a natural photoperiod with a mean room temperature of 23°C and a range of 18–26°C. Basking spots, as described above, were available every day from 0930 to 1630 h.

Scale counts, body measurements (to the nearest 1 mm using a meter stick), and notes on color patterns follow those described in Klauber (1972) and Campbell and Lamar (2004). Color pattern was recorded from live individuals only, and after the first molt in the case of neonates. Character values from the holotype and two paratypes of *C. tancitarensis* were taken from Alvarado-Díaz and Campbell (2004).

Results and Discussion

Scalation and color pattern.—Table 1 lists character values of the nine specimens reported herein and of the holotype and paratypes of *C. tancitarensis*. The new material conforms well with scutellation and color pattern of type specimens, all the new material expands the range of ventral scale number (from158–160 to 151–160), subcaudal scale number (from 21–22 to 15–22) and dorsal body crossband number (from 49–51 to 48–52). The two males have fewer ventral scales than do females (151 vs. 156–160). Subcaudal scales numbers were 17 and 22 in males (vs. 15–22 in females). Tail length constitutes about 9 and 9.3% of total body length in the two males and 7.5–8.9 % in females. All specimens (including types) exhibit 21 dorsal scale rows at mid-body, a loreal scale that does not contact the lower preocular scale but contacts the supralabial scale series, and a loreal scale that is longer than high (except in INIRENA 414, in which the right loreal is as long as high). Color pattern of the new specimens is similar to type specimens; dorsal ground color pale blue-gray, dark crossbands on body and tail, and a black omega-shaped nape mark. However, neonates and juveniles lacked the pinkish copper-colored stripe along the vertebral line that is exhibited by the types and the other two adults (Fig. 1). Although the range of variation for some characters increased, lepidosis aspects and color pattern of the new material are consistent with the characters that separate *C. tancitarensis* from other members of the *C. intermedius* group (Alvarado-Díaz and Campbell 2004).

Diet in captivity.—During the first two months of captivity, the non-gravid female (INIRENA 421) was offered various types of potential prey, including invertebrates (crickets, mealworms, centipedes), amphibians (*Hyla eximia*, *H. arenicolor*), rodents (newborn mice), and lizards (*Sceloporus grammicus*, *S. aeneus*, *Anolis*

FIG. 1. Adult female (INIRENA 421) and neonates of *Crotalus tancitarensis*.

nebulosus, *Plestiodon copei*). The snake only accepted lizards, consuming all species presented except *A. nebulosus*. Lizard species known to share the local habitat with *C. tancitarensis* include *S. grammicus*, *P. copei,* and *Barisia imbricata*. *Sceloporus grammicus* is the most abundant lizard in the area, so that species is most likely the primary food source of *C. tancitarensis*. Under captive conditions described above, the snake was sustained (until death occurred 41 months after capture) on a diet of adult *S. grammicus* and juvenile *S. aeneus*, at an average feeding rate of one lizard per week.

The gravid female (INIRENA 560) was fed an adult *S. grammicus* about every 10 days after being placed in captivity on 29 October 2005. She stopped feeding in mid February 2006, about one month before parturition. After giving birth on 21 March 2006, she refused all food and died 21 days later.

Neonates refused to eat various types of prey that were similar to those offered to adults, although all vertebrate pretty offered were neonates or juveniles. After 60 days without feeding, one neonate was force-fed a liquefied *S. grammicus*, but died within an hour. The rest of the neonates were subsequently euthanized.

Camarillo and Campbell (2002) reported that captive adult *C. transversus* fed on lizards (*P. copei, S. grammicus, S. mucronatus, S. aeneus*) and mice. They also reported that captive born *C. transversus* neonates refused to eat and eventually died. However, Camarillo and Campbell (1993) earlier reported a neonate *C. transversus* that fed readily in captivity on a diet of *S. grammicus*.

Reproduction.—As mentioned above, the gravid female (INIRENA 560) captured 29 October 2005 gave birth to five young on 21 March 2006. Neonate total lengths ranged from 131 to 150 mm (mean = 143 mm) and they weighed from 2.2 to 3.2 g (mean = 2.7 g). The entire litter weighed a total of 13.7 g, and after giving birth, the mother weighed 20.5 g. When originally captured, the female weighed 40 g, indicating that at time of parturition energy reserves were low. The first molt was on the 10th day postbirth for two neonates and on the 11th day for the other two.

Numerous authors have reported litter sizes of various species of rattlesnakes (see Campbell and Lamar 2004 for a review). Smaller species generally produce fewer offspring (often 5–8) that are relatively large as compared to adults. Conversely, large species produce more young (15–40) that are relatively small as compared to adults. Litter size and relative litter mass recorded herein for *C. tancitarensis* follow this pattern, as do reported litter sizes of other members of the *C. intermedius* group. As examples, a litter of *C. intermedius* from Guerrero consisted of five young

(Armstrong and Murphy 1979), a litter of *C. transversus* from the state of México consisted of four young (Camarillo and Campbell 2002), and litter size for *C. pricei* ranges from 3 to 9 (Campbell and Lamar 2004).

To our knowledge, only five adult *C. tancitarensis* have ever been reported by scientific investigators. Of those, all were females, two are reported for the first time herein, and the three others belong to the type series. Four of the five were collected in summer (June and July) and the other in fall (October). The females collected in summer showed no signs of pregnancy or recent parturition, as would be indicated by flaccid abdomens and longitudinal skin folds on the posterior part of the body (Macartney and Gregory 1988). The sizes of the two juveniles collected in the summer suggest that they were not more than two months old. Therefore, the parturition date of the captive female and the collection date of the two juveniles suggest that the parturition season for *C. tancitarensis* extends from March to July.

Table 1. Measurements (mm) and meristic counts of *Crotalus tancitarensis*. Data for holotype and paratypes from Alvarado-Díaz and Campbell (2004). All adult specimens are female. A = adult, J = juvenile, N = neonate, SVL = snout-vent length, TL = tail length, V = ventrals, S = subcaudals, SL = supralabials, IL = infralabials, PS = scales in the prefrontal region, HL = head length, BC = body dorsal crossbands (exclusive of tail). INIRENA 571 and 575 are males.

	SVL	TL	V	S	SL	IL	PS	HL	BC
INIRENA 560 (A)	397	37	156	22	9/9	9/9	3	16.6	51
INIRENA 421 (A)	363	28	160	20	9/9	9/9	3	17	52
INIRENA 423 (J)	172	14	156	19	9/9	9/9	3	11	50
INIRENA 414 (J)	156	15	156	21	9/9	9/9	4	11	52
INIRENA 570 (N)	119	12	156	18	9/9	9/9	4	10	51
INIRENA 571 (N)	130	13	156	18	9/9	9/9	3	10	48
INIRENA 572 (N)	133	13	156	15	9/9	9/9	4	10	50
INIRENA 574 (N)	134	12	160	18	9/9	9/9	4	10.5	50
INIRENA 575 (N)	136	14	151	22	9/9	9/9	3	10.5	51
INIRENA 309 (A)*	356	29	158	21	9/9	9/9	3	17.5	51
UTA R-52401 (A)**	397	30	159	21	9/9	9/9	3	18.2	49
FMNH 39115 (A)**	410	26	160	22	9/10	9/10	4	19.2	—

* Holotype, ** Paratypes

A number of literature sources have specified parturition dates in rattlesnakes from central and southern México that coincide with the rainy season (see Campbell and Lamar 2004 for a review). The presence of adult females with no signs of reproductive activity during the summer rainy season on Cerro Tancítaro suggests that *C. tancitarensis* has a more-than-annual reproductive cycle (Wharton 1966). The high elevation inhabited by *C. tancitarensis* might also influence reproductive cycles. Other species of Neotropical viperids from highland environments exhibit biennial reproductive cycles (Camarillo and Campbell 2002; Campbell and Solórzano 1992). Additional specimens collected from throughout the year and throughout its geographic distribution are needed to substantiate or refute hypotheses delineating reproductive season in *C. tancitarensis*.

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TECHNIQUES

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Detection of Crotamine and Crotoxin Gene Sequences in Genomic DNA from Formaldehyde-fixed Rattlesnakes

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Museum collections are an important source of material for studies of phylogeny, systematics, and phylogeography. These collections can represent rare or extinct species and provide historical samples and may be very useful for genetic studies of reptile populations. The material is usually formalin–fixed and stored in ethanol. Formalin (an aqueous solution of formaldehyde) is the fixative agent most widely used to preserve tissues and organisms, but it causes cross-links in DNA-DNA, DNA-protein and protein-protein (Schander and Halanych 2003; Srinivasan et al. 2002). Several chemical reactions between formaldehyde and nucleic acids have been demonstrated, such as the addition of a hydroxymethyl group (-CH_2OH) in any nucleotide, formation of a methylene bridge between two amino groups, generation of apurinic and apyrimidic sites, and hydrolysis of phosphodiester bonds (Masuda et al. 1999; Srinivasan et al. 2002), causing the break of DNA, mutations and the inhibition of *in vitro* polymerization reactions of nucleic acids. The polymerase chain reaction (PCR) enzymatically amplifies specific sequences of nucleic acids, using very small amounts of DNA as template. In addition to innumerable current applications, PCR also allows nucleic acids from fixed tissues to be used in molecular analyses (Chatigny 2000; France and Kocher 1996; Gioia et al. 1998; Karlsen et al. 1994).

Given that the Herpetological Collection Alphonse Richard Hoge at Instituto Butantan in São Paulo, Brazil has the largest Neotropical collection of snakes with a majority of Brazilian species, we decided to investigate if these formalin-fixed samples are useful for molecular analysis of venom variation. Thus, we studied the crotamine polymorphism of some Brazilian rattlesnakes.

The rattlesnake *Crotalus durissus* occurs throughout most of South America except in Ecuador and Chile. Seven subspecies occur in Brazil: *C. d. cascavella*, *C. d. collilineatus*, *C. d. dryinas*, *C. d. marajoensis*, *C. d. ruruima*, *C. d. terrificus,* and *C. d. trigonicus* (Campbell and Lamar 1989). The venom of *C. d. terrificus* contains four main toxins: crotoxin, convulxin, gyroxin and crotamine (Bercovici et al. 1987). Crotoxin, the most toxic component in *C. durissus* venom, is a neurotoxin with a basic and weakly toxic phospholipase A_2 subunit (Crotoxin B or CB), and an acidic, non-toxic subunit (Crotoxin A, crotapotin or CA) (Hendon and Fraenkel-Conrat 1971). The cDNA precursors of both subunits have been cloned and sequenced. The 5'-untranslated tracts of cDNAs encoding CA and CB are nearly identical and the 3'-untranslated tracts are very similar (Bouchier et al. 1991).

The other major toxic component in *C. durissus* venom is crotamine. Crotamine—a cationic peptide (4.9 kDa, pI 10.8)—translocates into cells *in vitro*, and causes hind limb paralysis and myonecrosis *in vivo* (reviewed in Oguiura et al. 2005). Gonçalves (1956) described a crotamine polymorphism in the South American rattlesnake venoms: the crotamine-positive venoms have the toxin while the crotamine-negative venoms do not. Later, Schenberg (1959) defined two regions in São Paulo state: in the northeastern region he found only crotamine-positive venoms, but in the southwestern region he found predominantly crotamine-negative venoms. Collares et al. (2006) observed that snakes in the northwestern part of Paraná had the highest proportion of crotamine-positive venoms, with the majority of the venoms (71%) having crotamine content more than 10%. Although the individual venom sample sizes varied among the regions, Collares et al. (2006) observed crotamine-positive venoms less frequently in the northern regions including the states of Maranhão and Bahia.

Crotamine-positive rattlesnakes possess the crotamine gene, which is organized in three exons and is located in the extremity of the long arm of chromosome 2 (Rádis-Baptista et al. 2003). The crotamine cDNA of 340-360 base pairs encompasses an open reading frame of 198 nucleotides with 5' and 3' untranslated regions of variable size, signal peptide sequences, and can produce two crotamine isoforms (crotamine and crotamine-Ile19) (Rádis-Baptista et al. 1999). Furthermore, it was demonstrated immunologically that crotamine-negative rattlesnakes do not have crotamine in their venom using (Oguiura et al. 2000) or crotamine mRNA in their venom glands (Rádis-Baptista et al. 1999). Although the crotamine gene is absent in crotamine-negative snake genome, a paralogous crotamine-like gene is present (Rádis-Baptista et al. 2004).

In this work, we present data concerning to the crotamine gene polymorphism in the genome of fixed *C. durissus* subspecies, which are maintained for up to 22 years in the Alphonse Hoge Collection at Instituto Butantan (São Paulo, Brazil), by using PCR and genomic DNA from preserved samples.

Material and Methods

Tissues.—Table 1 indicates the sites where the snakes were collected, their voucher numbers, and their storage time.

DNA.—The DNA was purified using the method described by Ausubel et al. (2000). One hundred milligrams of scraped tissues were washed in TE solution (pH 8.0) for 24 hours at 4°C and then treated at 37°C for 18 h with 0.5% SDS, 10 mM Tris.HCl, 0.1 mM EDTA, 0.1 M NaCl, 0.16 mg/ml Proteinase K and 40 ng/ml RNAse A. The DNAs were purified by phenol/chloroform extraction and

TABLE 1. *Crotalus durissus* tissue samples and sources used in this study.

Sample	Tissue	Taxon	Locality	State	Voucher number	Storage time
1	Blood	*C. d. terrificus*	—	—	—	non-fixed
2	Heart	*C. d. terrificus*	Cianorte	Paraná	61.808	two years
3	Liver	*C. d. terrificus*	Cianorte	Paraná	61.808	two years
4	Gut	*C. d. terrificus*	Tapejara	Paraná	61.805	two years
5	Lung	*C. d. terrificus*	Tapejara	Paraná	61.805	two years
6	Kidney	*C. d. terrificus*	Cianorte	Paraná	61.807	two years
7	Kidney	*C. d. terrificus*	Ponta Grossa	Paraná	61.811	two years
8	Heart	*C. durissus* ssp.	Itapagipe	Minas Gerais	60.130	five years
9	Liver	*C. durissus* ssp.	Pouso Alegre	Minas Gerais	60.288	five years
10	Skin	*C. durissus* ssp.	Ponta Grossa	Paraná	61.812	two years
11	Trachea	*C. durissus* ssp.	Ponta Grossa	Paraná	61.813	two years
12	Skin	*C. durissus* ssp.	Ponta Grossa	Paraná	61.813	two years
13	Liver	*C. durissus* ssp.	Pouso Alegre	Minas Gerais	60.287	five years
14	Liver	*C. durissus* ssp.	Itapagipe	Minas Gerais	60.118	five years
15	Liver	*C. d. marajoensis*	São Luís	Maranhão	44.779	22 years
16	Liver	*C. d. cascavella*	São Luís	Maranhão	45.305	21 years
17	Liver	*C . d. cascavella*	São Luís	Maranhão	45.310	21 years
18	Liver	*C. d. cascavella*	São Luís	Maranhão	46.968	20 years
19	Liver	*C. d. cascavella*	Brumado	Bahia	51.791	19 years
20	Liver	*C. d. cascavella*	Juazeiro	Bahia	51.794	19 years
21	Liver	*C. d. cascavella*	Ibiquera	Bahia	54.952	12 years
22	Liver	*C. d. cascavella*	Grajaú	Bahia	57.306	seven years
C+	Liver	*C. d. terrificus*	—	—	—	non-fixed

acetate (pH 7)/ethanol precipitation. The DNAs were analyzed by 1% agarose gel electrophoresis in TBE buffer (89 mM Tris; 89 mM boric acid; 25 mM EDTA) and stained with 1 µg/ml ethidium bromide.

Primers.—The crotoxin primers, F crotox (forward): 5'- CCC CTG CCT GGC TTC TCC TTC- 3' and R crotox (reverse): 5'- CCT CAA TCC AGA CCT GGG AA- 3', were synthesized based on cDNA sequences described by Bouchier et al. (1991). The crotamine primers, 5 crot (forward): 5'- CAG TGT CAT AAG AAA GGA GG- 3' and 3 crot (reverse): 5'- CAT CTC CAT CGA CAG TCC AT- 3', were designed based on cDNA sequences described by Rádis-Baptista et al. (1999).

PCR conditions.—The PCR of crotoxin gene was done in 30 µl, using 600 ng of genomic DNA, 6 mM dNTPs, 60 mM $MgCl_2$, 4 pmol of each primer and 1 U of Biotools DNA polymerase and temperature profiles of: 94ºC for 4 min; 40 cycles of 94ºC for 45 sec, 49ºC for 45 sec, and 72ºC for 30 sec. The PCR of crotamine gene was performed in two rounds using 30 µl reaction, and a temperature profile of: 94ºC for 4 min; 25 cycles of 94ºC for 20 sec, 45ºC for 20 sec, 72ºC for 20 sec; and 72ºC for 2 min. In the first round, we used 100 ng of genomic DNA as template and two micro-liters from this first step were added to the second reaction round.

PCR reaction analysis.—Five micro-liters of each amplification product was analyzed in 7.5% polyacrylamide gel electrophoresis (PAGE) in TBE buffer and was stained with 1 µg/ml ethidium bromide.

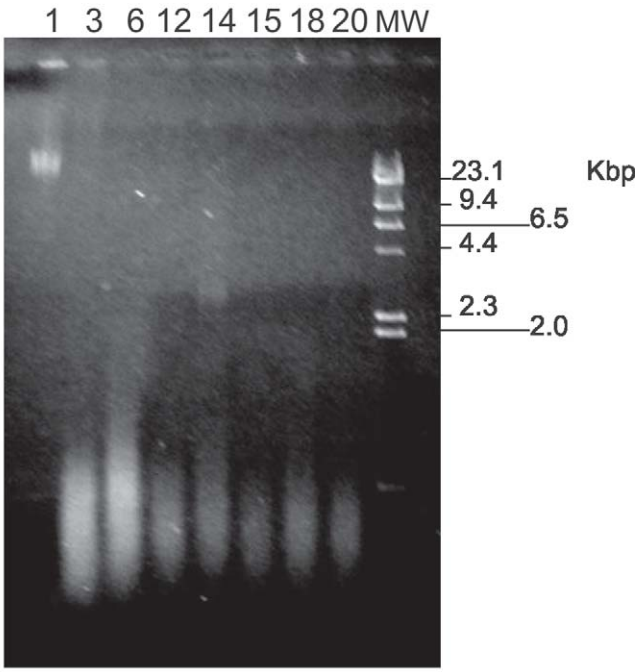

FIG. 1. 1% agarose gel of DNA purified from fresh and fixed tissues. The molecular weight standard (MW) was lambda DNA digested with *Hind* III purchased from Life Technologies.

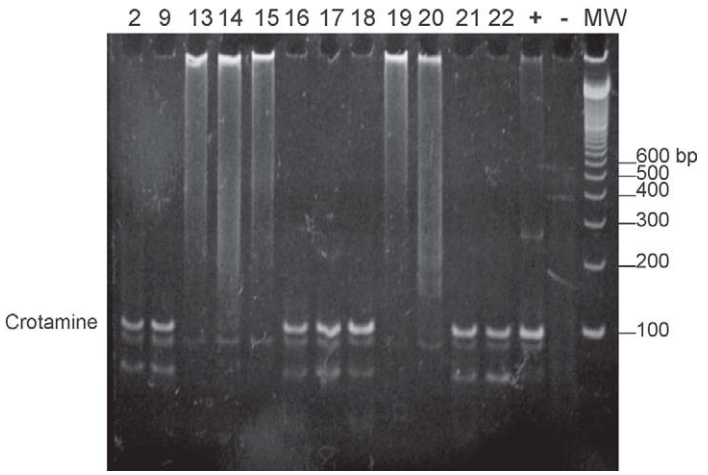

FIG. 2. 7.5% PAGE of PCR of fixed samples, a fresh sample (+), and no DNA (-). The arrow indicates the 100 bp fragment amplified using 5 crot and 3 crot primers. MW is the 100bp DNA ladder purchased by New England Biolabs.

RESULTS

The purification of DNA from fixed tissues took longer to be prepared by proteinase K/SDS method. More amount of proteinase K and longer time of digestion were necessary to disrupt the snake fixed tissue, in comparison to fresh tissues. Even so, a smaller quantity of DNA was obtained from fixed tissues than from non-fixed ones, starting from the same initial amount of material. In addition, the DNA purified from fresh tissue was longer than 23.1 kbp, as indicated in lane 1, Fig. 1, for DNA isolated from blood. Samples 3, 6, 12, 14, 15, 18, and 20 that represent genomic DNA from fixed tissues were markedly degraded, showing DNA lengths of less than 500 bp.

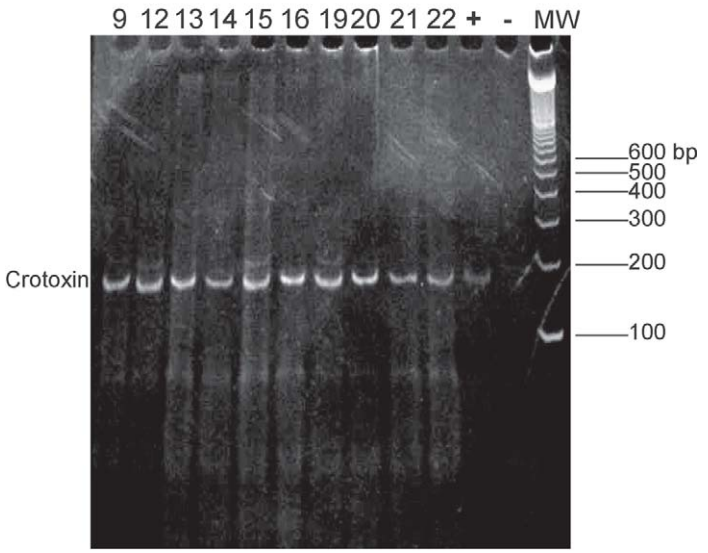

FIG. 3. 7.5% PAGE of PCR of fixed samples, one fresh sample (+) and no DNA (-). The arrow indicates the 200 bp fragment amplified using F-crotox and R-crotox primers. MW is the 100bp DNA Ladder purchased from New England Biolabs.

The PCR product (amplicon) of the crotamine gene was 100 bp long (Fig. 2) while that of the crotoxin gene was 200 bp (Fig. 3). Table 2 shows the PCR results for all the samples. Samples 2, 4, 6, 7, and 10 from the state of Paraná; 8 and 9 from Minas Gerais; 16, 17, and 18 from Maranhão; and 21 and 22 from Bahia were crotamine-positive. On the other hand, samples 5, 11, and 12 from the state of Paraná; 13 and 14 from Minas Gerais; 15 from Maranhão; and 19 and 20 from Bahia were crotamine-negative. As expected, all the samples have the crotoxin gene amplified, since all *C. durissus* in Brazil contain this neurotoxin in their venom. We observed some smear and faint bands in crotamine gel that are non-specific amplifications probably appeared in function of the high number of cycles used, more than 50 in polymerase chain reaction (double PCR reaction).

DISCUSSION

As it may be widely known, formalin fixation imposes a harsh condition of tissue preservation that damages nucleic acids inside the cells, despite its powerful ability to keep the intact structure of any preserved tissue. Huge collections of animals and plants that are potentially useful for studies of the molecular history of such organisms along space and time are kept in museums. For example, the Alphonse Richard Hoge Collection at Instituto Butantan (São Paulo, Brazil), contains over 70,000 catalogued Neotropical snake specimens, some of which are up to 100 years old.

Here, using PCR and specific primers, two genes encoding toxic components of rattlesnake venom (crotoxin and crotamine) were successfully amplified from genomic DNA extracted from formalin-fixed snake specimens. We were able to amplify the majority of DNA tested (approx. 90% of all samples), even in conditions of snake fixation that are not ideal for use in molecular biology protocols.

The low yield of DNA purified from formalized tissues may have resulted from the loss of low molecular weight (LMW) nucleic acid sequences that bind to proteins. During phenol treatments, it is possible to diminish the loss of DNA linked to protein by using DTE (dithioerythritol) or DTT (dithiothreitol) in extraction buffer, because these reducing agents break the cross-links between DNA and protein (Chatigny 2000; Schander and Halanych 2003). It is also possible to improve the recovery of LMW DNA during nucleic acid precipitation using carriers such as tRNA or glycogen (De Giorgi et al. 1994). The links between DNA-protein and DNA-DNA can also be broken by heating the DNA from fixed tissue in TE at 70°C, which improves the DNA yield (Masuda et al. 1999).

Even though the sizes of recovered genomic DNA samples were around 500 bp, they were useful for the molecular analysis of crotamine gene polymorphism and for accessing the presence of crotoxin gene. This is because the amplicons' size we were investigating lie between 100 and 200 bp. In fact, the lengths of amplicons in the PCR of genomic DNAs from fixed and fresh tissues were identical (that is, 100 bp) when using primers for crotamine gene (5 crot and 3 crot) and 200 bp when using crotoxin-specific primers (F crotox and R crotox). Both gene fragments were amplified from a single exon: exon II, in the case of crotamine, and the 5'-untranslated region of CA which is identical in CB, in the case of crotoxin. The crotamine gene polymorphism is well

TABLE 2. PCR of **CRO** – crotamine sequence and **CTX** – crotoxin sequence that resulted in amplification (+), no amplification (-) and not tested (**NT**).

Sample	CRO	CTX	Sample	CRO	CTX
1	NT	NT	13	-	+
2	+	+	14	-	+
3	NT	+	15	-	+
4	+	+	16	+	+
5	-	+	17	+	+
6	+	+	18	+	+
7	+	+	19	-	+
8	+	+	20	-	+
9	+	+	21	+	+
10	+	+	22	+	+
11	-	+	C+	+	+
12	-	+			

known among herpetologists: crotamine-negative rattlesnake have neither crotamine transcripts in their venom gland nor crotamine in their venom.

Our molecular results on fixed samples are consistent with the expected pattern of crotamine distribution. For example, Itapagipe and Pouso Alegre cities are in a region described as a mixed one, where both varieties are found, in the south-central region of Minas Gerais state (Bicalho et al. 1990). In the northwestern region of Paraná, including Cianorte and Tapejara, the rate of crotamine-positive venoms is high (Schenberg 1959), Crotamine was also detected in some venoms from Bahia it was using immunological method in a venom from Ibiquera (Collares et al. 2006). On the other hand, crotoxin is an ubiquitous toxin that is expressed in all *C. durissus* venom, independent of the local where snake are found. So, as expected all genomic DNA samples have the crotoxin gene fragment amplified, what worked as a positive control of PCR reaction. Lung tissue proved not to be useful because of the false negative result of sample 5.

In a parallel experiment, the PCR results of samples 2 to 14 were confirmed using DNA taken from the frozen livers from the same animals (data not shown). The amplification of gene sequences from genomic DNA isolated from fixed tissues posed greater difficulties than from fresh ones, since a larger amount of template was required to amplify the crotoxin sequence. Moreover, this was particularly true in the amplification of crotamine gene, for which an extra PCR round was carried out when compared with the PCR conditions routinely used in our laboratory, i.e., 100 ng of genomic DNA and 30 cycles. However, even in these circumstances, the formalin-fixed snakes constitute a valuable source to investigate the natural history of these animals and the correlation with their respective toxic traits.

Crotalus durissus terrificus is the predominant rattlesnake subspecies found in Brazil. In addition to it, we tested two subspecies, *C. d. marajoensis,* and *C. d. cascavella*, whose crotamine polymorphism has been little studied. *C. d. marajoensis* occurs in northern Brazil (Ilha de Marajó, Pará) and *C. d. cascavella* in northeastern Brazil (states of Maranhão, Piauí, Ceará, Rio Grande do Norte, Paraíba, Pernambuco, Alagoas, Sergipe, and Bahia). Although the venoms of rattlesnakes from the states of Bahia, Pernambuco, Piauí, and Maranhão are believed to be crotamine-negative (Santoro et al. 1999, Toyama et al. 2005), we detected the crotamine gene in *C. d. cascavella* from São Luiz (Maranhão) and from Ibiquera and Grajaú (Bahia). Dr I. Biondi also observed the effect of some crotamine-positive venoms from Bahia in mice which showed myonecrosis in hystological preparations from muscles (personal communication). Our findings therefore indicate not only that these specimens tested positive for crotamine gene but also that these populations of *C. d. cascavella* contain crotamine-positive individuals. The only *C. d. marajoensis* snake we tested was crotamine-negative. Interestingly, this is the first time that crotamine has been detected in the rattlesnake *C. d. cascavella* inhabiting the northeastern regions of Brazil, encompassing the states of Bahia and Maranhão. Thus, in addition to molecular analysis by northern and southern blot and immunological approaches like ELISA, PCR of fixed tissue appears to be a useful method to study venom variation in preserved rattlesnakes obtained from museum collections.

In conclusion, this study demonstrated that PCR is a reliable technique for detecting crotamine and other toxin genes, and to analyze their distribution among population of snakes without using the snake venom itself. This is valid for the investigation of genomic DNA isolated from fresh tissues, as well as from fixed specimens.

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The Effectiveness of Fluorescent Powdered Pigments as a Tracking Technique for Amphibians

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Researchers often use thread-trailing devices or radio-telemetry to study amphibian movement and terrestrial habitat use (Madison and Farrand 1998; Schwarzkopf and Alford 2002; Sinsch 1988; Tozetti and Toledo 2005; Watson et al. 2003). However, small size and sensitive skin can make these methods problematic, if not impossible, for some amphibian species or life stages. Fluorescent powdered pigments are useful for obtaining detailed information about short-term movement, behavior, and microhabitat use of other animals, including mammals (e.g., Lemen and Freeman 1985; Mullican 1988), reptiles (e.g., Blankenship et al. 1990; Dodd 1992; Stark and Fox 2000), and insects (e.g., Johansson 1959; Sujii et al. 2000). More recently, they have been used to track the terrestrial movements of amphibians (Birchfield and Deters 2005; Eggert 2002). Using fluorescent powder to track amphibians has several advantages, including being relatively inexpensive, harmless to amphibians (Rittenhouse et al. 2006), and suitable for use on juveniles and small species.

Powder tracking is becoming recognized as an underutilized amphibian tracking method that has great potential and may be the preferred method under certain circumstances (Birchfield and Deters 2005; Rittenhouse et al. 2006). However, the effectiveness of this method across amphibian taxa and under varying field conditions has not been evaluated. We present data from three species, the Marbled Salamander (*Ambystoma opacum*), Southern Toad (*Bufo terrestris*), and Southern Leopard Frog (*Rana sphenocephala*), to evaluate the potential strengths and limitations of powder tracking as a technique for amphibians. Our results shed light on the relative distances different species can be tracked with powder, the influence of precipitation on detectability of path length, and the effectiveness of different powder colors. This evaluation of fluorescent powder tracking as a technique has been extracted from a habitat and movement study by Graeter (2005) that is part of a larger experimental study called LEAP (Land-use Effects on Amphibian Populations).

Materials and Methods.—We released 44 adult *A. opacum* (February–March 2005; 22M, 22F), 36 adult *B. terrestris* (March–May 2005; 28M, 8F), and 48 adult *R. sphenocephala* (May–August 2004; 25M, 19F) on forest-clearcut edges at three LEAP sites (named 37, 119, and 1000) on the Savannah River Site (SRS) in the Upper Coastal Plain of South Carolina, USA (see Graeter 2005 for details). The forests were predominantly *Pinus* species (e.g., Longleaf, Loblolly, Slash Pine), but had hardwoods interspersed throughout (e.g., oak, maple, hickory, dogwood, sweetgum). Ten-acre clearcuts were created in the spring of 2004. At the time of this study, clearcuts had patches of resprouting hardwoods, bare soil, and scattered piles of woody debris.

We collected *A. opacum* and *B. terrestris* at drift fences encircling wetlands at LEAP sites 37 and 119, and released each animal within approximately 100 m of its capture location. Because our study sites did not have breeding populations of *R. sphenocephala*, we collected frogs from a wetland >15 km from the two LEAP sites (37 and 1000) where they were released, a distance at which there is no evidence for homing of ranids (Dole 1968). Body size (mean snout–vent length ± SD) was 57 ± 3 mm for *A. opacum*, 56 ± 6 mm for *B. terrestris*, and 65 ± 6 mm for *R. sphenocephala*.

Prior to release, we applied fluorescent powder (US $12/lb, Radiant Color Series T1, Richmond, California; now DayGlo Color Corporation, Cleveland, Ohio) to each individual by dipping the rear 2/3 of its body into powder until the skin was thoroughly covered. We were careful to prevent powder from coming in contact with the animal's eyes or mouth. The handling time was kept to less than 30 seconds per individual, and all releases took place just after dark. To give them sufficient time to move, we returned approximately 24 h after release and tracked the path of each individual using a Portable Rechargeable UV Lamp (UVL-26P, Fisher Scientific, Hampton, New Hampshire) until we either located the animal or could not find any more powder. We used a Global Positioning System (GPS) Trimble Pro-XR backpack unit with submeter accuracy to record each path from start to end. We then downloaded the GPS data and used the Animal Movement extension (Hooge and Eichenlaub 1997) in ArcView 3.3 (Environmental Systems Research Institute, Redlands, California) to calculate the detected path length for each individual. We recorded daily rainfall (All-Weather Rain Gauge, Forestry Suppliers Inc.), percent relative air humidity (Bacharach Pocket-Size Sling Psychrometer, Forestry Suppliers Inc.), and percent soil moisture (TH_20 Soil Moisture Meter, Dynamax Inc., Houston, Texas); humidity was recorded approximately 0.5 m off the ground and soil moisture was taken in the top 8 cm of soil.

We tested the effects of powder color, species (*A. opacum, B. terrestris, R. sphenocephala*), and the interaction of species and powder color on path length using a two-way ANOVA (Proc GLM, SAS Institute 2000). We used Type III sums of squares because we had unequal sample sizes and Tukey-Kramer's test to determine which colors differed from each other. We also assessed the effects of post-release precipitation on mean and maximum detected path length for each species. For this analysis, we categorized rainfall into precipitation classes: 0 mm, light (< 10 mm), and heavy (> 10 mm). Because there was no precipitation after releases of *B. terrestris*, we could not examine the effects of rainfall on path length for this species.

Results.—Path length differed among the three species ($F_{species\ 2,114} = 16.81$, $P < 0.0001$). The mean detected path length after 24 h was shortest for *A. opacum* and longest for *R. sphenocephala* (Fig. 1). The minimum distance an individual traveled was similar among the three species (1.9–3.5 m). Detected path length also varied among powder colors ($F_{color\ 3,114} = 2.36$, $P = 0.0757$; Fig. 2a). Chartreuse paths were longer than pink paths ($P = 0.0937$, Tukey-Kramer test). Path length did not differ among powder colors for *A. opacum*; however, chartreuse paths tended to be longer than other colors for both *B. terrestris* and *R. sphenocephala* (Fig. 2b). The interaction between species and powder color was not significant ($F_{species*color\ 6,114} = 1.02$, $P = 0.4157$).

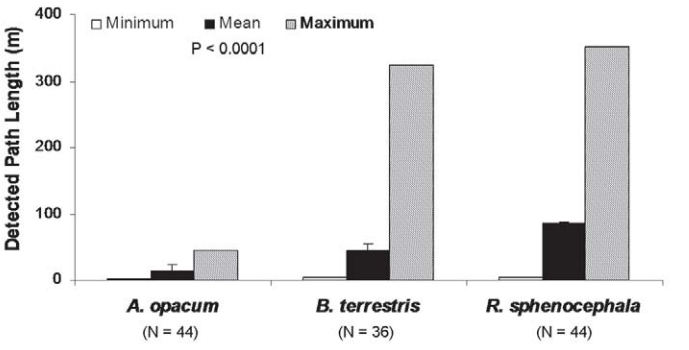

FIG. 1. Minimum, mean (± 1 SE), and maximum detected path lengths of *Ambystoma opacum*, *Bufo terrestris*, and *Rana sphenocephala* in South Carolina (24 h post-release).

The amount of post-release rainfall affected the detectability of path length. Light amounts of precipitation (< 10 mm/day) did not make detection of powder more difficult (Fig. 3). However, heavy rainfall (> 10 mm/day) tended to decrease the mean detected path length for *R. sphenocephala* (mean path length = 54.5 m for > 10 mm vs. 79.7 m for 0 mm). Most importantly, the maximum detected path length for *R. sphenocephala* was greatly reduced by heavy rains (77.0 m for > 10 mm vs. 178.7 m for 0 mm; Fig. 3a). Shorter paths, such as those created by *A. opacum*, were not affected by light rainfall (Fig. 3b). We observed that paths remained mostly intact for 1–2 days after the release when there was no precipitation. We could discern whether an individual had rested

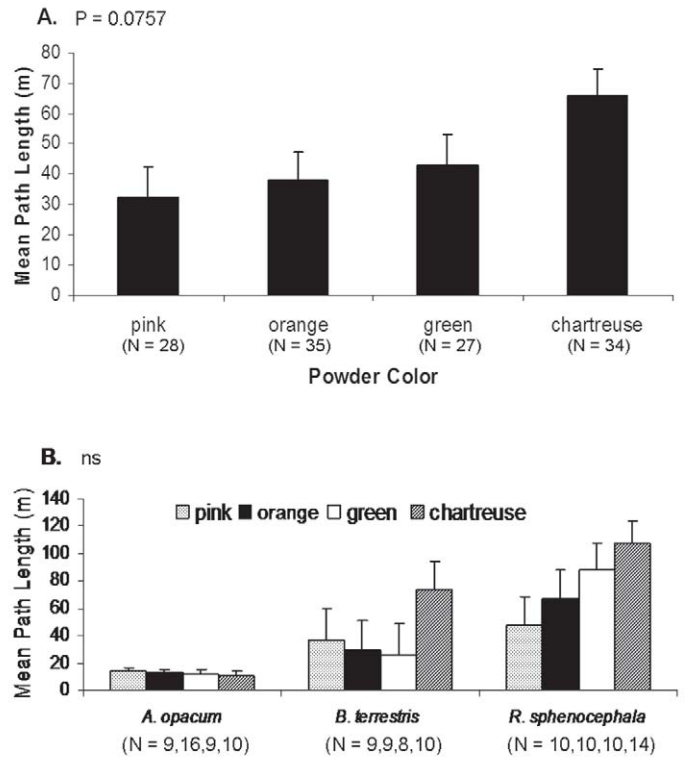

FIG. 2. Detected path length (mean ± 1 SE) for (A) the powder color and (B) powder color specific to species. Chartreuse paths were longer than pink paths ($P = 0.0937$).

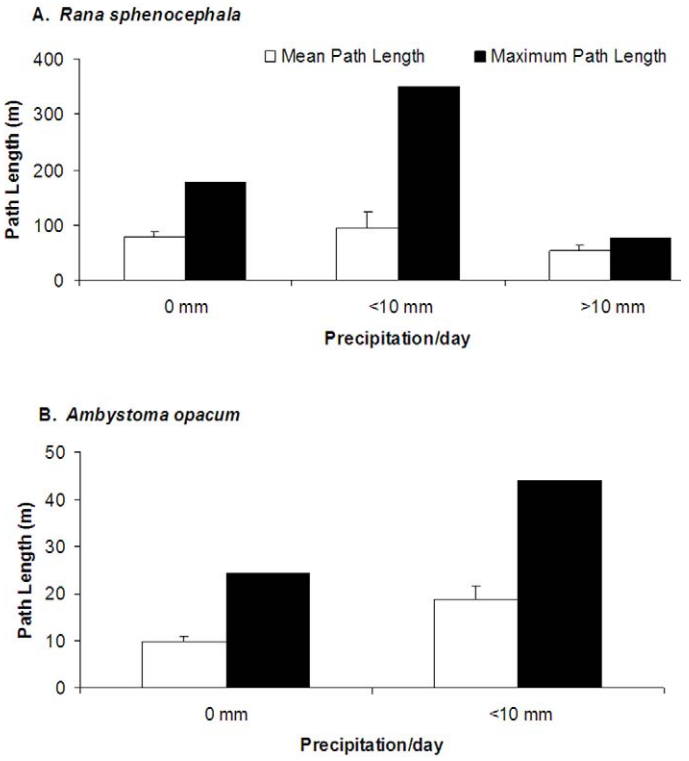

FIG. 3. Relationship between post-release precipitation per day and mean and maximum detected path length in (A) *Rana sphenocephala* at three different precipitation levels and (B) *Ambystoma opacum* at two different precipitation levels. No rainfall > 10 mm was recorded during the *A. opacum* releases, thus, that category is not included.

on woody debris or moved under it, the type of vegetation it had traveled through or avoided, and what type of cover it selected. The percent relative humidity and percent soil moisture (mean ± 1 SE), respectively, were 82.05 ± 1.31 and 19.90 ± 0.93 during the *A. opacum* trial, 67.03 ± 1.43 and 16.14 ± 1.22 during the *B. terrestris* trial, and 84.06 ± 1.12 and 10.36 ± 0.73 during the *R. sphenocephala* trial.

Discusssion.—Fluorescent powder tracking can be used successfully with a broad range of amphibian taxa, but the effectiveness of the technique depends greatly on a species' movement patterns and the environmental conditions. We found that amphibians can be tracked long distances (> 350 m) within a 24 h time period under ideal conditions (i.e., dry ground, little or no precipitation, and when movement is on the surface). However, some colors are more difficult to detect than others (Birchfield and Deters 2005; Stark and Fox 2000). The effect of powder color on path length was only evident for the relatively long paths we obtained with *B. terrestris* and *R. sphenocephala*. As path length increased and the flecks of powder became infrequent along the path, certain colors became more difficult to detect than others. Chartreuse and green paths were easiest to detect, followed by orange and then pink. With relatively short path lengths or slow-moving animals (e.g., *A. opacum*), the powder trails were heavy and color had little effect on detectability, as found in previous studies (Birchfield and Deters 2005). Although detectability varies by color, this is not an issue unless animals travel long distances. Some powder colors (e.g., pink and orange, chartreuse and green) are difficult to differentiate under UV light (Birchfield and Deters 2005; Stark and Fox 2000). However, this problem could often be remedied through close examination of the specks of powder under a white light.

Fluorescent powder, while non-toxic, is fairly persistent in the landscape (Halfpenny 1992), particularly if there is little moisture or precipitation. Thus, if movements are concentrated within a small area, it can be difficult to follow the path when powder trails cross and a heavy rainfall will be necessary before powder of the same color can be used again (Stark and Fox 2000). Although specks of powder sometimes remained visible for weeks, even after a heavy rain, the paths themselves were not discernable for more than a few meters. In situations where paths are unlikely to overlap (e.g., individuals are being tracked in separate locations) and only one powder color is needed, chartreuse may be the optimum color to use.

This technique is most effective in answering questions about fine-scale movement and microhabitat use because paths usually persist only 1–2 days after application. To answer long-term questions, powder could be reapplied, but rehandling and reapplication have the obvious disadvantage of influencing the animal's behavior. Recapturing individuals for reapplication is likely to be most effective when the study species is not moving long distances (e.g., *R. sphenocephala*, this study) or burrowing deep underground (e.g., some *A. opacum* in this study).

In other studies that have used fluorescent powder to track amphibians, path lengths were similar to the values and ranges presented here. For example, adult ringed salamanders (*A. annulatum*; tracked 3 h post-release; N = 60) and wood frogs (*R. sylvatica*; tracked 4 h post-release; N = 10) were tracked using fluorescent powder at LEAP study sites in Missouri and Maine, respectively, (C. Conner and S. Blomquist, unpubl. data). The mean detected path length for *A. annulatum*, at 36.9 m (range: 2.4–133.8 m), was slightly longer than the mean path length of *A. opacum*, indicating that this technique has the potential to be equally successful with two closely related species in different geographic regions. *Rana sylvatica* had a much shorter mean (10.4 m) and maximum (27.3 m) detected path length relative to *R. sphenocephala* and *B. terrestris* (this study), and this may have been due to wet ground conditions at the Maine site (S. Blomquist, unpubl. data). In another study, the mean path length of green frogs (*R. clamitans)* on golf courses in Missouri was 19.1 m (range: 4.7–33.9 m) when the frogs were given 1–3 h in which to move (Birchfield and Deters 2005). Likewise, in France, spadefoot toads (*Pelobates fuscus*) were tracked 17.0 m on average (range: 3.1–73.0 m) approximately 24 h after release (Eggert et al. 1999); these distances are well within the range of the species we studied. Eggert (2002) attributed the short movement distances of *P. fuscus* to their relatively small size and locomotory behavior (e.g., frequent burrowing, short daily movements, walking rather than jumping).

Just as powder works better for tracking some lizard species than others because of their scale type (Dodd 1992; Stark and Fox 2000), differing skin types and body sizes in amphibians may affect how well and how much of the powder clings to the skin, and thus, the efficacy of this technique. For example, powder may stay on *B. terrestris* better than *A. opacum* because *B. terrestris* has more surface area and uneven skin to which powder clings. However, by observing some individuals over multiple days we know that within 1–2 days, the majority of the powder had usually

brushed off the amphibians, such that only small remnants of powder were still visible on their skin. In a laboratory setting, where there was less opportunity to brush the powder off on natural objects (Rittenhouse et al. 2006), amphibians lost powder at a rate comparable to what we observed.

We found that certain techniques improved application and retention of the powder. Like many salamanders, *A. opacum* squirmed while being handled, causing the powder to wipe off; thus, we suggest minimizing handling time and keeping the powder in a small plastic container to ease application. *Rana sphenocephala* also can be difficult to handle so we advise holding the frog by its front legs with its snout in the palm of your hand while applying powder. Lastly, the powder clung best to *B. terrestris* if loose soil was brushed off and the animal's skin was slightly moist.

The success of this technique also can be influenced by the behavior of the study species. For example, if the study species spends time in an aquatic or moist environment (e.g., *R. sylvatica* in Maine, also Eggert 2002) or burrows underground (e.g., *A. opacum*, also see Eggert 2002), it will be more difficult to track them with powder. Likewise, species that move closer to the ground (e.g., *A. opacum*) may rub off more powder per distance traveled than those that hop (e.g., *R. sphenocephala*). Additionally, powder tracking will likely be most effective for pond-breeding amphibians if used during the non-breeding season at times when some surface activity is exhibited.

Others have suggested that precipitation reduces the visibility of powder trails or even obliterates them entirely (Blankenship et al. 1990; Lemen and Freeman 1985), but the relationship between rainfall and the detectability of path length of amphibian powder trails has not previously been evaluated quantitatively. We found that fluorescent powder trails made by amphibians persisted under light rainfall, but the detected path length was shortened considerably by rainfall > 10 mm. Likewise, light rainfall did not seem to affect the maximum detected path length of *R. sphenocephala*, but heavy rainfall tended to truncate the maximum path length, thus demonstrating that fluorescent powder tracking can be successful even with some precipitation. However, South Carolina is relatively dry (mean annual rainfall on SRS 1973-2003: 124.5 cm; Hunter 2004) and what we have termed heavy rainfall is likely considered light in other regions. Therefore, local and regional weather conditions should be carefully considered in deciding whether to use this technique. In areas where field conditions are typically moist, powder tracking may not be as informative or useful as it is in drier regions.

This technique has several advantages relative to other tracking techniques, such as radio-telemetry and thread-trailing, including that it is harmless to the animal (Rittenhouse et al. 2006) and can be used on juveniles and small species because a tracking device is not attached or inserted. Additionally, powder tracking is inexpensive relative to radio-telemetry and can yield high sample sizes due to the low intensity of the work. Nonetheless, when a study involves tracking for long periods of time and following movement in aquatic or subterranean habitats, other techniques may be more effectively employed.

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Evaluation of Two Types of Commercially-Made Aquatic Funnel Traps for Capturing Ranid Frogs

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Recently, several studies have attempted to develop methods for sampling aquatic or semi-aquatic amphibians and reptiles with minimal observer bias. Field experimentation has included devising and testing novel aquatic traps (Mushet et al. 1997; Richter 1995), and assessing efficacy of commercially-available aquatic traps (Buech and Egeland 2002; Casazza et al. 2000; Johnson and Barichivich 2004; Willson and Dorcas 2004; Willson et al. 2005). Trapping for amphibians has generally been directed towards larvae, a combination of larvae and breeding adults, or aquatic species. However, none of these studies sufficiently addressed our objective to determine which commercially-available funnel trap best samples relatively large (9–15 cm SUL [snout–urostyle length]) ranid frogs in aquatic habitats.

To evaluate the effectiveness of traps to capture ranids, we compared two commercially-available funnel traps having large-diameter interior funnel openings. These included 79 cm × 23 cm cylindrical, 6 mm galvanized steel mesh traps (steel trap) with interior funnel openings 5.5 cm in diameter (model G40CF, Cuba Specialty Manufacturing Company, Fillmore, New York) and 43 cm × 23 cm rectangular, 3 mm nylon mesh traps (nylon trap) having interior funnel openings 5 cm in diameter (model RN10, Memphis Net and Twine Co., Inc, Memphis, Tennessee). To allow traps to rise and fall with water levels, two polystyrene floats were attached to the interior, middle, and opposing sides of each trap with plastic cable ties (steel trap floats were 22.5 cm × 5 cm × 5 cm, nylon trap floats were 22.5 cm × 5 cm × 2.5 cm). Floats were attached to the interior of traps to reduce the likelihood of damage to or loss of floats, and to permit placement of traps directly against drift fences to maximize the probability of frogs encountering traps. Traps floated low enough in the water to completely submerge their interior funnel openings, yet high enough to provide trapped animals access to air.

Trap efficiency was tested in two aquatic habitats in Jackson and Union counties, Illinois between 30 August and 7 October 2005. Trap Site One (TS1) was a 0.1 ha human-made pond in Giant City State Park. Water depth (> 1 m) limited aquatic vegetation (common cattail [*Typha latifolia*] and cutgrass [*Leersia* sp.]) to within 3 m of the bank. Trap Site Two (TS2) was a shallow-water (< 0.45 m), 1.74 ha constructed wetland on private property. Wetland vegetation, which covered > 95% of the inundated portion of the basin, included Water Primrose (*Jussiaea repens*) and Waterthread Pondweed (*Potamogeton diversifolius*). During sampling, water covered half the basin.

At TS1, 20 pairs of traps were set 3 m apart within the nearshore vegetation along half the shoreline. Each trap pair included one steel trap and one nylon trap, 0.5 m apart, set parallel to the bank in water deep enough to inundate the interior openings of each trap. The type of trap was alternated at successive stations to eliminate possible bias associated with trap location relative to shore and water depth. For example, at trap station 1 the nylon trap was closer to shore than the steel trap, at trap station 2 the steel trap was closer to shore than the nylon trap, etc. Each trap was checked daily from 31 August–9 September 2005 (400 trap-nights). Captured frogs were marked for individual recognition by toe-clipping before releasing them into the water within 0.5 m of their point of capture. To prevent cross-contamination and infection, scissors were dipped in isopropyl alcohol between each use.

At TS2, traps were set along aquatic drift fences. Nine, 10-m long × 0.6-m high drift fences were constructed from 0.6-cm black polyethylene mesh by attaching the mesh to 1.5-m tall steel fence posts with plastic cable ties. The mesh extended from the substrate to an average of 0.4 m above the water surface. The fences were installed approximately 30 m apart, 2.5–19.5 m (mean = 6.25 m) from shore, and bordered approximately 25% of the shoreline. A steel trap and a nylon trap were paired on opposite sides of each end of every fence. Each fence had a shore-side steel trap and nylon trap, as well as a pond-side steel trap and nylon trap (four traps per fence). Traps were set between the fence and a pair of 1.5-m long, 1.2-cm diameter galvanized-steel pipes sunk vertically into the substrate. Each trap was loosely attached to the pipes with plastic cable ties to keep traps adjacent and parallel to the fence while allowing them to float up and down with fluctuations in water level. Traps were opened prior to predicted rain events and closed within 1–2 days. Trapping during rain events increased the likelihood of capturing Southern Leopard Frogs (*Rana sphenocephala*) which sometimes breed during fall rains in southern Illinois (Petzing and Phillips 1999). Traps were closed by fitting 0.26-L plastic cups into each funnel opening. Frogs were trapped for 11 nights during five trapping periods (15–17 September, 18–21 September, 25–27 September, 28–30 September, 5–7 October 2005) for a total of 396 trap-nights. Each captured frog was batched-marked by cutting the longest toe on the left hind limb.

Excluding recaptures, we captured 38 American Bullfrogs (*Rana catesbeiana*) and 60 Green Frogs (*Rana clamitans*) at TS1, and 211 *R. catesbeiana*, 12 *R. clamitans*, and three *Rana sphenocephala* at TS2 (Fig. 1). Our assumption of equal trap efficacy was tested by using chi square goodness-of-fit analyses (Sokal and Rohlf 1995). Both trap types were equally effective at capturing *R. catesbeiana* ($\chi^2 = 1.68$, df = 1, P = 0.194), *R. clamitans* ($\chi^2 = 0.6$, df = 1, P = 0.439), and both species combined ($\chi^2 = 0.408$, df = 1,

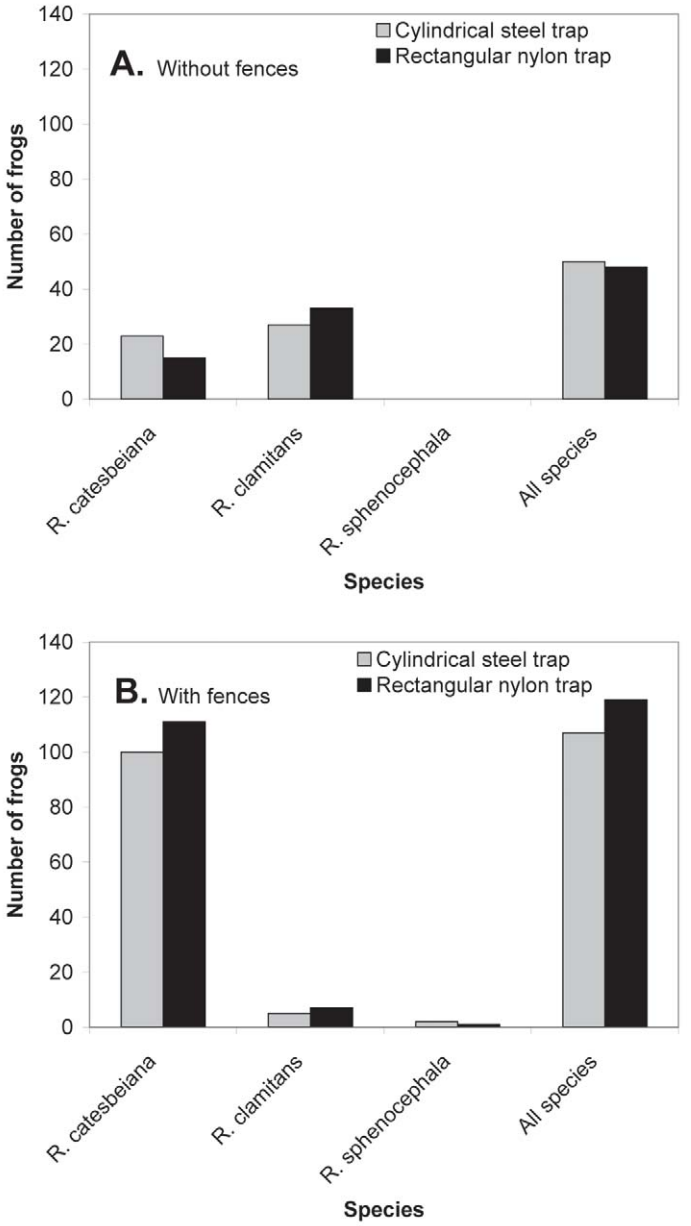

FIG. 1. Total capture of ranid frogs in cylindrical steel traps and rectangular nylon traps placed at study site TS1 without drift fences (A), and study site TS2 with drift fences (B).

P = 0.84) at TS1 and *R. catesbeiana* ($\chi^2 = 0.573$, df = 1, P = 0.449) and all frogs combined ($\chi^2 = 0.637$, df = 1, P = 0.425) at TS2. Although most frogs captured were young-of-the-year (93.9% at TS1 and 95.1% at TS2), traps did yield 12 subadult-adult *R. catesbeiana* (6 per trap type) ranging from 9–14 cm SUL.

Eight *R. catesbeiana* and four *R. clamitans* were recaptured once each at TS1, with most (83.3%) frogs being captured in one trap type then recaptured in the other. At TS2, we recorded eight recaptures (all *R. catesbeiana*). Trap mortality was low (1.0% at TS1, 0.4% at TS2) and appeared to be the result of invertebrate predation. One *R. clamitans* was killed by a fishing spider (*Dolomedes* sp.) and one *R. catesbeiana* was a casualty of crayfish (*Orconectes* sp.) predation.

Despite homogeneous shoreline habitat at both sites, the number of frogs captured at individual trap stations ranged from 1–10 at TS1 and from 15–41 at individual drift fences at TS2. Unequal catch along the shoreline suggests frogs were distributed non-randomly. Non-random distribution of frogs along the shoreline could influence results when using funnel traps, either alone or in conjunction with drift fences, to estimate frog abundance. The use of numerous traps or drift fences along as much shoreline as possible may compensate for location bias in studies designed to estimate population size. However, unequal capture probabilities along the shoreline can hamper interpretation of trapping results even when using large numbers of traps (K. Dodd, pers. comm.).

In summary, both trap types are equally effective for capturing ranid frogs. Nylon traps, however, are less durable than steel traps (Willson et al. 2005). Three nylon traps required repair (e.g., zippers broke) and two were rendered unusable following attempted predation of trap contents by a Snapping Turtle (*Chelydra serpentina*). In addition, nylon traps were more harmful to trapped animals; more frogs in nylon traps than steel traps rubbed surficial layers of skin from their snouts while attempting to escape.

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Glow Sticks as Effective Bait for Capturing Aquatic Amphibians in Funnel Traps

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Funnel traps of various designs have been used to capture adults and larvae of aquatic amphibians (e.g., Buech and Egeland 2002; Richter 1995). Most studies use unbaited funnel traps to capture amphibians while others have used shrimp or salmon eggs (Adams et al. 1997). Light traps and light sticks are commonly used in studies of fish, particularly larvae (Doherty 1987; Marchetti et al. 2004), but have not been widely used to capture amphibians. Glow sticks have been mentioned briefly in the literature as a means to increase capture rates of aquatic amphibians (Smith and Rettig 1996), but no studies have estimated their effectiveness. In this study we compared the capture success of unbaited funnel traps and funnel traps baited with glow sticks.

We used commercially available plastic minnow traps (similar to Challenge Plastic Products #50176) to capture eastern red-spotted newts (*Notophthalmus viridescens*) in Station Pond at Mountain Lake Biological Station (MLBS) in Giles County, Virginia. Station Pond is a 0.65 ha stream-fed permanent pond constructed in 1965. One hundred and four minnow traps were used to capture aquatic adult *N. viridescens* as part of a larger project to estimate the population size of newts in the pond. We used Pollock's robust design for our sampling regime (Pollock 1982), with eight sampling occasions divided into four primary periods with two secondary sampling occasions per primary period (Table 1), so the data could be used in a capture-recapture study reported elsewhere. Trap locations were randomly assigned to receive a glow stick or remain empty on the first sampling occasion and were switched to the other treatment for the subsequent primary period. Therefore, fifty-two randomly selected traps contained glow sticks for sampling occasions 1, 2, 5, and 6 (primary periods 1 and 3) and the other fifty-two contained glow sticks for sampling occasions 3, 4, 7, and 8 (primary periods 2 and 4). This design was chosen to maintain consistent conditions within a primary period, a requirement for Pollock's robust design, and to account for spatial and temporal effects in capture efficiency.

Sixty-four minnow traps were placed around the perimeter of Station Pond with 4–4.5 m between each trap. Traps were attached to a length of rope, tied to a PVC stake on the bank, and alternated between being placed 1 meter and 2 m from the bank. Forty traps were placed in a grid in the middle section of the pond using a row boat. A foam float tied to a rock using string noted the location for each trap. A second string for the trap was attached to each foam float with a fishing stringer tied to the end of the string for ease of placement and removal of traps. Therefore, every trap was in approximately the same location for each sampling occasion.

For each sampling occasion traps were placed in the pond from 1900–2000 h. A small rock was placed in each trap so it rested on the substrate of the pond. Traps were removed from 0800–1000 h the following morning and *N. viridescens* were counted and sexed. The number of tadpoles captured was also recorded.

The glow stick treatment traps were baited with non-toxic yellow bracelet-sized glow sticks (Glow Universe, US $9.49 per 100; 20.32 cm length, 0.5 cm diameter, 6–8 h glow time). We chose thinner bracelet-sized glow sticks to avoid catching more individuals than could be handled in one day due to the large number of traps. Glow products, which are widely available and normally used as novelty jewelry, come in several sizes and our preliminary trapping indicated thicker glow sticks (10.16 cm length, 10 mm diameter), which emit more light, catch more individuals (38.2 *N. viridescens* captured per trap using thick glow sticks vs. 10.8 captured per trap using bracelet-size glow sticks). We suggest that glow sticks are activated in a darkened setting before placing them in traps as we found that 5–10 glow sticks per 100 were defective and did not produce light.

We first tested if glow sticks increased the number of captures per trap. Based on the distribution of the number of individuals captured per trap, we used a generalized linear model (PROC GENMOD in SAS; SAS Institute, Inc., Cary, North Carolina) to analyze the effect of glow sticks on the total number of newts and tadpoles captured per trap assuming the Poisson distribution. Of the 832 trappings (104 trap locations for eight sampling occasions), nineteen trappings were excluded from this analysis because of trap failure due to the trap not being closed correctly or variable water levels, which left a few traps without the funnel in the water. Next, we determined if male and female newts responded differently to the glow stick bait by testing for differences in trap sex ratio due to glow stick treatment using a one-way ANOVA. We calculated the proportion of males captured in each trap and performed an arcsine square-root transformation to achieve normality. A further 121 trappings were excluded from this analysis where no newts were captured (87 of the trapping occasions with zero captures were unbaited traps while 34 were baited with glow sticks). We weighted the ANOVA by number of individuals captured because traps which contained more individuals most accurately reflected the trapped sex ratio. Lastly, to account for spatial differences in capture success, we conducted paired t-tests to compare the mean number of newts and tadpoles captured at each trapping location with and without glow sticks (N = 4 trapping occasions per location with glow sticks and 4 trapping occasions per location without glow sticks). We square-root transformed the data to achieve normality. Of the 104 trap locations, only locations with all eight sampling occasions being successful were used in the analysis (N = 89 with 15 trap locations excluded due to one or more sampling occasions being failures).

Results.—*Notophthalmus viridescens* is the main salamander species present in Station Pond. Very small numbers of *Eurycea cirrigera* and *Desmognathus* spp. are washed in from a stream and a single adult *E. cirrigera* was captured, the only non-newt salamander captured during all sampling occasions. *Ambystoma jeffersonianum* is the only species of mole salamander known to be present at MLBS and is rarely seen in Station Pond (elevation 1160 m). A variety of frogs have bred in Station Pond (*Pseudacris*

TABLE 1. Total captures of *Notophthalmus viridescens* for each sampling occasion. Secondary sampling occasions within a primary period were separated by one day. The vast majority of captured tadpoles were native *R. catesbeiana*.

Date	Sampling Occasion	Primary Period	Male Captures	Female Captures	Total Newt Capture	Tadpole Captures
5 June 2006	1	1	466	83	549	75
7 June 2006	2	1	351	67	418	73
3 July 2006	3	2	367	125	492	149
5 July 2006	4	2	313	114	427	113
11 July 2006	5	3	137	60	197	97
13 July 2006	6	3	299	118	417	95
24 July 2006	7	4	352	124	476	104
26 July 2006	8	4	460	175	635	90

crucifer, Hyla versicolor, Rana clamitans, R. sylvatica, R. palustris), but Bullfrogs (*R. catesbeiana*) dominate the tadpole community and comprised the majority of tadpoles captured.

Over the eight sampling occasions, 3611 adult *N. viridescens* and 796 tadpoles were captured (Table 1). We found that glow sticks significantly increased the number of *N. viridescens* captured (Fig. 1; $\chi^2_1 = 163.75$, $P < 0.0001$). Glow sticks increased the number of individuals captured for both males (mean ± SE per trap = 4.77 ± 0.22 for glow stick trappings vs. 1.99 ± 0.11 for unbaited trappings) and females (mean ± SE per trap = 1.45 ± 0.09 for glow stick trappings vs. 0.63 ± 0.04 for unbaited trappings). Overall, more male newts were captured than female newts (Table 1; mean ± SE per trap = 3.36 ± 0.13 males and 1.03 ± 0.05 females). The male-biased sex ratio per trap was not significantly affected by glow stick use ($F_{1, 691} = 1.64$, $P = 0.20$).

Similar results were found for tadpole captures (Fig. 2). More tadpoles were captured in traps with glow sticks than in unbaited traps (mean ± SE per trap = 1.21 ± 0.09 for glow stick trappings vs. 0.78 ± 0.07 for unbaited trappings; $\chi^2_1 = 17.91$, $P < 0.0001$).

We also found that spatial variation in trap success was high. Trapping locations varied from capturing a mean of 0.25–16.5 *N. viridescens* individuals per trap when glow sticks were used and 0–7 mean individuals per trap when unbaited. When examining captures at each trap location we found that traps captured significantly more newts when baited with glow sticks compared to when unbaited (mean increase ± SE = 3.80 ± 0.35 individuals; Student's $t = 12.44$, d.f. = 88, $P < 0.0001$). Trap locations also captured significantly more tadpoles when baited with glow sticks (mean increase = 0.30 ± 0.12 individuals; Student's $t = 3.59$, d.f. = 88, $P = 0.0005$). Overall, glow sticks increased newt captures at trapping locations by an average of 273% and increased tadpole captures at trapping locations by an average of 93%

We observed no negative effects of funnel trapping or glow stick use on captured amphibians. Of the 3611 *N. viridescens* captured, only two individuals were found dead. Both were gaunt and found in traps with other healthy individuals. No tadpole mortality was observed.

Discussion.—We found glow sticks to be extremely effective at increasing capture efficiency of aquatic amphibians in funnel traps. Overall, when using glow sticks as bait, we captured greater numbers of adult *N. viridescens* and *R. catesbeiana* tadpoles than when no bait was used. When the spatial variation in capture success was removed we found that a given trapping location was more successful when glow sticks were used compared to when the trap was set unbaited.

We captured significantly more male newts than female newts. A male-biased sex ratio in pond populations has been reported in numerous studies of *N. viridescens* (e.g., Attum et al. 2002; Chadwick 1944; Massey 1990), but has not been found in juveniles entering ponds and lakes to breed (Gill 1978; Healy 1974; Hurlbert 1969). A biased sex ratio in individuals captured in ponds could be due to an actual biased sex ratio (possibly caused by differential survival between the sexes) or differences in

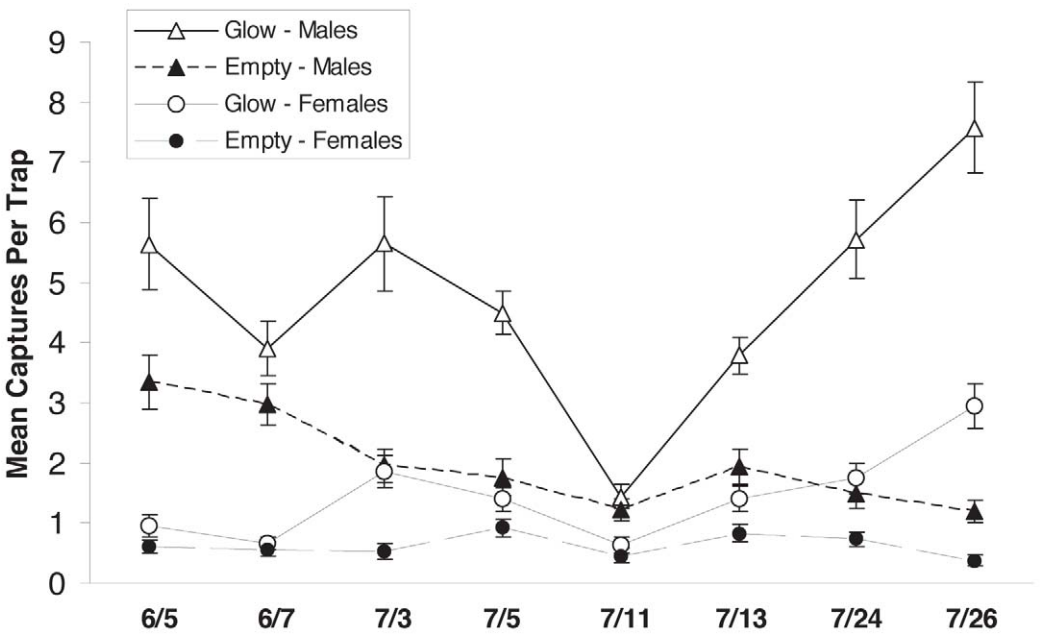

FIG. 1. Mean number of captures per funnel trap of *Notophthalmus viridescens* males and females over eight sampling occasions.

catchability between the sexes. For example, *N. viridescens* could have differences in movement patterns or microhabitat use between the sexes, which may result in female newts being more difficult to detect. Our data do indicate that male and female newts do not respond differently to glow sticks. Thus, while glow sticks increase captures for both sexes, one sex is not preferentially attracted to the glow stick bait compared to the other sex.

Capture efficiency varied over time likely due to differences in environmental conditions between sampling occasions. In particular, during the fifth trapping occasion (11 July 2006) less than half the typical numbers of individuals were captured. We noticed that a full moon and cloudless conditions resulted in particularly bright light conditions that evening. Moonlight can significantly impact the activity of aquatic salamanders (Anderson and Graham 1967; Green 2006) and we believe lunar illumination can lessen the effectiveness of the glow sticks compared to darker nights.

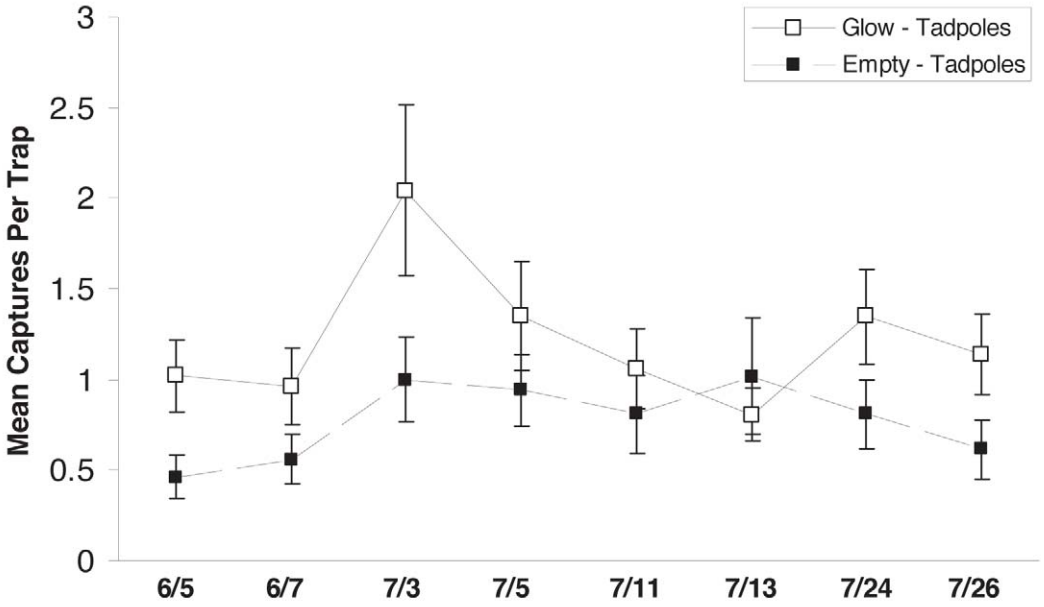

FIG. 2. Mean number of tadpole captures per funnel trap over eight sampling occasions. The vast majority of individuals captured were *Rana catesbeiana* due to their large size and numerical dominance in Station Pond.

The greatest number of individuals captured in a single trap was 37 *N. viridescens* and 14 *R. catesbeiana* for a glow stick trap and 14 *N. viridescens* and 12 *R. catesbeiana* for an unbaited trap. The pond trapped in this study is dominated by these two species but we suspect glow sticks would be effective for other species as well. Unless capturing too many individuals in a given night is a concern, we suggest the thickest glow sticks that produce the most light will result in the greatest number of captures per trap. However, further examination is necessary for studies of multiple species communities. As different species may vary in their catchability, response to glow sticks may also vary by species. We believe that glow sticks are a useful and inexpensive method for increasing capture efficiency in studies using funnel traps.

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Husbandry and Captive Reproduction in *Vipera nikolskii* (Viperidae)

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Nikolsky's Adder (*Vipera nikolskii*) is a moderately short, thick-bodied viperid occuring in woodland meadows, forest-steppe, forest edges, and broadleaved forests in the Ukraine, Moldova, and southern to central Russia (Ananjeva et al. 1998; Bozhansky and Orlova 1997; Milto and Zinenko 2005; Sytnik and Loparev 2003; Vedmederja et al. 1986). An inhabitant of predominately wet areas with dense vegetative cover (Mallow et al. 2003), observations suggest that it readily takes to water (Stettler 1991, 1993; Gumprecht 1994; Trutnau 1998), as well as occasionally burrows within loose soil (Stettler 1993). Despite recent studies (Milto and Zinenko, 2003; Sytnik and Loparev, 2003; Tabachishin et al. 2003), the taxonomy of *V. nikolskii* remains unclear. It appears to be genetically similar to *V. berus berus* (Joger et al. 1997), however, morphologically distinct from other forms (Franzen and Heckes 2000; Milto and Zinenko 2005). Hence, it has been recognized as a full species (Vedmederja et al. 1986), a subspecies of *V. berus* (Joger et al. 1997; Milto and Zinenko 2005; Sokolov 2003), and tentatively, even a subspecies of *V. barani* (Stettler 1993; Nilson and Andrén 1997). Joger et al. (2003) additionally suggest that two clades exist within this taxon, one being closely allied to *V. b. berus* and *V. b. sachalinensis*, the other being a geographically restricted population of *V. nikolskii*.

Although Nikolsky's Adder often is maintained in captivity, reproduction is not commonly reported (Gumprecht 1994; Trutnau 1998). Three pairs (3.3), ranging in size from 460 to 605 mm TL, were collected from the Ukraine and acquired in 1999 and 2000. Upon arrival, the snakes were treated with a 0.0025% solution of Neostomosan spray (theta-cypermethrin; produced by Agrochemie®) to eliminate possible external arthropod parasites. Entizol (metronidazol; S-D Chemical®) against protozoans and Drontal Plus (praziquantel; Bayer®) against helminths were applied per os. All specimens were quarantined in pairs on a substrate of newspaper with the addition of a water bowl and plastic hide box. Both light and heat were provided by a 25-watt incandescent bulb positioned inside each enclosure for 13 h a day. Temperatures fluctuated between 22–28°C during the day, with the provision of a basking area that reached 35°C, dropping to 18–22°C at night. One pair of snakes succumbed from sepsis soon after being received. The remaining specimens were initially force fed pink mice, eventually accepting subadult laboratory mice every 7–10 days. After a three-year period, the snakes reached 640–715 mm in TL, with females being larger than males.

In November 2000, after an initial year-long acclimation period, both lighting and heating were discontinued. Temperatures were maintained between 18 and 22°C for two weeks before transferring specimens to individual plastic enclosures that were placed within a darkened room at temperatures of 7–9°C. Water was provided *ad libitum*. In February 2001, after a 90-day hibernation period, temperatures and lighting were gradually returned to a warmer regimen and all snakes commenced feeding within 20 days. Introductions were made after a 30-day period, though no reproductive activity was observed.

The specimens were cooled down again in mid-October 2001. Both females were allowed to hibernate three weeks longer than the males, however, all other conditions remained the same as the previous year. Upon introduction in March 2002, copulatory activity was observed twice between one pair lasting approximately 60 minutes during each episode. On 25 July 2002, 143 days after the second copulation, the female produced 5 infertile ova.

The hibernation conditions were changed the following year. The males were cooled down from the beginning of November to the end of February; the females were allowed to hibernate two weeks longer. Temperatures during this period were reduced to -1 to +2°C. After the hibernation period, individual snakes were exposed to sunlight for 2–4 h a day several times a week. Introductions were made in the beginning of April 2003 by placing one female at a time with both males. Ritualized combat behavior was subsequently noted between the males. Upon removal of one male, copulation was observed between the remaining pair. This regimen was repeated several times resulting in copulations lasting 60–90 minutes. The last copulation was observed on 12 April 2003, after which both females were housed together. The females were fed *ad libitum* and accepted prey until 13 June 2003. On 21 June 2003, 70 days after the last observed copulation (78 days after the first), the first female gave birth to seven neonates. Two of the neonates had kyphoscoliotic deformations in the anterior third of the body, one of which died shortly after rupturing the fetal membrane. The remaining young averaged 188 mm SVL (157–202 mm, SD = 17.1) and 5.8 g (5.1–6.2 g, SD = 0.4). On 2 July 2003, 82 days after the last observed copulation (89 days after the first), the second female gave birth to three neonates as well as 4 infertile ova. The young averaged 205 mm SVL (198–211 mm, SD = 6.6) and 8.3 g (7.2–9.1 g, SD = 0.9). All neonates shed immediately after escaping from the fetal membrane.

All juveniles were set up in small containers in groups of 2 to 3 on paper substrates with a water bowl. Temperatures were maintained between 22–25°C during the day and 20–22°C at night. Some juveniles accepted prey after being tease fed while others actually trailed and consumed envenomated prey. The remaining neonates were force fed sections of pink mice.

Previous authors reported that *V. nikolskii* is problematic when housed indoors under dry conditions (Gumprecht 1994; Trutnau 1998), yet my experiences suggest that this viperid may be successfully maintained and reproduced in a captive indoor environment after adequate quarantine measures. The gestation periods of 70 and 82 days are considerably shorter than the 130 to 133 days previously reported by Stettler (1993) and Grumprecht (1994). Although further studies are needed, the regimen of providing lower hibernation temperatures and exposing specimens to natural sunlight might have been important for successfully reproducing this species.

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Prolonged Sperm Storage in the Asian Water Dragon (*Physignathus cocincinus*)

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Sperm storage has been documented in a number of species of squamates (Adams and Cooper 1988; Birkhead and Moller 1993; Conner and Crews 1980; Cuellar 1966). This note reports prolonged sperm storage in a captive female Asian Water Dragon (*Physignathus cocincinus*) at the Buffalo Zoo.

Three female and one male *P. cocincinus* were housed together in a large mixed species exhibit for a period extending from October to November 2004. Repeated copulations were observed during this period between the male and all three females. On different occasions all three females were observed depositing eggs on exhibit from December 2004 to March 2005. Due to medical reasons the male expired on 2 December 2004. On 3 July 2006, one female was observed digging test holes in the exhibit enclosure. Twelve eggs were discovered and collected the following day. The eggs, averaging 3 g, were placed in an incubator at 29°C. Over the next 30 days, eight eggs had collapsed and were found to be infertile after opening. After a period of 70 days, two of the four remaining eggs began sweating. The eggs stopped sweating after two days and began to cave in. Because there was no sign of pipping the decision was made to manually open the eggs. All eggs contained near full-term embryos, two of which were dead and beginning to decay. The remaining two were still living, but noticeably deformed. Major organs such as the heart and liver were outside the body cavity and attached to the yolk. Based on the date of the male's death and the date of egg laying, there was a minimum of 581 days between last possible copulation and deposition of the eggs.

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NATURAL HISTORY NOTES

Instructions for contributors to Natural History Notes appear in Volume 38, Number 1 (March 2007).

CAUDATA

AMBYSTOMA MABEEI (Mabee's Salamander). **DIET**. *Ambystoma mabeei* is a small mole salamander known from the Coastal Plain of southeastern Virginia to South Carolina. Relatively little natural history information is available for *A. mabeei* compared to its conspecifics. Recent studies have revealed the feeding ecology of *A. mabeei* larvae, however no published data exists for the diet of terrestrial forms (McCoy and Savitsky 2004. Southeast Nat. 3:409–416; Petranka 1998. Salamanders of the United States and Canada. Smithsonian Instit. Press, Washington, D.C. 587 pp.). On 7 Feb 2006 stomach contents of 35 freshly preserved juvenile to adult specimens (33.2–55.8 mm SVL) were examined. Twenty specimens contained prey, while 15 had empty stomachs (Table 1). Most prey items are invertebrates and are found terrestrially/fossorially, where *A. mabeei* spends a majority of its time. Plant parts were likely consumed incidental to prey capture. Supporting specimens (NCSM 18854) and stomach contents are in the NC State Museum of Natural Sciences collection.

TABLE 1. Stomach contents of freshly preserved *Ambystoma mabeei* adults (N = 20) collected near Laurinburg, Scotland Co., North Carolina. Data are presented as number of salamanders containing prey species (P).

Diet Categories	P
skin	3
Diptera (Mycetophilidae)	1
Lepidoptera (Noctuidae: *Leucania sp*. **)	1
Cantharidae (*Chauliognathus* sp. soldier beetle**)	9
Gryllotalpidae (mole cricket)	1
Lithobiomorpha (centipede)	1
unidentified centipede	1
unidentified arthropod	1
spider	3*
snail	2
vegetation (plant matter)	5
debris (unidentifiable matter)	5

* multiple prey digested by one specimen. ** includes larvae of prey items.

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AMPHIUMA TRIDACTYLUM (Three-toed Amphiuma). **COTTONMOUTH ENVENOMATION**. *Amphiuma tridactylum* is sympatric with the Cottonmouth (*Agkistrodon piscivorus*) throughout the amphiuma's entire range. Both species reside in swampy lowlands and likely encounter one another frequently while searching for prey. Few reports are available on their interactions, but *A. piscivorus* is known to prey upon amphiumas (Petranka 1998. Salamanders of the United States and Canada. Smithsonian Inst. Press. Washington, D.C. 587 pp). On 8 July 2004 we captured a large (100 cm TL) *A. tridactylum* in a 1-m terrestrial funnel trap with a Cottonmouth (73 cm TL) in a small backwater slough (30.98ºN, 87.92ºW), in the Mobile-Tensaw Delta Wildlife Management Area Baldwin County, Alabama. When we approached the trap the amphiuma became agitated and began moving inside the trap. The Cottonmouth struck and envenomated the amphiuma several times on the head and mid-body. In our opinion, the snake expended the vast majority of its venom supplies into the amphiuma. The amphiuma then bit the snake with surprising force and shook the snake side-to-side. The amphiuma scraped dorsal scales off the snake and broke several of the snake's ribs. We separated the two individuals and within seconds the amphiuma's head swelled to twice its normal size and the bites on the body of the amphiuma each swelled to the size of a golf ball. We released the Cottonmouth and it slowly swam away, we do not know if the snake survived the altercation. We transported the amphiuma to a 151 l tank at the Univ. South Alabama Vertebrate Natural History Museum for observation.

The bites secreted copious amounts of mucus for several hours after the envenomation. The amphiuma's bites remained swollen for two days while it remained motionless on the bottom of the tank, except when it surfaced to breathe every 10–15 minutes. On the third day the swelling subsided and the amphiuma began swimming around the tank. We offered the amphiuma chicken liver, which it quickly consumed. We released the amphiuma on day five, after it made a full recovery. To our knowledge, this is the first record of an envenomation of an amphiuma by a snake. Besides the amphiuma, we are unaware of any amphibians that are able to recover from envenomation by a Cottonmouth. The exact mechanism that allowed the amphiuma to survive the envenomation is unknown and needs further study.

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CHIOGLOSSA LUSITANICA (Golden Striped Salamander). **PREDATION.** *Chioglossa lusitanica* is endemic to the Iberian Peninsula. It is one of the most endangered European amphibians and is listed as "Vulnerable" by the IUCN. This salamander has the ability to autotomize its tail when being preyed upon.

Few data exists on the predators of this species. On 2 July 2004 (1800 h; air temp 20.4ºC), a sub-adult *C. lusitanica* (SVL 42 mm) was observed in Zarzo (San Julian de Vigo, Paderne, A Coruña province, NW Spain; UTM 29T NH79) moving among moss cov-

ered rocks along a shady stream bank in a forest with *Alnus glutinosa, Corylus avellana, Salix atrocinerea* and *Fraxinus excelsior*. The salamander went under a rock and quickly came out pursued by a 17 mm land beetle, *Carabus* (*Eucarabus*) *deyrollei* (Carabidae). The beetle bit the salamander's tail, which immediately autotomized at the point where it was bitten, approximately a third of the way along its length. The salamander took refuge under another nearby rock. A few seconds later the beetle with the tail moving between its jaws, went back under the rock from where it originally emerged. Twenty minutes later, the rock was lifted and the beetle was observed eating the piece of detached tail, which was no longer moving. It is interesting to note the rapid recognition of the beetle as a predator on the part of the salamander, its quick escape, and the automatization of its tail upon the first encounter with the beetle's jaws.

On 8 July 2005, at the same site, about 250 m from the previous observation and 4 m from the river (1930 h; 23.0ºC air temp), I observed, upon lifting a rock, a dead juvenile *C. lusitanica* (SVL 26 mm), which was being devoured by another species of land beetle, a 30 mm *Carabus* (*Chrysocarabus*) *lateralis*.

These observations confirm the role of the large carnivorous carabid beetles as predators of juvenile *C. lusitanica*. These beetles are numerous and at least six species ranging in length from 15–35 mm are found in the area. These beetles share the same habitat (Atlantic riverbank forests) and microhabitats (under rocks and between layers of moss and dead leaves) as the salamander, likely resulting in them being important predators of *C. lusitanica*.

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CRYPTOBRANCHUS ALLEGANIENSIS (Hellbender). **CHYTRID FUNGUS.** The chytrid fungus, *Batrachochytrium dendrobatidis*, has been implicated as a cause of the amphibian decline worldwide (Berger et al. 1998. *In* Campbell [ed.], Declines and Disappearances of Australian Frogs, pp. 23–33; Green et al. 2002. Ann. New York Acad. Sci. 969:323–339; McDonald et al. 2005. Cons. Biol. 11:114–120). Ouellet et al. (2004. Cons. Biol. 19:1431–1440) provided a review of the historical distribution of chytrid in North America with a list of species that have been examined for the presence of *B. dendrobatidis*. To our knowledge, this is the first report of *B. dendrobatidis* in captive-reared and wild *Cryptobranchus alleganensis*. During the past four years the St. Louis Zoo has been caring for 126 juvenile Ozark Hellbenders (*C. a. bishopi*) and Eastern Hellbenders (*C. a. alleganensis*), collected as eggs by Unger (2003. MS Thesis, Southwest Missouri State Univ.) from the wild in Missouri, Georgia, and North Carolina. Unger (2003, *op. cit.*) collected eggs from Eastern Hellbenders in the Gasconade River, and from Ozark Hellbenders in the North Fork of the White River in Missouri. In March 2006, the captive-reared hellbenders were diagnosed with *B. dendrobatidis*. Further investigations led to the testing for chytrid on hellbenders from the wild in locations where eggs were collected in 2002 in Missouri. Eight skin scrape samples of *C. a. bishopi* from the North Fork of the White River were obtained on 22 May 2006 and one skin scrape sample from *C. a. alleganensis* was obtained from the Gasconade River on 1 June 2006. Polymerase chain reaction assay showed that two *C. a. bishopi* from the North Fork of the White River had *B. dendrobatidis*, while the one sample from the Gasconade River was negative for *B. dendrobatidis*. These data confirm the presence of *B. dendrobatidis* from hellbenders in captive-reared conditions and wild populations in the North Fork of the White River. *Batrachochytrium dendrobatidis* may be one reason for the decline of hellbenders in Missouri. Further testing for *B dendrobatidis* in Missouri and throughout the range of *C. alleganensis* is warranted to determine the extent and prevalence of this lethal fungus in wild hellbender populations.

We thank J. Wood from Pisces Molecular, Boulder, Colorado for analyzing the skin scrape samples, J. Longcore for graciously providing the laboratory standard culture for *B. dendrobatidis* to Pisces Molecular, and numerous individuals who assisted with field collections and logistic support. We also thank the Saint Louis Zoo veterinarian staff for providing collection materials and other technical support.

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EURYCEA BISLINEATA (Northern Two-lined Salamander). **COLORATION.** The Northern Two-lined Salamander is described as having a pale yellowish to brown dorsum bordered by dark lines (Bishop 1941. The Salamanders of New York. New York State Mus. Bull. No. 324, Albany. 365 pp.; Conant and Collins 1998. A Field Guide to the Reptiles and Amphibians, Eastern and Central North America, Houghton Mifflin Company, Boston and New York, 616 pp.; Petranka 1998. Salamanders of the United States and Canada, Smithsonian Institution Press, Washington and London. 587 pp.). The 1373 records of this species from Québec in the provincial Atlas database (from D. Rodrigue, 22 Aug 2005) and the 293 records from Ontatio in the Ontario Herpetofaunal Summary (from M. Oldham, 21 Aug 2005); do not include any mention of unpatterned, dark, or pale individuals (Jock River specimens cited below are represented in the OHS by records that do not mention coloration). We report here two widely separated sites where we found unpatterned individuals of this species; we describe their pigmentation, and speculate on their significance. Specimens are deposited in the Canadian Museum of Nature (CMNAR).

On 1 Aug 1975, FWS, Aleta Karstad, and Paul W. Schueler visited the Jock River at the old Hwy. 16 bridge (Ontario: Ottawa-Carleton Region: Nepean, 45°15'35"N, 75°42'37"W, WGS 84), and collected a 69 mm pinkish, yellowish, cream-colored larval *E. bislineata*. Return visits to the seepage bank of this small clear rocky river, between *Tsuga canadensis* (Hemlock)/deciduous woods and grassy oldfields (now a municipal park) on 4, 9, and 10 Aug and 11 and 21 Sept 1975 resulted in the collection of more *Eurycea*. The largest individual (109 mm TL), had no dark pigmentation, but rather a pale mottled pattern all over the body. Since then, additional *Eurycea* have been found at this site, with one

unpatterned individual taken in 1980, and one possibly seen in 1995 (Schueler 2002. Trail and Landscape 36:68–71.

The overall frequency of unpatterned adults in the early sample was about 3%, and while none have been found recently, a sample of about 225 without an unpatterned individual would be needed to demonstrate a significant decline ($p = 0.05$) in the abundance of the unpatterned morph.

On 6 June 1999 J-FD and IP found two dark *Eurycea* at Rivière aux Rosiers, Ragueneau County, northeastern Québec (49°10'42"N; 68°36'35"W). This is a clear rock and gravel river, with fast current, 8 m wide, in Black Spruce (*Picea mariana*) forest, in an area of sport fishing and timbering, with a gravel access road. In 15 minutes, a search for salamanders under rocks on the river bank allowed them to observe 20 adults, all but two mentioned above being normally colored. One dark specimen (CMNAR 35817; 92 mm TL) was collected. The coloration of this live specimen was blackish with pale dots on the dorsum. The belly, usually yellow or yellowish at least in its posterior part (Bishop 1941, *op. cit.*; Petranka 1998, *op. cit.*), was gray.

On 21 July 2004 they returned to the site. An 8 min search yielded six typically-colored individuals (2 mature adults, 1 small adult, and 3 larvae). A second 25 min search yielded 21 individuals (15 adults and 6 larvae) with one adult and one larva dark in coloration. They then searched 200 m lower in the river (49°10'36"N; 68°36'34"W) for 10 min and found about 10 adults (1 dark morph). The river was 5–7 m wide at this site. Eleven specimens were collected, including those dark specimens (64 and 67 mm TL; CMNAR 35818). Overall, about 10% of those observed (5/57) were dark.

While specimens from these sites were described as 'black' and 'pale' upon capture (in life the Jock River specimen, CMNAR 21008, was "almost without non-melanic pigmentation except a faint pinkish blush all over the body"), the pattern of pigment in the specimens is similar. There is a background coverage of unclumped melanocytes which is interrupted by irregular pale areas, typically 1 mm in diameter, though 0.7 mm in CMNAR 19628 (which retained a trace of yellow in the pale patches in 1992, though no yellow was evident in 2006 or in the Rivière aux Rosiers specimens). The background melanocytes are sparsest in CMNAR 21008, denser in CMNAR 19628, and densest in the Rivière aux Rosiers specimens. The initially collected pale larva (CMNAR 16896) was "pinkish yellowish cream in color" at collection, while in 2006 it was creamy white with no trace of dark pigmentation or melanocytes.

The unpatterned adults differ from normal striped individuals both in completely lacking the densely melanic markings that constitute the lateral lines, and in the absence of irregular dark clumps of melanin which are scattered throughout, and sometimes concentrated along the dorsal midline of normal individuals (though the Rivière aux Rosiers specimens did have flecks of individual dark cells). Large normal larvae (60 mm) have the background coverage of unclumped melanocytes interrupted both by the pale patches seen in the unpatterned adults and the dark flecks seen in the striped adults. Smaller larva have the background coverage interrupted only by pale areas similar to those seen in the unpatterned adults (based mostly on CMNAR 21007 from the Jock River, FWS Jan 2006). The pale patches of the smaller larvae comprise the 6–9 pairs of dorsolateral pale spots described by Petranka (1998, *op. cit.*) and Bishop (1941, *op. cit.*).

The significance of this coloration is an open question. Unpatterned morphs have not been previously mentioned in this species, and there is no association with size, as large larvae from both sites were unpatterned. The simplest explication of this morph is retention of early larval coloration, with pale spots on the unpatterned adults that are about the same size (1 mm) as those on much smaller larvae. This is presumably the result of failure to develop the dark flecks that compose the lateral bands and other adult markings, and the persistence of the pale spots in the background coloration, but we cannot speculate further. The retention of larval pattern elements in these two populations, separated by about 700 km along the St Lawrence, Ottawa, and Rideau rivers, may be induced by some environmental characteristics, or genetic drift in isolated populations, without having a particular advantage for individuals.

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EURYCEA LONGICAUDA LONGICAUDA (Long-tailed Salamander). **PREDATION.** Natural predators of *Eurycea longicauda* are largely unknown. On 13 April 2006, 1500 h, we observed two adult *Thamnophis sirtalis sirtalis* that had recently fed on *E. longicauda*. The snakes were among six conspecifics observed within 10 m of a spring fed-pond lying adjacent to a small (< 10 hectare) fragment of upland deciduous forest. Upon capture one snake (ca. 55 cm TL) regurgitated an adult (45 mm SVL) male *E. longicauda*. The still living salamander was coated in shed skin and a mucus-like slime, possibly a combination of digestive enzymes and salamander skin secretion. The salamander was folded against itself, suggesting that it had been grasped and swallowed at mid-body by the snake. The tail was intact. Another *T. s. sirtalis* (size not recorded) was observed with the tail of an *E. longicauda* protruding from its mouth. The snake's mouth was held partially agape and was covered with a frothy secretion, presumably from the salamander. Eastern Garter Snakes are opportunistic foragers that are known to prey on other species of plethodontid salamanders including *E. bislineata, Desmognathus fuscus,* and *Pseudotriton montanus*. (Petranka 1998. Salamanders of the United States and Canada. Smithsonian Inst. Press. 587 pp.). This is the first report of predation on *E. longicauda* by *T. sirtalis* of which we are aware.

The spring-fed pond where this predation was observed is located in Wayne Co., Franklin Township, Ohio and is a productive site for *E. longicauda* (Wicknick et al 2005. Ohio J. Sci. 105:2–7). The hillside from which the spring emerges may serve as an underground winter retreat where these salamanders emerge in April

and return to in September and October (Bishop 1941. Salamanders of New York. New York State Mus. Bull. 324:1–365; Petranka 1998, *op. cit.*) A previous observation of predation on *E. longicauda* by *P. ruber* at this same locality (Reblin and Anthony 2001. Herpetol. Rev. 32:245–246) suggests that predators of *E. longicauda* might locate and exploit emergence sites when foraging.

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HEMIDACTYLIUM SCUTATUM (Four-toed Salamander). **REPRODUCTION.** Little is known about the disjunct Gulf Coast populations of *Hemidactylium scutatum*, with few records of adults reported from four counties (Gadsden, Leon, Walton, and Washington) in the Florida panhandle. Here we report the first published nesting and larval records of the species in Florida. Surveys for *H. scutatum* were conducted from 7–8 March 2005 in Joe Budd and Talquin wildlife management areas in Gadsden and Leon counties, Florida.

In Joe Budd WMA, Gadsden County, Florida, on 7 March 2005, three unattended, full-term *Hemidactylium* eggs were discovered in a tussock of mixed grass and *Sphagnum* sp. overhanging a small (ca. 1 m × 4 m) oxbow pool. The eggs hatched upon disturbance of the nest, and the larvae escaped to water before photographs could be taken. Alongside a slow-moving stream ca. 1.5 m wide, 5.5 m from the first nest, a female *H. scutatum* was observed tending 22 eggs under bark fragments in mixed pine needle/hardwood leaf litter adjacent to a sparse growth of *Sphagnum* sp. The eggs were located 17 cm above the waterline and contained fully developed embryos. Although *Sphagnum* sp. was present near both nests, the eggs were not located within dense hummocks of the moss, as is typified by the nesting microhabitat reported for more northern *Hemidactylium* populations (Breitenbach 1982. J. Herpetol. 16:341–346). When the second nest location was revisited on 8 March 2005, following heavy overnight rains, neither eggs nor the attending female could be found. The moisture from the rain may have triggered hatching and washed the larvae into the stream below. A single larval *H. scutatum* was dipped from the oxbow pool at the site of the first nest on 8 March 2005. Habitat at the Gadsden County site consisted of a meandering stream, 1–2 m wide with barely perceptible flow, surrounded by numerous oxbows in upland hardwood forest.

On 8 March 2005, a bottomland forest site in Talquin WMA, Leon County, Florida, was surveyed where adult *Hemidactylium* had previously been reported (Enge 1988. Proc. Annu. Conf. Southeast Assoc. Fish and Wildl. Agencies 52:336–348). Multiple *H. scutatum* larvae were seen in a shallow, seepage film wetland in the floodplain of a second-order stream in a steephead ravine. Two of these larvae were dipped by hand, photographed, and collected. Mosses noted around wetlands included *Thuidium*, *Climacium*, and some *Sphagnum*.

Previous reports indicate a geographical progression of nesting dates for *H. scutatum*, with females in warmer southern and coastal populations nesting earlier in the season, followed by populations in cooler, inland locales (Petranka 1998. Salamanders of the United States and Canada. Smithsonian Inst. Press, Washington, D.C. 587 pp.). Our findings corroborate this trend, and by extrapolating with a relatively low estimated incubation time of 38 days (Blanchard 1923. Am. Nat. 57:262–268), and a very conservative within-population egg-laying period of two weeks (Wood 1955. Am. Midl. Nat. 53:381–389), an early nesting date of 15 Jan 2005 is calculated. This would be the earliest reported nesting date to our knowledge, as would be expected from one of the southernmost coastal populations of *Hemidactylium*.

Photographs of the female, eggs, habitat, and larvae were taken and submitted with collection data to the Florida Natural Areas Inventory. Tissue collected from the female (autotomized tail) and larvae were preserved in 95% ethanol for genetic analysis at Bowling Green State University (sample ID#s: FL-GA-01, FL-GA-02, FL-LE-01, FL-LE-02).

We thank Jeremy Ross and Maria Tumeo for field assistance and Paul Moler for review and comments.

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PLETHODON DORSALIS (Northern Zigzag Salamander). **MAXIMUM SIZE**. Although Smith (1961. The Amphibians and Reptiles of Illinois. Bull. Illinois Nat. Hist. Survey 28:1–298) reported 114 mm TL for the largest *Plethodon dorsalis* collected in Illinois, Conant and Collins (1998. A Field Guide to Reptiles and Amphibians of Eastern and Central North America, 3rd ed., Expanded. Houghton Mifflin Co. Boston, Massachusetts, 616 pp.) reported maximum body size for this species as 111 mm TL. On 10 March 2006 we captured an adult female *P. dorsalis* beneath a decaying board at a field/forest edge in Cooper Hollow, Cannon County, Tennessee, USA that surpassed the previous record length. The specimen, deposited in the Middle Tennessee State University collection (MTSU 342C) had a TL of 120.1 mm and a SVL of 56.0 mm when relaxed prior to fixation. After preservation in 10% buffered formalin for 11 days TL was 118.6 mm and SVL was 55.2 mm.

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TARICHA TOROSA (California Newt). **FUNGAL INFECTION**. *Batrachochytrium dendrobatidis* (Bd) a fungal pathogen of amphibians, was first described as a new species in 1999 (Longcore et al. 1999. Mycologia 91:219–227). Bd is a recently emerged chytridiomycete fungus that has been identified as a causative agent in selected amphibian declines around the world (Berger et al. 1998. Proc. Nat. Acad. Sci. USA 95:9031–9036; Daszak et al. 1999. Emerg. Infect. Diseases 5:735–748; Bosch et al. 2001. Biol. Conserv. 97:331–337). In California this pathogen has been reported in wild populations of eight anuran species, Santa Cruz Long-toed Salamander (*Ambystoma macrodactylum croceum*), and

California Tiger Salamander (*Ambystoma californiense*) (Speare and Berger 2000. http://www.jcu.edu.au/school/phtm/PHTM/frogs/chyglob.htm; Vredenburg and Summers 2001. Herpetol. Rev. 32:151–152; Padgett-Flohr and Longcore 2005. Herpetol. Rev. 36:50–51). It has also been reported in Sonoran Tiger Salamander (*A. tigrinum stebbinsi*) in Arizona (Davidson et al. 2003. Copeia 2003:601–607). Herein, we report the first documented case of *B. dendrobatidis* in California Newt (*Taricha torosa*).

Ten California Newt larvae from nine different ponds (N = 90) in Joseph D. Grant County Park, Santa Clara County, California (37º20'29"N, 121º42'17"W; 650 m elev.) were collected in 2003 following a newt die-off observed by park personnel. The samples were preserved in 70% alcohol. We removed small pieces of toe skin from each specimen and microscopically examined unstained tissue for *B. dendrobatidis* zoosporangia. Six specimens from two different ponds were positive for the pathogen, as indicated by the presence of non-hyphal spherical zoosporangia with one or more inoperculate discharge papillae (Longcore et al. 1999, *op. cit.*). These data demonstrate that the potentially harmful pathogen is present in wild populations of California Newt.

Permission to collect California Newt specimens was authorized by permits issued by the California Department of Fish and Game (801160-02) and the County of Santa Clara Parks and Recreation Department to GEP. We thank D. Clark, K. Coffer, M. Goble, M. Jennings, M. Khosla, D. Rocha, and J. Wilcox for assistance in the field.

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ANURA

AGALYCHNIS CALLIDRYAS (Red-eyed Treefrog). **REPRODUCTION**. *Agalychnis callidryas* occurs from southern Mexico to western Colombia adjacent to Panama, in tropical forests (Frost 2004. Amphibian Species of the World: an Online Reference. Version 3.0, 22 Aug 2004). This species lays its eggs in "nests" with an average of 33 eggs on the underside of leaves above (average height 106 cm) relatively shallow water (Leary and Packer 1998. Herpetol. Nat. Hist. 6:55–59). Breeding behavior of *A. callidryas* was observed in a small, semi-permanent pond at the border of the forest, on Bocas del Toro Island (9°25'01"N, 82°19'30"W, WGS 84, ca. 9 m elev.), in western Panama. A pair was observed on 17 July 2002 from 2200 h until 0530 h of the following day (7.5 h observation). Observation began at 2200 h when the pair was seen to enter amplexus. The pair was ca. 1.5 m above the water in a large shrub. Carrying the male, the female moved among the vegetation, apparently searching for an oviposition site. Egg-laying began at 0125 h (after 3.25 h of movement). This first oviposition site was at 1.7 m height, and the egg mass was 5.2 cm length, 2.3 cm width, 1.5 cm deep with 62 eggs, on a leaf that was 12 × 7 cm. Following oviposition, the female descended the vegetation, while carrying the male, to the ground, where she laid against the humid soil to absorb water. This lasted for 32 minutes. Then, the female, still carrying the male, climbed the vegetation searching for the next oviposition site. The second oviposition began at 0330 h at a height of 2.6 m, with egg-mass dimensions of 6.7 × 2.8 × 1.3 cm, with 52 eggs, on a 10 × 6 cm leaf. The pair then moved to another leaf and began the third oviposition. At 2.4 m height, this nest was 2.9 × 2.4 × 1.7 cm, with 25 eggs on a 14 × 8 cm leaf, ending at 0505 h. At that time, the pair moved to a larger branch and began climbing. At 0515 h the pair separated and the female continued climbing into the higher vegetation until lost from sight while the male settled on a leaf ca. 2.5 m height. Thus, in ca. 4 h, this pair oviposited three times, laying a total of 139 eggs, with only one pause for rehydration. We suggest that this species lays eggs in several nests to reduce predation risk on any one nest, since nest survival until larvae fall into the water is low. Eggs predators observed at this same pond included a cat-eyed snake (*Leptodeira septentrionalis*) and unidentified wasps.

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AGALYCHNIS SPURRELLI (Gliding Leaf Frog). **CLUTCH SIZE.** The genus *Agalychnis* is composed of six species with Neotropical distribution, arboreal behavior, and oviposition on substrate out of water (Faivovich et al. 2005. Bull. Amer. Mus. Nat. Hist. 294:1–240). There are several studies of the natural history and breeding behavior of *Agalychnis*, but many aspects are unknown or incomplete. The largest clutch size reported for *A. spurrelli* had 67 eggs (Duellman 2001. Hylid Frogs of Middle America. SSAR Contrib. Herpetol. 18:1–1180 pp.; Savage 2002. The Amphibians and Reptiles of Costa Rica. Univ. Chicago Press 934 pp.). There is a record of a clutch with 533 eggs (Scott and Starret 1974. Bull. South. California Acad. Sci. 73:86–94) although Duellman (2001, *op. cit.*) suggested that report could be a multiple clutch. Here, I report two ovipositions, both larger than the clutch size previously reported for *A. spurrelli*.

During Oct 2005, I observed two ovipositions of *A. spurrelli* around an artificial body of water located in El Danubio, Region de Anchicayá, Department of Valle del Cauca, western Colombia. The frogs were in the water 15–20 min before they moved up into the vegetation and started to oviposit on the surface of a leaf. One clutch was 322 eggs (female SVL 11.3 cm), the other was 159 eggs (female SVL 8.8 cm). The first oviposition lasted ca. 30 min, while the second lasted ca. 19 min.

The larger oviposition described here is the biggest clutch size reported for *A. spurrelli*. Vargas et al. (2000. Rev. Acad. Colomb. Ciencias 24[90]:85–99) mentioned large clutch sizes (> 200 eggs) for *A. spurrelli*. The clutch size of 533 eggs reported by Scott and Starret (1974, *op. cit.*) was not verified as a single clutch because oviposition was not observed by the authors. Small clutch sizes (67 eggs) reported by Duellman (2001, *op. cit.*) and Savage (2002, *op. cit.*) for *A. spurrelli* could be due to: 1) no direct observation of oviposition; females may move to a different site and split the clutches into three or more parts (Fig. 1); and/or 2) differences in female body size (often related to the number of eggs laid); female *A. spurrelli* are larger in South American populations than in

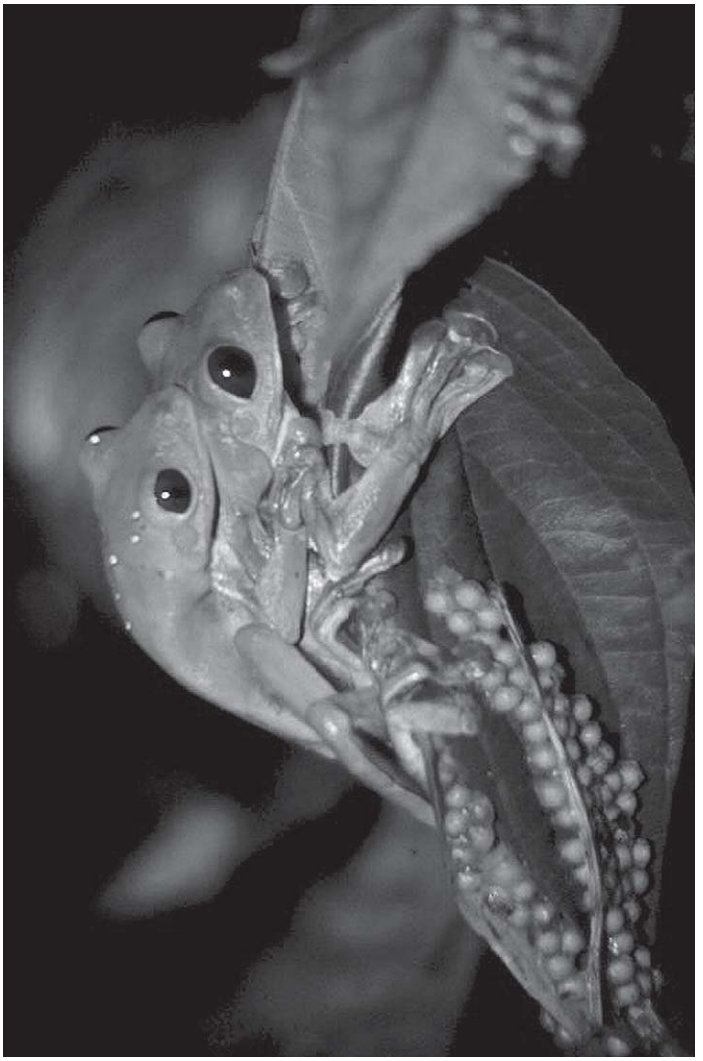

FIG. 1. Oviposition of the treefrog *Agalychnis spurrelli*. During oviposition the female may move to a nearby leaf, which divides the clutch into two or more parts (note several eggs in the upper right corner of photo).

Central American populations (Duellman 2001, *op. cit.*).

I thank J. D. Lynch for identification of these frogs.

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BUFO AMERICANUS (American Toad). **PREDATION.** Although bufonid toads produce toxic compounds that render them unpalatable to many vertebrates, they have been reported as prey of several species of mammals, snakes, and other predators (Groves 1980. Amer. Midl. Nat. 103:202–203; Heinen 1993. Amer. Midl. Nat. 130:184–192, and references therein). On the evening of 22 June 2001, JAC collected a Brown Trout (*Salmo trutta*), 22.8 cm total length (TL), by angling in Beaver Creek along County Road 30, ca. 2 km upstream from its confluence with the Whitewater River, Winona Co, Minnesota, USA (T108N R10W S16). The belly of the trout was obviously distended, and it contained, in addition to a few insect larvae, 13 newly metamorphosed *Bufo americanus*. We returned to the same location on the evening of 24 June 2001 and collected 10 Brown Trout (22.5–25.4 cm TL) by angling. Two had empty stomachs, five contained invertebrate prey, and three (22.9–25.4 cm TL) contained, in addition to invertebrates, newly metamorphosed toads (minimum individual counts of 3, 15, and 48). The creek where the trout were captured is bordered by springfed marshes; newly metamorphosed toads were abundant along the roadside and at some sites along the stream margin. In some pools we observed toads floating downstream along the surface (as many as several dozen during a ten-minute period). Trout were feeding at the surface in the same pools, although they were also feeding on caterpillars, grasshoppers, and other insects of terrestrial origin. Newly metamorphosed toads measured 9–12 mm, and, as noted by Vogt (1981. Natural History of Amphibians and Reptiles of Wisconsin, Milwaukee Public Museum, Milwaukee, Wisconsin), have bright red warts. It is conceivable that the latter serve an aposematic function against some predators, but they would not have been visible to trout attacking from below.

Our observations suggest that predation by trout on toads is substantial at this locality, where Cochran and Cochran (2003. Herpetol. Review 34:360) reported predation by a trout on a Spring Peeper (*Pseudacris crucifer*). Brown Trout are not native to North America, but they are present in most of the 1145 km in 139 streams that currently are managed for trout in southeastern Minnesota (Thorn et al. 1997. N. Amer. J. Fish. Manag. 17:860–872). Thus, they may be an important source of mortality to anurans associated with streams in this part of the state.

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BUFO BOREAS HALOPHILUS (California Toad). **LARVAL CANNIBALISM**. Cannibalism has been observed in anuran larvae within the genera *Rana* (Petranka and Thomas 1995. Anim. Behav. 50:731–739) and *Scaphiopus* (Low 1976. *In* Goodall [ed.], Evolution of Desert Biota, pp. 149–195. Univ. Texas Press, Austin.). Of the bufonids, cannibalism has been studied in the laboratory in *Bufo bufo* (Nagai et al. 1971. Agricult. Biol. Chem. 35:697–703) and *B. a. americanus* (Heinen and Abdella 2005. Am. Midl. Nat. 153:338–347) larvae, although field observations of larval cannibalism are lacking for these species. Recently, however, Jordan et al. (2004. West. N. Am. Nat. 64:403–405) documented *Bufo boreas boreas* larvae feeding on conspecifics and the larvae of two other species (*Rana cascadae* and *Pseudacris regilla*) in Oregon. Here we supplement the field observations of Jordan et al. (2004, *op. cit.*) with a report of apparent cannibalism by tadpoles of the California Toad (*B. boreas halphilus*) in California.

At 1330 h on 8 May 2006 while surveying the Santa Ynez Valley, Santa Barbara County, California for *B. californicus* larvae and egg masses, we observed eight *B. boreas halophilus* larvae in a circle feeding on a conspecific in Indian Creek (UTM Zone 11 0258628E, 3824554N; 1488 m elev.). The eight predators and the prey item were all similar in size (2–2.5 cm TL). These individuals were removed from the larger aggregation; the nearest individual was ca. 125 cm away. The event occurred ca. 20 cm from

the shore in shallow water (ca. 5 cm deep), which was 27.8°C. Although many *B. boreas halophilus* larvae were observed that day (estimated at > 100,000 individuals) and other trips to the area have been conducted, this was the only event of cannibalism observed.

Because the prey was dead at the time of the observation, it is impossible to state that the observed feeding was cannibalism rather than scavenging. Other factors suggest active cannibalism, however. Besides being partially eaten, the observed prey item appeared normal (with no anatomical abnormalities or signs of disease, and it was similar in size to the predators). Additionally, desiccation seems unlikely at the observation location and water depth, and no other dead conspecifics were observed in the area. Taken together, this observation most likely indicates a cannibalistic event, rather than one of scavenging. The small aggregation of eight individuals cannibalizing a conspecific is quite similar to events described by Jordan et al. (2004, *op. cit.*) in *B. boreas boreas* tadpoles, but this is the first account of apparent cannibalism in larvae of *B. boreas halophilus*.

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BUFO BUFO (Common Toad). **FORAGING BEHAVIOR**. Two individual *Bufo bufo* recorded were observed climbing on Lamiaceae shrubs (genus *Rosmarinus*) in Falmouth (50°08'52''N, 05°04'45''W) Cornwall, United Kingdom. These individuals were observed actively foraging during the night (2217–2346 h) of 12 July 2006. Air temperature was 14°C. One individual was observed for more than 10 minutes moving on the top of the shrub; the other was observed while climbing. The common toad has largely been recognized as a terrestrial species, assembling in ponds and streams almost exclusively during the breeding season (Arnold 2002. Reptiles and Amphibians of Europe. Princeton Univ. Press, Princeton and Oxford. 288 pp.). This note provides the first record of *Bufo bufo* selecting shrubs as microhabitat to forage.

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BUFO BUFO (Common Toad). **DEPTH RECORD**. In temperate climates, several anuran species are known to spend the winter months hibernating underwater, often below a layer of ice (Emery et al. 1972. Copeia 1972:123–126; Matthews and Pope 1999. J. Herpetol. 33:615–624). Even during the activity season, some adult (Hutchison et al. 1976. Respirat. Physiol. 27:115–129) and larval

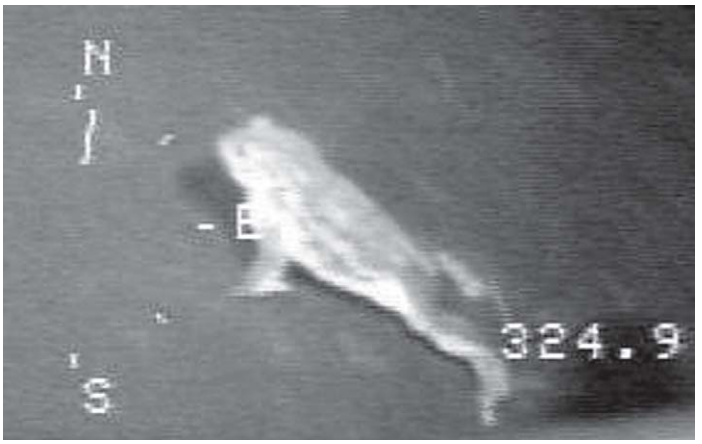

FIG. 1. *Bufo bufo* elevating its body off of the substrate in response to approach of submersible vehicle at 99 m depth in Loch Ness, Scotland, on 9 Sept 2005.

(Richmond et al. 1999. Herpetol. Rev. 30:90–91) frogs have been observed at depths of 3–8 m. Herein, we describe an observation of *Bufo bufo* at nearly 100 m depth in the Loch Ness of Scotland.

On 9 Sept 2005, at 1037 h local time, we were surveying the bottom of Urquhart Bay of Loch Ness, ca. 57°11'36"N, 4°35'36"W, ca. 250 m from the nearest shoreline. We were using a remote operating vehicle (ROV) with a mounted video camera. The surface air temperature was ca. 15°C, and the water temperature at the ROV depth (between 95–100 m) was 5.6°C. A toad was observed on the substrate, with its limbs splayed out slightly away from its body. The specimen was recorded on video for 78 sec, during which time it elevated its torso from the substrate (Fig. 1) and attempted to move away from the ROV. The toad's movements resembled lunges, but were very sluggish. The upper layers of sediment were disturbed with each of the toad's movements, indicating the loose substrate texture. Although the specimen was not collected, the species was inferred because it is the only bufonid known to occur in that part of Scotland (Gasc et al. 1997. Atlas of Amphibians and Reptiles in Europe. SEH and MNHN, Paris. 494 pp.).

The oligotrophic nature of the Loch Ness keeps oxygen saturation levels at around 80% and surface ice rarely forms during the winter months (Shine and Martin 1988. Scottish Nat. 100:111–199). In addition to a low metabolic rate inherent to the constant 5.6°C, the toad experienced pressures approaching 10 atm at 99 m. As such, its lungs would be completely deflated and the animal is negatively buoyant. We did not observe any swaying behaviors that would facilitate cutaneous respiration as have been documented in other species of anurans underwater (Hutchison et al., *op. cit.*).

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BUFO FERNANDEZAE (Lesser Common Toad). **BODY TEMPERATURE**. *Bufo fernandezae* is a typical inhabitant of northeastern Argentina, and is also found in Paraguay and Uruguay. (Cei 1980. Amphibians of Argentina. Monitore Zool. Ital., N. S. Monografia 2, 609 pp.). The thermal ecology of this toad is unknown. To study the thermoregulatory strategy of this species we measured the relationships between cloacal temperature (CT), snout-vent length (SVL), air temperature (AT), and substrate temperature (ST) of individuals of this species in natural microhabitats.

The study area was a permanent pond in the floodplain of the Middle Paraná River in Santo Tomé city, Santa Fe Province, Argentina (31º39'15.7"S, 60º45'35.3"W). The shore was largely covered with grass and *Solanum glaucophyllum* while the shallow areas were covered with *Ludwigia peploides*. Eleven individuals (SVL 5.5 ± 2.08 cm; mean ± SD) were captured between 1900 and 2200 h on 23 Nov 2005 in different microhabitats, including grass, mud, and shallow water. For each specimen, CT, ST, and AT were measured where the individual was collected with a digital thermocouple thermometer (Barnant model 600-1040).

Mean CT was 22.2 ± 1.3°C (N = 11, range 18.8–23.7°C). There were significant differences between ST and AT measured in each site (Mann Whitney, U = 14, N = 11, $p < 0.002$). CT differed significantly from AT (Mann Whitney, U = 21, N = 11, $p < 0.009$) but did not differ from ST (Mann Whitney; U = 0.43, N = 11, $p > 0.25$). CT showed a positive lineal association with ST (Spearman, R = 0.69; $p < 0.01$), but not with AT (Spearman, R = 0.27; $p > 0.47$). No association between the TC and SVL was observed ($p > 0.07$).

These results show that *B. fernandezae* analyzed in this study were predominantly thermopassive, following a mechanism in which the individuals do not actively invest time and energy selecting microhábitats for thermoregulation (Labra y Vidal M. 2003. *In* Francisco Bozinovic [ed.], Fisiología Ecológica y Evolutiva, pp. 207–224. Ediciones Universidad Católica de Chile. Santiago, Chile). The body temperature of this species depends primarily on the substrate temperature.

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BUFO GRANULOSUS (Granular Toad). **PREDATION**. On 9 May 2005 at 1905 h we found a juvenile *Bufo granulosus* (SVL 36.1 mm) in the stomach of the colubrid snake *Leptodeira annulata* (SVL 417 mm; adult male) at buildings surrounded by grassy fields and a mosaic of Cerrado vegetation in the Brazilian Pantanal, Nhumirim Ranch (18º59'S, 56º40'W), Mato Grosso do Sul State, Brazil. After it regurgitated the frog (deposited in Coleção Zoológica de Referência do Campus de Corumbá - CEUCH 3671), the snake was measured and released. Bufonids are known for their skin toxins, although they do not seem to be an effective strategy against anuran specialists, like *L. annulata* (Duellman 1958. Bull. Amer. Mus. Nat. Hist. 114:7–152).

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BUFO PUNCTATUS (Red-spotted Toad). **PREDATION**. Predation on chorusing *Gastrophryne olivacea* by *Thamnophis cyrtopsis* has recently been reported from Sonora, Mexico (Smith et al. 2005. Herpetol. Rev. 36:300). On 1 Aug 2005, we observed a similar event in the Pajarito Mountains of Santa Cruz Co., Arizona, USA. At ca. 0045 h, we encountered a mixed chorus of *G. olivacea* and *Bufo punctatus* calling from intermittent pools in a streambed adjacent to an unpaved road (31.460°N 111.249°W; 1243 m elev.). The sky was completely overcast with cloud cover and there was sporadic light rainfall. We observed four *T. cyrtopsis* foraging in and around the pools; two of the snakes had visible food boluses. We gently palpated these two snakes until they regurgitated; both contained recently swallowed *B. punctatus*. Smith et al. (2005, *op. cit.*) commented that in mixed breeding choruses of *Hyla wrightorum* and *G. olivacea*, *T. cyrtopsis* appeared to selectively consume the latter species. Our observation is noteworthy in that we observed *T. cyrtopsis* seemingly selecting *B. punctatus* in preference to more numerous *G. olivacea*. This provides an additional observation suggesting that foraging *T. cyrtopsis* may selectively consume specific anuran species in a chorus. This observation also further documents the potential importance of anurans as a seasonally concentrated and locally abundant food source for *T. cyrtopsis* in the Sonoran Desert region. A color transparency of a *T. cyrtopsis* with its associated food item is deposited at the University of Texas at Arlington slide collection (UTA 33309).

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CHAUNUS ARENARUM (Dunes Toad). **DIET**. *Chaunus arenarum* is a common toad in coastal dunes of Brazil, Uruguay, and Argentina. During the night, individuals of this species may go to the beach to forage. On 11 Jan 2002 at 2200 h, we observed an individual feeding on a juvenile Plata Pompano (*Trachinotus marginatus,* Pisces; Carangidae) within the wave wash zone. To our knowledge, this is the first record of anurans feeding on a marine fish.

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CHAUNUS BERGI (NCN). **ENDOPARASITES.** *Chaunus bergi* is associated with the floodplains of the Parana and Paraguay rivers in the northern Corrientes, eastern Chaco, Formosa, and northern and eastern Santa Fe, Argentina, and southern Paraguay (Céspedez 1999. Facena 15:69–82). The endoparasites of this toad have not been reported. The purpose of this note is to report the presence of three nematode species from Corrientes, Argentina.

Twenty adult (7 females, 13 males) *C. bergi* (mean SVL 30.78 mm ± 12.38 SD, range 2.81–43.0 mm; mass 4.67 g ± 2.32 SD, range 0.06–8.23 g) were collected in Corrientes, Argentina (27°28'S, 58°50'W) during Sept 2002–Nov 2003 and deposited in the herpetology collection of the Centro de Ecologia Aplicada del Litoral (CECOAL 2893, 2896–98, 3061–64, 3103, 3170, 3191, 3360–62, 3365–66, 3370–72, 3458). Toads were transported to the laboratory and placed in ether sulfuric solution. At necropsy, the alimentary canal, lungs, liver, and urinary bladder were examined for parasites by dissection. Nematodes were observed in vivo, counted and killed in distilled hot water, and fixed in 70% ethyl alcohol. They were cleared in glycerin or lactofenol and examined as temporary mounts.

Fifteen toads were parasitized (prevalence 75%) by three species of nematodes [in parentheses, prevalence (number infected frog/number examined × 100), mean intensity (mean number nematodes/infected frogs ± 1 standard deviation) and range]: one specimen of *Rhabdias* sp. localized in the lung (5%, 1), one hundred twenty-three *Cosmocerca podicipinus* localized in the large and small intestine and in the lung (65%, 9.46 ± 7.38, 1–24), and one hundred twenty-two *Cosmocerca parva* localized in the large and small intestine (40%, 15.25 ± 10.15, 2–30).

The nematodes are stored in the helminthological collection of Centro de Ecología Aplicada del Litoral: *Rhabdias* sp. (female 02103064), *C. parva* (male 02092898), and *C. podicipinus* (female 02092897).

In South America, nematodes belonging to the genera *Cosmocerca* and *Rhabdias* are widely distributed in amphibians and reptiles (Baker 1987. Mem. Univ. Newfoundland, Occas. Pap. Biol. 11, 325 pp.; Bursey et al. 2001. Comp. Parasitol. 68:21–35; Vicente et al. 1990. Rev. Brasil. Zool. 7:549–626) although they have not been found in *C. bergi*. This note represents the first record of *Rhabdias* sp., *C. podicipinus,* and *C. parva* in *C. bergi*.

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CHIASMOCLEIS PANAMENSIS (Panama Humming Frog). **PREDATION.** *Chiasmocleis panamensis* is a small, explosively breeding microhylid whose distribution is restricted to central Panama and northwestern Colombia (Nelson 1972. Copeia 1972:895; IUCN, Conservation International, and NatureServe 2004. http://www.globalamphibians.org/). Breeding choruses of *C. panamensis* are rarely observed and its ecology remains little known (Ibáñez et al. 1999. The Amphibians of Barro Colorado Nature Monument, Soberania National Park and Adjacent Areas Zone, Editorial Mizrachi and Pujol, S.A., Panama, 187 pp.). Here I report a predation event on *C. panamensis* by the colubrid snake, *Leptodeira annulata* observed on 18 May 2005 at 0320 h, under a partly cloudy sky and a moon roughly 4/7 full, following perhaps the heaviest rain of the newly begun wet season. The locality was Bridge Pond, Gamboa, Colón Province, Republic of Panama, 30 m elev. (9.116ºN, 79.700ºW).

While observing a chorus of *C. panamensis*, I noticed a *L. annulata* moving through the leaf-litter along the pond's edge. The snake had a bulge in the anterior portion of its body. I caught the snake and forced regurgitation of its prey. A still-living *C. panamensis* emerged from the snake, but the frog died within a few minutes. The frog was male, judging from the darkly colored throat region (Nelson 1972, *op. cit.*; Ibáñez et al. 1999, *op. cit.*), (SVL 25.45 mm). This is exceptionally large for a male *C. panamensis* (Nelson 1972, *op. cit.*). The snake measured 32.0 cm SVL, and 44.5 cm total length. *Leptodeira annulata* from Costa Rica, Brazil, and Ecuador are known to commonly prey on frogs (Vitt 1996. Herpetol. Nat. Hist. 4:69; Savage 2002. Amphibians and Reptiles of Costa Rica. Univ. Chicago Press, Chicago, 934 pp.).

Identification of the frog and snake were confirmed by César Jaramillo. The snake was released two days after capture. The frog (field number AJC 1164) was deposited in the Museo de Vertebrados de la Universidad de Panamá (MVUP number not yet available).

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CROSSODACTYLUS GAUDICHAUDII (Gaudichaud's Frog). **BEHAVIOR.** *Crossodactylus gaudichaudii* is endemic to southeast Brazil (states of Rio de Janeiro and São Paulo), inhabiting rocky streams inside forests (Heyer et al. 1990. Arq. Zool., São Paulo 31:291; Izecksohn and Carvalho-e-Silva 2001. Ed. UFRJ, Rio de Janeiro: 70). The only report on agonistic behavior comes from captive observations (Weygoldt and Carvalho-e-Silva 1992. Amphibia-Reptilia 13:35–45) and includes calling, visual displays, and agonistic interactions. Here we present the first record of agonistic behavior in this species in nature. On 10 Aug 2003, between 1210–1230 h, an agonistic encounter between two male *C. gaudichaudii* was observed in an area of Atlantic Forest at Ilha Grande, Rio de Janeiro state, Brazil. The observation was made along a trail in the forest, close to Vila Dois Rios Village (23º11'S, 44º12'W). One of the males was calling while perched on a rock ca. 15 cm above the water, at the margin of a puddle ca 1 m diameter and 3 cm deep. Four minutes after this male was located, a second male (distinguishable from the first one by its paler dor-

sum) entered the puddle and started to call from a distance of ca. 50 cm from the rock where the first male was perched, while facing the latter. After ca. 30 seconds, the two males apparently noticed each other's presence and began signaling with their four limbs. During the signaling, they raised the anterior part of the body and lifted the front limbs first and then the hind limbs, one at a time, apparently without a defined pattern. During those displays, the front limbs were completely raised from the substrate, but the hind limbs were not, with only the feet being lifted. Simultaneously, the male on the rock started to emit a differentiated call (presumably an aggressive encounter call). After ca. 2 min., the resident male jumped off the rock into the puddle below and approached the intruder male up to a distance of ca. 10 cm. The two males stayed face to face for about 1 minute, partially immersed and motionless. Then, the resident male jumped on the intruder and started a "wrestling" combat in which they wrapped their front limbs around each other and started rolling, venter to venter, until the resident male overturned the intruder and pushed him underwater with his forefeet, keeping him completely submerged. This combat sequence lasted for about five seconds, with the resident male seemingly subduing the invader. After the end of the combat, the resident male chased the invader off the puddle. Then, the resident male returned to the top of the rock it was initially sighted on, restarting calling activity. After about one minute, the invader male reappeared and returned to the center of the puddle. After about 30 seconds, the two males repeated the sequence of visual signaling and (in the case of the resident male) aggressive encounter calls. Then, the resident male jumped once again to the water and stayed at a distance of ca. 30 cm from the intruder, with the two males facing each other until another combat ensued. This time, however, it was the invading male who took the initiative to attack the resident. Again, the combat ended with the resident male chasing the invader off the puddle, before returning to his original perch on the rock to resume his calling activity. The invader male stayed outside the puddle for about 2 minutes and then returned, but, unlike the first time, he did not move to the center of the puddle and instead remained near its margin at a distance of about 1 m from the resident male's rock, almost totally submerged and silent. Apparently, neither of the two males suffered any kind of physical damage during the combats.

The observations made in the present study are similar to those described by Weygoldt and Carvalho-e-Silva (*op. cit.*) in captivity. The present observation indicates that males *C. gaudichaudii* may compete actively and directly for calling perches. The rock on which the resident male was perched apparently allowed a panoramic view of the puddle area, making it an important observation point at that particular site.

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CTENOPHRYNE GEAYI (Brow Egg Frog). **BEHAVIOR.** Defensive behavior is common in many species of amphibians and can evolve stereotyped postures (Duellman and Trueb 1994. Biology of Amphibians. Johns Hopkins Univ. Press. 670 pp.). On 29 and 30 April 2004, two adult *Ctenophryne geayi* were captured in pitfall traps in the Reserva Florestal Adolpho Ducke (02°55'S, 59°59'W), Manaus County, central Amazonia, Brazil. While being manipulated for photographs, we observed three different defensive postures in *C. geayi*. During the daylight one individual (female, SVL 52 mm) assumed the following posture: crouched with the chin near the ground, eyes closed, limbs held tightly against the slightly arched body, and immobile. The other female (SVL 47.5 mm), manipulated during the night, exhibited a defensive posture of a fully inflated body with head down, forelimbs extended parallel to the body, and an elevation of the posterior part of the body, displaying a bright black color on the posterior and ventral surface of the thighs. The ventral surface of *C. geayi* is black with irregular white or cream spots. A third defensive posture (legs stretched backwards in a stiff-legged posture), described by Schlüter and Salas (1991. Stuttgarter Beitr. Naturk., Ser. A, 458:1–17), also was observed in the second individual. The first and third postures assumed by *C. geayi* could be associated with the cryptic coloration of the dorsum, thus protecting against visually oriented predators. The second posture, elevating the rear of the body by extending the hindlegs, causes these frogs to appear even larger which may help deter predators.

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DENDROPSOPHUS COLUMBIANUS (NCN). **DISPERSAL**. In Europe there are sometimes rumors of live animals such as spiders or frogs that arrive as stowaways in shipments of fruit or flowers from South America. A package of flowers imported from Colombia to Vienna, Austria, included such a stowaway. On 15 May 2006, I was notified by the owner of a flower shop in Vienna that a recently received shipment of flowers of the genus *Heliconia* contained a live frog. The flowers were wrapped in newspapers from Colombia, and the shop owner reported that the shipment came from Cali, Colombia. The shop owner gave me the frog, which was in good condition. I maintained the frog for a week in captivity and shared photographs via the internet. The frog was identified as *Dendropsophus columbianus* (formerly *Hyla columbiana*) and donated a week later to a local frog breeder who had others of the same species. The geographic distribution of *D. columbianus* is limited to the upper Río Cauca valley and roughly centered on the city of Cali, Colombia (IUCN, Conservation International, and NatureServe. 2006. Global Amphibian Assessment. Downloaded 4 May 2006), although the frog has also been reported from northern Ecuador (Frost 2004. Amphibian Species of the World: an Online Reference. Ver. 3.0 [22 Aug 2004] http://research.amnh.org/herpetology/amphibia/index.html). According to my contacts, this case is not singular: a local frog breeder has

collected three *D. columbianus* in Vienna in the last few years. Species identification verified by Christian Proy.

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ELEUTHERODACTYLUS BUCCINATOR (NCN). **CLUTCH SIZE AND PARENTAL CARE**. *Eleutherodactylus buccinator* is a moderate-sized leptodactylid known from the departments of Madre de Dios and Puno in southeastern Peru, in lowland tropical forest (Rodriguez 1994. Alytes 12:49–63). The species may also occur in Bolivia (Köhler 1999. Bonn. Zool. Monog. 48:69).

On 14 Sept 2004 we found a brooding adult female (SVL 41.0 mm; Fig. 1) *E. buccinator*. The female and eggs were found under leaf litter in the floodplain forest of the Rio Los Amigos Research Center (12°35'10"S, 70°05'26"W WGS 84; 270 m), Departamento Madre de Dios, Peru. The nest contained 43 eggs, each ca. 4 mm in diameter. The egg nest was in a ground depression approximately as large as the frog. We observed the female protecting the eggs and noted the development of eggs (with embryos moving inside the eggs) every day for a week after our initial finding. On 22 Sept we noted that both the female and the eggs had disappeared with no visible trace of predation around the nest. However, it is unlikely that all embryos had hatched at the same time, based on our observations of egg development in other species of *Eleutherodactylus*.

This is the first report of egg nest size and parental attendance in *E. buccinator*. Egg attendance in Eleutherodactlyinae frogs is performed by the male only (*E. coqui*, Townsend 1986. Behav. Ecol. Sociobiol. 19:187–195), the female only (*E. cundalli*, Diesel et al. 1995. Copeia 1995:354-360), or by both genders (*E. johnstonei*, Bourne 1998. Behav. Ecol. 9:1–7) depending on the species. Our finding excludes male-only egg attendance as the form of parental care in *E. buccinator*.

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FIG. 1. Female *Eleutherodactylus buccinator* attending terrestrial eggs.

ELEUTHERODACTYLUS COQUI (Puerto Rican Coqui). **ENDOPARASITES.***Eleutherodactylus coqui* is native to Puerto Rico and has colonized Culebra (Joglar and Rios-Lopez 1998. Herpetol. Rev. 10:101), Dominican Republic (Joglar and Rios-Lopez 1998. Herpetol. Rev. 29:107), Florida (Meshaka et al. 2004. The Exotic Amphibians and Reptiles of Florida. Krieger Publ. Co., Malabar, Florida, 155 pp.), U.S. Virgin Islands (Thomas 1966. Quart. J. Fla. Acad. Sci. 28:375-391), Vieques (Joglar 1998. Los Coquîes de Puerto Rico: su Historia Natural y Conservación. Editorial de la Universidad de Puerto Rico, San Juan, 232 pp.), and the Hawaiian Islands (Kraus et al. 1999. Herpetol. Rev. 30:21-25). *Eleutherodactylus coqui* arrived in Hawaii in potted plants from the Caribbean or Florida in the late-1980s or early 1990s (Kraus et al. 1999. Herp. Rev. 30:21-25; Kraus and Campbell 2002. Biol. Inv. 4:327-332). There are currently no reports of helminths from Hawaiian *E. coqui*, but there are four reports from Puerto Rico: *Aplectana* sp., *Poekilostrongylus puertoricensis* (Schmidt and Whittaker 1975. Parasitology 70:287-294), *Oswaldocruzia lenteixeirai* (Moravec and Kaiser 1995. Carib. J. Sci. 31:252-268), and *Parapharyngodon garciae* (Dyer et al. 1995. Trans. Illinois State Academy Sci., 88:39-41). The purpose of this note is to report helminths from *E. coqui* from Hawaii.

Five hundred twenty *E. coqui* (mean SVL 26.1 mm ± 4.4 SD, range: 8-39) were collected between Dec 2000 and Sept 2005. Thirty-four were collected off Huina Road, 2 km W of Hwy 11, Puna District, (19°35'N, 155°05'W) Hawaii, Hawaii. The remainder were collected at Lava Tree State Monument, Puna District, (19°29'N, 154°54'W) Hawaii, Hawaii. Frogs were fixed in 10% formalin and preserved in 70% ethanol and are deposited at the Museum of Zoology, University of Michigan (UMZ), Ann Arbor, Michigan and the Bernice P. Bishop Museum, Herpetology Collection, (BPBM), Honolulu, Hawaii.

A mid-ventral incision was made in the abdominal wall and the digestive tract removed and examined for helminths. The body cavity was also examined for helminths. Nematodes were cleared in a drop of concentrated glycerol and identified. Trematodes were regressively stained in hematoxylin, mounted in Canada balsam and identified. One species of cosmoceroid nematode (n = 296, prevalence: number infected/number examined x 100 = 57 %; mean intensity; mean number helminths per infected frog = 5.0 ± 7.2; range: 1-66) was found in the intestine. Cysts containing larvae of the nematode *Physocephalus* sp. were found embedded in the stomach wall: prevalence: 1.0%, mean intensity: 15.0 ± 21.4: range 2-47. The trematode, *Mesocoelium monas*, was found in the intestine: prevalence: 0.4%; mean intensity: 1.0. Helminths were deposited in the United States National Parasite Collection, USNPC, Beltsville, Maryland and the Bishop Museum, BPBM, Honolulu, Hawaii as: *Cosmocerca* sp. (USNPC 97601, BPBM H142); *Physocephalus* sp. (USNPC 97602); *Mesocoelium monas* (USNPC 97600).

Cosmocercoid nematodes are identified to genus by the morphology of males, i.e., presence of plectanes, rosette papillae, or simple papillae. Our sample of cosmocercoids consisted on 294

females and 2 males; based on the presence of plectanes we have assigned them to *Cosmocerca*. Unfortunately, the post cloacal portion of the body was missing in both of the males, thus it was not possible to assign a species to our *Cosmocerca*. *Eleutherodactylus coqui* represents a new host record for each of the helminth species found in this study, *Cosmocerca* sp. *Physocephalus* sp. (larvae), and *M. monas*.

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ELEUTHERODACTYLUS DANAE (NCN). **REPRODUCTION**. In tropical frogs, reproductive variations in altitudinal gradients have not been documented. Studies of ectotherms found that females are larger and have bigger eggs in colder zones than in warmer zones. These variations are influenced by environmental characteristics, which are correlated with latitudinal variations. For this reason, it is not surprising to find the same responses to an increase in altitude, given its correspondence with environmental characteristics (Stevens 1992. Am. Nat. 140:893–911).

Here we report variations in body size, and number and size of eggs in *Eleutherodactylus danae*. This study took place in a mountain cloud forest (1240–2040 m) in Cosñipata Valley, Department of Cuzco, Peru. Between January and March 1999, we collected 5 reproductive females at each of the 3 study locations at different altitudes: Radiochayoc (13°02'S, 71°31'W, 1240 m elev.), San Pedro (13°03'S, 71°32'W, 1480 m elev.) and Suecia (13°02'S, 71°34'W, 2040 m elev.). Female SVL was measured to the nearest 0.01mm. In the laboratory we measured egg size and counted the number of eggs with a millimetric microscope. To measure the reproductive effort, body and egg mass and volume were measured using the Archimedes principle of water displacement. The difference between egg mass and female body volume represents female energy investment in the production of eggs.

We found that female body size and the size of eggs they lay are larger at higher altitudes (Table 1), showing an association between both variables (0.6634, P< 0.01). Furthermore, we found that the number of eggs produced decreases at higher altitudes (Table 1), observing that there is a negative correlation between the number of eggs and their diameter (-0.8916, P< 0.001). On the other hand, neither female body volume nor egg mass volume were different among the 3 locations. Although our observations suggest that the reproductive effort would decrease at higher altitudes. The increase in body size of females *E. danae* along its altitudinal range would be related to the decrease of temperature at higher altitudes (=5.5°C), while precipitation does not present any influence due to the amount of rain in the altitudinal range of the species, which is more than 400 cm (450 cm at 201 m elev. and 540 cm at 982 m elev., data taken at Cosñipata Valley, PROMANU project).

Studies have shown that frog species, living in high latitudes and cold zones when females are bigger, lay fewer and bigger eggs (Berven 1982. Evolution 36:962–983; Pettus and Angleton 1967. Evolution 21:500–507; this study). Studies among turtles, snakes, lizards, and frogs—including this study—found a correlation between female body size and egg size. If this is a phenotypic or genotypic trait it will have implications in the conservation of *Eleutherodactylus*, the genus that accounts for the majority of frog diversity.

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ELEUTHERODACTYLUS RANOIDES (NCN). **DISTRIBUTION.** Many amphibian populations have been severely threatened by habitat destruction (Ron et al. 2003. J. Herpetol. 37:116–126). In addition, several populations are threatened by unknown agents even in unaltered habitats (Young et al. Cons. Biol. 15:1213–1223). Species that inhabit riparian habitats seem to be the most affected (Lips et al. 2003. Cons. Biol. 17:1078–1088). The *Eleutherodactylus "rugulosus"* species group is one of the best examples. There are eight species in this group in Costa Rica (Savage 2002. The Amphibians and Reptiles of Costa Rica. Univ. Chicago Press, Chicago. 934 pp.). In recent years, the only record of any of these was one population of *E. ranoides* inhabiting the Río Murciélago in Península de Santa Elena (Puschendorf et al. 2005. Herpetol. Rev. 36:53). This finding was based on previous observations of Sasa and Solórzano (1995. Herpetol. Nat. Hist. 3:113–126).

On 25 Jan 2005, we confirmed the continued presence of *E. ranoides* in the Río Murciélago. This was early in the dry season and the habitat was somewhat dry and the water level in the river

TABLE 1. Comparison of body size, egg size, and number of *Eleutherodactylus danae*, mean (± SE, range) at three study locations at different elevations using Kruskal–Wallis Test.

Variables	N	Radiochayoc (1240 m)	San Pedro (1480 m)	Suecia (2040 m)	H	P< 0.1
SVL (mm)	5	45.02 ± 2.32, 41.3–47.3	46.56 ± 1.41, 44.5–48.2	48.34 ± 1.39, 46.4–49.7	6.6506	0.036
Egg size (mm)	5	2.3 ± 0.41, 2.0–3.0	2.75 ± 0.31, 2.5–3.0	2.89 ± 0.23, 2.5–3.2	5.5317	0.0629
Egg number	5	35.4 ± 3.88, 32–40	32.6 ± 2.57, 30–35	31 ± 3.57, 28–34	4.8051	0.0905

was low. A total of 41 individuals were counted on rocks and under boulders in the stream (10º54'10"N, 85º44'48"W) between 1900–2100 h along a transect of 300 m. Water temperature was 28ºC. One specimen was collected.

On 26 Jan 2005, we visited two additional sites. The first one was the Río Potrero Grande. This is a river with many tributaries and a large volume of water during the rainy season. One frog was observed and collected (10º52'51"N, 85º43'07"W) between 1930–2030 h. In addition, we found 2 individuals between 1800–1915 h in the Quebrada La Danta (10º52'52"N, 85º43'04"W), a tributary of the Río Potrero Grande. It had a slow and continuous flow of water with a high water temperature (28ºC). One specimen was collected.

The same day we visited the Río La Calera, a slow flowing river. We found 11 individuals (10º52'54"N, 85º40'53"W) between 2245–2315 h. Water temperature was 28ºC. One specimen was collected. All specimens are deposited at the Museum of Zoology, Universidad de Costa Rica.

The sites where *E. ranoides* was found were always slow flowing, rocky, watercourses with high water temperatures during the dry season in dry forest. The existence of some unexplored watercourses in the Península de Santa Elena, which share the same characteristics, may represent new records for *E. ranoides* in Costa Rica.

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ELEUTHERODACTYLUS STEJNEGERIANUS (Stejneger's Robber Frog). **PREDATION.** *Eleutherodactylus stejnegerianus* is a small, generally diurnal, leptodactylid frog common in the leaf litter of the humid lowlands and premontane Pacific slopes of western Panama and Costa Rica. In Costa Rica it occurs on the Meseta Central Occidental, in gallery forests in the subhumid northwest, and peripherally on the Atlantic lowlands near Laguna Arenal, 3–1330 m elev. (Frost 2005. Amphibian species of the world 3.0, http://research.amnh.org/herpetology/amphibia/index.php; Savage 2002. The Amphibians and Reptiles of Costa Rica: a Herpetofauna between Two Continents, Between Two Seas, Univ. Chicago Press, 954 pp; Scott 1976. Biotropica 8:41–58). Scott (1976, *op. cit.*) reported *E. stejnegerianus* (as *E. bransfordii*) as the most common amphibian species in the forest litter at study sites in the Osa Peninsula and San Vito, Puntarenas Province, Costa Rica.

Predation of *E. stejnegerianus* by the wandering spider, *Cupiennius coccineus* (Ctenidae), was observed on two separate occasions. On the evening of 8 Nov 2004 (~1830 h), within the La Merced National Wildlife Refuge, Puntarenas Province, Costa Rica (9°11'14"N, 83°45'43"W; ca. 60 m elev.) a *C. coccineus* (8 mm carapace length [CL]) was observed grasping a partially consumed *E. stejnegerianus* adult (~15 mm SUL). On the evening of 10 Nov 2004 (~1915 h), in the Oro Verde Biological Reserve, Puntarenas Province, Costa Rica (9°12'40"N, 83°1545'48"W; ca. 300 m elev.) another *C. coccineus* (8 mm CL) was observed grasping a partially consumed *E. stejnegerianus* adult (~15 mm SUL).

During both observations, the spider was grasping the frog with its chelicerae, positioning the frog under its body as it actively chewed on exposed frog viscera. Both frog/spider pairs were photographed, and submitted to the herpetological collection of the Los Angeles County Museum of Natural History (LACM-PC 1428-29).

To our knowledge these are the first reports of a ctenid spider preying on *E. stejnegerianus* in a natural setting. A variety of spider species are known to prey on anurans in tropical areas (Hayes 1983. Biotropica 15:74–76; McCormick and Polis 1982. Biol. Rev. 57:29–58). Based on the abundance of *E. stejnegerianus* (*sensu lato*, Scott 1976, *op. cit.*) and the variety and commonness of spider taxa in leaf litter, we agree with Hayes (1983, *op. cit.*) that spiders likely are important predators of tropical leaf litter anurans.

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HELEIOPORUS AUSTRALIACUS (Giant Burrowing Frog). **PREDATION**. A series of predation events of adult *Heleioporus australiacus* were observed during a radio-telemetry study of a population in southeastern Australia. The study was undertaken between 1 Feb 2002 and 30 June 2004 (Penman et al. 2006. Wildlife Res. 33:35–40). During this time 33 individuals (19 male; 13 female; 1 sub-adult male) were radio-tracked for periods of 5–599 days, of which five males and one female were lost to predation. In four cases the predator was located and identified through the use of the telemetry signal. One male frog was eaten by a Laughing Kookaburra (*Dacelo novaeguinaea*). Three others (two males; one female) were eaten by a Red-bellied Black Snake (*Pseudichis porphyriacus*). The other two male frogs were also eaten by snakes that were observed briefly but were not positively identified. They were either *P. porphyriacus* or the Tiger Snake (*Notechis scutatus*). Four of the six frogs were taken by predators at their breeding sites after having migrated from their non-breeding activity areas. Furthermore, while another frog was last observed burrowed ca. 30 m from a breeding site, its recent movement and the presence of rain suggested that it was migrating to the breeding site and we

believe it was also predated at the breeding site. The final frog (taken by an unidentified snake) was predated 100 m from the breeding site and was consumed the night it was released. Hence this may not represent a "natural" predation event.

One of the *P. porphyriacus* was killed shortly after eating a telemetered frog and an examination found it had eaten two additional *H. australiacus* (one male: one female) that had been marked with PIT tags at a breeding site. We cannot be sure that the snake found these frogs at the breeding site, but it seems likely.

Rates of predation in the study were higher than expected. When distressed *H. australiacus* produces a sticky white substance from its back that was thought to be toxic to predators (Lemckert 2001. Nat. Aust. 26–33). However this substance is not a deterrent to all predators with one snake consuming three *H. australiacus* within a week.

We believe that all natural predation occurred immediately around the breeding sites, suggesting that these sites represent the highest mortality risk for this species. In this study, individuals spent less than 3% of the time in the breeding habitat with many individuals not accessing the breeding site every year (Penman 2005. PhD Thesis, Univ. Newcastle). It is possible that this represents a behavioral adaptation to the high predation risk. However, there is limited information on the breeding behavior or predation of *H. australiacus* in other areas to determine whether this is the typical situation.

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HYLA LOQUAX (Swamp Tree Frog). **PREDATION**. Wandering spiders (*Cupiennius;* Araneae, Ctenidae) are known to prey upon a variety of insects and small vertebrates (Toledo 2005. Herpetol. Rev. 36:395–400). Herein we report on invertebrate predation of an adult male *H. loquax* at the Cantarana Swamp, Organization of Tropical Field Studies La Selva Field Station. On the evening of 26 June 2002, between 2100–2200 h we observed a small chorus of male *H. loquax* calling from emergent vegetation and several amplectic pairs ca. 0.3–0.61 m above the water. We observed a wandering spider (*Cupiennius* sp.) perched on vegetation, digesting an adult male ca. 1 m above the water (Fig. 1). *Hyla loquax* has not been reported previously as a source of prey for spiders or any other invertebrate.

We thank Matjaz Kunter, Smithsonian Institute, Department of Entomology for spider identification, and J. Robertson, and S. Biswas for field assistance.

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HYPSIBOAS FABER (Blacksmith Treefrog). **PREDATION.** Predators are a major source of mortality of tadpoles (Alford 1999. *In* McDiarmid and Altig [eds.], Tadpoles: The Biology of Anuran Larvae, pp. 240–278. Univ. Chicago Press, Chicago). The hylid frog *Hypsiboas faber* occurs from eastern to southern Brazil, southeastern Paraguay, and northern Argentina (Frost 2004. Amphibian Species of the World: an Online Reference. Ver. 3.0, 22 Aug 2004). The natural history of *H. faber* is fairly well known (Martins and Haddad 1988. Amphibia-Reptilia. 9:49–60; Martins 1993. Amphibia-Reptilia 14:441–421; Martins et al. 1993. Amphibia-Reptilia 14:307–309; Martins et al. 1998. Amphibia-Reptilia 19:65–73). Important predators include frogs, snakes, and water-bugs (Kluge 1981. Misc. Publ. Mus. Zool. Univ. Michigan 160:1–170; Martins et al. 1993, *op. cit*.).

During fieldwork in RPPN Estação Vera Cruz, Municipality of Porto Seguro, State of Bahia, Brazil (16º20'S, 39º10'W; 30–60 m elev.) I observed an adult turtle (*Acanthochelis radiolata*), capture and consume *H. faber* tadpoles. To my knowledge, this is the first report of predation on *H. faber* tadpoles by a turtle.

Thanks to C.C. Canedo (Museu Nacional/UFRJ, Brazil) for comments.

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ITAPOTIHYLA LANGSDORFFII (NCN)**. DIURNAL BASKING.** Thermoregulatory behavior can be highly significant in the overall energetics of ectothermic animals (Lillywhite et al. 1973. Ecology 54:375–383) and yet constitute a challenge for amphibians in terms of cutaneous water loss (Tracy and Christian 2005. Physiol. Biochem. Zool. 78:839–846). On 27 February 2006 at ca. 1000 h, we observed a large tree frog, *Itapotihyla langsdorffii* (Anura: Hylidae), attached to a dry cliff face 30 m from the Cachoeira do Salto, Estação Ecológica Juréia-Itatins, municipality of Iguape, São Paulo State, Brazil (24°33'13"S, 47°13'48"W). The rock was facing the sun and warm to the touch; the frog's body (SVL 107 mm after preservation) was completely exposed to solar radiation, flattened with fore and hind limbs tucked along the lateral body surface, head lowered on its forefeet, and thus seemingly forming a seal between the underside of the frog and the rock surface (Fig. 1). Its eyes were shut. The basking site was ca. 10 m from the nearest vegetation (15 m from the nearest forest, *I. langsdorffii*'s natural habitat) and at least 20 m distant from wet rock surfaces. The individual was collected as part of a biological survey and when first seized it voided a substantial volume of clear liquid. Upon dissection, we found that the animal's stomach and upper intestine were empty; the lower intestine contained unidentified debris and a few fragments of arthropods.

Itapotihyla langsdorffii is endemic to the Brazilian Atlantic coastal rain forest (Izecksohn and Carvalho-e-Silva 2001. Anfíbios do Município do Rio de Janeiro. Editora UFRJ, Rio de Janeiro), and we were surprised to encounter this nocturnal mesophyllic species basking on a warm summer morning. Thermoregulatory behavior has been documented in hylids of arid habitats; *Hyla arenicolor*, a North American species, exhibits the same stereotyped posture to conserve water while basking (Snyder et al. 1993 J. Arid Environ. 25:321–329). The Brazilian hylid *Bokermannohyla*

FIG. 1. Basking site (indicated by arrow) for *Itapotihyla langsdorfii* near the Cachoeira do Salto, Estação Ecológica Juréia-Itatins, São Paulo State, Brazil.

alvarengai is commonly found in arid open rocky habitats ("campos rupestres;" Sazima and Bokermann 1977. Rev. Bras. Biol. 37:413–417), and its resting posture appears similar to that we observed in *Itapotihyla*. Also, *B. alvarengai* seems to modify the coloration of its skin in response to temperature and illumination (Tattersall et al. 2006 J. Exp. Biol. 209:1185–1196), an ability that remains to be investigated in *I. langsdorffii*. Tracy and Christian (2005, *op. cit.*) suggested that daytime retreat site selection by frogs might be important for temperature regulation and therefore influences daily energy budgets, allowing them to digest and/or grow more quickly. Basking by *I. langsdorffii* might be related to temperature regulation due to its large size; in addition, its dorsal color pattern closely resembles rock lichens despite its arboreal habit, suggesting that basking on rocks might be a common behavior for this species and the coloration may have adaptive value in predator avoidance under exposed conditions.

The voucher specimen (CFBH 11474) is housed in the Coleção de Anuros Célio F. B. Haddad, Depto. de Zoologia da Universidade Estadual Paulista, campus de Rio Claro.

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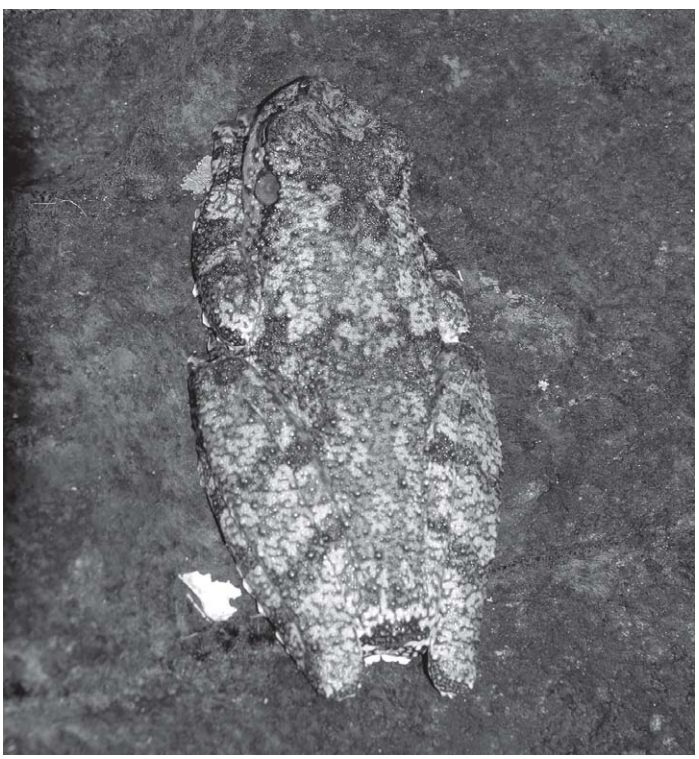

FIG. 2. *Itapotihyla langsdorfii* basking near the Cachoeira do Salto, Estação Ecológica Juréia-Itatins, São Paulo State, Brazil.

LEIOPELMA PAKEKA (Maud Island Frog). **REPRODUCTION.** The leiopelmatid frogs of New Zealand are among the most archaic anuran species in the world. The genus is comprised of three extinct and four extant species, all currently threatened. Despite the attempts at conservation of these species, little is known about their reproductive biology. For two of the four extant species, *L. pakeka* and *L. hamiltoni*, which were recently recognized as separate cryptic species (Bell et al. 1998. J. Royal Soc. New Zealand 28:39–54), there are no published reports of mating in the wild nor have eggs been observed in the wild. All of the current information about reproduction in these species comes from captive individuals (Bell 1978. Herpetologica 34:340–354; Bell 2002. Unpubl. report to NZ Native Frog Recovery Group).

During recent field studies on Maud Island in the Pelorus Sound, New Zealand (41°01'S, 173°53'E WGS 84), three pairs of amplecting frogs were found up trees. The first pair was found in Dec 2005, and two additional pairs were found in Jan 2006. This behavior is surprising for these species, which are thought to be extremely saxicolous and spend the majority of their lives under rock piles. Though all frogs from amplecting pairs were examined, none appeared to be carrying eggs and no eggs were found

in the vicinity of the event. To our knowledge this type of arboreal mating behavior in *Leiopelma* has only been anecdotally reported twice before. In 1972, a NZ Wildlife Service worker took photographs of pairs of frogs in the trees on a rainy night (R. Morris, pers. comm.). In 2004, a pair of frogs in amplexus was captured up a tree in December (Waldman 2004. ARC Conference, Captivity, Reintroduction and Disease Control Technologies for Amphibians, Victoria, Australia, URL: http://frogs.org.au/arc/conference.html). This pair was taken to Canterbury University where the male later died. No eggs were laid.

These sightings provide information on the timing of reproductive events for *L. pakeka* and likely for the closely related *L. hamiltoni*. All events appear to occur later than those recorded in captivity in Wellington, New Zealand (Bell 2002, *op. cit.*). Despite these recent sightings, eggs of *L. pakeka* or *L. hamiltoni* have not been found laid in the wild and much remains unknown about their reproductive biology. Current work is investigating the timing, effects of habitat, behavior, and other aspects of *Leiopelma* reproduction.

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LEPTODACTYLUS OCELLATUS (Rã Manteiga). **DIET**. *Leptodactylus ocellatus* has a broad distribution that includes Brazil, Argentina, Paraguay, and Uruguay (Maneyro et al. 2004. Iheringia 94[1]:57–61). Several reports describe the diet of this species (Gallardo 1964. Anfibios de los Alrededores de Buenos Aires. Buenos Aires, Editorial Universitaria de Buenos Aires; Basso 1990. Monografias Asociación Herpetológica Argentina 1:1–70; França et al. 2004. Stud. Neotrop. Fauna Environ. 39[3]:243–248), which consists of arthropods, mollusks, and amphibians. An adult male *L. ocellatus* (Museu de Ciências e Tecnologia of the Pontifícia Universidade Católica do Rio Grande do Sul [MCP 8865]; SVL 91.8 mm) was collected at 0730 h on 28 Jan 2006, under a rock on the seashore in the State of Santa Catarina (Municipality of Palhoça). The specimen was dissected and two partially digested *Ligia* sp. (beach woodlouse) were found in the stomach. Maneyro et al. (2004, *op. cit.*) cite isopods and amphipods in the diet of *L. ocellatus* from Uruguay. However Maneyro (pers. comm.) informed us that the isopods found in the diet of *L. ocellatus* in Uruguay are a terrestrial species popularly known as woodlouse. This is the first record of *Ligia* sp. in the diet of *L. ocellatus*.

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MEGAELOSIA APUANA (NCN). **PREY**. *Megaelosia apuana* is a recently described giant torrent frog from Pedra Azul, municipality of Domingos Martins, State of Espírito Santo, Brazil (Pombal et al. 2003. J. Herpetol. 37:453–460). Congeners are known to prey on other anurans (Giaretta et al. 1993. J. Herpetol. 27:276–285), but this habit has not been reported for *M. apuana*.

Herein we report a predation attempt by *M. apuana* on *Proceratophrys boiei*. The observation was made on 25 Sept 2005 at 2000 h near the type locality for *M. apuana* in Pedra Azul (20°24'47"S, 41°01'30"W, 1100 m elev.). We observed an adult *M. apuana* (SVL 83 mm) attempting to swallow an adult *P. boiei* (SVL 52 mm). At the moment of the observation, both individuals were in a shallow pond near a stream at the forest edge. The *P. boiei* was being bitten on its cloacal region and had both hind limbs outside of the *M. apuana* mouth. We did not see if the prey was captured on land and brought to the water or if it was captured in the pond. As a defensive behavior the *P. boiei* inflated its body, not allowing the *M. apuana* to finish swallowing it (Napoli 2001. Herpetol. Rev. 32:36–37; Toledo and Zina 2004. Herpetol. Rev. 35:375). After nearly two minutes of observation the *P. boiei* escaped its predator, which stayed motionless for a few moments before it tried to escape.

Both specimens were captured and deposited in the Amphibian Collection Célio F. B. Haddad (CFBH), at Universidade Estadual Paulista, Rio Claro, São Paulo (CFBH 10811, *M. apuana*; CFBH 10812, *P. boiei*).

We thank João L. Gasparini and Charles R. Nunes for help with fieldwork. Célio F.B. Haddad read the manuscript and provided valuable suggestions. The Brazilian National Institute of Natural Environments (IBAMA) issued the collecting permit to J.L. Gasparini (license number 054/05 – IBAMA/RAN, Process number 02001.002792/98-03).

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ODONTOPHRYNUS OCCIDENTALIS (NCN). **BODY TEMPERATURE**. *Odontophrynus occidentalis* inhabits western Argentina from Catamarca to Neuquén and Río Negro, eastward into the Pampa and Sierras de Cordoba (Cei 1980. Amphibians of Argentina. Italian J. Zool., N.S. Monografia 2, 609 pp.). The thermal ecology of this species has not been previously studied. Herein we briefly describe select aspects of the thermal ecology of *O. occidentalis*.

Our study area was located 70 km SE of San Juan City, Argentia on National Route N 141. This area is in the Monte phytogeographic Province (Cabrera 1994. Enciclopedia Argentina de Agricultura y Jardinería, Tomo II, Regiones fitogeograficas Argentinas, Editorial ACME S.A.C.I.). Elevation reaches 749 m. The region is arid with an annual mean temperature of 20°C (mean max 40°C, mean min 16°C). The rains occur mostly in the summer with an annual average of 84 mm.

Thirteen *O. occidentalis* (mean SVL 5.03 cm; SD 1.7 cm) were collected on 16 Dec 2005. The cloacal temperature (TC), soil temperature (TS), and air temperature (TA) were measured with a digital thermometer (Barnant Model 600-1040). TS and TA were

significantly different (t-student, t = -2.5, df = 24, p < 0.01). Mean TC was 20.5°C (SD = 1.6, range = 19.4–24°C, N = 13). TC was positively associated with TS (Spearman, R = 0.6; p < 0.02), and TA (Spearman, R = 0.67; p < 0.02). TC was not significantly different from TS (t-student; t = -0.3, df = 24, p > 0.7) and was significantly different than TA (t-student, t = 2.33, df = 24, p < 0.02). There was no association between TC and SVL (p > 0.91).

These results indicate *O. occidentalis* in this situation is thermopassive, a mechanism where individuals do not need to invest time and energy actively selecting microhabitat for thermoregulation (Labra and Videl. 2003. *In* F. Bozinovic [ed.], Fisiología Ecológica y Evolutiva, pp. 207–224. Ediciones Universidad Católica de Chile. Santiago, Chile). These individuals were in a breeding chorus, when the biggest demand for energy is in calling to attract females, thus this thermopasive mode seems to be the most effective strategy for thermoregulation.

We thank Alejandro Laspiur for help with fieldwork.

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OSTEOCEPHALUS YASUNI (NCN) and ***OSTEOCEPHALUS PLANICEPS*** (NCN). **TERRESTRIAL BEHAVIOR**. Frogs of the genus *Osteocephalus* are largely arboreal and nocturnal and occur throughout the Amazon Basin and along the eastern Andean slope. There are 18 species recognized, at least 8 of which are known from Yasuní Research Station (YRS) (0°40'S, 76°24'W) and Tiputini Biodiversity Station (TBS) (0°37'S, 76°8'W) in the Province of Orellana, Ecuador. Information on the natural history of most *Osteocephalus* species is scarce, although species exhibit a variety of reproductive strategies including the use of streams, seasonally flooded pools, and phytotelms for amplexus and egg deposition.

Osteocephalus yasuni and *O. planiceps* are common species at YRS and TBS. Eggs and tadpoles are undescribed, but it is suspected that *O. planiceps* is a phytotelm breeder, because males often call from bromeliads in the canopy (Ron 2006. http://www.bio.utexas.edu/grad/ecuador/web/yasuni/esp/anfyas.htm), and that *O. yasuni* uses seasonally flooded ponds for breeding, because males form large choruses around pools after heavy rains (Ron and Pramuk 1999. Herpetologica 55:433–446). Like other *Osteocephalus* species, *O. yasuni,* and *O. planiceps* are nocturnal and arboreal (Ron 2006, *op. cit*.) although, *O. yasuni* choruses may occasionally continue calling into the day following their nocturnal assembly and pairs in amplexus have been witnessed during the morning hours (pers. obs.).

Here we report an unusual behavior: during 2 field seasons in the Ecuadorian Amazon, we observed *O. planiceps* and *O. yasuni* females sleeping in the litter during the day. The first individual, a small adult female *O. yasuni* (SVL 48.9 mm, mass 6.97 g), was found at YRS on 24 May 2005 (ca. 1030 h) in a 5 × 5 m forest floor quadrat that was sampled for leaf litter herpetofauna. The frog was buried under the leaf litter and completely concealed from view. Despite disturbance, it remained motionless until it was picked up by hand, at which point it attempted to escape. During our second field season, we encountered three additional *O. yasuni* and two *O. planiceps* sleeping in the litter at TBS. On 27 March 2006, we found an adult female *O. planiceps* (SVL 56.5 mm, 9.74 g) at ca. 1030 h. On 28 March at ca. 830 h, we encountered a second *O. planiceps* (SVL 59.5 mm, 12.05 g). We found two *O. yasuni* on 29 March: the first (SVL 57.0 mm, 12.14 g) at ca. 1030 h and the second (SVL 59.0 mm, 14.6 g) at ca. 1500 h. All were found during searches of 5 × 5 m forest floor plots, and they were buried under the litter, just as the first individual found at YRS in 2005. On 31 March at ca. 1000 h, while searching an 8 × 8 m quadrat we encountered a third female *O. yasuni* (SVL 59.2 mm, 11.28 g) sleeping on the ground. Five of the individuals were photographed and released.

All six females were found in primary, terra firme forest within a week following a heavy rain. At TBS, the rain stimulated a very large chorus of *O. yasuni* males. However, the females were found a kilometer or more away from where the males were calling and they were completely inactive when found. Because the females were so well buried under the litter, the possibility that they fell from the trees seems unlikely. The leaf litter habitat may represent an important and previously unrecognized part of the life cycle of adult female *O. planiceps* and *O. yasuni*. We suggest that this behavior may be typical and that *O. planiceps* and *O. yasuni* may only exhibit this behavior in the breeding season, though this warrants further investigation.

We thank our field assistants at YRS and TBS, especially A. Enomenga and I. Nenqemo, as well as K-H. Jungfer and D. Cisneros-Heredia for verifying species identification. These observations were made during dissertation fieldwork of JLD, which was supported by grants from the Conservation, Food and Health Foundation, and the Louisiana Governor's Office of Environmental Education. Research was conducted under permit issued by the Ecuadorian Ministerio del Ambiente (004-IC-FA-PNY-RSO).

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PELOBATES CULTRIPES (Iberian Spadefoot Toad). **MAXIMUM SIZE**. *Pelobates cultripes* occurs in southern France and throughout most of the Iberian Peninsula (Spain and Portugal) (Lizana et al. 1994. J. Herpetol. 28:19–27). De La Vega (1988. Anfibios y Reptiles de la Provincia de Huelva, Ertisa [Ed.]. Huelva, Spain. 238 pp.) reported maximum size as 89 mm SVL. Talavera (1990. Evolución de Pelobatidos y Peloditidos [Amphibia: Anura]: Morfología y Desarrollo del Sistema Esquelético. Unpubl. Ph. D. Thesis, Universidad Complutense de Madrid, Spain.) reported maximum size for females from Madrid, Spain as 101 mm SVL. The record size reported for females is 113 mm SVL (Salvador and García-París 2001. Anfibios Españoles. Identificación, Historia Natural y Distribución. Canseco [Ed.], Talavera de la Reina. 269 pp.). Herein, we report a new maximum size for this species.

On 21 Oct 2002, between 1900–2200 h, we captured three gravid adult female *P. cultripes* that surpassed the previous record length (119 mm SVL, 124 g; 120 mm SVL, 145 g; 125 mm SVL, 168 g) in a temporary pond near Aznalcóllar (Seville Province, Spain, 37º31'N, 6º16'W; 130 m elev.). Each individual was measured in

the field and then carefully released into the pond where they were captured. The terminal phalange of the third digit of the right forefoot was removed for a skeletochronological study to estimate the age of each individual based on successive resting lines in the bone (Hemelaar 1998. J. Herpetol. 22:369–388). The biggest female was five years old, but in the remaining individuals age determination was not possible.

Recently reported geographic variation in body size of *P. cultripes* (Marangoni 2006. Variación clinal en el tamaño del cuerpo a escala microgeográfica en dos especies de anuros [*Pelobates cultripes* y *Bufo calamita*]. Ph.D. Thesis. Univerdidad de Sevilla, Spain), suggests that the differences in body size among different studies could be due to latitudinal variation in body size.

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PELOBATES CULTRIPES (Iberian Spadefoot Toad). **PREDATION.** *Pelobates cultripes* occurs in southern France and throughout most of the Iberian Peninsula (Spain and Portugal) (Lizana et al. 1994. J. Herpetol. 28:19–27). In southern Spain, *P. cultripes* breed in a mosaic of small temporary ponds and streams that generally fill with the first autumnal rains in October–November, and dry at the end of May (Tejedo and Reques 2002. *In* Pleguezuelos et al. [eds.], Atlas y Libro Rojo de los Anfibios y Reptiles de España, pp. 94–96. Dirección General de Conservación de la Naturaleza, Madrid). Birds, mammals, and reptiles have been reported as important predators of juvenile and adult *P. cultripes* (Salvador and García-París 2001. Anfibios Españoles. Identificación, Historia Natural y Distribución. Canseco [Ed.], Talavera de la Reina. 269 pp.; Díaz-Paniagua et al. 2005. Los Anfibios de Doñana. Organismo Autónomo Parques Nacionales, Ministerio de Medio Ambiente [Ed.], 181 pp. and references therein). In addition, the snake *Natrix maura* may also be an important predator of this species (Santos 2004. *In* Carrascal and Salvador [eds.], Enciclopedia Virtual de los Vertebrados Españoles. Museo Nacional de Ciencias Naturales, Madrid. http://www.vertebradosibericos.org).

FIG. 1. Ventral side photo of *Pelobates cultripes*, showing three injuries caused by *Natrix maura*. The photo was taken 12 h after the capture.

On 5 Nov 2001 at 1920 h, we observed a gravid female *P. cultripes* being preyed upon by *N. maura* in a temporary pond near Aznalcóllar (Seville Province, Spain, 37º31'N, 6º16'W; 130 m elev.). The middle anterior part of the toad's body was inside the snake's mouth, and only its stomach and legs were visible. The snake was captured and the toad (SVL 79.5 mm, head width 29.5 mm, right hind leg length 92 mm, mass 41.5 g) was photographed and released alive. Injuries were observed on the body of the toad; three on the ventral side (with two apparent bite marks: Fig. 1), and two on the head immediately behind the eyes. The toad died ca. 30 min after capture. We estimated the age of the female (five years old) by skeletochronology (Hemelaar 1998. J. Herpetol. 22:369–388).

The *P. cultripes* (ID AZN2) was deposited in the Estación Biológica de Doñana (CSIC), Seville Province, Spain. We thank the Consejería de Medio Ambiente de la Junta de Andalucía and the Reserva Biológica de Doñana, for providing the corresponding permits and facilities.

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PHYSALAEMUS PUSTULOSUS (Tungara Frog). **DISPERSAL.** *Physalaemus pustulosus* is widely distributed along the isthmus of Central America and northern South America through northwestern Venezuela (Ryan 1985. The Tungara Frog: A Study in Sexual Selection and Communication. Univ. Chicago Press, Chicago), and occurs as two disjunct populations on the northern and southern Pacific Coast of Costa Rica, with an approximately 165 km gap between them (N. J. Scott, pers. comm.; Savage 2002. The Amphibians and Reptiles and Costa Rica: a Herpetofauna Between Two Continents, Between Two Seas. Univ. Chicago Press, Chicago). The northern population occurs in the Tropical Dry Forest of Guanacaste Province and the southern population occurs in the Tropical Moist Forest of the Golfo Dulce region (Holdridge 1967. Life Zone Ecology. Tropical Science Center, San Jose, Costa Rica). The northern population is contiguous with the species' range in Nicaragua, and in the south the population is continuous into Panama and east into South America (Ryan 1985, *op. cit.*). *Physalaemus pustulosus* is a small, conspicuous species as males vocalize loudly in choruses and breed in altered and disturbed habitats including roadside ditches, puddles, ponds, and flooded agricultural fields (Rand 1983. *In* Janzen [ed.], Costa Rica Natural History, pp. 333–335. Univ. Chicago Press; Savage 2002, *op. cit.*).

The apparent Costa Rican gap in distribution has been surveyed periodically since 1964 (Savage and Scott, unpubl.; Bolaños and Chavez, unpubl.) and this species had not been recorded from 1964–2002. I surveyed the south-central Pacific Coast of Costa Rica from Dec 2000–April 2002 from Quepos to Palmar Norte,

and east to San Isidro de El General as part of a herpetological inventory. Herein I report on the expansion of the range of *P. pustulosus* into this gap along the Pacific Coast and the Valle General.

On 12 Jan 2002 I found a small chorus of ca. 5 *P. pustulosus* males calling from a flooded rice field adjacent to the Coastal Highway near Coronado (08º57'99"N, 83º26'60"W; 35 m elev.) after heavy rains. The rice field was ca. 2 ha in size, and water depth ranged from 2 cm at the shore to 0.5 m towards the center of the field, and less than 20 m from the Coastal Highway. This population is ~ 45 km N of the Golfo Dulce populations and is across the large Río Terraba. Six days later on 18 Jan 2002 I found 3 puddles along the Pan American Highway in San Isidro de El General (09º31'97"N, 84º46'51"W; 900 m elev.) with 1–3 male *P. pustulosus* calling. The first puddle was 500 m, the second 1.5 km, and the third 4 km south of San Isidro on the southbound side of the Pan American Highway. There is little forest left in the valley but it is in the Premontane Moist forest. I had surveyed these areas bimonthly from Dec 2000–April 2002 and it was not until Jan 2002 that I encountered this species.

Two major highways, the Pan American Highway and the Coastal Highway, connect this region to the Golfo Dulce and Panama. I suggest that *P. pustulosus* is expanding its range northward in southwestern Costa Rica along trucking routes, possibly as stowaways on commercial trucks shipping agricultural or forest products from the Golfo Dulce region or Panama where this species is known to occur. Savage (2002, *op. cit.*) also reports a "new" population in Siquirres in the Limón Province providing evidence that this species is also invading on the Caribbean versant. Future monitoring along the Coastal Highway north to Quepos may validate my hypothesis that *P. pustulosus* is moving north along trucking routes. It is possible that genetic markers could be used to identify where these "new" populations of *P. pustulosus* originated and the speed at which the species is expanding its range.

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PROCERATOPHRYS AVELINOI (Cow Frog). **ADVERTISEMENT CALL**. *Proceratophrys avelinoi* was recently described (Barrio and Barrio 1993. Amphibia-Reptilia 14:13–18) and its advertisement call was described by Kwet and Baldo (2003. Amphibia-Reptilia 24:104–107), who classified *P. avelinoi* as rare. Ecological information on advertisement call and reproductive site and seasonality of this species remain little known. Herein I present information on advertisement call and reproduction.

Surveys of calling male *P. avelinoi* were conducted from Sept 2003 to Dec 2004 in Brazil, Paraná state, municipality of São João do Triunfo (25º34'18"S; 50º05'56"W), 780 m elev.. Sites were surveyed two days each month in two fountainheads in Araucaria Forest and two in plantation fields; all sites were ca. 10 m^2. During each visit information was collected on seasonal, daily, and spatial patterns of vocalization and reproduction.

In the Araucaria Forest, *P. avelinoi* could be heard calling all day between September and February. In plantation fields there was only one record of a single male in October 2003. No more than six individuals were heard in the same fountainhead (1–6, N = 36). Individuals were recorded and collected on 25 Oct 2003 by A M X Lima and placed at the Instituto de Pesquisas em Cananéia, Campinas, state of São Paulo (MIPEC 0001; MIPEC 0002). For individuals recorded (N = 7) on 25–26 Oct 2003 (air temp 11–24ºC; water temp 16.5–22ºC), I observed differences in call duration (868–1184 ms at this locality vs. 220–754 ms reported by Kwet and Baldo 2003, *op. cit.*), although there were no differences between SVL, pulse rate, number of pulses/call, or dominant frequency. Distance between calling males was 52–128 cm (N = 26) and no contact interactions were observed. Call site selection was consistent (N = 63), always in the water, and often under or above dead leaves. A mark-recapture effort (toe clipping) was conducted in Sept (N = 11) and Oct (N = 8) 2004, although no individuals were recaptured. Tadpoles were found from October–February in the forest.

The patterns of vocalization, distribution, and tadpole occurrence suggest the species has low density, open populations, with a variable length of advertisement call, and an extended reproductive season (six months) coinciding with the wet season. Although *P. avelinoi* can be found in fountainheads in open areas, reproduction is sensitive to deforestation.

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PROCERATOPHRYS MELANOPOGON (NCN). **REPRODUCTION.** *Proceratophrys melanopogon* is a little known species of ceratophryine leptodactylid that inhabits the forest floor leaf litter in Atlantic Rainforest areas of southeastern Brazil (Izecksohn et al. 1998. Rev. Univ. Rural, Sér. Ciênc. Vida 20:37–54). Males of this species vocalize near small bodies of water, and tadpoles develop in lentic water at the edges of permanent streams (Izecksohn and Peixoto 1996. Rev. Univ. Rural, Sér. Ciênc. Vida 18:105–107). Little else is known of the biology of this species, which was removed from the synonymy of the morphologically similar *P. appendiculata* (Heyer et al. 1990. Arq. Zool., São Paulo 31:318). On 16 Nov 2005, at 1845 h, a pair of *P. melanopogon* in were collected in axillary amplexus in an area of montane rainforest (22º21'38.5"S, 44º34'14.6"W; 1360 m elev.) located within the Área de Preservação Ambiental (APA) da Serra da Mantiqueira, in Resende municipality, state of Rio de Janeiro, Brazil. The pair (female: SVL 47.6 mm, preserved mass 11.7 g; male: SVL 34.7 mm, preserved mass 4.4 g) was kept in a plastic bag containing a small amount of water and some leaves. The following morning, the female had laid 664 eggs. Upon dissecting the female, we found an additional 78 eggs, indicating that all eggs were not laid at spawning. The frogs were deposited in the Museu Nacional, Rio de Janeiro (MNRJ 40711, male; MNRJ 40712, female).

The total number of eggs (742) reported for the female *P. melanopogon* is within the range (729–946; N = 3) reported by

Boquimpani-Freitas et al. (2002. J. Herpetol. 36:318–322) for the closely-related species *P. appendiculata*. We know of no other published information on fecundity for members of the genus *Proceratophrys*.

We thank Eugênio Izecksohn and Gustavo M. Prado for the identification of the frogs. The Center for Biodiversity Conservation (CCB) of the Conservation International do Brasil and the Conselho Nacional de Desenvolvimento Científico e Tecnológico – CNPq provided financial support for fieldwork at the APA da Serra da Mantiqueira.

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PSEUDACRIS REGILLA (Pacific Treefrog). **DEATH FEIGNING**. Anurans commonly employ death feigning (Edmunds 1974. Defense in Animals. Longman, New York, 357 pp.; Pough et al. 1998. Herpetology. Prentice-Hall, Inc. Upper Saddle River, New Jersey. 579 pp.) as an anti-predatory strategy (Zamprogno et al. 1998. Herpetol. Rev. 29:96–97; McCallum et al. 2003. Herpetol. Rev. 34:54–55; Carneiro and Rocha 2005. Herpetol. Rev. 36:301), although this behavior has not been documented in *Pseudacris regilla*. Herein, I report two instances of death feigning in *P. regilla*, a hylid common along the Pacific Coast of USA.

At 1515 h on 7 Aug 2006, an adult *P. regilla* (SVL 38.5 mm, 5 g) was captured underneath a metal grate (34°25'11"N, 119°39'57"W, WGS 84; 233 m elev.) at the Santa Barbara Zoological Gardens, Santa Barbara Co., California. While being handled, the frog abruptly tucked all four limbs in close to the abdomen while lying on its dorsum. I placed the frog onto a table, and the frog remained motionless in this position for ca. 20 seconds. I then turned the frog right side up so that it was sitting on its ventral side. It quickly became alert and active, and attempted to flee. The frog was taken back to the site of capture and released.

At 0900 h on 13 Aug 2006, I captured a smaller adult *P. regilla* (SVL 34.5 mm, 4 g) in the same location. Upon handling, this individual exhibited death-feigning behavior similar to the individual captured six days prior. With all limbs pulled tightly into and underneath the abdomen and its snout tucked tightly into its body, the frog became very rigid. I placed the frog on a table and it remained on its dorsum for ca. 5 min while I photographed it. Afterwards, I turned the frog over onto its abdomen. The frog continued to feign death, remaining motionless with the snout terminus tilted downwards into the body and all four limbs tucked tightly underneath for ca. 20 sec. The frog then raised its head, became alert, and attempted to escape. This individual was also released at the site of capture. To my knowledge, this note represents the first reported case of death feigning in *P. regilla*.

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RANA AURORA (Northern Red-legged Frog). **MOVEMENT**. The spatially finite nature of movement studies often imposes the cost-linked restriction that population-level and maximum movement distances will be underestimated (Barrowclough 1978. Bird Banding 49:333–341). Such underestimation, confirmed using molecular methods (e.g., Sumner et al. 2001. Mol. Ecol. 10:1917–1927), may be highest among species with the potential to move the longest distances (i.e., >1 km), since the search area for even a simple radial model increases as no less than the square of the distance, with variation depending on local topography. Based on our previous report of seasonal movement distances up to 2.4 km (Hayes et al. 2001. Herpetol. Rev. 32:35–36), *R. aurora* (*fide* Shaffer et al. 2004. Mol. Ecol. 13:2667–2677) represents an extreme example of this problem. Here, we provide seasonal movement distances for *R. aurora* which much exceed those of our previous report.

Our observations were made during a habitat study of *R. aurora* within the Squaw Flat Research Natural Area (Umpqua National Forest) in the South Umpqua basin, Oregon, USA; a site description is provided elsewhere (Hayes et al., *op. cit.*). Over the interval of May–July 2002, during ca. monthly surveys of the riparian margin of Squaw Creek, we recaptured four adult *R. aurora* at straight-line distances of 4.8, 4.2, 3.5, and 3.7 km from the known breeding pond. These frogs were, respectively, three adult females (102 mm SVL, 84 g; 97 mm SVL, 61 g; 89 mm SVL, 53 g), and an adult male (79 mm SVL, 35 g). All four had been previously marked using PIT tags and had been recaptured or first marked during January–February 2002 surveys of the breeding pond. A fifth frog (also an adult female; 104 mm SVL, 82 g), captured 4.5 km from the breeding pond, may also represent a recapture. However, some uncertainty exists regarding the capture status of this frog, as it was marked with a single toe clip rather than a PIT tag.

The maximum distance reported here doubles that of our earlier report. Longer movements have been reported for other North American ranid frogs, but those consist of recaptures of dispersing juveniles (e.g., Seburn et al. 1997. *In* D. M. Green [ed.], Amphibians in Decline: Canadian Studies of a Global Problem, pp. 64–72. Herpetol. Cons. 1; Funk et al. 2005. Biol. Lett. 1:13–16), between-year recaptures of adults or subadults (e.g., Dole 1971. Copeia 1971:221-228; Reaser and Dexter 1996. Herpetol. Rev. 27:195–196), or annual movement distances estimated from the colonization of habitat in areas where species had been recently introduced (Platz et al. 1990. Copeia 1990:324–333; see Smith and Green 2005. Ecography 28:110–128 for details). The key difference between these reports and ours is that we report adult frog movements within a season. Coupled with our previous report (Hayes et al., *op. cit*), this pattern of movement appears annual, but whether the same individuals move in the same general pattern each year remains unclear. Movement distances for three (and perhaps four) of the frogs we report here match or exceed the seasonal maxima reported for adults of other North American ranid taxa (see especially Bugler et al. 2003. Biol. Cons. 110:85–95; Rathbun and Schneider 2001. Wildl. Soc. Bull. 29:1300–1303; and Smith and Green, *op. cit.*). Although the frogs described here may be approaching the maximum seasonal movement distance for *R. aurora*, Barrowclough's missive (*op. cit.*) about movement distance underestimation remains. Lastly, we recaptured few individuals more than once, so our low within-season recapture reso-

lution may also contribute to underestimating the movement distances of the individuals upon which we report.

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RANA BOYLII (Foothill Yellow-legged Frog). **CANNIBALISM AND PREDATION**. Cannibalism has been reported in 12 of 21 families of anurans, including ranids (Crump 1992. *In* Elgar and Crespi [eds], Cannibalism: Evolution Among Diverse Taxa, pp. 256–276. Oxford University Press, Oxford). *Rana boylii* consume a wide variety of invertebrate prey including insects, spiders, centipedes, and water snails, however cannibalism has not been reported (Ashton et al. 1998. Foothill yellow-legged frog (*Rana boylii*) natural history. USDA Forest Service, Pacific Southwest Research Field Station, Arcata, California). Herein, we report two observations of cannibalism in *R. boylii*.

On 8 Sept 2004 at 1300 h an adult *R. boylii* (ca. 50 mm SUL) was observed in a seep 3.0 m from the bank of the South Fork Trinity River near Surprise Creek, Humboldt Co., California (UTM 0452944E; 4515190N; NAD 27 Zone 10). The frog had captured a recently metamorphosed juvenile (ca. 23 mm SUL) conspecific. After the photograph was taken (Fig. 1), the frogs were not captured and were left undisturbed. On 27 Sept 2005 at 1143 h, an adult *Thamnophis couchii* (field no. KDW 243; 46.5 cm SVL; 63.5 cm TL; 39.0 g) was observed along the left bank of Silver Creek, ca. 315 m upstream of the confluence with the South Fork American River (UTM 0709458E; 4296166N; NAD 27 Zone 10;

FIG. 1. Adult *Rana boylii* consuming a juvenile conspecific (Humboldt County, California).

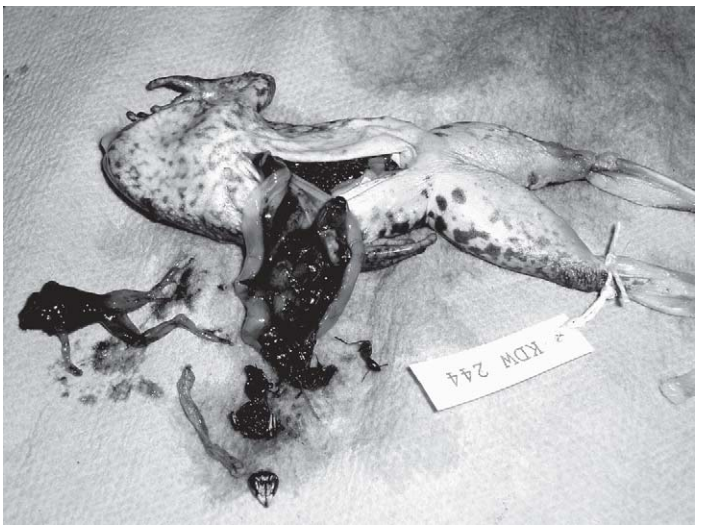

FIG. 2. Stomach contents of CAS 233406 included a juvenile conspecific (El Dorado County, California).

ca. 634 m elev.) within a large aggregation of hibernating ladybird beetles (*Hippodamia convergens*). The snake was noticeably distended and upon palpation, regurgitated an adult female *R. boylii* (California Academy of Sciences [CAS] 233406; 60.0 mm SUL; 26.0 g), which was swallowed legs-first. On 29 Sept 2005, stomach contents of CAS 233406 were examined and included: 6 ladybird beetles (*H. convergens*), one vespid wasp, one tetrigid grasshopper, one spider, one moth, one geometrid caterpillar, one mycetophilid gnat, four *Campanotus* ants, and a juvenile *R. boylii* (17 mm SUL; ca. 1.0 g; Fig. 2).

Both observations of cannibalism in *R. boylii* occurred in September, a time when recently-metamorphosed frogs are relatively abundant, and could constitute a significant proportion of the available prey base. On the North Fork Feather River (Butte Co., California) adult female *R. boylii* lose an average 31% of their body mass following oviposition (range 8–46%; N = 52; GANDA, unpubl. data) and the consumption of juvenile conspecifics may help recoup some of this mass in the fall. Given the taxonomic variation of prey found in the Silver Creek frog and that numerous metamorphs were in the immediate vicinity of both observations, cannibalism in *R. boylii* is likely indiscriminate, where juvenile frogs are of appropriate size and elicit a feeding response from adults.

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RANA CASCADAE (Cascades Frog). **PREDATION**. Because predator/prey relationships are a key factor in food web interac-

FIG. 1. Dragonfly naiad (*Aeshna* sp.) eating a metamorphosing Cascades Frog in the Trinity Alps Wilderness, California. The frog was alive at the time this photograph was taken.

tions, it is important to identify all the species and their role in the ecosystem. Documented invertebrate predators for larval *Rana cascadae* include dragonfly naiads (Jones et al. [eds.] 2005. Amphibians of the Pacific Northwest. Seattle Audubon Society, Seattle, Washington. 227 pp.), beetles (Dytiscidae), and giant water bugs (Belostomatidae) (Peterson and Blaustein 1992. Copeia 1992:577–584). The only documented invertebrate predators of post-metamorphic *R. cascadae* are giant water bugs (Nauman and Dettlaff 1999. Herpetol. Rev. 30:93).

On 10 Oct 2004 at ca. 1500 h, we observed a dragonfly (*Aeshna* sp.) naiad (32 mm TL) consuming a metamorphosing *R. cascadae* (17.5 mm SUL, Gosner Stage 45) in a small spring-fed meadow pond (6.8 m^2, 0.31 m deep) located in the Trinity Alps Wilderness, Trinity Co., California USA (UTM Zone 10, 509661E 4530014N; 2118 m). The naiad's lower mandibles were fastened onto the frog's right hindlimb and its appendages were grasping the frog's body (Fig. 1). The frog was alive and attempting to escape; however its foot, tibia/fibula, and most of the femur of the right hindlimb had been chewed off and presumably eaten. We returned to the pond at ca. 1600 and found the frog dead, half-consumed and floating in the pond. The frog's left forelimb and right hindlimb were completely amputated, a significant portion of its left lateral tissue was removed and the internals were exposed.

This observation extends the reported predation capabilities of naiad dragonflies from tadpoles to metamorphosing *R. cascada*e. There are at least 18 species of Odonata that occur within the Trinity Alps Wilderness area (Pope, unpubl. data). This local diversity suggests that Odonata may be an important natural predator of *R. cascadae* larvae and newly metamorphosed individuals in this area.

Ongoing research on *R. cascadae* ecology has been supported in part by the US Forest Service, California Department of Fish and Game, National Fish and Wildlife Foundation, and Declining Amphibian Populations Task Force.

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RANA SPHENOCEPHALA UTRICULARIA (Southern Leopard Frog). **ECTOPARASITES.** Chiggers (Acari: Leeuwenhoekiidae and Trombiculidae) are known to infest a variety of reptile and amphibian species worldwide (Wharton and Fuller 1952. A Manual of the Chiggers. Mere. Entomol. Soc. Washington 4:1–185), yet their occurrence is often overlooked and underreported in the literature. Larvae of the genus *Hannemania* (Leeuwenhoekiidae) parasitize a variety of amphibian species including salamanders, toads, spadefoot toads, tree frogs, and rain frogs (Duszynski and Jones 1973. Int. J. Parasit. 3[4]:531–532; Loomis 1956. Univ. Kansas Sci. Bull. 37, II[19]:1195–1443).

The chigger *Hannemania dunni* was first described as a parasite on the Dusky Salamander (*Desmognathus fuscus*, Sambon 1928. Ann. Trop. Med. Parasitol. 22:67–132). Within Alabama, infestations have only been reported on Southern Two-lined Salamanders (*Eurycea bislineata* = *E. cirrigera*) (Hribar and Tyler 1989. Melsheimer Entomol. Ser. No. 37:28). We present here the first report of *H. dunni* in the Southern Leopard Frog (*Rana sphenocephala utricularia*) and provide the second documented occurrence of this parasite in Alabama.

Three adult Southern Leopard Frogs were encountered under a section of log on a sandbar thickly vegetated with Water Willow (*Justicia americana*) in Big Canoe Creek near Ashville, St. Clair County, Alabama, USA (33°50'25"N, 86°16'11"W WGS84/NAD83) on 14 Oct 2005. Two of the frogs were captured and upon close examination numerous orange subcutaneous lesions were apparent on the ventral surface, especially the ventral and posterior aspects of the thighs and the interdigital webbing. These frogs were collected and transported back to Auburn University.

The frogs were euthanized on 17 Oct 2005 with benzocaine. The frogs had 16 and 29 lesions on their ventral surfaces. Eleven mites (two from the first host and nine from the second) were removed from these lesions using fine-tipped forceps. The frogs were formalin fixed and deposited in the Auburn University Museum of Natural History Collection (AUM 37280–37281). Mites were cleared in Andre's Fluid (1/3 glacial acetic acid, 1/3 chloral hydrate, and 1/3 water), and preserved by slide mounting in Hoyer's Medium (50 ml distilled water, 30 g gum Arabic, 200 g chloral hydrate, 20 ml glycerin; Krantz 1978. A Manual of Aracology. OSU Bookstores Inc., Corvallis, Oregon 335 pp.). They were identified to genus using Brennan and Goff (1977. J. Parasitol. 63:554–566) and to species using Loomis (1956, *op. cit.*) by examination under a light microscope. Voucher specimens of the *Hannemania dunni* are deposited in the Florida State Collection of Arthropods Gainesville (E2006-881-1).

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RANA SYLVATICA (Wood Frog). **PREDATION**. Much information exists on the role of predation in the larval ecology of *Rana sylvatica* (Wellborn et al. 1996. Ann. Rev. Ecol. Syst. 27:337–363; Wilbur 1972. Ecology 53:3–21), but little data exist on specific predators of adult Wood Frogs (Muths et al. 2005. http://

www.fs.fed.us/r2/projects/scp/assessments/woodfrog.pdf). During Spring and Summer 2003 we radiotracked 43 Wood Frogs in southern Maine for an average of 25.6 days each. Wood Frogs were tracked using 0.9 g external transmitters attached with a soft rubber belt (Baldwin et al. 2006. J. Herpetol. 40:443–454). During this time, 15 frog remains were found, and 12 deaths (27.9% of tracked frogs) were attributed to vertebrate predation. Of these, three were confirmed Common Gartersnake (*Thamnophis sirtalis*) predation, and three were suspected to be raptor predation. An additional six events showed signs of predation or consumption but could not be traced to a specific predator. All snake predation events occurred during the post-breeding, springtime emigration period (3 May; 18 June; 23 June), while raptor predation overlapped temporally and continued into midsummer (7 June; 19 June; 14 July).

Garter snake predation occurred in or on the margins of breeding pools and neighboring forested wetlands. One snake carrying a frog and transmitter was captured while it was swimming in a vernal pool within 2 m of the last location of the frog (previous day). Another was tracked to a sphagnum hummock in a large forested wetland where the Wood Frog had migrated following breeding. The third garter snake was tracked to an upland refuge under a log and dry leaves, 13 m from the pool margin where the Wood Frog was located 4 days earlier. Two of the snakes were held in captivity and excreted the Wood Frog transmitters within 1 week of capture.

Raptor predation was inferred from semiarboreal locations and conditions of the carcasses. In one instance the transmitter was recovered from an oak tree (*Quercus* sp.), 2 m from the ground, adjacent to a mossy stream bank in which the frog had been located the previous day. The carcass had been largely stripped of flesh, leaving the belt, transmitter, and bones. A second carcass was found on top of a *Tsuga canadensis* snag, 2.3 m from the ground, inside a forested wetland and 21 m from the previous location. The carcass was relatively fresh with only the head consumed. The third attributed to a raptor was found 4 m from its previous location on top of a sphagnum hummock in a forested wetland, with sharp incisions near the base of the hind legs and a portion of its skull removed. The 6 events that were not attributed to a specific predator occurred terrestrially, and involved crushing-type wounds suggestive of those caused by a mammal (e.g., fox, skunk, raccoon).

Vernal pools are threatened ecosystems, widely recognized for their value as important amphibian breeding habitat (Comer et al. 2005. http://cheetah.natureserve.org/library/isolated_wetlands_05/isolated_wetlands.pdf). Our observations suggest that vernal pools also play a significant role in the local ecology of terrestrial forest food webs.

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RANA SYLVATICA (Wood Frog). **PREDATION**. I observed the predation of an adult *Rana sylvatica* by a giant water bug (*Lethocerus* sp.) in a vernal pool in Shapleigh, Maine, USA (43°30'32.3"N, 70°46'33.4"W). On 15 April 2006, in a small (<0.1 ha) vernal pool containing Red Maple (*Acer rubrum*) hummocks, calls emitted on various pitches attracted my attention to a Wood Frog attempting to haul itself out of the water onto a small floating log, while being clasped at the waist level by a giant water bug. The giant water bug's rostrum appeared to be inserted near the base of the spine. During a period of ca. 3 min., the frog was partly pulled back in the water, its upper body gradually tilted forward until the snout was just under the surface. Over this period the calls became progressively shorter in duration and volume, until the frog was flat on the water surface, motionless and silent.

Giant water bugs have been observed preying on adults of two species of anurans, *Rana cascadae* (Nauman and Dettlaff 1999. Herpetol. Rev. 30:93) and *Bufo terrestris* (McCoy 2003. Herpetol. Rev. 34:135–136). This observation provides evidence for another interaction, part of the complex ecology of vernal pools.

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RANA YAVAPAIENSIS (Lowland Leopard Frog). **LARVAL CANNIBALISM.** *Rana yavapaiensis* is known to oviposit primarily in late winter-spring, with a smaller pulse of oviposition in early fall (Sartorius and Rosen 2000. Southwest. Nat. 45:267–273). Large tadpoles sometimes overwinter (Collins and Lewis 1979. Southwest. Nat. 24:371–373). These observations occurred during winter 2005–06 in a semi-natural, urban backyard pond (3 × 4 m, 0.4 m deep), which had a self-sustaining frog population derived from three southeastern Arizona populations. In monitoring the fourth of eight egg masses deposited in February–early March 2006, I noted 5–6 large tadpoles (5.5–7.5 cm LOA) from a single September 2005 clutch active around and under the egg mass, which had just begun to hatch on 5 March. On 7 March, closer inspection of the fifth egg mass, which was estimated to be at Gosner stages 16–19 and predicted to be 50% hatched on 9 March, revealed 12–18 large tadpoles (of an estimated 48+ present in the pond) active under, around, and on the egg mass. Tadpoles were swimming lazily, pushing into the mass with actively moving mouthparts and, in at least one case observed to swallow a dislodged embryo. Water was 11 cm deep at the mass, which was about 8 cm diameter, temperature was 17ºC (range 13–20ºC over 24 h). The mass contained an estimated 1100 eggs based on previous counts of hatchlings in clutches of similar size; 30 h later there were only 18 developing ova remaining, the egg mass was reduced in size but not dissociating as expected post-hatching, and no hatchlings were observed near the egg mass site, as would normally be seen. Other egg masses appeared to be less affected in proportion to the depth of water column below them, with hatchlings seen around all of them, and there was less activity of large tadpoles near them. However, the eighth and deepest-water egg mass, which hatched last (15 March), attracted about 15 large tadpoles on the bottom where a cone of detaching hatchlings from

it would likely fall. Five of these tadpoles transferred to a screened-in observation tray with 10 hatchlings apparently consumed four hatchlings in a 24 h period.

The frog and tadpole densities involved here are similar to the highest Lowland Leopard Frog abundances I have observed in Arizona and Sonora during 1983–2005, and the only other vertebrate in the pond is the Gila Topminnow (*Poeciliopsis occidentalis*). An accumulating literature on oophagy, larvivory, and cannibalism in tadpoles (Gunzberger and Travis 2005. J. Herpetol. 39:457–571), and their occurrence in species with generalized tadpoles such as *R. yavapaiensis* and the American Bullfrog (*R. catesbeiana*; Kiesecker and Blaustein 1997. Ecology 78:1752–1760) may support suggestions in McDiarmid and Altig (1999. Tadpoles: The Biology of Amphibian Larvae, pp. 218, 246) that these might be widespread and ecologically important phenomena.

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SCINAX FUSCOVARIUS (Snouted Treefrog). **DEATH FEIGNING**. Posturing is often important in defense (Ducey and Brodie 1991. Herpetologica 47:89–95). Death feigning or thanatosis is widespread in amphibians (Duellman and Trueb 1994. Biology of Amphibians. John Hopkins Univ. Press, Baltimore and London), mainly among frogs (Azevedo-Ramos 1995.Rev. Bras. Biol. 55:45–47). *Scinax fuscovarius* occurs in south, southern, and central Brazil as well as in the eastern regions of Argentina, Paraguay, and Bolivia (Kwet and Di-bernardo 1999. Amphibians. Edipucrs, Porto Alegre). On 4 Jan 2006 at 1839 h in Poxoréu municipality (54º24'W; 15º51'S), Mato Grosso state, Brazil, we found an adult male *S. fuscovarius* (46 mm SVL) resting ca. 0.5 m above the ground on a shrub. When we approached, the frog jumped to the ground and remained motionless with the head tipped downward and eyes closed for two minutes. When DJR captured the treefrog, it jumped from his hand and fell to the ground in a death feigning position with the dorsum on the ground and the limbs close to the body. This behavior protects vulnerable parts of the body, and sometimes creates an impression of bigger size. This is the first report of death feigning in *S. fuscovarius*.

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SCINAX TRAPICHEIROI (NCN). **PREDATION**. Although most adult viperid snakes consume predominantly warm-blooded prey, juvenile viperids commonly prey on frogs (Duellman and Trueb 1986. Biology of Amphibians. McGraw-Hill. New York. 670 pp.; Martins et al. 2002. *In* Campbell and Brodie [eds.], Biology of the Vipers, pp. 307–328. Eagle Mountain Publishing, Utah). Some invertebrates are also important predators of frogs, although crustaceans have rarely been reported to prey on such animals (Duellman and Trueb 1986, *op. cit.*; Toledo 2005. Herpetol. Rev. 36:395–400). Here we describe two cases of predation on the treefrog *Scinax trapicheiroi* in an Atlantic rainforest area—one by the viperid snake *Bothrops jararaca* and the other by the freshwater shrimp *Macrobrachium carcinus*. Both predators, and their prey, were deposited at the Museu Nacional, Rio de Janeiro (MNRJ).

On 29 Oct 2004, at night, during fieldwork at a creek near Vila Dois Rios (23°12'S, 44°13'W), on Ilha Grande island, State of Rio de Janeiro, Brazil, we collected a juvenile Jararaca Lancehead (*Bothrops jararaca;* MNRJ 12663) (SVL 232.3 mm; tail 50.6 mm), that was resting on a branch 1.88 m above the ground. It was transferred to a cloth bag where it regurgitated a partly digested adult male *S. trapicheiroi*. *Bothrops jararaca* has been reported to prey on other hylids (*Scinax fuscovarius*, *Hyla leucopygia*, and *H. prasina*; Sazima 1992. *In* Campbell and Brodie [eds.], Biology of the Pitvipers, pp. 199–216. Selva Press, Tyler, Texas), but this is the first report of *S. trapicheiroi* as prey.

During Feb 2005, at night, during an anuran mark-recapture study at the same creek, after we released an adult male *S. trapicheiroi* on a rock, it jumped into the water, being promptly captured by the freshwater shrimp (*Macrobrachium carcinus*; body size 83.3 mm, MNRJ 19524) which started to consume it. Before the shrimp had finished eating, we collected and placed it (and its prey) in a plastic bag with water. Inside the bag, the shrimp finished consuming the frog. *Scinax trapicheiroi* are known to release their eggs in lentic water (Rico et al. 2004. Amphibia-Reptilia 25:277–286) and thus predation by aquatic invertebrates might be relatively common.

This note suggests that *Bothrops jararaca* and freshwater shrimp might be important sources of mortality for *S. trapicheiroi* at Ilha Grande, because of their abundance in the area.

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SPEA HAMMONDII (Western Spadefoot). **REPRODUCTIVE PATTERN.** It is known that breeding congregations of *Spea hammondii* quickly assemble in response to heavy rainfall that triggers emergence, saturates the soil, and fills ephemeral breeding pools (Storer 1925. Univ. California Publ. Zool. 27:153–163; Morey 2005. *In* Lannoo [ed.], Amphibian Declines: The Conservation Status of United States Species, pp. 514–517. Univ. California Press, Berkeley, California). Breeding records are strongly correlated with regional rainfall patterns; consequently, breeding generally occurs from January through May (Stebbins 2003. Western Reptiles and Amphibians, 3rd ed. Houghton Mifflin Co., Boston, Massachusetts; Storer 1925, *op. cit.*) with a peak in activity, most years, during the months of February and March (Brown 1976. Contrib. Sci., Los Angeles Co. Mus. Nat. Hist. 286:11; Morey 2005, *op. cit.*).

On 12 Aug 2005, *S. hammondii* larvae (N = 30) (4–10 mm TL)

were collected from an excavated unshaded temporary pond (ca. 7 m × 11 m, 0.5 m deep) located within a Redshank Chaparral plant community (*Adenostoma fasciculatum, A. sparsifolium, Arctostaphylos* spp., *Ceanothus* spp., *Quercus dumosa, Rhus ovata*) in Tierra Del Sol, San Diego Co., California, USA (T17S, R6E, Sec. 35; ca. 1160 m elev.). Because of the size range of the larvae, we inferred that breeding likely took place during or shortly after a storm on 1 Aug 2005 that resulted in 1.4 cm of rainfall. A series of preserved larvae (N = 14) was deposited in the herpetological collection of the California Academy of Science (CAS 233766).

Opportunistic breeding as a reproductive pattern is defined by the ability to breed throughout the year and often is a strategy used by species from arid regions characterized by uncertain rainfall, with heavy rainfall being the most common cue to initiate reproductive behavior (Duellman and Trueb 1986. The Biology of Amphibians. John Hopkins Univ. Press, Baltimore, Maryland; Long 1989. J. Herpetol. 23:176–179). Because *S. hammondii* has the ability to breed shortly after emerging from aestivation, and has been documented to breed in at least 11 months of the year (Brown 1976, *op. cit.*; Ervin et al. 2005. Herpetol. Rev. 36:309–310; this report), the species clearly demonstrates the characteristics of an opportunistic breeder. Based on this new information, *S. hammondii* should be recognized as a species that generally breeds from January through May, as well as being an opportunistic breeder (*sensu stricto*) that is physiologically capable of breeding any time of the year given favorable environmental conditions.

Our thanks to J. Vindum of California Academy of Sciences for providing museum numbers, and to Roland Sosa for making useful comments on this manuscript. *Spea hammondii* larvae were collected under California Dept. Fish and Game permit number 5399 issued to ELE.

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SPEA HAMMONDII (Western Spadefoot). **PREDATION.** *Spea hammondii* is an aquatic breeding terrestrial anuran. Although highly nocturnal, occasionally it remains active into daylight hours while in amplexus (Storer 1925. Univ. California Publ. Zool. 27:153–163; E. Ervin, pers. obs.).

An increase in predation risk has been demonstrated for aquatic breeding terrestrial species during breeding periods because of a combination of factors, including increased density, increased activity levels, and spawning pairs occupying aquatic sites into daylight hours (Beebee 1996. Conservation and Ecology of Amphibians, Chapman and Hall, UK; Stebbins and Cohen 1995. The Natural History of Amphibians. Princeton Univ. Press, Princeton, New Jersey).

Amphibians, reptiles, wading and passerine birds, and mammals are known to prey on transformed individual *Spea* (see individual species accounts in Lannoo [ed.] 2005. Amphibian Declines, The Conservation Status of United States Species. Univ. California Press, Berkeley, California). The only cases of predation on transformed *S. hammondii* individuals we are aware of are the Two-striped Gartersnake, *Thamnophis hammondii* (Ervin and Fisher 2001. Herpetol. Rev. 32:265–266) and the introduced American Bullfrog, *Rana catesbeiana* (Hayes and Warner 1985. Herpetol. Rev. 16:109; Morey and Guinn 1992. *In* Williams et al. [eds.], Endangered and Sensitive Species of the San Joaquin Valley, California, pp. 149–158. Wildlife Soc., Western Section, Sacramento, California; Balfour and Ranlett 2006. Herpetol. Rev. 37:212).

Because there are no previous reports of predation on transformed *S. hammondii* by any bird or mammal species the following accounts are notable. On 27 Sept 1997 (1250 h), JPP discovered the remains of two adult *S. hammondii*; two heads with intact skin (1F:1M), on the bank of an ephemeral pool (10.5 m × 15.25 m, 70 cm deep) in the headwaters of Temecula Creek, Dodge Valley, San Diego Co., California (33.362°N, 117.756°W, 955 m elev.). The only fresh animal sign left by the predator were raccoon tracks at the place the remains were observed.

On 27 April 1998 (ca. 1600 h), DSJ observed three desiccated adult (1F:2M) *S. hammondii* at the entrance of a burrow occupied by a pair of Burrowing Owls (*Athene cunicularia*) at Naval Air Station Lemoore, near Lemoore, Kings Co., California (36.3565°N, 119.9335°W, 66.4 m elev.). The carcasses were wholly intact; mouths stretched open, less their fleshy tongues. In addition to a single Burrowing Owl observed active at the burrow, owl pellets were present at the top of the mound located adjacent to the burrow.

On 24 Feb 2004 (1505 h), AKG and ELE collected the remains of two adult *S. hammondii* from the bank of an ephemeral pool (18 m × 5 m, 25 cm deep) in Escondido, San Diego Co., California (33.12005°N, 117.11745°W, 237 m elev.). The remains were found within an area of ca. $1m^2$. The disarticulated remains consisted of two skulls with intact skin (1F:1M), two complete stomachs, two fat body clusters, as well as sections and pieces of large and small intestines, fat body clusters, livers, and oviducts containing ova. Because of the lack of direct observation and no fresh animal sign found, it is unclear what preyed on the adult *S. hammondii*. In this observation, we rule out raptors as the predator for the following reasons: Typical raptor predatory behavior, based on raptor predation sequence observations, including those based on adult spadefoots, report that the raptors often fly to a more secure place after the capture of their prey (Mills 1977. Wilson Bull. 89[4]:623; Sexton and Marion 1974. Wilson Bull. 86[2]:167–168). In addition, we are unaware of discussions that have identified diagnostic physical characteristics that would enable us to reliably determine whether the predator was either avian or mammalian by reexamining the physical remains (e.g., intact heads, limbs, viscera).

To our knowledge, this is the first report of avian and mammalian predation on adult *S. hammondii*. Specific details suggest that the *S. hammondii* remains collected in 1997 and 2004 were preyed on as amplexing pairs. At each of the sites, individuals collected consisted of one male and one female (determined by degree and pattern of vocal sac pigmentation), the male and female remains were generally found in the same area, and the pool contained *S. hammondii* egg clusters < 24 h old (pre neural folds; pre Gosner Stage 14). Consequently, our observations support the idea that aquatic breeding terrestrial anurans might be at greater risk of predation while at their breeding habitat and while engaged in amplexus.

We thank M. R. Jennings and S. R. Morey for suggestions that improved the manuscript. *Spea hammondii* specimens were sal-

vaged under California Department of Fish and Game collecting permit issued to ELE and AKG. Remains were preserved in 70% ethanol and are retained by ELE for further study.

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STEFANIA WOODLEYI (Woodley's Treefrog). **DEFENSIVE BEHAVIOR.** Antipredator strategy and defensive behavior is widespread among anurans, the most common being crypsis, mimicry, thanatosis (death feigning), toxicity, Unken reflex, and other defensive postures (Duellman and Trueb 1994. Biology of Amphibians, The Johns Hopkins University Press, Baltimore and London, 670 pp.; Zug et al. 2001. Herpetology – An Introductory Biology of Amphibians and Reptiles, 2nd Ed., Academic Press, San Diego, California, 630 pp.). Aggressive response to a potential predator, unrelated to parental care, is less typical. This behavior includes gaping, jumping towards the potential predator with mouth wide open, sometimes with the emission of a distress call, and occasionally biting (Duellman and Trueb 1994, *op. cit.*; Fabrezi and Emerson 2003. J. Zool., Lond. 260:41–51; Myers 1966. Herpetologica 22:68–71; Veloso 1977. Herpetologica 33:434–442; Zweifel 1972. Bull. Am. Mus. Nat. Hist. 148:1–140). Most frogs exhibiting this behavior are stout-bodied and some have fang-like teeth (Fabrezi and Emerson 2003, *op. cit.*).

We collected 14 specimens of the poorly known cryptobatrachid *Stefania woodleyi* in Kaieteur National Park, west-central Guyana. *Stefania woodleyi* is endemic to the southern Pakaraima region, Guyana (Señaris and MacCulloch 2005. Bull. Biol. Soc. Washington 13:9–23), and little is known about its ecology (MacCulloch and Lathrop 2002. Herpetologica 58:327–346). One of these specimens, IRSNB 13799, a male SVL 45.8 mm, collected 25 March 2006 at 2130 h, in the vicinity of Elinkwa River in the southeastern part of the park (5°09'46"N, 59°24'01"W; 550 m elev.) displayed an aggressive defensive behavior on two occasions. When first captured, and later while being photographed, the frog suddenly inflated its lungs, opened its mouth wide and jumped toward the handler's hand while emitting a single high-pitched catlike "meow" distress call. The defensive mechanism was similar to an attempt to bite the handler's hand. The first "attack" was so surprising that the handler almost released the frog. Three other specimens from the same locality also displayed the same behavior with some variation. IRSNB 13801, a male SVL 47.3 mm collected 23 June 2006 at 2230 h only inflated its lungs and opened its mouth without jumping, emitting any distress call and/or attempting to "bite". IRSNB 13802, a female SVL 58.2 mm collected 26 June 2006 at 2130 h several times displayed the same aggressive defensive behavior as IRSNB 13799 and IRSNB 13803, a juvenile SVL 26.8 mm also displayed, but a single time only, the complete aggressive defensive behavior. This indicates that both sexes and juveniles display this defensive mechanism.

There is much intraspecific variation in defensive behaviors (Myers 1966, *op. cit.*), which may be influenced by ecological factors (Gomes et al. 2002. Copeia 2002:994–1005). Interestingly, only some of the *S. woodleyi* collected in Kaieteur National Park displayed this aggressive antipredator mechanism and all of them were collected at the same locality, in the vicinity of Elinkwa River. As far as we know, this is the first report of aggressive defensive behavior within the genus *Stefania* and within the family Cryptobatrachidae. Unlike most anuran taxa that exhibit this type of behavior, *Stefania* are gracile, and lack fang-like teeth. Specimens are deposited in the herpetological collections of the Institut Royal des Sciences Naturelles de Belgique (IRSNB), Brussels, Belgium.

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XENOPUS LAEVIS (African Clawed Frog). **PREDATION.** Observations of predation on *Xenopus laevis* by fish, birds, and otter have been documented in native and feral populations (Lobos et al. 2005. Biodivers. Conserv. 14:429–439; McCoid 1980. Bull. South. California Acad. Sci. 79[2]:82–86; Tinsley et al. 1996. *In* Tinsley and Kobel [eds.], The Biology of *Xenopus*, pp. 35–59). Virtually no information exists on predation of clawed frogs by invertebrates. Here we provide field observations of predation by crabs on adult *X. laevis* in South Africa.

We observed *X. laevis* in South Africa, Mpumalanga province (previous NE-Transvaal), Hoedspruit district, at the "Torchwood Pond" (24°25'S; 30°50'E). The pond was 65 m^2 in size, fed with crystal clear water by a perennial mountain torrent, and located on the wooded slopes of the Drakensberg Mountains at 750 m elev. The pond harbored a native population of about 80–100 *X. laevis* and ca. 20–30 river crabs, *Potamonautus* sp. (Decapoda: Potamonautidae).

On 2 Feb 1996 at 0045 h, while we were observing *Xenopus* with the aid of a flashlight, a hand-sized crab was spotted at a depth of about 60 cm, holding a female *Xenopus* (ca. 80 mm SVL) in its claws. The frog was fixed by the claws at the head and at the left hind leg and was almost unable to move. The crab was feeding using its mandibles at the frog's left lateral side, and had produced an injury about 15 mm. Small motions of the forelegs and the right hind leg of *Xenopus* indicated that it was still alive. Probably disturbed by the flashlight, the crab moved backward under the rotten leaf litter.

A similar case of predation was observed on 7 Feb 1996 at 2200 h at a depth of 40 cm. Two hand-sized crabs were observed feeding on a female *Xenopus* (ca. 70 mm SVL). One of the crabs had

grasped the head of the female, the second crab grasped one hind leg. The frog had large wounds at the eye region and at its shank, but still showed some motion. Checking the site about 10 min later, both crabs and the body of the frog had disappeared.

We never directly observed a crab catching a clawed frog successfully. But we often observed grasping movements of the crabs when frogs came close. A male (SVL 67 mm) and a female (SVL 88 mm) frog have been observed being grasped by crabs at the hind legs, but escaped. We also found two other *Xenopus*, a male (SVL 62 mm) and a female (SVL 96 mm), with wounds at the hind legs consistent with attack by crabs.

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GYMNOPHIONA

GYMNOPIS MULTIPLICATA (Purple Caecilian). **PREDATION.** The natural predators of *Gymnopis multiplicata* are relatively unknown and the diet of *Micrurus mipartitus* is assumed to be other snakes (Guyer and Donnelly 2005. Pp. 228-229 *in* Amphibians and Reptiles of La Selva, Costa Rica, and the Caribbean Slope). Here I report on predation by *M. mipartitus* on *G. multiplicata* from the La Selva Biological Station, Heredia Province, Costa Rica. On 15 Oct 2005 at 2105 h, I observed an adult *M. mipartitus* (ca. SVL 80 cm) consuming an adult *G. multiplicata* (ca. SVL 35 cm; Fig. 1). This interaction was observed on the ground adjacent to the Sendero Sura trail between 200 and 250 m elevation. To the best of my knowledge, this represents the first report of a predator for *G. multiplicata* and the second report of a prey item for *M. mipartitus*.

FIG. 1. Predation by an adult *Micrurus mipartitus* on an adult *Gymnopis multiplicata* at La Selva Biological Station, Costa Rica.

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TESTUDINES

ERETMOCHELYS IMBRICATA (Hawksbill), ***CHELONIA MYDAS*** (Green), and ***CARETTA CARETTA*** (Loggerhead) Seaturtles. **EPIZOANS**. The Columbus Crab, *Planes* sp., is a common epizoan of oceanic stage (juvenile) Loggerhead Seaturtles (*Caretta caretta*) in the southwestern Atlantic. Columbus or Swimming Crabs, including *Planes minutus*, *P. cyaneus,* and *P. marinus*, are essentially oceanic species rarely found near the coast (Davenport. 1992. J. Mar. Biol. Ass. U.K. 77:611–620), and occur on both natural and artificial floating material (Chace 1951. Proc. U.S. Nat. Mus. 101:65–103; Dellinger et al. 1997. J. Mar. Biol. Ass. U.K. 77:185-194). Columbus Crabs occurred with 83% of southwestern Atlantic juvenile Loggerheads (Carranza et al. 2004. Mar. Turtle Newsl. 102:5–7), 82% of those found off Madeira Island (Dellinger et al. 1997, *op. cit.*), and 27% from the Mediterranean (Casale et al. 2004. J. Mar. Biol. Ass. U.K. 84:1005–1006).

On the other hand, Columbus Crabs rarely are reported to associate with other sea turtle species. Columbus Crabs were scantly reported for the Olive Ridley Seaturtle, *Lepidochelys olivacea*, in Playon de Mexiquillo, Pacific coast of Mexico (Díaz et al. 1992. Publ. Soc. Herpetol. Mex. 1:19–25) and Chile (Miranda and Moreno. 2002. Rev. Biol. Mar. Oceanogr. 37:145–146), both pertaining to *P. minutus,* while off La Jolla, California, (Hubbs 1977. California Fish Game 63:263–267) and Jalisco, Mexico (Hernandez-Vazquez and Valadez-Gonzales 1998. Cienc. Mar. 24:119–125) they pertain to *P. cyaneus*. For the Hawksbill Seaturtle, *Eretmochelys imbricata*, Chace (1951, *op. cit.*) reported *P. minutus* from Rhode Island turtles and *P. cyaneus* from Baja California, while Schärer (2003. Rev. Biol. Trop. 51:87–89) reported only 3 out of 105 Hawksbills to be associated with *P. minutus* in Puerto Rico. Schärer (2003, *op. cit.*) found them associated with small turtles, and argue they were probably arriving from a pelagic habitat. For Green Seaturtles, *Chelonia mydas*, *P. cyaneus* was recorded by Crane (1937. *apud* Chace 1951, *op. cit.*) in Baja California, by Chace (1951, *op. cit.*) in Acapulco, Santa Inez Bay, Mexico, in the Galápagos Islands, by Brown and Brown (1995. *In* K.A. Bjorndal [ed.], Biology and Conservation of Sea Turtles, pp. 235–240. Smithsonian Institution Press, Washington, D.C.) in Peru, by Wickstein and Behrens (2000. SCAMIT Newsl. 19:7) in California, and by Green (1998. NOAA Tech. Memo. 412:63) who reported 'small crabs hiding among algae' on Galápagos Green Seaturtles, which could be Columbus Crabs.

Planes cyaneus and *P. marinus* are the species that occur in the southwestern Atlantic (Juanicó 1976. Dusenia 9:145–150; Spivak and Bas 1999. J Crustacean Biol. 19:72–76; Prado and Melo 2002. Crustaceana 75:579–595), but only the former was reported as a commensal of Loggerhead Seaturtles by Carranza et al. (2003, *op. cit.*). During 2005 we found Columbus Crabs associated with Hawksbill, Green, and Loggerhead turtles and report these findings here. Crabs were identified according to Chace (1951, *op. cit.*) and Spivak and Bas (1999, *op. cit.*) and all belong to *P. cyaneus*. Records for each turtle species are given in detail below.

A juvenile Hawksbill Seaturtle (Curved Carapace Length, CCL

= 39 cm, Curved Carapace Width-CCW = 33.5 cm) was captured by handnet on 19 January 2005 off southern Brazil (27.76°S, 46.80°W) over waters ca. 1500 m in depth. Five *P. cyaneus* were found, one male with Curved Carapace Length-CL = 11.3 mm, and four females CL = 10.8, 11.4, 12.6, and 12.9 mm. The largest female was gravid and the smallest one had an autotomy at the base of the left chelae. In addition, 1 remora, *Remora* sp., and 1 Goose Barnacle, *Lepas anserifera*, were found on the turtle.

A juvenile Green Seaturtle (CCL = 40.7 cm, CCW = 37.1 cm) was captured by gillnet on 18 February 2005 off southern Brazil (29.06°S, 49.24°W) over waters 35 m deep. One gravid female crab was found (CL = 16.3 mm).

During three cruises on a pelagic longline vessel carried out in January, July, and August 2005, Columbus Crabs were found on 18 Loggerhead Turtles incidentally captured. Capture locations were between 27.51 and 33.77°S, and 44.88 and 50.28°W, over waters 266–4600 m deep. Turtle CCL ranged from 49 to 97 cm (mean = 61.3 cm). Only one female with CCL of 97 cm was adult based on minimum CCL of nesting females of 83 cm in Espírito Santo, southeastern Brazil (Baptistote et al. 2003. Chel. Conserv. Biol. 4:523–529). All others were immature in their pelagic stage. A total of 32 *P. cyaneus* were collected (mean 1.8 crabs per turtle, min = 1, max = 3), of which 16 were male and 16 female, which does not differ from the expected 1:1 ratio reported for the genus (Dellinger et al. 1997, *op. cit.;* Spivak and Bas 1999, *op. cit*.; Carranza et al. 2003, *op. cit*.). Crab measurements - CL and Carapace Width CW (mean ± 1 SD, minimum-maximum), in mm, were: males CL - 15.6 ± 3.7, 9.3–21.3, CW - 15.6 ± 3.6, 9.3–21.3, N = 16; ovigerous females CL - 17.4 ± 3.1, 12.7–20.7, CW - 17.5 ± 3.0, 12.9–21.1, N = 7; nongravid females CL - 13.9 ± 3.7, 10.1–22.0, CW - 14.0 ± 3.7, 9.8–22.2, N = 9. CL and CW of gravid females were significantly larger than that of nongravid (Mann-Whitey U = 13, p = 0.05, both CL and CW); males and females (gravid and nongravid pooled) did not differ in CL and CW (Mann-Whitney test U = 119, p = 0.73 and U = 123.5, p = 0.87, respectively). The 22% of crabs with pereiopod autotomy was similar to 25% reported for *P. minutus* in Madeira Is. (Dellinger et. al. 1997, *op. cit*.) and lower than 45% reported for *P. marinus* in Argentina (Spivak and Bas 1999, *op. cit*.).

The scarcity of records of *Planes* spp. on adult Loggerheads or on other sea turtle species could be related to the preference of Columbus Crabs for deep waters as opposed to the shallow habitats used by all nesting turtles, and large immature Green and Hawksbill Seaturtles. However, because of opportunistic commensalisms with crabs, all hard-shelled turtles are equally prone to being colonized by crabs when in deep waters, as shown by this study.

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GRAPTEMYS GIBBONSI (Pascagoula Map Turtle). **DIET.** *Graptemys pulchra* (*sensu lato*) was originally described as inhabiting coastal rivers of the Gulf of Mexico from the Pearl River drainage in Louisiana to the Yellow River in Florida and south Alabama (Lovich 1985. Cat. Amer. Amphib. Rept. 360.1). However, based on morphological data, Lovich and McCoy (1992. Ann. Carnegie Mus. 61:293–315) split *G. pulchra* into three distinct species by describing two new species, *G. gibbonsi* and *G. ernsti*. The *pulchra* clade, at the time comprised of only *G. pulchra* and *G. barbouri*, was considered by McKown (1972. Phylogenetic Relationships within the Turtle Genera *Graptemys* and *Malaclemys*. Unpubl. Ph.D. dissertation, University of Texas, Austin) to be part of the "broad-headed" group. The larger head width in this clade compared to other *Graptemys* species was thought to be an adaptation for consuming mollusks (Ernst et al. 1994. Turtles of the United States and Canada. Smithsonian Institution Press, Washington, D.C. 578 pp.; Lindeman 2000. Biol. J. Linn. Soc. 69:549–576).

G*raptemys gibbonsi* inhabits the Pearl and Pascagoula River drainages in Mississippi and Louisiana. Since its split from *G. pulchra*, there has been little ecological research conducted on the species, especially on feeding ecology. Prior to the recognition of *G. gibbonsi*, Cagle (1952. Copeia 1952:223–234) reported fragments of clams and snails in the stomach of one juvenile female *G. pulchra* (now *G. gibbonsi*) from the Pearl River. On 18 April 2006, we witnessed the capture of a large female *G. gibbonsi* by a local fisherman using hook and line baited with chicken liver at the MS Hwy 42 boat ramp on the Leaf River near the confluence of the Bouie River (31°20'562"N, 89°16'855"W [WGS84]). We acquired and transported the individual to the laboratory for blood collection and held the individual in a cooler over night prior to its release. During that time, the individual defecated 56 fragments of *Corbicula fluminea* ranging from 2 to 17.7 mm (mean = 9.24 mm, SD = 4.23 mm) in length. This is the first observation of *Corbicula* in the diet of *G. gibbonsi* from either the Pearl or Pascagoula River basins. This is not an aberrant report for the *pulchra* clade, as *Corbicula* has been documented in the diets of other species: *G. barbouri* (Sanderson 1974. Unpublished master's thesis, University of South Florida, Tampa); and *G. ernsti* and *G. pulchra* (Shealy 1976. Bull. Florida St. Mus. 21:47–111).

The research that led to this observation was being conducted under Mississippi Administrative Scientific Research Collection Permit for collection of *G. flavimaculata* and *G. gibbonsi* for hormone and genetic analysis. We thank Jon Davenport for reviewing this document.

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MACROCHELYS TEMMINCKII (Alligator Snapping Turtle). **REPRODUCTION.** *Macrochelys temminckii* is considered a valuable commodity in portions of the United States, leading to potential overexploitation of the species (Sloan and Lovich 1995. Chelon. Cons. Biol. 1:221–222; Pritchard 1989. The Alligator Snapping Turtle: Biology and Conservation. Milwaukee Publ. Mus. 104 pp.).

TABLE 1. Temperatures (°C) of an Alligator Snapping Turtle (*Macrochelys temminckii*) nest during Summer 2005, in Faulkner County, Arkansas.

Time Period	Mean	Maximum	Minimum
11–25 Jun	24.2	28.1	21.0
26 Jun–10 Jul	25.4	28.7	23.2
11–25 Jul	26.1	29.8	23.2
26 Jul–9 Aug	26.1	30.5	23.5
10–20 Aug	26.5	28.7	24.8

Conservation planning will require life history information from throughout the species' range. Apparently, there are no published reports on the nesting habits of *M. temminckii* in Arkansas.

On 9 June 2005, a nest of *Macrochelys temminckii* was discovered on a southeast-facing bank (35°10.229'N, 92°19.020'W) of Cadron Creek in Faulkner Co., Arkansas, USA. The nest, located 2.8 m from the water, was situated on a small ledge devoid of vegetation. The flask-shaped nest had a maximum diameter of 20 cm and a depth of 17 cm. Thirty-six spherical eggs were excavated from the nest and measured. Egg mass ranged from 21.0 to 24.7 g (mean = 22.7 g). Egg diameter ranged from 33.2–35.5 mm (mean = 34.4 mm). The eggs were subsequently reburied to incubate under natural conditions, with a temperature-sensitive data logger placed in the center of the nest to record hourly nest temperatures. Nest temperatures are reported in Table 1. The nest was checked on 20 August and 25 eggs and the data logger were retrieved; of the remaining 11 eggs left in the nest, external appearance suggested that 9 were unfertile and 2 were fertile. Incubation of the 25 collected eggs continued in the laboratory at 29°C for the duration of development. Thirteen eggs hatched from 23 to 28 September. The remaining 12 unhatched eggs were dissected and found to be infertile.

Hatchling morphometrics were recorded within 12 h of hatching. Hatchling mass ranged from 12.0–15.4 g (mean = 13.8 g). Carapace length varied from 33.2–37.7 mm (mean = 35.7 mm) while carapace width ranged from 30.6–34.3 mm (mean = 33.0 mm). Plastron length ranged from 22.1–25.7 mm (mean = 23.8 mm) and plastron width ranged from 12.0–17.2 mm (mean = 15.2 mm).

Scientific collecting permits were obtained from the Arkansas Game and Fish Commission prior to commencement of the study. An Institutional Animal Care and Use Protocol was issued by the University of Central Arkansas.

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RHINOCLEMMYS PUNCTULARIA (Spot-legged Wood Turtle). **REPRODUCTION.** *Rhinoclemmys p. punctularia* is a semi-aquatic geoemydid turtle found in Trinidad, eastern Venezuela, French Guiana, and northern Brazil (Pritchard and Trebbau 1984. Turtles of Venezuela. SSAR Contr. Herpetol. 2:1–403; Ernst and Barbour 1989. Turtles of the World. Smithsonian Inst. Press, 313 pp.). The exact distribution and habitat requirements of this turtle need further study but it apparently inhabit igarapés (small rivers) and tributaries (Vogt et al. 2001. Biodiversidade e Funções Ecológicas dos Ecossitemas, ISA). The reproductive behaviors of this species are not well known, but clutches generally consist of one or two large eggs that are deposited on the ground in depressions or under leaf litter. (Pritchard and Trebbau, *op. cit.*; Ernst and Barbour, *op. cit.*).

Copulation of two specimens at Maranhão, Brazil, was observed in July 1997, at about 1030 h, on a cloudy day with an ambient temperature of 23°C. The duration of copulation was undetermined. The female weighed 1400 g, the male 700 g. In January 1998 (182 days after the observed copulation), a nest of three eggs (possibly a product of the observed copulation) was found in tall grass near the water reserve of the habitat. Two of the eggs were standing up and the third on its side. They were slightly elongated and had a white-yellowish coloration. The eggs ranged from 59.6 to 63.6 mm (mean 61 ± 2.2 mm) long and 29.9–30.5 mm (mean 30.3 ± 0.3 mm) wide. Egg mass was 32.2–36.5 g (mean 34.4 ± 2.2 g). The eggs were incubated in the laboratory and in April 1998, 90 days after the nest was found, a single egg hatched. The hatchling had a mass of 16 g, the carapace was 46 mm long and 37 mm wide, and the plastron was 46 mm long and 30 mm wide. On the next day another egg hatched, but the hatchling had a malformed carapace and plastron. The third egg was lost to an apparent fungus infestation. Clutch size reported here is the same as that from a captive specimen in a zoo in Guiana (Pritchard 1979. Encyclopedia of Turtles, TFH, Inc., Neptune, New Jersey. 895 pp.) and confirms that *R. punctularia* clutch size is small, but the eggs are relatively large.

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TRACHEMYS SCRIPTA ELEGANS (Red-eared Slider). **PREDATION**. Predation on waterfowl and other birds by Common Snapping Turtles (*Chelydra serpentina*) is well known, but avian predation by other aquatic turtles is rarely reported (Pryor 1996. Wilson Bull. 108:190–192; Ernst et al. 1994. Turtles of the United States and Canada. Smithsonian Inst. Press, Washington, D.C.). Here I report an observation of predation of an adult passerine by aquatic emydid turtles.

At approximately 1400 h on 31 May 2002, an agonistic encounter was observed between two adult male Red-winged Blackbirds (*Agelaius phoeniceus*) on the surface of a small pond in Greer Co., Oklahoma, USA. Three adult *Trachemys scripta elegans* were observed swimming toward the two birds. When the turtles got within ca. 3 m, one of the birds flew away. The second bird stayed on the surface of the water with wings spread and beak agape, apparently exhausted. A third male blackbird attacked the water-bound male, but retreated almost immediately, perhaps after noticing the turtles nearby. After the second aggressor retreated all three turtles disappeared beneath the water, and seconds later the remaining blackbird disappeared as well. An incomplete bird carcass floated back to the surface less than a minute after being pulled under water, and the turtles were not observed again.

With the exception of waterfowl, predation of adult birds by turtles is apparently an unusual and opportunistic event. The fact that three turtles were involved likely does not necessarily suggest cooperation, but is perhaps an indication of the high densities of *T. scripta* in this and other nearby ponds

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SERPENTES

AGKISTRODON PISCIVORUS LEUCOSTOMA (Western Cottonmouth). **BEHAVIOR**. *Agkistrodon piscivorus leucostoma* is highly nocturnal during summer months in the Missouri Ozarks (Johnson 2000. The Amphibians and Reptiles of Missouri. Missouri Department of Conservation, Jefferson City. 339 pp.). Aggregations of *A. p. leucostoma* have been documented denning (Dundee and Burger 1948. Nat. Hist. Misc. 21:1–2) and feeding (Keiser 1993. Herpetol. Rev. 24:34), but not basking.

On 12 August 2004 we observed an aggregation of three similar-sized *A. p. leucostoma* basking on the root system of an overturned tree located on a gravel-bar, near the shoreline of the North Fork of the White River, Ozark Co., Missouri. The root system extended about 0.5 m in height above the gravel-bar and had been invaded by vegetation along one side, creating sun mosaics within the lower portions. The three snakes were coiled and basking on the top of the root system. Two recently shed individuals flashed their mouths and retreated into a more secure area within the root system upon disturbance. On 14 August 2004, five individuals were observed on the same root system. Two snakes on top had just shed and were coiled over the body of a third. The two remaining snakes had opaque eyes and were lower, coiled within the root system in dappled sunlight. Both observations occurred at ca. 1500 h on overcast days with high temperatures of 20°C (below the average daytime high temperature for August of 27°C). Based on size, all of these snakes appeared to be about two years old (MAN, unpubl. data). We did not observe any abundant food source, thus there was no indication that these were feeding aggregations. We made more diurnal observations of cottonmouths on these two days (eight observations) than were made over 179 days during a survey in the same area (MAN, unpubl. data).

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AGKISTRODON PISCIVORUS PISCIVORUS (Eastern Cottonmouth). **PREDATION**. Numerous avian predators, primarily wading birds and raptors, are known to feed on juvenile *Agkistrodon piscivorus* (Gloyd and Conant 1990. Snakes of the *Agkistrodon* Complex: A Monographic Review. SSAR, Oxford, Ohio. 614 pp., and references therein; Ernst 1992. Venomous Reptiles of North America. Smithsonian Institution Press, Washington, D.C., 236 pp.; Mitchell 1994. Reptiles of Virginia. Smithsonian Institution Press, Washington, D.C., 352 pp.). Here, we provide the first report of juvenile *A. p. piscivorus* predation by a passerine.

On 14 March 2006 at 1640 h, while driving on a dirt road within the Donnelly Wildlife Management Area (WMA), Colleton Co., South Carolina, USA, we encountered an adult crow (*Corvus* sp.) subduing a juvenile *A. p. piscivorus* (273 mm SVL, 326 mm TL) on the road edge adjacent to a large pond (32°41'48"N, 80°36'12"W). The crow was manipulating the snake by the head with its bill, but upon our approach released the snake and flew to a nearby tree. The snake suffered trauma to its head, particularly the left eye and jaw, and within ca. 10 min of our arrival the snake died. The fresh condition of the snake, the limited road traffic in the WMA, and the absence of any trauma normally associated with road injuries (e.g., crushed body, torn skin, viscera protruding from mouth or vent) suggested that the snake had been killed by the crow. A bulge in the snake's abdomen indicated the animal had recently eaten, and palpation of the stomach contents revealed a partially digested frog (likely *Rana clamitans*), which had been swallowed head-first. Voucher photographs of the snake and frog were deposited in the Campbell Museum, Clemson University, Clemson, South Carolina (CUSC 2314).

Birds of the family Corvidae (jays and crows) are generalist predators that feed on a variety of vertebrates, including snakes (Bent 1947. Life Histories of North American Birds. Jays, Crows, and Titmice. Bull. 191, U.S. Nat. Mus, Washington, D.C., pp. 226–257). Thus, predation of juvenile cottonmouths by large corvids such as crows is not unexpected.

We thank Stanlee Miller of the Campbell Museum, Clemson University for archiving voucher materials.

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AGKISTRODON PISCIVOROUS PISCIVOROUS (Eastern Cottonmouth). **BRUMATION.** *Agkistrodon piscivorous* is one of the last snakes to begin brumation in our area, sometimes waiting until the first heavy frost of winter to move to higher ground to hibernate in stumps (Gloyd and Conant 1990. Snakes of the *Agkistrodon* Complex. A Monographic Review. SSAR, Oxford, Ohio. 614 pp.). Between ca. 1245 h and 1345 h on 27 November 2005, three *A. piscivorous* were seen on the grounds of the Sumter High School Environmental Education Center (33°53.748'N 80°23.604'W), Sumter, South Carolina, USA. The first was a juvenile perched ca. 1.5 m above the water line on the steep bank of a free flowing ditch. The snake fled into the bank when approached. The second snake was a larger female (1030 mm SVL, 590 g)

found coiled on the northwest side of a small island under an observation tower. The third snake was a smaller female (760 mm SVL, 426 g) found on a moderately traveled path on an east-facing bank.

The latter two snakes did not flee when approached. The location of these two snakes was checked daily at ca. 1430 h and their location and position noted. During the observation period (27 November 2005 to 21 December 2005) both snakes remained exposed in the same general location (within 2 m^2 of the original location). Sometimes the snakes were found coiled and sometimes stretched out. The average temperature during this time was 9.6°C with frost events occurring on 2, 6, 10, 11, 13, and 20 December (total time below freezing was ca. 52 h over the observation period). During the measuring process neither snake displayed defensive behaviors. Head tracking was observed, but the snakes did not vibrate their tails, gape their mouths, musk, or assume defensive coils. The second snake was last observed at 1045 h on 21 December 2005. She swam away at a moderate speed upon approach (water temperature 6.2°C). The third snake was last observed at 1730 h partially submerged in the water (5.9°C).

Previous records of *A. piscivorous* activity in December (Gloyd and Conant, *op. cit.*) have attributed their presence to unusually warm periods in winter. This is obviously not the case here. The presence of *A. piscivorous* in December following six frost events suggests that these snakes may be more cold tolerant than previously thought. There may also be a bioenergetic advantage to female snakes that can tolerate colder temperatures. Zaidan et. al. (2003. Copeia 2003:231–240) noted that parturition in *A. piscivorous* occurs in August or September, potentially leaving a short time for the snake to prepare energetically for brumation. Females that are capable of foraging at colder temperatures would then have a selective advantage over the snakes that entered brumation earlier. There could be, however, an energetic disadvantage to snakes that are active too late into the colder months (M. Dorcas, pers. comm.) because of their inability to properly digest food items at cold temperatures.

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ALSOPHIS PORTORICENSIS ANEGADAE (Puerto Rican Racer). **SCAVENGING**. Evidence for scavenging by pit vipers and aquatic species continues to accumulate (DeVault and Krochmal 2002. Herpetologica 58:429–436), but cases of terrestrial colubrids feeding on carrion are much less common. On 23 September 2005 at 1150 h we captured a male *Alsophis portoricensis angadae* (560 mm SVL, 82.5 g) within a hotel complex (18.4793ºN, 64.5781ºW) on Guana Island, British Virgin Islands. It had recently ingested a relatively large food item of unusually angular shape, which we obtained by forced regurgitation (Fig. 1). The ejected food items consisted of two chicken bones (a humerus weighing about 5 g and about half of an ulna, weighing about 1 g) which we deposited in the Yale Peabody Museum (YPM F-4171-2). The snake was released at the site of capture. Chicken wings are provided to workers at a construction site located about 70 m from the capture site and leftovers are often discarded in the nearby brush. Based on the state of digestion, which had left few traces of meat on the bones, the snake had likely encountered the bones very recently. *Anolis cristatellus*, a major component of the diet of the racer, is abundant at the site, thus lack of food is unlikely to have been a factor. Although scavenging is not a large part of the diet of *A. portoricensis*, this observation suggests that some snake species have greater dietary flexibility than often believed.

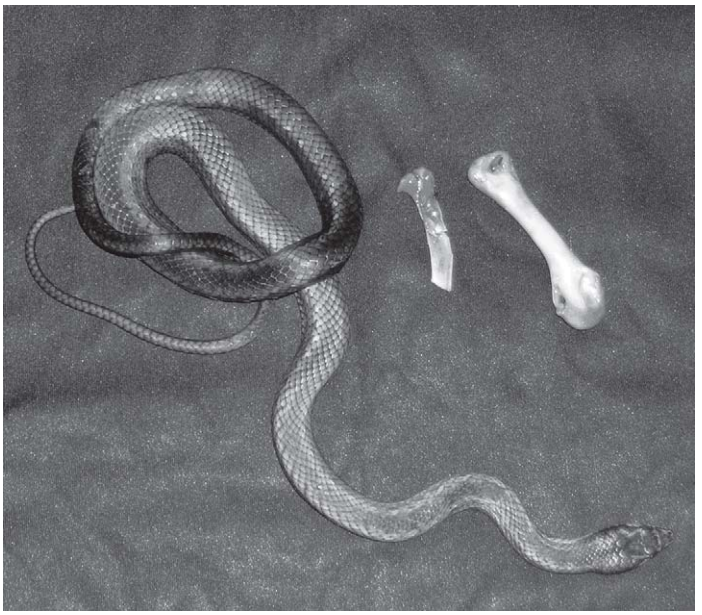

FIG. 1. *Alsophis portoricensis* and chicken bones it regurgitated.

We thank the Falconwood Corporation, The Conservation Agency and Texas Tech University for assistance.

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CLELIA RUSTICA (NCN). **REPRODUCTION**. Maximum clutch size for *Clelia rustica* is reported as eight eggs (Achaval 1973. Trab. V. Congr. Latinoam. Zool. 1:17–29; Vaz-Ferreira et al. 1973. Trab. V Congr. Latinoam. Zool. 1:232–244; Cei 1993. Mus. Reg. Sci. Nat. Torino 14:1–949). An adult specimen collected 19 December 2004 at Parque Rivera (Departamento Montevideo, Uruguay) laid thirteen eggs (mean dimensions = 41 × 22 mm, mean mass = 11.72 g) on 27 December 2004. Twelve neonates (mean SVL = 257.9 mm; mean mass = 7.49 g) hatched after 68–71 days of incubation. Two specimens were sacrificed and along with the unhatched egg were deposited in Colección Zoología Vertebrados, Reptiles (ZVC-R), Facultad de Ciencias, Montevideo (ZVC-R 6300-6302).

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COLUBER CONSTRICTOR MORMON (Western Yellow-bellied Racer). **CANNIBALISM**. Cannibalism has been reported for multiple subspecies of racers including *C. c. constrictor* (Conant 1938. Amer. Midl. Nat. 20:53), *C. c. priapus* (Hamilton and Pollack 1956. Ecology 37:519–526; Jackson 1971. J. Herpetol. 5:196), and *C. c. flaviventris* (Fitch 1963. Univ. Kansas Publ. Mus. Nat. Hist. 15:351–468). Here, we report cannibalism by *C. c. mormon*. On 21 August 2006 at 1810 h, we encountered an adult (678 mm SVL) *C. c. mormon* in the act of ingesting another snake (headfirst) on a hillside adjacent to Greenwood State Beach, Mendocino Co., California, USA (39º07'40"N, 123º42'56"W). Approximately 10 cm of the ingested snake's tail protruded from the mouth of the predator and was securely wrapped around a poison oak (*Toxicodendron diversilobum*) stem, deterring further ingestion. The predator vigorously struggled to pull the snake's tail free, but was unsuccessful. After 15 min, we carefully extracted the racer from among the dense vegetation to obtain a body measurement and voucher photograph. In doing so, the ingested snake, still secured to the plant stem by its tail, was released from the racer's grasp and pulled completely free from the racer's gut. The partially ingested snake was an apparently unharmed (no visible bite marks) *C. c. mormon* (436 mm SVL) and was immediately active and seemingly alert upon removal from the larger racer. Voucher photographs of the two snakes were taken (CUSC 2348; Campbell Museum, Clemson University) and both snakes were released at the capture site. Cunningham (1959 Herpetologica. 15:17–19) reported consumption of conspecifics by captive *C. c. mormon*, but to our knowledge this is the first reported observation of cannibalism by this species in the wild.

We thank Stanlee Miller of the Campbell Museum, Clemson University for archiving the voucher photographs.

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CROTALUS AQUILUS (Queretaran Dusky Rattlesnake). **MAXIMUM SIZE**. The maximum total length recorded for *Crotalus aquilus* is 678 mm, but most adults are less than 500 mm (Campbell and Lamar 2004. The Venomous Reptiles of the Western Hemisphere. Cornell University Press, Ithaca, New York. 870 pp.). During July and August of 2006 we measured three adult male *C. aquilus* that exceed the previously reported maximum size. All three were found near Acambay, Estado de México, México at an elevation of ca. 2510 m. We preserved a male captured on 12 July 2006 with a total length of 681 mm (618 mm SVL, 63 mm tail length, 237.3 g). This specimen was deposited in the herpetological collection of the Museo de Zoología de la Facultad de Ciencias at the Universidad Nacional Autónoma de México (MZFC 19258). Additional males captured on 5 August 2006 (619 mm SVL, 66 mm tail length, 203.4 g) and 6 August 2006 (633 mm SVL, 61 mm tail length, 230.7 g) also exceeded the previously reported maximum length. Because three of 17 male *C. aquilus* exceeded the recorded maximum length, we suggest that animals of this size are not unusual at this location.

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CROTALUS AQUILUS (Queretaran Dusky Rattlesnake). **MORTALITY**. In México, forest fires follow one of two seasonal patterns. In most of the country, the fire season runs from January to June, but in northeastern México the fire season begins in May and ends in September. Both fire seasons coincide with the dry season (SEMARNAP 2000. Texto Guía Forestal. Subsecretaría de Recursos Naturales, Dirección General Forestal-SEMARNAP. México, D.F., 150 pp.). Forest fires have the potential to negatively affect forest faunas, and in particular, amphibians and reptiles (Bury 2004. Conserv. Biol. 18:968–975). Fire-induced formation of light gaps in forest canopies can favor certain reptiles, but reptiles may also have greater difficulty finding refuge in fire-affected sites (Bury, *op. cit*.; Ernst et al. 1995. Herpetol. Rev. 26:185–187). However, few data exist indicating the vulnerability of reptiles in Mexico. Hence, here we provide an observation from the Mexican state of Hidalgo suggesting that *Crotalus aquilus* may sometimes be at risk from fires.

During a visit to the state of Hidalgo at 0030 h on 16 July 2005, we found a *C. aquilus* in an area known as El Calicanto at kilometer 13.5 on Highway 105 between Pachuca and Tampico, municipality of Mineral del Chico (20º09'01"N, 98º40'51"W, elev. 2590 m, NAD27). The area lies in the Sierra de Pachuca and has a mixed oak (*Quercus*) forest vegetation with *Q. laurina, Q. affinis, Q. mexicana*, and *Pinus teocote* present. The snake, a juvenile female (270 mm SVL; 18 mm tail length), died a few days later. The tail, which was missing the rattle, appeared burned to a distance 22 mm anterior to the vent, and displayed wrinkled and infected tissue dorsally. Although we did not weigh the snake, she appeared emaciated.

During 12–23 June 2005, a forest fire had swept through this entire area (Jimenez-Rosenberg et al. 2004. Biodiversitas 52:1–10). The appearance of the snake suggested that it was either exposed to fire directly or to a hot substrate. Our visit to the site occurred about a month after the fire, and we suggest that this animal survived the fire but succumbed from fire-related injuries.

The *C. aquilus* (ITAH1278) was deposited in the herpetological collection of the Instituto Tecnologico Agropecuario de Hidalgo, Mexico.

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QUIJANO, Instituto Tecnologico Agropecuario de Hidalgo, A.P. 94 Km. 5.5 Huejutla/Chalahuiyapa, Huejutla de Reyes, C.P. 43000, Hidalgo, Mexico (e-mail: mendozaq2000@yahoo.com.mx); **ALAN KARDON**, San Antonio Zoological Gardens, 3903 North St. Marys Street, San Antonio, Texas 78212, USA; **CRISTINA GARCIA DE LA PEÑA** (e-mail: crisgp15@yahoo.com), and **GAMALIEL CASTAÑEDA** (e-mail: biosg@yahoo.com), Universidad Autónoma de Nuevo León, Facultad de Ciencias Biológicas, Laboratorio de Herpetología, Apartado Postal - 513, San Nicolás de los Garza, Nuevo León, C.P. 66450, México.

CROTALUS AQUILUS (Queretaran Dusky Rattlesnake). **REPRODUCTION**. Published reports of litter size in *Crotalus aquilus* are few, although Armstrong and Murphy (1979. The Natural History of Mexican Rattlesnakes. Univ. Kansas Mus. Nat. Hist. Spec. Publ. 5:1–88) reported that litter size ranged from 6–7 young that ranged in size from 153–177 mm SVL. On 03 March 2004 a gravid female *C. aquilus* (459 mm SLV, 139.55 g) was collected by Jessica Cortes, in Cerro del Tenayo, Estado de México, México. She was maintained in captivity (Laboratorio de Herpetología de la Facultad de Estudios Superiores Iztacala, UNAM) on a diet of mice. On 26 March she gave birth to six live offspring. The neonates averaged 161.3 ± 6.0 (range 134–177) mm SVL and 4.8 ± 0.3 g (range 4.4–5.1) g in mass. Relative clutch mass (Vitt and Price 1982. Herpetologica 38:237–255) was 0.271.

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CROTALUS MOLOSSUS MOLOSSUS (Northern Black-tailed Rattlesnake). **DIET.** Many snake species are known to prey upon bats, primarily by capturing them while they are roosting, although some snakes capture flying bats that are either emerging or returning from roosts or while the bats are foraging (Hutson et al. 2000. Microchiropteran bats. IUCN Global Status and Conservation Action Plan. IUCN/SSC Chiroptera Specialist Group. IUCN, Gland, Switzerland). The only rattlesnakes known to prey on bats are *Crotalus helleri* and *C. horridus* (Klauber 1972. Rattlesnakes: Their Habits, Life Histories, and Influence on Mankind, Second Edition. University of California Press, Berkeley, California; Uhler et al. 1939. *In* Transactions of the Fourth North American Wildlife Conference, pp. 605–622. Washington, D.C.). Here we report an instance of predation by *Crotalus m. molossus* on Pallid Bats (*Antrozous pallidus*). At ca. 0200 h on 17 September 2006, in Brewster Co., Texas, USA (NAD 1927, 029°39'N, 103°06'W, ca. 742 m elev.), we watched an adult *C. m. molossus* striking at Pallid Bats flying in and out of a roadway bridge. A small colony of bats were roosting in the internal structure of the bridge. The snake was positioned on the bridge at the edge of the pavement with its anterior extended into the air near where the bats were flying in and out of the culvert. We captured the snake and palpated a single recently ingested bat from its stomach. Lumps present in the snake (but not palpated) suggest additional recently ingested food items.

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CROTALUS WILLARDI AMABILIS (Del Nido Ridge-nosed Rattlesnake). **DIET**. The diet of *Crotalus willardi* is known to include mice, lizards, centipedes, and birds (Holycross et al. 2002. *In* Schuett et al. [eds.], Biology of the Vipers, pp. 243–252. Eagle Mountain Publishing, Eagle Mountain, Utah). However, there are only a few diet records for *Crotalus willardi amabilis*. These include a Southern Pocket Gopher, *Thomomys umbrinus* (Bryson and Holycross 2001. Herpetol. Rev. 32:262), the mention of a rodent in one stomach (Smith et al. 2005. Bull. Chicago Herpetol. Soc. 40:210), and mention of unidentified rodent hairs in the scat of wild specimens (Armstrong and Murphy 1979. The Natural History of Mexican Rattlesnakes. Univ. Kansas Mus. Nat. Hist. Special Publ. 5:1–88).

Here we report the presence of an adult squirrel (*Tamias dorsalis*) in the stomach of an adult female *C. w. amabilis* (Colección de Anfibios y Reptiles del Laboratorio de Ecología de la Unidad de Biología, Tecnología y Prototipos, LE-UBIPRO 14490). The snake was collected 21 September 2005 at the bottom of a deep canyon near the crest of the Sierra del Nido, Chihuahua (29º29'37.7"N, 106º43'21.8"W, 2550 m elev.). The squirrel was at least twice the normal diameter of the snake's body.

We thank David Armstrong for identifying the squirrel.

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CROTALUS WILLARDI (Ridge-nosed Rattlesnake). **REPRODUCTION**. On 8 August 2004, one of us (KS) encountered a gravid female *Crotalus willardi* (453 mm SVL, 43 mm tail length, 99.1 g) in the northern Sierra San Luis, Sonora, México (31º17.2'N, 108º46.2'W, 2104 m elev.). Surrounding habitat consists of young oak woodland-scrub regenerating from a 1989 wildfire. The female was maintained in captivity until parturition on 30 August 2004. On the morning of 30 August, the female gave birth to four live healthy neonates, and a single live deformed neonate. The four healthy neonates were measured, weighed and sexed (172, 181, 172, 176 mm SVL; 5.5, 6.8, 6.1, 6.2 g; sex male, male, female, female). The deformed neonate was eyeless, smaller than siblings, had failed to completely absorb available yolk prior to birth, weighed 4.1 g, and died soon after birth. The female weighed 63.5 g immediately following parturition. Relative clutch mass (including 1.9 g of undigested yolk) was 0.31. This litter was born later in the year than all but one previously reported parturition event (Holycross and Goldberg 2001. Copeia 2001:473–481). Clutch size and neonate sizes fall within previously reported ranges (Holycross and Goldberg, *op. cit.*)

We thank the Rocky Mountain Research Station, U.S. Forest Service for funding.

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CROTALUS WILLARDI (Ridge-nosed rattlesnake) **DIET.** *Crotalus willardi* are known to consume small mammals, lizards, centipedes, and birds (Holycross et al. 2002. *In* Schuett et al. [eds.], Biology of the Vipers, pp. 243–252. Eagle Mountain Publishing, Eagle Mountain, Utah). To date, only six accounts of avian prey items have been recorded from the diet of *C. willardi*, five from *C. w. obscurus* in the Animas Mountains and the Sierra San Luis (Holycross et al., *op. cit.*), and an additional record from *C. w. willardi* in the Huachuca Mountains (Parker and Stotz 1997. Bull. Maryland Herpetol. Soc. 13:123). Three of these prey items were identified to species, all small passerines; *Aimophila ruficeps, Myadestes townsendi,* and *Wilsonia pusilla* (Parker and Stotz, *op. cit.*; Holycross et al., *op. cit.*).

Here we report another observation of avian predation by *C. willardi*. At 1640 h on 4 October 2003, one of us (EMD) observed an adult female *C. willardi* (465 mm SVL, 78.8 g) attempting to ingest an adult male Hermit Thrush (*Catharus guttatus*) (30.1 mm tarsus length, 101.6 mm wing chord length, 153 mm total length). The snake was found beneath a manzanita shrub within a meter of a small pool of a mostly dry intermittent stream in the northern Sierra San Luis (Chihuahua, México; 31°17.3'N 108° 45.5'W, 2068 m elev.). The snake regurgitated the thrush when we disturbed it. However, because the widest part of the bird's body had already been ingested, we believe the snake would have been able to completely swallow the bird had it not been disturbed. Feces obtained while processing this snake contained feathers, suggesting that the snake had consumed a bird prior to the witnessed attempt. The thrush was deposited in the Colección de Aves of the Museo de Zoología de la Facultad de Ciencias, Universidad Nacional Autónoma de México (MZFC 19304).

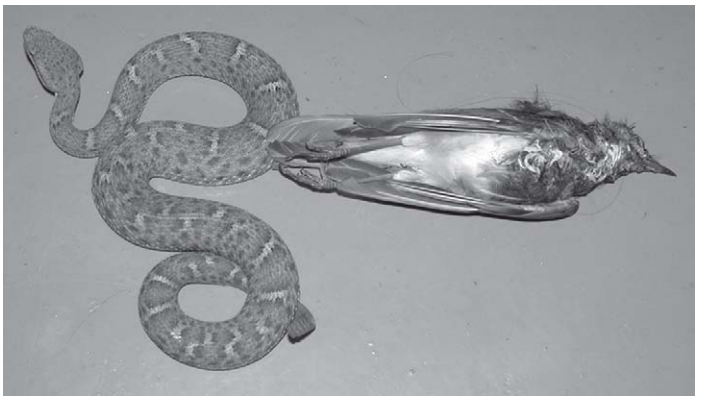

FIG. 1. Female *Crotalus willardi* with a male *Catharus guttatus* she attempted to swallow.

We thank José León Pérez, Alejandro Gordillo, Eric Garcia Trejo, Luis Antonio Sánchez, and the Rocky Mountain Research Station, U. S. Forest Service for assistance.

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ELAPHE CARINATA CARINATA (Keeled Rat snake). **DIET.** Keeled rat snakes appear to be dietary generalists and have been known to prey on mice, rats, birds, bird eggs, frogs, lizards, snakes and reptile eggs (Schulz 1996. A monograph of the Colubrid snakes of the genus *Elaphe* Fitzinger. Koeltz Scientific Books, Würselen, Czechoslovakia. 439 pp.).

In September 2004 a monitoring program was initiated in a wetland habitat near an industrial park of Taoyuan County, northern Taiwan. We collected YOY *Elaphe carinata carinata* with prey items in their stomachs in permanent drift fence/funnel traps on 18 February, 26 March and 31 March, 2 males (391 and 393 mm SVL, 28 and 33 g) and 1 female (410 mm SVL, 37.7 g), respectively. The fence was set along the bank of a pond, where the dominant vegetation consists of *Bambusa oldhamii*, *Broussonetia papyrifera*, *Lantana camara*, and *Pennisetum purpureum*. Forced regurgitation revealed that the snakes had consumed one *Crocidura attenuata* (Tanaka's Gray Shrew), two newborn *Apodemus agrarius* (Formosan Striped Field Mouse), one *Laevicaulis alte* (garden slug), and one *Takydromus stejnegeri* (Stejneger's Grass Lizard). In Taiwan, a chick, a beetle (Scarabaeidae), a grasshopper (Acridiidae), a damselfly (Euphaeidae) (Lin et al. 1995. Foods of snakes from Taiwan. NOW 3:19-21), *Dinodon rufozonatum* (Lee and Lue 1996. A preliminary study on the food habits of snakes in Taiwan. Biol. Bull. National Taiwan Normal University. 31:119-124), *Ptyas mucosus* (Hsien-Pin Chu, pers. comm.), and *Rattus rattus* (Norval *pers. obs.*) have been recorded as prey of *Elaphe carinata carinata*. To our knowledge this appears to be the first record of this snake species preying on shrews and land slugs.

We thank Ying-Ping Fang and Wei-Shin Jenq for assistance with identifications.

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ELAPHE VULPINA (Western Foxsnake). **HABITAT USE.** *Elaphe vulpina* is a state endangered species (Missouri Dept. Conservation 2006. Missouri Species and Communities of Conservation Concern, Jefferson City, Missouri. 58 pp.) that occurs in northern Missouri, including Squaw Creek National Wildlife Refuge (SCNWR). Past research conducted on SCNWR suggests this spe-

cies avoids wetland centers and is associated with wetland prairies, wetland edges and developed lands (Shew 2004. Spatial Ecology and Habitat Use of the Western fox Snake (*Elaphe vulpina vulpina*) on Squaw Creek National Wildlife Refuge. Masters thesis. Southwest Missouri State University, Springfield, Missouri. 51 pp.). Although observations have been made of this species preying upon duck nests on wetland edges (Wheeler 1984. Wildl. Soc. Bull. 12:77–78), they have not been reported to utilize wetland centers containing relatively deep water habitat (> 90cm).

During the period of May through mid-June 2005 and 2006, ca. 50 *E. vulpina* were observed utilizing deep water wetland habitats in a 239-ha marsh located on the southwest portion of SCNWR, Holt County, Missouri, USA. Individuals were typically observed in cattail (*Typha* sp.) patches coiled on Red-wing Blackbird (*Agelaius phoeniceus*) and Yellow-headed Blackbird (*Xanthocephalus xanthocephalus*) nests, ca. 60–90 cm above the surface of the water. Using a geographic information system we calculated that the snakes had to swim a minimum of 130 m to reach the cattail patches where they were located. Utilization of this habitat type has been observed on SCNWR annually since 2001 by refuge staff members.

Although *E. vulpina* were never observed feeding on eggs or nestlings, depredation was suspected as this appears to be one of the major food resources in this habitat type during this time period which coincides with nesting period of several bird species. The three dominant species of arboreal nesting birds located in this habitat include the aforementioned blackbirds and Least Bittern (*Ixobrychus exilis*). Additionally, five other species of platform nesting birds may also be found in this habitat including Pied-billed Grebe (*Podilymbus podiceps*), American Bittern (*Bontaurus lentiginosus*), Ruddy Duck (*Oxyura jamaicensis*), American Coot (*Fulica americana*), and Common Moorhen (*Gallinula chloropus*). The eggs and nestlings of all of these species represent potential prey items. Cattail patches as well as other deep water wetland vegetation may play a more significant role in the spatial ecology of the species than previously suspected. This relationship is likely on a temporal basis that coincides with wetland breeding bird activity. Further research on the habitat use of *E. vulpina* within managed wetlands may prove useful in fully understanding the ecology of this species.

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FARANCIA ABACURA REINWARDTII (Western Mud Snake). **REPRODUCTION**. Information regarding reproduction of *Farancia abacura reinwardtii* is limited due, in part, to its secretive habits. Specifically, copulation has only been reported once, by Anderson (1965. The Reptiles of Missouri. Univ. Missouri Press, Columbia. 330 pp.). Herein, we report on copulation of *F. a. reinwardtii* from Reelfoot Lake, Lake County, Tennessee, USA.

On 05 June 2005 at 1100 h, we observed (from a boat) a large (142 cm SVL, 162 cm TL) *F. a. reinwardtii* on the northwest bank of Horse Island Ditch at Reelfoot Lake, Tennessee (36º24'57"N, 89º22'30"W, NAD27). Upon approach, we noticed that the snake was copulating with a smaller individual. We captured the pair after 2–3 minutes of observation, and discovered that the larger individual was a dead, bloated female. The pair was transported, *in coitus*, to the University of Tennessee-Martin Reelfoot Lake Research and Teaching Center at Samburg, Tennessee. Copulation continued until 1430 h, when the smaller male separated from the dead female. The male (ca. 95 cm TL) was returned to the point of capture the following day. The female was deposited into the Herpetology Collection at Middle Tennessee State University (MTSU 178S).

We could determine neither the cause nor timing of death of the female, or if copulation was initiated before or after the female died. Although from the bloated appearance of the female, we speculate post-mortem initiation of copulation. In field experiments, several snake species have followed chemical trails left by (and courted with) recently deceased females (Shine et al. 2000. Behaviour 137:727–739). Besides providing an additional observation of post-mortem copulation, our observation on 05 June appears to be the earliest report of copulation for *F. a. reinwardtii*. Copulation in Western Mud Snakes has been observed as early as 13 June in southeastern Missouri (reported by Max Nickerson in Anderson 1965, *op. cit.*). Additionally, this observation supports the conclusions of Robinette and Trauth (1992. Proc. Arkansas Acad. Sci. 46:61–64) that the reproductive cycles of both male and female *F. a. reinwardtii* peak in May and June. Research was supported by a grant to VAC from the Tennessee Wildlife Resources Agency (Contract Num. ED-05-01679-00). Specimen was collected under authorization of the Tennessee Wildlife Resources Agency (permit no. 1798).

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LAMPROPELTIS PYROMELANA (Sonoran Mountain Kingsnake). **PIGMENT LOSS.** On 22 September 2003 we captured a normally pigmented adult female *Lampropeltis pyromelana* (622 mm SVL, 74.0 g) in the northern Sierra San Luis (Chihuahua, México; 31°18.1'N, 108°45.9'W, 1878 m elev.). We surgically implanted a radio transmitter, and released her on 27 September 2003. Between 28 September and 2 November 2003 we relocated this individual five times, however we observed her only once, on 2 November, at which time she weighed 71.3 g, and remained normally pigmented. We next relocated this snake on 17 May 2004. Although she had lost considerable weight (mass 59.6 g), and had an open, dry wound along her side exposing a small section of the transmitter antenna, the snake seemed to be in good health otherwise, and exhibited no signs of infection or systemic disease. However, she had lost some pigment. Most orange bands exhibited areas where the orange had been replaced by an uneven alabaster to faded salmon coloration. Pigment loss was most severe dorsally, with pigment loss extending down towards the venter in some bands. Most white bands were unchanged, however small areas along the dorsum of some bands had changed from cream to alabaster. Black bands were unaffected by any pigment loss. Coloration on both the head and tail remained unchanged.

Mid-body bands were more severely impacted than were bands closer to the snake's head and tail. The snake's venter remained normally pigmented along the length of the snake. Pigment loss was not centered at the site of the surgical scar, nor did the snake display any natural wounds or evidence of skin disease. We removed the transmitter from this individual on 18 May 2004 and did not again observe her after her release. Hence, we cannot speculate on the permanence of this color change. We observed 28 other *L. pyromelana* in the Sierra San Luis and contiguous areas of the Sierra Pan Duro during 2002–2004, all of which were typically colored.

We thank Rocky Mountain Research Station, U. S. Forest Service for funding.

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LEPTOTYPHLOPS BORRICHIANUS (NCN). **PREDATION**. *Leptotyphlops borrichianus* is known from La Rioja, San Juan, Mendoza, and Rio Negro provinces in Argentina (Cei 1993. Reptiles del centro, centro-oeste y sur de la Argentina. Herpetofauna de zonas áridas y semiáridas. Mon. IV Mus. Reg. Sci. Nat. Torino. 524 pp). Here we report an incidence of predation on *L. borrichianus* in San Juan, Argentina (31°31'44"S, 68°41'44"W). A male (140 mm SVL) *L. borrichianus* was discovered in the stomach of a male *Bufo arenarum* (89 mm SVL) during the course of a dietary study. The *B. arenarum* had been collected from a desert shrubland dominated by *Prosopis* sp., *Bulnesia retama, Solanum eleagnifolium*, *Caparis atamisquea*, *Grabousquia obtusa*, and *Tamarix gallica*.

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LIOPHIS MILIARIS (Common Water Snake). **PREY**. In the wild *Liophis miliaris* feeds on a wide array of ectothermic prey, including a variety of amphibians (adults, larvae, and eggs), lizards, amphisbaenids, and fish (Michaud and Dixon 1989. Herpetol. Rev. 20:39–41; Chicarino et al. 1998. XXII Congresso Brasileiro de Zoologia, Recife 271–272). In August 2005 we collected a juvenile female of *L. miliaris* (310 mm SVL, 70 mm tail length, 16.3 mm head length; 10 g) moving along an unpaved road at Caucaia do Alto, São Paulo, Brazil (23°41'S, 47°01'W, 895 m elev.). The snake contained a recently ingested juvenile *Bufo ornatus* (29 mm SVL, 1.3 g). To the best of my knowledge, this species has not been previously documented in the diet of *L. miliaris*. Both specimens are deposited in the Coleção Herpetológica "Alphonse Richard Hoge," São Paulo, Brazil (IBSP 73.469).

I thank Valdir José Germano (IBSP) and Jorge Jim (UNESP, Botucatu) for assistance.

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LYSTROPHIS HISTRICUS (Rayed or Jan's Hog-nosed Snake). **DIET.** No specific prey records have been published for *Lystrophis histricus,* probably because the species is scarce throughout its distribution and poorly represented in zoological collections. Several authors suggest that amphibians appear in the diet (Amaral 1977. Serpentes do Brasil: Iconografia Colorida. Univ. São Paulo, Ed. Melhoramentos, Inst. Nac. Do Livro y Universidade de Sao Paulo. 248 pp.; Schouten 1931. Rev. Soc. Ci. Paraguay 1:5–32) but do not cite specific records.

We discovered prey remains in the guts of two of three specimens held in the Uruguay Museum of Natural History collection (MNHN). A male (MNHN 58; 270 mm SVL) collected in 1914 in Departmento Maldonado contained two reptilian eggs (11 × 5 mm and 10 × 6 mm). A female (MNHN 87; 249 mm SVL) collected on 23 March 1935 in the Departmento Cerro Largo contained one eggshell that measured ca. 25 mm length. Based on the comparison with reptile eggs deposited in the Faculty of Sciences Collection, we believe that the eggs eaten by MNHN 58 are *Cercosaura schreibersii* (supported by number of eggs, size, color, and shape). The shell found in MNHN 87 appears to be than of an amphisbaenid (based on shape and size). These observations indicate that the diet of *L. histricus* includes the eggs of other reptiles.

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MASTICOPHIS SCHOTTI SCHOTTI (Schott's Whipsnake). **MAXIMUM SIZE RECORD**. *Masticophis schotti schotti* is a large, long-tailed (to 38% TL), boldly striped whipsnake inhabiting arid scrub and grassland throughout south central Texas in the United States westward through eastern Coahuila, northern Nuevo Leon, and extreme northern Tamaulipas, Mexico (Camper 1996. Cat. Amer. Amphib. Rept. 638.1–638.4). The maximum size listed for *M. s. schotti* is 1676 mm total length (Boundy 1995. Bull. Chicago Herpetol. Soc. 30:109–122.; Conant and Collins 1998. A Field Guide to Reptiles and Amphibians: Eastern and Central North America. 3rd ed. Houghton Mifflin Company, Boston, Massachusetts. 616 pp.). However, no supporting information exists for this record (locality and date of collection or disposition of the specimen). Herein, we report a new maximum size record for this species.

On 30 September 2005 at 1750 h an exceptionally large female DOR *Masticophis schotti schotti* was collected on Sage Road ca. 120 m east of the junction with farm road 1898 (27°32.292N, 097°52.589W) Kleberg County, Texas, USA. The specimen measured SVL 1169 mm, TL 1681 mm. This exceeds the maximum length previously recorded for this species. The specimen is deposited in the Laboratory for Environmental Biology, Centennial Museum, University of Texas at El Paso (UTEP 19302).

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MICRURUS ALTIROSTRIS (Southern Coral Snake). **DIET**. The diet of South American coral snakes includes amphisbaenians, lizards, snakes, caecilians, fishes and invertebrates (Souza et al. 2003. Herpetol. Rev. 34:151). *Micrurus altirostris* is a semifossorial species that feeds primarily on amphisbaenids of the genus *Amphisbaena*, and terrestrial, fossorial and semifossorial snakes and lizards (Carreira et al. 2005. Reptiles de Uruguay. Ed. Dirac – Facultad de Ciencias, Montevideo. 639 pp.).

We examined an adult male *M. altirostris* deposited in the Museu de Ciências Naturais da Fundação Zoobotânica do Rio Grande do Sul (MCN 3866, 755 mm total length) and discovered a specimen of *Sordellina punctata* (357+ mm total length) in its stomach. MCN 3866 was probably collected in the state of Rio Grande do Sul, Brazil, though specific collection data are not associated with the specimen. The prey was swallowed headfirst and its head was completely digested. *Sordellina punctata* is a diurnal, semiaquatic snake that feeds on earthworms (Marques et al. 2001. Serpentes da Mata Atlantica - Guia Ilustrado para a Serra do Mar. Ed. Holos, São Paulo, 184 pp.). This is the first record of *Sordellina punctata* in the diet of *Micrurus altirostris*.

We thank Moema Leitão de Araujo, Nelson R. de Albuquerque, and the Conselho Nacional de Desenvolvimento Científico e Tecnológico for assistance.

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OXYBELIS FULGIDUS (Green Vine Snake). **PREY**. The diet of *Oxybelis fulgidus,* a neotropical, arboreal colubrid, consists of lizards and small birds (Martins and Oliveira 1998. Herpetol. Nat. Hist. 6:78–150). Prior to this report, the largest bird consumed by *O. fulgidus* was a *Thraupis episcopus* (Martins and Oliveira, *op. cit.*) which average 165 mm in length (Hilty and Brown 1984. A Guide to the Birds of Colombia. Princeton University Press, Princeton, New Jersey. 996 pp.).

Here we report predation upon an adult *Monasa nigrifrons* (Black-fronted Nunbird; ca. 280 mm) in March 2002 on the border of a seasonally flooded Amazonian forest at the Mamirauá Sustainable Development Reserve, Amazonas State, in northwest Brazil (03°03'S; 64°50'W). The forest floor was partially flooded by rising waters and the snake was first observed in a tree ca. 3 m above the water at around mid-day. The snake did not constrict the bird, but grasped it near the head and let it hang until it seemed to be dead (Fig. 1), whereupon the bird was ingested head-first. Despite its size the bird was completely ingested in less than 30 min.

We thank the Conselho Nacional de Desenvolvimento Científico e Tecnológico, Setor Mamirauá, M. Menin, and F. Waldez for assistance.

FIG. 1. *Oxybelis fulgidus* killing its prey, *Monasa nigrifrons*. Photo by M. Amend.

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PITUOPHIS CATENIFER (Bullsnake). **MAXIMUM LENGTH**. The Eastern Indigo Snake (*Drymarchon corais couperi*) has been heralded as the longest native snake in the United States, having been documented to reach 2629 mm TL (Boundy 1995. Bull. Chicago Herpetol. Soc. 30:109–122). Although Dixon (1952. Copeia 1952:193) reported a bullsnake measuring "9ft" (2745 mm), he took this measurement from a skin and not a whole animal (J. Dixon, pers. comm.). In June 1999 one of us (AM) collected a *Pituophis catenifer* near Loma Alta (Val Verde County, Texas, USA) that measured 2667 mm TL on 12 October 2001 after being kept and fed in captivity for ca. 2 years (Fig. 1). This specimen represents a new record for the longest native snake in the United States and extends the record length for the genus *Pituophis* by 127 mm (Boundy, *op. cit.*). A voucher image of this snake has been deposited in the Texas Natural History Collection (TNHC 65425).

FIG. 1. Armin Meier (185 cm) with a *Pituophis catenifer* (2667 mm TL) captured in Val Verde County, Texas.

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PITUOPHIS MELANOLECUCUS LODINGI (Black Pinesnake). **TREE CLIMBING**. On 11 April 2005 a non-gravid female *Pituophis melanoleucus lodingi* was captured on the Camp Shelby Training Site, Forrest Co., Mississippi, USA and implanted with a temperature sensitive radio-transmitter (Hohohil SI-2T). Upon release, the snake immediately climbed an *Ilex vomitoria*, and attained a height of ca. 4 m; it remained in the shrub until we left (~20 min later). When the snake was relocated on 12 May 2005, it was found 2 m off the ground in a *Magnolia virginiana*, it remained motionless until we left. The next day it was located 4–5 m off the ground in an *Ilex vomitoria* and upon our approach it moved into the branches of a *Quercus incana*. On 16 May 2005 this snake was located 4 m off the ground in an *Ilex vomitoria*, and remained motionless while it was photographed. On 8 June 2005 this snake was found dead on the road. Of the 23 observations made of this animal it was found in trees or shrubs on only the four occasions (17%) described above. To the best of our knowledge this is the first report of arboreality for this subspecies.

Submitted by **MELISSA A. OLSEN** and **JAMES R. LEE**, The Nature Conservancy, Camp Shelby Field Office, CSTS-ENV Building 6678, Camp Shelby, Mississippi 39407, USA (e-mail: molsen@tnc.org).

PITUOPHIS MELANOLEUCUS LODINGI (Black Pine Snake). **BEHAVIOR.** When threatened, *Pituophis melanoleucas lodingi* retreat into a defensive coil and hiss loudly (Cook 1943. Snakes of Mississippi. Survey Bull., Mississippi Game and Fish Comm., Jackson, Mississippi. 73 pp.) or attempt to escape into nearby subterranean refugia, most often stump holes (D. Baxley, pers. obs.). The following account is the first record, to our knowledge, of *P.m. lodingi,* seeking an arboreal retreat when threatened. On 30 July 2005 at 1350 h we radio-tracked an adult female *P.m. lodingi* within a recently burned stand of *Pinus palustris* (longleaf pine) adjacent to a mesic bottom-land area in Wayne County, Mississippi, USA. Presumably in response to our presence, the snake moved towards the bottom-land area while the observer recorded locality and temperature data. At 1401 h the snake was observed, hissing loudly, 1.83 m above the ground, coiled in the crook of a *Quercus nigra* (Water Oak). Of 112 previous radio-telemetry location records for six individuals between 24 April and 30 July 2005, no other occurrences of tree use by *P. m. lodingi* have been recorded.

Submitted by **DANNA BAXLEY** (e-mail: Dannaster@yahoo.com) and **CARL QUALLS**, Department of Biological Sciences, University of Southern Mississippi, Hattiesburg, Mississippi 39406-0001, USA.

REGINA RIGIDA SINICOLA (Gulf Crayfish Snake). **DIET**. *Regina rigida* is a secretive snake that inhabits the lowlands of the southeastern United States (Conant and Collins 1991. Reptiles and Ampbihians Eastern/Central North America. Houghton Mifflin, Boston, Massachusetts. 450 pp.). They feed predominately on both soft and hard-shelled crayfish; however, they are also known to prey on fish and amphibians (Ernst and Ernst 2004. Snakes of the United States and Canada. Smithsonian Institution Press, Washington, DC. 680 pp.). On 12 November 2004 we collected three males and one large female (69 cm SVL) in a single aquatic funnel trap placed in a small backwater slough (30.98ºN, 87.92ºW), in the Mobile-Tensaw Delta Wildlife Management Area (MTD) Baldwin Co., Alabama, USA. All four snakes were transported to the University of South Alabama Vertebrate Natural History Museum (USAVNHM) to acquire tail clippings for DNA. Snakes were then placed into separate cages overnight. Early the next morning we noticed the female snake had defecated in her cage, we found her feces to be primarily composed of crayfish pieces. However, upon closer inspection we discovered mammalian hairs and uni-

dentifiable bone fragments in the feces. Given the amount of fur and the presence of bones in the feces we feel it unlikely the hair was secondarily ingested. The hairs were identified as that of a Golden Mouse (*Ochrotomys nuttalli*), a common resident of the MTD. Slides were deposited at the USAVNHM. This is the first record of *Regina* spp. consuming mammalian prey. It is possible the snake mistook the mouse for its normal prey (crayfish). Alternately, large *Reginia rigida* might occasionally take mammalian prey as part of their diet.

We thank Suzanne Peurach of the USGS Patuxent Wildlife Research Center at the Smithsonian Institution for identifying the hairs of the Golden Mouse.

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SIPHLOPHIS PULCHER (NCN). **PREY**. The colubrid *Siphlophis pulcher* feeds primarily on lizards (*Placosoma glabella*, *Hemidactylus mabouia*: Sazima and Argôlo 1994. Herpetol. Rev. 25:126; Prudente et al. 1998. Rev. Bras. Zool. 15:375–383; *Gymnodactylus darwini*, *Tropidurus torquatus*, *Mabuya* sp., *Ophiodes striatus*: Prudente et al., *op. cit.*) and snakes (*Imantodes cenchoa*; Sazima and Argôlo, *op. cit.*). Here we report a new prey record as well as the largest prey/predator mass ratio for this semi-arboreal species. An adult female *S. pulcher* (SVL = 530 mm, tail length = 150 mm, mass = 31 g, IBSP 73308) from Cananéia Island (25º00'S, 47º55'W, 8 m elev.) was collected in remnants of Atlantic Forest in May of 2005 with a freshly eaten *Ophiodes fragilis* (Sauria, Anguidae; SVL = 70 mm, tail = 170 mm, mass = 14 g). The lizard was ingested head first and found in the gut along with its broken tail. Prey/predator mass ratio was ca. 0.451, although the head was partially digested. *Ophiodes fragilis* readily exhibit tail autotomy, we suspect that the tail and lizard were ingested separately. Vouchers of snake and lizard are in the Instituto Butantan, São Paulo, Brazil.

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STENORRHINA FREMINVILLII (Freminville's Scorpion-Eating Snake). **DIET**. *Stenorrhina freminvillii* is a medium-sized fossorial inhabitant of thorn forest, savannas, and agricultural areas (Lee 1996. The Amphibians and Reptiles from the Yucatan Peninsula. Cornell Univ. Press, Ithaca, New York. 500 pp.). The diet of *S. freminvillii* includes insects, scorpions, and tarantulas (Greene 1997. Snakes. The Evolution of Mystery in Nature. University of California Press, Berkeley and Los Angeles. 351 pp).

On 19 March 2005 at 1120 h, I found a *S. freminvillii* (810 mm SVL, 115 g) feeding on an undescribed scorpion (Diplocentridae, male, 81 mm, 15.3 g) alongside a road in tropical deciduous forest ca. 23 km south of Ejido Caobas (18º14'57"N, 89º03'06"W), Quintana Roo, México. When I first observed the pair, the scorpion was alive and its stinger embedded in the snake's neck. After ca. four minutes the snake began to ingest the scorpion (Fig. 1). I captured the snake and recovered the live scorpion. The scorpion was preserved and the snake was held for behavioral observations. Three days later the snake defecated and its feces contained exoskeletal remains of a tarantula (*Brachypelma vagans*). The scorpion was sent to O. Francke at Universidad Nacional Autónoma de México. The snake will be deposited in the Herpetological Collection of El Colegio de la Frontera Sur, Chetumal, Quintana Roo, México (ECO-CH-H).

FIG. 1. *Stenorrhina freminvillii* consuming an undescribed diplocentrid scorpion.

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THAMNOPHIS ATRATUS HYDROPHILUS (Oregon Gartersnake). **DIET**. *Thamnophis atratus hydrophilus* use a variety of foraging methods including crawling underwater on the bottom of streams and probing in crevices in search of prey (Lind and Welsh 1994. Anim. Behav. 48:1261–1273). *Thamnophis a. hydrophilus* feed on a variety of prey items including adult ranid frogs and tadpoles (Garwood and Welsh 2005. Herpetol. Rev. 36:165), aquatic salamanders such as the Pacific Giant Salamander (*Dicamptodon tenebrosus*) and fishes such as juvenile salmonids (Welsh and Lind 2000. J. Herpetol. 34:67–74) and sculpins (Brown et al. 1995. Reptiles of Washington and Oregon. Seattle Audubon Society. Seattle, Washington. 176 pp.).

On 28 May 2005 at ca. 1600 h, an adult female *T. a. hydrophilus* (501 mm TL) was captured during routine snake surveys on Spanish Creek (40°11'00"N, 124°15'24"W), located in the King Range National Conservation Area in northern California, USA. We forced the snake to regurgitate a single hard mass of small eggs, each ca. 1.2 mm in diameter. These eggs were later identified as fish eggs

from the genus *Cottus*. Two species of sculpin are known to co-occur in this stream: C*ottus asper* and *C. aleuticus* (W. Duffy, pers. comm.). *Cottus asper* eggs generally are found in burrows or tunnels whereas the eggs of *C. aleuticus* are found under rocks (Kresja 1965. Ph.D. dissertation. University of British Columbia, Vancouver. 109 pp.; Moyle 2002. Inland Fishes of California. University of California Press. Berkeley, California. 502 pp.). Although we did not observe the snake find and consume the eggs, *T. a. hydrophilus* actively forage along stream substrates by probing cracks and crevices, and it seems likely that this individual found the eggs in this manner.

Predation on fish eggs by *T. a. hydrophilus* has not been documented and could represent an important seasonal component of their diet. Our observation suggests that *T. a. hydrophilus* can feed on all life stages of some sculpins.

Submitted by **JAMES B. BETTASO**, US Fish and Wildlife Service, Arcata, California 95521, USA (e-mail jamie_bettaso@fws.gov); **REBECCA S. STUDEBAKER**, Fisheries Biology, Humboldt State University, Arcata, California 95521, USA; and **JUSTIN M. GARWOOD**, USFS Redwood Sciences Laboratory, 1700 Bayview Drive, Arcata, California 95521, USA.

GEOGRAPHIC DISTRIBUTION

Instructions for contributors to Geographic Distribution appear in Volume 38, Number 1 (March 2007, p. 95). Please note that the responsibility for checking literature for previously documented range extensions lies with authors. Do not submit range extension reports unless a thorough literature review has been completed.

CAUDATA

AMBYSTOMA OPACUM (Marbled Salamander). USA: ARKANSAS: Hot Spring Co.: 4.8 km S Lono on St. Hwy. 9 (Sec. 25, T6S, R16W). 4 December 2006. Henry W. Robison. Verified by S. E. Trauth. Arkansas State University Herpetological Museum (ASUMZ 30351). New county record, filling a distributional hiatus in the west Gulf Coast Plain of south-central Arkansas among Clark, Grant, and Saline counties (Trauth et al. 2004. Amphibians and Reptiles of Arkansas. Univ. Arkansas Press, Fayetteville. 421 pp.).

Submitted by **HENRY W. ROBISON**, Department of Biology, Southern Arkansas University, Magnolia, Arkansas 71754, USA (e-mail: hwrobison@saumag.edu); and **CHRIS T. McALLISTER**, Department of Physical and Life Sciences, Chadron State College, Chadron, Nebraska 69337, USA (e-mail: cmcallister@csc.edu).

AMBYSTOMA OPACUM (Marbled Salamander). USA: TENNESSEE: Sullivan Co.: Off of TVA Road South ca. 100 m NE of intersection with Holston View Dam Road across from Osceola Island parking area (36.5213°N, 82.1081°W). 13 October 1970. Wallace Coffey. Austin Peay State University Museum of Zoology, APSU 18171 (photo of live individual). On this date Coffey and Brent Rowell also had an unvouchered nesting record of one female with 40–50 eggs that was found under a log. An additional specimen was collected 1.5 km SW of the original location along Piney Hill Road (36.5166°N, 82.1222°W). 03 May 1978. Tim Malone. APSU 18170. On the night of 18 March 1998, an individual was observed crossing Holston View Dam Road across from Osceola Island parking area (36.5211°N, 82.1071°W). It was raining and the animal was moving toward a wetland area. Phil Gentry. APSU 03459 (photo of live individual). 21 October 2005. South Holston Weir Dam Wetland 100 m from the 1998 location (36.5237°N, 82.1108°W). Kevin Hamed, Tom Laughlin, and Phil Gentry. Two individuals were observed guarding eggs under leaf litter at the edge of a dry wetland. Verified by A. Floyd Scott, Austin Peay State University Museum of Zoology, APSU 18165 (photo of live individual). An additional 55 nests (41 with females guarding eggs) were found in the same wetland during October and November 2005.

These observations represent the first records from Sullivan County and the only records from upper East Tennessee (Redmond and Scott 1996. Atlas of Amphibians in Tennessee. Misc. Publ. No. 12, The Center for Field Biology, Austin Peay State University, Clarksville, Tennessee 94 pp. [Hard copy and Internet versions, the latter of which includes a link to information on amphibians in Tennessee having appeared since 1996], http://www.apsu.edu/amatlas, accessed 26 April 2006).

Submitted by **M. KEVIN HAMED**, Virginia Highlands Community College, P.O. Box 828, Abingdon, Virginia 24212, USA (e-mail: khamed@vhcc.edu); **THOMAS F. LAUGHLIN**, East Tennessee State University, ETSU Box 70703, Johnson City, Tennessee 37614-1710, USA (e-mail: Laughlin@etsu.edu); **PHILLIP D. GENTRY**, Tennessee High School, 1112 Edgemont Ave., Bristol, Tennessee 37620, USA (e-mail: gentryp@btcs.org); and **J. WALLACE COFFEY**, 100 Belle Brook Drive, Bristol, Tennessee 37620, USA (e-mail: jwcoffey@tricon.net).

AMBYSTOMA TEXANUM (Smallmouth Salamander). USA: ARKANSAS: Howard Co.: 4.0 km NW Athens on St. Hwy. 246 (Sec. 8, T5S, R28W). 17 September 2006. Henry W. Robison. Verified by S. E. Trauth. Arkansas State University Herpetological Museum (ASUMZ 30349). New county record filling a distributional hiatus in the Ouachita Mountains of southwestern Arkansas among Hempstead, Pike, and Polk counties (Trauth et al. 2004. Amphibians and Reptiles of Arkansas. Univ. Arkansas Press, Fayetteville. 421 pp.).

Submitted by **HENRY W. ROBISON**, Department of Biology, Southern Arkansas University, Magnolia, Arkansas 71754, USA (e-mail: hwrobison@saumag.edu); and **CHRIS T. McALLISTER**, Department of Physical and Life Sciences, Chadron State College, Chadron, Nebraska 69337, USA (e-mail: cmcallister@csc.edu).

DESMOGNATHUS BRIMLEYORUM (Ouachita Dusky Salamander). USA: ARKANSAS: Faulkner Co.: 5.6 km S Conway. 18 April 1965. J. H. Bartee. Angelo State Natural History Collection (ASNHC 5750, 5752). 4.8 km W Conway. 18 April 1965. J. Wilkinson. (ASNHC 5753). Verified by J. Kelly McCoy. New county record and only the second and third verifiable localities north of the Arkansas River (the other being the city of Russellville) (Means 1974. Bull. Florida State Mus., Biol. Ser. 18:1–100; Trauth

et al. 2004. Amphibians and Reptiles of Arkansas. Univ. of Arkansas Press, Fayetteville. 421 pp.).

Submitted by **CHRIS T. McALLISTER**, Department of Physical and Life Sciences, Chadron State College, Chadron, Nebraska 69337, USA (e-mail: cmcallister@csc.edu); and **STANLEY E. TRAUTH**, Department of Biological Sciences, Arkansas State University, State University, Arkansas 72467, USA (e-mail: strauth@astate.edu).

DESMOGNATHUS FOLKERTSI (Dwarf Black-bellied Salamander). USA: NORTH CAROLINA: Clay Co.: An unnamed tributary of Beech Creek, ca. 0.8 km N of the Georgia state line (34°59'58.5"N, 83°32'51.6"W, 836 m elev.). 15 October 2006. Betsie Rothermel and Scott Rothermel. GMNH 49978. Identification was confirmed through gel electrophoresis of allozymes at the MDH-2 locus, one of four loci for which *D. folkertsi* and *D. quadramaculatus* show fixed differences (Camp et al. 2002. Herpetologica 58:471–484); morphological verification by Carlos D. Camp. First state record (Lannoo 2005. Declining Amphibians: the Conservation Status of United States Species. Univ. of California Press. 1094 p.) and first record within the Savannah River drainage (Camp 2004. Cat. Amer. Amph. and Rept. 782:1–3).

Submitted by **BETSIE B. ROTHERMEL**, The Center of Excellence for Field Biology, Austin Peay State University, P.O. Box 4718, Clarksville, Tennessee 37044, USA (e-mail: rothermelb@apsu.edu); **JOHN B. JENSEN**, Georgia Department of Natural Resources, Nongame Conservation Section, 116 Rum Creek Drive, Forsyth, Georgia 31029, USA; **CARLOS D. CAMP**, Department of Biology, Piedmont College, P.O. Box 10, Demorest, Georgia 30535, USA; and **TERRY D. SCHWANER**, Department of Biology, North Georgia College & State University, Dahlonega, Georgia 30597, USA.

HYDROMANTES PLATYCEPHALUS (Mount Lyell Salamander). USA: CALIFORNIA: Placer Co.: Blackwood Canyon, Fourth of July Chutes (Peak 8514): 39°3'56.8"N, 120°13'35.8"W, 2560 m elev. 20 July and 12 August 2006. T. Will Richardson. Two adults collected 12 August: MVZ 250724–725. Verified by Sean M. Rovito. One probable adult and four juveniles found and photographed on 20 July. Two adults and two juveniles found on 12 August. Found under granite stones on moist decomposed granite gravel near base of cliffs, adjacent to melting snowfields. One adult on 12 August was found under a stone, in matted *Primula suffrutescens* with snowmelt running through it. This population represents the first record for Placer County, the Lake Tahoe basin, and the Truckee River drainage, the northernmost record for the eastern slope of the Sierra Nevada, and the second-northernmost record for the species (Schlesinger and Romsos 2000. Appendix G. Vertebrate Species of the Lake Tahoe Basin, pp. G1–G15 *In* D. D Murphy and C. M. Kopp [eds.], Lake Tahoe Watershed Assessment: Volume II. Appendices. U.S. Forest Service SW-GTR-176; Stebbins 2003. A Field Guide to Western Reptiles and Amphibians, 3rd. Ed. Houghton Mifflin, New York). This also bridges a significant gap between the nearest known populations at Smith Lake, El Dorado Co. (23 km S) and Sierra Buttes, Sierra Co. (69 km NW). This report establishes a second salamander species from the Lake Tahoe basin.

Submitted by **T. WILL RICHARDSON** and **C. M. GIENGER,** Department of Biology, MS 314, University of Nevada, Reno 89557, USA.

PSEUDOEURYCEA QUETZALANENSIS (Cuetzalan Salamander). MÉXICO: PUEBLA: Municipality of Zacapoaxtla: Ejido Apulco (19º91'91.7"N, 97º60"67'W), 1450 m elev. 08 May 2004. Carlos Hernández Jiménez. Museo de Zoología, Facultad de Ciencias, Universidad Nacional Autónoma de México (MZFC 19350). First record for municipality and extends the known range ca. 18 km (airline) SE of Xocoyolo, Cuetzalan, Puebla (Parra-Olea et al. 2003. Herpetologica 60:478–484). Municipality of Tlatlauquitepec: Ejido La Unión (19°53'51.3"N, 97°28'38"W), 1585 m elev. 30 August 2005. Israel Solano Zavaleta. MZFC 19301. First record for municipality and extends the known range ca. 11.64 km (airline) from 2 km NE Xocoyolo, Cuetzalan, Puebla (Para-Olea et al., *op. cit.*). Both specimens verified by Edmundo Pérez Ramos. Another individual collected in Tlatlauquitepec, within Ejido Atlalpa (MZFC 19304; 19°51'1.3"N, 97º30'12"W), was found at 1900 m elev., which is the highest recorded elevation for this species (Parra-Olea et al., *op. cit.*). MZFC 19301 and 19350 were found under decaying logs in montane cloud forest; MZFC 19304 was found beneath a rock in pine-oak forest.

Submitted by **ESTRELLA MOCIÑO-DELOYA, URI OMAR GARCÍA-VÁZQUEZ, ISRAEL SOLANO-ZAVALETA,** and **MANUEL ROSADO-LUNA,** Museo de Zoología, Facultad de Ciencias, Universidad Nacional Autónoma de México, Ciudad Universitaria, A.P. 70-399, México, D.F. 04510, México (e-mail: allertsemoci@yahoo.com).

SIREN INTERMEDIA NETTINGI (Western Lesser Siren). USA: ARKANSAS: Howard Co.: 3.2 km S Tollette on St. Hwy. 355 (Sec. 20, T11S, R29W). 17 September 2006. Henry W. Robison. Verified by S. E. Trauth. Arkansas State University Herpetological Museum (ASUMZ 30348). New county record filling a distributional hiatus in the Millwood Lake watershed area of southwestern Arkansas among Hempstead, Polk, and Sevier counties (Trauth et al. 2004. Amphibians and Reptiles of Arkansas. Univ. Arkansas Press, Fayetteville. 421 pp.).

Submitted by **HENRY W. ROBISON**, Department of Biology, Southern Arkansas University, Magnolia, Arkansas 71754, USA (e-mail: hwrobison@saumag.edu); and **CHRIS T. McALLISTER**, Department of Physical and Life Sciences, Chadron State College, Chadron, Nebraska 69337, USA (e-mail: cmcallister@csc.edu).

SIREN INTERMEDIA NETTINGI (Western Lesser Siren). USA: TENNESSEE: Chester Co.: Henderson, Freed-Hardeman University Campus in the vicinity of Hwy 100 bypass and Sugar Creek (16S, 0351701E, 3922459N). 10 November 2006. David Crowell. Verified by A. Floyd Scott. Austin Peay State University Museum of Zoology (APSU 18303, photo voucher). New county record (Redmond and Scott 1996. Atlas of Amphibians in Tennessee. Misc. Publ. No. 12. The Center for Field Biology, Austin Peay State University, Clarksville, Tennessee. 94 pp.). Collected in a cypress slough adjacent to Sugar Creek using an unbaited minnow trap.

Submitted by **DAVID A. CROWELL** and **BRIAN P.**

BUTTERFIELD, Department of Biology, Freed-Hardeman University, Henderson, Tennessee 38340, USA (e-mail: bbutterfield@fhu.edu).

BUFO ATACAMENSIS (Atacama Toad; Sapo de Rulo). CHILE: III REGION (Atacama): QUEBRADA DE LOS SAPOS: 70 km N of the city of Vallenar and 16 km E of the main Panamericana Highway (28º04'48.4''S, 70º24'35.2''W, 1002 m elev.), 25 October 2006. Herpetological collection of Departamento de Biología Celular y Genética de la Universidad de Chile (16 specimens, DBGUCH 061001–16); QUEBRADA LA HIGUERA: 70 km N of the city of Vallenar and 32 km E of the main Panamericana Highway (28º01'21.3''S, 70º16'29.5''W, 1100 m elev.), 25 October 2006 (5 specimens, DBGUCH 061017–21). IV REGION, COQUIMBO: Chungungo, 56 km N of La Serena, at ca. 1 km W of the main road (29º35'12.5''S, 71º15'10.4''W, 161 m elev.), 28 October 2006 (3 specimens, DBGUCH 061022–24); Canela Alto, 140 km S of Ovalle and 38 km W of the main road in the Colihue stream (31º23'08.2''S, 71º25'11.7''W, 307 m elev.), 18 January 2007 (1 adult and 24 immature specimens, DBGUCH 070101–25); Mauro, at the origin of Pupío stream, 70 km E of Los Vilos (31º56'59.5''S, 71º03'50.7''W, 764 m elev.), November 2006 (1 immature specimen and larva, DBGUCH 061101–02). All collected by the authors, and verified by A. Veloso. This new information includes precise localities for the species in the central part of the range, extending the southern limit of the distribution previously described by Sallaberry and Mendez 2002 (Herpetol. Rev. 33:218–219) by more than 152 km. These new localities have been recorded with the support of grants PG-025-06 University of Chile and Fondecyt 1061256-2006.

Submitted by **MICHEL SALLABERRY A.** (e-mail: msallabe@uchile.cl) and **EDUARDO SOTO M.** (e-mail: edosoto@gmail.com), Departamento de Ciencias Ecológicas, Facultad de Ciencias, Universidad de Chile, Las Palmeras 3425, Ñuñóa, PO Box 653, Santiago, Chile; and **CLAUDIO CORREA Q.** (e-mail: ccorrea@uec.inta.uchile.cl) and **MARCO MENDEZ T.** (e-mail: mmendez@uec.inta.uchile.cl), Laboratorio de Genómica Evolutiva, INTA, Universidad de Chile, Macul 5540, PO Box 138-11 Santiago, Chile.

EPIPEDOBATES MACERO (Manu Poison Frog): PERU: JUNÍN: Satipo: Río Tambo: Coriteni Tarso Native Community (11º12´27"S 74º02´56.6"W, 583 m elev.). 26 July 2004. M. Medina-Müller and J. Rodrigo. Verified by L. O. Rodríguez. Museo de Historia Natural Universidad San Marcos, Lima, Peru (MHNSM 22102, MHNSM 22109, adult collected on leaf, near forest stream). Endemic from Peru, previously known from Peruvian departments of Cuzco, Ucayali, and Madre de Dios (Dallmeier et al. 1997. SI/MAB Series No. 2. Smithsonian Inst. MAB Biodiv. Progr., Washington, D.C.; Myers et al. 1998. Amer. Mus. Nat. Hist. Novitates 3238:1–20; Rodríguez et al. 1993. Amer. Mus. Nat. Hist. Novitates 3068:1–15). First departmental record, extends the known distribution 190 km NW from Campamento Kapiromashi at Bajo Urubamba, Cusco, Peru (Dallmeier et al. 1997, *op. cit.*).

Submitted by **MARGARITA MEDINA-MÜLLER**, Museo de Historia Natural San Marcos, Av. Arenales 1256, Jesús María, Lima, Perú; e-mail: emmmuller@yahoo.com.

EUHYAS PLANIROSTRIS (Greenhouse Frog). USA: LOUISIANA: TERREBONNE PARISH: Houma. June 2005. Ernest A. Liner. Louisiana State University Museum of Zoology (LSUMZ 89720–89729 adults; 89739 eggs). Verified by Jeff Boundy. Extends the range ca. 60 miles SW of the range as given by Dundee and Rossman (1989. The Amphibians and Reptiles of Louisiana. LSU Press, Baton Rouge, Louisana, XXX pp.) and establishes the species in the ninth of 64 parishes of the state (J. Boundy, pers. comm.).

Submitted by **ERNEST A. LINER**, 310 Malibou Boulevard, Houma, Louisiana 70364-2598, USA; e-mail: eliner@mobiletel.com.

HYLA CHRYSOSCELIS/HYLA VERSICOLOR **SIBLING SPECIES COMPLEX** (Cope's Gray Treefrog/Gray Treefrog). USA: ARKANSAS: VAN BUREN CO.: 5.6 km S Bee Branch on US 65 (Sec. 20, T9N, R13W). 21 May 2006. Henry W. Robison. Verified by S. E. Trauth. Arkansas State University Herpetological Museum (ASUMZ 30350). New county record filling a distributional hiatus in the southern Ozark foothills/Arkansas Valley among Conway, Pope, and Stone counties (Trauth et al. 2004. Amphibians and Reptiles of Arkansas. Univ. Arkansas Press, Fayetteville. 421 pp.).

Submitted by **HENRY W. ROBISON**, Department of Biology, Southern Arkansas University, Magnolia, Arkansas 71754, USA (e-mail: hwrobison@saumag.edu); and **CHRIS T. MCALLISTER**, Department of Physical and Life Sciences, Chadron State College, Chadron, Nebraska 69337, USA; e-mail: cmcallister@csc.edu.

ISCHNOCNEMA SAXATILIS (Tarapoto Big-headed Frog): PERU: JUNÍN: Satipo: Río Tambo: Coriteni Tarso Native Community (11º12´27"S 74º02´56.6"W, 583 m elev.). 21–29 July 2004. M. Medina-Müller, J. Rodrigo, and M. FitzPatrick. Verified by C. Aguilar. Museo de Historia Natural Universidad San Marcos, Lima, Peru (MHNSM 22078, MHNSM 22082, MHNSM 22087, MHNSM 22096, MHNSM 22141. Collected on rocks of a forest stream). The Coriteni Tarso native community record represents the southernmost locality for this endemic species of Peru. The new record extends the distribution 605 km SE from the only known locality (Ponga de Shilcayo, 6°31´S, 76°53´W; Duellman 1990. Occas. Pap. Mus. Nat. Hist. Univ. Kansas 138:1–7).

Submitted by **MARGARITA MEDINA-MÜLLER**, Museo de Historia Natural San Marcos, Av. Arenales 1256, Jesús María, Lima, Perú; e-mail: emmmuller@yahoo.com.

KALOULA BALEATA (Brown Bull Frog). BRUNEI DARUSSALAM: Belait District, Melilas (04º13'N, 114º40'E), Labi. 11–12 November 1992. Collected by F. Kraus. Brunei Museum, BM 79.1992; BM 141.1992; UMMZ 201718–20. Vicinity (between 1.6–24.6 km N) Sungei Liang (04º30'N, 114º40'E), Labi Road. 6 December 1992. Collected by F. Kraus. BM 254–256.1992; UMMZ 201721–24. First records for Brunei Darussalam (see Das 2007. A Pocket Guide. Amphibians and Reptiles of Brunei. Natural History Publications [Borneo] Sdn Bhd. Kota Kinabalu. viii + 200 pp.). Previous Bornean records were from Sabah, Sarawak, and Kalimantan (Inger and Tan 1996. Raffles Bull. Zool. 44:551–574), and the species is generally widespread in Southeast Asia (Inger 1999. *In* W. E. Duellman [ed.], Patterns of Distribution of

Amphibians. A Global Perspective, pp. 445–482. The John Hopkins University Press, Baltimore and London).

Submitted by **INDRANEIL DAS**, Institute of Biodiversity and Environmental Conservation, Universiti Malaysia Sarawak, 94300 Kota Samarahan, Sarawak, Malaysia (e-mail: idas@ibec.unimas.my); and **FRED KRAUS**, Bishop Museum, 1525 Bernice Street, Honolulu, Hawaii 96817, USA (e-mail: fkraus@hawaii.edu).

LEPTODACTYLUS PLAUMANNI (Nova Teutonia White-lipped Frog). BRAZIL: Paraná: Municipality of São João do Triunfo (25º34'18"S, 50º05'56"W) 780 m elev. 22 December 2003. A. M. X. Lima. Scientific collection of Instituto de Pesquisas em Cananéia, Cananéia, São Paulo State (MIPEC 024). Verified by R. A. Machado. Individual was collected from a short grass pasture close to Iguaçu River margin while it was calling. Previously known from Argentina in Misiones, and Brazil, in Rio Grande do Sul and Santa Catarina State (Silva et al. 2004. Amphibia-Reptilia 25:186–195). First state record, extends the known range of the species 400 km NE from the municipality of Seara, Santa Catarina State.

Submitted by **ANDRÉ MAGNANI XAVIER DE LIMA**, Programa de Pós-Graduação em Ecologia e Conservação, UFPR, rua Bento Viana, 932, ap 41, CEP 80210-170, Curitiba, Paraná, Brazil; e-mail: "mailto:andremxlima@uol.com.br" andremxlima@uol.com.br.

LEPTODACTYLUS SYPHAX. BRAZIL: GOIÁS: Caldas Novas municipality: 17º43'56"S, 48º40'0"W. 12 August 2002. K. G. Facure. Verified by A. A. Giaretta. Coleção Zoológica da Universidade Federal de Uberlândia (Anura), AAG-UFU 002307. *Leptodactylus syphax* was known from the Brazilian states of Mato Grosso, Minas Gerais, and Paraíba, as well as southern Paraguay and eastern Bolivia (Heyer 1979. Smithson. Contrib. Zool. 301:1–43; Frost 2004. Amphibian Species of the World: An Online Reference. Amer. Mus. Nat. Hist., New York, http://research.amnh.org/herpetology/amphibia/index.php). Adult male, calling in sandy rocks beside water (ca. 35°C). First state record, Caldas Novas is intermediate between previously known localities in Alpinópolis (Minas Gerais State, ca. 500 km SE) and Cuiabá (Mato Grosso State, ca. 800 km NW) (Cardoso and Heyer 1995. Alytes 13[2]: 67–76).

Submitted by **WAGNER R. SILVA** (e-mail: wagnerdrigues@yahoo.com.br) and **KÁTIA G. FACURE**, Laboratório de Taxonomia, Sistemática e Ecologia Comportamental de Anuros Neotropicais, Instituto de Biologia, Universidade Federal de Uberlândia, CEP 38 400-902, Uberlândia, Minas Gerais, Brazil; e-mail: thoropa@inbio.ufu.br,

OSTEOPILUS SEPTENTRIONALIS (Cuban Treefrog). NETHERLANDS ANTILLES: Saba: Windward side. 27 July 2006. John Magor. MPM P736. Verified by Robert W. Henderson. First record for Saba (Powell et al. 2005. The Reptiles and Amphibians of the Dutch Caribbean: St. Eustatius, Saba, and St. Maarten. St. Eustatius National Parks Foundation, Gallows Bay, St. Eustatius, Netherlands Antilles. 192 pp.). The species is well established on St. Maarten, the presumed origin of this individual.

Submitted by **ROBERT POWELL**, Department of Biology, Avila University, Kansas City, Missouri 64145, USA; e-mail: robert.powell@avila.edu.

PHYLLOMEDUSA OREADES (NCN). BRAZIL: MINAS GERAIS: Municipality of Cabeceira Grande, District of Palmital (16º14'S, 47º18'W, 877 m elev.). 18 October 2006. R. R. Carvalho-Jr. and E. G. Pereira. Laboratório de Herpetologia, Museu de Ciências Naturais, Pontifícia Universidade Católica de Minas Gerais, Belo Horizonte, Minas Gerais, Brazil (MCNAM 8294–95). Verified by L. B. Nascimento. *Phyllomedusa oreades* was found only in states of Goiás (Serra da Mesa, Chapada dos Veadeiros, and Serra dos Pirineus) and Distrito Federal (ARIE Capetinga-Taquara and Reserva Ecológica do IBGE, Brasília), Brazil, above 900 m elev. (Brandão 2002. Herpetologica. 36:571–578; Caramaschi 2006. Arq. Mus. Nac. 6[2]:159–179). First state record extends known distribution ca. 295 km airline SE from the type locality, Minaçu/Serra da Mesa, state of Goiás, and ca. 110 km airline from Brasília (Brandão, *op. cit.*).

Submitted by **RONALD REZENDE DE CARVALHO JÚNIOR**, Pontifícia Universidade Católica de Minas Gerais, Museu de Ciências Naturais, Av. Dom José Gaspar 290, Coração Eucarístico, 30536-610, Belo Horizonte, MG, Brazil (e-mail: rcjunior.bh@terra.com.br); and **MARCO ANTÔNIO SCHETTINO CANELAS** (e-mail: cotonhocanelas@yahoo.com).

PLETHODONTOHYLA MIHANIKA (Malagasy Climbing Rain Frog). MADAGASCAR: (1) Masoala Peninsula, Andranobe Field Station, Maroantsetra Fivondronana, Toamasina Faritany (15°39.50'S, 49°57.50'E; 15 m elev.), Museo Regionale di Scienze Naturali di Torino, MRSN A2645. 29 October 1998. J. E. Randrianirina; (2) Masoala Peninsula, Antsarahan'Ambararato, Antalaha Fivondronana, Antsiranana Faritany (15°23.52'S, 50°02.82'E; 500–530 m elev.), MRSN A4594. 9 December 1999. F. Andreone and J. E. Randrianirina; (3) Masoala Peninsula, Mahalevona Maroantsetra Fivondronana, Toamasina Faritany (15°25.12'S, 49°56.77'E, 778 m elev.), MRSN A2705. 09 February 2002. J. E. Randrianirina. Verified by M. Vences. Recently described from eastern Madagascar by Vences et al. (2003. J. Herpetol. 37:629–636). Data on distribution is scanty and known from localities on the east coast of Madagascar, including Ambatovaky, Zahamena, Andasibe, Ankeniheny, Fierenana, Ranomafana, and Sandranantitra. The three new records from Masoala mark the northernmost sites, at ca. 150 km N of Ambatovaky. The specimen from Andranobe was listed as a voucher in a recent mt-DNA analysis on Malagasy cophyline frogs (Andreone et al. 2005. Mol. Phylogen. Evol. 34:315–322). Antsarahan'Ambararato and Mahalevona lie outside boundary of Parc National de Masoala, and fall within relatively undisturbed rainforests. The three specimens measure, respectively, 37.1 mm (MRSN A2645), 34.5 mm (MRSN A2705), and 36.6 mm (MRSN A4594), and are larger than those previously reported (26.4–31.1 mm). They were further assigned to *P. mihanika* because of the longer hind limbs relative to those of *P. notosticta,* the dorsal pattern, and semiarboreal habits. Specimens were captured using a pitfall device associated with a plastic drift-fence, as described by Andreone et al. (2000. Biodiv. Conserv. 9:1587–1622), thus showing the value of this method to detect secretive amphibian species.

Submitted by **FRANCO ANDREONE**, Museo Regionale di Scienze Naturali di Torino, Via G. Giolitti, 36, I-10123 Torino, Italy; e-mail: f.andreone@libero.it.

RANA BLAIRI (Plains Leopard Frog). USA: NEW MEXICO: Dona Ana Co.: Hatch, 0.62 mi S, 0.54 mi E jct. I-25 and NM Hwy 26; T19S, R3W, S9 (NE 1/4); 13S, 3617236N, 0298848E (WGS 84). MSB 71927. 15 September 2004. Shawn Collier. Verified by Charles W. Painter. New county record (Degenhardt et al. 1996. Amphibians and Reptiles of New Mexico. University of New Mexico Press, Albuquerque. 431 pp.).

Submitted by **MICHAEL T. HILL**, Department of Wildlife and Fisheries Sciences, Texas A&M University, 2258 TAMU, College Station, Texas 77843, USA; and **DEBRA M. HILL**, U.S. Fish and Wildlife Service, 500 Gold Avenue, Suite 9019, Albuquerque, New Mexico 87103, USA.

RHINELLA SCITULA. BRAZIL: MATO GROSSO DO SUL: Aquidauana (Piraputanga, Vale das Bruchas, 20°27'23,01"S; 55°29'55,70"W). 08 February 2007. F. P. Maragno. Verified by M. Uetanabaro. Coleção Zoológica do Departamento de Biologia, Universidade Federal de Mato Grosso do Sul, Campo Grande, Brazil (ZUFMS 01254 adult male, SVL 44 mm). Known only from the type locality (Bonito, Mato Grosso do Sul State; Caramaschi and Niemeyer 2003. Boletim do Museu Nacional. Rio de Janeiro. 501:1–16). This new record extends distribution 121 km W from type locality (Caramaschi and Niemeyer, *op. cit.*).

Submitted by **FRANCIÉLE PEREIRA MARAGNO**, Programa de Pós Graduação em Ecologia e Conservação, Universidade Federal de Mato Grosso do Sul, 79070-900, Campo Grande, Mato Grosso do Sul, Brazil (e-mail: fmaragno@gmail.com); and **FRANCO LEANDRO DE SOUZA**, Centro de Ciências Biológicas e da Saúde, Departamento de Biologia, Universidade Federal de Mato Grosso do Sul, 79070-900, Campo Grande, Mato Grosso do Sul, Brazil (e-mail: flsouza@nin.ufms.br).

SYRRHOPHUS CYSTIGNATHOIDES (Rio Grande Chirping Frog). USA: TEXAS: Austin Co.: San Felipe: Stephen F. Austin State Park (29°48'25''N, 096°05'49''W, 155 ft elev.) 3 January 2007, 1430 h, 52°F. Collected by Thomas A. Sinclair, John T. Williams, and Scott A. Wahlberg. Verified by Travis J. LaDuc. Texas Natural History Collections-Texas Memorial Museum-University of Texas (TNHC 65939). New county record (Dixon 2000. Amphibians and Reptiles of Texas. Second Edition. Texas A & M University Press, College Station, Texas, 421 pp.). An adult found under a rotten log next to a *Eumeces fasciatus*, in a torpid state. The animal was released at the site.

Submitted by **THOMAS A. SINCLAIR**, 12903 Cloverwood Drive, Cypress, Texas 77429, USA (e-mail: tsinclair2@houston.rr.com); **JOHN T. WILLIAMS**, 1001 Harvey 14, College Station, Texas 77840, USA (e-mail: john-thomas-williams@neo.tamu.edu); and **SCOTT A. WAHLBERG**, 3008 Chimney Rock, Apartment 2, Nacogdoches, Texas 75965, USA (e-mail: wahlbergsa@titan.sfasu.edu).

SYRROPHUS INTERORBITATLIS (Spectacled Chirping Frog). MÉXICO: SONORA: Municipio de Yécora: 26.1 km (by Mex. Hwy. 16) E Yécora (28.38234°N, 108.76937°W), 1332 m elev. 7 July 2005. E. Enderson and R. Bezy. Verified by John Lynch. UAZ 56549-PSV. First record for Sonora, extending the range ca. 350 km (airline) N from the vicinity of Guamuchil, Sinaloa (Hardy and McDairmid 1969. Univ. Kansas Publ. Mus. Nat. Hist. 28:39–252). The voucher was one of about 30 others calling in oak woodland.

Submitted by **ERIK F. ENDERSON**, Dryland Institute, PMB 405 2509 North Campbell Avenue, Tucson, Arizona 85719, USA (e-mail: erikenderson@msn.com); and **ROBERT L. BEZY,** Herpetology, Natural History Museum of Los Angeles County, Los Angeles, California 90007, USA.

XENOPUS MUELLERI (Müller's Platanna). SOUTH AFRICA: LIMPOPO PROVINCE: 1 km N of Albasini Dam (23°05'47"S, 30°05'22"E, 780 m elev.). 01 December 2004. B. Maritz. Verified by Lemmy Mashinini. Transvaal Museum, Tswane, South Africa (TM 85487–88). Extends the known distribution by at least 50 km from the closest record—the opposite slope of the Soutpansberg Mountains (Minter et al. 2004. Atlas and Red Data Book of the Frogs of South Africa, Lesotho and Swaziland. SI/MAB Series No. 9. Smithsonian Institution, Washington, D.C.). This record also increases the altitudinal distribution by >150 m (previously thought to occur <600 m elev.). Additionally, this is the first record from the Luvuvhu River catchment. *Xenopus laevis* was recorded within 500 m, but not in the same water body. Possible case of micro-allopatry between these two species.

Submitted by **BRYAN MARITZ**, **GAVIN P. R. MASTERSON**, **DARIAN MACKAY**, and **GRAHAM J. ALEXANDER**, School of Animal, Plant and Environmental Sciences, University of the Witwatersrand, Johannesburg, South Africa, Private Bag 3, Wits, 2050, South Africa (e-mail: maritz@gecko.biol.wits.ac.za).

TESTUDINES

ACTINEMYS MARMORATA (Pacific Pond Turtle). MEXICO: BAJA CALIFORNIA NORTE**:** Río San Rafael, 17.12 air km ENE of Punta Colonet near Potrero (31.09353ºN, 116.02786ºW), 157 m elev. 18 May 2005. Thomas Akre, John Blackburn, Antonio Robison, and Robert Lovich. Verified by Jeffrey Lovich. Universidad Autónoma de Baja California UABC 1524. First documented record from the Río San Raphael, although sightings in the upper reaches of the river were reported by Welsh (1988. Proc. California Acad. Sci.46:1–72) and other sightings without precise locality data were mentioned by Roberts (1981. Paper presented during California Riparian Systems Conference, Univ. California Davis, 17–19 September; 1982. Abstr., Proc. Desert Tortoise Council Symposium, pp. 154–161). The record also bridges the distribution gap between known localities in the Río San Telmo (19 km NW) and Río San Juan (35 km SW) reported in Lovich et al. (2005. Herpetol. Rev. 36:200–201). The adult male turtle was observed swimming downstream in a shallow (< 0.5 m), bolder-strewn riffle with gravel substrate.

Submitted by **ROBERT E. LOVICH**, Department of Earth and Biological Sciences, Loma Linda University, Loma Linda, California 92350, USA (e-mail: rlovich@gmail.com.); **THOMAS S. AKRE**, Department of Natural Sciences, Longwood University,

201 High Street, Farmville, Virginia 22309, USA; **JOHN BLACKBURN,** Department of Biology, George Mason University, 4400 University Drive, Fairfax, Virginia 22020, USA; **TONY ROBISON,** 5505 Woodlawn Manor Court, Alexandria, Virginia 22309, USA**;** and **CLARK MAHRDT,** San Diego Natural History Museum, San Diego, California 92112, USA.

KINOSTERNON INTEGRUM (Mexican Mud Turtle). MÉXICO: SONORA: MUNICIPIO DE BAVIÁCORA: W slope of the Sierra El Chinito, ca. 27 km (airline) E of Baviácora (29.768530°N, 109.988982°W), 1400 m elev. 04 September 2004. E. Enderson, R. Bezy, and S. Hale. Verified by Philip C. Rosen. UAZ 56547-PSV. Northernmost record for Sonora, extending the range ca. 116 m (airline) NE of Río Matape, Sonora (Iverson 1998. Cat. Amer. Amphib. Rept. 652.1–6). Habitat at this locality is a mosaic of oak woodland and foothills thornscrub.

Submitted by **ERIK F. ENDERSON**, Drylands Institute, PMB 405 2509 North Campbell Avenue, Tucson, Arizona 85719, USA (e-mail: erikenderson@msn.com); **ROBERT L. BEZY**, Herpetology, Natural History Museum of Los Angeles County, Los Angeles, California 90007, USA; and **STEPHEN F. HALE,** EcoPlan Associates, Inc., 701 West Southern Avenue, Ste. 203, Mesa, Arizona 85210, USA (e-mail: sfhale@comcast.net).

PSEUDEMYS TEXANA (Texas River Cooter). USA: TEXAS: COLORADO CO.: Shell fragments were found at a picnic area next to Cummins Creek on FM-1291, 220 m W of intersection of FM-1291 and Kickler Road (29.89916°N, 96.6065°W, WGS84, 75 m elev. 18 June 2006. Diana J. McHenry and Shawn F. McCracken. Verified by Toby Hibbitts. Texas Cooperative Wildlife Collection, TCWC 91783. First county record (Dixon 2000. Amphibians and Reptiles of Texas. 2nd Edition. Texas A&M Univ. Press, College Station, Texas, 421 pp.).

Submitted by **DIANA J. MCHENRY**, Division of Biological Sciences, University of Missouri, Columbia, Missouri 65211, USA; **SHAWN F. MCCRACKEN** and **MICHAEL R. J. FORSTNER**, Department of Biology, Texas State University, San Marcos, Texas 78666, USA (e–mail: mf@txstate.edu).

LACERTILIA

AMPHISBAENA PLUMBEA. ARGENTINA: CHUBUT: TELSEN: Road to Laguna de la Vaca, 5 km SW Provincial Road 4 (42°26'52.6"S 67°18'51.6"W) 667 m elev. 08 February 2007. L. J. Avila, M. Kozykariski, and N. Feltrin. Fundación Miguel Lillo herpetological collection (FML 18118). Verified by R. Montero. This species is endemic to western Argentina and shows a large distribution along Monte phytogeographic formation, from northern Tucumán province to the Atlantic shore of Chubut province. Its geographic distribution is poorly known for Rio Negro and Chubut provinces where only three localities are cited. This is the westernmost record for Chubut and extends the known distribution ca. 200 km W from the nearest records in the coastal areas (Montero 1996. Cuad. Herpetol. 10:25–45).

Submitted by **LUCIANO JAVIER AVILA**, **MONICA KOZYKARISKI**, **NATALIA FELTRIN**, and **MARIANA MORANDO**, CENPAT-CONICET, Boulevard Almirante Brown s/n, U9120ACV, Puerto Madryn (Chubut), Argentina (e-mail: avila@cenpat.edu.ar).

ANOLIS SAGREI (Brown Anole). USA: LOUISIANA: LAFOURCHE PARISH: Thibodaux, Hebert's Nursery, 1500 St. Mary St. 5 October 2006. Michael P. Wiley. Verified by Ernest A. Liner. American Museum of Natural History (AMNH R156219). TERREBONNE PARISH: Houma, Starke's Garden Center, 4836 Hwy. 311. 27 October 2006. Michael P. Wiley. Verified by Ernest A. Liner. American Museum of Natural History (AMNH R156218). New parish records. The owner of Starke's Garden Center has observed *A. sagrei* arriving on shipments of Sable Palm (*Sable major*) from southern Florida. Hebert's Nursery also receives plants from southern Florida. Starke's is located ca. 25 km SSE of Hebert's Nursery. Nearest recorded locations are Orleans Parish (ca. 80 km ENE of Thibodaux; Thomas et al. 1990. Herpetol. Rev. 21:22) and East Baton Rouge Parish (ca. 85 km NNW of Thibodaux; Platt and Fontenot 1994. Herpetol. Rev. 25:33).

Submitted by **MICHAEL P. WILEY**, **ALLYSE M. FERRARA**, and **QUENTON C. FONTENOT,** Bayousphere Research Lab, Department of Biological Sciences, Nicholls State University, Thibodaux, Louisiana 70310, USA.

CROTAPHYTUS VESTIGIUM (Baja California Collared Lizard). MEXICO: BAJA CALIFORNIA SUR: 9.5 km N of Loreto on peninsular coast facing Isla Coronados (26°05'52.6"N, 111°19'26.9"W), near sea level. 25 September 2004. Armando Tejas. Verified by Jesse L. Grismer. La Sierra University Digital Photo Catalogue (LSUDPC 690–91). Southeastern most record for the Central Gulf Coast phytogeographic region, extending the range 66 km SE from Bahía Concepción (Grismer 2002. Amphibians and Reptiles of Baja California Including Its Pacific Islands and the Islands in the Sea Of Cortez. Univ. California Press, Berkeley. 399 pp.) and a 41 km range extension SE from the closest known locality, 28 km S of San José Comondú on the Sierra de La Giganta (McGuire 1996. Bull. Carnegie Mus. Nat. Hist. 32:1–193), which is located in the arid tropical phytogeographic region.

Submitted by **CRYSTIAN S. VENEGAS-BARRERA**, **GUSTAVO ARNAUD**, Centro de Investigaciones Biológicas del Noroeste, La Paz, B.C.S. 23090, México (e-mail: sadiel@cibnor.mx); and **L. LEE GRISMER**, Department of Biology, La Sierra University, Riverside, California 92515, USA.

CTENOSAURUS SIMILIS (Spiny-Tailed Iguana). USA: FLORIDA: SARASOTA CO.: Englewood, 446 Court Street (26.959367^{0}N, -82.343267^{0}W). 15 January 2007. Missy L. Christie and Cathy A. Olson. Verified by Kenneth Krysko. University of Florida Museum of Natural History (UF 150493, photo voucher). New county record. Although common on Boca Grande, an island ca. 11 miles SE in Charlotte and Lee counties, there are few reports on the mainland. This represents the first report in Sarasota County and is ca. 8 miles N of other reports from Cape Haze (Krysko et al. 2003. Florida Sci. 66[2]:141–146).

Submitted by **CATHY A. OLSON**, Lee County Department of Parks and Recreation, 3410 Palm Beach Blvd., Fort Myers, Florida 33916, USA (e-mail: colson@leegov.com); **GREGG S. KLOWDEN**, Department of Wildlife Ecology and Conservation, University of Florida, P.O Box 110430, Gainesville, Florida 32611, USA (e-mail: geckoguy@ufl.edu); and **MISSY L. CHRISTIE**, Charlotte County Natural Resources Division, 25550 Harborview Rd., Punta Gorda, Florida 33980, USA (e-mail: missy.christie@charlottefl.com).

CYRTODACTYLUS IRIANJAYAENSIS (NCN). INDONESIA: PAPUA PROVINCE: 'Waibya Camp,' northern Salawati Island (130°47'060"E, 00°57'383"S; < 100 m elev.). 28 June 2005. Arthur Tipawael. Museum Zoologicum Bogoriense (MZB 5576). Verified by Mark Hutchinson. Adult female, with a moderately enlarged follicle. Collected at night from ca. 6 m on trunk of large tree along road in disturbed lowland rainforest. Previously known from pet trade specimens exported from Papua Province, without specific locality data (Rösler 2001. Zool. Abhand. Staatliches Mus. Tierkunde Dresden 51:61–71). First specimen in an institutional collection with locality data. Further collecting required to ascertain whether the species is endemic to Salawati Island, or is more widespread.

Submitted by **PAUL OLIVER**, Herpetology Section, South Australian Museum, 0 North Terrace, Adelaide, South Australia 5000, Australia (e-mail: paul.oliver@adelaide.edu.au); **BURHAN TJATURADI,** Conservation International Papua Program, Jl. Bhayangkara, 1#5, Jayapura 99610, Papua Province, Indonesia; and **STEPHEN RICHARDS**, Herpetology Section, South Australian Museum, Adelaide, South Australia 5000, Australia.

DRYADOSAURA NORDESTINA (Briba Cabeçuda). BRAZIL: BAHIA: Município de Mata de São João: Fazenda de Camurujipe (12º30'5''S, 38º2'19''W).12 and 23 February 2005. A. Camacho Guerrero. Museu de Zoologia da Universidade Federal de Bahia, Salvador, Bahia, Brazil (UFBA – 672). Caught with pitfall traps near the border of a 1390-ha patch of well preserved Atlantic Rainforest. Verified by E. M. Xavier Freire. Species previously known from Paraiba, Pernambuco, Alagoas, and Rio Grande do Norte states, Brazil (Rodrigues et al. 2005. Zool. J. Linn. Soc. 44[4]:546–547). First state record, extends the range more than 400 km S from Maceió, Alagoas (Rodrigues et al. *op. cit.*).

Submitted by **AGUSTÍN CAMACHO GUERRERO**, Laboratório de Vertebrados Terrestres, Departamento de Zoologia, Instituto de Biologia.Universidade Federal da Bahia, Rua Barão de Geremoabo, 147 - Campus de Ondina, CEP 40170-290, Salvador-BA, Brazil; and **MIGUEL TREFAUT RODRIGUES**, Instituto de Biociências, Departamento de Zoologia, Universidade de São Paulo, Caixa Postal 11.461. CEP 05422-970 São Paulo, SP, Brazil.

GEKKO MONARCHUS (Malaysian House Gecko). THAILAND: SURAT THANI PROVINCE: Muang District, Surat Thani (9°10'N, 99°15'E). 12 October 2004. N. Paisanwattanakul. Institut Royal des Sciences Naturelles de Belgique, Brussels (IRSNB 17008). Verified by Georges Lenglet (IRSNB). Subadult specimen (SVL 63 mm) caught on a building in the city. Only specimen observed. First provincial record and extension of ca. 140 km northwest from the previous northernmost locality which was situated in Takua Pa District, Phang-Nga Province (Grossmann and Tillack 2001. Sauria 23[3]:21–34; Pauwels et al. 2000. Dumerilia 4[2]:123–154). The species is now recorded in Thailand from Narathiwat, Pattani, Phang-Nga, Phuket, and Surat Thani provinces (Nabhitabhata et al. "2000" 2004. Checklist of Amphibians and Reptiles in Thailand, Office of Environmental Policy and Planning, Bangkok). We thank Nopnarong Paisanwattanakul (Surat Thani) for the donation of the specimen.

Submitted by **OLIVIER S. G. PAUWELS**, Department of Recent Vertebrates, Institut Royal des Sciences Naturelles de Belgique, Rue Vautier 29, 1000 Brussels, Belgium (e-mail: osgpauwels@yahoo.fr); and **MONTRI SUMONTHA**, Ranong Marine Fisheries Station, 157 M. 1, Saphan-Pla Rd., Paknam, Muang, Ranong 85000, Thailand (e-mail: knotsnake2211@yahoo.com).

HELODERMA HORRIDUM HORRIDUM (Mexican Beaded Lizard). MÉXICO: ZACATECAS: Municipio de Valparaíso: on dirt road between San Juan Capistrano and San Rafael de las Tablas, ca. 1300 m elev. 12 July 2006. Nicolás Escalante Grijalva. Verified by Oscar Flores-Villela. Photographic collection of Museo de Zoología de la Facultad de Ciencias, Universidad Nacional Autónoma de México (MZFC 1599–1601). First record for Zacatecas (Beck 2005. Biology of Gila Monsters and Beaded Lizards, University of California Press, Berkeley). The dirt road passes through tropical scrub vegetation within the Sierra Madre Occidental near the border with Nayarit, Jalisco, and Durango.

Submitted by **HECTOR AVILA-VILLEGAS,** Dirección de Recursos Bióticos, Instituto del Medio Ambiente del Estado de Aguascalientes, Aguascalientes, México; e-mail: avila_hec@yahoo.com.mx.

HEMIDACTYLUS TURCICUS (Mediterranean House Gecko). USA: ARKANSAS: Columbia Co.: Magnolia city limits (Sec. 31, T16S, R20W). 02 October 2006. Lindsey Fowler. Arkansas State University Museum of Zoology, Herpetological Collection (ASUMZ 30415). Verified by Stanley E. Trauth. New county record in southern Arkansas (Trauth et al. 2004. Amphibians and Reptiles of Arkansas, Univ. of Arkansas Press, Fayetteville). The specimen was taken from an office wall of a local trucking company.

Submitted by **LINDSEY FOWLER** and **HENRY W. ROBISON**, Department of Biological Sciences, Southern Arkansas University, Magnolia, Arkansas 71754-9354, USA (e-mail: hwrobison@saumag.edu).

HEMIDACTYLUS TURCICUS. (Mediterranean House Gecko). USA. LOUISIANA: Beauregard Parish: Outside walls of South Beauregard High School, 19.31 km N of the Beauregard Parish/Calcasieu Parish line on US Hwy 171. 14 January 2007. Terry Sylvester and Constance Kersten. Verified by Avery Williams. Louisiana State University at Eunice Museum (LSUE 2575–76). First parish record (Meshaka et al. 2006. Herpetol. Conserv. Biol. 19[1]:45–50). The two specimens are sub-adults collected at night. A large population of geckos lives on the brick buildings of the South Beauregard Elementary School/High School complex and has been the subject of population studies since 2005.

Submitted by **TERRY SYLVESTER** and **CONSTANCE KERSTEN**, Department of Biological and Environmental Sciences, McNeese State University, Lake Charles, Louisiana 70609, USA (e-mail: msu-tsylvester@student.mcneese.edu); and **MARK A. PAULISSEN**, Department of Natural Sciences, Northeastern State University, Tahlequah, Oklahoma 74464, USA (e-mail: paulisse@nsuok.edu).

HEMIPHYLLODACTYLUS TYPUS TYPUS (Common Indo-Pacific Tree Gecko). THAILAND: KANCHANABURI PROVINCE: Sai Yok District, Sai Yok Noi. September 2002. M.

Sumontha. Institut Royal des Sciences Naturelles de Belgique, Brussels (IRSNB 17014). Verified by Georges Lenglet (IRSNB). First provincial record. The species is thus presently recorded in Thailand from Kanchanaburi, Nakhon Ratchasima, Narathiwat, Phang-Nga, Phuket, Ranong, Trang, and Trat provinces (Chanard et al. 1999. Amphibians and Reptiles of Peninsular Malaysia and Thailand. An Illustrated Checklist. Bushmaster Publications, Würselen, 240 pp.; Nabhitabhata et al., "2000" 2004. Checklist of Amphibians and Reptiles in Thailand, Office of Environmental Policy and Planning, Bangkok; Pauwels and Bauer 2001. Herpetol. Rev. 32:119).

Submitted by **OLIVIER S. G. PAUWELS**, Department of Recent Vertebrates, Institut Royal des Sciences naturelles de Belgique, Rue Vautier 29, 1000 Brussels, Belgium (e-mail: osgpauwels@yahoo.fr); and **MONTRI SUMONTHA**, Ranong Marine Fisheries Station, 157 M. 1, Saphan-Pla Rd., Paknam, Muang, Ranong 85000, Thailand (e-mail: knotsnake2211@yahoo.com).

HOLASPIS GUENTHERI (Günther's Gliding Lizard). EQUATORIAL GUINEA: Monte Alen National Park. July 2001. T. Stévart. Institut Royal des Sciences Naturelles de Belgique, Brussels (IRSNB 16638). Verified by Georges L. Lenglet (IRSNB). Adult specimen found active by day in secondary forest nr. ECOFAC station and hotel (01°39'N, 10°18'E, ca. 800 m elev.). New record for Park and for Centro Sur Province (Lasso et al. 2002. Graellsia 58[2]:21–34; De la Riva 2004. Quercus 215:56–61). We thank Ignacio J. De la Riva (Museo Nacional de Ciencias Naturales, Madrid) for comments. This is Contribution 89 of the Smithsonian Institution's Gabon Biodiversity Program.

Submitted by **OLIVIER S. G. PAUWELS**, Smithsonian Institution, National Zoological Park, Monitoring and Assessment of Biodiversity Program, Gamba, Gabon; mailing address: Département des Vertébrés Récents, Institut Royal des Sciences naturelles de Belgique, Rue Vautier 29, 1000 Brussels, Belgium (e-mail: osgpauwels@yahoo.fr); and **TARIQ STÉVART**, Missouri Botanical Garden, mailing address: Laboratoire de Botanique systématique et de Phytosociologie, Université Libre de Bruxelles, CP 169, Av. F. D. Roosevelt 50, 1050 Brussels, Belgium (e-mail: tstevart@yahoo.com).

LIOLAEMUS TELSEN (NCN). ARGENTINA: RIO NEGRO: 9 DE JULIO DEPARTMENT: Ruta Provincial 60, 65.6 km S Police Post El Rincón, near Cerro Corona (41°23'40.8"S 66°57'33.3"W) 1425 m elev. 2 November 2006. L. J. Avila. Museo de La Plata herpetological collection (MLP.S 2596). Verified by J. A. Scolaro. Previously known only from type locality—"Chubut, Argentina (some 80 km to west from Telsen)." First province record and northernmost record for the species, extending the known distribution ca. 100 km NE from the type locality in Chubut Province (Cei and Scolaro 1999. Revue Francaise de Aquariologie 1–2:79–82).

Submitted by **NICOLAS FRUTOS, CRISTIAN H. F. PEREZ, MONICA KOZYKARISKI, MARIANA MORANDO,** and **LUCIANO JAVIER AVILA,** CENPAT-CONICET, Boulevard Almirante Brown s/n, U9120ACV, Puerto Madryn (Chubut), Argentina (e-mail: avila@cenpat.edu.ar).

PHELSUMA MADAGASCARIENSIS GRANDIS (Madagascar Giant Day Gecko). USA: FLORIDA: MONROE CO.: Vaca Key, Marathon, 1117 28th Street (24°42'26.924"N, 81°5'52.051"W, NAD83; elev. <1 m). 15 October 2006. Richard S. Lake. Verified by Josiah H. Townsend. Florida Museum of Natural History (photographic vouchers UF 150102–04). New island record and extends the range 16.5 km SW of the closest known locality on Grassy Key (Krysko et al. 2003. Florida Sci. 66:222–225; Krysko and Sheehy 2005. Carib. J. Sci. 41:169–172). Neonate and adults observed on side of house. On 27 October 2006, three neonates (photographic voucher UF 150105) and three adults were observed at this site. On 7 January 2007, several individuals were again observed at this site, as well as an adult (photographic voucher UF 150187) at 1313 28th Street (24°42'25.056"N, 81°5'51.54"W, NAD83; elev. <1 m).

Submitted by **KENNETH L. KRYSKO**, Division of Herpetology, Florida Museum of Natural History, Dickinson Hall, University of Florida, Gainesville, Florida 32611, USA (e-mail: kenneyk@flmnh.ufl.edu); **RICHARD S. LAKE**, 302 Daniel Paul Drive, Archdale, North Carolina 27263, USA; and **CARL D. MAY**, 1311 N Lakeside Drive, Lake Worth, Florida 33460, USA (e-mail: cdmfla@aol.com).

PHRYNOSOMA DOUGLASII (Pygmy Short-horned Lizard). USA: WYOMING: LINCOLN CO.: T21N, R113W, SW 1/4 Section 16. 08 August 1994. Kris H. Johnson. YPM 10176. Juvenile, with distinct umbilical scar. Verified by Greg Watkins-Colwell. New species record for Wyoming, and new county record for the genus (Baxter and Stone 1985. Amphibians and Reptiles of Wyoming, Wyoming Game and Fish Dept. Bull. 16; Cerovski et al. 2004. Atlas of Birds, Mammals, Amphibians, and Reptiles in Wyoming. Wyoming Game and Fish Dept.). Extends known range ca. 70 km E of the Idaho/Wyoming border (e.g., Hodges 2003. Digital Morphology, accessed 18 December 2006 at http://digimorph.org/specimens/Phrynosoma_douglassii/**;** Stebbins 2003. A Field Guide to Western Reptiles and Amphibians, 3rd Ed.. Houghton Mifflin Co.).

Submitted by **KRIS H. JOHNSON**, U.S. Fish and Wildlife Service Ecological Services Division, 620 East Greene Street, Carlsbad, New Mexico 88220, USA.

SCELOPORUS CYANOGENYS (Blue Spiny Lizard). USA: TEXAS: NUECES CO.: South of Bishop, ca. 20 m S of County Road 4, 1 road km E of business Highway 77 (27°34.130N, 097°48.358'W). 08 October 2006. Randy L. Powell. Verified by Travis J. LaDuc. Texas Natural History Collections (TNHC 65743). New county record, extends range east one county (Dixon 2000. Amphibians and Reptiles of Texas, 2nd ed. Texas A&M Univ. Press, College Station. 421 pp.).

Submitted by **RANDY L. POWELL** Department of Biological and Health Sciences, MSC 158, Texas A&M University, Kingsville, Texas 78363, USA; e-mail: randy.powell@tamuk.edu.

SCINCELLA GEMMINGERI (Forest Ground Skink) MÉXICO: QUERÉTARO: MUNICIPALITY OF CADEREYTA DE MONTES: 0.5 km E de Maconi. (20º49'48"N, 99º32'99"W), 1920 m elev. 23 May 1996. Laura Contreras Narváez. Verified by Luis Canseco Márquez. Colección Herpetológica, Facultad de Ciencias, UNAM (MZFC 9781). First record for the municipality and second record for the state, extending the known distribution 44.6 km SW from 1.6 km

W Landa de Matamoros in the Sierra Gorda region, Querétaro (Ketchersid 1974. Herpetofauna of Two Biogeographic Transects in Eastern Mexico. Unpublished dissertation. Texas A&M Univ., College Station), and ca. 40.9 km range extension W from the closest known locality at La Placita, Hidalgo (García-Vázquez 2004. Revisión Taxonómica del Genero *Scincella* [Lacertilia: Scincidae] de México. Unpublished thesis, Univ. Autón. de Puebla, Puebla). The specimen was caught in riparian vegetation.

Submitted by **URI OMAR GARCÍA-VÁZQUEZ** and **ANDRÉS ALBERTO MENDOZA-HERNÁNDEZ,** Museo de Zoología, Facultad de Ciencias, UNAM, A.P. 70-399, México D. F. 04510 (e-mail: urigarcia@gmail.com).

SERPENTES

AHAETULLA FASCIOLATA (Speckled-head Whip Snake). THAILAND: RANONG PROVINCE: Muang District: forest stream near Klong Hat Som Paen (ca. 9°57'N, 98°41'E). 21 February 2004. M. Sumontha. Queen Saovabha Memorial Institute, Bangkok (QSMI 600). Verified by L. Chanhome (QSMI). Found on a tree along a forest stream in syntopy with *Ahaetulla prasina* (voucher at the Institut Royal des Sciences Naturelles de Belgique, Brussels: IRSNB 16997). First provincial record and extension of ca. 175 km N from the previous northernmost locality which is situated at Raman Forest Park, Takua Thung District, Phang-Nga Province (Pauwels et al. 2002. Nat. Hist. J. Chulalongkorn Univ. 2[1]:25–30). We thank Lawan Chanhome (QSMI) and Wudtichai Wungkahart (Ranong Marine Fisheries Station) for working facilities.

Submitted by **OLIVIER S. G. PAUWELS**, Department of Recent Vertebrates, Institut Royal des Sciences Naturelles de Belgique, Rue Vautier 29, 1000 Brussels, Belgium (e-mail: osgpauwels@yahoo.fr); and **MONTRI SUMONTHA**, Ranong Marine Fisheries Station, 157 M. 1, Saphan-Pla Rd., Paknam, Muang, Ranong 85000, Thailand (e-mail: knotsnake2211@yahoo.com).

CLONOPHIS KIRTLANDII (Kirtland's Snake). USA: MISSOURI: Clark Co.: Near Wayland (T65N, R6W). 28 April 2006. Christopher Shulse. Verified by J. M. Jones and R. Daniel. Dean E. Metter Memorial Collection, University of Missouri, Columbia (UMC 7936). Rediscovery in state, new county record, only second report west of Mississippi River, and extends the range in Missouri by ca. 51 km. One dead specimen was found on the shore of a constructed pond. Four live specimens were observed near the pond from 28 April – 31 May 2006. This species was first recorded in Missouri in 1964. A single live female was collected on 10 May 1964 in Marion County near Taylor, Missouri (Jones 1967. Herpetologica 23:66–67). No additional specimens were observed until those described herein. Therefore, this species was not included as part of Missouri's herpetofauna by Johnson (2000, The Amphibians and Reptiles of Missouri. Second Ed. Missouri Dept. Conserv., Jefferson City. 400 pp.). Based on these discoveries, *C. kirtlandii* is now considered extant in Missouri and is state ranked as critically imperiled (Missouri Department of Conservation 2007. Missouri Species and Communities of Conservation Concern. Missouri Dept. Conserv., Jefferson City. 50 pp.) This species is known to occur in six other states where it is listed as either state endangered or threatened (Ernst and Ernst 2003. Snakes of the United States and Canada. Smithsonian Inst. Press, Washington, DC. 668 pp.), and has an imperiled global rank (Missouri Department of Conservation 2007, *op. cit.*). Additional studies are planned to investigate its distribution and abundance in northeast Missouri (J. Briggler, pers. comm.).

Submitted by **CHRISTOPHER SHULSE**, 212 Tucker Hall, Division of Biological Sciences, University of Missouri, Columbia, Missouri 65211, USA; e-mail: cdsxzc@mizzou.edu.

CROTALUS WILLARDI WILLARDI (Arizona Ridge-nosed Rattlesnake). MÉXICO: SONORA: Municipio de Nogales: Sierra de Pinitos, unnamed canyon on private land S of Los Picos Peaks, ca. 20 km SE (straight line) from the city of Nogales (ca. 31°13'10.15"N, 110°49'30.04"W; UTM: 518000E, 3450000N; horizontal datum ITRF92; ellipsoid GRS80; UTM zone 12), ca. 1524 m elev. 05 May 2006. Robert Villa, Paul Condon, and Trevor Hare. Verified by George L. Bradley. UAZ Sonoran Herpetological Photographic Voucher Initiative, UAZ 56499-PSV (skin with rattle). Westernmost locality for the species in México, extending known range ca. 50 km NW (straight line) from Cananea, Sonora (UAZ 27945). This is also the only record west of the Santa Cruz River. The snake was found in Madrean evergreen woodland.

Submitted by **ROBERT A. VILLA**, 1125 East Missouri Street, Tucson, Arizona 85714, USA (e-mail: herpsandviolin@aol.com); **PAUL T. CONDON**, 8832 East Buckboard Road, Tucson, Arizona 85749, USA; **TREVOR A. HARE** and **SERGIO AVILA-VILLEGAS**, Sky Island Alliance, 738 North 5th Avenue, Suite 201, Tucson, Arizona 85705, USA; and **DAVID G. BARKER**, Vida Preciosa International, Inc., P.O. Box 300, Boerne, Texas 78006, USA.

DENDRELAPHIS KOPSTEINI (Kopstein's Bronzeback Tree Snake). BRUNEI DARUSSALAM: BELAIT DISTRICT: Sungei Rampayoh (04°26'N, 114°24'E). Earlier reported as *Dendrelaphis formosus* (Das 1999. Malayan Nat. J. 53[4]:349–350; Das 2007. A Pocket Guide. Amphibians and Reptiles of Brunei. Natural History Publications [Borneo] Sdn Bhd. Kota Kinabalu. viii + 200 pp.), this species was recently described as new on the basis of specimens formerly identified as *D. formosus* from Thailand, Peninsular Malaysia, Singapore, and Sumatra (Vogel and van Rooijen 2007. Zootaxa 1394:25–45) and diagnosable from congeners in showing the following combination of characters: dark stripe covers only the lower part of temporal region, terminating at rear of neck; nuchal region red in life when inflated; eyes large; two supralabials in contact with orbit of eye. First record for Borneo.

Submitted by **INDRANEIL DAS**, Institute of Biodiversity and Environmental Conservation, Universiti Malaysia Sarawak, 94300 Kota Samarahan, Sarawak, Malaysia; e-mail: idas@ibec.unimas.my.

LEPTODEIRA SPLENDIDA EPHIPPIATA (Saddled Cat-eyed Snake). MÉXICO: SONORA: Municipio de Yécora, 45.7 km (by Mex. Hwy. 16) E Yécora (28.40430°N, 108.67572°W), 1280 m elev. 06 July 2006. E. Enderson and R. Bezy. UAZ 56548-PSV. Verified by George Bradley. Northernmost record for Sonora, extending the range ca. 232 km (airline) N from the vicinity of Agua Marín, Sonora (Duellman 1958. Bull Amer. Mus. Nat. Hist. 114:1–

152) and 150 km NW of Río Urique, Chihuahua (Tanner 1986. Great Basin Nat. 45:615–676). The snake was DOR in pine-oak woodland.

Submitted by **ERIK F. ENDERSON,** Drylands Institute, PMB 405 2509 North Campbell Avenue, Tucson, Arizona 85719, USA (e-mail: erikenderson@msn.com); and **ROBERT L. BEZY**, Herpetology, Natural History Museum of Los Angeles County, Los Angeles, California 90007, USA.

LEPTOPHIS MEXICANUS (Mexican Parrot Snake). HONDURAS: CAYOS COCHINOS ARCHIPELAGO: Bay Island Province: Cayo Cochino Grande, on east side of island near village of Eastend (15º58'36"N, 86º28'19"W, datum: WGS84), 1 m elev. 22 June 2006. J. A. Frazier. Verified by Robert Henderson. Photographic collection, ASU HP.00057–58). First record for Cayo Cochino Grande (McCranie et al. 2005. Amphibians and Reptiles of the Bay Islands and Cayos Cochinos, Honduras. Bibliomania, Salt Lake City, Utah).

We thank the Honduran Coral Reef Foundation and Operation Wallacea for supporting our research in the Cayos Cochinos.

Submitted by **JULIUS A. FRAZIER**, Department of Zoology, Southern Illinois University, Carbondale, Illinois 62901, USA (e-mail: tonyf@siu.edu); **CHAD E. MONTGOMERY**, University of Wisconsin La Crosse, La Crosse, Wisconsin 54601, USA (e-mail: chad_mont@yahoo.com); **SCOTT M. BOBACK**, Department of Biological Sciences, University of Alabama, Tuscaloosa, Alabama 35487, USA (e-mail: sboback@ua.edu); and **ROBERT N. REED**, Invasive Species Science, USGS Fort Collins Science Center, 2150 Centre Ave, Bldg C, Fort Collins, Colorado 80526, USA (e-mail: robert_reed@usgs.gov).

MASTICOPHIS TAENIATUS (Striped Whipsnake). USA: CALIFORNIA: Modoc Co.: Jess Valley Road (41.23089°N, –120.43909°W, WGS 84). 02 September 2006. Thomas J. Devitt and Susan E. Cameron. Verified by Jimmy A. McGuire. Museum of Vertebrate Zoology (MVZ 253453). New county record. Data were obtained from records held in the following institutions accessed via the HerpNET data portal (http://www.herpnet.org) on 05 March 2006: California Academy of Sciences, San Francisco; Museum of Vertebrate Zoology, University of California, Berkeley. The same results were obtained when all participating providers were included.

Submitted by **THOMAS J. DEVITT**, Museum of Vertebrate Zoology, University of California, Berkeley, California 94720-3160, USA (e-mail: tdevitt@berkeley.edu); and **SUSAN E. CAMERON**, Department of Environmental Science and Policy, One Shields Avenue, University of California, Davis, California 95616, USA.

OPHEODRYS AESTIVUS (Rough Greensnake). USA: ARKANSAS: Van Buren Co.: Near Brock Creek Lake: 35.49037°N, 92.80132°W. 15 Oct. 2005. Josh Engelbert, Melissa Patrick, Ashley Patrick, and Mauricio Solis. Verified by Stanley E. Trauth. Voucher specimen in Arkansas State University Museum of Zoology (ASUMZ 29441). Record represents first for county (Trauth et al. 2004. The Amphibians and Reptiles of Arkansas. Univ. of Arkansas Press, Fayetteville, 421 pp.)

Submitted by **JOSH ENGELBERT, MELISSA PATRICK,** and **MAURICIO SOLIS**, Department of Biological Sciences, Arkansas State University, P.O. Box 599, State University, Arkansas 72467-0599, USA (e-mail: josh.engelbert@smail.astate.edu).

RAMPHOTYPHLOPS BRAMINUS (Brahminy Blindsnake). USA: FLORIDA: Charlotte Co.: Port Charlotte, 2376 Elkcam Blvd (26.99295ºN, -82.103593ºW). August 2003. Joyce Burke. Verified by Kenneth Krysko. University of Florida Museum of Natural History (UF 150413, photo voucher). New county record. This fills in a distributional gap for this non-native species on the west coast of Florida from Pasco County south to Monroe County (Meshaka et al. 2004. The Exotic Amphibians and Reptiles of Florida, Krieger Publ. Co., Malabar, Florida).

Submitted by **GREGG S. KLOWDEN**, University of Florida, Department of Wildlife Ecology and Conservation, P.O. Box 110430, Gainesville, Florida 32611, USA (e-mail: geckoguy@ufl.edu); and **CATHY A. OLSON**, Lee County Department of Parks and Recreation, 3410 Palm Beach Blvd, Fort Myers, Florida 33916, USA (e-mail: colson@leegov.com).

REGINA RIGIDA (Glossy Crayfish Snake). USA: TEXAS: FORT BEND CO.: Cow Creek Rd, 10.7 mi S County Rd 42. 22 May 2006. 423+125 mm; adult female collected DOR. TNHC 66071 (TNHC-FS 4258). Cow Creek Rd, 9.5 mi S TX Rte 762. 21 May 2006. 463+130 mm; adult female collected DOR. TNHC 66072 (TNHC-FS 4263). Verified by Travis J. LaDuc. First two county records, fills in gap within distribution (Dixon 2000. Amphibians and Reptiles of Texas, 2nd edition, Texas A&M University Press, 421 pp.).

Submitted by **DAVID W. HALL**, Department of Genetics, The University of Georgia at Athens, Athens, Georgia 30602, USA.

SEMINATRIX PYGAEA (Black Swampsnake). USA: FLORIDA: Nassau Co.: US Hwy 301, 2.24 km S of Georgia state line (S of Boulogne near Hwy 301 crossing of Pigeon Creek). 4 September 2005. M. P. Wallace and D. Wallace. Verified by Kenneth L. Krysko. Florida Museum of Natural History photo voucher (UF 144585). New county record (Meshaka and Ashton 2005. *In* Meshaka and Babbitt [eds.], Amphibians and Reptiles Status and Conservation in Florida, pp. 242–282. Krieger Publ. Co., Malabar, Florida).

Submitted by **MARK P. WALLACE**, 784 Kelsall Drive, Richmond Hill, Georgia 31324, USA; and **DIRK J. STEVENSON**, 414 Club Drive, Hinesville, Georgia 31313, USA.

SEMINATRIX PYGAEA (Black Swampsnake). USA: FLORIDA: Okeechobee Co.: CR 724, 0.1 mi E 700A (27.4652°N, -81.0096°W, datum WGS84). 15 March 2006. Verified by Kenneth L. Krysko. Florida Museum of Natural History (UF 150211). New county record (Ashton and Ashton 1988. Handbook of Reptiles and Amphibians of Florida. Part One: The Snakes. Windward Publ., Inc. 176 pp.). Adult found DOR at 2100 h in area of a mixture of dry prairie, marsh, and cattle pasture, and bordered by periodically flooded drainage ditches, which contained Pickerel Weed (*Pontederia cordata*), Wax Myrtle (*Myrica cerifera*), and Cabbage Palm (*Sabal palmetto*). Several live individuals, which were not collected, have been observed on the road or netted out of drainage ditches (Chris Lechowicz, pers. comm.) in the same area.

Submitted by **DANIEL J. PARKER**, 741 Star Fruit Ave, Lake Placid, Florida 33852, USA; e-mail: Mudsnake6@earthlink.net.

SONORA SEMIANNULATA (Groundsnake). USA: NEVADA: PERSHING CO.: Sonoma Range, above Sonoma Creek (40°48'49.0"N, 117°42'29.8"W, 1505 m elev.) under a small rock in sagebrush habitat. 07 May 2006. Bryan Hamilton. Verified by Jack Sites (BYU 8591). Three individuals of this species were observed at this locality in 1993 but no vouchers were collected (Scott, pers. comm.). This record fills a gap in the northeastern distribution of this species with the nearest documented records 64 km E (Battle Mountain, Humboldt Co., Nevada; CAS-SUR 10032), 160 km NW (Denio, Pershing Co., Nevada; Stebbins 2003. Western Reptiles and Amphibians. 3rd Ed.. Houghton Mifflin Co., Boston, Massachusetts, xxx pp.), and 60 km SW (Humboldt House, Pershing Co., Nevada; UNR 493).

Submitted by **BRYAN HAMILTON,** 100 Great Basin National Park, Baker Nevada 89311, USA; and **PAULETTE CONRAD,** Nevada Department of Wildlife, 4747 Vegas Drive, Las Vegas, Nevada 89108, USA (e-mail: pconrad@ndow.org).

TELESCOPUS FALLAX SYRIACUS (Common Cat Snake). LEBANON: HERMEL: Hermel Pyramid (34º22'N, 36º25'E). 28 May 2006. Collected by David Jandzík. Verified by Ján Kautman. Specimen (dead on road) deposited in Slovak National Museum (SNMB St. 634). This is the northernmost country record for the species, extending the range in Lebanon ca. 40 km NE from the closest previous locality in Bcharré (Müller and Wettstein 1933. Sitz. Akad. Wiss., math-naturwiss. Abt. 1 142:135–144; Hraoui-Bloquet et al. 2002. Zool. Middle East 27:35–46).

Submitted by **DAVID JANDZÍK**, Department of Zoology, Faculty of Sciences, Comenius University, Mlynská dolina B-1, SK-84215 Bratislava, Slovakia; e-mail: jandzik@fns.uniba.sk.

THAMNOPHIS ELEGANS ELEGANS (Mountain Gartersnake). USA: CALIFORNIA: AMADOR CO.: El Dorado National Forest, Oyster Lake (38°40'20.0"N, W120°6'59.4"W) 2205 m elev. 5 August 2006. Chris R. Feldman. CAS 233734–35. AMADOR CO.: El Dorado National Forest, unnamed pond 0.5 km NE of Mud Lake via FSR 17E24 (38°36'47.0"N, 120°8'39.0"W) 2402 m elev. 6 August 2006. Chris R. Feldman. CAS 233736–55. Verified by E. D. Brodie Jr. New county record. There is a literature account of *T. e. elegans* from a small, unnamed lake near the southern end of Silver Lake, Amador Co. (Livezey 1953. Herpetologica 9:73) but apparently no vouchers exist to support this record. Otherwise, the nearest known localities are: 3.9 km to the north, Carson Spur, El Dorado Co. (MVZ 67502), 15.7 km to the east, near Blue Lake, Alpine Co. (CAS-SUR 9127), and 21.6 km to the south, Big Meadows, Calaveras Co. (MVZ 65741). Along the western slope of the Sierra Nevada, *T. e. elegans* generally occurs in wet meadows and along pond and lake margins at mid to high elevations (usually above 1200 m). Such habitat is common and *T. e. elegans* is likely contiguous throughout this mountain range.

We thank the California Department of fish and Game for Scientific Collecting permits to CRF (803059-5).

Submitted by **CHRIS R. FELDMAN**, Department of Biology, Utah State University, Logan, Utah 84322-5305, USA (e-mail: elgaria@biology.usu.edu); **JENS V. VINDUM**, Department of Herpetology, California Academy of Sciences, San Francisco, California 94103-3009, USA (e-mail: jvindum@calacademy.org); and **ROBERT W. HANSEN**, 16333 Deer Path Lane, Clovis, California 93619-9735, USA (e-mail: rwh13@csufresno.edu).

THAMNOPHIS PROXIMUS PROXIMUS (Orange-striped Ribbonsnake). USA: ARKANSAS: LEE CO.: At intersection of US Hwy 79 and US Hwy 78: 34.46.545N, 90.57.874W (WGS 84): 22 April 2005. Josh Engelbert and Melissa Patrick. Verified by Stanley E. Trauth. Voucher specimen in Arkansas State University Museum of Zoology (ASUMZ 29276). Record is first for county (Trauth et al. 2004. The Amphibians and Reptiles of Arkansas. Univ. of Arkansas Press, Fayetteville, 421 pp.)

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New Country and Department Records for Amphibians and Reptiles from El Salvador

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El Salvador is the smallest Central American country, encompassing an area of approximately 21,000 km^2. Despite massive deforestation over the last century due primarily to agriculture practices associated with coffee, corn, cotton, and sugar cane and a national parks system that protects less than 1% of El Salvador's land area (Komar 2002), a panoply of aquatic and terrestrial habitats continue to support a surprising diversity of vertebrates (Serrano 1995). Until recently, but with a few exceptions (e.g., Hidalgo 1983; Mertens 1952), herpetologists had largely ignored El Salvador, which was considered to have the most poorly known herpetofauna in Central America as recently as 2001 (Dueñas et al. 2001). Renewed interest in the last decade has resulted in several new species descriptions, country records, natural history reports, and a book about the Salvadoran herpetofauna

(e.g., Köhler and Kreutz 1999; Greenbaum et al. 2002; Greenbaum 2004; Leenders and Watkins-Colwell 2004; Herrera et al. 2005; and Köhler et al. 2006). Greenbaum and Komar (2005) assessed the threat for each of El Salvador's 130 species of amphibians and reptiles and noted that distribution and taxonomic status of many species remained poorly known.

Herein, we present one new country record and 64 new department records for El Salvador amphibians and reptiles compiled during field work undertaken from 1997 through 2006 that were not reported in Köhler et al. (2006). Abbreviations for museum collections housing voucher specimens include the American Museum of Natural History (AMNH); The University of Kansas Natural History Museum Color Transparency collection (KUCT); The University of Kansas Natural History Museum Digital Archive (KUDA), and Museo de Historia Natural de El Salvador, San Salvador (MUHNES). Most of the following records are based on photographs or digital images of specimens; only photos showing unambiguously diagnostic features are listed as vouchers. All vouchers were verified by Larry David Wilson, except for ones identified separately in the text. Generic name changes identified by Frost et al. (2006a) for several anuran species are recognized. Additional taxonomic changes that differ from Köhler et al. (2006) are discussed in the species records below.

New Country Record

Anura

Ollotis ibarrai. SANTA ANA: Municipio de Metapán, Hacienda Los Planes de Montecristo. 9 October 1976. Victor Hellebuyck. Verified by Joseph R. Mendelson III. AMNH 125854. New El Salvador record based on maps shown by Mendelson et al. (2005), although Köhler et al. (2006) discussed the likely presence of this species within moderate to high elevations (likely between 1800–2400 m) of northwestern El Salvador. Identification of this specimen was determined after reexamination of a toad tentatively identified as *Bufo coccifer* by Köhler et al. (2006). Frost et al. (2006b) recently changed the name of this genus from *Cranopsis* to *Ollotis*.

New Department Records

Gymnophiona

Dermophis mexicanus. USULUTÁN: Municipio de Jiquilisco, Chaguantique protected natural area (13º17'N, 88º33'W), 30 m elev. 18 June 2001. Néstor Herrera. Verified by William E. Duellman. KUCT 11946.

Caudata

Oedipina taylori. SONSONATE: Municipio de Caluco, Plan de Amayo protected natural area (13º41'N, 89º40'W), 260 m elev. 27 December 2002. Néstor Herrera. Verified by William E. Duellman. KUCT 11947.

Anura

Craugastor rhodopis. SANTA ANA: Municipio de Chalchuapa, La Magdalena protected natural area (14º05'24"N, 89º41'3"W), 700 m elev. 12 December 2005. Ricardo Pérez León. Verified by James R. McCranie. KUDA 000104. Crawford and Smith (2005) first recognized *Craugastor* as a distinct genus from *Eleutherodactylus*, and their phylogenetic results do not support the recognition of *Craugastor loki* (Frost et al. 2006a; Lynch 2000).

Leptodactylus fragilis. CABAÑAS: Municipio de Cinquera, Montaña de Cinquera protected natural area (13º52'21.4"N, 89º57'49.0"W), 550 m elev. 16 September 2005. Néstor Herrera. KUDA 000105.

Leptodactylus melanonotus. LA PAZ: Municipio de Zacatecoluca, Escuintla protected natural area (13º23'33.4"N, 88º54'8.1"W), 50 m elev. 9 September 2001. Néstor Herrera. KUDA 000106.

Lithobates forreri. LA PAZ: Municipio de Zacatecoluca, Escuintla protected natural area (13º23'33.4"N, 88º54'8.1"W), 50 m elev. 9 September 2001. Néstor Herrera. KUDA 000107. LA UNIÓN: Municipio de Conchagua, Laguna Los Negritos (13º16'36"N, 87º55'50"W), 100 m elev. 28 March 2003. Vladlen Henríquez. KUDA 000149.

Ollotis luetkenii. CABAÑAS: Municipio de Cinquera, Montaña de Cinquera protected natural area (13º52'21.4"N, 89º57'49.9"W), 550 m elev. 21 September 2003. Vladlen Henríquez. KUDA 000100. LA PAZ: Municipio de Zacatecoluca, Escuintla protected natural area (13º23'33.4"N, 88º54'8.1"W), 50 m elev. 9 September 2001. Néstor Herrera. KUDA 000101.

Scinax staufferi. CABAÑAS: Municipio de Cinquera, Montaña de Cinquera protected natural area (13º52'21.4"N, 89º57'49.0"W), 550 m elev. 16 September 2005. Néstor Herrera. Verified by James R. McCranie. KUDA 000103.

Trachycephalus venulosa. CABAÑAS: Municipio de Cinquera, Montaña de Cinquera protected natural area (13º52'21.4"N, 89º57'49.0"W), 550 m elev. 16 September 2005. Néstor Herrera. KUDA 000102.

Crocodylia

Caiman crocodilus. SAN MIGUEL: Municipio de El Transito, Laguna El Jocotal, El Desagüe (13º20'N, 88º15'W), 30 m elev. 9 October 1997. Néstor Herrera. Verified by William E. Duellman. KUCT 11953.

Testudines

Kinosternon scorpioides. CHALATENANGO: Municipio de El Paraíso, Santa Bárbara protected natural area (14º04'17"N, 89º05'37"W), 550 m elev. 1 April 2005. Néstor Herrera. KUDA 000108.

Rhinoclemmys pulcherrima. CABAÑAS: Municipio de Cinquera, Montaña de Cinquera protected natural area (13º52'21"N, 89º57'49.0"W), 550 m elev. 5 May 2006. Pedro Ramón Fuentes. Verified by William E. Duellman. KUDA 000153. CUSCATLÁN: Municipio de Suchitoto, Colima protected natural area (14º02'13"N, 89º07'10.4"W), 300 m elev. 22 September 2004. Vladlen Henríquez. KUDA 000148.

Lacertilia

Aspidoscelis deppii. AHUACHAPÁN: Municipio de San Francisco Menéndez, Laguna El Bijagual (13º41'32"N, 89º34'38.5"W), 30 m elev. 15 May 2004. Vladlen Henríquez. KUDA 000116. SAN VICENTE: Municipio de San Estebán Catarina, Laguna de Chalchuapán (13º42'30.0"N, 88º45'22.4"W), 600 m elev. 25 May 2004. Néstor Herrera. KUDA 000115.

Ctenosaura similis. CABAÑAS: Municipio de Cinquera, Montaña de Cinquera protected natural area (13º52'21.4"N, 89º57'49.0"W), 550 m elev. 16 September 2005. Néstor Herrera. Verified by Gunther Köhler and James R. McCranie. KUDA 000117.

Gonatodes albogularis. CABAÑAS: Municipio de Cinquera, Montaña de Cinquera protected natural area (13º52'21.4"N, 89º57'49.0"W), 400 m elev. 4 October 2003. Vladlen Henríquez. KUDA 000109.

Gymnophthalmus speciosus. USULUTÁN: Municipio de Jiquilisco, Chaguantique protected natural area (13º17'N, 88º33'W), 30 m elev. 28 July 2004. Vladlen Henríquez. KUDA 000114.

Hemidactylus frenatus. AHUACHAPÁN: Municipio de Jujutla, Barra de Santiago protected natural area (13º41'48"N, 89º59'11"W), 5 m elev. 30 December 2005. Néstor Herrera. Verified by Aaron M. Bauer. KUDA 000110. SAN SALVADOR: Municipio de Mejicanos, Residencial Metrópolis Norte, Cantón Zacamil, (13º43'56.52"N, 89º12'44.0"W), ca. 760 m elev. 18 November 2003. Oliver Komar. Verified by William E. Duellman. KUCT 11948. This introduced species was first collected in El Salvador in the department of La Libertad (Greenbaum 2002), and later observed in La Paz by Herrera et al. (2005).

Lepidophyma smithii. CABAÑAS: Municipio de Cinquera, Montaña de Cinquera protected natural area (13º52'21.4"N, 89º57'49"W), 550 m elev. 10 January 2004. Vladlen Henríquez. Verified by Gunther Köhler and James R. McCranie. KUDA 000122.

Mabuya unimarginata. CABAÑAS: Municipio de Cinquera, Montaña de Cinquera protected natural area (13º52'21.4"N, 89º57'49.0"W), 550 m elev. 16 September 2005. Néstor Herrera. KUDA 000120. SAN VICENTE: Municipio de San Esteban Catarina, Laguna de Chalchuapán (13º42'30.0"N, 88º45'22.4"W), 600 m elev. 11 September 2002. Néstor Herrera. KUDA 000121.

Norops sericeus. CABAÑAS: Municipio de Cinquera, Montaña de Cinquera protected natural area (13º52'21.4"N, 89º57'49.0"W), 550 m elev. 10 January 2004. Vladlen Henríquez. KUDA 000118.

Phyllodactylus tuberculosus. CABAÑAS: Municipio de Cinquera, Montaña de Cinquera protected natural area (13º52'21"N, 89º57'49.0"W), 550 m elev. 16 September 2005. Vladlen Henríquez. KUDA 000112. CHALATENANGO: Municipio de El Paraíso, Santa Bárbara protected natural area (14º04'17"N, 89º05'37"W), 550 m elev. 1 April 2005. Néstor Herrera. KUDA 000111. LA PAZ: Municipio de Zacatecoluca, Escuintla protected natural area (13º23'33.4"N, 88º54'8.1"W), 50 m elev. 9 September 2001. Néstor Herrera. KUDA 000113.

Sceloporus olloporus. LA PAZ: Municipio de Zacatecoluca, Escuintla protected natural area (13º23'33.4"N, 88°54'8.1"W), 50 m elev. 9 September 2001. Néstor Herrera. KUDA 000119. Although the phylogenetic study of Mendoza-Quijano et al. (1998) did not include samples from Central America, *S. variabilis olloporus* was elevated to species status, which presumably includes *S. variabilis* populations in El Salvador (Köhler et al. 2006).

Serpentes

Agkistrodon bilineatus. LA LIBERTAD: Municipio de La Libertad, Parque Walter Thilo Deininger (13º31'N, 89º16'W), 8 m elev. 24 August 2002. Vladlen Henríquez. KUDA 000144.

Boa constrictor. CHALATENANGO: Municipio de El Paraíso, Santa Bárbara protected natural area (14º04'17"N, 89º05'37"W), 550 m elev. 4 December 2000. Néstor Herrera. KUDA 000147. SANTA ANA: Municipio de Metapán, San Diego-La Barra protected natural area (14º16'2.7"N, 89º28'0.6"W), 472 m elev. 8 May 2005. Vladlen Henríquez. KUDA 000146.

Coniophanes piceivittis. LA LIBERTAD: Municipio de La Libertad, Parque Walter Thilo Deininger (13º31'N, 89º16'W), 200 m elev. 10 September 2002. Néstor Herrera. Verified by William E. Duellman. KUCT 11950.

Conophis concolor. SAN VICENTE: Municipio de San Esteban Catarina, Laguna de Chalchuapán (13º42'30.0"N, 88º45'22.4"W), 600 m. 25 May 2004. Néstor Herrera. KUDA 000123. Pérez-Higareda et al. (2002) elevated *C. lineatus concolor* to species status based on a disjunct distribution of *C. l. lineatus* in central Veracruz, Mexico, and variation in stripe pattern.

Crotalus simus. CUSCATLÁN: Municipio de Suchitoto, Colima protected natural area (14º03'N, 89º08'W), 230 m elev. 12 September 2000. Néstor Herrera. Verified by William E. Duellman. KUCT 11944. First department record with specific locality. CABAÑAS: Municipio de Cinquera, Montaña de Cinquera protected natural area (13º53'N, 88º57'W), 400 m elev. 9 August 2003. Néstor Herrera. MUHNES 30-1463. CHALATENANGO: Municipio de La Montañona (14º07'N, 88º55'W), 1430 m elev. 1 April 2006. Néstor Herrera. KUDA 000152. SAN MIGUEL: Municipio de San Miguel, Volcán de San Miguel (13º26'N, 88º16'W), 2000 m elev. 3 December 2002. Néstor Herrera. MUHNES 30-1462. Shed skin (with distinctive Mesoamerican rattlesnake diamond pattern) found in a depression under an agave plant in tropical altimontane meadow containing plants in the families Ericaceae, Agavaceae, Onagraceae, and Plantaginaceae. New elevational record in El Salvador (Köhler et al. 2006).

The taxonomic status of *C. simus* in El Salvador is presently controversial. A molecular phylogenetic study by Wüster et al. (2005) indicated that *C. s. simus* (*sensu* Campbell and Lamar 2004) was polyphyletic with respect to a population in Veracruz, Mexico (sister to *C. culminatus*), and a clade from Chiapas, Mexico, El Salvador, and Costa Rica (sister to South American *C. durissus*). The Veracruz population (that renders *C. simus* polyphyletic) is likely to be described as a full species when additional data become available (W. Wüster, pers. comm.). Seemingly unaware of Wüster et al. (2005), Savage et al. (2005) designated a neotype for *Crotalus simus* from Guatemala, presumably based on Campbell and Lamar's (2004) idea of *C. simus*. Until future studies clarify its taxonomy, we recognize El Salvador Neotropical rattlesnakes as *C. simus*, as defined by Campbell and Lamar (2004) and Savage et al. (2005).

Drymarchon melanurus. CABAÑAS: Municipio de Cinquera, Montaña de Cinquera protected natural area (13º52'21.4"N, 89º57'49.0"W), 550 m elev. 15 September 2005. Néstor Herrera. KUDA 000125. SANTA ANA: Municipio de Santa Ana, Finca Kilimanjaro (13º52'17.1"N, 89º37'17.9"W), 1720 m elev. 31 August 2004. Walter Chacón. KUDA 000124. New elevation record for El Salvador (Köhler et al. 2006). Although Köhler et al. (2006) continued to recognize *D. corais* for Salvadoran populations of *Drymarchon* because molecular data remain lacking, *D. melanurus* has gained common acceptance as a valid species (e.g., Cisneros-Heredia 2006; McCranie et al. 2005).

Imantodes gemmistratus. CABAÑAS: Municipio de Cinquera, Montaña de Cinquera protected natural area (13º52'21.4"N,

89º57'49.0"W), 550 m elev. 22 April 2003. Néstor Herrera. Verified by James R. McCranie. KUDA 000131.

Lampropeltis triangulum. MORAZÁN: Municipio de Osicala, Cantón Llano Alegre (13º48'47.62"N, 88º8'46.17"W), 478 m elev. 21 December 2005. Néstor Herrera. KUDA 000127. SANTA ANA: Municipio de Metapán, San Diego-La Barra protected natural area (14º17'N, 89º29'W), 500 m elev. 18 June 2000. Ricardo Ibarra Portillo. KUDA 000126.

Leptodeira annulata. CABAÑAS: Municipio de Cinquera, Montaña de Cinquera protected natural area (13º52'21.4"N, 89º57'49.0"W), 550 m elev. 16 October 2005. Vladlen Henríquez. KUDA 000129. LA PAZ: Municipio de Zacatecoluca, Escuintla protected natural area (13º23'33.4"N, 88º54'8.1"W), 50 m elev. 9 September 2001. Néstor Herrera. KUDA 000128. SAN VICENTE: Municipio de San Esteban Catarina, Laguna de Chalchuapán (13º42'30.0"N, 88º45'22.4"W), 600 m elev. 25 May 2004. Néstor Herrera. KUDA 000130.

Leptophis mexicanus. LA PAZ: Municipio de Zacatecoluca, Escuintla protected natural area (13º23'33.4"N, 88º54'8.1"W), 50 m elev. 27 August 2003. Néstor Herrera. KUDA 000132. SANTA ANA: Municipio de Metapán, San Diego-La Barra, (14º17'N, 89º29'W), 500 m elev. 18 June 2000. Roberto Rivera. KUDA 000133.

Loxocemus bicolor. SANTA ANA: Municipio de Metapán, San Diego-La Barra protected natural area (14º17'N, 89º29'W), 500 m elev. 18 July 2002. César Mendoza. KUDA 000143. USULUTÁN: Municipio de Jiquilisco, Laguna San Juan del Gozo (13º14'3.9"N, 88º44'5.0"W), 10 m elev. 2002. Enriqueta Ramírez. Verified by William E. Duellman. KUCT 11949.

Masticophis mentovarius. SONSONATE: Municipio de Caluco, Plan de Amayo, Plan de las Mesas protected natural area (13º40'N, 89º39'W), 260 m elev. 6 August 2002. Néstor Herrera. Verified by William E. Duellman. KUCT 11951.

Micrurus nigrocinctus. CABAÑAS: Municipio de Cinquera, Montaña de Cinquera protected natural area (13º52'21.4"N, 89º57'49.0"W), 550 m elev. 12 September 2005. Karla Lara. KUDA 000150. MORAZÁN: Municipio de Osicala, Cantón Llano Alegre (13º49'45.91"N, 88º08'50.02"W), 343 m elev. 21 December 2005. Vladlen Henríquez. KUDA 000151.

Ninia sebae. CABAÑAS: Municipio de Cinquera, Montaña de Cinquera protected natural area (13º52'21.4"N, 89º57'49.0"W), 550 m elev. 7 September 2003. Néstor Herrera. KUDA 000134.

Porthidium ophryomegas. SANTA ANA: Municipio de Metapán, San Diego-La Barra protected natural area (14º16'2.7"N, 89º28'0.6"W), 472 m elev. 8 May 2005. Néstor Herrera. KUDA 000145.

Rhadinaea pilonaorum. SONSONATE: Municipio de Izalco (13º47'18"N, 89º35'37"W), 1000 m elev. 12 August 2005. Vladlen Henríquez. Verified by James R. McCranie. KUDA 000135–36.

Sibon anthracops. SANTA ANA: Municipio de Chalchuapa, La Magdalena protected natural area (14º05'24"N, 89º41'39"W), 700 m elev. 12 December 2005. Ricardo Pérez León. Verified by James R. McCranie. KUDA 000137.

Sibon carri. CABAÑAS: Municipio de Cinquera, Montaña de Cinquera protected natural area (13º52'21.4"N, 89º57'49.0"W), 550 m elev. 7 September 2003. Vladlen Henríquez. Verified by James R. McCranie. KUDA 000138.

Spilotes pullatus. LA UNIÓN: Municipio de Nueva Esparta, Upire (13º52'36"N, 87º50'28"W), 910 m elev. 4 October 2005. Ricardo Ibarra Portillo. KUDA 000139. USULUTÁN: Municipio de Jiquilisco, Nancuchiname protected natural area (13º22'N, 88º30'W), 30 m elev. 15 March 1997. Néstor Herrera. Verified by William E. Duellman. KUCT 11952.

Stenorrhina freminvillii. CABAÑAS: Municipio de Cinquera, Montaña de Cinquera protected natural area (13º52'21.4"N, 89º57'49.0"W), 550 m elev. 16 January 2004. Vladlen Henríquez. KUDA 000140.

Thamnophis proximus. CABAÑAS: Municipio de Cinquera, Montaña de Cinquera protected natural area (13º52'21.4"N, 89º57'49.0"W), 550 m elev. 12 September 2004. Néstor Herrera. KUDA 000141.

Trimorphodon biscutatus. CUSCATLÁN: Municipio de Suchitoto, Colima protected natural area (14º02'13.8"N, 89º07'10.4"W), 300 m elev. 22 September 2004. Néstor Herrera. KUDA 000142.

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New Distributional Records for Amphibians and Reptiles from the State of Tamaulipas, México

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Tamaulipas lies in the northeastern corner of México; it is bordered to the north by the state of Texas (USA) and by the Gulf of México to the east. Transected by the Tropic of Cancer, the state's relatively small area (ca. 79,389 km^2) has encompassed within its boundaries arid tropical thorn forest, tropical deciduous forest, cloud forest, the eastern limits of the Chihuahuan Desert, beaches and barrier islands at sea level, and pine-oak forest at elevations over 3200 m in the Sierra Madre Oriental. A complete overview of the Tamaulipas herpetofauna has never been published. The pioneering work of Martin (1958), is the most comprehensive, although it was restricted to a limited area of the state and in some aspects was taxonomically flawed (King and Thompson 1968) and is now outdated. Canseco-Márquez et al. (2004) described the herpetofauna known to them from the Sierra Madre Oriental, including southwestern Tamaulipas, in relationship to vegetation types, elevational ranges, and general distributions of included species. However, numerous species that have been documented in the Sierra Madre Oriental of Tamaulipas in various publications, including several recorded in Martin (1958), were overlooked by Canseco-Márquez et al. (2004). Other publications on the amphibians and reptiles of Tamaulipas are few in number, limited in scope, and many included inconsistent and contradictory distributional information.

We have all conducted numerous field surveys within Tamaulipas over the last 15 years, both independently and in collaboration. During that time, we also searched the literature and museum collections for additional distributional data on the herpetofauna occurring within the state. This report addresses information on 20 species, including 19 range extensions involving eight new state records and a statement on one species that we believe should not be counted among the fauna of Tamaulipas, contrary to over 110 years of literature placing it in the state.

Over one hundred natural history museums and universities in Canada, the United States, and México were polled for their amphibian and reptile holdings from Tamaulipas. Sixty-one institutions responded, providing a combined total of approximately 11,500 localities and other data on reptiles and amphibians col-

lected in the state. Museum abbreviations used follow the standard symbolic codes found in Leviton et al. (1985) and Leviton and Gibbs (1988), except the following institutions that were not included in those publications: Instituto Tecnológico Agropecuario de Hidalgo (ITAH), Hidalgo, México; Instituto Tecnológico de Cd. Victoria, (ITCV), Tamaulipas, México; Universidad Autónoma de Ciudad Juárez (UACJ), Chihuahua, México; West Texas A&M University Natural History Museum (WTAMU) Canyon, Texas; and the private collection of Ernest A. Liner (EAL), Houma, Louisiana (The EAL collection was recently donated to the AMNH).

All longitude and latitude coordinates are expressed using the WGS84 (World Geodetic System 1984) datum. Longitude and latitude coordinates and elevations recorded in the original locality data are presented in parentheses ( ). Data in brackets [ ] were obtained either by plotting original localities without corresponding data on topographic maps produced by INEGI (Instituto Nacional de Estadística Geografía Informática), or in some cases, by taking readings with a handheld GPS unit after returning to the original localities. Due to the imprecise nature of some of the original locality data, the supplemented coordinates and elevations presented in brackets should be interpreted as approximate points of collection. Original locality data listed as miles and feet have been converted to metric measurements and presented along side coordinates in brackets. Distances were calculated on INEGI topographical maps and are expressed in air km (not road km) unless otherwise stated. Sierra de Miquihuana, as used herein, includes all areas in the municipality of Miquihuana, Tamaulipas, México, at elevations above 2250 m and lying north of 23°33'N and west of 99°40'W, including El Aserradero, El Capulín, Las Joyas de Miquihuana, Marcela, Valle Hermoso, Sierra El Borrado, Sierra Los Borregos, Sierra La Gloria, Sierra El Pedregoso, and the eastern slopes of Sierra San Antonio Peña Nevada.

Caudata

*Bolitoglossa platydactyla (*Broadfoot Mushroomtongue Salamander). Municipio Gómez Farías: Gómez Farías, Estación Los Cedros [23°02'62"N, 99°09'54"W, 320 m elev.]. 11 January 1994. James R. Dixon. Verified by Kathryn Vaughan. TCWC 71137. Municipio Ocampo: Santa Maria de Guadalupe, 22 km NW of Ocampo (22°54'89"N, 99°29'37"W, 346 m elev.). 11 July 2005. William Farr and José Cortes-Larriva. Verified by Fernando Mendoza-Quijano. UANL 6406. First record for Tamaulipas for both genus and species (Wake and Lynch 1976; Canseco-Márquez et al. 2004) and range extensions of ca. 105 km N for UANL 6406 and *ca*. 120 km N for TCWC 71137, from the nearest locality in southeastern San Luis Potosí (Wake and Lynch 1976). Both localities are situated in tropical deciduous forest.

Chiropterotriton priscus (Primeval Splayfoot Salamander) Municipio Miquihuana: Las Joyas de Miquihuana, 11 km N La Peña (23°39'44"N, 99°42'53"W, 2940 m elev.). 4. July 2004. William Farr, Pablo Lavín Murcio, Gilberto Herrera-Patiño, Oscar M. Hinojosa-Falcón, Ricardo Enrique-Nuñez, Armando Martínez, and Michael R. J. Forstner. Tentatively verified by James R. Dixon (see below). TCWC 90156-161. First record for Tamaulipas, although Rabb (1956) predicted its occurrence there, and a 30 km range extension S from the closest known locality in Nuevo León (Liner 1998a). The identity of this series as *Chiropterotriton priscus* is tentative and may represent examples of an undescribed species discussed by Rabb (1958) from a locality approximately 35 km to the NE in Tamaulipas and addressed in more detail below. All specimens were found on the ground, in and under logs, in dead agaves, and rarely under rocks, in pine-oak-madrone forest with an understory of agaves and scrub heavily littered with fallen logs. Reasons for the tentative identification of these salamanders are discussed below.

The salamanders agree, in most aspects, with the original description of *C. priscus* given in Rabb (1956), including, short legs with three to four costal spaces between adpressed limbs, twelve costal spaces between axilla and groin, eleven distinct costal grooves, and a weak mid-dorsal furrow. However, two key characters given for *C. priscus*, ventral coloration and size seem to be irreconcilable with the series from the Sierra de Miquihuana, and in both features are more consistent with the *Chiropterotriton* sp. discussed in Rabb (1958). Rabb (1956) describes ventral color in *C. priscus* as having "sides progressively lighter than the dorsum as the tan ventral surfaces are approached." Likewise, Liner's (1998a) definition describes a lighter, mostly cream-colored venter. This condition is exactly reversed in the salamanders from Sierra de Miquihuana, with sides progressively darker than the dorsum as the black ventral surfaces are approached, so in this respect they more closely resemble the purported undescribed *Chiropterotriton* represented in Rabb (1958) that had a dark venter. Rabb (1956) does note that ontogenetic variation shows young being considerably darker than the adults, particularly on the venter in *C. priscus*. However, these salamanders were extremely abundant in July and August of 2003 through 2005, so it seems unlikely that of the hundreds of these salamanders observed over three years, all were juveniles.

The average size of the six Sierra de Miquihuana specimens is 31.66 mm snout–vent length (64.33 mm total), with the largest specimen being 37 mm SVL (74 mm total). This is slightly smaller than the 32–42 mm SVL of the *Chiropterotriton* sp. in Rabb (1958), but notably smaller than the 37–50 mm SVL given by Rabb (1956) for *C. priscus*. Rabb (1956) also comments on the robust body of *C. priscus* and notes the resemblance to small individuals of *Pseudoeurycea galeanae*. Subsequent authors (Darda 1994; Liner 1998a; Parra-Olea 2003; Wake and Lynch 1976) all commented on the robust body and *Pseudoeurycea*-like appearance of *C. priscus*. These descriptions would not seem applicable to the small and slender *Chiropterotriton* from the Sierra de Miquihuana. In numerous surveys conducted from 1997 to 2005, many *P. galeanae* were found in and under dead logs and in dead agaves alongside the *Chiropterotriton* in question, but the morphological differences between samples of the two genera from the Sierra de Miquihuana are clear and obvious. Likewise, the general and overall appearance of these salamanders is quite consistent with other species of *Chiropterotriton* (e. g., *C. cracens* and *C. multidentatus*) observed by us in other areas of Tamaulipas.

The coloration of these salamanders can be highly variable. Most, but not all, have a faint and poorly delineated rusty-colored ring or collar around the dorsal part of the neck on a drab and nondescript mottled or peppered ground color of tans, browns and black on the dorsal surface and a darker, mostly black ventral surface. Many individuals have a weak and poorly defined dark line, or sometimes a dark line of weakly defined chevrons, pointing to-

wards the anterior, running down the spine. Another less common "red-backed" variant bears a faint rusty-red dorsal surface on the body and tail outlined by darker pigment that extends down the lateral surface.

Individuals of the undescribed *Chiropterotriton* discussed in Rabb (1958) are currently in the University of Michigan Museum of Zoology (UMMZ 111323–327) cataloged as *Chiropterotriton multidentatus* and have not been examined by us. Rabb (1958) believed these salamanders were clearly related to the two Tamaulipan populations of *C. multidentatus*, but most likely represented another species. Rabb (1958) furthermore included the original description of *Chiropterotriton chondrostega cracens* (= *Chiropterotriton cracens*), and by having previously described *C. priscus*, he obviously believed the undescribed *Chiropterotriton* was distinct from both of those taxa. The UMMZ series were collected by Paul Martin in 1953, from two localities, El Chihue, 17 km by road southeast of Revillagigedo [23°52'N, 99°25'W] Tamaulipas, México, ca. 6200 ft. [1860 m elev.] and from Ojitos Mine, ca. 2 miles [3.21 km] west of El Chihue, 8600 ft. [2580 m], which is ca. 65 miles [104 km] north of the Gómez Farías region (Rabb 1958). One character described by Rabb (1958) in the UMMZ series, the longer length of the legs, is irreconcilable with the salamanders from the Sierra de Miquihuana. Rabb (1958) reported a gap of 1/2 to an overlap of 1/2 of a coastal groove between adpressed limbs in the UMMZ series. Dental characters have not been examined in the present series, although Rabb (1958) questioned their importance for discriminating among taxa in the genus.

More recently, Darda (1994) and Parra-Olea (2003) examined *Chiropterotriton* allozyme variation and DNA from multiple localities throughout México, including samples from all of the currently recognized species in the genus except *C. mosaueri*. Those publications identified at least seven new cryptic species, but left them undescribed, and regrettably did not include samples collected from the Sierra de Miquihuana or from El Chihue, the locality of the UMMZ specimens.

We conclude that these salamanders represent either: a) a southern range extension of *Chiropterotriton priscus* with characters that exceed the current definition of the species, or b) an undescribed species of *Chiropterotriton* geographically located 30 km S of the known distribution of *C. priscus* in adjacent areas of Nuevo León, and 60 km NW of *C. multidentatus* in the Sierra de Guatemala (= El Cielo).

Pseudoeurycea sulcata (Sulcate False Brook Salamander). Municipio Casas: 10 km N of Rancho La Sauceda [23°11'50"N, 99°20'50"W, 1140 m elev.] in the Sierra de Tamaulipas, ca. 39 km N of González. 11 October 2002. Pablo Lavín Murcio and Oscar M. Hinojosa-Falcón. Verified by James R. Dixon (as *P. cephalica*, see below). ITCV 970-971. First record from the Sierra de Tamaulipas and a range extension of 90 km E from the Sierra de Guatemala range of the Sierra Madre Oriental where *Pseudoeurycea sulcata*, *P. bellii*, and *P. scandens* are all documented (Martin 1958; Walker 1955). The Sierra de Tamaulipas is an isolated mountain range located over 50 km E of the Sierra de Guatemala, and separated by 30 km of lowland tropical thorn scrub that is unsuitable habitat for *Pseudoeurycea*. The habitat in the Sierra de Tamaulipas, where these salamanders were collected, is pine-oak forest.

As a side note, a single specimen (KU 129226) cataloged as *Pseudoeurycea scandens*, reportedly collected 9 October 1955, at Agua Linda in the Sierra de Tamaulipas, is in fact a *Pseudoeurycea sulcata*. We consider this specimen as having erroneous locality data and believe it was actually caught 9 October 1965, at Agua Linda, Sierra de Guatemala along with other specimens in the University of Kansas collection obtained by the same collectors on the latter date and location. We are unaware of any locality by the name of Agua Linda in the Sierra de Tamaulipas, whereas Agua Linda in Sierra de Guatemala is a familiar locality and has long been an established destination for biologists (Martin 1955, 1958; Sutton and Pettingill 1942; Walker 1955). Therefore, we consider the record of *P. sulcata* to be the first record for a plethodontid salamander from the Sierra de Tamaulipas. The name *Pseudoeurycea sulcata* has previously been referred most often to *P. cephalica*, which, as pointed out by Frost (2007), is a *nomen nudum*; the next available name is *P. sulcata* (Brocchi 1883), as used herein.

Pseudoeurycea galeanae (Galeana False Brook Salamander). Municipio Miquihuana: Las Joyas de Miquihuana, 11 km N of La Peña. (23°39'30"N, 99°42'65"W), 2936 m elev. 4 July 2004. William Farr, Pablo Lavín Murcio, Gilberto Herrera-Patiño, Oscar M. Hinojosa-Falcón, Ricardo Enrique-Nuñez, Armando Martínez, and Michael R. J. Forstner. Verified by James R. Dixon. UACJ 474. First record for Tamaulipas and a 20–30 km range extension S from the closest known locality in Nuevo León (Liner 1998b). The salamander was caught in pine-oak forest.

Notophthalmus meridionalis (Black-spotted Newt). Municipio Ocampo: Laguna La Loca, 5 km E of El Pensil, 20 km S of Ocampo [22°40'00"N, 99°19'75"W, ca. 300 m elev.]. 27 October 2001. Oscar M. Hinojosa-Falcón and Gilberto Herrera-Patiño. Verified by Jerry D. Johnson. ITCV 683, 741. Westernmost record for this species from throughout its geographical range and a range extension of ca. 37 km W of the vicinity of Ciudad Mante [22°45'00"N, 98°59'00"W, 80 m elev.] (Mecham 1968). Laguna La Loca lies just east of the main body of the Sierra Madre Oriental, and west of the smaller Sierra Tamalave and Sierra Cucharas. Vegetation in the area is tropical deciduous forest.

Anura

Anaxyrus punctatus (Red-spotted Toad). Municipio Jaumave: 5.2–6.2 [road] mi. [8.36–9.97 km] NW Jaumave, Hwy 101 [23°29'N, 99°25'W], 2425–2450 ft. [727.5–735 m] elev. 26 June 1976. James R. Dixon and Carl S. Lieb. Verified by Kathryn Vaughan. TCWC 52642–644. Jaumave [23°24'50"N, 99°23'00"W, 740 m elev.]. 16 May 1946. Hellmuth Wagner. Verified by Gregory Schneider. UMMZ 95237. Hwy 101 at Río Chihue [23°35'30"N, 99°20'10"W, 660 m elev.]. 9 June 1978. Peter Meylan, John Iverson, and Ron Magill. Verified by James R. Dixon from a digital photograph supplied by Kenneth L. Krysko. FLMNH 44080. Municipio San Carlos: 2.6 mi. [4.18 km] WNW San Carlos [24°36'N, 98°58'W, 500 m elev.]. 3 January 1975. Fred. S. Hendricks and party. Verified by James R. Dixon. TCWC 49393. 0.4 mi. [0.64 km] SW Rancho Carricitos [24°36'N, 98°55'W, 600 m elev.]. 8 January 1976. Fred S. Hendricks and party. Verified by James R. Dixon. TCWC 49394. Vicinity Rancho Carricitos [24°37'N, 98°55'W, 700 m elev.]. 17 May 1977. Fred S. Hendricks and H. E. Bonham.

Verified by James R. Dixon. TCWC 58053, 58059. 0.3 mi. SSW Rancho Carricitos [24°37'N, 98°55'W, 750 m elev.]. 18 May 1977. M. Sims. Verified by James R. Dixon. TCWC 58066. 6.4–7.0 mi. [10.29–11.26 km] S San Carlos [24°30'N, 98°57'W, 700–800 m elev.]. 5 May 1977. Fred S. Hendricks. Verified by James R. Dixon. TCWC 58131. Marmolejo [24°37'50"N, 99°00'30"W, 540 m elev.]. 28 July, 5 August 1930. L. R. Dice. Verified by Gregory Schneider. UMMZ 69206 (two specimens), 69208. Municipio Casas: 42.2 [road?] mi. [67.89 km] E of Ciudad Victoria [23°34'N, 98°30'W, 400 m elev.], near Soto La Marina. 27 August 1972. Jeremy F. Jacobs. Verified by James R. Dixon. USNM 244735-736. Municipio Bustamante: 9 km S of Bustamante on the paved road going to highway 101. (23°21'25"N, 99°43'91"W), 1435 m elev. 12 July 2004. William Farr and Michael R. J. Forstner. Verified by James R. Dixon. UACJ 480. Municipio Burgos: Mulato [24°53'50"N, 98°57'00"W, 250 m. elev.]. 20 August 1930. L. R. Dice. Verified by Gregory Schneider. UMMZ 69209–210. Municipio Tula: 9 [road?] mi. [14.48 km] SSW of Tula [22°51'50"N, 99°50'30"W, 1100 m elev.]. 14 July 1951. Paul and Marian Martin. Verified by Gregory Schneider. UMMZ 110731 (12 specimens). Municipio Palmillas: 2 [road?] mi. [3.21 km] N of Palmillas [23°19'50"N, 99°33'00"W, 1000 m elev.]. 16 July 1951. Paul and Marian Martin. Verified by Gregory Schneider. UMMZ 110732 (2 specimens). 15 km S of the town of Palmillas, near Ejido El Llano de Azuas, on the dirt road going to San Vicente. (23°10'04"N, 99°33'24"W). 1506.6 m elev. 11 July 2004. William Farr, Pablo Lavín Murcio, Gilberto Herrera-Patiño, Oscar M. Hinojosa-Falcón, Ricardo Enrique-Nuñez, Armando Martínez, and Michael R. J. Forstner. Verified by James R. Dixon. UTA slide collection 31343. Municipio Soto La Marina: Soto La Marina [23°46'00"N, 98°11'50"W], 500 ft. [150 m] elev. [The elevation of the town of Soto La Marina is 30 m., so 500 ft. was either recorded in error or the specimen was collected in hills 10–20 km S or W of the town]. 18 May 1953. Gerd H. Heinrich. Verified by James R. Dixon. KU 33986. Municipio Victoria: 1 [road] mi. [1.60 km] E Ciudad Victoria [23°43'N, 99°06'W, 300 m elev.]. 6 June 1959. James R. Dixon. Verified by Omar Torres-Carvajal. KU 60515–516. 3–5 [road] mi. [4.82–8.04 km] E Ciudad Victoria [23°43'N, 99°04'.0W– 99°02'60"W, 200–300 m elev.]. 6 June 1959. James R. Dixon. Verified by Omar Torres-Carvajal. KU 60517–525. 6–8 [road] mi. [9.65–12.87 km] E Ciudad Victoria [23°43'N, 99°01'20"W–98°03'80"W, 200–300 m elev.]. 6 June 1959. James R. Dixon. Verified by Omar Torres-Carvajal. KU 60526–532. 10–13 [road] mi. [16.09–20.91 km] E Ciudad Victoria [23°43'N, 98°57'50"W–98°54'70"W], 1100 ft. [330 m] elev. 6 June 1959. James R. Dixon. Verified by Omar Torres-Carvajal. KU 60533–536. Municipio Antiguo Morelos: 47 mi. [75.63 km] N Valles on hwy 85 [22°36'N, 99°02'W]. 24 August 1952. Collector not recorded. Verified by James R. Dixon. FLMNH 7674-1, 2. Municipio Miquihuana: In the town of Miquihuana (23°34'N, 99°46'W), 1840 m elev. 10 August 2003. William L. Farr, Gilberto Herrera-Patiño, Omar Martínez Alvirde, and Ricardo Enrique-Nuñez. Verified by James R. Dixon. UTA slide collection 31336–338. 0.5 km SE of the town of La Peña (23°33'16"N, 99°41'33"W), 1781.1 m elev. 4 July 2004. William L. Farr and Michael R. J. Forstner. Verified by James R. Dixon. UTA slide collection 31339–340. 17 km SE of Miquihuana, near Ejido Altamira, on the paved road going to highway 101 (23°27'51"N, 99°37'68"W), 1719.6 m elev. 8 July 2004. William L. Farr, Oscar M. Hinojosa-Falcón, and Ricardo Enrique-Nuñez. Verified by James R. Dixon. UTA slide collection 31341–342.

The distribution of *Anaxyrus punctatus* in Tamaulipas has not been well documented. Frost (2007) and Smith and Taylor (1966) include Tamaulipas in the range of the species, but partial distribution maps in Conant and Collins (1998) and Stebbins (2003) fail to show the species as occurring within the state. The distribution map in Korky (1999) shades a small portion of southwest Tamaulipas, but precise distribution was not supported by any locality dots. Our data reveal *A. punctatus* occurring in 11 of the 43 municipalities in the state, including all five positioned west of the Sierra Madre Oriental. Localities ranging from the Municipio of Burgos in northcentral Tamaulipas, to Soto La Marina (KU 33986) near the Gulf Coast, and Municipio of Antiguo Morelos on the state's southern border (and numerous localities in between), establish the distribution of this species through most of the central and southern two-thirds of the state. Vegetation types occupied by this species in Tamaulipas are predominantly tropical thorn scrub east of the Sierra Madre Oriental, Chihuahua Desert scrub west of the Sierra Madre, and the Jaumave Valley, where elements of both environments overlap. The Antiguo Morelos locality has elements of both thorn scrub and tropical deciduous forest.

Syrrhophus verrucipes (Bigear Chirping Frog). Municipio Palmillas: Near El Llano de Azúas, 15 km S of Palmillas on the road to San Vicente (23°10'04"N, 99°33'24"W), 1506.6 m elev. 11 July 2004. William Farr, Pablo Lavín Murcio, Gilberto Herrera-Patiño, Oscar M. Hinojosa-Falcón, Ricardo Enrique-Nuñez, Armando Martínez, and Michael R. J. Forstner. Verified by James R. Dixon. UACJ 481. New state record and a range extension ca. 200 km NNW of the nearest known locality, 9.6 km W Ahuacatlán, San Luis Potosí (Lynch 1970). This specimen was found under a rock within a canyon in the Sierra Madre Oriental during morning hours in a cleared field that previously contained thorn scrub.

Lacertilia

Basiliscus vittatus (Brown Basilisk). Comments on distribution in northeastern México. Numerous publications including, but not limited to Köhler (2003), Lee (1996), Peters and Donoso-Barros (1970), Savage (2002), and Smith and Taylor (1966), all affirmed that southern Tamaulipas comprises the northernmost geographic range of *Basiliscus vittatus* on the Atlantic slopes of México. Lang (1989) and Maturana (1962) also include Tamaulipas in the range of the species, although maps provided in those publications clearly identify central Veracruz or eastern Hidalgo as the northernmost occurrences based on actual localities. No specimens of *Basiliscus vittatus* from Tamaulipas are cataloged among 11,500 vouchers from the 61 institutions that we queried. Only a very small percentage of the holdings from these collections have been personally examined by us, but misidentification is highly unlikely because *B. vittatus* is easily recognized and not to be confused with other lizards native to Tamaulipas. Additionally, over 20 natural history museums and universities in Europe were surveyed specifically for records of *B. vittatus* from Tamaulipas. Of those, 14 responded and no specimens from Tamaulipas were located. Literature searches have not yielded any locality records specific to Tamaulipas, nor did numerous field surveys conducted over many years.

The origin of the prevailing idea that *B. vittatus* occurs in Tamaulipas might date to Velasco (1892), although Smith and Smith (1976) commented on the probable inaccuracy of his list. An examination of literature published before Velasco revealed no prior references to *B. vittatus* in Tamaulipas (e.g., Boulenger 1885, 1887; Cope 1863, 1887; Duges 1896; Dumeril and Dumeril 1851; Dumeril et al. 1870–1909; Fitzinger 1826, 1843; Griffth and Pidgeon 1831; Günther 1885–1902; Hallowell 1861). Therefore, we judge that *B. vittatus* should not be considered among the herpetofauna of Tamaulipas. Available locality records indicate that central Veracruz is the northern limit of the species in eastern México, as illustrated in the maps of Lang (1989) and Maturana (1962).

Iguana iguana (Green Iguana). Municipio Altamira: 17 km N of Playa Miramar on the road to Puerto Altamira (22°27'00"N, 97°53'00"W), 10 m elev. 16 July 2004. Pablo A. Lavín-Murcio. Verified by James R. Dixon. ITCV 980. First record for Tamaulipas and a range extension of ca. 50 km N of the nearest previously known locality in Veracruz, on the shore of Laguna de Tamiahua, 17 miles [27.5 km] S of Tampico (Smith and Burger 1950; de Queiroz 1995). The specimen was found DOR in a transition zone between a beach and remnants of mangrove forest.

Crotaphytus collaris (Collared Lizard). Municipio Jaumave: near San Vicente, 5 km E of Jaumave (23°25'08"N, 99°19'67"W), 658.5 m elev. 9 September 2005. William L. Farr. Verified by James R. Dixon. UANL 6431. New municipality record and a range extension of ca. 90 km NE from the closest known locality in extreme southwestern Tamaulipas (Axtell and Webb 1995). The habitat in the Jaumave Valley is a combination of elements of Chihuahuan Desert scrub and the tropical thorn scrub of the Tamaulipan plain.

Phrynosoma modestum (Roundtail Horned Lizard). Municipio Villagran: Carretera de Lucio Blanco-San Carlos en San Salvador a 2 km (Terraceria) [Highway from Lucio Blanco to San Carlos, in San Salvador (ca. 24°40'N, 99°20'W), ca. 350 m elev.]. 6 December 1996. David Lazcano. Verified by James R. Dixon. UANL 4311. First municipality record and a range extension of ca. 150 km NE from the only other record of this species in the extreme southwestern corner of the state, as depicted by Whiting and Dixon (1996). This is also the first record for this species east of the Sierra Madre Oriental, although isolated accounts from Jim Hogg, Webb, and Zapata counties, Texas (Dixon 2000; Whiting and Dixon 1996) suggests that this species might be more widely distributed on the Gulf lowlands of northeastern México than currently confirmed. The habitat in this area is arid tropical thorn scrub.

Anelytropsis papillosus (Mexican Blind Lizard). Municipio Tula: San Pablo, 17 km SW of Tula (22°54'35"N, 99°50'51"W), 1103 m elev. 15 August 2004. William L. Farr and Tim Burkhardt. UANL 6740. El Malpais, km 16 carretera Tula SW Ejido Magdaleno Cedillo [22°49'N, 99°53'W, 1050 m elev]. 18 August 2002. Humberto Velez. ITCV 803. Municipio Gomez Farías: 20.5 km by road WNW of Los Estación Cedros in Gómez Farias [22°03'N, 99°14'W, 1360 m elev]. 23 May 1995. J. T. Anderson. TCWC 72818. All verified by James R. Dixon. These localities fill a gap between numerous records in southeastern San Luis Potosí (Campbell 1974) and from 2 miles [3.21 km] SW of Cd. Victoria, Tamaulipas (Axtell 1958). Greer (1985) commented on the wide variety of habitats occupied by this species, but did not list the two plant formations acknowledged herein. The Tula localities are in Chihuahuan Desert scrub within a valley on the western slope of the Sierra Madre Oriental, whereas the record northwest of Gómez Farías is from humid cloud forest on the eastern slopes of that mountain range.

Plestiodon lynxe (Oak Forest Skink). Municipio Antiguo Morelos: 4.0 mi. [6.43 km] N (via Mex. Hwy 85), 0.2 mi. [0.32 km] W of Tamaulipas-San Luis Potosí border [22°27'83"N, 99°05'05"W, 266 m elev.]. 29 May 1980. Laurence M. Hardy. Verified by Amanda Crnkovic and James R. Dixon. LSUS 4513. First record for the state and a range extension of ca. 100 km N of the nearest localities in southern San Luis Potosí (Parker 1960; Webb 1968). The habitat was originally tropical deciduous forest and tropical thorn forest with patches of palm forest, but has since been altered for grazing and agriculture.

Plestiodon obsoletus (Great Plains Skink). Municipio Victoria: Rt. 101, 5 mi. [8.04 km] N Ciudad Victoria [23°50'N, 99°04'W, 200 m elev]. 28 April 1974. John Iverson and party. Verified by James R. Dixon from digital photographs provided by Kenneth L. Krysko. FLMNH 41951. Municipio Tula: El Malpais, km 16 carretera Tula SW Ejido Magdaleno Cedillo [22°49'N, 99°53'W]. 18 August 2002. Humberto Velez. Verified by James R. Dixon. ITCV 794. According to Hall (1976), the nearest recorded localities are from northern Tamaulipas in the vicinity of Matamoros, which is a range extension of ca. 280 km SW for FLMNH 41951 and a range extension of ca. 410 km SW for ITCV 794. FLMNH 41951 is from tropical thornscrub east of the Sierra Madre Oriental and ITCV 794 was from Chihuahuan Desert scrub, west of the Sierra Madre Oriental.

Anguis incomptus (Plainneck Glass Lizard). Municipio Aldama: 11.7 km. NE Aldama. 1983 [day and month not recorded]. Michael Bishop. Verified by Oscar Flores-Villela, Luis Canseco-Márquez, and Carl Franklin. UTA 14069. 19.2 mi. [30.7 km] E Aldama (Carretera 100, Aldama-Barra del Tordo) [ca. 22°57'35"N, 97°49'15"W, 50 m elev.]. 18 July 2006. Chris Rodriquez, Ian Recchio, David Lazcano, and Alan Kardon. Verified by Fernando Mendoza-Quijano. UANL 6824. New state records and range extensions of ca. 150 km NE of the type locality, 7 mi S of Valles, San Luis Potosí (Holman 1971) in tropical deciduous forest. These appear to be only the second and third published records for this species. UANL 6824 was found DOR in tropical thorn scrub, although riparian areas in the region support some tropical deciduous forest. We suspect that UTA 14069 was caught on the same road, so we have reservations about the preciseness of its locality data; specifically the probable direction east as opposed to northeast as originally recorded. Unfortunately the collector is now deceased, thus clarification was not possible. This potential discrepancy will be discussed in more detail below with the intent of identifying specific habitat associations for this extremely rare lizard.

The locality 11.7 km NE of Aldama [ca. 22°59'N, 97°59'W, 430 m elev.] as recorded, is near the center of a small isolated volcanic mountain range covered by oak forest with a maximum elevation of 660 m. This range has no towns or villages, is only accessible by one unpaved road that is not shown on road maps, is unmarked on the highway, and dead ends on private ranch land. To access

this road one must drive north on highway 180 from Aldama approximately 11 km and then return southeast to reach a point 11.7 km NE of Aldama. Although not impossible, it seems extremely unlikely that the specimen came from this out-of-the-way locality.

A more feasible point of origin is 11.7 km E of Aldama [22°57'N, 97°58'W, 140 m elev.] on a paved road leading to the coastal fishing village of Barra del Tordo. The habitat there is arid tropical thornscrub. An examination of this specimen indicated it was DOR. Based on surveys of the area and examining INEGI topographical maps, there is only one road going east from Aldama (no roads going northeast), which is the highway to Barra del Tordo. This highway is on all road maps of Tamaulipas and is one of only four paved roads in the state between Matamoros and Tampico that access the Gulf of México. Barra del Tordo is located northeast of Aldama and without careful analysis it would be reasonable for someone to assume that if they were driving from Aldama to Barra del Tordo that they were going northeast. However, because there are mountains between the two towns, the highway goes east from Aldama and then just a few kilometers before reaching the coast it turns north and parallels the coast to Barra del Tordo.

Serpentes

Boa constrictor (Boa Constrictor). Municipio Jaumave: La Florida, 12 km W of Jaumave (23°23'25"N, 99°30'25"W), 1040 m elev. 11 July 2004. Pablo A. Lavín Murcio. Verified by James R. Dixon. ITCV 974 (head only). Municipio Soto La Marina: Carretera Soto La Marina-La Pesca, en km 16 Rumbo a La Pesca (23°47'48"N, 98°03'01W). 19 July 1997. David Lazcano. Verified by James R. Dixon. UANL 4889. First municipality records and a range extension of ca. 130 km NE for UANL 4889, the northernmost record known to us from the state and northeastern México, and a range extension of ca. 45 km NW for ITCV 974, the westernmost record within the state (Martin 1958). While commenting on specimens from the municipality of Gómez Farías, Martin (1958) stated that the species is restricted to tropical deciduous forest in the south. The Soto La Marina locality is tropical thornscrub of the Tamaulipan plain. La Florida is in the Jaumave Valley where the Tamaulipan plain thornscrub blends with elements of the Chihuahuan Desert.

Hypsiglena torquata (Night Snake). Municipio Bustamante: 7 km S of the town of Bustamante, on the paved road going to highway 101 (23°22'57"N, 99°44'63"W), 1476 m elev. 8 July 2004. William Farr, Oscar M. Hinojosa-Falcón, and Ricardo-Nuñez. Verified from photographs by James R. Dixon. UTA slide collection 31347–349 (three slides of one specimen). Municipio Tula: San Pablo, 17 km SW of Tula (22°54'35"N, 99°50'51"W), 1103 m elev. 15 August 2004. William L. Farr and Tim Burkhardt. Verified from photograph by James R. Dixon. UTA slide collection 31350. New municipality records that fill a large gap in known distribution of this species within the Sierra Madre Oriental of southwestern Tamaulipas (Dixon and Dean 1986; maps in Conant and Collins 1998 and Stebbins 2003). A range extension of ca. 60 km W for UTA 31347–349 from the nearest locality, 3 mi [4.8 km] S of Cd Victoria, Tamaulipas (Dixon and Dean 1986), and a range extension of ca. 50 km E for UTA 31350 from nearest locality in San Luis Potosí (Dixon and Dean 1986). The specimens recorded herein represent only two of many individuals observed within the Sierra Madre Oriental of southwestern Tamaulipas, and all were associated with arid canyons and valleys at elevations below 1476 m.

Masticophis mentovarius (Neotropical Whipsnake). Municipio Aldama: Los Colorados Rancho, 26 km NE, 7 km S Aldama [22°54'50"N, 97°51'00"W, 30 m elev.]. 12 January 1992. James R. Dixon. Verified by Kathryn Vaughan. TCWC 70389. First verified record for the state and a range extension of ca.140 km NE of the nearest known locality, 3 mi [4.8 km] E Taruin [= Tamuin?] (Johnson 1977, 1982; EAL 3429) in southeastern San Luis Potosí. An unconfirmed record mentioned in Blair et al. (1997; WTAMU 312, now apparently lost), from 4 mi. [6.4 km] E Mante, Hwy. 80 [22°43'00"N, 98°53'75"W, 40 m elev.], is located ca. 110 km W of the Aldama record, and is not unexpected. The habitat around the Aldama locality is tropical thornscrub.

Senticolis triaspis (Green Rat Snake). Municipio Soto La Marina: 24 km SW of Soto La Marina on Mexican Highway 70 (23°37'04"N, 98°22'46"W), 397 m elev. 23 October 2004. William L. Farr. Verified by Fernando Mendoza-Quijano. UANL 6741. First municipality record and a range extension of ca. 85 km E of the nearest localities in the vicinity of Cd. Victoria (Schulz 1996). The habitat is a transition zone between arid tropical thorn forest and the more humid montane oak forest located at higher elevations in the Sierra de Tamaulipas to the south. It is curious why Price's (1991) distribution map has the southeastern quarter of Tamaulipas shaded even though there are no locality dots to support his contention. We are unaware of any previous records of this species, published or unpublished, from that region of the state.

Thamnophis exsul (Montane Garter Snake). Municipio Miquihuana: Las Joyas de Miquihuana, 11 km N of La Peña (23°39'44"N, 99°42'53W), 2916 m elev. 8 July 2004. James R. Dixon, Michael R. J. Forstner, and William L. Farr. Verified by Jerry D. Johnson. UACJ 585–86. Las Joyas de Miquihuana,11 km N of La Peña (23°39'50"N, 99°42'37"W), 2884 m elev. 16 August 2004. William L. Farr and Tim Burkhardt. Verified by Fernando Mendoza-Quijano. UANL 6742. First state records and a range extension of ca. 20 km S from 19.6 km NE San Antonio de Peña Nevada, Nuevo León (Liner 1992; Rossman et al. 1989).

Thamnophis exsul was described by Rossman (1969) from a single specimen found 6 July 1961, 17.5 km E, 5.6 km S San Antonio de las Alazanas, Coahuila. Rossman et al. (1989) considered *T. exsul* the rarest of all garter snakes because only 10 individuals were known to them when they redescribed the species. High rates of encounter in our surveys have lead us to the conclusion that this species can be locally abundant, so its reported rarity is probably an artifact of under representation in museum collections, restricted distribution, and remote habitat. As an example, on 8 July and 16 August 2004, eight individuals were observed during about six hours of searching.

A vertical distribution of 2650–2860 m elevation was reported for the species in Rossman et al. (1996). The specimens reported herein were found at slightly higher elevations, between 2884 and 2916 m. Additionally, numerous observations of this species were taken at even higher elevations. A GPS reading of 3007.8 m was recorded for three specimens observed 3 km N of Las Joyas de Miquihuana on 16 August 2004, and others were observed at 3237 m in another study site on Sierra San Antonio Peña Nevada, Zaragoza, Nuevo León, on 29 June 2001 (Lazcano 2005).

Rossman et al. (1996), and our experiences, indicate that this species is not restricted to semiaquatic habitats near water sources, as is typical of most species of *Thamnophis*. All individuals observed in our surveys were fast moving and associated with dead agaves and talus slopes in semiarid terrestrial habitats, even though some small streams, seeps, seasonal pools, and cattle tanks were found in the study areas. Another interesting note is that the distribution of *T. exsul* is largely sympatric with *Crotalus pricei miquihuanus*. There is an ontogenetic change in *T. exsul*, resulting in an adult body form that bears striking resemblance to that small rattlesnake, suggesting a possible Batesian mimetic system involving the two species.

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New County Records for Amphibians in Middle Tennessee

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Here we report new county records of amphibians from middle Tennessee. Several counties within middle Tennessee have few if any amphibian distribution records in contrast to the more thoroughly documented regions around Reelfoot Lake in northwest Tennessee, the Land Between the Lakes area in north-central Tennessee, and the Great Smoky Mountains in east Tennessee (Redmond and Scott 1996). Localities were determined by either use of a Garmin® global positioning system (GPS) or use of U.S. Geological Survey topographic maps. Voucher specimens were verified by Brian T. Miller and were deposited into the Middle Tennessee State University Herpetology Collection (MTSU) in Murfreesboro, Tennessee. Specimens were collected under authorization of the Tennessee Wildlife Resources Agency (permit no. 1450) and the Tennessee Department of Environment and Conservation (permit no. 2004-018).

Caudata

Ambystoma opacum (Marbled Salamander). Rutherford Co: Larva in spring-fed pond ca. 2.4 km SE of Shiloh (35º51'12.6"N, 86º18'26.8"W). 20 February 2004. M. Niemiller and G. Wyckoff. MTSU 340C.

Desmognathus fuscus (Northern Dusky Salamander). Warren Co: Adult in Hurricane Hollow Creek on Harrison Ferry Mountain (35º35'38.7"N, 85º38'19.4"W). 11 October 2003. M. Niemiller, B. Glorioso, and G. Wyckoff. MTSU 319C.

Eurycea cirrigera (Southern Two-lined Salamander). Warren Co: Adult in Hurricane Hollow Creek on Harrison Ferry Mountain (35º35'24.6"N, 85º38'16.8"W). 11 October 2003. M. Niemiller, B. Glorioso, and G. Wyckoff. MTSU 316C.

Notophthalmus viridescens viridescens (Red-spotted Newt). Warren Co: Eft adjacent to Hurricane Hollow Creek on Harrison Ferry Mountain (35º35'26.9"N, 85º38'14.7"W). 11 October 2003. M. Niemiller, B. Glorioso, and G. Wyckoff. MTSU 315C.

Pseudotriton ruber ruber (Northern Red Salamander). Moore Co: Adult in creek in Bobo Hollow ca. 1.4 km NW of Raysville (35º20'08.9"N, 86º19'47.0"W). 2 March 2004. M. Niemiller and B. Glorioso. MTSU 336C.

Anura

Acris crepitans crepitans (Northern Cricket Frog). Dekalb Co: Adult ca. 140 m NNE of privately-owned cave on Caney Fork River (35º50'11.9"N, 85º39'00.9"W). 19 September 2004. M. Niemiller. MTSU 141A.

Bufo americanus americanus (Eastern American Toad). Moore Co: Adult on road ca. 0.2 km SE of junction of Motlow Road and Spring Creek Road (35º20'50.2"N, 86º1'50.9"W). 1 July 2003. M. Niemiller. MTSU 123A. Warren Co: Adult on old logging road adjacent to Hurricane Hollow Creek on Harrison Ferry Mountain (35º35'22.5"N, 85º38'21.4"W). 11 October 2003. M. Niemiller, B. Glorioso, and G. Wyckoff. MTSU 128A.

Rana catesbeiana (American Bullfrog). Moore Co: Juvenile on road ca. 1.7 km W of junction of Rt 130 and Ledford Mill Road (35º22'13.5"N, 86º17'27.2"W). 1 July 2003. M. Niemiller. MTSU 121A.

Rana clamitans melanota (Northern Green Frog). Moore Co: Adult on road ca 0.7 km NE of Rural Road 6 and Raysville Road (35º20'31.3"N, 86º18'24.7"W). 1 July 2003. M. Niemiller. MTSU 127A.

Rana palustris (Pickerel Frog). Dekalb Co: Adult in stream exiting privately-owned cave on Caney Fork River (35º50'07.6"N, 85º39'02.2"W). 19 September 2004. M. Niemiller. MTSU 140A. Marshall Co.: Adult in creek adjacent to Bradford Road ca. 2.2 km NE of Archer (35º20'27.1"N, 86º44'23.4"W). 7 December 2003. M. Niemiller and J. Spiess. MTSU 142A. Moore Co: Adult on road ca. 0.3 km NW of junction of Spring Creek Road and Motlow Road (35º21'00.9"N, 86º18'06.6"W). 1 July 2003. M. Niemiller. MTSU 126A. Warren Co: Adult in Hurricane Hollow Creek on Harrison Ferry Mountain (35º35'37.3"N, 85º38'21.0"W). 11 October 2003. M. Niemiller, B. Glorioso, and G. Wyckoff. MTSU 129A.

Rana sphenocephala utricularia (Southern Leopard Frog). Moore Co: Adult on road near junction of Motlow Road and Spring Creek Road (35º20'55.3"N, 86º17'56.0"W). 1 July 2003. M. Niemiller. MTSU 122A.

Scaphiopus holbrookii (Eastern Spadefoot). Moore Co: Adult on road ca. 0.4 km W of Rural Road 6 and Spring Creek Road (35º20'44.5"N, 86º18'02.4"W). 1 July 2003. M. Niemiller. MTSU 124A. Adult on road ca. 2.0 km SE of junction of junction of SR 55 and Raysville Road (35º20'22.6"N, 86º18'52.1"W). 1 July 2003. M. Niemiller. MTSU 125A.

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New Distributional Records of Amphibians and Reptiles from Estado Zulia in the Maracaibo Basin, Venezuela

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The Estado Zulia, with a surface of 63,100 km^2, is located in northwestern Venezuela and comprises a large portion of the biogeographic region denominated Maracaibo Basin (Barrio-Amorós 1998; Liddle 1946). This region is covered by dry tropical forest and xerophytic coastal zones in the north, and by tropical lowland rain forest and extensive wetlands zones in the south. The state also includes the Lake Maracaibo, at 12,780 km^2, is the largest in South America; this is filled by numerous rivers originating from the eastern versant of Sierra de Perijá and the western versant of the Cordillera de Mérida. The eastern slopes of the Sierra de Perijá, a mountain range of the northernmost Andes, are also included in the state and that watershed represents the natural limit between Colombia and Venezuela.

Scarce studies on the amphibians and reptiles from this state and particularly on the Venezuelan slope of Perijá and south of Lake Maracaibo, make the composition and geographic distribution of the local herpetofauna poorly understood. Recent herpetological records lend evidence to the great potential of the region for new contributions to the herpetofauna of Venezuela, both by the discovery of new species and new records (Barrio-Amorós 1998, 2001; Barros and Barrio 2001; Barros and Pirela 2000; Harvey et al. 2004; Manzanilla et al. 1998; Manzanilla et al. 1999; Rivas et al. 2002). Some authors foresee the occurrence of several species, not yet recorded for the country (Barrio 1998; Harvey et al. 2004), in the state.

Ongoing efforts by the staff of the herpetology section at the Museo de Biología de La Universidad del Zulia, Maracaibo, Venezuela (MBLUZ) focused on data collected during field expeditions and collections examinations, form the basis for these contributions to the herpetology of the region. In this document, we report new herpetological records and range extensions for the state. All specimens reported herein were verified by Gilson Rivas and are deposited in the amphibian and reptile collections of the MBLUZ and/or the Museo de la Estación Biológica Rancho Grande, Maracay, Venezuela (MEBRG).

Anura

Eleutherodactylus johnstonei (Coquí antillano). Municipio Maracaibo: Ciudad de Maracaibo (10°41'00"N, -71°38'22"W). July 2004. C. Solórzano. MBLUZ-A-0236. This species native to the Lesser Antilles was introduced in Venezuela about five decades ago (Barrio-Amorós 1998). Currently recorded from several cities of the country (mainly in northern Venezuela), and neighboring Colombia (see Kaiser et al. 2002 for a detailed list of inhabited towns in both countries). First state record of this exotic anuran, extending the distribution ca. 200 km northwest of the city of Trujillo in Estado Trujillo, the nearest locality recorded (La Marca 1992), and confirming the expansion of the species throughout northern South America.

Rhaebo haematiticus (Sapo hojarasquero). Municipio Machiques de Perijá: Hacienda Nevada, comunidad El Guamo, Río Yasa. 02 February 2002. T. Barros. MBLUZ-A-0173–74. The species occurs from Honduras to Chocoan Colombia, western Ecuador, and northwestern Venezuela (Frost 2004). These vouchers confirm the presence in Venezuela. Previously known from a single specimen from northwest Estado Zulia (Barrio-Amorós 2001), the eastern limit of the species. This specimen represents the southernmost record for the country, extending the range ca. 110 km south from the previous record (Barrio-Amorós 2001).

Scarthyla vigilans (Ranita vigilante). Municipio Mara: Fundo La Orchila, Sierra de Perijá (10°48'44"N, -72°21'13"W), 210 m elev. 18 October 2003. F. Rojas and E. Infante. MBLUZ-A-0186. *H. vigilans* is only know from northeastern Colombia and northwestern Venezuela. In Venezuela the range had been restricted to south of the Maracaibo Basin among the states of Zulia, Mérida, and Trujillo (Barrio-Amorós 1998; La Marca 1992; Péfaur and Rivero 2000), with one isolated record from northeast Estado Falcón (Mijares-Urrutia et al. 1998). This specimen represents the northernmost record for the species and extends the range to the foothills north of the Sierra de Perijá in the western Maracaibo Basin, about 215 km from the nearest previously known locality (Barrio-Amorós, *op. cit.*).

Testudines

Podocnemis vogli (Galápago llanero). Municipio Lagunillas: Burro Negro, embalse de Pueblo Viejo (10°10'00"N, -71°03'40"W). 07 October 1999. T. Barros. MBLUZ-R-0444. The species is found only in the Llanos of the Orinoco basin, in Venezuela and Colombia (Pritchard and Trebbau 1984). First state record, extending the distribution ca. 260 km northwest of Guanarito, the nearest locality mentioned by Pritchard and Trebbau (*op. cit.*). One of us (TBB) has information that the population established at the Pueblo Nuevo dam is the result of one or more human introductions.

Lacertilia

Anolis nigropunctatus (Aguacerito). Municipio Machiques de Perijá: Sierra de Perijá. 13 August 1975. M. Castro. MEBRG-863. The species is known in the Departamento Norte de Santander in Colombia, and two localities of estados Táchira and Trujillo in the Venezuelan Andes (Williams 1974). First state record and northernmost locality for the species. This record extends the distribution ca. 240 km from Villa Páez, estado Táchira, the nearest locality recorded (Williams, *op. cit.*).

Gymnophthalmus speciosus (Lucia). Municipio Maracaibo: Ciudad Universitaria, La Universidad del Zulia (10°40'15"N, -71°38'27"W). 06 October 2003. J. Larreal. MBLUZ-R-0777. The distribution of this species comprises Central America and northern South America (Peters and Donoso-Barros 1970). It has a wide distribution through savannas and dry forests of Venezuelan lowlands, but it was unknown from the Maracaibo Basin (Donoso-Barros 1968; Esqueda et. al. 2001; Markezich 2002; Pefaur and Rivero 2000; Rivas and Oliveros 1997). This taxon is probably part of a species complex. This is the first state record, and also the first for the Maracaibo Basin. This account extends the range ca. 257 km to the northwest of Guanare (estado Portuguesa), the nearest locality previously mentioned (Markezich, *op. cit.*).

Norops tropidogaster (Machorro). Municipio Mara: Fundo La Orchila, Sierra de Perijá (10°48'44"N, -72°21'13"W), 230 m elev. 05 June 2004. F. Rojas and E. Infante. MBLUZ-R-0794; MBLUZ-R-0797; Municipio Jesús María Semprún: Hacienda El Mirador, km 497 carretera Machiques-Colón (08°36'34"N, -72°31'42"W). 11 May 2004. C. Hernández and C. Valeris. MBLUZ-R-0803. The distribution of the species extends from southern Panama through northern Colombia, reaching northwestern Venezuela, were it is known from one locality (El Tokuko) in the foothills of the Sierra de Perijá, Estado Zulia (Donoso-Barros 1968). Second country record. The two first specimens extend the distribution ca. 117 km northward, and the third extends the range ca. 130 km towards the southeast of the single locality previously recorded for the country. The species is now known from the entire western side of the Maracaibo Basin, the eastern limit of its distribution.

Serpentes

Atractus ventrimaculatus (Culebra tierrera). Municipio Machiques de Perijá: Ayajpaina, cuenca del río Negro (10°03'00"N, -72°45'58"W), 1200 m elev. 19 April 1994. J. Urdaneta and J. C. López. MBLUZ-R-0390. *A. ventrimaculatus* has been considered an endemic species of the Cordillera de Mérida in the Venezuelan Andes (Esqueda and La Marca 2005; Roze 1966). First state record, extending the distribution ca. 260 km to the northwest of the others localities recorded.

Micrurus mipartitus anomalus (Coral). Municipio Jesús María Semprún: Hacienda El Mirador, km 497 carretera Machiques-Colón (08°36'34"N, -72°31'42"W). 11 May 2004. C. Hernández and C. Valeris. MBLUZ-R-0804. This subspecies ranges from Cordillera Oriental and the Sierra Nevada de Santa Marta in Colombia, to the Cordillera de Mérida in Venezuela (Roze 1996). This record bridges the previous distribution gap of ca. 260 km between Sierra de Perijá and the Cordillera de Mérida (Roze, *op. cit.*).

Liophis epinephelus kogiorum. Municipio Rosario de Perijá: Mesa Turik, Sierra de Perijá (10°24'44"N, -72°42'06"W), 1700 m elev. 20 March 1991. F. Herrera. MBLUZ-R-0318; MBLUZ-R-0319; Municipio Machiques de Perijá: Sierra de Perijá, Valle del Ocari, cañón del río Negro. 1300 m elev. 28 March 1990. T. Barros. MBLUZ-R-0235. The distribution previously known for this subspecies was restricted to the Sierra Nevada de Santa Marta and the western slopes of the Sierra de Perijá in Colombia (Bernal-Carlo 1994; Dixon 1983). This record of the subspecies is the first for Venezuela and the easternmost locality. This record extends the distribution of this subspecies about 40 km eastward of the locality reported by Dixon (*op. cit.*) in Colombia.

Tantilla melanocephala (Culebrita cabeza negra). Municipio Mara: Granja Santa Genoveva, road Campo Mara – Carrasquero (10°56'N, -71°56'W). 8 October 1990. J. Moscó. MBLUZ-R-0229. This species ranges from Guatemala in Central America, through South America, to northern Argentina (Peters and Orejas-Miranda 1970; Wilson 1992). Widely distributed in Venezuela (Gorzula and Señaris 1998; Lancini 1986; Lancini and Kornacker 1989; Markezich 2002; Rivas and Oliveros 1997; Roze 1966). First state record and westernmost locality for the country, with a range extension of ca. 244 km northwest of nearest record from Estado Mérida (Wilson and Mena 1980). This record fills the gap between Venezuelan Andes (Wilson and Mena, *op. cit.*) and Colombian Guajira (Pérez-Santos and Moreno 1988).

Typhlops reticulatus (Culebra ciega). Municipio Colón: río Abajo, cerca de San Carlos del Zulia (08°59'59"N, -71°55'10"W). 05 July 2003. E. Arrieta. MBLUZ-R-0761. This species is widespread over tropical South America east of the Andes (Peters and Orejas-Miranda 1970). In Venezuela, the species has been documented from the states of Amazonas, Bolívar, Yaracuy, Falcón, Portuguesa, and Barinas (Dixon and Hendricks 1979; Gorzula and Señaris 1998; Markezich. *op. cit.*; Rivas 2001; Rivas et al. 2001). New record for the Maracaibo Basin, first record from Estado Zulia, and westernmost locality known for the species, with a range extension of ca. 290 km to the west of the nearest localities previously recorded (Markezich 2002; Rivas et al. 2001).

Xenodon rabdocephalus (Culebra sapa). Municipio Jesús Enrique Lossada: Ocagui, San José de los Altos, Sierra de Perijá, 1000 m elev. 05 May 1963. G. Vargas. MBLUZ-R-0043; Cueva La Carlotica, cuenca del río Socuy, Sierra de Perijá, 1200 m elev. 22 December 1990. T. Barros and A. Viloria. MBLUZ-R-0297; cuenca del río Socuy, 1300 m elev. 17 December 2000. T. Barros and O. Guerrero. MBLUZ-R-0534; Municipio Machiques de Perijá: Cuenca del río Negro, carretera vía Toromo, Sierra de Perijá (10°03'07"N, -72°40'40"W), 100 m elev. January 2000. T. Barros. MBLUZ-R-0484; Municipio Mara: Fundo La Orchila, riecito Maché, Sierra de Perijá (10°48'44"N, -72°21'13"W), 230 m elev. 31 April 2000. E. Arrieta. MBLUZ-R-0523; 04 August 2004. E. Infante. MBLUZ-R-0834. Species is widely distributed from Mexico through Mesoamerica to Bolivia (Peters and Orejas-Miranda 1970). In Venezuela, it was only known from south of the Orinoco River, in the states of Bolívar and Amazonas (Lancini and Kornacker 1989; Paolillo 1984). The species is apparently very common in the foothills of the Sierra de Perijá. First state record and first record from the Maracaibo Basin. This is the northwesternmost locality recorded for the country, and northernmost for South America. This record extends the distribution of this species more than 700 km to the northwest of the state of Amazonas, the nearest locality recorded for the country (Paolillo, *op. cit.*), and fills a wide gap of ca. 1200 km between southern Venezuela (Paolillo 1984) and northern Colombia (Pérez-Santos and Moreno 1988).

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New Distributional Records for Reptiles in Central Arkansas

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The distribution of reptiles within Arkansas was first described in 1957 in "A Review of the Amphibians and Reptiles of Arkansas" (Dowling1957). In 2004, distributions were updated with "The Amphibians and Reptiles of Arkansas" (Trauth et al. 2004). Since that date, there have been numerous county records and range extensions for reptiles reported throughout the state, but little was ever reported for Faulkner and adjacent counties. Within the following article, we report new county records for Faulkner County and neighboring Conway County. All records were verified by Kelly Irwin (Arkansas State Herpetologist) and are currently housed at the University of Central Arkansas Museum (UCAM).

Testudines

Apalone spinifera hartwegi (Western Spiny Softshell). Faulkner Co. Caught on the East Fork of Cadron Creek ca. 7 km E of Springhill. 24 April 2006. C.A. Howey. Voucher specimen in

UCAM (UCAA119). Caught using turtle hoop trap. First county record (Trauth et al. 2004).

Chrysemys picta dorsalis (Southern Painted Turtle). FAULKNER CO. Caught on the East Fork of Cadron Creek ca. 7 km E of Springhill. June 2005. C.B. Caldwell. Voucher specimen in UCAM (UCAA120). Caught using a turtle hoop trap. First county record (Trauth et al. 2004).

Deirochelys reticularia miaria (Western Chicken Turtle). CONWAY CO. Caught in borrow pits adjacent to Cox Lake, Plumerville. May 2005. S.A. Dinkelacker and R. Bland. Photo voucher in UCAM (UCAA136). Caught using a fyke net. First county record (Trauth et al. 2004).

Graptemys ouachitensis ouachitensis (Ouachita Map Turtle). CONWAY CO. Caught near Morrilton cut-off on the Arkansas River. 14 June 2005. S.R. Adams. Voucher specimen in UCAM (UCAA122). Caught using a gill net. First county record (Trauth et al. 2004).

Graptemys ouachitensis ouachitensis (Ouchita Map Turtle). FAULKNER CO. Caught on the Arkansas River at Toad Suck Park, Conway. 2004. S.R. Adams. Voucher specimen in UCAM (UCAA123). Caught using a seine. First county record (Trauth et al. 2004).

Lacertilia

Eumeces septentrionalis obtusirostris (Southern Prairie Skink). FAULKNER CO. Caught in University of Central Arkansas Jewel Moore Nature Reserve, Conway. 16 March 2006. S. Ruane. Voucher specimen in UCAM (UCAD114). Found under pile of debris in sandy substrate with numerous ground skinks. This is a first county record and also extends the range of *E. septentrionalis obtusirostris* by four counties. This species was originally reported to only inhabit extreme western portions of the state (Trauth et al. 2004). This record extends the range ca. 170 km into the central regions of the state.

Serpentes

Agkistrodon piscivorus leucostoma (Western Cottonmouth). FAULKNER CO. Two females were collected on the East Fork of Cadron Creek ca. 7 km E of Springhill. 14 April 2006. C.A. Howey and S.A. Dinkelacker. Voucher specimens are in UCAM (UCAG123, UCAG124). An additional *A. piscivorus leucostoma* juvenile was found dead after a flood on the East Fork of Cadron Creek ca. 7 km E of Springhill. 1 May 2006. C.A. Howey. Voucher specimen in UCAM (UCAG145). First county record (Trauth et al. 2004).

Opheodrys aestivus (Rough Greensnake). FAULKNER CO. Caught in University of Central Arkansas Jewel Moore Nature Reserve, Conway. 11 April 2006. G. Adams. Voucher specimen in UCAM (UCAG113). First county record (Trauth et al. 2004).

Regina grahamii (Graham's Crayfish Snake). FAULKNER CO. Caught in a ditch on the S side of Highway 64 ca. 1 km E of Menifee. 12 June 2004. S.R. Adams. Female was pulled out of the mouth of *A. piscivorus leucostoma*. Voucher specimen in UCAM (UCAG116). First county record (Trauth et al. 2004).

Thamnophis proximus proximus (Orange-striped Ribbonsnake). FAULKNER CO. Found near large debris piles in University of Central Arkansas Jewel Moore Nature Reserve, Conway. 16 March 2006. S. Ruane. Voucher specimen in UCAM (UCAG117). First county record (Trauth et al. 2004).

Thamnophis sirtalis sirtalis (Eastern Gartersnake). FAULKNER CO. Found dead on Route 65 ca. 4 km N of Conway. 20 June 2006. R. Bland. Voucher specimen in UCAM (UCAG128). First county record (Trauth et al. 2004).

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Updated and New Amphibian and Reptile Records from Clark County, Illinois

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Habitat loss and fragmentation are major contributors to declines of amphibian and reptile species (Kingsbury and Gibson 2002). Changes in the land use of Illinois (especially the Grand Prairie region) have led to a decrease in the percentage of land covered by forest. Agricultural fields fragment much of this forested area; croplands cover approximately70% of available habitat within Illinois (Bretthauer and Edgington 2003). Early knowledge of herpetofaunal distributions in Illinois was chiefly due to the work of Smith (1961). A preliminary search of one of the two state parks in Clark County (Foster and Hampton 2003) indicated that the herpetological species list for this area is incomplete. Prior to these surveys 17 species of amphibians and 17 species of reptiles were documented in Clark County (Phillips et al. 1999), nineteen of these records are pre-1980 reports. Twenty-four additional species occur in surrounding counties. We hypothesized that some of these species might occur within Clark County. We surveyed approximately 280 ha of privately owned land, locally referred to as Rocky Hollow, in Clark County, Illinois and report herein, data for 14 different species.

Specimens reported were found by active searching (e.g., turning rocks and logs), by use of cover boards at our field site, or as

road kills. All specimens were verified by Christopher A. Phillips of the Illinois Natural History Survey (INHS).

Anura

Bufo woodhousii (Woodhouse's Toad). 100 m W of CR1400E at top of ravine, S of Joe's Fork Mill Creek, Melrose (39°15.51'N, 87°44.56'W). 08 May 2003. C. Drew Foster and Stephen J. Mullin. INHS 18902. Updates pre-1980 records for this species in Clark County (Phillips et al. 1999).

Testudines

Chrysemys picta marginata (× *bellii*) (Midland Painted Turtle × Western Painted Turtle). 60 m E of CR1400E along east side of dam across Joe's Fork Mill Creek, Melrose (39°15.51'N, 87°44.56'W). 12 April 2003. Stephen J. Mullin and Anthony Fennel. IHNS 18800. Updates pre-1980 records for this species in Clark County (Phillips et al. 1999).

Lacertilia

Eumeces fasciatus (Common Five-lined Skink). 150 m E of CR 1400E along ravine, S of Joe's Fork Mill Creek, Melrose (39°15.51'N, 87°44.56'W). 12 April 2003. Stephen J. Mullin and Justin Florey. INHS 18801–18802. Updates pre-1980 records for this species in Clark County (Phillips et al. 1999).

Scincella lateralis (Little Brown Skink). W of CR1400E, S of Joe's Fork Mill Creek, Melrose. 2 May 2002. Stephen J. Mullin and C. Drew Foster. INHS 18494. New county record (Phillips et al. 1999). Many individuals of both sexes and all age/size classes were seen crawling on substrate.

Serpentes

Carphophis amoenus helenae (Midwestern Wormsnake). 200 m W of CR1400E, S of Joe's Fork Mill Creek, Melrose (39°15.65'N, 87°45.37'W). 02 May 2002. Stephen J. Mullin and C. Drew Foster. INHS 2002.10 (Photo). New county record (Phillips et al. 1999).

Coluber constrictor foxii (Blue Racer). 100 m W of CR1400E at top of ravine, S of Joe's Fork Mill Creek, Melrose (39°15.51'N, 87°44.56'W). 08 May 2003. C. Drew Foster and Stephen J. Mullin. INHS 18901. Updates pre-1980 records for this species in Clark County (Phillips et al. 1999).

Diadophis punctatus edwardsii (Northern Ring-necked Snake). 100 m W of CR1400E at top of ravine, S of Joe's Fork Mill Creek, Melrose (39°15.51'N, 87°44.56'W). 8 May 2003. C. Drew Foster and Stephen J. Mullin. INHS 18900. Updates pre-1980 records for this species in Clark County (Phillips et al. 1999).

Elaphe spiloides (Central Ratsnake). 1.6 km N of Interstate 70 overpass on Cleone Road, Martinsville. 2 July 2003. C. Drew Foster and Stephen J. Mullin. INHS 19338. Updates pre-1980 records for this species in Clark County (Phillips et al. 1999). Specimen was dead on road (DOR).

Lampropeltis c. calligaster (Prairie Kingsnake). 1.6 km E of SR-49 on CR1700, Oilfield. 27 August 2003. C. Drew Foster and Stephen J. Mullin. INHS 19339. Updates pre-1980 records for this species in Clark County (Phillips et al. 1999). Specimen was DOR.

Nerodia sipedon pleuralis (× *sipedon*) (Midland Watersnake × CommonWatersnake). 40 m E of CR1400E along east side of dam across Joe's Fork Mill Creek, Melrose (39°15.63'N, 87°45.50'W). 12 April 2003. Stephen J. Mullin and Justin Florey. INHS 18799. Updates pre-1980 records for this species in Clark County (Phillips et al. 1999).

Opheodrys aestivus (Rough Greensnake). 4.8 km W of Cleone Road on CR1700, Oilfield. 5 June 2003. C. Drew Foster and Stephen J. Mullin. INHS 19337. Updates pre-1980 records for this species in Clark County (Phillips et al. 1999). Specimen was DOR.

Storeria dekayi wrightorium (Midland Brownsnake). Along ravine, S of Joe's Fork Mill Creek, Melrose (39°15.80'N, 87°45.35'W). 15 April 2004. C. Drew Foster and Stephen J. Mullin. INHS 19434. Updates pre-1980 records for this species in Clark County (Phillips et al. 1999).

Storeria o. occipitomaculata (Northern Red-bellied Snake). 120 m E of CR1400E, S of Joe's Fork Mill Creek, Melrose (39°15.51'N, 87°44.56'W). 10 May 2002. Stephen J. Mullin and C. Drew Foster. INHS 18495. New county record (Phillips et al. 1999).

Thamnophis s. sirtalis (Eastern Gartersnake). CR1400E near Joe's Fork Mill Creek, Melrose (39°15.63'N, 87°45.50'W). 30 April 2003. Stephen J. Mullin, C. Drew Foster, and Leroy Walston. INHS 18803. Supplemental record for Clark County (supports two skins submitted in May 2002 as county records).

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Filling in the Gaps II: New Illinois Amphibian and Reptile County Records from 2000–2005

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Since the early 1990s, numerous geographic distribution notes and articles have appeared in *Herpetological Review* regarding new amphibian and reptile county records in Illinois. Larger contributions include Crawford and Meyer (2002), Giazzon (2002), Kuhns and Crawford (2004), Markezich and Beckett (2001), Petzing et al (1998, 2000, 2002), Redmer and Ballard (1995), Tucker (1994), and Wilson (1999). This article is the second in the "Filling in the Gaps" series detailing new amphibian and reptile county records in Illinois. Specimens reported herein are housed in the Illinois Natural History Survey (INHS) amphibian and reptile collection. County records were verified by checking databases located at the Illinois Natural History Survey and recent issues of *Herpetological Review*. Databases at the Illinois Natural History Survey contain records of amphibians and reptiles from Illinois in 30 museum and private collections and unvouchered records from herpetologists and other state biologists. Using information from these databases, county-level distribution maps for all 102 species of amphibians and reptiles in Illinois have been developed and are accessible at http://www.inhs.uiuc.edu/cbd/collections/amprep/distribmaps.html. Common names follow Crother et al (2000). All Universal Transverse Mercator (UTM) coordinates are in 1983 North American datum.

Caudata

Ambystoma texanum (Small-mouthed Salamander). Bureau Co: SW of Bureau, pond bordered by IL Rt. 26 to the ENE, floodplain forest of Big Bureau Creek to the N, and the Chicago, Rock Island and Pacific RR to the S (Zone 16: E300519m, N4572434m). 07 May 2002. J. E. Petzing and J. M. Mui. Verified by C. A. Phillips. INHS 18086. Adult found under RR tie on RR embankment at the edge of an ephemeral pond; Perry Co.: E of Pinckneyville, flooded forest S of IL Rt. 154 and W of Beaucoup Creek (Zone 16: E292190m, N4217311m). 14 March 2002. J. M. Mui, M. J. Dreslik, J. E. Petzing, and D. B. Shepard. Verified by C. A. Phillips. INHS 18017. Adult male collected under log in floodplain forest.

Ambystoma tigrinum (Tiger Salamander). Perry Co.: 5.7 km SW of Pinckneyville (Zone 16: E285781m, N4212648m). 01 March 2001. B. C. Jellen, J. E. Petzing, M. J. Dreslik, and D. B. Shepard. Verified by C. A. Phillips. INHS 17698. Larva; Scott Co.: 0.6 km S of IL Rt. 106 on the Hillview-Eldred Blacktop (Zone 15: E712126m, N4389008m. 15 March 2001. J. K. Tucker. Verified by C. A. Phillips. INHS 17895. DOR adult.

Notophthalmus viridescens (Eastern Newt). Saline Co.: 6.75 km NW of Carrier Mills; 0.8 km E of Saline/Williamson Co. line and N of IL Rt. 13 (Zone 16: E350568E, N4177844m). 15 March 2002. D. B. Shepard, M. J. Dreslik, J. M. Mui, and J. E. Petzing. Verified by C. A. Phillips. INHS 18018. Adult female collected in wetland. Two males (INHS 18019 and 18020) were also collected on this date just east of where the female was collected.

Anura

Acris crepitans (Northern Cricket Frog). Lee Co.: Richardson Wildlife Foundation (Zone 16: E317278m, N4619314m). 12 June 2002. V. Olinik. Verified by C. A. Phillips. INHS 18210. Individual collected in pothole pond. *Acris crepitans* has now been vouchered from every county in Illinois.

Bufo americanus (American Toad). Whiteside Co.: Fulton Quarry, Ackers Rd. 1.6 km S of Co. Rd. 2100N; 10 km S of Thomson (Zone 15: E741078, N4640595m). 21 June 2001. J. K. Warner, M. J. Dreslik, C. A. Phillips, and J. M. Mui. Verified by J.E. Petzing. INHS 17273. Individual 38 mm SVL.

Bufo fowleri (Fowler's Toad). Franklin Co.: 2.8 km NNE of Mulkeytown, 0.2 km N of Co. Rd. 900N on County Rd. 300E (Zone 16: E316001m, N4207545m). 15 June 2001. J. M. Mui, J. E. Petzing, and M. J. Dreslik. Verified by C. A. Phillips. INHS 17343. AOR adult.

Pseudacris crucifer (Spring Peeper). Carroll Co.: 1.6 km NE jct. Mill Hollow Rd. and Scenic Ridge Rd. (Zone 15: E734139m, N4672804m). 20 June 2001. C. A. Phillips, J. K. Warner, M. J. Dreslik, J. M. Mui, and W. C. Handel. Verified by J. E. Petzing. INHS 17811. Twelve metamorphic individuals were collected from a sand pond surrounded by forest; Iroquois Co.: N side of County Rd. 3300N ca 1.8 km W of Co. Rd. 3000E (Zone 16: E451055m, N4538346m). 04 May 2002. D. Mauger. Verified by C. A. Phillips. INHS 18145. Adult collected in ditch; Kankakee Co.: E of Doney (Zone 16: E450196m, N4547171m). 14 April 2002. D. Mauger and T. G. Anton. Verified by C. A. Phillips. INHS 18140. Adult collected in shallow ditch along edge of fallow farm field.

Pseudacris triseriata (Western Chorus Frog). BUREAU CO.: SW of Bureau, pond bordered by IL Rt. 26 to the ENE, floodplain forest of Big Bureau Creek to the N, and the Chicago, Rock Island and Pacific RR to the S (Zone 16: E300519m, N4572434m). 09 April 2002. A. R. Kuhns and J. E. Petzing. Verified by C. A. Phillips. INHS 18008. One of four individuals (INHS 18008–18011) that were found under cover objects along the edge of an ephemeral pond; FULTON CO.: ENE of Marietta, jct. East Pony Rd. and North Pheasant Lane (Zone 15: E722507m, N4487176m). 13 May 2004. J. E. Petzing and W. C. Handel. Verified by C. A. Phillips. INHS 19444. Male collected from puddle along side of the road; LIVINGSTON CO.: S of Fairbury, N of E 670 North Rd. and E of N 2150 East Rd. near unnamed tributary of Indian Creek (Zone 16: E372254m, N4509530m). 18 April 2005. H. Wessels. Verified by C. A. Phillips. INHS 19658. Adult found dead in plowed field; MENARD CO.: WNW of Petersburg at Hilltop at SE corner jct. Kelly Lane and Chicago and Illinois Midland RR (Zone 16: E254708m, N4434493m). 15 May 2002. J. E. Petzing, J. M. Mui, and J. R. Jakubanis. Verified by C. A. Phillips. INHS 18179. One of two adults (INHS 18179–18180) that were collected from a flooded railroad right-of-way; OGLE CO.: NE of Daysville, north-central part of the Kyte River bottoms along S side of the Burlington Northern RR tracks (Zone 16: E308820m, N4651597m). 03 April 2004. D. Mauger. Verified by C. A. Phillips. INHS 19500. Adult captured on northwest side of shallow, open water depression rimmed by buttonbush; WHITESIDE CO.: NE of White Pigeon; E of Rock Creek, S of Pilgrim Rd. (Co. Rd. 2200N), and W of Yorktown Rd. (Zone 16: E262178m, N4642455m). 13 April 2002. A. M. Readel. Verified by C. A. Phillips. INHS 18053. One of two adults (INHS 18053–18054) that were collected from this site.

Rana blairi (Plains Leopard Frog). MOULTRIE CO.: Shelbyville Fish and Wildlife Area, West Okaw River Unit (Zone 16: E352552m, N4386682m). 26 June 2001. J. M. Mui, J. R. Jakubanis, and M. J. Dreslik. Verified by C. A. Phillips. INHS 17372. Confirms literature record of Brown and Morris (1990). Adult; PUTNAM CO.: 0.4 km S Bureau Co. line on IL Rt. 29 adjacent to Miller Anderson Woods Nature Preserve (Zone 16: E298897m, N4567294m). 19 June 2001. D. B. Shepard and A. R. Kuhns. Verified by C. A. Phillips. INHS 17319. Confirms literature record of Brown and Morris (1990). Adult collected from right-of-way adjacent to wetland along the west side of IL Rt. 29.

Rana catesbeiana (American Bullfrog). FRANKLIN CO.: 0.3 km S of Co. Rd. 1010N on County Rd. 300E by Christopher Lake (Zone 16: E316022m, N4208300m). 15 June 2001. J. M. Mui, J. E. Petzing, and M. J. Dreslik. Verified by C. A. Phillips. INHS 17342. AOR individual collected just south of where Christopher Lake meets the county road; PUTNAM CO.: 1.8 km N of IL Rt. 18 on IL Rt. 26, pond on W side (Zone 16: E305174m, N4554482m). 19 June 2001. A. R. Kuhns and D. B. Shepard. Verified by C. A. Phillips. INHS 17338. Adult; WHITESIDE CO.: W of Rock Falls, Rock River at terminus of Regan Rd. (Zone 16: E271525m, N4627523m). 03 September 2001. A. R. Kuhns, M. J. Dreslik, and J. M. Mui. Verified by C. A. Phillips. INHS 17596. Adult.

Rana clamitans (Green Frog). CALHOUN CO.: Salt Spring Rd. (Illinois side), 0.8 km W of Illinois River Rd. (Zone 15: E705716m, N4332188m). 20 August 2003. C. A. Phillips, T. R. Hunkapiller, F. T. Burbrink, and A. R. Kuhns. Verified by J. E. Petzing. INHS 19086. Female; PUTNAM CO.: 1.8 km N of IL Rt. 18 on IL Rt. 26, pond on W side (Zone 16: E305174m, N4554482m). 19 June 2001. A. R. Kuhns and D. B. Shepard. Verified by C. A. Phillips. INHS 17339. Adult; ST. CLAIR CO.: Wagon Lake (Zone 16: E260523m, N4253003m). 12 June 2002. D. B. Shepard, A. R. Kuhns, and N. J. Kuhns. Verified by C. A. Phillips. INHS 18363. Adult male.

Rana pipiens (Northern Leopard Frog). MARSHALL CO.: Ditch W side of IL Rt. 29, N of County Rd. 1005N (Camp Grove Rd.) and S of Crow Creek (Zone 16: E296653m, N4549273m). 07 May 2002. J. E. Petzing and J. M. Mui. Verified by C. A. Phillips. INHS 18089. Adult collected from roadside ditch.

Testudines

Chelydra serpentina (Snapping Turtle). FORD CO.: N of Paxton, mile marker 263 on northbound I-57 (Zone 16: E406797m, N4481782m). 25 May 2001. J. M. Mui and J. E. Rice. Verified by C. A. Phillips. INHS 17742. DOR adult; MARION CO.: U.S. Rt. 50, 0.4 km W of I-57 Salem overpass (Zone 16: E327756m, N4276872m). 01 July 2001. M. J. Dreslik and D. B. Shepard. Verified by C. A. Phillips. INHS 17741. DOR adult; SALINE CO.: 7 km NW of Carrier Mills; 0.5 km E of Saline/Williamson county line on IL Rt. 13 (Zone 16: E350046m, N4177826m). 23 April 2002. J. E. Petzing. Verified by C. A. Phillips. INHS 19657. DOR.

Chrysemys picta (Painted Turtle). GALLATIN CO.: 7 km N Old Shawneetown, Round Pond (Zone 16: E403170m, N4179400m). 08 August 2002. M. J. Dreslik and J. K. Warner. Verified by C. A. Phillips. INHS Herpetological Slide 2002.08. Adult male captured in fyke net. This specimen was not vouchered because it is a marked individual that is part of a long-term study of a floodplain lake turtle community.

Graptemys geographica (Northern Map Turtle). CASS CO.: W of Beardstown (Zone 15: E717980m, N4432104m). 22 April 2001. B. Wilson. Verified by C. A. Phillips. INHS 17906. Hatchling.

Graptemys ouachitensis (Ouachita Map Turtle). MADISON CO.: S end of Piasa Island, just S of the Jersey Co. line (Zone 15: E736433m, N4312286m). 13 July 2001. E. Ratcliff and E. Gittinger. Verified by C. A. Phillips. INHS 17904. Male.

Graptemys pseudogeographica (False Map Turtle). MADISON CO.: Piasa Island, Mississippi River (downstream, channel side; Zone 15: E737126m, N4312250m). 13 July 2001. E. Gittinger, R. Cosgriff, and B. Lubinski. Verified by C. A. Phillips. INHS 17907. Adult male.

Terrapene carolina (Eastern Box Turtle). CHRISTIAN CO.: 0.2 km N of County Rd. 990E on IL Rt. 48 (Zone 16: E298587E, N4376004m). 18 June 2001. J. K. Tucker and J. B. Towey. Verified by C. A. Phillips. INHS 18001. DOR adult.

Terrapene ornata (Ornate Box Turtle) CASS CO.: 1.6 km SSW of Beardstown Airport (Zone 15: E721015m, N4426387m). 20 June 2001. C. A. Phillips, J. M. Mui, M. J. Dreslik, and J. K. Warner. Verified by J. E. Petzing. INHS 17813. Carapace and plastron (some scutes still attached) of an adult collected in a sand prairie.

Trachemys scripta (Pond Slider). CLAY CO.: 0.6 km S of Co. Rd. 800N on County Rd. 1875E; 1.1 km S of Little Muddy Creek and N of the Little Wabash River (Zone 16: E382328m, N4285766m). 08 June 2001. J. E. Petzing, M. J. Dreslik, and J. M. Mui. Verified

by C. A. Phillips. INHS 17710. DOR adult male; MONTGOMERY CO.: 1.6 km S of Taylor Springs, 2.9 km S of IL Rt. 185 on IL Rt. 127 (Zone 16: E284945m, N4332250m). 05 May 2002. A. R. Kuhns. Verified by C. A. Phillips. INHS Herpetological Photograph 2002.06. AOR individual in the southbound lane of Illinois Route 127; it was not collected because it was an adult female.

Apalone spinifera (Spiny Softshell). JEFFERSON CO.: S of Bonnie, Atchison Creek at Chicago and Eastern Illinois RR trestle (Zone 16: E333328m, N4228164m). 17 September 2003. J. R. Jakubanis and J. E. Petzing. Verified by C. A. Phillips. INHS 19262. Juvenile.

Lacertilia

Cnemidophorus sexlineatus (Six-lined Racerunner). IROQUOIS CO.: Iroquois County Conservation Area (Zone 16:E452758m, N4538322m). 26 May 2003. T. R. Hunkapiller. Verified by C. A. Phillips. INHS 18990. Adult male.

Eumeces laticeps (Broad-headed Skink). VERMILION CO.: NNW of Humrick, Cherokee Hills Camp (Zone 16:E451880m, N4421836m). 23 May 2002. C. Montgomery. Verified by C. A. Phillips. INHS 18489. Adult male.

Serpentes

Coluber constrictor (Eastern Racer). MORGAN CO.: S of Jacksonville, jct. U.S. 67 and IL Rt. 267 (Zone 15:E737898m, N4387662m). 05 July 2000. J. K. Tucker and J. B. Towey. Verified by C. A. Phillips. INHS 17849. DOR adult.

Elaphe vulpina (Western Foxsnake). MOULTRIE CO.: W of Lanton, just S Co. Rd. 2500N on Co. Rd. 950E (Zone 16:E359969m, N4403328m). 06 July 2003. J. E. Petzing, K. S. Petzing, and E. E. Petzing. Verified by C. A. Phillips. INHS 19034. DOR adult.

Heterodon platirhinos (Eastern Hog-nosed Snake). CASS CO.: W of Beardstown (Zone 15: E717980m, N4432104m). 30 April 2001. J. K. Tucker and B. Wilson. Verified by C. A. Phillips. INHS 17900. Adult; CLINTON CO.: Eldon Hazlet State Park (Zone 16: E298347m, N4282302m). 10 May 2001. D. B. Shepard, B. C. Jellen, and M. J. Dreslik. Verified by C. A. Phillips. INHS 17731. Adult collected in woodland.

Lampropeltis calligaster (Yellow-bellied Kingsnake). FULTON CO.: WSW of Seville on Seville Rd. (Zone 15:E724212m, N4484644m). 16 April 2004. J. E. Petzing and A. M. Readel. Verified by C. A. Phillips. INHS 19427. DOR juvenile on gravel road; KNOX CO.: 0.8 km E of Warren County line on Co. Rd. 300N (Zone 15: E716325m, N4514886m). 12 August 2003. C. A. Phillips, A. R. Kuhns, and J. K. Warner. Verified by J. E. Petzing. INHS 19164. AOR sub-adult.

Lampropeltis triangulum (Milksnake). IROQUOIS CO.: 0.5 km N of N boundary of Hooper Branch Nature Preserve just W of W boundary of N unit Iroquois County Conservation Area (Zone 16: E453580m, N4540279m). 16 May 2005. C. A. Phillips. Verified by J. E. Petzing. INHS 19582. Juvenile collected under piece of corrugated tin; WASHINGTON CO.: S side of Clear Lake (Zone 16: E268993m, N4256625m). 03 June 2002. A. R. Kuhns and D. B. Shepard. Verified by C. A. Phillips. INHS 18261. Adult.

Nerodia erythrogaster (Plain-bellied Watersnake). GREENE CO: 0.5 km N Apple Creek on Hillview-Eldred Blacktop (Zone 15: E711072m, N4361073m). 29 April 2003. J. K. Tucker. Verified by C. A. Phillips. INHS 18914. DOR adult.

Opheodrys vernalis (Smooth Greensnake): PIATT CO.: County Rd. 1500E immediately N of jct. with Co. Rd. 3100N (Zone 16: E375800m, N4455100m). 15 August 2003. P. Nielsen. Verified by C. A. Phillips. INHS 19165. DOR adult salvaged from a road bordered by a cemetery and soybean and corn fields.

Pituophis catenifer (Gophersnake). PUTNAM CO.: ENE of Hennepin on IL Rt. 71 (Zone 16: E305480m, N4569859m). 10 October 2002. J. E. Petzing, C. A. Phillips, and J. F. Doolen. Verified by M. J. Dreslik. INHS 18690. DOR adult.

Storeria dekayi (DeKay's Brownsnake). BOND CO.: Crane Woods, NE of Old Ripley (Zone 16: E275890m, N4313000m). 26 September 2001. D. B. Shepard, M. J. Dreslik, J. M. Mui, A. R. Kuhns, D. Baum, and T. A. Cochran. Verified by C. A. Phillips. INHS 17721. Male collected on small rock outcrop on slope of ravine; FULTON CO.: 1.4 km N of Ogden Lane (Co. Rd. 555N) in Summum on Hammack Rd. (Co. Rd. 900E) (Zone 15: E731409m, N4462892). 20 October 2003. A. R. Kuhns and J. E. Petzing. Verified by C. A. Phillips. INHS 19279. DOR adult; GRUNDY CO.: 1.1 km SSE of Morris, W of Mud Slough (Zone 16: E382990m, N4579096m). 06 July 2001. A. R. Kuhns, J. E. Petzing, and J. M. Mui. Verified by C. A. Phillips. INHS 17454. Adult male found in flood debris in old field habitat; OGLE CO.: S side Burlington Northern RR tracks along the N boundary of the Kyte River bottoms, approx. 100 ft. W of where the bend in the Kyte River comes closest to the RR (Zone 16: E309321m, N4651555m). 20 June 2003. T. G. Anton and D. Mauger. Verified by C. A. Phillips. INHS 19106. Gravid female captured under piece of RR tie; WAYNE CO.: Forest along E side of Moutray Slough (Zone 16: E394688m, N4268057m). 11 October 2002. J. E. Petzing, J. M. Mui, M. J. Dreslik, J. F. Doolen, and C. A. Phillips. Verified by A. R. Kuhns. INHS 18745. Adult found in wood debris on forest floor.

Storeria occipitomaculata (Red-bellied Snake). FAYETTE CO.: 0.3 km S of Lorton Bridge (Kaskaskia River) on Co. Rd. 1925E (Zone 16: E336380m, N4337975m). 14 April 2002. J. E. Petzing. Verified by C. A. Phillips. INHS 18050. DOR individual collected on a gravel road; FULTON CO.: S of Marietta on the Toledo, Peoria and Western RR tracks (Zone 15: E721647m, N4485198m). 17 September 2004. J. K. Warner and J. E. Petzing. Verified by C. A. Phillips. INHS 19508. Male collected under piece of wood on the railroad.

Thamnophis proximus (Western Ribbonsnake). Cass Co.: W of Beardstown (Zone 15: E717980m, N4432104m). 08 April 2001. J. K. Tucker, P. Owen, and B. Wilson. Verified by C. A. Phillips. INHS 17902. New county record. Adult.

Virginia valeriae (Smooth Earthsnake). FULTON CO.: S of Marietta, forest along Toledo, Peoria and Western RR tracks (Zone 15: E721898m, N4484722m). 17 September 2004. J. K. Warner and J. E. Petzing. Verified by C. A. Phillips. INHS 19507. Adult male collected under rock and debris on a forested hillside.

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New Distributional Records for Amphibians and Reptiles in Northeastern Louisiana

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We found several new locality records in the course of reviewing museum holdings of amphibians and reptiles from northeastern Louisiana. All the specimens reported here represent either new parish records (Dundee and Rossman 1989), or clarification of parish records. The majority of these help fill in distributional gaps for parishes in northeastern Louisiana, particularly in the Mississippi Alluvial Valley. Museum acronymns follow Leviton et al. (1985). Taxonomy and vernacular names used follow Crother (2000) and Crother et al. (2003). Unless indicated otherwise, specimens were verified by J. L. Carr.

Anura

Hyla chrysoscelis/versicolor (Gray Treefrog). Franklin Par: 7 mi S of Hwy 33 & Hwy 84 intersection at Roxie. 06 June 1989. M. Farr. NLU 70172–70182. New parish record.

Pseudacris crucifer (Spring Peeper). Caldwell Par: Columbia, 1.1 mi N, 0.5 mi E of Copenhagen. 08 April 1997. LSUMZ 58347. New parish record. Tensas Par: 8 mi W of Newelton. 27 February 1965. M. Carnaham. AMNH A-123120. New parish record.

Rana catesbeiana (American Bullfrog). Franklin Par: Big Creek at Baskin. 12 September 1992. Seltzer and Boudreaux. NLU 70047. New parish record.

Rana sphenocephala (Southern Leopard Frog). LaSalle Par: Hwy 460 between Nebo and Whitetail. R.Wallus, J. Hatten. 03 August 1968. NLU 19360; 5 mi W of Nickel. 12 June 1950. TU 12603. Hemphill Creek at Hwy 460, R3E, T7N, Sec. 14. 27 September 1985. TU 22018. Both verified by Harold Dundee. New parish records.

Caudata

Ambystoma maculatum (Spotted Salamander). CALDWELL PAR: 12 mi SE Chatham. 30 January 1950. F. Cagle. One clutch of eggs, TU 19523. Verified by H. A. Dundee. New parish record.

Testudines

Kinosternon subrubrum (Eastern Mud Turtle). EAST CARROLL PAR: 6 mi S Lake Providence, Hwy 134. 09 April 1966. C. B. Coburn, Jr. LSUMZ 30011. New parish record.

Graptemys pseudogeographica kohnii (Mississippi Map Turtle). CALDWELL PAR: no specific location. 13 March 1953. LSUMZ 34032. New parish record.

Terrapene carolina triunguis (Three-toed Box Turtle). RICHLAND PAR: 3 mi S of Dunn. 13 June 1966. H. Stegall. NLU 10338. New parish record.

Trachemys scripta elegans (Red-eared Slider). FRANKLIN PAR: 8 km SW of Winnsboro. 1 April 1966. D. D. Smith. KU 177218. Verified by E. Greenbaum. New parish record.

Lacertilia

Eumeces laticeps (Broad-headed Skink). CONCORDIA PAR: Slocum, ~10 mi N abandoned farm off Hwy 15 along Mississippi River levee. 03 March 1987. J. W. Tamplin. TNHC 55988, 55998, 56004. New parish record.

Sceloporus consobrinus (Prairie Lizard). RICHLAND PAR: 7 mi S Mangham in woods. CM 44166–44174. New parish record.

Scincella lateralis (Little Brown Skink). FRANKLIN PAR: 7 mi S of Hwy 33 & Hwy 84 intersection at Roxie. 29 May 1989. M. Farr. NLU 70185–70187. New parish record.

Serpentes

Agkistrodon piscivorus (Cottonmouth). FRANKLIN PAR: SE of Winnsboro. April 1969. D. D. Smith. KU 177035-177039. 17 April 1965. D. D. Smith. KU 177040–177049. Verified by E. Greenbaum. New parish record.

Crotalus horridus (Timber Rattlesnake). EAST CARROLL PAR: no specific location. 1 September 1956. J. L. Herring. FMNH 245315–245316. New parish record.

Lampropeltis getula holbrooki (Speckled Kingsnake). CALDWELL PAR: Columbia Lock and Dam sight [sic] on the Ouachita River. 3 April 1966. LSUMZ 41364. New parish record. LASALLE PAR: 2 mi E of Nickel. 12 June 1950. TU 12611. Verified by Harold Dundee. New parish record.

Lampropeltis triangulum amaura (Louisiana Milksnake). MADISON PAR: Hunter's Bend Club. 28 May 1985. K. Lofton. NLU 53792. New parish record.

Nerodia cyclopion (Mississippi Green Watersnake). CALDWELL PAR: S of Columbia. 06 April 1973. C. Corkern. NLU 36400. New parish record. RICHLAND PAR: Clear Lake. 15 April 1963. R. F. Cox. NLU 874 and 01 May 1963. R. F. Cox. NLU 875. New parish record.

Nerodia sipedon pleuralis (Midland Watersnake). OUACHITA PAR: Russell Sage about 1/4 mi off Hwy. 80 at exit 2. 3 November 1972. S. G. Walmsley. NLU 35886. Verified by Jeff Boundy. New parish record. This is the first vouchered specimen reported from northern Louisiana (Dundee and Rossman 1989; Gibbons and Dorcas 2004).

Regina grahamii (Graham's Crayfish Snake). LASALLE PAR/ CATAHOULA PAR: Gibbons and Dorcas (2004) attribute this species to LaSalle Parish. The basis for their literature record was Dundee and Rossman (1989), in which a dot straddles the border between Catahoula and LaSalle parishes. The basis for the dot was "Walters" (fide J. Boundy; LSUMZ 4824). Specimen identification has been verified by Jeff Boundy. Walters is a place name found approximately 1.1 km E of the parish line in Catahoula Parish (Anon. 1997). The same specimen was correctly used to document the Catahoula Parish museum record (Gibbons and Dorcas 2004).

Storeria dekayi (Dekay's Brownsnake). TENSAS PAR: Chicago Mills Game Management Area. 27 March 1965. E. D. Keiser. Verified by Jeff Boundy. LSUMZ 23774. New parish record.

Virginia valeriae elegans (Western Smooth Earthsnake). FRANKLIN PAR: Extension 0.5 mi SE off LA Hwy 356. 24 March 1971. D. Dosher. NLU 35430. New parish record.

*Acknowledgment*s.–We thank the following curators and collection managers who provided assistance in obtaining museum records and specimens: L. Ford (American Museum of Natural History), J. A. McGuire (Louisiana State University Museum of Natural Science), D. Cannatella and J. Rosales (Texas Natural History Collection), and F. Pezold (NLU), J. E. Simmons (KU), H. K. Voris and A. Resetar (FMNH), and J. J. Wiens and S. Rogers (CM). We thank the following individuals for verification of museum records and specimens: Jeff Boundy (Louisiana Department of Wildlife and Fisheries, LSUMZ specimens), Eli Greenbaum (KU), and Harold Dundee (Tulane University).

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Herpetological Review, 2007, 38(2), 245.

New Records for Anurans from Lawrence County, Tennessee

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The geographic distribution of the amphibians of Tennessee is well documented (Redmond and Scott 1996). However, many counties in west and south-central Tennessee have not been adequately sampled. Here we provide records of four common anurans not previously recorded from Lawrence County, Tennessee (Redmond and Scott 1996). All specimens were collected while compiling a herpetofaunal list for use by park personnel at David Crockett State Park. All voucher specimens are deposited in the Austin Peay State University Museum of Zoology (APSU) and were verified by A. Floyd Scott. Collections were made under the authority of TWRA Permit No. 1494 to BPB.

Bufo fowleri (Fowler's Toad). Found on main park road adjacent to an open field and Lake Lindsay. UTM 16S, 0467005E, 3903059N. 22 July 2006. Collected by H. A. Messer. APSU 18217 (color photo). First county record.

Rana catesbeiana (American Bullfrog). Found in a small spring that feeds a millpond located behind David Crockett State Park Visitor Center. UTM 16S, 0467540E, 3902521N. 26 July 2006. Collected by H. A. Messer. APSU 18218 (color photo). First county record.

Rana clamitans (Green Frog). Found in a small spring that feeds a millpond located behind David Crockett State Park Visitor Center. UTM 16S, 0467724E, 3902577N. 14 July 2006. Collected by H. A. Messer. APSU 18219 (color photo). First county record.

Rana sphenocephala (Southern Leopard Frog). Found on the main park road adjacent to a wooded area near Crockett Falls. UTM 16S, 0467563E, 3902436N. 10 August 2006. Collected by H. A. Messer. APSU 18220 (color photo). First county record.

Acknowledgments.—We thank the David Crockett State Park personnel for their cooperation in the survey. R. Bridges and J. Walsh assisted on numerous occasions during the survey. We especially thank H. Phillips for allowing HAM to conduct this survey during work hours.

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New Geographic Distribution Records of Amphibians and Reptiles in South Arkansas

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In the three short years since the seminal publication of Trauth et. al. (2004) on amphibians and reptiles of Arkansas, numerous new county records have been published for species in the state (Milanovich et al. 2005; Plummer and McKenzie 2005; Solis et al. 2006; Stanley and Trauth 2005; and many others). Between February 2005 and May 2006, we discovered 12 additional, new county records for four amphibians (one salamander, three frogs) and eight reptiles (one turtle, seven snakes) from south Arkansas. Specimens were verified by Stanley E. Trauth. Township, section, and range are provided for each locality. Voucher specimens were deposited in the Arkansas State University Herpetological Museum (ASUMZ), State University, Arkansas.

Caudata

Siren intermedia nettingi (Western Lesser Siren). Ashley Co.: 3.2 km S Crossett on St. Hwy. 133 (Sec. 5, T19N, R8W). 30 May 2006. H. W. Robison. ASUMZ 30256. New county record that completely fills in hiatus in extreme southern part of state between Chicot and Union counties.

Anura

Hyla chrysoscelis/versicolor complex (Gray Treefrog). Chicot Co.: 4.8 km SE Lake Village on US 82 (Sec. 23, T16S, R2W). 07 April 2006. Dan Thomas. ASUMZ 30257. New county record that fills a gap in extreme southeast part of state; this sibling species complex has now been reported from all but three counties of Arkansas (Trauth et al., *op. cit.*, pp. 149–151, fig. 187).

Hyla cinerea (Green Treefrog). Cleveland Co: Saline River at US 79 (Sec. 27, T9S, R11W), 5.6 km NE Kingsland. 28 April 2006. H. W. Robison. ASUMZ 30254. New county record. Partially fills hiatus but species has yet to be recorded from adjacent Dallas and Lincoln counties.

Pseudacris triseriata (Western Chorus Frog). Calhoun Co.: 1.6 km E Locust Bayou at US 278 (Sec. 31, T13S, R15W). 23 Feb. 2005. H. W. Robison. ASUMZ 30253. New county record filling gap in distribution between Bradley and Ouachita counties. Robison and Rader (2005a) recently reported this frog from nearby Cleveland County.

Testudines

Sternotherus odoratus (Stinkpot). CLARK CO.: 1.6 km N Whelen Springs on St. Hwy. 53 (Sec. 22, T10S, R20W). 15 October 2005. Patrick Daniel. ASUMZ 30261. New county record that partially fills a hiatus between Dallas and Pike counties.

Serpentes

Agkistrodon contortix contortrix (Southern Copperhead). HEMPSTEAD CO.: 3.2 km SE Washington (Sec. 35, T11S, R25W). 15 October 2005. Patrick Daniel. ASUMZ 30264. New county record that fills a gap in distribution in southwestern Arkansas between Little River and Nevada counties.

Carphophis vermis (Western Wormsnake). UNION CO.: 1.6 km N Cairo on St. Hwy. 172 (Sec. 21, T17S, R17W). 27 October 2005. H. W. Robison. ASUMZ 30255. New county record. This secretive species is relatively uncommon in the southern part of the state and has been reported from only four counties: Clark, Columbia, Drew, and Hempstead (Trauth et al., *op. cit*.).

Crotalus horridus (Timber Rattlesnake). UNION CO.: 6.4 km W El Dorado (Sec. 30, T17S, R10W). 13 November 2005. Patrick Daniel. ASUMZ 30263. New county record filling a hiatus between Bradley and Columbia counties.

Lampropeltis triangulum amaura (Louisiana Milk Snake). HEMPSTEAD CO.: 3.2 km SE Washington (Sec. 35, T11S, R25W). 15 October 2005. Patrick Daniel. ASUMZ 30262. New county record that represents the southwestern most locality for the subspecies in the state.

Sistrurus miliarius streckeri (Western Pigmy Rattlesnake). UNION CO.: 13.7 km S El Dorado (Sec. 18, T19S, R15W). 08 Oct. 2005. H. W. Robison. ASUMZ 30260. New county record that fills a distribution gap between Ashley and Columbia counties (see Robison and Rader 2005b).

Storeria dekayi wrightorum (Midland Brownsnake). CLARK CO.: 1.6 km S Gurdon (Sec. 4, T10S, R20W). 13 November 2005. Patrick Daniel. ASUMZ 30259. New county record that fills a hiatus between Hot Spring and Pike counties. Specimen appears to be an intergrade *S. d. wrightorum* × *texana*; another intergrade was reported previously from nearby Hempstead County of southwestern Arkansas (Trauth et al., *op. cit*., pp. 333–336, fig. 474).

Thamnophis sirtalis sirtalis (Eastern Gartersnake). NEVADA CO.: 11.3 km W Rosston (Sec. 35, T13S, R20W). 13 November 2005. Patrick Daniel. ASUMZ 30258. New county record that partially fills a distribution gap between Hempstead and Ouachita counties.

Acknowledgments.—We thank S. E. Trauth for curatorial assistance and specimen verification, and the various collectors noted herein for providing vouchers. Specimens were collected under the authority of Arkansas Scientific Collecting Permits issued to CTM and HWR by the Arkansas Game and Fish Commission.

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Herpetological Review, 2007, 38(2), 246–247.

New County Records of Amphibians and Reptiles from Rains County, Texas

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Rains County, a small county in northeastern Texas, has been overlooked for its amphibian and reptile diversity. Although sufficient habitat exists, many common species remain undocumented. In the spring of 2006, we sampled this county periodically and collected previously unrecorded species for the county (Dixon 2000). These records help fill gaps in the distribution of the regional herpetofauna. Our nomenclature is in accordance with Crother et al. (2000) and identifications were verified by Ronald L. Gutberlet, Jr. Voucher specimens are deposited at the Amphibian and Reptile Diversity Research Center (UTA), University of Texas at Arlington, Arlington, Texas.

Anura

Gastrophryne carolinensis (Eastern Narrow-mouthed Toad). Approximately 50 m E of County Road 1490 (1 km S of Farm Road 2324). UTM (NAD 83) 15S, 0230367 N, 3636061 W, 119 m elev. 05 May 2006. Jessica L. Coleman and Robert C. Jadin. UTA A-57308. Adult male calling among large chorus of *Gastrophryne* and *Hyla versicolor*. Collected in cattle pasture (2040 h) composed of sedges, grasses, and some shrubs. Pasture partially flooded with standing water from previous night/morning rain.

Hyla versicolor (Gray Treefrog). 62.3 m N of Farm Road 779 (0.5 km W of Highway 69). UTM (NAD 83) 15 S, 0244540 N, 3637960 W, 143 m elev. 14 April 2006. Robert C. Jadin and Jessica L. Coleman. UTA A-57311. Captured in tree (2035 h) approximately 2.4 m above the ground. Tree was approximately 10 m N of small pond. Adult male found calling among large chorus of *H. versicolor* and *Acris c. crepitans*. Species identified from *H. chrysoscelis* by call. Vocal recordings and sonograms were made for verification.

Pseudacris feriarum (Southeastern Chorusfrog). Just off County Road 1490 (1.5 km W of County Road 1495). 17 May 2002. Ronald L. Gutberlet, Jr. and Carol Gutberlet. UTA A-57607–57608. An amplectant pair collected in a partially flooded field. On 05 May 2006 the authors heard several small choruses in the southwestern section of the county and a male was captured but not collected.

Scaphiopus hurterii (Hurter's Spadefoot). Farm Road 779 (10.0 km SE of Jct 3274). UTM (NAD 83) 15 S, 0249235 N, 3628237 W, 124 m elev. 20 April 2006. Robert C. Jadin, Jessica L. Coleman, and Allyson M. Modra. UTA A-57310. Found alive on road (2035 h) during moderate rainfall. Solitary adult with no chorus heard in background.

Testudines

Terrepene ornata ornata (Ornate Box Turtle). Highway 69 (2.0 km S of Jct 47). UTM (NAD 83) 15S, 0232823 N, 3646028 W, 157 m elev. 05 May 2006. Jessica L. Coleman and Robert C. Jadin. UTA R-54163. Adult female found recently run over with front half of body and carapace missing.

Lacertilia

Anolis carolinensis carolinensis (Northern Green Anole). 163 m W of Farm Road 514 (0.4 km N of Jct 2946). UTM (NAD 83) 15 S, 0250837 N, 3647152 W, 123 m elev. 25 March 2006. Robert C. Jadin and Jessica L. Coleman. UTA R-54164. (55 mm SVL, 160 mm TL). Captured on large branch (approx. 1200 h) in incomplete clear cut oak forest. Two additional green anoles observed within 60 m of vicinity.

Serpentes

Agkistrodon piscivorus leucostoma (Western Cottonmouth). 34 m NE of Farm Road 779 (8.0 km S of Jct 3274). UTM (NAD 83) 15 S, 0249289 N, 3629877 W, 138 m elev. 25 March 2006. Robert C. Jadin and Jessica L. Coleman. UTA R-54070. Adult male (545 mm SVL; 660 mm TL; 28 mm HW; 39 mm HL). Captured at an abandoned tin field (1640 h) in small open pasture. Found under 8 ft × 8 ft piece of tin 13.7 m W of small drainage canal. Approximately 20ºC on sunny afternoon. Hemipenis everted and stained. Recorded from all neighboring counties.

Acknowledgments.—We thank Ron and Carol Gutberlet for graciously donating two specimens of *Pseudacris feriarum* to this publication. Alan Byboth was generous in lending equipment for the *Hyla versicolor* recording and putting it into digital format.

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New Records for Amphibians and Reptiles from Trousdale County, Tennessee

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Here we report new county records of amphibians and reptiles from Trousdale County, Tennessee. Unlike such regions as the Land Between the Lakes area in north-central Tennessee, and the Great Smoky Mountains in east Tennessee, Trousdale County has few records of amphibians and reptiles (Redmond and Scott 1996). The lack of records in Trousdale County can be attributed to the county's small size and scarcity of state and federal lands. With permission from landowners we were able to survey some expanses of private lands. Localities were determined by use of a Magellan handheld global positioning system (GPS) unit. Voucher specimens were verified by Brian T. Miller and were deposited into the Middle Tennessee State University Herpetology Collection (MTSU) in Murfreesboro, Tennessee. Photo vouchers were verified by A. Floyd Scott and deposited into the Austin Peay State University (APSU) database in Clarksville, Tennessee. Scientific and common names follow Crother et al. (2000). All specimens were collected under authorization of the Tennessee Wildlife Resources Agency (permit no. 1450) and the Tennessee Department of Environment and Conservation (permit no. 2004-018). Collectors were B. M. Glorioso and J. Pruett for all specimens except as noted.

Caudata

Eurycea cirrigera (Southern Two-lined Salamander). Adult in Rocky Creek under the overpass at Canoe Branch Road (36º20'54"N, 86º15'33"W). 27 February 2005. MTSU 352C.

Notophthalmus viridescens viridescens (Red-spotted Newt). Adult found in shallow pond on private property 550 m NW of Cumberland River mile marker 265 (36º19'32"N, 86º15'09"W). 27 February 2005. MTSU 351C.

Plethodon dorsalis (Northern Zigzag Salamander). Adult found under water meter cover 10 m E of Highway 231 in the 3200 block at private residence (36º20'44"N, 86º15'22"W). 27 February 2005. MTSU 350C.

Plethodon glutinosus (Northern Slimy Salamander). Adult found on private property under fallen timber 700 m WNW of Cumberland River mile marker 265 (36º19'27"N, 86º15'19"W). 04 May 2005. MTSU 349C.

Anura

Acris crepitans crepitans (Eastern Cricket Frog). Adult found at edge of shallow pond on private property 550 m NW of Cumberland River mile marker 265 (36'32"N, 86º15'09"W). 27 February 2005. MTSU 160A.

Rana catesbeiana (American Bullfrog). Juvenile found in spring on private property 350 m SW of Cumberland River mile marker 265 (36º19'12"N, 86º15'01"W). 27 February 2005. MTSU 159A.

Rana clamitans melanota (Northern Green Frog). Juvenile found in Rocky Creek under the overpass at Canoe Branch Road (36º20'54"N, 86º15'33"W). 27 February 2005. MTSU 158A.

Rana palustris (Pickerel Frog). Juvenile found in spring on private property 350 m SW of Cumberland River mile marker 265 (36º19'12"N, 86º15'01"W). 27 February 2005. MTSU 157A.

Rana sphenocephala (Southern Leopard Frog). Adult found on road during rainy night in the 2500 block of Oldham Road (36º22'49"N, 86º13'27"W). 28 April 2005. J. Pruett. MTSU 156A.

Testudines

Trachemys scripta elegans (Red-eared Slider). Adult found DOR in the 2100 block of State Highway 25 (36º24'16"N, 86º11'18"W). 04 May 2005. APSU Photo Voucher 18181.

Lacertilia

Eumeces fasciatus (Common Five-lined Skink). Adult found under tin 45 m E of Highway 231 in the 3200 block at private residence (36º20'43"N, 86º15'20"W). 04 May 2005. MTSU 50L.

Serpentes

Coluber constrictor constrictor (Northern Black Racer). Adult encountered on private property at edge of limestone bluff 175 m NW of Cumberland River mile marker 265 (36º19'25"N, 86º14'56"W). 4 May 2005. APSU Photo Voucher 18179.

Lampropeltis triangulum triangulum (Eastern Milksnake). Subadult found under tin 50 m E of Highway 231 in the 3200 block at private residence (36º20'46"N, 86º15'19"W). 4 May 2005. APSU Photo Voucher 18180.

Regina septemvittata (Queen Snake). Juvenile found under rock at edge of Rocky Creek under the overpass at Canoe Branch Road (36º19'32"N, 86º15'09"W). 4 May 2005. MTSU 179S.

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BOOK REVIEWS

Herpetological Review, 2007, 38(2), 248–250.

Guia de Sapos da Reserva Adolpho Ducke, Amazônia Central (Guide to the Frogs of Reserva Adolpho Ducke, Central Amazonia), by Albertina P. Lima, William E. Magnusson, Marcelo Menin, Luciana K. Erdtmann, Domingos J. Rodrigues, Claudia Keller, and Walter Hödl. 2006. INPA, PPBio, Fundación BBVA, CNPq, Attema, Manaus, Brazil. Hardcover. 168 pp. Sent free to recognized investigators. ISBN 85-99387-01-4.

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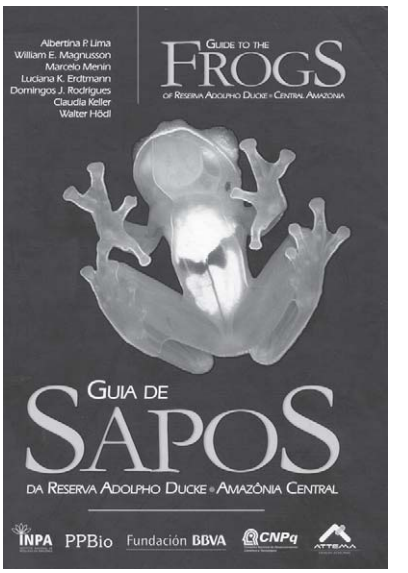

Amazonia is among the most well investigated areas of high biodiversity in the world. Regarding herpetology, some places have a long tradition of surveys, and thus, are reasonably well known. Unfortunately, these areas are few in comparison to the total extent of Amazonia, which is also one of the most threatened zones in the world. Some of these well-studied locations are Santa Cecilia (Duellman 1978) and Cuyabeno (Vitt and de la Torre 1996), both in Ecuador, Manu (Morales and McDiarmid 1996), Llullapichis (Schulter et al. 2004), Iquitos (Rodriguez and Duellman 1994), and Cusco Amazonico (Duellman 2005) all in Peru, and the Reserva Florestal Adolpho Ducke (RFAD) close to Manaus, in Brazil (e.g., Martins and Oliveira 1998 for snakes). The book reviewed here provides a comprehensive review of the amphibians of the last of these localities.

Guia de Sapos da Reserva Adolpho Ducke, Amazonia Central is well designed and illustrated and is printed on plasticized paper, making it very bright, attractive, and durable. The book starts with a preface by William E. Duellman, a table of contents, and an introduction placing the area into context and giving a general idea about the importance of the Reserva Adolpho Ducke and the scientists who have studied there. The occurrence of taxonomically difficult groups, such as *Colostethus* and the *Leptodactylus pentadactylus* group, in the area is also noted.

This is followed by a chapter on the general biology of anurans, including information about the confusion associated with common names, color and defence, predation, reproductive mode, and developmental strategies (aquatic – 21 species; semiterrestrial – 19 species; terrestrial – 8 or 9 species, and egg deposition and

direct development on the dorsum of the female – 2 species). Frog call types (including mating, aggressive, release and distress calls) are also explained at an introductory level. All these components of the introduction are very well illustrated by good examples taken from many of the species occurring in the area.

A short chapter on how to use the guide is also provided. This points out that the book is aimed at ecologists, tourist guides and the general public. Given the audience, the characters used for identification purposes are geared toward live identification in the field and, as the authors explain, the many photos provided, supplemented by a figure (page 47) showing the principal names of body parts that appear in the text, are intended to be adequate for that purpose.

The species accounts making up the bulk of the guide include representatives of the Bufonidae (5 species), Centrolenidae (1 species), Dendrobatidae (3 species, one unnamed), Hylidae (17 species), Leptodactylidae (16 species), Microhylidae (6 species), and Pipidae (2 species), totaling 50 species at the RFAD. Each account appears on one page of two columns (one in Portuguese, the other in English) and includes data on distribution in RFAD, general distribution, a superficial description, similar species, and natural history. The facing page usually displays four or five photos of each species, all of very high quality, including ventral views, multiple dorsal patterns (if intraspecifically variable), animals in amplexus, calling males, nests and tadpoles. The result is an excellent overview of the batrachofauna of the area.

A short bibliographic section containing all references appearing in the text follows, as well as a page introducing each of the authors of the book. The book closes with acknowledgments, and introductions to the BBVA (Banco Bilbao Vizcaya) Foundation (which financed the printing) and the PPBio (Program for Biodiversity Research).

I found no errors in the book and I only can congratulate the authors for providing such jewel for my library. The book is not currently for sale but, in a real act of philanthropy by the authors and financers, it will be sent to researchers and especially to local schools and students who could not normally afford it.

One caveat is that in books dealing with Neotropical amphibians, the names of the species can change (often as result of new phylogenetic data). In this respect, the book was probably in press when the two most recent important revisions of Neotropical amphibians, Faivovich et al. (2005) and Frost et al. (2006), appeared. Accordingly, the names listed in the book corresponding to the revised taxonomy of these authors are: *Bufo granulosus* = *Chaunus granulosus*, *Bufo marinus* = *Chaunus marinus*, *Bufo proboscideus* = *Rhinella proboscidea*, *Epipedobates femoralis* = *Allobates femoralis*, *Hyla boans* = *Hypsiboas boans*, *Hyla* cf. *brevifrons* = *Densropsophus* cf. *brevifrons*, *Hyla geographica* = *Hypsiboas geographicus*, *Hyla granosa* = *Hypsiboas cinerascens* (see also Barrio-Amorós 2004), *Hyla lanciformis* = *Hypsiboas lanciformis*, *Hyla minuta* = *Dendropsophus minutus*, *Phrynohyas resinifictrix* = *Trachycephalus resinifictrix*, *Adenomera andreae* = *Leptodactylus andreae*, *Adenomera hylaedactyla* = *Leptodactylus hylaedactylus*, *Lithodytes lineatus* = *Leptodactylus lineatus*.

Further, taxonomic issues in Neotropical amphibians are not well resolved for many species. Thus, in the book, the species *Atelopus spumarius*, *Bufo granulosus*, *Scinax ruber* (or, more likely, a *S. x-signatus* complex), both *Adenomera* species (now *Leptodactylus*), and *Elachistocleis bicolor*, are members of complexes that could soon be subject to name changes as species boundaries become established through systematic research.

Taxonomic issues aside, I have only two minor criticisms of the work. First, the general distribution section of the species accounts is too general and sometimes does not include all confirmed species in adjacent regions. For example, there is no mention of the presence of *Hyla boans, Hyla granosa, Osteocephalus buckleyi, Phyllomedusa bicolor, P. tarsius, P. vaillanti, Scinax garbei, S. ruber, Leptodactylus petersi, Chiasmocleis hudsoni, Ctenophryne geayi,* and *Synapturanus salseri* in Venezuela, where these species are reported or well known (Barrio-Amorós 2004). On the contrary, two species (*Ceratophrys cornuta* and *Leptodactylus rhodomystax*) are listed as present in Venezuela, although neither is supported by vouchers or included in the most recent Venezuelan checklist (Barrio-Amorós 2004). Second, a local guide such a this would be an ideal place to include more detailed descriptions of species calls, even if only in an onomatopoeic way. Indeed, a future edition of this book would benefit by the inclusion of a CD with all possible calls from the area, as was provided by Ibañez et al. (1999) for the Barro Colorado area in Panama.

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Tales from the Thébaïde: Reflections of a Turtleman, by Peter C.H. Pritchard. 2007. Krieger Publishing Company, Malabar, Florida (www.krieger-publishing.com). 340 pp. Hardcover. US $44.50. ISBN 1-57524-277-X.

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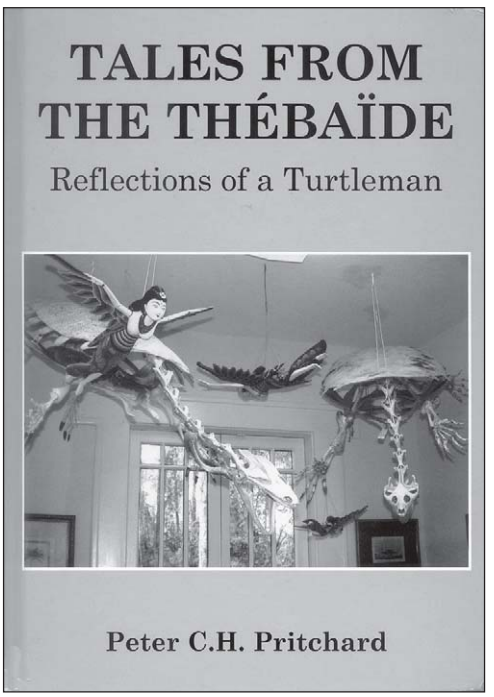

Tales from the Thébaïde is a collection of articles, essays, and speeches by Peter C.H. Pritchard. In the publisher's news release it is stated that "a cheloniological thread thus runs through his Tales from the Thébaïde, as he (Pritchard) expands the study of his favorite animals into commentaries upon the universe itself, and includes brilliant, erudite, and always humorous accounts of his adventures in many lands seeking further insight into the shelled reptiles." There are some golden threads within this book, but they do not run through it. In several places the thread gets snarled and in other areas an out-of-place stitch is added to try to tie a chapter to chelonians.

The book starts with a collection of stories about Archie Carr in the chapter "The Master Turtler." These stories bring new views of the greatest turtle researcher and advocate of the twentieth century, from Carr's changing views on the use of sea turtles to his opinions on personal recognition. Pritchard gathered these stories though his long friendship with Carr, first as a Ph.D. student and then as a colleague. This is followed by a chapter on "Tortoise Life" which meanders from feeding strategies, including an interesting piece on early morning forays by Aldabra Tortoises, to the learning ability of tortoises—Pritchard relates how his captive tortoises are known to ram their heater when it is not on during cold weather. This chapter has other interesting stories and bits of natural history, but does not flow well from point to point.

After the introductory chapters, the remaining 26 chapters are organized into six sections: Galápagos, Sea Turtles, Schooldays, Personalities and History, Speeches, and Essays. Pritchard, one of the leading turtle experts in the world, provides personal insights that include important information not normally provided in the turtle literature. This is especially true in the chapters dealing with the Galápagos and sea turtles.

In a Galápagos tortoise chapter, "Whatever Happened to the Pinta Tortoise?," Pritchard details a survey of Pinta Island to try to find a live female tortoise for Lonesome George. During their expedition they located a number of sites with tortoise shells and bones, but not live tortoises. Pritchard's conclusions on the "extinction" of this race of turtles include a discussion on how the whalers collected the smaller females because they were more easily carried and came to the lower elevations of the island for nesting. This skewed the harvest, which led to a male-dominated population that could not sustain itself.

A sea turtle chapter, "Life and Death in Oaxaca," provides a very graphic, but important view of the commercial sea turtle business in Mexico during the 1970s. The efficient harvest and processing of turtles highlights how they can be easily exploited. The owner of the processing plant, Antonio Suarez, is shown to be an intelligent man with a different view on the role of sea turtles. Many turtle conservationists would not be able to see past the negative side of Suarez's business of killing sea turtles. The information contained in this chapter makes the entire book worthwhile.

The chapters "Old Masters Remembered" and "Origins" give an interesting look into 1950s Northern Ireland boarding school life and the semi-aristocratic background of the Pritchard clan, but has little connection to turtles. These chapters might have worked better earlier in the book, although the book would not have been diminished if they were omitted all together.

The chapter on "Greenie Remembered" was fun to read. We have all had a college friend similar to Greenie. They are always willing to help, provide conversation, and freeload, but normally they were not willing to tough it out in primitive field camps as Greenie did in Suriname and other locales. The description of the early Suriname field station shows the difficulty accessing remote areas. The lack of roads and expansive mud flats in front of the beach made it a challenge to get to and set up camp at the premier turtle beach in the country. Those same barriers probably also allowed the beach to persist.

The collections of speeches and essays give several different viewpoints into Pritchard's thoughts on turtle conservation, turtle conservationists, and the future of conservation in general. Several previously published papers and speeches appear in other sections of this book. In all over one third of the chapters consist of previously published material.

In the essay section, there is a long chapter on why Pritchard set up his personal Thébaïde, the Chelonian Research Institute. The publisher includes the French dictionary definition of thébaïde — "an intellectual retreat, a remote place, away from the bustle of life, where conversation, scholarship, and scientific and literary discourses are sacred." This chapter gives a history on the formation of the Institute and the diverse collection of turtle specimens, representing a greater species diversity than most major research museums. In parts of the chapter, Pritchard seems to vent on es-

tablished research institutions and their funding sources for not treating the Chelonian Research Institute as an equal. This gives the chapter a negative tone, when it should have been one of the most positive chapters highlighting Pritchard's legacy.

Peter Pritchard has provided an interesting view into his life and research. It is too bad that there is not more structure to the work as a whole. The sections about Schooldays and Personalities would have been workable had they been located at the beginning of the book and included a better thread connecting them to the overarching chelonian theme. This problem, and the general organization of the book, should have been corrected by the publisher when the early drafts of manuscript were received. However, despite some negative issues raised in this review, *Tales from the Thébaïde* is an interesting foray into the thoughts and experiences of an interesting gentleman who is one of the modern day turtle gurus.

Herpetological Review, 2007, 38(2), 251–252.

A Guide to the Reptiles and Amphibians of Egypt, by Sherif M. Baha El Din. 2006. American University in Cairo Press, 113 Sharia Kasr el Aini, Cairo, Egypt (www.aucpress.com). xvi + 360 pp., 48 pls. Hardcover. US $34.95. ISBN 997-424-979-8.

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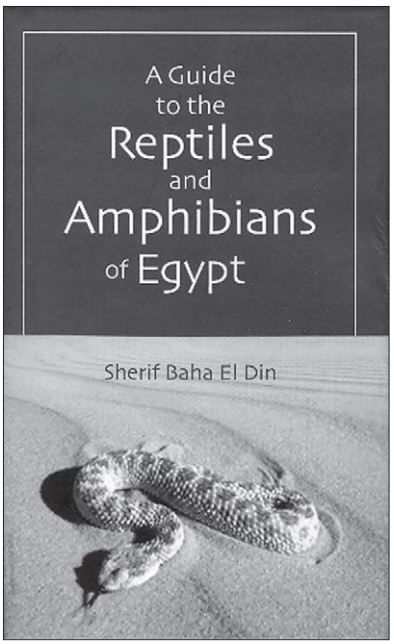

The herpetology of North Africa has received increasing attention during the past twenty years, mostly from European researchers. Several introductory guides to the herpetofauna have been produced for the region, which is treated variously as North Africa (Schleich et al. 1996), Northern Africa (Salvador 1996), or the Sahara (Le Berre 1989), as well as for specific countries or territories, including Morocco (Bons and Geniez 1996) and Western Sahara (Geniez et al. 2004). While not the earliest study of amphibians and reptiles in North Africa, John Anderson's (1898) zoological study of Egypt was the first major contribution to studies of the reptiles and amphibians of this region. This detailed and scholarly work firmly established Egypt as an important crossroads of the herpetofauna of Africa, the Mediterranean, and the Middle East. Nearly a century after the publication of Anderson's work, Mostafa Saleh's (1997) *Amphibians and Reptiles of Egypt* provided a synthesis of more recent knowledge of Egypt's herpetofauna, including major works such as the checklist by Hyman Marx (1968) and descriptions of new species such as *Bufo kassasii* (Baha El Din 1993). However, most species accounts in Saleh's book are very short and most details on the biology and ecology were taken from the literature rather than personal experience. Until now, Saleh's (1997) work has been the only recent summary of the study of Egypt's amphibians and reptiles.

Sherif Baha El Din's new book, *A Guide to the Reptiles and Amphibians of Egypt*, surpasses previous work on the Egyptian herpetofauna and stands as perhaps the most thorough book focused on the reptiles and amphibians of any single African country. Unlike many other treatments of the North African herpetofauna, this book is written by an Egyptian and sets an excellent precedent for future work by African herpetologists. The book builds on Baha El Din's extensive and expert knowledge of the biology and distribution of Egypt's reptiles and amphibians, which were the focus, at least in part, of his recent doctoral thesis work at the University of Nottingham. This work is of a high caliber and is an extremely important contribution to both African and Mediterranean herpetology.

As Saleh's (1997) book is the only other recent extensive treatment of Egypt's herpetofauna, it is appropriate to make comparisons between it and the recent work by Baha El Din (2006). In many ways, the layout of the two books is very similar. Baha El Din's book begins with several brief chapters introducing the reader to Egyptian herpetology, climate, geological history, patterns of herpetofaunal diversity, relevant habitats, and conservation. Each chapter is short and concise but contains sufficient details and references to enable further pursuit of the topics. These chapters build on similar sections found in Saleh's book that detail the history of Egyptian herpetological research, the relevant habitats of Egypt, and general remarks about Egypt's herpetofaunal diversity. In general, the sections of Saleh (1997) are more extensive, but the briefer descriptions by Baha El Din (2006) are very appropriate for a field guide. The photographs of representative habitat types included by Baha El Din are less numerous than those found in Saleh (1997) but still provide a general idea of diversity. Both books consist mostly of species accounts and keys for determining genera and species. For example, Baha El Din's section on lizards begins with a key to the families that occur in Egypt, which is then followed by sections on each family that contain keys to both genera and species as well as accounts for each. The keys of the two books are quite similar and those of Baha El Din's book are essentially refined versions of the other that include additional species, additional characters, and/or more precise descriptions. Several of the keys, including those for anurans, lizards in general, gekkonids in particular, and snakes, are accompanied by useful illustrations showing characters of interest; drawings of head scales are also presented for all of the Egyptian leptotyphlopid and typhlopid snake species. Brief accounts are provided for each genus and include comments on diagnostic features and geographic range.

The species accounts in Baha El Din's book are extensive and much more detailed than those of Saleh (1997). These accounts are full of useful information regarding biology and ecology, most of which Baha El Din gained from personal experience with the species. Each species account contains a map showing the geographic distribution on a half-degree grid, a list of synonymies, including at least those relevant to Egypt, the English and Arabic

common names, and thorough sections on taxonomy, variation, habitat and ecology, range, distribution within Egypt, and conservation status. In general, each section is well referenced. Information on the conservation status comes from the recent Global Amphibian Assessment (IUCN et al. 2004) and the ongoing, but still unpublished, Global Reptile Assessment. Except for the photographs placed in the center of the book, all information for a given species is found in the species account. The detailed species accounts and consolidation of information for each species makes this book a truly handy field resource.

Baha El Din specifically details information regarding particular museum collections on which the distribution and taxonomic data is based. In some species accounts, especially for species that are poorly known in Egypt (e.g., *Ptychadena schillukorum*, *Leptotyphlops nursii*) or those with interesting or isolated populations (e.g., *Eumeces schneideri*), museum specimens are referenced by catalogue number. In other species accounts, Baha El Din discusses and redetermines particular museum specimens that were previously assigned to a given species; some of these redeterminations result in significant changes in the distribution maps (e.g., *Acanthodactylus pardalis*). The citation of museum specimens is a welcome departure from most other books focused on the reptiles and amphibians of African countries. Impressively, all but one of the 118 species included in the book were documented based on voucher specimens (single exception: *Psammophis punctulatus*), although these are not referenced in the text.

Much of the data regarding geographic distributions comes from Baha El Din's work over more than 20 years. His extensive fieldwork and examination of museum specimens has resulted in the refinement of the species distribution maps presented by Saleh (1997) and includes many new localities. Baha El Din takes a very systematized approach to presenting geographic distribution data; each species has a map on which its presence is indicated on a half-degree base map. This is an improvement over many other works that include maps with overlapping point localities, which can be difficult to interpret. Baha El Din inferred the presence of species in areas intervening between known localities by using ecological data to refine a minimal complex polygon around the known localities. This is entirely appropriate and quite useful. However, this does not entirely explain a few distribution maps of species with discontinuous ranges in which there are seemingly isolated cells where a species is predicted to occur (e.g., *Hemidactylus turcicus*, *Stenodactylus petrii*, *Lytorhynchus diadema*). A gazetteer of localities including coordinates is an excellent accompaniment to the geographic distribution data presented in the species accounts. By explicitly presenting both known localities and predicted areas of occurrence, the distribution maps should be very useful for guiding future field research in Egypt. Scientific names are accompanied by information on synonymy that, appropriate for a guide, is restricted to that which is most relevant to Egypt. In addition, common names in both English and Arabic are provided; names in Arabic script can be found in Saleh (1997). If readers are interested in other common names for North African animals in Arabic or other languages, including Tamasheq, Tebu, or Fulfulde, they should refer to Monteil (1951) and Le Berre (1989).

Color photographs of living specimens accompany most species descriptions. These images are generally sufficient and significantly add to the species descriptions by illustrating coloration and even details of morphology such as snout shape (e.g., *Scincus scincus*, Fig. 74). In comparison to the photographs of Saleh (1997), those presented by Baha El Din are of higher quality and exhibit both greater detail and better color.

I found very few errors in the text. A very minor exception is the statement on page 145 that there are 16 lacertids in Egypt; there are actually 17 species, as correctly indicated by the number of species accounts.

Both museum and field researchers will enjoy Baha El Din's *A Guide to the Reptiles and Amphibians of Egypt*. The extensive species accounts, which include references to museum specimens, are an excellent resource for collections-based research, whereas the range maps, ecological data, photographs, and compact size ensure that this will be the single resource used by interested professional or amateur herpetologists traveling in Egypt. I highly recommend this book to anyone interested in the zoology of Africa, the Mediterranean, or the Middle East. It will be difficult to surpass such an excellent work.

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PUBLICATIONS RECEIVED

Turtles in My Sandbox, by J. K. Curtis. 2006. Sylvan Dell Publishing, 976 Houston Northcutt Blvd., Suite 3, Mt. Pleasant, South Carolina 29464, USA (www.sylvandellpublishing.com). 31 pp. Hardcover. $15.95. ISBN 78-0976882374.

I shared this book with a member of its target audience, an el-

ementary school level child, as well as two younger children, and it was well received in every case. The brief text and excellent illustrations tell the story of a little girl who finds a diamondback terrapin nest in her sand box and then with the advice of experts she and her mother headstart the hatchlings for nine months. The youngsters are then released into the ocean under the watchful eye of terrapin conservationists. The controversies regarding headstarting are, of course, not mentioned, but the text is biologically accurate. I liked that the eggs were incubated *in situ*, and that the hatchlings were fed somewhat natural foods. It would have been advisable to recommend hand washing to a child maintaining turtles. The text implies that it is difficult to find good advice on terrapin husbandry and conservation, so the book could have listed some of the good sources that are available on the web and in print. The last three pages of the book contain outlines for making fun turtle cut-out toys. A great gift for the 4–8 year old you know.

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Bibliotheca Cordyliformium, by Klaus Adolphs. 2006. Squamata Verlag, Sankt Augustin, Germany (www.squamata.de). 304 pp. Hardcover. € 42,00 (approx. US $55.00). ISBN 978-3-9805086-1-2.

This book is intended as a reference work on the lizard families Cordylidae and Gerrhosauridae. It begins with an up-to-date listing of the 120+ species and subspecies in these groups, complete with synonyms and a short statement (in German) of their distribution. The bulk of the work is occupied by a comprehensive bibliography, with over 1370 numbered entries listed alphabetically. The entries span the period from Seba's *Thesaurus* in 1734–35 to mid-2006 and include even the most obscure references in all languages. An extremely valuable feature is the inclusion of the complete (unabbreviated) titles of journals—a feature lacking in most bibliographies of any kind and one that is especially critical for those working with early systematic literature. For all references for which the content of the paper is not self-evident from the title, a short summary of the taxa dealt with and the nature of the data presented is provided. This is usually in German, but some references are accompanied by their original English abstracts. Separate indices are provided to authors, co-authors and editors, species and subspecies, and subjects (more than 100 keywords). This handsomely produced volume will be invaluable for those interested in cordylids and gerrhosaurs and is recommended for herpetobibliophiles and those studying African herpetology.

Avian and Exotic Animal Hematology and Cytology, 3rd Edition, by Terry W. Campbell and Christine K. Ellis. 2007. Blackwell Publishing (www.BlackwellVet.com). ix + 287 pp. Hardcover. US $149.99. ISBN 978-0-8138-1811-5.

This is the third edition of a standard veterinary work on the hematology and cytology of a diversity of vertebrates, including amphibians and reptiles. Herpetological information is included chiefly in chapters 2 (Hematology of Reptiles, 31 pp.), 3 (Hematology of Amphibians, 9 pp.), and 6 (Comparative Cytology, 83 pp). Topics covered include blood sample collecting and handling, cytological sampling techniques, morphology, laboratory evaluation and disease responses of erythrocytes, leucocytes, and thrombocytes, blood parasites, hematopoiesis, and normal and abnormal cytology. Most examples are drawn from species commonly kept as pets, but others derive from sea turtles, crocodilians and other, more exotic taxa. Also, there is an extensive section dealing with the hematology of birds and shorter chapters treating fish and small mammals (exclusive of dogs and cats). A separate chapter on diagnostic microscopy using wet-mount preparations focuses on fish, but is relevant for amphibian disease detection and treatment. Two appendices provide a useful guide to stains and solutions and give hematologic values for selected taxa, including 33 reptile and eight amphibian species. A 27-page bibliography of over 1000 references completes the book, which is illustrated throughout by color cytological, parasitological, and blood film micrographs. Of obvious direct relevance to veterinarians dealing with herpetological patients, this book will also be valuable to those academics, zoo professionals, and very serious herpetoculturists with an interest in amphibian and reptile diseases and parasites. However, the treatment of some relevant topics with an extensive literature, such as lizard malaria, is relatively superficial; other topics, such as chytridiomycosis in amphibians, which one might expect to be treated in the cytological and/or wet-mount preparation sections of the book, are not mentioned.

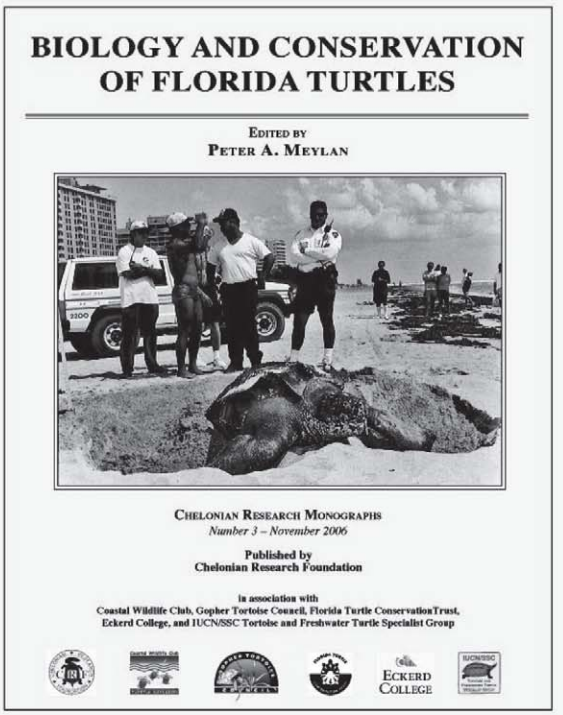
Ecology and Ecosystem Conservation, by Oswald J. Schmitz. 2007. Island Press, 1718 Connecticut Avenue, NW, Suite 300, Washington, D.C. x + 166 pp. Hardcover. US $40.00, ISBN 978-1-59726-048-0; Softcover. US $19.95. ISBN 978-1-59726-049-7.

This small book is aimed at a broad audience and is part of the series Foundations of Contemporary Environmental Studies. It uses specific examples from conservation biology to present underlying principles of modern ecology and to explain why ecosystem and biodiversity conservation are crucial to dealing with current environmental problems. Among the topics included are climate change, carrying capacity, habitat fragmentation, and population dynamics. Amphibians and reptiles are mentioned in several places, with sea turtles serving as a focal taxon in the chapter "Viability of Threatened Species." This book is perhaps most appropriate for an undergraduate audience in introductory courses in environmental science or conservation biology, but its clear, simple style and real-life examples make it accessible to laypeople in general. Biologists whose research interests are far removed from ecology might also find this a convenient introduction to some of the main issues in conservation biology.

Back Issue Clearance for Publications of The Herpetologists' League

In an effort to reduce the need for storage space, The Herpetologists' League will be holding a clearance sale of back issues of its publications at the Joint Meetings in St. Louis in July 2007. Single issues of *Herpetologica* or *Herpetological Monographs* ($5°°) or complete volumes of *Herpetologica* ($20°°) will be available for purchase as long as supplies last. Only cash or checks (USD$, drawn from a US bank) will be accepted, and these sale prices are valid only when purchasing back issues in person at JMIH'07. Sale hours will be from 1330–1700 h on 12–15 July. Please contact Steve Mullin (<sjmullin@eiu.edu>) with any questions.

CHELONIAN RESEARCH MONOGRAPHS, NUMBER 3



Now Available

Chelonian Research Foundation is pleased to announce the publication of Volume Number 3 of *Chelonian Research Monographs*, published November 2006:

BIOLOGY AND CONSERVATION OF FLORIDA TURTLES

Edited by
PETER A. MEYLAN

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