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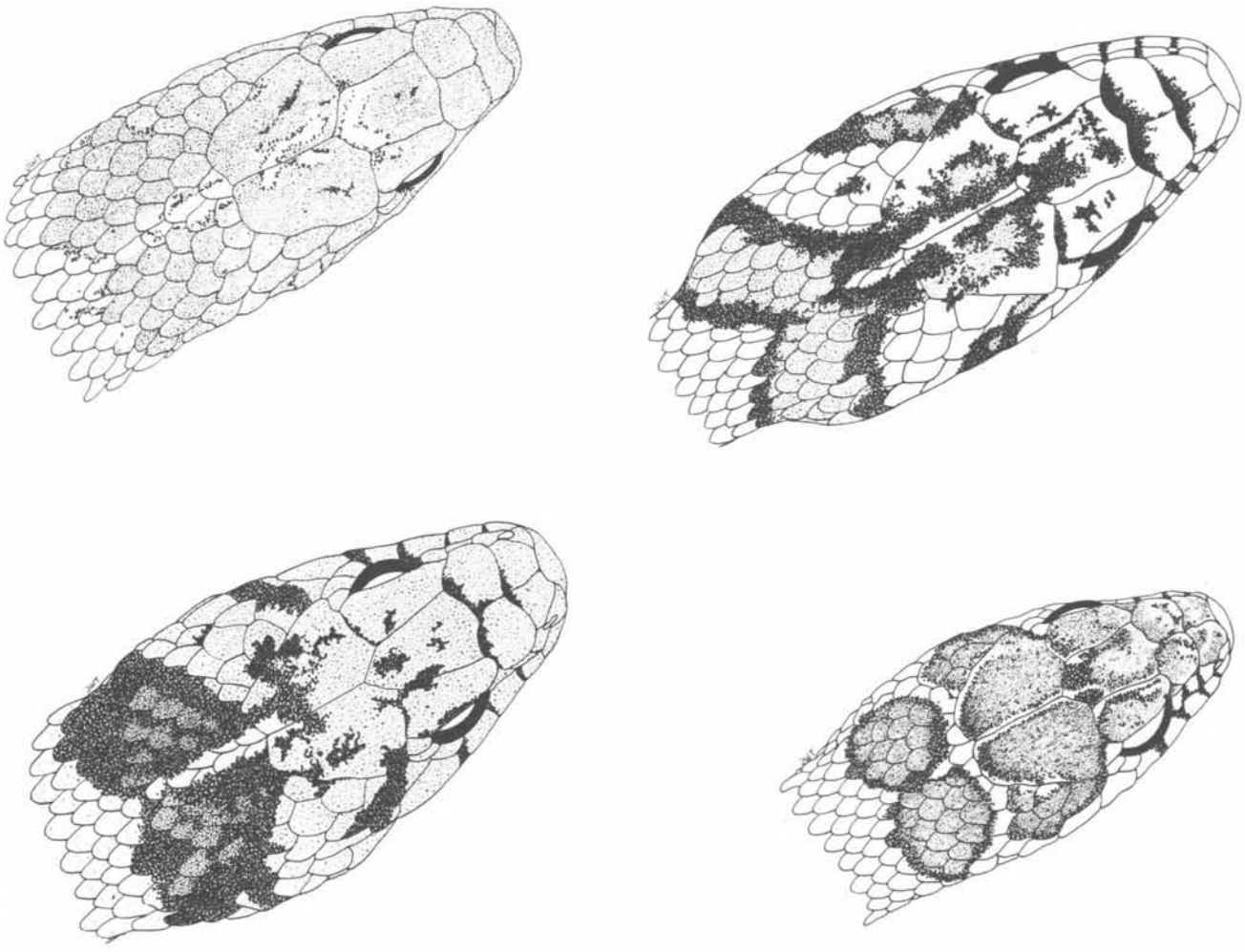
Herpetological Review



SOCIETY FOR THE STUDY OF AMPHIBIANS AND REPTILES

Herpetological Review

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SOCIETY FOR THE STUDY OF AMPHIBIANS AND REPTILES

Membership is open to anyone interested in amphibians and reptiles. Members have voting privileges in the Society. They receive the ***Journal of Herpetology*** (4 issues annually), ***Herpetological Review*** (4 issues annually), and occasional issues of ***Facsimile Reprints in Herpetology.*** Members may purchase other Society publications at reduced rates.

ANNUAL DUES 1994

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About the Cover.—The cover illustrations were executed by Jeffrey W. Tamplin, Department of Zoology & Physiology, Louisiana State University, Baton Rouge. Clockwise, from upper left: *Thamnophis exsul* (USNM 166423, holotype: Coahuila); *Thamnophis sumichrasti* (USNM 7079a: Veracruz); *Thamnophis scalaris* (MVZ 144489: Veracruz); *Thamnophis mendax* (LSUMZ 35340: Tamaulipas). Readers interested in the systematics of this group of Mexican garter snakes are referred to the following publication: D. A. Rossman. 1992. Taxonomic status and relationships of the Tamaulipan montane garter snake, *Thamnophis mendax* Walker, 1955. Proc. Louisiana Acad. Sci. 55:1–14.

INSTITUTIONAL PROFILE

Herpetology At The University of Georgia

The University of Georgia is located in the Classic City of Athens, a friendly college town of approximately 90,000 persons (including students) surrounded by a semi-metropolitan to rural area with a population of 160,000. A progressive town with an assortment of interesting restaurants and shops in a pleasant pedestrian-oriented downtown area at the very edge of campus, Athens is recognized world-wide as the Mecca of New Wave music and the downtown is the center of lively clubs, coffee houses, and other entertainment establishments after dark. The city is known for its fine examples of early 19th century antebellum architecture. It boasts two modern hospitals and an assortment of shopping complexes. Bus transportation is readily available throughout the community and on campus. Open rolling hills and forests, with streams and lakes for swimming, canoeing, and fishing are only minutes from town. The University is home to the Georgia Museum of Art and the State Botanical Garden as well as an array of recreation and sports facilities including tennis, golf, racquetball, pools, and intramural fields. Athens is only an hour from Atlanta, host city for the 1996 Olympics, and a major shopping and entertainment center that boasts the fine new Fernbank Museum of Natural History, the Atlanta Zoo, Six Flags, and more. Within a modest drive are the Great Smoky Mountains, the Okefenokee Swamp, and Georgia's Golden Isles, the barrier islands.

Piedmont oak-pine forest

History of Herpetology at the University of Georgia

The University of Georgia is the nation's oldest Land Grant institution, incorporated in 1785. The first modern natural historian associated with the University of Georgia was Eugene Odum, the father of modern ecology. Although Gene's early work focused primarily on birds and mammals, and later, of course, on ecology, several of his students, notably John Crenshaw and Robert Gordon, specialized in herps. Herpetology began in earnest with the arrival of Bernard Martof in the early 1950's. Martof was most noted for his work on salamanders and frogs and his 1956 *Guide to the Reptiles and Amphibians of Georgia*. Martof, along with Don Scott and their students, such as Robert Humphries, were active in developing the significant herpetological collections now associated with the Museum of Natural History. With the arrival of Whit Gibbons at the Savannah River Ecology Laboratory, a unit of the University of Georgia located at the Savannah River Site near Aiken, South Carolina, in 1967, and later Justin Congdon, the Savannah River Ecology Laboratory and the University of Georgia became an acknowledged

PIT-tagging a common kingsnake at SREL

center of herpetological research. Throughout the past 15 years the Savannah River Ecology Laboratory has been recognized for its research in population dynamics and ecology of reptiles and amphibians. Numerous students and postdoctoral research associates who have gone on to careers in herpetology include Harold W. Avery, Miriam Benabib, Laura A. Brandt, Janalee P. Caldwell, David B. Clarke, James O. Farlow, Bruce W. Grant, Trip Lamb, Jeff Lovich, Mary T. Mendonca, Stephen J. Morreale, David H. Nelson, Robert R. Parmenter, Richard A. Seigel, Raymond D. Semlitsch, Edward A. Standora, Anton D. Tucker, and Laurie J. Vitt.

Facilities

The University of Georgia boasts a number of facilities and resources attractive to students and researchers with interests in herpetology. The Savannah River Ecology Laboratory is a permanent research facility with resident faculty of the University of Georgia. Herpetological research facilities include experimental ponds, terrestrial enclosures, holding tanks, electrophoretic and molecular genetics laboratories, reptile and amphibian animal

care facilities, and approximately 300 square miles of protected field sites.

The Institute of Ecology is a multidisciplinary research unit with modern laboratory and computer facilities housed in the Ecology Building on campus. Other significant facilities include the Marine Institute on Sapelo Island, Skidaway Institute of Oceanography, Coweeta Forestry Experiment Station in North Carolina, and the Horseshoe Bend Research Site in Athens. The University is an active participant in the Organization of Tropical Studies in Costa Rica and Highlands Biological Station in Highlands, North Carolina. The University of Georgia Museum of Natural History is a major repository maintaining extensive research collections in numerous areas including approximately 25,000 herps from Georgia and the Southeast. Specific requests for information are welcome at any time. Admission to the collection is by appointment only; attendees of the SSAR/HL 1994 meeting wishing to visit the collection must schedule a time in advance. For more information please contact the Collections Manager, Elizabeth McGhee (tel. 706-542-3940). A listing of the Museum's herpetology holdings can be found on the University of Georgia's Gopher computer, which can be used by any computer that has Internet access (gopher.uga.edu). The University of Georgia Library, with more than 3 million books, is one of the largest in the nation, and subscribes to 96% of all biological and chemical publications covered in *Current Contents*. On-line computer services provide the capacity to search over 500 data bases from any computer on campus. Other University facilities include a CDC Cyberplus 960 and IBM mainframe 3090, Center for Advanced Ultrastructural Research, Molecular Genetics Instrumentation Facility, and Biological Sequence/Structure Computation Facility, among others.

Experimental ponds at SREL

Academic Programs

The Biological Sciences are particularly well represented at the University of Georgia. Departments offering undergraduate and advanced degrees include Biochemistry, Botany, Entomology, Genetics, Microbiology, and Zoology, as well as the School of Ecology and the School of Forest Resources. The majority of students and faculty with an interest in herpetology have been associated with either the Department of Zoology, the Institute of Ecology, or the Savannah River Ecology Laboratory. Traditionally, academic degrees have been awarded through Zoology (M.S. and Ph.D.) or the Graduate Program in Ecology (Ph.D.). As a result of recent recognition of the Institute of Ecology as the School of Ecology and its reorganization as an academic unit, most of the ecological, organismal, and systematics teaching and research programs associated with the former Department of Zoology have now been transferred to the School of Ecology. Researchers and students here have broad interests in population and community ecology, conservation biology, marine, freshwater and thermal ecology, tropical and temperate forest ecology, as well as traditional areas of organismal and systematic biology.

Rushing stream at Highlands Biological Station.

University Faculty Research Programs

John Avise (Professor, Department of Genetics)—John's interests include the evolutionary genetics and ecology of natural populations, especially the processes governing the distribution of genetic variability within and among species. His approach is largely empirical and utilizes information obtained from morphology, protein variation, and especially mitochondrial DNA heterogeneity. His research topics range from microevolutionary problems of population structure analysis to macroevolutionary concerns relating to speciation and phylogenetic reconstruction. While John's work encompasses a variety of vertebrate and invertebrate groups, many of his papers have focused on amphibians and reptiles.

Brian R. Chapman (Assistant Professor, School of Forest Resources)—Most of Brian's recent research has focused on the ecology of both birds and mammals, but he has also conducted status surveys for threatened and endangered amphibians in several states. He has several current projects involving the effects of forest management practices on reptiles and amphibians in Georgia.

Justin Congdon (Senior Research Ecologist, SREL)—Justin's interests are in the broad area of evolutionary ecology. His research focuses on physiological and bioenergetic processes

Eastern glass lizard and eggs.

that shape life history traits and, in addition, on the population biology of long-lived organisms.

Nat B. Frazer (Associate Director, SREL)—Nat's early research focused on the ecology and demography of loggerhead turtles and eventually moved to modeling life history patterns of other sea turtles. At SREL he has been primarily involved in the demography and basic ecology of freshwater turtles, including the preparation of life tables using long-term data bases.

J. Whitfield Gibbons (Professor of Ecology, SREL)—Whit's research interests center around studies on life history, demography, and ecology of reptiles and amphibians, especially freshwater turtles; these include studies on longevity and aging phenomena in reptiles, patterns of herpetofaunal biodiversity, and responses of herpetofauna to stress phenomena associated with energy technologies and industrial activities.

Chester Karwoski (Professor, Department of Psychology)—Chet specializes in cellular physiology in amphibians and reptiles in response to environmental stimuli. His work encompasses circadian rhythm in *Anolis carolinensis* in response to light, retinal cell physiology of *Rana*, and intercellular physiological studies in *Necturus*.

Joshua Laerm (Director, Museum of Natural History)—Although most of Josh's recent work has been with mammals he retains an interest in herps and is presently involved in broad ranging surveys of amphibians in the mountain provinces of Georgia.

Jim Richardson (Adjunct Research Professor, Institute of Ecology)—Jim is widely recognized for his work on marine turtles. His particular research interests are in population ecology and management of turtle populations both regionally and worldwide. Jim has developed long term data bases from nesting records at a number of sites which are critical for long term population monitoring and conservation.

Robert J. Warren (Professor, School of Forest Resources)—Although Bob is widely recognized for his research on deer physiology and reproduction, wildlife contraception, and the effects of predator reintroductions, he is also involved in studies of the impacts of predators and scavengers on the reproductive success of endangered sea turtles.

Graduate Student Research Programs

The research activities of numerous graduate students at the University of Georgia and SREL focus on herpetological questions, including projects by Kathleen Barker (distribution and habitat preferences of montane salamanders in NE Georgia), Kurt Buhlmann (population ecology and conservation genetics of turtles), Vincent Burke (terrestrial activities of freshwater turtles), Robert Fischer (behavior, morphology, and physiology of reptiles), Frank Hensley (energetics of tadpoles), Chris Hudson (genetics and ecology of amphibians), Mark Komoroski (amphibian egg lipid energetics in relation to life history), John Krenz (population genetics and ecology of salamanders), John Lee (winter behavior and ecology of cottonmouths), Mark Mills (ecology of reptiles and amphibians in response to natural and human-caused fires), Joe Pechmann (aquatic and terrestrial density-dependence and long term population dynamics in amphibians), Mary Ratnaswamy (raccoon ecology and depredation of loggerhead and green sea turtle nests), David Scott (life history, demographics, and ecology of salamanders), DeEtte Walker (geographic variation in the mud turtle), Mark Wilson (amphibian retinas), Brian Wunschl (amphibian retinas), Rebecca Yeomans (orientation and homing ability of turtles), Huaiyuan Yu (amphibian retinas).

Common snapping turtles hatching.

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and
J. WHITFIELD GIBBONS
Savannah River Ecology Laboratory
P.O. Drawer E
Aiken, South Carolina 29802, USA.

SSAR/HL Meeting Highlights

Dates: 27 July–1 August 1994
Place: The University of Georgia, Athens, Georgia

Keynote Lecture: "The Evolution of Reptilian Viviparity Revisited," by Richard Shine (University of Sydney).

Forum: "Issues in Conservation: Point-Counterpoint." *Moderator*: Robert Jaeger. *Speakers*: Henry Wilbur and S. Bradley Shaffer.

Symposium: "Field and Behavioral Endocrinology." *Organizer*: Diana Hews. *Participants:* Dale DeNardo, Kent Dunlap, Tyrone Hayes, Lynne D. Houck, Rosemary Knapp, Catherine A. Marler, Robert T. Mason, Mary Mendonça, Catherine Propper, Matthew Rand, and Thane Wibbels.

Symposium: "Interfaces Among Inter-individual Variation, Life Histories, and Population Dynamics of Reptiles and Amphibians." *Organizer:* Arthur E. Dunham. *Participants not yet finalized.*

Symposium: "West Indian Herpetology: A Symposium in Memory of Albert Schwartz." *Organizers:* Robert W. Henderson and Robert Powell. *Participants (tentative)*: Karen Anderson, Karen A. Bjorndal, Alan B. Bolten, Hans E. A. Boos, Ellen J. Censky, Brian I. Crother, Mark L. Day, C. Kenneth Dodd, Jr., Karen L. Eckert, Alberto R. Estrada, Richard Franz, Mary Garvin, Carla A. Hass, S. Blair Hedges, Duncan Irschick, Thomas A. Jenssen, Hinrich Kaiser, James D. Lazell, Julian C. Lee, Allen R. Lewis, Jonathan B. Losos, Walter E. Meshaka, Jr., José A. Ottenwalder, Octavio Pérez-Beato, G. Larry Powell, Douglas P. Reagan, Jonathan Roughgarden, Anthony P. Russell, Andreas Schubert, Sharoni Shafir, Margaret M. Stewart, Richard Thomas, Roger S. Thorpe, Peter J. Tolson, Daniel S. Townsend, and Peter Vogel.

Colloquium: "Turtle Biogeography and Phylogeography." *Organizer:* Brian Bowen. *Participants:* Eugene S. Gaffney, S. Bradley Shaffer, Scott Davis, Edward O. Moll, Fredric J. Janzen, DeEtte Walker, Sandra Encalada, Peter Dutton, and Anna Bass.

Herpetological Travelogue Slide Shows: Profusely-illustrated lectures of exotic herps and their habitats.

Multimedia Presentations: "Herps of the West," and "Amphibians of the Appalachians," by David Dennis and Eric Juterbock; "Namesakes of North American Amphibians and Reptiles" (new) by Kraig Adler and David Dennis.

Oral and Poster Sessions: Several concurrent sessions each day.

Student Paper Awards: Seibert Prizes (SSAR) to be awarded to the two best student-presented papers at the meeting ($250 first prize, $150 second prize). The Herpetologists' League Award for Graduate Research is for the best student-authored manuscript; winner receives $500 and ten years back issues of *Herpetologica*.

"The Great Reprint Scavenge" (for students only!). Professionals are asked to clear unwanted duplicate reprints out of their offices (and receive free raffle tickets as a "thank you").

Social Activities: Welcoming Social, the SSAR Annual Auction, Barbecue Picnic, Graduate Student Program ("Graduate School: The Greatest Pit-fall Trap of All") & Social, local tours.

Field Trips: Zoo Atlanta, Savannah River Ecology Lab, Highlands Biological Station, Okefenokee Swamp, and Sapelo Island.

Art Exhibit: Featuring art with a herptile focus. $100 cash award for the art work judged unique and interesting.

Live Exhibit: Featuring herps of the region. Sponsored by Savannah River Ecology Lab.

Costs: Registration $80 student, $115 regular; $160 late registration fee after 20 June. Lodging at Residence Hall (air-conditioned dorms): $13 person/day (double occupancy) and $19 person/day (single occupancy). Lodging at Georgia Center (meeting location) or local Hotel: $45-$51/day (single occupancy) and $52-$55/day (double occupancy).

Further Details: See December 1993 issue of *Herpetological Review* (pages 117–119). Meeting Announcement/Call for Papers will be mailed to all North American members of SSAR and HL in March 1994, or on request from *Amy Edwards, Program Coordinator, Museum of Natural History, University of Georgia, Athens, Georgia 30602, USA (telephone 706-542-4137; FAX 706-542-3920; email AEDWARDS@ZOOKEEPER.ZOO.UGA.EDU).*

SSAR BUSINESS

SSAR Election Results

Results of the recent SSAR election are as follows:

President-elect (to serve as President for 1995): Alan H. Savitzky.

Secretary: J. Eric Juterbock (unopposed).

Treasurer: Karen L. Toepfer (unopposed).

Directors: Janalee P. Caldwell, Paul E. Moler.

Donations Needed For SSAR Symposium

"West Indian Herpetology: A Symposium in Memory of Albert Schwartz," is to be held at the 1994 SSAR/HL meeting. Several of the invited participants living in the West Indies require assistance with travel expenses in order to attend the symposium. Donations are being sought from individuals and institutions to help defray travel costs.

All donations are tax-deductible, and may be made payable to "SSAR–Albert Schwartz Symposium," and mailed to *Dr. Robert Powell, Department of Natural Sciences, Avila College, 11901 Wornall Road, Kansas City, Missouri 64145, USA (tel. 816-942-8400 ext. 2352; fax 816-942-3362).* All contributors will be acknowledged in the symposium program and in any publications emanating from the symposium.

SSAR Symposium Organizers

Individuals organizing symposia for the 1995 or 1996 annual meeting should contact the SSAR Meeting Events Coordinator for guidelines. Please send inquiries to: *Don C. Forester, Biological Sciences, Towson State University, Towson, Maryland 21204, USA. e-mail: In%"E7BFOR@toe.towson.edu", Tel. (410) 830-2385, Fax (410) 830-2604.*

"HERPETOLOGY OF CHINA" *Date of Publication*

Because knowledge of the precise date of publication is important for taxonomic works, we wish to record that our book, "Herpetology of China," was issued on 29 November 1993. Due to unforeseen delays in printing and binding, publication was delayed one month from the date printed in the book.

ER-MI ZHAO
KRAIG ADLER

(For details about price and ordering, see the September 1993 issue of *Herpetological Review*, vol. 24, no. 3, p. 78.—Ed.)

NEWSNOTES

Southwestern Research Station Volunteer Program

Approximately 20 volunteer positions are open in 1994 at the American Museum of Natural History's Southwestern Research Station in Portal, Arizona. The volunteer program is run annually and offers students in biological sciences outstanding opportunities to observe and become involved with scientists doing field research. Food and lodging are provided to volunteers in exchange for 24 hours per week of routine chores, with the remaining time available for research activities.

The program is open to both undergraduate and graduate students; the latter may pursue their own research projects. Faculty knowing of promising students should alert them to this opportunity for professional experience toward, development of, and evaluation of their career goals.

Volunteers are needed between 15 March and 1 November. Appointments are for part of this period, with a minimum appointment of six weeks. Applicants for spring positions (March–May) should submit applications by 15 February, summer volunteers (June–August) by 1 April, and fall volunteers (September–November) may apply any time.

For applications, write: *Dr. Wade C. Sherbrooke, Director, Southwestern Research Station, American Museum of Natural History, Portal, Arizona 85632, USA; Tel. (602) 558-2396.*

New Publication

Dumerilia is a new herpetological series published by the Association des Amis du Laboratoire des Reptiles et Amphibiens du Muséum, Paris (AALRAM). The first volume, "Liste bibliographie des Reptiles actuels. I. Chéloniens" (128 pp. by Patrick David) will appear by the end of 1993. Subsequent volumes will cover all reptiles. Each volume in this series of checklists contains: 1) a list of all taxa (species and subspecies) currently recognized as valid within the group covered, by scientific name (with author and date) and English and French common names; 2) a list of selected references for each taxon to direct the reader to the major references; 3) a bibliography for all publications mentioned and a full citation for each publication.

The turtle volume may be purchased for $26 (individuals) and $52 (institutions) from the *AALRAM c/o Patricia B. Zug, Division of Amphibians & Reptiles/mrc 162, National Museum of Natural History, Washington, DC 20560.* Please make checks payable to ALLRAM. Subsequent volumes of *Dumerilia* will be offered at a discounted prepublication price.

Vial Retires As DAPTF Coordinator

Dr. James L. Vial, IUCN/SSC Declining Amphibian Populations Task Force Coordinator since its inception in 1991, has announced his retirement effective 31 December 1993. From a start-up working group of 12 persons, the Task Force now numbers over 1200 collaborators in 91 countries or regions.

The herpetological community is indebted to Jim Vial for his efforts in developing the DAPTF program and helping to establish numerous working groups. Persons interested in obtaining additional information about the DAPTF or its newsletter, *Froglog*, should contact: *Coordinator, DAPTF, EPA Environmental Research Laboratory, 200 SW 35th Street, Corvallis, Oregon 97333, USA. Tel. (503) 754-4798.*

New Turtle Journal

The inaugural issue of *Chelonian Conservation and Biology*, the new scientific Journal of the IUCN/SSC Tortoise and Freshwater Turtle Specialist Group and International Bulletin of Chelonian Research, was published in November, 1993. The journal is published by Chelonian Research Foundation with support from Conservation International, Chelonia Institute, NYZS/The Wildlife Conservation Society, Florida Audubon Society, and IUCN (The World Conservation Union) - Species Survival Commission. The journal is co-edited by John L. Behler, Peter C.H. Pritchard, and Anders G.J. Rhodin, with the Editorial Review Board comprising several well-known turtle biologists and conservationists: Indraneil Das, C. Kenneth Dodd, Jr., Arthur Georges, J. Whitfield Gibbons, John B. Iverson, Michael W. Klemens, Jeffrey E. Lovich, Russell A. Mittermeier, Edward O. Moll, David J. Morafka, Ian R. Swingland, Bern W. Tryon, and George R. Zug.

Manuscripts are welcome from any individuals, and are not limited to members of the Specialist Group. Manuscripts may cover any aspects of turtle and tortoise research with an emphasis on conservation or biology. Studies on freshwater turtles and tortoises are of primary interest, but articles on marine turtles are also welcome. Manuscripts dealing with conservation biology, systematic relationships, chelonian diversity, geographic distribution, natural history, ecology, reproduction, morphology and natural variation, population status, and human exploitation or conservation management issues are of special interest. Either full-length original research articles or shorter notes and field reports are welcome. English translations of foreign language articles are potentially of interest. Newsnotes and announcements of interest to the turtle conservation and research community are also welcome. All manuscripts will be submitted for review by the Editorial Staff and selected members of the Editorial Review Board, as well as independent outside peer-review as necessary. Manuscripts should be submitted in triplicate to A.G.J. Rhodin at the address below, preferably accompanied by a computer disk in either Macintosh or IBM format.

Subscription rates are for a full volume of four published issues, with two issues planned per year. Subscription rates are US$ 25 for individuals and US$ 50 for institutions, with a US$ 20 surcharge for Air Mail to foreign addresses. Make checks or money orders payable to Chelonian Research Foundation and remit to: *Anders G.J. Rhodin, Chelonian Research Foundation, 168 Goodrich Street, Lunenburg, Massachusetts 01462, USA.*

Gopher Tortoise Council Research Award

In honor of his numerous contributions to the biology of the gopher tortoise and its sandhill community, the Gopher Tortoise Council has named its student research award the J. Larry Landers Student Research Award. Those wishing to contribute to the fund should send their contributions to Brian Bearwood, Treasurer, Gopher Tortoise Council, P.O. Box 13, Mariana, Florida 32447, USA.

The J. Larry Landers Student Research Award is presented annually to the best student research project concerning the biology of the gopher tortoise, *Gopherus polyphemus*, or any aspects of its sandhill community. Recent awards have averaged $400. Deadline for receipt of proposals to be considered for the 1994 award is 31 August 1994. Students interested in applying should submit a concise description of their project with a detailed budget and a brief curriculum vita to: *Bob Herrington, Research Advisory Committee, Department of Biology, Georgia Southwestern College, Americus, Georgia 31709, USA.*

Summer Course In Larval Amphibian Biology

The Highlands Biological Station, located in the Blue Ridge Mountains of southwestern North Carolina, is offering a course in Larval Amphibian Biology, to be taught by Dr. Richard J. Wassersug of Dalhousie University and guest instructors. This is a lecture, laboratory, and field course addressing a variety of topics on the biology of amphibian larvae. Among the topics to be covered are: the identification of local larvae, the evolution of complex life cycles and metamorphosis, and the feeding behavior of tadpoles and salamander larvae. Assorted aspects of the morphology, ecology, behavior, and population genetics of amphibian larvae that reflect the special interests and expertise of the instructors will be emphasized. Students will conduct individual projects of their own design and execution. Course dates are 6–17 June 1994.

The course is designed for advanced undergraduate and graduate students. Course credit is available from either Western Carolina University or the University of North Carolina at Chapel Hill. For further information and application form contact: *Highlands Biological Station, P.O. Box 580, Highlands, North Carolina 28741, USA. Tel. (704) 526-2602.*

Summer Course In Tropical Diversity

The Organization for Tropical Studies (OTS) will be offering *Tropical Diversity and Conservation* in Costa Rica, 1–23 August 1994. This course is designed to be an intensive, field-oriented introduction to tropical diversity in rainforest, seasonally dry forest, and cloud forest ecosystems. The program consists of orientation walks, faculty-led field research projects, discussions, and lectures. The course will be held in Costa Rica at the OTS-operated field stations in lowland rainforest (La Selva) and seasonally dry forest (Palo Verde), and at a mid-elevation site, Volcán Cacao, in Guanacaste National Park. After one day of orientation and introductory lectures in San José, the class will operate entirely in the field spending one week at each site. The coordinator is Dr. Maureen Donnelly, University of Miami. Enrollment is limited to 22 persons. Past participants have ranged from advanced undergraduates to established biology faculty seeking an introduction to tropical biology. The application deadline is 15 April 1994, with selection announcements to be made by 15 May 1994. For further information, including costs and other admission criteria, or to apply, contact: *Organization for Tropical Studies, Box 90630, Durham, North Carolina 27708-0630, USA. Tel. (919) 684-5774, Fax (919) 684-5661.*

MEETINGS

Aquatic Fauna In Peril: The Southeastern Perspective

The Tennessee Aquarium is sponsoring a conference to be held 31 March–1 April 1994 in Chattanooga, Tennessee. The purpose of this two-day meeting is to focus on the problems facing the imperiled aquatic fauna of the southeastern United States. It will provide a thorough historical review of the imperiled aquatic animals of the Southeast as well as a review of the management efforts aimed at conserving and restoring these faunas. Presentations will also address the management of aquatic ecosystems in the Southeast, the roles of government and the public in aquatic conservation, and the formulation of a unified practice of resource management. Sessions are scheduled that specifically address imperiled amphibians and reptiles and their management. For further information contact: *Tennessee Aquarium, Attn. Janet Allen, P.O. Box 11048, Chattanooga, Tennessee 37401, USA. Tel. (800) 262–0695; FAX (615) 267–3561.*

17th Annual AFHC

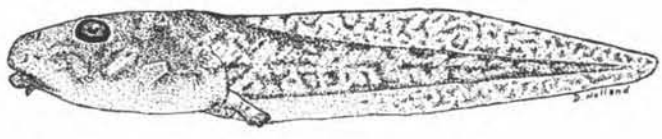
The All Florida Herpetology Conference will be held 9 April 1994 at the University of Florida in Gainesville. The Florida Museum of Natural History and Gainesville Herpetological Society are co-sponsors. Morning talks are devoted to conservation and natural history, with afternoon talks concerning captive breeding of amphibians and reptiles. Two disease prevention workshops, as well as a young herpetologists' workshop, wil be held concurrently. "Maintaining Collection Security" will be the topic of the late afternoon talks and panel discussion. An evening barbecue will be held at the museum. To pre-register, call or write to *Dr. David L. Auth, Division of Herpetology, Florida Museum of Natural History, University of Florida, Gainesville, Florida 32611, USA. Tel. (904) 392-1721.*

Wildlife Water Development Symposium

The Water for Wildlife Foundation is sponsoring the second Wildlife Water Development Symposium to be held at the University of Wyoming, 27–29 April 1994. The primary focus of the workshop will be to provide a forum for discussion and presentation of work and ideas regarding the state of the art of wildlife water developments. Topics to be covered in the workshop will include: Recent Developments in the Field of Wildlife Water Development; Developing Low Maintenance Water for Wildlife; Developing Wetlands and Riparian Areas to Provide Water to Wildlife; Management of Water Developments for Wildlife; Maximizing Multiple Use Options; Optimizing Habitat Values in Association with Water Developments; Utilizing Produced Water from Industry and Agriculture for Water Developments for Wildlife. For further information contact: *Susan Powell, School of Extended Studies & Public Service, University of Wyoming, P.O. Box 3972, Laramie, Wyoming 82071-3972, USA. Tel. (800) 448–7801.*

Herpetology Weekend

The U.S. Forest Service, Kentucky State Parks, and Kentucky Department of Fish & Wildlife Resources are sponsoring a Herpetology Weekend, 8–10 April 1994 at Natural Bridge State Park in Slade, Kentucky. Presentations will be made by Jim Harrison (Miami Valley Serpentarium), Dave Dennis (Ohio State University), and Sherman Minton (Indiana University). Activities will include field trips, night hikes, photo opportunities, and a tour of the Miami Valley Serpentarium. Programs start at 8:00 p.m. on Friday, 8 April at the Activities Center at Natural Bridge State Resort Park. For additional information contact: *Natural Bridge State Park, tel. (606) 663-2214 or (800) 325-1710, or the Stanton Ranger District, tel. (606) 663-2852.*



IN MEMORIAM

Howard Kirke Swann (1919–1993) Bookseller Extraordinaire

Wheldon and Wesley Ltd., the largest dealer specializing in natural history books, celebrated its 150th anniversary in 1990. The company has had a longstanding and well-deserved reputation for integrity and service to an international clientele, a stature that was personified by the company's chairman, H. K. Swann, who died at the age of 74 on 27 October 1993. Howard was known to several generations of herpetologists throughout the world for his careful attention to their library-building needs and he was a generous host to those who visited Wheldon and Wesley's establishment, which since 1957 has been located in the rolling English countryside north of London, almost halfway to Cambridge. Besides bookselling, Howard was involved in book publishing, including reprints of scarce classical works such as Boulenger's British Museum catalogues, the herpetological volume in Anderson's "Zoology of Egypt" series, and Jan and Sordelli's great atlas of snake illustrations. Howard was also the editor for the revised edition of Pitman's "Snakes of Uganda," which was published by Wheldon and Wesley in 1974.

Howard had a boyhood interest in natural history, particularly birds, and although he qualified for entry at Oxford to read classics, he soon entered the army, was captured by German troops shortly before Dunkirk, and spent five years as a prisoner of war. The latter gave him the opportunity to learn German well; indeed, he had a particular facility with foreign languages, including Japanese which he decided to learn quite late in life. After the war, together with his older brother, C. K. Swann, he joined Wheldon and Wesley, a firm that their father had entered in 1904. Howard's amateur interest in natural history was a convenient entrée to the company's line of business and he maintained that interest throughout his life. Among other posts, he held offices in the Hawk and Owl Trust and the Society for the History of Natural History.

Howard's knowledge of books and authors was encyclopedic. Searching through the company's storerooms I often found interesting but incomplete fragments of books—often just a few pages or plates—for which Howard invariably knew all the details about author and title at a moment's glance (and which I could then check later against complete copies). On other occasions I appealed to Howard for help in completing the new introductions to volumes in the SSAR *Facsimile Reprints in Herpetology* series or for biographies in the book "Contributions to the History of Herpetology." Sometimes this involved obscure bibliographic details that are simply unavailable in any existing reference books. Howard's replies were always prompt (he relished the challenge) and often were accompanied by relevant original material that he ferreted out of the enormous accumulated stocks at Wheldon and Wesley's. This scholarly interest in the business is unusual in booksellers today and, together with his friendly nature, will be greatly missed by me and the many others who were privileged to know him.

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ARTICLES

Body Color Polymorphism In The Snake *Trimeresurus flavoviridis* On Okinawa Island, Japan

Some snake species show intrapopulation variation in pattern type or body color, but there are few studies that describe color frequencies (Camin and Ehrlich 1958; King 1987) or that analyze the mechanisms of color determination (Zweifel 1981). On Okinawa Island, the habu, *Trimeresurus flavoviridis* (Viperidae), exhibits a polymorphism in dorsal body color (Takara 1962). Most have a yellow ground color, although a few are white. In this paper we quantify the frequencies of the two morphs in mother/offspring groups and present evidence on the mechanism of color determination.

Two-hundred forty hatchlings and 67 full-term embryos were obtained from eggs laid by 55 females collected on Okinawa Island from 1981 to 1992. The eggs of most hatchlings were incubated at a fluctuating temperature in individual containers. The snakes were classified as yellow or white, with the exception of three adults that were intermediate in color.

Yellow individuals were most common: 49 of 55 adults (89%) were yellow, three adults (5.5%) were intermediate, and three adults (5.5%) were white. We obtained no clutches containing only white offspring. Five clutches included both white and yellow young; 49 clutches included only yellow progeny; and the single yellow offspring of a white female could have represented either condition (and is excluded from further consideration). There appeared to be an association between maternal and offspring color: 47 of 49 clutches (96%) of yellow mothers were all yellow, as were 2 of 3 clutches (67%) of intermediate mothers, and 0 of 2 clutches of white mothers. The other five clutches included both white and yellow offspring, with approximately equal numbers of each color in each clutch (Table 1).

TABLE 1. Composition of clutches containing both white and yellow offspring.

Maternal color	Clutch size*	Number of Individuals	
		Yellow	White
Yellow	7	4	3
Yellow	5	2	3
Intermediate	9	4	5
White	9	3	6
White	5**	2	2
Total	35	15	19

* Number of fertilized eggs.
** One embryo died early in development.

TABLE 2. Observed and expected color frequencies in the progeny under two hypotheses of genotypic color determination.

Condition	Frequency	Observed (%)	Hypothesized Dominant	
			White Expected (%)	Yellow Expected (%)
Yellow mother: mixed clutches/ all clutches	2/49	4.1	5.8	17.9**
white hatchlings/ all hatchlings in mixed clutches	6/12	50.0	50.7	28.4*
White mother: mixed clutches/ all clutches	2/2	100.0	100.0	42.8*
white hatchlings/ all hatchlings in mixed clutches	8/13	61.5	54.0	56.8

* $P = 0.1$;
** $P < 0.05$ (Fisher's exact test); other expected frequencies were not significantly different from the observed ($P > 0.1$).

The frequency of white individuals in the maternal generation was 5.8% (excluding intermediates from the sample). If body color is determined genotypically at a single locus, and the white allele is dominant, the white allele frequency in the maternal sample would have been about 2.9% (half the alleles in the white mothers). If body color is genotypically determined at a single locus, but the white allele is recessive, the frequency of the white allele would have been about 24% (all alleles in white specimens and half of the alleles in presumed heterozygotes). The observed color frequencies in the progeny closely conform to the values expected under the dominant white allele model (Table 2). Thus, ground color in *T. flavoviridis* in Okinawa may be determined by a single locus, with a relatively rare (about 3%) dominant white allele.

Acknowledgments.—We thank many persons for collecting gravid females, Akira Nakachi for help with the literature, Hitoshi Shiroma for comments on a draft, and Gordon Rodda and Richard A. Seigel for improving the manuscript.

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POINTS OF VIEW

Iguanians And The Cladistic Party Line

Frost and Etheridge (1993) have mistaken what is "the most controversial aspect of cladistics," or at least the most important difference between cladistics and evolutionary systematics. That aspect or difference is in how we perceive and understand relationship. For Hennig (1950), relationship was absolutely and unequivocally nothing more than the inverse of relative lineage age: time, and time alone, distances relationship. Thus, if one can construct a dendrogram of the temporal sequence of lineage branching events, that would—for Hennig and the cladists—be a precise picture of relationship. Hennig's "relationship" is a property of organismal lineages precisely equal to the inverse of lineage age.

For the evolutionary systematist, relationship is ever-so-much more complex. We hope for a system that codifies evolution, and we immediately see that evolutionary rates and roles are enormously variable in time. I would go so far as to say that no two lineages evolve at the same rate during any given period of time, and that no single lineage evolves at the same rate during all of its earthly tenure.

Thus, while an accurate dendrogram of the temporal sequence of branching events would be a very useful component of relationship assessment, it could never—for the evolutionary systematist—be the whole picture.

The origin of higher taxa is a problem for all systematists. All valid genera, for example, must originate as single species. During their tenure in monotypy, then, novel genera do enjoy the same objective reality as other biological species. As soon as a genus becomes polytypic, however, it becomes an abstraction: a word, not a thing.

The cladistic form of taxon definition, "*Novogenus* consists of *N. primus* and all of its descendents," confronts all systematists (not just cladists) with the uncomfortable fact that *Novogenus primus* was, in very real and meaningful ways, more closely related to its immediate ancestors in *Oldogenus*, and probably some other species in *Oldogenus*, than it is or will be to some of its descendents. The cladistic solution is to elevate every member of *Oldogenus* to the rank of an independent, new genus at the instant any one of them becomes differentiated enough to merit such status.

How does this inform us of relationships? How is the relationship of species A to species B altered by evolutionary events—no matter how major—in independent lineage C?

Cladistic methodology is no more objective than that of qualified, educated, evolutionary systematists. The cladist selects characters subjectively, decrees their polarity subjectively, and subjectively assigns them weight or value (most irrationally when all are decreed precisely equal).

Frost and Etheridge (1993) state that "leading systematists" cleave to the cladistic party line. Maybe so, but that begs many questions: leading in what sense? Number of new names coined for old taxa? Number of pages published divided by number of new facts presented (ah, but division by zero is impossible). Whom do they lead? Where do the followers get led to in terms of understanding evolution?

I love cladograms. I think they are sometimes a great help in trying to understand relationships. I often, however, suspect they are far more invented than "recovered." I note that different sets of characters almost invariably produce different cladograms (because different sorts of characters evolve at different rates within and between lineages, of course). I acknowledge that,

given X different cladograms for a group, X-1 of them *Have to be wrong*. I question that making consensus cladograms out of X-1 certainly wrong trees and maybe one right one has much to do with science or reality. . . .

What has all this to do with the Iguania? Practically nothing. Frost and Etheridge did not produce an unequivocal, compelling iguanian cladogram. The characters they used were mostly just modal differences or features demonstrably plastic and variable. Even if the groups they proposed really were based on a correct understanding of the temporal sequence of events, that would not necessitate giving them formal nomenclatural status as families.

Chaos has been generated and, sadly, will long reign.

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In Response To Bringsøe On The Inclusion Of *Dendrobates* And *Phyllobates* In Appendix II Of CITES

Bringsøe (1992) described what he viewed as the total lack of logic behind adopting all members of the genera *Dendrobates* and *Phyllobates* into CITES Appendix II. He argued that this is "unjustified" and it "impugns the reputation of the Convention." He continued to state that the only possible course of action to correct this embarrassing issue was to remove both genera from CITES immediately arguing that no species of Dendrobatidae is considered threatened or endangered.

Arguing for the removal of any taxon from CITES II because there are no threatened populations is entirely circular. CITES II taxa are defined as "all species which although not necessarily now threatened with extinction may become so unless trade in specimens of such species is subject to strict regulation in order to avoid utilization incompatible with their survival" and "other species which must be subject to regulation in order that trade in specimens of certain species . . . may be brought under effective control." CITES I is for taxa that are presently endangered or threatened.

Bringsøe argues that inclusion of the entire genus into Appendix II is unnecessary as most species can be readily recognized and confusion should be rare. Although I have little experience with specimens of *Dendrobates* and *Phyllobates* in captivity, I have dealt with many different species of Boidae, *Iguana, Phelsuma, Cordylus, Varanus*, and Chamaeleonidae, all of which are protected under CITES Appendix II and most of which can be readily distinguished from congeners. The only exception noted for these taxa is that some species are CITES I; again, those taxa are readily recognized. Nevertheless, their trade is regulated under Appendix II to help curtail endangerment of species in the future. Yet, they are still imported as are *Dendrobates* and *Phyllobates*. It seems to be customary for CITES to list a higher taxon, such as an entire genus, under Appendix II if there is a high demand for trade in members of that taxon, such as *Phelsuma* in the pet trade, or *Varanus* in the skin trade. To insist upon the removal of any taxon from Appendix II when there is a clear trade market for that taxon is questionable. Bringsøe points out that dendrobatids are locally quite abundant in parts of the New World tropics. Yet it seems that the removal of any taxon from CITES II on the basis of local abundance is shortsighted. While no dendrobatid is currently listed as endangered or threatened, the habitat in which they occur could easily be listed as such and continued trade could put unnecessary pressure on those populations.

Bringsøe points out there is no evidence of range contractions in historic times for dendrobatids. However, in recent years *Dendrobates* have increased in popularity in the live animal trade (Bertram 1989). This increase in trade has almost certainly created a new pressure for existing populations. Therefore, the lack of evidence of range contraction in historic times seems to be a moot point. The question is, could trade lead to range contractions in the future?

Lastly, Bringsøe states that Charles Myers (American Museum of Natural History) collected 7600 *Dendrobates histrionicus* from a single population over a four-year period with no detrimental effects seen in the population. Bringsøe uses this study as an example of the resilience of dendrobatids. Furthermore, he states that the number of specimens Myers collected greatly exceeds the number of *Dendrobates* imported into the U.S. during 1985. However, the data are not available to support this claim. *Dendrobates* and *Phyllobates* were not listed on CITES until 22 October 1987. Therefore, the exact number of dart frogs imported during 1985 is not known by the U.S. Fish and Wildlife Service Office of Management Authority. Nevertheless, since these genera were listed, the number of live individuals imported has steadily increased with a peak of 1405 individuals in 1989 (55 of which were captive born in the Netherlands). Between 1987 and 1991 a total of 2372 (95 captive born) individual dendrobatids were legally imported. Whether the number imported in 1985 was less than 7600 cannot be verified. Having the family listed under CITES has at least made determining the number of specimens imported annually a simplified matter.

In short, I see nothing wrong with listing all species of *Dendrobates* and *Phyllobates* in CITES Appendix II so long as there continues to be a demand for them in the live animal trade. If such a time should come when they are no longer in demand, then perhaps a reduction in CITES status would be warranted. However, at present, removing *Dendrobates* and *Phyllobates* from CITES Appendix II would be counter-productive.

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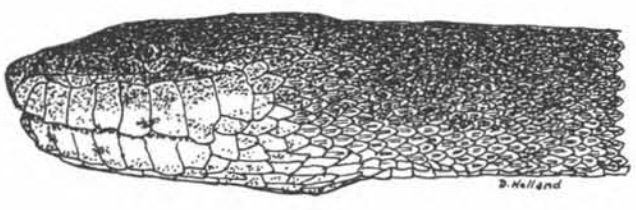

TECHNIQUES

Nonlethal Blood And Muscle Tissue Collection From Redbelly Turtles For Genetic Studies

There is increased interest in the development of nonlethal procedures for collecting blood and muscle tissue samples from fish and wildlife populations for genetic studies, particularly for endangered species (Smith et al. 1976). A variety of nonlethal blood collection techniques have been described for turtles (see Dessauer 1970; Frye 1991), ranging from relatively invasive cardiac puncture (Maxell 1979; Stephens and Creekmore 1982) to less invasive venapuncture of surface veins such as jugular (Jacobson et al. 1992), scapular (Avery and Vitt 1984), ventral caudal (Powell and Knesel 1992), and dorsal coccygeal (Samour et al. 1984). Collection techniques for muscle and other tissue samples from turtles range from killing the animal to taking samples from toe and tail clips. Because of their unique anatomy, turtles present challenges in both sample collection and restraint. Unlike birds and mammals, visualizing and stabilizing surface veins of turtles is difficult. It also often requires two handlers to collect a blood sample and/or mechanical restraint devices (Powell and Knesel 1992). While these techniques work well in laboratory or clinical situations, they are sometimes difficult to apply under field conditions, particularly when only one researcher is available. We present an alternate restraint technique that is easily used in the field and requires only one individual to both restrain the turtle and collect samples. We also discuss collecting blood from the dorsal coccygeal vein at a specific location, and a standard surgical procedure for taking muscle biopsies. These techniques were developed on redbelly turtles (*Pseudemys rubriventris*), but should be applicable to other freshwater turtle species.

Restraint.—To restrain redbelly turtles, we used four small rags (or paper towels) and one standard sized bath towel. Small rags were rolled into balls and placed into the cavities formed behind each leg when they are in complete flexion (i.e., withdrawn into the shell); rags were slightly larger than the size of the cavity. The pressure provided by these rags replaced digital pressure that would ordinarily be supplied by a second handler. We loosely wrapped the bath towel around the front half of the turtle to prevent visual stimulus, leaving the back half exposed. Both techniques resulted in passivity. To have both hands free to collect blood and muscle tissue samples, we placed the turtle between our legs with its head facing downward and carapace directed away from the handler's body. The turtle's head was then forced into its shell by gently placing it against a hard surface, such as the ground. With the turtle firmly grasped between our legs in this manner, both hands were left free—one to hold the tail and one to collect the samples.

Blood Collection.—After restraining the turtle, we collected blood by firmly grasping the turtle's tail with a gauze sponge for traction, pulling the tail out in straight-line extension, and flexing it over the plastron at a 90° angle. With the tail in this position, the turtle offered little resistence. We then collected a 1–3 ml blood sample from the dorsal coccygeal vein directly into syringes that were coated with sodium heparin (USP 1000 units/ml; ELKINS-SINN, INC.); however, lithium heparin is currently the recommended anticoagulant for reptiles (Jacobson et al. 1992). For small (<100 mm greater carapace length) turtles (N=60) we used a 1 ml syringe with a beveled 23 or 25 gauge needle; for large (>100 mm greater carapace length) turtles (N=140) we used a 3 ml syringe with a 21 gauge beveled needle. When a 3 ml syringe was used on small turtles, too much suction was created and the vein collapsed.

We discovered certain landmarks and positions that facilitated locating the dorsal coccygeal vein. First, the needle was inserted slightly to the right (or left) of the spinous process of the first or second caudal vertebrae at a 45° angle. Second, the tail must be fully extended before flexing it over the plastron and the vertebral spinous processes should be symmetrical. Finally, the needle should just touch the spinous process and then be backed off very slightly. Once blood appears, gentle suction that mimics the pulsating flow of the venous sinus should be applied for the duration of blood collection.

Muscle Plug Collection.—Before taking the muscle biopsy, we always instituted a local anesthetic nerve block at a site about 2 cm distal to the base of the tail midway between the spinous and transverse vertebral processes. Approximately 0.03 ml of a 0.1% lidocaine HCl solution (Burns Vet. Supply, Oakland, California) was injected into the muscle at five places to form a circle around the biopsy site. We tested whether anesthesia was present by pinching the site with forceps; if the turtle reacted, we injected additional lidocaine.

We followed standard aseptic surgical techniques (Knescht et al. 1981) by scrubbing the tail with betadine scrub and then liberally applying betadine solution (Purdue Frederick Co., Norwalk, Connecticut), followed by ethyl alcohol. The skin was picked up with forceps, and a longitudinal 1 cm incision was made through the skin using straight-straight scissors. The exposed flexor caudae lateralis muscle was then lifted up with the forceps, and a 1–2 mm longitudinal wedge was cut. After taking the muscle sample, the biopsy site was lavaged with 10% betadine solution and the skin sutured with 4-0 monofilament nylon (ETHICON) in an interupted pattern (Knescht et al. 1981). This standard surgical technique offers a safer approach than using a scalpel by reducing the possibility of cutting the muscle too deeply or severing a blood vessel.

After sample collection, all turtles were returned to their respective ponds of capture with the exception of turtles that were biopsied. These turtles were held overnight to ensure no systemic anesthetic effects before release.

We collected 200 blood and 40 muscle tissue samples from Massachusetts and New Jersey redbelly turtles for genetic studies during June and August, 1991. We observed no mortalities as a result of sample collection. Further, in August we recaptured two New Jersey turtles that had biopsies taken in June; both turtles' incision sites were completely healed with no observable signs of infection. Currently, we are using these same techniques to collect samples from spotted turtles (*Clemmys guttata*) for genetic studies.

Acknowledgments.—We are grateful to T. and A. Graham in Massachusetts, and A. Rich and A. Blades in New Jersey for their assistance with redbelly turtle field collections. This work was supported by U.S. Fish and Wildlife Service contract 50181-5236 and by the Massachusetts Division of Fisheries and Wildlife through the Biodiversity Conservation Program in the Department of Forestry and Wildlife Management, University of Massachusetts, Amherst.

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Suggestions For Handling Museum Specimens Of *Phrynosoma* (Iguania, Phrynosomatidae)

Horned lizards, genus *Phrynosoma*, are among the most unusual of desert lizards because of their peculiar squat habitus and spiny armament. The cephalic horns vary in number, size, and orientation among several species, and therefore are diagnostically important. Also, geographic variation in horn size is apparent among populations of some species (e.g., *Phrynosoma douglasi*). Further studies of the cephalic horns of these lizards may reveal interesting information about ontogenetic and clinal (altitudinal and latitudinal) patterns of variation.

Museum specimens of horned lizards have been utilized extensively for systematic and ecological studies over the past few decades. Inevitably, preserved specimens have sustained some damage during handling. The tips of the occipital and temporal horns are especially susceptible to breakage when a specimen is placed (ventral side up) on the hard surface of a laboratory table during dissection or to take measurements. In a sample of 158 specimens known to have been used in previous studies, 71 (45%) sustained damage to the horns. The damage was more severe in specimens which had been dissected compared to those which had not. Unfortunately, such damage renders the specimen less useful (or useless) for studies of ontogenetic, geographic, and clinal variation in the length of the cephalic horns. I offer several suggestions to minimize the damage to *Phrynosoma* specimens during study and routine handling for packing and shipping.

A specimen selected for dissection, measurement, or study of the ventral squamation should be placed on a small Styrofoam platform (Fig. 1). The horns of the specimen will pierce the Styrofoam and the platform will support the specimen without damage to the horns. In order to be effective, however, the thickness of the Styrofoam must exceed the length of the horns. The most problematic species are large *Phrynosoma asio* and *P. cornutum* because their horns are quite long and have an upright orientation. In any case, I have found that a thickness of 17 mm (11/16 inch) is more than adequate for even the largest horned lizard. I routinely use a platform when taking measurements or studying preserved specimens under a dissecting microscope. A shallow, covered tray containing alcohol can be used to periodically moisten specimens during study. Live horned lizards used for simple surgical procedures in the laboratory, or field collected for taking snout-vent and tail length measurements, can also be placed on Styrofoam. I have found this material to be safe and effective during restraint of the lizard. A Styrofoam platform can be fashioned from the walls of a Styrofoam cooler, or obtained from insulated shipping containers. The latter often have square or rectangular pieces of suitable size.

Museum specimens packed for shipment are typically wrapped in cheesecloth, rolled, soaked in alcohol, and placed in plastic bags. Damage to the specimens during this process can be minimized by laying the specimens ventral side down on the cheesecloth. When the specimens are rolled into a bundle on the table top, the horns of the lizards will face inward and are less likely to contact the hard surface of the table, thereby avoiding potential damage. A series of specimens rolled in such a manner is also less likely to puncture the plastic bag and cause leakage of alcohol. Specimens of similar size should be bundled together as this will more effectively protect the horns than if specimens of mixed sizes are wrapped together.

Finally, the horns of preserved *Phrynosoma* can be damaged when the specimens are removed and returned to museum storage jars. They should, accordingly, be removed and replaced with care. Specimens which are situated against the glass sides of the jar are more susceptible to damage than those in the center. They should be oriented so that the ventral surface, rather than the spiny dorsal surface, is against the glass.

FIG. 1. A Styrofoam platform (19.5 x 19.5 x 1.7 cm) used to support *Phrynosoma* specimens during morphological study. Photograph courtesy of David H. Lewis.

Specimens in museum collections are an important resource for scientific research and public education. Museum specimens are becoming increasingly difficult to replace as more biological populations are lost through habitat destruction, and the enactment of protective legislation restricts the further collecting of threatened and endangered taxa. These considerations should be kept in mind when borrowing specimens for study.

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An "Easy" Method To Remove Common Snapping Turtles (*Chelydra serpentina*) From Legler Hoop Traps

The Legler hoop trap (Legler 1960) is widely used to trap aquatic turtles. This trap and modifications of it utilize narrow openings ("throats") that can be fixed in size by tying off the throat loop which allows standardization of trap throat size. Once set, the throats cannot be easily untied to remove turtles. Consequently, turtles can only be removed by pulling them back through the narrow throat opening. With turtles of the genera *Chrysemys, Trachemys, Kinosternon*, etc., this is a simple task. However, clearing a trap can become difficult, dangerous, and time consuming with large specimens of the common snapping turtle (*Chelydra serpentina*). These large turtles defend themselves with alacrity and strike at any moving object, including the researcher or other turtles inside the trap at the time. A single bite can cause death or serious injury to smaller turtles caught along with the *C. serpentina*.

During the 1992 field season, I had much practice removing these animals from Legler hoop traps and a method evolved which made this task much easier and safer to accomplish. I have not seen this method in use anywhere else nor have I seen it described in the literature. Because this method makes removing *C. serpentina* from traps quicker, easier, and safer for the researcher and the other occupants of the trap it is described here.

After recovering and collapsing the hoop trap, it should be placed so that one of the throats is on the substrate and the other is on top of the resulting pile of hoops and turtles. The researcher then reaches through the upper throat and grasps the tail and posterior edge of the carapace of the first *C. serpentina* to be removed. The turtle is then upended with the head of the turtle down and with the plastron facing the researcher. With the turtle in this vertical orientation, it should be slowly pressed down upon the substrate (the ground if ashore, the bottom if in shallow water, or the deck if in a boat). In this manner, the head of the turtle is forced to withdraw into the carapace. Once the anterior part of the shell is flush with the substrate, the hind limbs of the turtle should be grasped with one hand so that the claws of each foot face one another. The researcher's other hand can then easily work the throat over the back of the carapace and down to the anterior portion of the carapace until all but the anteriormost part of the carapace is free of the netting. At this point, the turtle with the plastron facing the researcher is lifted free of the substrate. Because the turtle extends its head and neck out and towards the researcher at this point, the turtle is completely freed of the net except for the forelimbs. These can then be shaken loose from the netting. If more than one *C. serpentina* is in the trap, the carapace of the individual being removed should be rotated so that the carapace faces any other *C. serpentina* in the trap. Not only does this shield the researcher from the attentions of other *C. serpentina* but it protects the individual being removed from injuries inflicted by strikes of the other *C. serpentina* in the trap. Using this method, *C. serpentina* can be rapidly removed from traps with little risk of injury to the researcher or to the other turtles in the trap.

Acknowledgements.—I thank L. E. Brown for discussing the value of the method with me and D. Moll for reading a copy of the manuscript.

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Tracking Small Animals With Thread Bobbins

Identifying the specific pathways of animal movements may be useful when trying to determine microhabitat and resource use (Dodd 1992), behavioral responses to habitat structure, and/or nesting sites of secretive animals. A technique that has been used to follow the direct routes taken by animals in the field is the spool-and-line tracking method (e.g., Broughton and Dickman 1991; Miles et al. 1981). Previously, this technique incorporated a rotating spool of thread that was attached to the animal on a trailing device which allowed the spool to unwind as the animal moved (Miles 1976). The method was improved by using a quilting cocoon of thread (cocoon bobbins) which allowed the thread to unwind from the center of the spool rather than rotate off the outside of the spool (Miles et al. 1981). Researchers using spool-and-line tracking enclose the thread bobbins in some type of container, such as plastic tubing. This type of encapsulation of the thread bobbin adds considerable weight and bulk which may overburden or hinder free movement of small animals. Also, it has been difficult to find a readily available source for obtaining the bobbins in the U.S.

Here, I provide the address of a U.S. company that currently manufactures thread bobbins and information on a quick and easy method of encapsulating them that adds very little weight or bulk. Bobbins can be purchased from Culver Textiles, P.O. Box 360, West New York, New Jersey 07093, USA (tel. 800-526-7188 or 201-866-6200 in New Jersey). Currently, two sizes of thread bobbins are available from Culver Textiles: a small bobbin that is 4 cm long and 1 cm wide and weighs approximately 1.8 g uncoated and 2.3 g coated; and a large bobbin that is 5 cm long and 1.5 cm wide and weighs approximately 4.5 g uncoated and 5.3 g coated. I encapsulate the thread bobbins in the following way: (1) I pull about a meter of thread from the center of the bobbin to ensure that the thread line is free-moving. (2) I wrap the bobbin in clear plastic wrap (e.g., Saran Wrap™), twist it at the bottom of the bobbin, and tape it to the side of the bobbin (Fig. 1). (3) Using forceps, I hold the protruding plastic wrap from the thread end of the bobbin and dip the bobbin in plastic dip (Plasti Dip™, used for dipping tools, is available in several colors in most local hardware stores). (4) I place the coated bobbin on a piece of waxed paper and allow it to dry. The flat surface that is formed while the bobbin is drying facilitates attachment of the bobbin to the animal (especially turtles). I have used this technique successfully in tracking striped mud turtles, *Kinosternon baurii*, to their nesting sites.

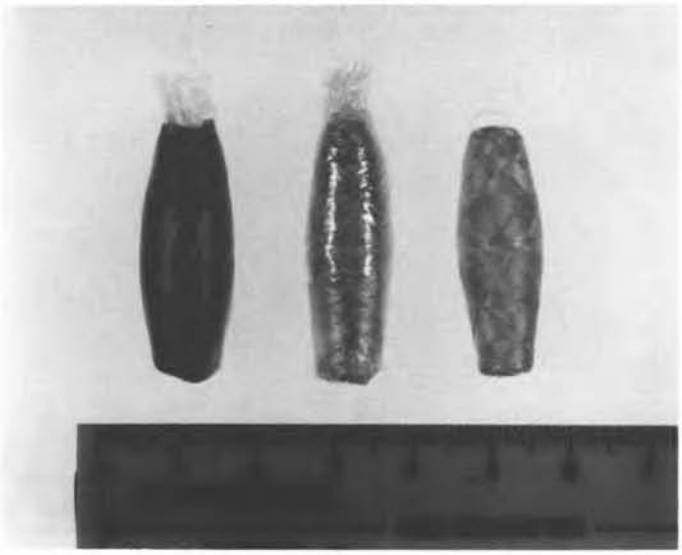

FIG. 1. Cocoon bobbin: plain (right), wrapped, and dipped.

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A Method For The Restraint And Transport Of Crocodilians

Devices for restraining and transporting crocodilians include cargo netting, ropes, squeeze cages, and planks to which the animals are tied (Fowler 1978). None of these devices are without drawbacks in working with American alligators (*Alligator mississippiensis*) in the wild. Our specific concerns are to reduce further stress to an animal after the stress of capture, protect it from the direct heat of the sun, keep it immobile to prevent injury to the animal or its handlers, and allow for ease of collecting data (e.g., taking measurements, ascertaining sex, attaching tags, collecting blood from the cervical or caudal regions). A technique was developed to address these concerns that is similar in concept to the method developed by Murphy (1971) for restraining snakes within acrylic tubing.

We utilized a white PVC pipe (50 pound plastic irrigation pipe) to contain the alligator and ropes to secure and maneuver the anterior and posterior portions of the body. The pipe had an inside diameter of 0.31 m, a wall thickness of 0.32 cm, and was cut to 3.0 m in length. Holes of a diameter sufficient to allow the passage of a rope without binding were drilled along the length of the pipe at intervals of 15.2 cm. The dimensions given for the pipe are suitable for adult American alligators up to 3.0 m in total length and other similarly-sized crocodilians. If smaller species/individuals are to be dealt with, a smaller size diameter and length of pipe would be desirable to increase maneuverability and reduce the space surrounding the animal while it is in the pipe. Conversely, with extremely large individuals, a pipe of greater diameter and length would be appropriate.

The procedure begins by noosing the crocodilian around the neck with a rope (Fig. 1a), either as a form of capture or after being captured by another means such as a snare trap (Murphy and Fendley 1974). The end of the noose rope is passed through the pipe (Fig. 1a), and the pipe is guided over the animal's head. Once the head is inside the pipe, constant tension is applied to the rope to hold the pipe in position, and the pipe is rotated so that the holes are on the top. The forelimbs are folded back against the body by the pipe, as the animal is pulled into its lumen until the back legs come even with its end (Fig. 1b). A second rope is then tied immediately anterior to the back legs (Fig. 1b). By pulling on the anterior or posterior rope the animal can be positioned exactly within the pipe, or so that the head or caudal region extends from an end of the pipe for a desired distance. If access is required to the head region, a rubber bicycle inner tube is tied around the snout to keep the jaws closed (Fig. 1c). Once the animal is positioned, each rope can be secured through a nearby hole and tied in a knot (Fig. 1d). The tension on the ropes should restrict forward or backward movement within the pipe but allow enough freedom so that the animal can move its head up and down to prevent regurgitated stomach contents from blocking the glottis. The procedure can be accomplished with two people. However, additional personnel may be needed for lifting the crocodilian into a vehicle for transport.

The regularly-spaced holes in the pipe can aid in measuring total and snout-vent lengths, as well as providing places to secure the ropes. The holes allow the snout and tail tips to be seen; thus a tape measure can be placed on top of the pipe to get an accurate measure of total length. Moreover, if the tip of the snout is positioned at the exact end of the pipe, much of the measurement can be calculated without the use of a tape measure, by knowing and/or marking on the pipe the distance between holes. Snout-vent length can be determined by lining up the end of the cloaca with the end of the pipe and measuring forward.

To release the animal, the rope near the tail is removed first (Fig. 2a). The animal is then pulled to the front of the pipe, until the rope on the neck can be released (Fig. 2b). The inner tube securing the jaws is removed by pulling it off with a snake hook rather than untying it (Fig. 2b), and then the pipe is tipped upward and/or jerked backwards/upwards, until the animal is induced to leave it (Fig. 2c).

This technique has been used successfully on American alligators in the wild at Brazos Bend State Park, Ft. Bend Co., Texas since 1990. We believe it has significantly reduced post-capture stress to the animals and has increased safety to both the animals and their handlers. The animal cannot hurt itself once restrained in the pipe, and because the legs are folded back rather than tied there is not the potential problem of restricting circulation to the limbs. It is not necessary to cover the animal's eyes while it is in the pipe, but we do drape a cloth over the eyes if we have the head positioned outside the pipe. The only difficulty that we have encountered with the technique is that some individuals begin to roll after they are noosed and this makes it somewhat difficult to get them started into the pipe. However, once the head is inside the pipe it is not a problem to pull the rest of the body inside.

The pipe diameter and length that we utilized was chosen to accommodate a varying size range of adult alligators. However,

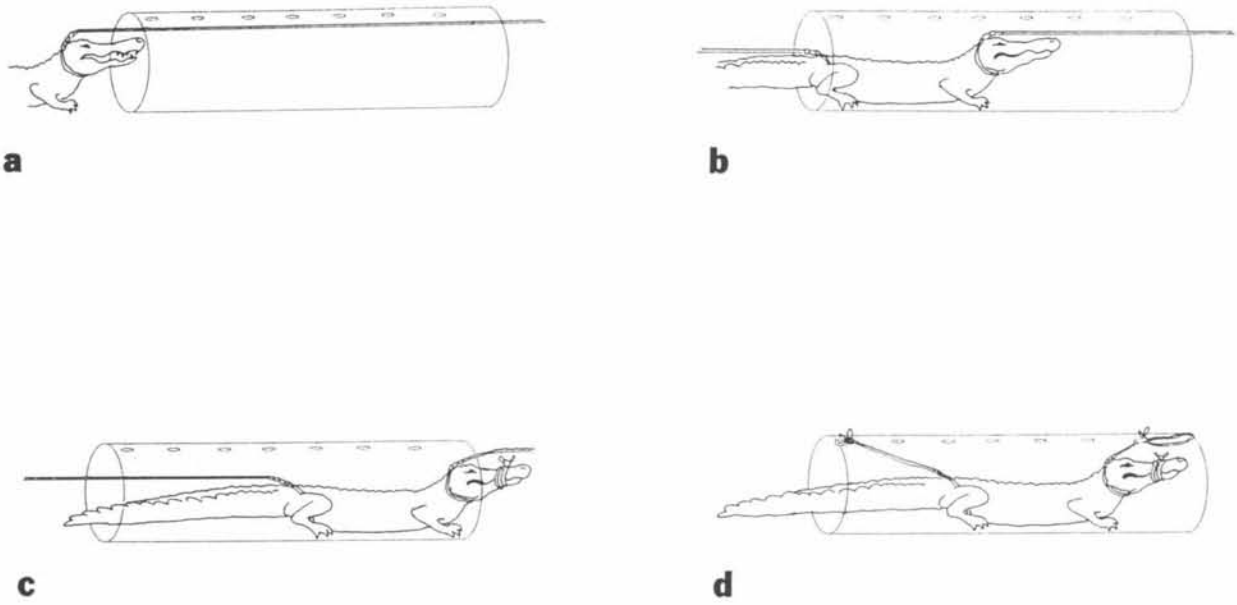

FIG. 1. Restraining the crocodilian in the pipe. (a) Pulling the noosed crocodilian into the pipe. (b) Attaching a rope in front of the hind legs. (c) Positioning the crocodilian within the pipe. (d) Securing the ropes.

if smaller crocodilians were to be handled exclusively, then a shorter pipe with a smaller diameter would be preferable to reduce the weight and increase maneuverability. Because PVC plastic deteriorates from extended exposure to UV light, the pipe should be stored out of direct sunlight.

Although the technique has not been tested on crocodilians in captivity, we believe it could be applied to farm or zoo settings as well. Since preparing the initial draft of this manuscript, we have been made aware of two instances where pipe has been used as a restraint and transport device for crocodilians. In the early 1980's some crocodiles were shipped to the U.S. inside PVC pipes (L. Brandt, pers. comm.). Also, a photograph in Alderton (1991) shows a juvenile alligator being placed into a corrugated drain pipe with a caption stating that the pipe was filled with young alligators to transport them safely.

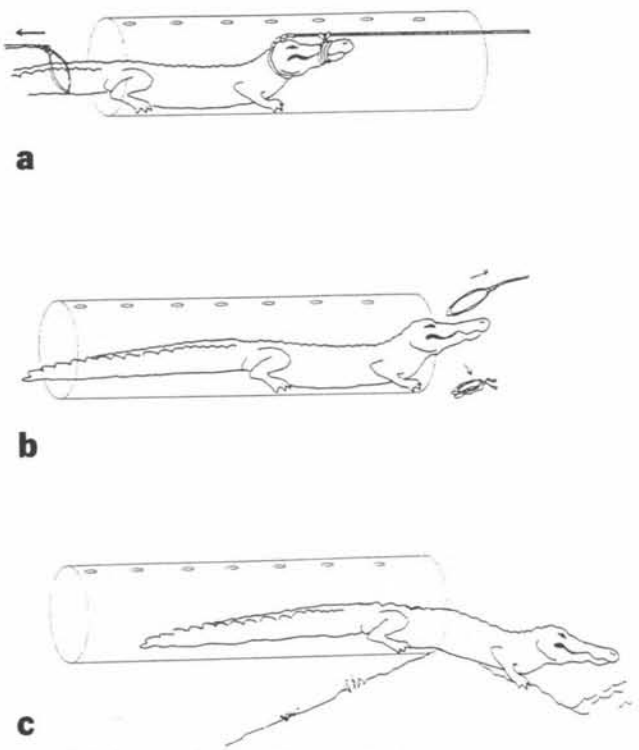

FIG. 2. Releasing the crocodilian from the pipe. (a) Removing the posterior rope. (b) Removing the rope from the neck and the inner tube from the jaws. (c) Tilting the pipe to induce the crocodilian to leave.

Acknowledgments.—We thank Lisa McDonald for illustrating the diagrams and R. Andrew Odum for reviewing the manuscript. Thanks is also extended to Jan Beatty and Donna Garde for their assistance in the field.

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The Use Of Leverage To Facilitate The Search For The Hellbender

During September 1991, we searched for hellbenders (*Cryptobranchus alleganiensis alleganiensis*) in the New York portion of the Susquehanna River drainage. The purpose of this survey was to attempt to verify previous records (Bishop 1941; Bothner 1981; Breisch 1990) and to find new localities and potential habitat.

Many methods have been tried to locate hellbenders including visually searching, electroshocking, and rock-lifting (Williams et al. 1981). We tried visually searching both day and night and electroshocking with a Smith-Root model 11-A (Smith-Root Inc., 14014 N.E. Salmon Creek Ave., Vancouver, Washington 98665, USA) with no hellbenders being located using those methods. We tried to trap hellbenders using 0.6 m by 0.6 m by 0.2 m high wire mesh traps baited with chicken livers with the same results. This left us with only the rock lifting method to try.

As hellbenders are normally found under large rocks in riverine situations, a technique was devised to enable two people to quickly lift large rocks with as little back strain as possible and without destroying the habitat. Anyone who has ever looked for hellbenders should be able to appreciate the difficulty of bending over or kneeling to hand lift large rocks in 10-15°C water.

A device available in forestry supply catalogs (e.g., Forestry Suppliers Inc., P.O. Box 8397, Jackson, Mississippi 39284-8397, USA) called a peavey was used to lift the chosen rocks. As the peavey is normally used to roll heavy logs in the 0.3–0.75 m diameter range we thought that this device would be both inexpensive and sturdy enough to safely lift large rocks. One person using a single peavey was able to lift rocks measuring up to 1.25 m by 1.85 m by 0.25 m thick. The hook on the peavey was caught on the underside of the rock or on any irregularity on the side of the rock. The person doing the lifting would then hold the end of the 1.3 m handle, bend at the knees, and then lift with a straight back. The second person would then probe under the rock with a long-handled dipnet to attempt to dislodge any hellbender that might be hiding under the rock. Rocks were lifted upward from the downstream edge just far enough to allow a dipnet to be passed under the rock. No attempt was made to flip the rocks completely over as it was desirable to have as little effect on the habitat as possible. In most cases the upper edge of the rock just barely broke the surface of the water. As this survey was done during the hellbender nesting season we choose to lift the rocks from the downstream edge in order to minimize effects on any nests that might be present. At other times of the year lifting the rocks from the upstream edge will allow the current to quickly clear disturbed sediment and make locating hellbenders easier.

Another advantage of using the peavey is that searching in relatively cold deep water is possible. We were able to lift rocks and verify the presence of hellbenders in water depths of up to 1 m without getting anything more than our chestwaders and hands wet. This method can be used during any season of the year without undue discomfort on the part of the users. One must be cautious during the nesting season to minimize nest disturbance.

The peavey is inexpensive ($49.95 Forestry Suppliers) and much safer to use than electroshocking. Electroshocking equipment can cost over $2000 and requires safety gear to be worn. A word of caution is in order. Do not try this method by yourself. It is estimated that many of the rocks we lifted weighed 275–450 kg We used two people (one netting and one lifting) and found that in some cases that was not enough. In one case a hellbender escaped to the left while the netter was to the right and the lifter attempted to pursue the hellbender while pushing away a rock in the 350-450 kg range. The best way to utilize the peavey is with a crew of at least three persons. One person lifts the rock and does not pursue anything while the others attempt to capture hellbenders either by dipnet or seine.

This method was successfully used to move many thousands of kg of rocks over six days of searching and resulted in the location of 33 hellbenders and five hellbender nests. Many old sites were verified and almost 50 km of river were added to the known range of *C. alleganiensis* in New York. A big advantage of the peavey was the relative ease in which rocks could be lifted in a controlled manner. This enabled us to put all nests discovered back together (with eggs and attending male). Only one animal discovered using the peavey technique was injured and this injury was a scraped front foot that should heal quickly.

This method was further put to the test during a one-day search for hellbenders on 17 November 1992 during which it snowed almost constantly with an air and water temperature of 2°C. One hellbender was located. This search was hampered by both the weather and high water conditions. Without the peavey it would have been very difficult to locate any hellbenders.

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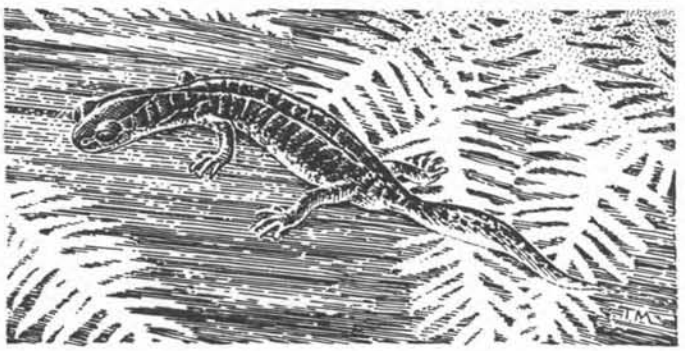

Ensatina eschscholtzii. USA: California: Del Norte Co., Ruby Van Deventer County Park, Smith River. Illustration by Tim Manolis.

HERPETOLOGICAL HUSBANDRY

Cannibalism In A Captive West African Bush Viper (*Atheris chloroechis*)

On 28 September 1992 at the Audubon Zoological Garden, an adult male West African bush viper (*Atheris chloroechis*) was introduced into a large exhibit containing two adult female conspecifics. The exhibit measured 152 x 91 x 91 cm, and was furnished with climbing branches and a gravel substrate. All specimens were healthy, long-term captives and had previously been together from 3 December 1991, through 28 January 1992, without incident. On 9 October 1992, the male was missing, and it was presumed that he had been consumed by a female whose body was distended almost its entire length. The female had a SVL of 66 cm, and weighed 161 g. Each snake had been accepting live three-week old mice (*Mus musculus*) on a weekly basis, and there were no food items in the enclosure at the time of the incident.

Cannibalism in arboreal vipers has been reported in captive *Atheris squamiger* (Wallach 1980), and *A. superciliaris* (Broadley 1983), as well as *Trimeresurus wagleri* and *Bothriechis schlegelii* (Bridegam et al. 1990). Previous accounts of cannibalism or ophiophagy in captive *A. chloroechis* have not been reported.

Wild *A. chloroechis* are opportunistic feeders, preying upon birds, small rodents, lizards and frogs (Cansdale 1961), but are not known to include snakes in their diet. Typically, these snakes ambush prey while hanging concealed amid branches, with the head often lower than the prehensile tail. As is typical with this species, the prey is bitten and held until dead before swallowing.

This occurrence of cannibalism may be interpreted as aberrant behavior; however, caution should be exercised during introductions with *A. chloroechis* or any of its congeners.

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A Radiographic Sexing Technique For *Heloderma suspectum*

Sexual dimorphism is not at all apparent in *Heloderma suspectum* despite Laszlo's (1975) and Tinkham's (1971) description of differences in head size and scalation. Methods currently utilized for sexing *H. suspectum*, such as probing (Laszlo 1975; Wagner et al. 1976), are inconclusive. Visualizing sex organs with a fiberoptic laparoscope, although reliable, involves invasive procedures. The method of injecting saline solution into the hemipenial area to promote eversion has proven somewhat successful, but requires anesthesia (L. DeNardo, pers. comm.). Captive reproduction of this species has occurred at several institutions (Lamont 1987; Peterson 1982; Wagner et al. 1976), but a reliable method of sex determination was not mentioned in those reports. In this note we describe a non-invasive osteometric method to determine sex by revealing gender differences in ischial length and width. Intraspecific structural variation occurs

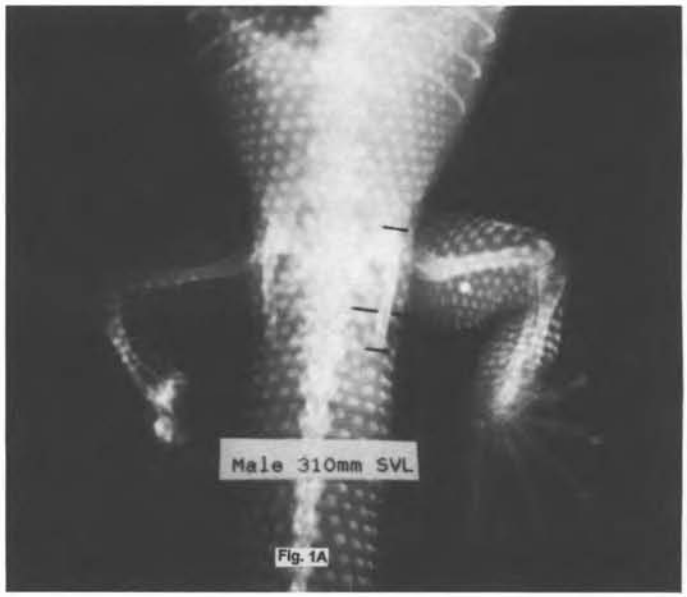

FIG. 1. Radiographs of (A) male and (B) female *Heloderma suspectum* indicating measurements for length and width.

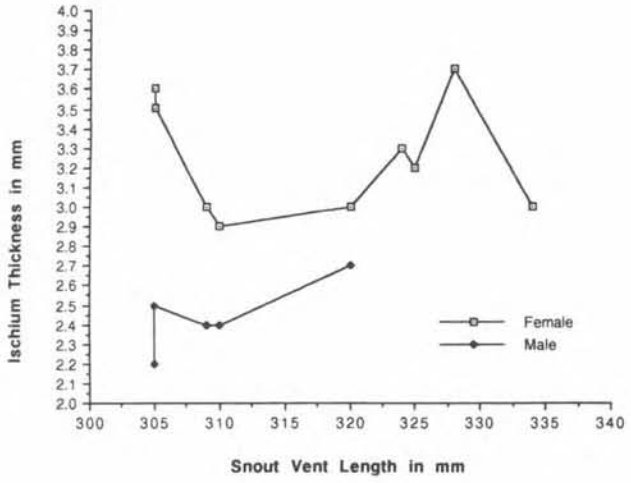

Fig. 2A

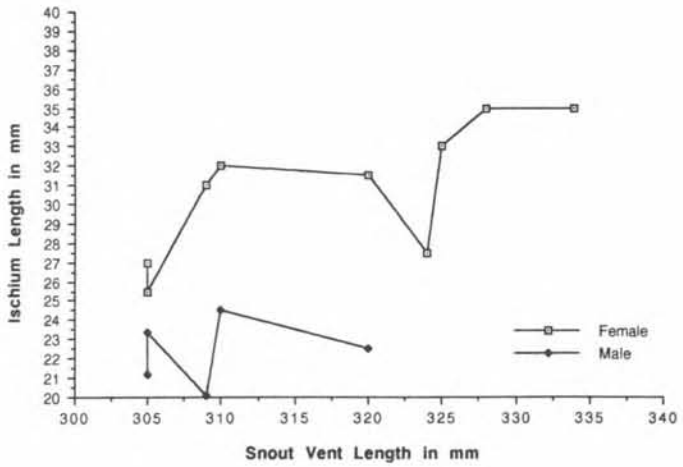

Fig. 2B

FIG. 2. Graphs showing separation of sexes by (A) ischium thickness and (B) ischium length.

in the pelvis of certain mammals (Becker 1954; Cornwall 1956; Dunmire 1955; Gardner 1936; Guilday 1951; Krogman 1962; Taber 1956), but has not been documented for other groups of vertebrates.

Radiographs from seven live specimens of *H. suspectum* were examined. Radiograph dosages were KVP 40, mass 75 @ 1/60 of a second (3M standard veterinary x-ray film). Seven skeletal preparations of known sex were also examined to substantiate data from radiographs (see Appendix 1). All measurements were made to the nearest 0.1 mm using dial calipers. Only the ischial arm could be accurately measured from radiographs. The magnification of the radiographic image was assumed to be minimal since the film was placed directly under the pelvic region.

Two measurements were made: the length from the posterior angle to the anterior angle of the ischium, and maximum thickness of the ischium (Figs. 1a, 1b). By plotting the first measurement against snout-vent length (SVL), and the second measurement against SVL for both sexes (Figs. 2a, 2b), males were clearly differentiated from females. Student t-tests were used to determine the statistical significance of the gender differences (for thickness, $t=5.53$, $df=12$, $P<0.01$; for length, $t=3.45$, $df=12$, $P<0.01$).

To determine pelvic girdle differentiation during ontogeny, a radiographic record of a group of 3 sub-adult *H. suspectum* was made. These specimens were radiographed at 2 weeks, 24 weeks, and 36 weeks post hatching. At 36 weeks, gender differentiation in these individuals becomes discernible in both measures (Table 1).

TABLE 1. Radiographic history of sub-adult *Heloderma suspectum*.

Specimen No.	Sex	SVL	Ischium Length	Ischium Thickness
2 wks				
304	?	92	6.2	1.5
309	?	102	7.0	0.9
307	?	90	7.5	1.4
12 wks				
304	?	145	8.1	1.6
309	?	152	11.0	1.2
307	?	146	10.7	1.7
36 wks				
304	M	215	13.9	1.7
309	F	209	18.6	2.1
307	F	198	17.2	2.0

Specimens of similar size should be used when making comparisons, as differentiation in ischium length is not apparent between large males (>450 mm SVL) and small females (<250 mm SVL). However, ischium thickness is closer to being unequivocal for sex determination. This character is greater in females than in males, provided that animals are at least 300 mm SVL.

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APPENDIX 1

Referred specimens of *H. suspectum*. (L=Live, P=Preserved). One male and six females (P). University of Michigan Museum of Zoology 181640, 173549, 183546, 181641, 181639, 183802, 181150. One female (L). Department of Herpetology, Central Florida Zoological Park, Lake Monroe, Florida. Five males and four females (L). Dallas Zoo.

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Symptoms Of Gas-bubble Trauma In Two Species Of Turtles, *Chelydra serpentina* And *Apalone spinifera*

Gas supersaturation in aquaculture systems can be caused by any one of a variety of situations. These include entry of air into the suction side of a pump (Marsh and Gorham 1905), photosynthesis (Renfro 1963; Woodbury 1941), and use of well or spring water (Gorham 1901; Weitkamp and Katz 1980).

Heating of gas-saturated water has also been shown to cause gas-supersaturated water in aquaria (Marsh and Gorham 1905), culture tanks (Lightner et al. 1974), cooling-water outfalls of power plants (DeMont and Miller 1971; Marcello and Strawn 1972), fish hatcheries (Rucker and Hodgeboom 1953), and salmonid hatching containers (Zirges and Curtis 1975). Malouf et al. (1972) observed gas supersaturation resulting from heating cold seawater in closed heat exchangers.

Gas-bubble trauma (GBT) has long been recognized as a problem for fish (e.g., Gorham 1901; Marsh 1903). Gas supersaturation has also produced symptoms in shrimp (Lightner et al. 1974), crabs (Johnson 1976), and other gill-breathing invertebrates (Malouf et al. 1972; Nebeker 1976). Amphibians are also susceptible to gas-bubble trauma (Colt et al. 1984a; Colt et al. 1984b).

Symptoms of GBT include erosion of fins due to bubble formation in capillaries, exophthalmia, subcutaneous emphysema of the head, inability to remain submerged (Colt et al. 1984a), bubble formation in the epidermis and viscera, hemorrhage (Weitkamp and Katz 1980), equilibria disturbance, cessation of feeding, hemostasis, and death.

I am unaware of reports of reptilian species exhibiting symptoms of GBT. In this paper, I report symptoms of GBT in two species of turtles, the common snapping turtle (*Chelydra serpentina*) and soft-shelled turtle (*Apalone spinifera*).

Approximately sixty, one-year-old common snapping turtles were held in an indoor culture system supplied with city water. The system consisted of six plastic trays (91.44 cm x 182.88 cm x 15.24 cm) with a flow-through water supply. Turtles were held in plastic containers (50 cm x 35 cm x 22 cm) within these trays. The containers had four 0.95 cm holes drilled into the bottom and were suspended above the tray bottom on sections of 1/2" (21 mm od) PVC pipe.

Approximately 7.5 cm of water was maintained in the containers by a central standpipe in each tray. City water (22°C) heated to 29°C with a commercial water heater was supplied continuously to the individual containers. The turtles did not have access to dry substrate and were unable to leave the water.

Symptoms appeared approximately one week after turtles were introduced into the system. Gaseous lesions developed under the skin of the feet and neck causing the animals to float (Fig. 1). The feet became grossly distended and many of the affected animals eventually lost their claws. This was apparently due to loss of blood supply and subsequent soft-tissue necrosis. Lesions were also prominent around the cloacal opening, causing distention and hemorrhaging. Several of the turtles eventually died.

Animals exhibiting pathology were sent to the Louisiana State University School of Veterinary Medicine for examination. Dead and live turtles exhibiting pathology were analyzed. Bacterial analyses were performed with only *Citrobacter freundii* and *Proteus vulgaris* being identified. These two species have not been shown to be gas producers.

All of the one-year-old common snapping turtles were removed from the culture system and placed into a fiberglass holding tank which was raised at one end. Ambient city water (22°C) was introduced into the lower end of the tank, leaving sufficient space to allow the turtles to leave the water. Within 48 h, all symptoms had disappeared. The turtles resumed normal behavior and began feeding. Schiewe (1974) showed that recovery of fish from sublethal exposure to gas supersaturated water can be rapid.

Subsequently, hatchling common snapping turtles (315) were stocked into the flow-through culture system for a feeding trial. Within four days, over 50% of the hatchlings exhibited GBT-related pathology. These turtles were removed from the culture system and placed into a plastic tub with approximately 1.27 cm of water. Within 24 h, all symptoms disappeared and the hatchlings resumed feeding.

FIG. 1. Common snapping turtles exhibiting symptoms of gas-bubble trauma. Note involuntary floating and distended limbs and neck. Unaffected turtle can be seen submerged on lower left.

Similarly, hatchling soft-shelled turtles were placed into one of the flow-through containers and symptoms of GBT appeared within 24 h. Large bubbles emerged from the feet and neck as with the snapping turtles. Large bubbles also arose from around the eyes and carapace causing inflammation to the surrounding tissue. All soft-shelled turtles exhibiting these symptoms died within 36-48 h.

Heating of water in closed systems has been shown to cause gas supersaturation in fish culture systems. In the situation described in the present study, it could be assumed that the incoming water was saturated with gases before entering the water heater. With the increase in water temperature and the inability of dissolved gases to come out of solution in the water lines, it follows that the heated water introduced into the turtle containers was supersaturated with dissolved gases. These dissolved gases produced the symptoms observed in the turtles.

To remedy the problem, the culture system was modified by tilting the containers, allowing a small amount of water to collect in the lower third of the plastic container. This modification allowed access to dry areas in the container. The system was further modified by the addition of a timer and an electronically-actuated valve to control the water supply. Heated city water was added to the containers for five minutes at eight-hour intervals with this timing system. Water in the lower third of the container was flushed out with the incoming fresh water and exited through holes in the container bottoms. Following these modifications, no further gas-bubble pathology has been observed in more than 10 months of continual use.

Investigations to fully describe the effects of gas-bubble trauma on aquatic reptiles are under consideration. These findings would be especially important to the emerging aquaculture industries for these animals.

Acknowledgements.—I wish to thank the Louisiana Agricultural Experiment Station for the support of the facilities required. I also thank Dudley D. Culley, Jr., Robert C. Reigh, and Terrence R. Tiersch for their critical review of this manuscript.

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NATURAL HISTORY NOTES

Natural History Notes (formerly Life History Notes) is analogous to Geographic Distribution. Preferred notes should 1) focus on observations with little human intrusion; 2) represent more than the isolated documentation of developmental aberrations; and 3) possess a natural history perspective. Individual notes should, with few exceptions, concern only one species, and authors are requested to choose a keyword which best describes the nature of their note (e.g., Reproduction, Longevity, Morphology, etc.). Use of figures to illustrate any data is encouraged, but should **replace** words rather than embellish them. The section's intent is to convey information rather than demonstrate prose. Articles submitted to this section will be reviewed and edited prior to acceptance. Send two copies of manuscripts, double-spaced, directly to the appropriate section co-editor (addresses on inside front cover). Manuscripts concerning reptiles should be sent to Lee A. Fitzgerald; those concerning amphibians should be sent to Randy D. Jennings.

Standard format for this section is as follows: SCIENTIFIC NAME (in caps), COMMON NAME (lower case, in parentheses) as it appears in Collins (1990. *Standard Common and Current Scientific Names for North American Amphibians and Reptiles*, 3rd ed., Herp. Circ. 19:1-41), KEYWORD (in caps). DATA on the animal. Place of deposition or intended deposition of specimen(s), and catalog number(s). Then skip a line and close with SUBMITTED BY (Name(s) in caps, and address(es) in full). (NCN) should be used for common name where none is recognized. References may be briefly cited in text (refer to this issue for citation format).

CAUDATA

RHYACOSIREDON LEORAE (NCN). **SIZE.** Taylor (1943. Univ. Kans. Sci. Bull. 29:343–361) reported maximum body size for a female *R. leorae* as 98 mm SVL and 207 mm total length. On 12 August 1993 we captured a female *R. leorae* (JLE00307) in a small stream near Río Frio, México, México at 3210 m elevation. The salamander was in a shallow pool (10 cm deep x 1 m wide) with slow circular movement and a water temperature of 13.2°C. Upon preservation, the salamander measured 103 mm SVL (to medium point of cloaca or 100 mm SVL to anterior point), 233 mm total length, and 62.0 g live wet body mass.

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TESTUDINES

APALONE FEROX (Florida Softshell). **DIET.** *Apalone ferox* is the largest North American softshell, with a maximum reported size of 29.48 kg (Allen 1982. Herpetol. Rev. 13:49). Dalrymple (1977. J. Herpetol. 11:255–285) examined digestive tracts from 96 *A. ferox* and found the diet was comprised predominantly of snails, insects, and fish. Wright and Funkhouser (1915. Proc. Acad. Nat. Sci. Phila. 67:107–192) reported that "according to the natives the larger specimens devour also such water fowl as are unfortunate enough to be taken unaware by these reptiles." Dalrymple (*op. cit.*) found that one small male had eaten "a moderate sized passerine bird," but it is not known whether the bird had been captured or scavenged.

In the early afternoon of 24 July 1987, one of us (MBE) observed a large Florida softshell take a juvenile tricolor heron (*Hydranassa tricolor*) at Guana River Wildlife Management Area, Saint Johns County, Florida. The bird was in obvious distress when first seen standing in shallow water at the edge of a ditch, and it soon became apparent that a large softshell was holding it by the lower leg and attempting to pull it to deeper water. The water was too shallow to allow the turtle to pull the bird under, and a struggle continued for ca. 20 min (Fig. 1). Finally, a second large softshell joined the fray. The bird finally drowned when its head was submerged by one of the turtles. The total period of observation was ca. 30 min. This is the first unequivocal documentation of predation by *A. ferox* on birds. We can only speculate on the method used to catch the bird initially, but softshells frequently lie buried in the sand in shallow water, and the bird may have been ambushed when it stepped in front of a buried softshell.

FIG. 1. *Apalone ferox* struggling with a tricolored heron. The carapace of the turtle is visible to the left. The light "?" in the center is the white venter of the bird's neck. The bird is attempting to spear the turtle with its bill.

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APALONE SPINIFERA (Spiny Softshell). **EXTREME KYPHOSIS.** An adult female *Apalone spinifera* was captured by a local fisherman on approximately 22 June 1993 while it was crossing Moon Lake Road, between Michigan Center Lake and Little Olcott Lake, in Jackson County, Michigan. Although normal in most respects (CL=241 mm, mid body CW=229 mm), the turtle exhibited extreme kyphosis (maximum total height= 127 mm, Fig. 1). It otherwise appeared to be in good health. I unsuccessfully attempted to induce oviposition using oxytocin on 9 July 1993. However, a clutch of hard-shelled eggs was laid on 10 July 1993, but unfortunately they were oviposited in water and destroyed. It was not possible to determine exactly how many eggs were laid or if they were fertile. The animal was later released at the capture site. Photographs and radiographs were deposited at the UMMZ.

Radiographs confirm external observations that the vertebral column was dramatically arched and directly underlies the carapace throughout the deformity. There were no organs or other defined tissues visible within the hump.

Extreme kyphosis has been previously documented in at least three Trionychidae species (two *A. spinifera* and one *A. mutica*: Smith 1947. Univ. Kansas Pub. Mus. Nat. Hist. 1:117–124; one *Lissemys punctata*: Duda and Gupta 1977. Herpetol. Rev. 8:119–120).

I thank Tom Hodgson of the Dahlem Nature Center for bringing this turtle to my attention. Doug Nelson generously contributed his time for the radiographs.

FIG. 1. Adult female *Apalone spinifera* exhibiting extreme kyphosis.

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CARETTA CARETTA (Loggerhead). **GROWTH and PELAGIC MOVEMENT.** Carr (1986. BioScience 36:92–100) proposed that loggerhead hatchlings from the southeastern U.S. nesting beaches become incorporated in oceanic gyres and are carried to the eastern Atlantic. The hypothesized path of travel passes through the Azores, Madeira, Canary Islands, and, possibly, the Cape Verde Islands, and then back to the western Atlantic. The movement of a juvenile loggerhead on one portion of this path—from Madeira to the Canary Islands—has been documented. The loggerhead was one of many sea turtles tagged in the eastern Atlantic by a joint project of the University of Florida and the International Fund for Animal Welfare. On 29 June 1990, the crew of the *R/V Song of the Whale* placed two plastic tags (Jumbo-Roto tags, Dalton Ltd., Oxfordshire, England) on a loggerhead captured in the waters near Madeira (34°05'N, 17°21'W). The turtle had a curved carapace length (CCL) of 40.5 cm. On 4 February 1993, the turtle was captured on a longline of a Spanish vessel in the waters around the Canary Islands (29°46'N, 13°05'W). Both tags were still in place. The turtle was taken to Algeciras Bay, Spain, where an observer from the Centro Oceanográfico de Málaga recorded its straight carapace length (SCL measured from nuchal notch to posterior tip) as 46.0 cm. The turtle was held for two weeks, but did not feed. It was released alive but in poor condition in Algeciras Bay.

During the 950 days at large, the turtle moved a minimum distance of 610 km. To determine growth rate, 40.5 cm CCL was converted to 37.0 cm SCL as in Bolten et al. (1992. Herpetol. Rev. 23:116), yielding a growth rate of 3.5 cm/yr. This rate is slower than the 3.7 cm/yr rate reported for a smaller pelagic loggerhead in the eastern Atlantic (Bolten et al., *op. cit.*), but growth in carapace length usually decreases with increasing length (Bjorndal and Bolten 1988. Copeia 1988:555–564). The logistic and von Bertalanffy growth models developed for Florida loggerheads by Frazer and Ehrhart (1985. Copeia 1985:73–79) predict growth rates of 3.3 cm/yr and 6.4 cm/yr, respectively, for the size interval of loggerheads reported here. The measured growth rates are closer to those predicted by the logistic model for both our observation and for that of Bolten et al. (*op. cit.*). These slow growth rates suggest that the pelagic, juvenile stage of Atlantic loggerheads may span many years.

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ERETMOCHELYS IMBRICATA (Hawksbill). **REPRODUCTION**. On 20 June 1992 at Ostional National Wildlife Refuge, Santa Cruz, Guanacaste, Costa Rica, we observed a female *Eretmochelys imbricata* come ashore at 1615 h. This locality is known as the El Rayo sector of beach (10°00'N, 85°43'W), and is 2 km north of the main beach utilized for nesting by Pacific ridleys (*Lepidochelys olivacea*).

The female hawksbill measured 82 x 70 cm curved carapace length and width, and 60 x 53 cm curved plastron length and width. There was no evidence that this turtle had been previously tagged. She crawled to 25 m above the tide limit to the border of vegetation dominated by *Bromelia pinguin*, and selected a nesting site only after moving and presumbly smelling the substrate along a distance of 23.4 m parallel to the vegetation. She also attempted to move into the vegetation. Nest construction followed and 120 eggs were laid. Times noted for nesting activities were as follows: active search for nesting site, 60 min; nest cavity construction, 9 min; egg-laying, 12 min; filling-in the nest cavity, 10 min, for a total of 91 min.

The nest was subsequently protected by a wire cage measuring 40 x 40 x 25 cm. While installing the cage, we discovered another *E. imbricata* nest containing eggs in an advanced embryonic stage. Species determination was made by examination of an embryo. This second nest was reburied and left unprotected. It was preyed upon by dogs ten days later. The incubation period in the protected nest lasted 60 days, with 89 hatchlings found, yielding a hatching success of 74.2%. This is the first report of nesting for *E. imbricata* at this site.

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MACROCLEMYS TEMMINCKII (Alligator Snapping Turtle) and ***CHELYDRA SERPENTINA*** (Common Snapping Turtle). **AGONISTIC BEHAVIOR**. In July 1991, we observed two *C. serpentina* that had emerged from a partially submerged brush pile in Onion Creek, Montgomery County, Kansas. The turtles, both probably juveniles (Bury 1979, *In* M. Harless and H. Morlock (eds.), Turtles: Perspectives and Research, pp. 571–602. John Wiley & Sons, New York) were found one day apart with bites presumably inflicted by a 24.7 kg female *M. temminckii* that was the subject of a biotelemetry study (Shipman 1993. Unpubl. M.S. Thesis, Emporia St. Univ., Emporia, Kansas. 90 pp.).

The first *C. serpentina* was found lying on the bank of the creek opposite the brush pile at 2000 h on 8 July. The inferred interaction was not directly observed, however a blood trail from the *C. serpentina* led to the location of the *M. temminckii* in the brush pile 10 m away. One of us (DB) had passed this site less than one hour earlier, and the *C. serpentina* was not there at that time. The second turtle was found at approximately the same time and location on the following day. Pattern and size of both bite marks matched those of a museum specimen *M. temminckii* skull of like proportions to that of the alligator snapping turtle in the creek. The bites were also similar in their location on the left posterior margin of the carapace (Fig. 1).

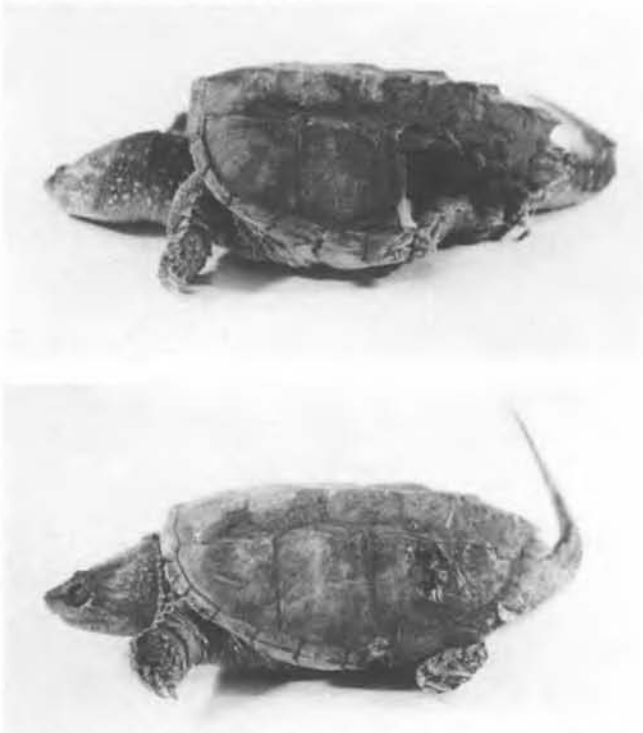

FIG. 1. Common snapping turtles presumably bitten by alligator snapping turtle, Montgomery County, Kansas. Carapace length = 155 mm straight-line maximum, postmortem weight = 670 g (top). Carapace length = 178 mm straight-line maximum, postmortem weight = 975 g (bottom).

Alligator snapping turtles in captivity have been observed to stalk and eat live turtles of the genera *Deirochelys*, *Kinosternon*, *Graptemys*, *Chrysemys*, and *Chelydra* (Allen and Neill 1950. Spec. Publ. No. 4, Ross Allen's Reptile Institute; Ernst and Barbour 1989. Turtles of the United States. Smithsonian Inst. Press, Washington, D.C. 313 pp.; Pritchard 1989. The Alligator Snapping Turtle: Biology and Conservation. Milwaukee Publ. Mus., Milwaukee, Wisconsin. 104 pp.). Our observation is the first such interaction noted in the field. Ernst and Barbour (*op. cit.*) reported that *M. temminckii* does not occupy the same habitat as *C. serpentina*, but prefers a more sedentary existence in deeper waters. Our

observations of its interaction with *C. serpentina* cast doubt on the universality of this claim. Further, we captured six *C. serpentina* in turtle traps set in areas used by the alligator snapping turtle in Onion Creek.

It is impossible to determine if our observations represent predation attempts or agonistic territorial behavior. Our observations suggest *M. temminckii* and *C. serpentina* may utilize similar habitats on occasion.

These observations were made possible in part by the Kansas Department of Wildlife and Parks' Kansas Nongame Wildlife Improvement Fund (Chickadee Checkoff) and Emporia State University via a Faculty Research and Creativity Grant.

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PLATEMYS SPIXI (Grooved Sideneck Turtle). **PARASITISM.** During a study of aquatic reptiles in a reservoir in the region of Américo Brasiliense, São Paulo, southeastern Brazil (21°45'S, 48°08'W), we collected two female and one male *Platemys spixi* (female #1: CLC = 192 mm; PL = 153 mm; W = 620 g; female #2: CLC = 190 mm; PL = 156 mm; W = 650 g; male #1: CLC = 157 mm; PL = 119 mm; W = 325 g). Numerous leeches of the family Hirudidae (probably *Glossiphonia*) were found on the turtles (female #1 had 244 leeches; female #2 and male #1 only 26 each). The leeches were concentrated in the skin folds on the axillary and inguinal regions of the turtles. Leeches on female #1 spread evenly over the surface of the carapace after a period of exposure to sunlight and warming.

All leeches on female #1 were removed, and the turtle was returned to the reservoir for 24 h, after which we found 11 new leeches on the turtle s inguinal region. Afterward, female #1 was kept in captivity for six months. During this period, the leeches remained on the turtle.

Leeches have been reported on *Kinosternon sonoriense*, but were observed only on the carapace (Hulse 1976. J. Herpetol. 10:45–48). In *P. spixi* the leeches occur in the inguinal and axillary regions, probably because the folds of these regions are protected by the carapace, providing the leeches with highly vascularized tissues for feeding.

We are grateful to Nelson da S Cordeiro for identification of the leeches, to Aricio Xavier Linhares, Ivan Sazima, Johannes Kempers, Karin D. Kempers, Keith S. Brown, and Randy D. Jennings for reading and making suggestions to the manuscript and to the "Clube Nautico Araraquara" for supporting the study on aquatic reptiles.

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PSEUDEMYS CONCINNA (Cooter). **MAXIMUM SIZE.** Conant and Collins (1991. A Field Guide to Reptiles and Amphibians of Eastern and Central North America, 3rd ed. Houghton Mifflin Co., Boston, Massachusetts, 450 pp.) give maximum sizes for several races of *Pseudemys concinna*, showing a maximum of 17 1/4 in. (438 mm) (straight-line carapacial length; CL) for *P. c. suwanniensis* but no more than 14 3/4 in. (375 mm) for any other race. An extensive area of intergradation involving *P. c. concinna*, *P. c. suwanniensis*, *P. c. hieroglyphica*, and *P. c. metteri* was depicted by Ward (1984. Spec. Publ. Mus. Texas Tech. Univ. [21]:1–50); Conant and Collins (*op. cit.*) show a gap belween the range of *P. c. suwanniensis* and the intergrade area and other races. From that intergradation zone the Tulane University Museum of Natural History collection contains TUMNH 29861, a female measuring 15 1/8 in. (383 mm) CL collected from Gulf County, Florida, 4 mi. N of Wewahitchka at the bridge by the Chipola Dam on the Chipola River (forming Dead Lake) by Joseph T. Willis and Felix Famularo on 10 June 1963. Another specimen, TUMNH 29861, also a female measuring 383 mm CL, was collected in Gulf Co., Florida, 3 mi. E of Wewahitchka in the Chipola River on 12 June 1966 by a Tulane University environmental biology class led by R. D. Suttkus. Whatever genetic or environmental influences that have resulted in *P.c suwanniensis* reaching substantially larger size than the other races of *P. concinna* apparently persist in the intergradation zone.

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PSEUDEMYS TEXANA (Texas River Cooter). **NESTING INTERFERENCE**. The exotic red fire ant, *Solenopsis invicta*, has been reported to have an adverse affect on both invertebrates (Porter 1990. Ecology 71:2095–2106) and vertebrates (Mount et al. 1981. J. Alabama Acad. Sci. 52:71–78). In the case of turtles, Mount et al. (*op. cit.*) report several instances of hatchling turtle mortality due to fire ants; however, fire ants have not been reported to interfere with adult turtles during nest construction.

During a herpetofaunal survey of Camp Mabry in Austin, Texas (11 June 1993), a *Pseudemys texana* was discovered in the initial stages of nest excavation. The turtle was discovered at ca. 1115 h, and probably had been digging for less than 1 h. At that time the turtle was covered with ca. 150-200 fire ants. These ants were probably from two colonies located about 3 m away. Observer interference was kept to a minimum by periodically checking the turtle from a distance using binoculars. After 45 min the turtle ceased nest excavation, and returned to the nearest pond ca. 100 m away. The irritation caused by the fire ants presumably prevented the *P. texana* from completing the nesting process.

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LACERTILIA

CALOTES VERSICOLOR (Oriental Garden Lizard). **CANNIBALISM and DIET**. Cannibalism or intraspecific predation refers to the killing and consumption of an individual of the same species at any stage of its life cycle. This behavior occurs in over 1000 species of animals (Polis 1981. Ann. Rev. Ecol. Syst. 12:225–251; Elgar and Crespi 1992. Cannibalism: Ecology and Evolution Among Diverse Taxa). In reptiles, cannibalism has been observed in both captive (Frye 1991. Biomedical and Surgical Aspects of Captive Reptile Husbandry, Vol. 1:67) and wild populations (Fox 1975. Ann. Rev. Ecol. Syst. 6:87–106; Rocha 1992. Herpetol. Rev. 23(2):60; Rootes and Chabreck 1993. Herpetologica 49(1):99–107) and may involve adults cannibalizing juveniles or subadults, adults cannibalizing eggs, and juveniles cannibalizing juveniles in a descending order of size (Polis and Myer 1985. J. Herpetol. 19:99–107).

During a study on food habits and gastrointestinal parasites of *Calotes versicolor* in 1992, I examined stomach contents of 124 adult lizards (SVL 74-122 mm) collected from two urban parks in Singapore (1°09'N, 103°38'E; 1°29'N, 104°06'E) and found two

positive cases of cannibalism. The stomach of one lizard (SVL 104 mm, TL 342 mm, mass = 38.92 g), collected on 12 August 1992, had one slightly digested conspecific juvenile of SVL 35 mm, ants, beetle larva, and plant materials, while that of the other cannibalistic lizard (SVL 110 mm, TL 394 mm, mass = 44.15 g), collected on 18 September 1992, contained an undigested conspecific juvenile of SVL 41 mm, a cockroach, beetles, and ants. In both cases, the juvenile lizards were swallowed whole, easily identifiable, and had only a few teeth marks on the midbody skin. The orientation of the preys' head in the distal end of the predators' stomachs indicates that the juvenile conspecifics were eaten head first.

Calotes versicolor feeds primarily on insects, but adults occasionally prey on small birds, nestlings, frogs, and geckos (Rao 1975. British. J. Herpetol. 5(4):467–470; Sharma 1989. J. Bombay Nat. Hist. Soc. 88:459). The first record of intraspecific predation in *C. versicolor* was an anecdotal report of a sighting of an adult lizard (TL 330 mm, sex unknown) attacking and swallowing a subadult conspecific (Sharma 1991. J. Bombay Nat. Hist. Soc 88(2):290–291). The findings of conspecific individuals in the stomach contents, a first record for the species, confirms cannibalistic behavior in this species. The low incidence (1.6%) of cannibalism indicates that intraspecific predation is incidental and probably represents opportunistic carnivory. *Calotes versicolor* is sexually dimorphic; males are larger than females. The observation that both cannibalistic lizards were males further supports the hypothesis that sexual differences in frequency of cannibalism could be related to the larger size of males (Rocha, *op. cit.*) The study was supported by a research grant SIBiol RP10/92 from the Singapore Institute of Biology.

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CTENOSAURA PECTINATA (Mexican Spiny-tailed Iguana). **PREDATION**. Ramirez-Bautista and Uribe (1992. Herpetol. Rev. 23:82) reported ingestion of *C. pectinata* by the snake *Trimorphodon biscutatus* in Jalisco, México. Here we report predation on this species by another snake, *Boa constrictor imperator*.

On 3 July 1993 while collecting in a tropical deciduous forest near Km 186 (México Highway 95, México-Acapulco) at 650 m elevation, we observed a *B. constrictor imperator* to fall from an *Acacia* sp. tree (2 m high). The snake was constricting a female *Ctenosaura pectinata* that had some acacia leaves in its mouth. The snake constricted the lizard at its abdominal region and was biting the lizard's right shoulder. The snake took 15 min to kill the lizard after which we collected it to prevent ingestion. The lizard (JLE00240) measured 340 mm in SVL and 1030 mm in total length. The snake measured 1600 mm total length. We released the snake at the site of capture. This is the first record of predation on *C. pectinata* by *Boa constrictor*.

We thank Susana Sanoja-Sarabia for field assistance.

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EUMECES LONGIROSTRIS (Bermuda Rock Lizard or Skink) **PREDATION**. On 5 August 1993, on Castle Island, Bermuda, we observed an adult male of the introduced Jamaican anole, *Anolis grahami* (SVL ca. 70 mm), consuming a recent hatchling of *Eumeces longirostris*, estimated SVL ca. 30-35 mm. The anole was on top of a stone wall, swallowing the skink head first, with the jaws of the anole at the level of the anterior limbs of the skink. After 2-3 minutes, the previously immobile skink writhed weakly, and was then ingested further. After the skink had been consumed to the level of the hind limbs (with feet and tail base protruding from the mouth of the anole), the anole ran from the top of the wall and was lost from view. The tail of the skink had been autotomized prior to our observations and was not found after the anole departed.

This is the first observation of reptile predation upon *E. longirostris*. It is also the first record of *Anolis* eating a skink. *Anolis grahami* is known to consume other anoles, but its diet in Bermuda consists primarily of hemipteran and hymenopteran insects (Schwartz and Henderson 1991. Amphibians and Reptiles of the West Indies: Descriptions, Distributions, and Natural History. Univ. Florida Press, Gainesville, 720 pp.).

Anolis grahami was introduced to Bermuda from Jamaica in 1905 (Wingate 1966. Herpetologica 21:202–218). It occurs throughout Bermuda, and almost completely overlaps the range of *E. longirostris*, which is the only terrestrial vertebrate native to Bermuda, and which remains common only in a few localities, notably on the islands of Castle Harbour. Hatchling skinks appear in late July to mid-August, and even if they are uncommon prey items of *A. grahami*, predation by the anole may be a serious threat to this declining species, which is also killed by feral and domestic cats, introduced kiskadee flycatchers (Aves: Tyrannidae: *Pitangus sulphuratus*), and recently reintroduced yellow-crowned night-herons (*Nyctanassa violacea*) (Wingate, pers. obs.). A larger introduced species of *Anolis* (*A. leachi*) is well-established in Bermuda and could also be considered as a potential predator of *E. longirostris*.

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GAMBELIA SILA (Bluntnose Leopard Lizard). **CANNIBALISM**. *Gambelia sila* is a large predacious lizard of the San Joaquin Valley in California and often is the most conspicuous and behaviorally dominant local lizard species. Its chief prey by number are insects, especially orthopterans, although small lizards can account for a large portion of the mass of their diet (Montanucci 1965. Herpetologica 21:270–283). Adult *G. sila* are twice the length of conspecific hatchlings and weigh ten times more. Although the most common lizard prey are *Uta stansburiana*, *G. sila* are known to eat small conspecifics (Montanucci, *op. cit.*). However, no specific instances of cannibalism have been recorded. Here we report on two observations of adult *G. sila* eating hatchling conspecifics.

On the morning of 4 August 1991, we were censusing one of our plots on the Elkhorn Plain, San Luis Obispo Co., California, used to study the long-term demographics of *G. sila*. While walking the plot, we spotted an adult male (107 mm SVL, 35 g) in the open, about 100 cm from clumps of snakeweed (*Gutierrezia californica*) on a small berm of a dirt road. As we approached, it quickly snatched at the ground as a small lizard ran by. The male caught the small lizard and swallowed it, with only the tail of the captured lizard visible after a few seconds. The tail of the captured lizard extending from the mouth of the adult male was markedly banded, which is a positive identification of a hatchling *G. sila*. Tails of the other two lizards found at this site are either plain brown (*U. stansburiana*) or bright blue (hatchling *Cnemidophorus tigris*).

The second instance of cannibalism was noted on 11 August 1993, and also occurred on the Elkhorn Plain. An adult female *G. sila* (99 mm SVL, 28 g), found during surveying, had the rear legs and tail of a hatchling *G. sila* sticking out of its mouth. We use PIT tags to permanently mark *G. sila* (Germano and Williams 1993. Herpetol. Rev. 24:54–56.), and both lizards had PIT tags. The

hatchling was 53 mm SVL and 4.2 g when first marked 8 August 1993. We kept the female in captivity until it passed the PIT tag of the hatchling, which occurred 15 August 1993.

Peak activity periods of adult and hatchling *G. sila* usually are temporally separated. The greatest activity of yearlings and adults occurs from April to June, and some activity may occur until September (Tollestrup 1982. Am. Midl. Nat. 108:1–20; Germano and Williams, unpubl. data). Yet, only a small percentage of the adult population of *G. sila* remains active past July on the Elkhorn Plain, and this has occurred three times in 6 yr (Germano and Williams, unpubl. data). In contrast, *G. sila* usually hatch in late July or early August and remain active until October or early November (Tollestrup, *op.cit.*; Germano and Williams, unpubl. data). By the time hatchlings emerge from winter torpor the following spring, they are sufficiently large to escape predation by larger conspecifics. This separation of activity periods effectively minimizes impact to the hatchling population by adults, and also makes the observation of cannibalism by researchers unusual.

We thank Walter Tordoff III, Corey Cates, Terry Trasatti, Jr., and Damien Germano for help with censuses when these observations were made.

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SCELOPORUS MUCRONATUS MUCRONATUS (NCN). **PREDATION**. This species is distributed in parts of the Mexican states of Veracruz, Hidalgo, México, Tlaxcala, Puebla, and D.F. (Alvarez and Huerta 1973. An. Esc. Nac. Cienc. Biol. Mex. 20:177–184) at high elevations where rocky outcrops or lava deposits provide crevice microhabitats. Natural history observations are limited to reproduction (Mendez-de la Cruz et al. 1988. J. Herpetol. 22:1–12) and diet (Mendez-de la Cruz et al. 1992. Southwest. Nat. 37:349–355).

On 25 July 1993 while collecting reptiles near km 24.5 on the Ajusco-Tianguistenco highway (Mex. Highway 892, D.F.) at an elevation of 3500 m, we collected a female *Barisia imbricata imbricata* (JLE00293, wet mass 10.0 g, SVL 98 mm) that had eaten a young *S. m. mucronatus* (SVL 30 mm). Previously we reported *S. m. mucronatus* to eat young *Barisia* at this site (Lemos-Espinal and Ballinger 1992. Herpetol. Rev. 23:117). This is an interesting and rarely recorded situation where syntopic lizards are mutual predators rather than competitors. Adults of *S. m. mucronatus* were common on basaltic rocks and lava at this site, whereas young were more commonly observed at the edge of basaltic rocks and areas of grass (*Festuca amolisma*) where *B. i. imbricata* was quite common (N = 57 observed). This is the first account of predation on *S. m. mucronatus* by *B. i. imbricata*.

Preserved specimen JLE00293 will be deposited in the Museum of Natural History, University of Kansas. Susana Sanoja-Sarabia kindly provided field assistance.

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SCELOPORUS SPINOSUS SPINOSUS (NCN). **BEHAVIOR**. On different occasions during a three-year study of cactus wren (*Campylorhynchus brunneicapillus*) ecology in the southwestern United States and México, one of us (GHF) observed reptiles (including an unidentified colubrid snake and an unidentified iguanid lizard) using unoccupied nests of this bird species as diurnal refugia. The nests are large (average 19.5 cm x 16.0 cm), thick-walled, enclosed structures made primarily of grass, and frequently are maintained and used year-round as nighttime roosts. Nests are typically placed in hard-to-reach locations in spinescent vegetation. On 2 July 1991 (ca. 1530 h) in eastern Guanajuato, México, GHF observed a *Sceloporus spinosus spinosus* in a cactus wren nest located 1.5 m above ground in a 1.8-m tall cholla cactus (*Opuntia* sp.), in a sandy wash with scattered cholla, prickly pear (*Opuntia* sp.), and columnar cacti (*Cereus* sp.). The lizard, estimated to be ca. 120 mm SVL, was completely concealed inside the nest and was not collected. There was no precipitation falling at the time of this observation, but the surrounding area had received frequent rain for several weeks. Portions of the study site were flooded, and slowly moving water was observed in areas that were dry during March 1991. These observations indicate that reptile species use the arboreal nests of the cactus wren for shelter. *S. spinosus spinosus* evidently uses these nests as refugia during flooding, and nests may also provide suitable microclimates and potentially allow for predator avoidance at other times.

We thank Hobart M. Smith for encouraging us to publish this record and for identifying the *S. spinosus spinosus* from a photograph.

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SCELOPORUS UNDULATUS CONSOBRINUS (Southern Prairie Lizard). **PREDATION**. On 27 July 1992, while conducting a survey of lizards of the genus *Sceloporus*, we collected an adult male *S. undulatus consobrinus* (MZFC 5337-3, 53.9 mm SVL, 121 mm TL) on a Joshua tree (*Yucca* sp.) in xerophytic habitat, 1 km SE Castaños, near Monclova, Coahuila, México, elevation 969 m. Examination of the stomach contents revealed a small portion of indeterminable material, and the head and neck of a hatchling *Cnemidophorus inornatus*, 4.6 mm head width, with the color pattern typical for this species. The anterior dorsal portion of head, which was ingested first, was crushed from snout to interparietal area, and did not show scales or skin.

Smith (1946. Handbook of Lizards. Comstock Publishing Associates, Ithaca, New York. 557 pp.) reported that *S. u. consobrinus* consumed beetles, ants, grasshoppers, and fragments of vegetable matter. Groves (1971. J. Herpetol. 5(3-4):205) reported cannibalism and predation on other non-sceloporine lizards by *S. undulatus hyacinthinus*.

Predation on teiid lizards by sceloporines was reported by Vitt and Ohmart (1974. Herpetologica 30(4):413); who found that *S. magister* preyed on juvenile *C. tigris*.

Ferguson et al. (1983. *In* R. B. Huey et al. (eds), Lizard Ecology, Studies of a Model Organism, pp. 134–148. Harvard Univ. Press., Cambridge, Massachusetts) suggested that in *S. u. garmani* aggressive behavior is due to reproductive activity associated with territoriality. We think this phenomenon is also likely for the case reported here, as the enlarged testes of the *S. u. consobrinus* suggested it was sexually active.

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SERPENTES

ALSOPHIS VUDII VUDII (Brown Runner). **DIET and GROWTH**. An adult female (84.0 cm SVL, 116.7 cm TL, 196.0 g [mass minus prey item]) was caught on 14 July 1993 on the ESE side of Raleigh Beach on the north end of Waderick Wells Cay, Exuma Cays Land and Sea Park, Exuma Islands, Bahamas. This snake exceeds the maximum SVL (76.5 cm) reported by Schwartz and Henderson (1991. Amphibians and Reptiles of the West Indies: Descriptions, Distributions, and Natural History. University of Florida Press, Gainesville, xvi + 720 pp). The snake showed an obvious body bulge indicating it had fed recently. The prey, which we palped from the body, was a large male *Ameiva auberi* (10.5 cm SVL, 34.4 cm TL, 34.5 g). The lizard had been ingested head first and showed no signs of digestion. It represented 29% and 18%, respectively, of the total length and weight of the snake. The snake was collected at 1655 h (EST) as it moved from a sandy beach dominated by palms where *Ameiva* lizards were plentiful to an adjoining limestone ridge with coppice vegetation. The *Alsophis* (marked #124 by scale clipping) was originally captured on 17 March 1992 in a palm thicket on the NE side of Powerful Beach, approximately 185 m from the recapture site. Between captures (484 days), the snake increased 1.5 cm in SVL, 4.2 cm in TL, and 21.0 g in weight. Schwartz and Henderson (*op. cit.*) listed frogs, lizards, snakes, mice, and birds in the diet of this species. They found that *Ameiva* accounted for only 4.1% of the 49 food items identified from *A. vudii*.

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CHIRONIUS BICARINATUS (NCN). **FORAGING BEHAVIOR**. An adult male *Chironius bicarinatus* (preserved SVL 717 mm, TL 414 mm) was observed on 7 May 1982 hunting in *Viresia gigantea, V. saundersii, V. bituminosa,* and *Neoregelia compacta* (all are species of Bromeliaceae) in a garden at São Conrado, Rio de Janeiro, RJ, Brasil, adjacent to the Tijuca Forest National Park. The snake elevated the anterior part of its body and systematically dove into each axil of the bromeliads, until finding a *Scinax trapicheiroi* (Hylidae) that was promptly swallowed. At the same location, another *C. bicarinatus* was observed trying to cross a streamlet to reach a bromeliad. The animal repeatedly attempted to extend its body over the water at several different points, until finding a dry path. It is well known that bromeliads provide habitat for a rather diverse fauna of invertebrates and small vertebrates, especially anurans, and these observations lead us to speculate that *C. bicarinatus* is an active forager of bromeliad-inhabiting anurans. This report also supports Weist's [1978. Revision of the Neotropical Snake Genus *Chironius* Fitzinger (Serpentes, Colubridae). Ph.D. Thesis, Texas A&M University] findings that this species is stenophagous, feeding only on anurans. The first specimen was deposited in the collection of the Biology Institute of the Federal University of Rio de Janeiro (SPCS 86).

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CROTALUS HORRIDUS (Timber Rattlesnake). **COLORATION**. An essentially striped specimen (Tulane Museum of Natural History TU 28514) was obtained 3 April 1981 on the Tulane University F. Edward Hebert Center located about 5 km NE of Belle Chasse, Plaquemines Parish, Louisiana. A striped specimen from Pennsylvania was described by Gloyd (1934. Pap. Michigan Acad. Sci., Arts Lett. 20:661–668), and Nickerson and Mays (1968. Wasmann J. Biol. 26:125131) reported two striped specimens from close proximity in extreme northern Illinois. Nickerson and Mays included a photograph and a drawing of the skin of one of the Illinois specimens.

The present specimen is a male 109.5 cm SVL plus 8.2 cm to base of rattle. The anterior third of the body shows two abortive chevrons. Otherwise, on either side of the middorsal yellow band a disrupted dark stripe, usually one scale wide, runs along scale rows 3-4 from the middorsal line. Another disrupted dark stripe, 1/2 scale wide, runs on each side along scale rows 5-6 from the ventral scutes. Between each of the lower disrupted stripes a dark blotch reaching to the 4th scale row above the ventrals is present.

The scale counts of 169 ventrals, 27 single plus one divided subcaudals, 25 rows at midbody, 14-14 supralabials, and 15-17 infralabials fall very close to the averages for southern specimens (often referred to as *Crotalus horridus atricaudatus*) as reported by Klauber (1956. The Rattlesnakes. University of California Press, Berkeley and Los Angeles. 2 vols.).

The present specimen demonstrates that a striped mutation can occur at widely disparate parts of the range.

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MASTICOPHIS FLAGELLUM (Western Coachwhip). **FORAGING BEHAVIOR**. Intrasubordinal predation is not uncommon in snakes. Kingsnakes (*Lampropeltis* spp.), coral snakes (*Micrurus* spp.), and indigo snakes (*Drymarchon*) have long been known to prey on other snakes (Conant 1958. A Field Guide to Reptiles and Amphibians, Houghton Mifflin Co., Boston Massachusetts. 366 pp.).

On 26 June 1991, approximately 3 km W of Barstow on State Hwy 247, San Bernardino Co., California, we observed an adult *Masticophis flagellum piceus* moving quickly with its head raised approximately 15 cm above the ground and carrying a dead glossy snake (*Arizona elegans*) in its mouth. Upon our approach the *Masticophis* dropped the snake and retreated. The glossy snake was dorso-ventrally flattened apparently as a result of being run over by an automobile. After we retreated several meters, the *M. flagellum* immediately returned to the glossy snake, retrieved it, and continued on its way.

Cowles (1946. Herpetologica 3:121–122) reported carrion-eating behavior (a bird carcass) by *M. flagellum* in Riverside Co., California. Our observation documents a second incidence of carrion consumption by *M. flagellum*. To our knowledge, this is the first observation of *M. flagellum* using snake carrion and exploiting a "road kill" as a food source.

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NERODIA RHOMBIFER RHOMBIFER (Diamondback Water Snake). **REPRODUCTION**. *Nerodia rhombifer* reaches the northern limit of its range in central Illinois (Conant and Collins 1991. A Field Guide to Reptiles and Amphibians of Eastern and Central North America, 3rd ed. Houghton Mifflin Co., Boston, Massachusetts, 450 pp.; Smith 1961. The Amphibians and Reptiles of Illinois. Illinois. Nat. Hist. Surv. Bull. 28:1–298), where it is restricted to habitats bordering the Illinois and Mississippi Rivers (Smith, *op. cit.*).

We collected two gravid females from Calhoun Co., Illinois, on 26 July 1992. One female, found dead from unknown causes, contained 34 embryos (INHS 10911, female and embryos). A second female was caught on 29 July 1992, near the location where the dead female had been found. This animal was kept in an aquarium and fed living centrarchid fishes until the birth of the litter on 16 September 1992.

The second female had 40 offspring; all were born alive and emerged from fetal membranes unassisted. Eighteen were males and 22 were females, making a male to female ratio of 0.82, not statistically distinguishable from unity ($X^2 = 0.40$, $p > 0.05$). Birth began at about 1900 h and was completed by 2300 h. Mass, snout-vent length (SVL), and total tail length (TTL) of the female and young were measured. Neonates were weighed (nearest 0.01 g) and measured (nearest mm) between 0400 and 0600 h on 17 September. Gender of the neonatal snakes was determined by the method described by Gregory (1983. Herpetol. Rev. 14:42–43). The female was also weighed (to the nearest 1 g) and measured (to the nearest mm) on 17 September. The adult female weighed 625 g and measured 900 mm SVL and 100 mm TTL. The female and all young were released on 21 September 1992.

We estimated relative clutch mass (RCM) by dividing offspring mass by the sum of the female mass after parturition plus the offspring mass (Seigel and Fitch 1984. Oecologia (Berlin) 61:293–301; 1985. J. Anim. Ecol. 54:497–505; Seigel et al. 1986. Herpetologica 42(2):179–185). The estimate therefore does not include the mass attributable to birth fluids and embryo membranes. We calculated a RCM of 0.370.

The mean mass of neonates was 9.14 g for males (range = 8.29–9.80 g; SD = 0.43) and 9.19 g for females (range = 7.99–9.76 g; SD = 0.44). The means do not differ significantly ($t = -0.349$, $p > 0.05$).

Mean SVL for males was 211.2 mm (range = 200–220 mm, SD = 5.77), and mean TTL males was 72.6 mm (range = 66–80 mm, SD = 3.52). Mean SVL for females was 213.2 mm (range = 203–225 mm, SD = 5.45), and the mean TTL for females was 66.3 mm (range = 58–71 mm, SD = 3.43). SVL did not differ significantly between male and female neonates ($t = -1.0977$, $p > 0.05$). However, TTL was significantly shorter for females than males ($t = 5.498$, $p < 0.0001$).

Little is known about reproduction of *N. rhombifer* in Illinois. Smith (*op. cit.*) reported litters of 23 and 32 from specimens collected in Illinois. Anderson (1965. The Reptiles of Missouri. University of Missouri Press, Columbia, Missouri, xxiii + 330 pp.) reported mean litter size of 47.3 (N = 22) based on dissection of gravid females and on counts of live-born litters from Missouri. In Indiana, Minton (1972. Amphibians and Reptiles of Indiana. Ind. Acad. Sci. Monogr. 3:1–346) documented 15 embryos from a single gravid specimen.

There are no previous reports of measurements of lengths and weights of entire litters of this species. In their review, Seigel and Fitch (*op. cit.*) found no published reports of RCM for *N. rhombifer* but they used unpublished data to calculate an RCM of 0.289 for the species. We observed a much higher value (0.370) in the single litter for which it could be measured. Compared to RCM values reported for other natricines, the RCM that we determined for *N. rhombifer* is closer to that reported by Seigel and Fitch for *Clonophis kirtlandii* (0.396 from Conant 1943. Am. Midl. Nat. 29(2):313–341; 0.386 from Tucker 1976. J. Herpetol. 10(1):53–54); we determined a somewhat lower RCM value (0.337) for *C. kirtlandii* based on data reported by Powell and Parmerlee (1991. Bull. Chicago Herpetol. Soc. 26(2):32). The large range in RCMs for natricines suggests that many more data are needed before natural variability in this important life history trait can be adequately described.

We thank Mack Sitzes for assistance in capturing the female. John Nelson helped with statistics. Charles Theiling also assisted with statistical evaluations of the data. John P. Ballenot, Carie Nixon, Eric Ratcliff, Chuck Theiling, and Glendy Vanderah made comments on the manuscript. Lee A. Fitzgerald made several helpful suggestions on the manuscript.

Submitted by **JOHN K. TUCKER** and **JAMES B. CAMERER**, Illinois Natural History Survey, Long Term Resource Monitoring Program Pool 26, 1005 Edwardsville Road, Wood River, Illinois 62095, USA.

NERODIA SIPEDON (Northern Water Snake). **FATALITY**. Plastic debris has been implicated in the deaths of numerous aquatic and marine vertebrates, including fish, birds, mammals, and turtles (e.g., Committee on Sea Turtle Conservation 1990. Decline of the Sea Turtles: Causes and Prevention. National Academy Press, Washington, DC, 259 pp.). Here we report on mortality to *Nerodia sipedon* caused by entanglement in Bird-X™, a flexible plastic netting used to control bird damage in gardens and orchards.

On 22 June 1992, a female *Nerodia sipedon* (Denison University Vertebrate Collection A0063: 718 mm SVL, 941 mm TL) was found dead, entangled in Bird-X™ used to exclude small rodents from a plant ecology experiment in progress at Mountain Lake Biological Station (MLBS), Giles County, Virginia. The snake had lacerations to the upper thoracic region and prominent constrictions to the mid-tracheal and anterior lung region. Apparently the snake either strangled or perished from thermal stress, as it had been restrained in full sunlight on a warm afternoon. On 17 August 1993, another female *N. sipedon* (DUVC A0075: 595 mm SVL, 771 mm TL) was found entrapped in a snarl of Bird-X™ (a 170 mm fragment discarded from the above experiment), grass, and sedge. It was writhing upside-down when encountered, and the netting had already inflicted multiple lacerations, including an upper-thoracic wound that almost completely severed the ventral and lateral musculature. The wounds were too severe to treat, so the snake was euthanized.

At least three additional snakes were ensnared in plastic netting from 1991-1993 at MLBS, including another *N. sipedon*, a black rat snake (*Elaphe obsoleta*), and a timber rattlesnake (*Crotalus horridus*). The two nonvenomous snakes were released unharmed, but the rattlesnake was already dead when it was discovered. Large, heavy-bodied snakes appear particularly vulnerable to entrapment because their scales snag the flexible netting when they reverse direction. Smaller snakes probably encounter plastic netting frequently but are able to maneuver through the mesh easily. Because they are active hunters that forage along ecotones where trash often accumulates, water snakes appear particularly vulnerable to such accidental fatalities (e.g., Herrington 1985. Herpetol. Rev. 16(4):113).

Submitted by **JOHN E. FAUTH** and **STEPHANIE M. WELTER**, Department of Biology, Denison University, Granville, Ohio 43023, USA.

STORERIA OCCIPITOMACULATA OCCIPITOMACULATA (Northern Red-bellied Snake). **PREDATION**. On 1 July 1992, a 25 cm *Storeria occipitomaculata occipitomaculata* (sex unknown) was found in an American kestrel (*Falco sparverius*) nest box located on a 50% dead tree in the middle of a fallow field on Ile Perrot, Quebec (lat. 45°22'30"N, long. 73°55'00"W). The snake's spinal cord was severed at the base of the head and it was presumed it would soon become food for the three 3-week old *F. sparverius* chicks within the box. According to Sherrod (1978. Raptor Research 12(3/4):49–121), *S. occipitomaculata* has not been recorded previously in the diet of *F. sparverius*. *Falco sparverius* feeds on a variety of reptiles and amphibians, but it is unusual to find *S. occipitomaculata* in the diet due to this snake's habit of residing

under logs, stones, or other cover during most of the day (Froom 1972. The Snakes of Canada, McClelland and Stewart Ltd., Toronto.).

Submitted by **GLENN C. BARRETT***, and **MORRIS R. VILLARROUL,** Avian Science and Conservation Centre, Macdonald Campus, McGill University, 21111 Lakeshore, Ste-Anne-de-Bellevue, Quebec, Canada, H9X 3V9.

* Present address for GCB: 2429 Lakeshore Road, Burlington, Ontario, Canada, L7R.

THAMNOPHIS SIRTALIS SIRTALIS (Eastern Garter Snake). **ALBINISM.** Reports of albinistic and leucistic individuals of this species are not uncommon. Dyrkacz (1981. SSAR Herpetol. Circ. 11) reported 11 instances from throughout its range. However, no reports of albinistic *T. sirtalis* from Virginia have been published (Mitchell, *in press*. The Reptiles of Virginia. Smithsonian Inst. Press, Washington, D.C.). A leucistic, approximately 600 mm total length, adult female *T. s. sirtalis* was found on 2 July 1992 near a small stream on the Clifton Farm, 7 km north of Warrenton, Fauquier County, Virginia. The snake's eyes were normally pigmented, but the skin was uniformly white with only the barest traces of pattern visible (Fig. 1).

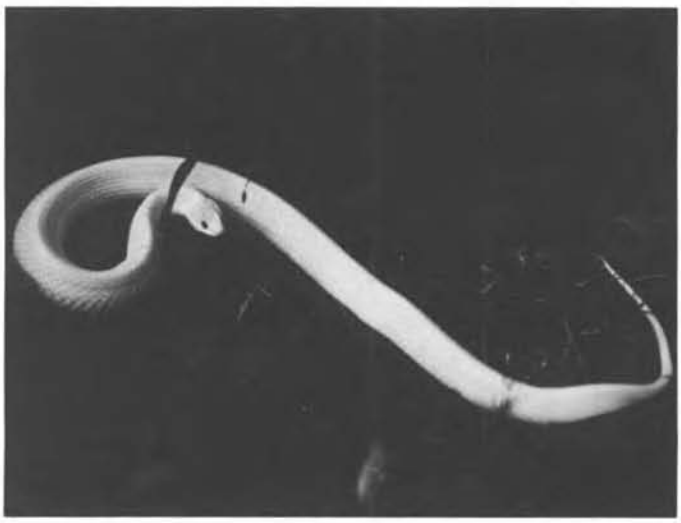

FIG. 1. Leucistic *Thamnophis s. sirtalis* from Fauquier Co., Virginia.

The snake was kept in captivity where it refused food (ranid frogs). On 19 September, it gave birth to 30 neonates, all of which were normally pigmented and patterned. Five of the neonates were either stillborn or died shortly after birth. The female and surviving young were released on 21 September. However, on the following day the female was found at the release site weak and emaciated, and was recaptured. She died on 30 September after regurgitating a force-fed frog. Dissection of the snake revealed one additional, somewhat decomposed neonate, also normally pigmented and patterned. The lack of leucistic neonates in this female suggests that albinism in this species may follow Mendelian inheritance patterns.

Submitted by **STEPHEN H. SHIVELY**, Louisiana Natural Heritage Program, Louisiana Department of Wildlife and Fisheries, P.O. Box 98000, Baton Rouge, Louisiana 70898-9000, USA, and **JOSEPH C. MITCHELL**, Department of Biology, University of Richmond, Richmond, Virginia 23173, USA.

GEOGRAPHIC DISTRIBUTION

Herpetological Review publishes brief notices of new geographic distribution records in order to make them available to the herpetological community in published form. Geographic distribution records are important to biologists in that they allow for a more precise determination of a species' range, and thereby permit a more significant interpretation of its biology.

These geographic distribution records will be accepted in a **standard format** only, and all authors *must* adhere to that format, as follows: SCIENTIFIC NAME, COMMON NAME (as it appears in Collins, 1990, *Standard Common and Current Scientific Names for North American Amphibians and Reptiles, Third Edition*, Herp. Circ. 19:1–41), LOCALITY (use metric for distances and give precise locality data), DATE (day-month-year), COLLECTOR, VERIFIED BY (*cannot* be verified by an author — curator at an institutional collection is preferred), PLACE OF DEPOSITION (where applicable, use standardized collection designations as they appear in Leviton et al., 1985, *Standard Symbolic Codes for Institutional Resource Collections in Herpetology and Ichthyology*, Copeia 1985(3):802–832) and CATALOG NUMBER (required), COMMENTS (brief), CITATIONS (brief), SUBMITTED BY (give name and address in full — spell out state names — no abbreviations).

Some further comments. This geographic distribution section does not publish "observation" records. Records submitted should be based on preserved specimens which have been placed in a university or museum collection (private collection depository records are discouraged; institutional collection records will receive precedence in case of conflict). A good quality color slide or photograph may substitute for a preserved specimen *only* when the live specimen could not be collected for the following reasons: it was a protected species, it was found in a protected area, or the logistics of preservation were prohibitive (such as large turtles or crocodilians). Color slides and photographs *must* be deposited in a university or museum collection along with complete locality data, and the color slide catalog number(s) must be included in the same manner as a preserved record. Before you submit a manuscript to us, check Censky (1988, *Index to Geographic Distribution Records in Herpetological Review: 1967–1986*) to make sure you are not duplicating a previously published record.

Please submit any geographic distribution records in the **standard format only** to the Section Co-editors, Joseph T. Collins (USA & Canadian records only), Museum of Natural History—Dyche Hall, The University of Kansas, Lawrence, Kansas 66045–2454, USA, or Jerry D. Johnson (the rest of the world), Department of Biology, El Paso Community College, P.O. Box 20500, El Paso, Texas 79998-0500, USA. Short manuscripts are strongly discouraged, and are only acceptable when data cannot be presented adequately in the standard format.

Recommended citation for new distribution records appearing in this section is: Painter, C. W., and C. M. Milensky. 1993. Geographic Distribution. *Crotalus tigris*. Herpetol. Rev. 24:155-156.

CAUDATA

AMBYSTOMA MACULATUM (Spotted Salamander). USA: TENNESSEE: Humphrys Co: adjacent small creek near jct. Bodine Loop and Cuba Landing Roads. 28 March 1993. M. Varner and B. T. Miller. Middle Tennessee State University (MTSU 84C–85C). Verified by B. T. Miller. New county record (Redmond 1985, A Biogeographic Study of Amphibians in Tennessee, Doctoral Thesis, Univ. Tennessee, Knoxville. 290 pp.).

Submitted by **MURLIN E. VARNER, JR.**, Department of Biology, Middle Tennessee State University, Murfreesboro, Tennessee 37132, USA.

AMBYSTOMA OPACUM (Marbled Salamander). USA: ILLINOIS: Shelby Co: 2 km W Towerhill & 4 km S Rt. 16 (39°20'53"N, 88°59'30"W). 10 April 1993. Tony Glick. Verified by Ronald A. Brandon. Southern Illinois University at Carbondale (SIUC H-

4451). New county record; extends range ca. 55 km WNW of nearest known locality in Cumberland County (Smith 1961, The Amphibians and Reptiles of Illinois, Illinois Nat. Hist. Surv. Bull. 28:1–298).

Submitted by **ALLAN K. WILSON**, Max McGraw Wildlife Foundation, P.O. Box 9, East Dundee, Illinois 60118, USA.

ANEIDES AENEUS (Green Salamander). USA: INDIANA: Crawford Co: see below. 24 August 1993. R. F. Madej. Verified by A. R. Resetar. FMNH 251486. Adult female. This is the first occurence for Indiana. Frozen tissue samples are also stored at the Field Museum of Natural History. Other individuals (adult and juvenile) observed and photographed at site. Precise locality data have been withheld because this species has been recommended for legal protection under the Indiana Nongame and Endangered Species Conservation Act (IC 14-2-8.5).

Submitted by **ROBERT F. MADEJ**, Indiana Department of Natural Resources, Division of Fish and Wildlife, Nongame and Endangered Wildlife Program, 300 West First Street, Bloomington, Indiana 47403, USA.

CRYPTOBRANCHUS ALLEGANIENSIS (Hellbender). USA: ILLINOIS: White Co: Wabash River at Maunie. 8 August 1990. Captured by commercial fishermen, obtained by a fish market in McLeansboro, and given to Saint Louis Zoo where it was displayed until it died in 1993. The frozen specimen was given to the Southern Illinois University at Carbondale Department of Zoology where it was preserved and deposited (SIUC H-4462). Verified by Ron Goellner. Previously considered extirpated from state but, on the basis of this specimen, the Department of Conservation is adding the Hellbender to the list of Illinois endangered species. The most recently documented specimens were from Cave In Rock, Hardin County (1956) and Metropolis, Massac County (1956), both from the Ohio River (Stein and Smith 1959, Copeia 1959:178–179). These specimens, previously reported to be at Southern Illinois University, are now INHS 9669 and 9670, respectively. Stein and Smith (*op. cit.*) mentioned a specimen collected in 1947 near Maunie. Klimstra and Hutchison (1965, Trans. Illinois St. Acad. Sci. 58:151–156) reported a specimen from the Ohio River near Joppa, Massac County, but it is undocumented.

Submitted by **RONALD A. BRANDON**, Department of Zoology, Southern Illinois University, Carbondale, Illinois 62901, USA, and **SCOTT R. BALLARD**, Illinois Department of Conservation, Division of Natural Heritage, 4521 Alton Commerce Parkway, Alton, Illinois 62002, USA.

DICAMPTODON TENEBROSUS (Pacific Giant Salamander). USA: WASHINGTON: Pacific Co: tributary of Willapa River, ca. 1.6 km E of Willapa Harbor Airport, NW 1/4 Sec. 15, T14N, R9W. 5 September 1993. W. P. Leonard and D. Doherty. Verified by R. A. Nussbaum. University of Michigan Museum of Zoology, Ann Arbor, Michigan (RAN 31885). First coastal record N of the Willapa River. Extends range ca. 24 km N of only other county record (Jones and Atkinson 1989, Northwest. Nat. 70:40–42.).

Submitted by **WILLIAM P. LEONARD**, Washington Department of Ecology, P. O. Box 47600, Olympia, Washington 98504-7600, USA, and **DEIRDRE DOHERTY**, P. O. Box 319, Bridgeton, New Jersey 08302, USA.

NOTOPHTHALMUS VIRIDESCENS LOUISIANENSIS (Central Newt). USA: ALABAMA: Mobile Co: Dauphin Island, Gorgas Swamp. 12 November 1993. T. A. Sinclair. Verified by James D. Lazell. MCZ A11825. New island record; extends range in Alabama W of the Alabama River ca. 117 km S of Greene County locality and ca. 35 km S of Mobile County literature record (Mount 1975, The Reptiles and Amphibians of Alabama. Auburn Univ. Agric. Exp. Sta., Auburn, Alabama. 347 pp.). Salamanders are absent or rare on barrier islands. This increases to three the number found on Dauphin Island (Mount, *op. cit.*).

Submitted by **THOMAS A. SINCLAIR**, The Conservation Agency, 6 Swinburne Street, Jamestown, Rhode Island 02835, USA.

PLETHODON WEHRLEI (Wehrle's Salamander). USA: NORTH CAROLINA: Alleghany Co: 6.8 km and 6.9 km SSE Edmonds, Saddle Mountain. 14 November 1993. J. C. Beane, J. R. Everhart, and A. B. Somers. NCSM 34832–34833; Surry Co: 5.8 km WSW Low Gap, Saddle Mountain. 16 October 1993. J. C. Beane, C. K. Cheshire, S. K. Eanes, J. R. Everhart, and A. B. Somers. NCSM 34825; 6.0 km WSW Low Gap, Saddle Mountain. 13 November 1993. J. C. Beane and C. K. Chesire. NCSM 34831. All verified by Alvin L. Braswell. A total of eighteen additional specimens from contiguous populations were observed but not collected on 16 October, 22 October, and 13–14 November 1993 at these localities. New county records; second locality for North Carolina. Extends range ca. 70 km S of nearest records in Patrick and Grayson counties, Virginia, and ca. 60 km W of nearest records in Stokes County, North Carolina (Highton 1987, Cat. Amer. Amph. Rept. 402.1–402.3). Only two specimens had been known from North Carolina, and the exact locality and specific collection data for those specimens have apparently not been previously reported. Both are from Hanging Rock State Park in Stokes County. One (NCSM 32093, formerly DU A14806) on 16 April 1978 by J. R. Bailey et al. Highton (1962, Bull. Florida State Mus. 6(3):235–367) noted that Whitetop Mountain in Grayson County, Virginia, was the only site where *P. wehrlei* was sympatric with *P. yonahlossee*. The two species are also sympatric at this new locality.

Submitted by **JEFFREY C. BEANE**, North Carolina State Museum of Natural Sciences, Box 29555, Raleigh, North Carolina 27626-0555, USA, and **ANN BERRY SOMERS**, Department of Biology, University of North Carolina at Greensboro, Greensboro, North Carolina 27412-5001, USA.

ANURA

ASCAPHUS TRUEI (Tailed Frog). USA: WASHINGTON: Okanogan Co: Williams Creek (tributary to Twisp River), 0.3 km SW of Twisp River, SW 1/4 Sec. 34, T34N, R19E. 25 September 1993. D. Visalli and W. P. Leonard. Verified by L. L. C. Jones. University of Washington Burke Museum, Seattle, Washington (UWBM 2218). New county record; fills ca. 180 km distributional gap between Chelan County, Washington, and British Columbia along E slope of Cascade Mountains (Nussbaum et al. 1983, Amphibians and Reptiles of the Pacific Northwest. Univ. of Idaho Press, Moscow. 332 pp.).

Submitted by **DANA VISALLI**, P. O. Box 175, Winthrop, Washington 98862, USA, and **WILLIAM P. LEONARD**, Washington Department of Ecology, P. O. Box 47600, Olympia, Washington 98504-7600, USA.

ASCAPHUS TRUEI (Tailed Frog). USA: WASHINGTON: Wahkiakum Co: tributary to Elochoman River, ca. 21 km N of Town of Cathlamet, NW 1/4 Sec. 3, T10N, R5W. 29 April 1993. S. W. Manlow. Verified by L. L. C. Jones. University of Washington Burke Museum, Seattle, Washington (UWBM 2216). New county record; extends range ca. 30 km SW in Willapa Hills (Adams 1993, Herpetol. Rev. 24(2): 64). Found in stream with sympatric populations of *Dicamptodon copei*, *D. tenebrosus*, and *Rhyacotriton kezeri*.

Submitted by **STEVEN W. MANLOW**, Washington Department of Wildlife, 11203 NE 96th Street, Vancouver, Washington 98662, USA.

BUFO AMERICANUS (American Toad). USA: ILLINOIS: Fayette Co: Sec. 28, T7N, R3E, junction of Brickyard Branch of South Fork Creek with County Road 2000N, 0.25 km W of St. Elmo. 17 April 1993. J. K. Tucker. Verified by K. Cummings. Illinois Natural History Survey (INHS 10957–10959). Three males. New county record (Smith 1961, The Amphibians and Reptiles of Illinois. Illinois Nat. Hist. Surv. Bull. 28:1–298); extends range 24 km S of nearest Illinois record and confirms Smith's hypothesis that species occurs in the county.

Submitted by **JOHN K. TUCKER**, Illinois Natural History Survey, Long Term Resource Monitoring Program, 1005 Edwardsville Road, Wood River, Illinois 62095, USA.

BUFO AMERICANUS AMERICANUS (Eastern American Toad). USA: ILLINOIS: Kane Co: 1 km W Rt. 25 and 1.8 km S Rt. 72 (42°5'17"N, 88°15'55"W). 1 September 1993. A. K. Wilson. Verified by Ronald A. Brandon. Southern Illinois University at Carbondale (SIUC H-4473). New county record; Smith (1961, The Amphibians and Reptiles of Illinois, Illinois Nat. Hist. Surv. Bull. 28:1–298) shows literature record but no voucher for the county.

Submitted by **ALLAN K. WILSON**, Max McGraw Wildlife Foundation, P. O. Box 9, East Dundee, Illinois 60118, USA.

BUFO MICROSCAPHUS MICROSCAPHUS (Arizona Toad). USA: ARIZONA: Gila Co: Pinto Creek at U.S. Forest Service Road 287, Sec. 2, T1N, R13E. 19 April 1993. S. G. Seim. Verified by B. K. Sullivan. Arizona State University Lower Vertebrate Collection (ASU 28812). One calling male observed 60 km southwest of nearest record (Sullivan, Great Basin Nat. *in press*). Not previously known to occur on south side of Lake Roosevelt.

Submitted by **SHARON G. SEIM**, Arizona Game and Fish Department, Nongame Branch, 2221 West Greenway Road, Phoenix, Arizona 85023, USA.

BUFO WOODHOUSII FOWLERI (Fowler's Toad). USA: MISSOURI: St. Charles Co: NE 1/4 Sec. 26, T48N, R7E, Ellis Island, Riverlands Road. 2 April 1993. J. Tucker. Verified by L. Page, Illinois Natural History Survey (INHS 10981-10986). Six adults taken AOR. New county record (Johnson 1987, The Amphibians and Reptiles of Missouri. Publ. Missouri Dept. Conserv., Jefferson City, 368 pp.).

Submitted by **JOHN K. TUCKER** and **CHARLES H. THEILING**, Illinois Natural History Survey, Long Term Resource Monitoring Program, 1005 Edwardsville Road, Wood River, Illinois 62095, USA.

RANA CATESBEIANA (Bullfrog). USA: ILLINOIS: Peoria Co: Peoria, Teton & N. University Avenue, Sec. 8, T9N, R8E, DOR. 11 July 1993. F. T. Burbrink. Verified by Kevin S. Cummings. Illinois Natural History Survey, Champaign, Illinois (INHS 10973). (Smith 1961, The Amphibians and Reptiles of Illinois, Illinois Nat. Hist. Surv. Bull. 28:1–298) shows a published record but no voucher for this species in the county; new county record.

Submitted by **FRANK T. BURBRINK**, Center for Wildlife Ecology, Illinois Natural History Survey, Natural Resources Building, 607 East Peabody Drive, Champaign, Illinois 61820, USA.

SCAPHIOPUS HOLBROOKII HURTERII (Hurter's Spadefoot). USA: TEXAS: Grayson Co: 4.8 km SE Denison. 29 April 1993. J. D. Camper. TCWC 70375. Verified by James R. Dixon. County record; fills substantial gap between Denton and Red River counties at western portion of range (Dixon 1987, Amphibians and Reptiles of Texas. Texas A & M University Press, College Station, Texas. 434 pp.). Adult taken (2030 h) at breeding pond in lowland area of red-sandy soil about 8 km S Red River.

Submitted by **JEFFREY D. CAMPER**, Department of Biology, Austin College, Sherman, Texas 75091-1177, USA.

SYRRHOPHUS CYSTIGNATHOIDES (Rio Grande Chirping Frog), USA: TEXAS: Tarrant Co: jct. Daggett and Sunset Terrace. 18 September 1993. M. T. Dixon, L. K. Ammerman and L. S. McGown. Verified by James R. Dixon. TCWC 70873–70874. Northernmost record for the species (Dixon 1987, Amphibians and Reptiles of Texas. Texas A & M University Press, College Station, Texas. 434 pp.). Introduced into the San Antonio and Houston area via the plant nursery trade, and possibly arrived in Fort Worth in a similar manner. The frogs have established themselves in rocky areas along a two mile stretch on the bluff of the Clear Fork of the Trinity River.

Submitted by **LAURINE S. McGOWN, MICHAEL T. DIXON**, and **LOREN K. AMMERMAN**. Department of Biology, Texas Wesleyan University, 1201 Wesleyan, Fort Worth, Texas 76105, USA.

TESTUDINES

APALONE SPINIFERA ASPERA (Gulf Coast Spiny Softshell). USA: NORTH CAROLINA: Montgomery Co: 5.9 km WSW Pekin in Little River. 20 June 1993. J. C. Beane, S. L. Alford, and J. Hurley. Verified by W. M. Palmer. NCSM color slides JCB 93-1172. New county record (NCSM files).

Submitted by **JEFFREY C. BEANE**, North Carolina State Museum of Natural Sciences, Box 29555, Raleigh, North Carolina 27626-0555, USA, and **STANLEY L. ALFORD**, North Carolina Zoological Park, Route 4, Box 83, Asheboro, North Carolina 27203, USA.

CHELYDRA SERPENTINA (Snapping Turtle). USA: ILLINOIS: Kane Co: 1 km W of Rt. 25 & 1.9 km S of Rt. 72 (42°5'15"N, 88°15'56"W). 15 June 1993. L. A. Fray and A. K. Wilson. Verified by Ronald A. Brandon. Southern Illinois University at Carbondale (SIUC R-2500). New county record; (Smith 1961, The Amphibians and Reptiles of Illinois, Illinois Nat. Hist. Surv. Bull. 28:1–298) shows a literature record but no voucher for the county.

Submitted by **ALLAN K. WILSON**, Max McGraw Wildlife Foundation, P. O. Box 9, East Dundee, Illinois 60118, USA.

MELANOCHELYS TRICARINATA (Tricarinate Hill Turtle). INDIA: UTTAR PRADESH: Dehradun: Chandrabani, on Wildlife Institute of India campus. 10 August 1993. Stephen D. Busack. Verified by S. Bhupathy. One live individual, represented by four transparencies (CM Acc. 35560.1–35560.4) and at least ten additional specimens living in the area and individually marked by S. Bhupathy. These turtles may represent a previously unreported and disjunct population 1000 km NW of available records (Tikader and Sharma 1985, Handbook Indian Testudines, Zool. Surv. India, Calcutta, 156 pp.), or an introduction attempt that may be successful.

Submitted by **STEPHEN D. BUSACK**, National Fish and Wildlife Forensic Laboratory, 1490 East Main Street, Ashland, Oregon 97520, USA.

STERNOTHERUS ODORATUS (Common Musk Turtle). USA: MISSOURI: St. Charles Co: NE 1/4 Sec. 26, T48N, R7E, Ellis Island, Riverlands Road. 8 July 1993. J. Tucker. Verified by L. Page, Illinois Natural History Survey (INHS 10987). Adult taken AOR. New county record and second record north of Missouri River for the species (Johnson 1987, The Amphibians and Reptiles of Missouri. Publ. Missouri Dept. Conserv., Jefferson City, 368 pp.).

Submitted by **JOHN K. TUCKER** and **CHARLES H. THEILING**, Illinois Natural History Survey, Long Term Resource Monitoring Program, 1005 Edwardsville Road, Wood River, Illinois 62095, USA.

TRACHEMYS SCRIPTA (Slider). USA: KANSAS: Riley Co: Fort Riley Military Reservation, Vinton Pond, SE 1/4, NE 1/4 Sec. 35, T10S, R5E. 11 September 1993. J. R. Parmelee. Verified by Joseph T. Collins. KU 221248. Caught in turtle trap; new county record (Collins 1993, Amphibians and Reptiles in Kansas. Univ. Kansas Mus. Nat. Hist. Pub. Ed. Series 13: 1–397).

Submitted by **JEFFREY R. PARMELEE**, Museum of Natural History and Department of Systematics and Ecology, The University of Kansas, Lawrence, Kansas 66045-2454, USA.

TRACHEMYS SCRIPTA ELEGANS (Red-eared Slider). USA: ILLINOIS: Kane Co: Max McGraw Wildlife Foundation, 1.05 km W Rt. 25 & 2.5 km S Rt. 72 (42°4'29"N, 88°16'8"W). 16 July 1993. A. K. Wilson. Verified by R. A. Brandon. Southern Illinois University at Carbondale (SIUC R-2485). Other sightings in area possibly indicate breeding has occurred; new county record (Smith 1961, The Amphibians and Reptiles of Illinois, Illinois Nat. Hist. Surv. Bull. 28:1–298).

Submitted by **ALLAN K. WILSON**, Max McGraw Wildlife Foundation, P.O. Box 9, East Dundee, Illinois 60118, USA.

LACERTILIA

ANOLIS SAGREI (Brown Anole). USA: LOUISIANA: East Baton Rouge Parish: Baton Rouge, greenhouse on Sottle Drive, ca. 2 km NE jct. Interstate 10 and Highland Road. 8 October 1993. Mike Leggio. Verified by Richard R. Montanucci. Vertebrate Collection, Department of Biological Sciences, Clemson University (CUSC 792). Single specimen collected. At least five additional individuals observed in greenhouse with *Anolis carolinensis*. Nearest reported populations are in Orleans and Jefferson Parishes, Louisiana (Thomas et al. 1990, Herpetol. Rev. 21:22). Extends range ca. 115 km northeast. Greenhouse may provide thermal refuge from occasional low winter temperatures; it is likely that *A. sagrei* is established at this site. Probably introduced in shipments of houseplants originating from Florida.

Submitted by **STEVEN G. PLATT** and **LANCE W. FONTENOT**, Department of Biological Sciences, Clemson University, Clemson, South Carolina 29634-1903, USA.

CNEMIDOPHORUS DEPPEI DEPPEI (Lagartija Rayada). NICARAGUA: ZELAYA: Puerto Cabezas. 18 May 1970. Jaime D. Villa. KU 174105–8. Verified by Joseph T. Collins; Krukira, ca. 40 km S Puerto Cabezas. 20 December 1991. J. D. Villa, E. J. Petuch, R. Solórzano. Three uncatalogued specimens to be deposited at the University of Florida. First records on the Caribbean versant of Nicaragua, extending distribution beyond the map given by Wright (*In* Wright and Vitt 1993, Biology of Whiptail Lizards [Genus *Cnemidophorus*], pp. 27-81. Publ. Oklahoma Mus. Nat. Hist., Norman, Oklahoma). Extends known range ca. 165 km SSE Tancín, Departamento de Gracias a Dios, the nearest known locality in Honduras (Meyer and Wilson 1973, Los Angeles Co. Mus. Contrib. Sci. 244:1-39), and 320 km NNW of the Ciudad Darío-Sébaco area (Departamento de Matagalpa), the nearest Nicaraguan localities (KU 86066–67, 103270–76). The Tancín specimens (LACM 48023–25, LSUMZ 21628–31), as well as one from Puerto Castillo, Colón (LSUMZ 22482), are also outside the range as depicted in Wright (*op. cit.*).

Submitted by **JAIME D. VILLA**, Department of Biological Sciences, Florida Atlantic University, Boca Raton, Florida 33431-0991, USA.

OPHISAURUS ATTENUATUS (Western Slender Glass Lizard). USA: KANSAS: Saline Co: DOR, 1.5 km SSE Bridgeport, NE 1/4 Sec. 36, T16S, R3W. 21 May 1993. Jerry D. Johnson and Travis J. LaDuc. Verified by Robert G. Webb. University of Texas at El Paso (UTEP 15298). First county record (Collins 1993, Amphibians and Reptiles of Kansas. Third ed. Univ. Kansas Mus. Nat. Hist. Publ. Ed. Ser. 13:1–397.).

Submitted by **JERRY D. JOHNSON**, Biology Department, El Paso Community College, El Paso, Texas 79998-0500 and Department of Biological Sciences, The University of Texas at El Paso, El Paso, Texas 79968-0519, USA, and **TRAVIS J. LaDUC**, Department of Biological Sciences, The University of Texas at El Paso, El Paso, Texas, 19968-0519, USA.

PODARCIS MURALIS (Common Wall Lizard). USA: KENTUCKY: Campbell Co: Ft. Thomas, along Clover Ridge Avenue, 39°05'30"N, 84°27'25"W. 22 September 1993. Matthew and Dana Draud. Verified by Rafe M. Brown. Cincinnati Museum of Natural History (CMNH 3897). State record and collected from a large breeding population. Common across the Ohio River in Cincinnati (Hedeen 1984, Herpetol. Rev. 15:70–71).

Submitted by **MATTHEW DRAUD**, Chandler #17, Behavioral and Evolutionary Sciences, Lehigh University, Bethlehem, Pennsylvania 18018, USA and **JOHN FERNER**, Department of Biology, Thomas More College, Crestview Hills, Kentucky 41017, USA.

SCINCELLA LATERALIS (Ground Skink). USA: NORTH CAROLINA. Surry Co: 6.5 km NNW Mountain Park along Mitchell River. 11 September 1993. J. C. Beane and A. B. Somers. Verified by W. M. Palmer. NCSM 34711. New county record; extends range ca. 75 km WNW of nearest record in Forsyth County (NCSM files) and partially fills the range hiatus as shown in Conant and Collins (1991, A Field Guide to Reptiles and Amphibians of Eastern and Central North America. Third ed. Houghton Mifflin, Boston, Massachusetts, 450 pp.). Another specimen was observed but not collected 0.8 km SSW Dobson on 3 October 1993.

Submitted by **JEFFREY C. BEANE**, North Carolina State Museum of Natural Sciences, Box 29555, Raleigh, North Carolina 27626-0555, USA, and **ANN BERRY SOMERS**, Department of Biology, University of North Carolina at Greensboro, Greensboro, North Carolina 27412-5001, USA.

SERPENTES

CLONOPHIS KIRTLANDII (Kirtland's Snake). USA: OHIO: Greene Co: Belbrook, Spring Lakes. 17 September 1993. Michael Bernhard. Verified by J. T. Collins. Animal photographed and released. KU Color Slide 11044. Adult male found near water during daylight hours. The species is considered threatened in the state of Ohio and is thought to be restricted to a few southern counties. This individual could represent a previously unknown population and is likely the first record of this species in Greene County (Wynne, unpubl. ms.).

Submitted by **GREGORY J. WATKINS-COLWELL**, Department of Biological Sciences, Ohio University, Athens, Ohio 45701, USA.

CROTALUS HORRIDUS (Timber Rattlesnake). USA: LOUISIANA: Beauregard Parish: DOR on U. S. Rt. 190, 5.6 km SW Merryville. 6 October 1972. R. D. Suttkus. Verified by D. A. Rossman. Tulane University Museum of Natural History (TU 28888). New parish record. This is only a short distance (ca. 30 km) from a Newton County, Texas record (Dixon 1987, Amphibians and Reptiles of Texas. Texas A&M University Press, College Station, Texas. xii + 434 pp.), but equidistant from the two closest localities in Louisiana (111 km west, 111 km south) (Dundee and Rossman 1989, The Amphibians and Reptiles of Louisiana. Louisiana State University Press, Baton Rouge, Louisiana. xi + 300 pp.). The species is rare in pinelands of Louisiana, occurring

primarily in bottomlands or hardwood forests. The Merryville record is in bottomland forest near the Sabine River.

Submitted by **HAROLD A. DUNDEE**, Department of EEO Biology, Tulane University, New Orleans, Louisiana 70118-5698, USA.

ELAPHE EMORYI (Great Plains Rat Snake). USA: NEBRASKA: Richardson Co: gravel road through center of Sec. 15, T2N, R13E. 31 July 1993. C. Bridgewater and T. Leonard. University of Nebraska at Lincoln (UNL 15399). Verified by John D. Lynch. New county record; easternmost occurrence of the species in Nebraska (Lynch 1985, Trans. Nebraska Acad. Sci. 13:33–57).

Submitted by **T. LEONARD**, 5006 South 36th Avenue, Omaha, Nebraska 68107, USA.

NERODIA RHOMBIFER RHOMBIFER (Diamondback Water Snake). USA: ILLINOIS: Calhoun Co: mouth of Swan Lake, Illinois River mile 5.0. 26 July 1992. J. K. Tucker and J. Nelson. Verified by K. S. Cummings. Illinois Natural History Survey (INHS 10911). New county record; extends range 4.9 km SW of nearest Illinois record in Jersey County (Smith 1961, The Amphibians and Reptiles of Illinois. Illinois Nat. Hist. Surv. Bull. 28:1–298).

Submitted by **JOHN K. TUCKER** and **JAMES B. CAMERER**, Illinois Natural History Survey, Long Term Resource Monitoring Program Pool 26, 1005 Edwardsville Road, Wood River, Illinois 62095, USA.

RAMPHOTYPHLOPS BRAMINUS (Braminy Blind Snake). MEXICO: OAXACA: municipality of Cuicatlan, trail station Cuicatlan (17°26'N, 96°13'W), 600 m elev. 28 July 1993. Dan G. Mink. Verified by Oscar Flores-Villela. Museo de Zoología, Facultad de Ciencias, Universidad Nacional Autonoma de México (MZFC 6009, two specimens). First record for the state and a southwestern range extension of 178 km (airline) from Playa Mocambo, Veracruz, on the Gulf Coast (Mendoza-Quijano et al. 1993, Herpetol. Rev. 24(3):110). Previously reported introductions are in Baja California Sur (Murphy and Ottley 1979, Herpetol. Rev. 10(4):119), Jalisco (Dundee and Flores-Villela 1991, Herpetol. Rev. 22(1):26), Sinaloa, Michoacan, and Guerrero on the Pacific Coast, and inland from Queretaro and Morelos (Dixon and Hendricks 1979, Zool. Verhandelingen 173:1–39).

Submitted by **FERNANDO MENDOZA QUIJANO** and **ALEJANDRA RENDON ROJAS**, Museo de Zoología, Facultad de Ciencias, Universidad Nacional Autonoma de México, Apartado Postal 70-399, México D. F. 04510, México, and **DANIEL G. MINK**, Department of Zoology, Brigham Young University, Provo, Utah 84602, USA.

RAMPHOTYPHLOPS BRAMINUS (Braminy Blind Snake). USA: FLORIDA: Highlands Co: Lake Placid at residence in Placid Lakes subdivision. 26 June 1993. W. E. Meshaka, Jr. Verified by H. R. Mushinsky. Vertebrate collection, Archbold Biological Station (ABS 1177). New county record and northernmost locality in Florida; extends inland range ca. 100 km NW of Palm Beach County record (DeLorey and Mushinsky 1987, Herpetol. Rev. 18(3):56) and ca. 90 km NE of Lee County record (Conant and Collins 1991, A Field Guide to Reptiles and Amphibians of Eastern and Central North America. Third Ed. Houghton Mifflin Co., Boston, Massachusetts, 450 pp.). Like *Anolis sagrei* (Godley et al. 1981, Herpetol. Rev. 12(3):84–86), presence of the species on the central ridge is likely the result of introduction of ornamental plants in such human-modified habitats as subdivisions, from which this individual was collected.

Submitted by **WALTER E. MESHAKA, JR.**, Archbold Biological Station, P.O. Box 2057, Lake Placid, Florida 33852, USA.

RHAMPHOTYPHLOPS BRAMINUS (Braminy Blind Snake). USA: LOUISIANA: Orleans Parish: Mid-City area of New Orleans. 11 November 1993. Richard Lopicallo. Verified by Douglas A. Rossman. LSUMZ 56317. New state record (Dundee and Rossman 1989, The Amphibians and Reptiles of Louisiana. Louisiana State University Press, Baton Rouge. 300 pp). Found under a board on a slab in a city lot that had been used as a storage site for nursery products. Specimen presumably arrived in a potted plant. Other introduced species found in the area are *Eleutherodactylus planirostris*, *Anolis sagrei*, and *Hemidactylus turcicus*.

Submitted by **ROBERT A. THOMAS**, Society for Environmental Education and University of New Orleans, New Orleans, Louisiana 70187-6010.

RHADINAEA FLAVILATA (Pine Woods Snake). USA: ALABAMA: Mobile Co: Mobile, Hillcrest Road near Cottage Hill Road. 23 October 1974. James Harden. University of South Alabama (USA 2163); Scoutshire Woods (Girl Scout Camp), 21.6 km SE Citronelle. 8 May 1982. F. A. Harrington and D. H. Nelson. USA 2306; Mobile, 1255 Dauphin Street. 18 May 1993. J. D. Cochran and C. G. Drew. USA 2409. All specimens verified by Craig Guyer. Substantiates an early literature record from near Mobile (Mount 1975, Reptiles and Amphibians of Alabama. Auburn Univ. Agric. Exp. Stat., Auburn, Alabama. 347 pp.). A previous record (USA 1403), also mentioned by Mount (*op. cit.*), was first reported by Jackson and Jackson (1970, Quart. J. Florida Acad. Sci. 33:281–287).

Submitted by **DAVID H. NELSON**, Department of Biology, University of South Alabama, Mobile, Alabama 36688, USA, and **JUSTIN D. COCHRAN**, **CORBERT G. DREW**, and **TERRY D. SCHWANER**, Alabama School of Mathematics and Science, 1255 Dauphin Street, Mobile, Alabama 36604, USA.

RHADINAEA MARCELLAE (NCN). MEXICO: HIDALGO: municipality of Tlanchinol, 5.3 km E Tlanchinol, Arroyo de Apantlazol (21°00'N 98°35'W), 1550 m elev. 28 March 1991. Efraín Hernández García. Verified by Oscar Flores Villela. Museo de Zoología, Facultad de Ciencias, Universidad Nacional Autonoma de México (MZFC 5868, female). Found crushed on road by potrero surrounded by cloud forest. First record for the state and a southern range extension ca. 60 km SE of nearby record in Xilitla Region, San Luis Potosí (Taylor 1949, Univ. Kansas Sci. Bull. 23(2):169–215); second known specimen of the species. Specimen agrees fully with descriptions of *R. marcellae* (Taylor 1949, *op. cit.* Myers 1974, Bull. Amer. Mus. Nat. Hist. 153(1):88–89) except for the presence of an incomplete neck collar and a high number of ventral scales (137 versus 128 in holotype).

Submitted by **EFRAIN HERNANDEZ GARCIA** and **FERNANDO MENDOZA QUIJANO**, Museo de Zoología, Facultad de Ciencias, Universidad Nacional Autonoma de Mexico, Apartado Postal 70-399, D. F. 04510, México.

SALVADORA HEXALEPIS (Western Patchnose Snake). USA: CALIFORNIA: Kern Co: west side of San Joaquin Valley, 6.5 map km NNW McKittrick (T29S, R22E, NW 1/4 of Sec. 19), ca. 152 m elev. 4 May 1992. Scott Cameron. LACM PC 1255 (photo voucher). Verified by R. L. Bezy. The collection site consists of generally flat terrain occasionally dissected by arroyos; the vegetation is saltbush scrub characterized by *Atriplex polycarpa*, *A. spinifera*, and non-native annual grasses. This is the first record of *Salvadora* from the west side of the San Joaquin Valley and bridges a gap in an otherwise enigmatic distribution pattern. *Salvadora* previously has been recorded from the Carrizo Plain to the west (San Luis Obispo County) and from the southeastern margin of the San Joaquin Valley (from near Bakersfield to 2 mi. N of Grapevine Station, Kern County). Despite considerable field work in central California following Bogert's studies of patchnose snakes

(1939, Publ. Univ. California Los Angeles Biol. Sci. 1:177–236; 1945, Amer. Mus. Nov. 1285:1–14), remarkably few specimens have been collected in the southern San Joaquin Valley and adjacent Carrizo Plain, and *S. hexalepis* remains a rare snake at the western margin of its range (Hansen, unpubl.). The San Joaquin Valley population has been referred to the Mojave Desert subspecies *S. h. mojavensis* while specimens from the Carrizo Plain southward belong to the subspecies *S. h. virgultea* (Bogert 1945, *op. cit.*; Stebbins 1985, A Field Guide to Western Reptiles and Amphibians. Houghton Mifflin Co., Boston, Massachusetts. 336 pp.). Because the present specimen was released after being photographed in the field, we are unable to make any allocation to subspecies. However, its occurrence in the San Joaquin Valley suggests placement within *S. h. mojavensis*; thus, this record extends the range of that subspecies 61 map km W from Bakersfield, Kern County.

Submitted by **SCOTT CAMERON**, Michael Brandman Associates, 7676 Hazard Center Drive, Suite 400, San Diego, California 92108, USA, and **ROBERT W. HANSEN**, 16333 Deer Path Lane, Clovis, California 93611, USA.

STORERIA DEKAYI (Brown Snake). USA: ILLINOIS: Fayette Co: 8.9 km W Rt. 128 on 3050N and 3000N. 7 August 1993. John E. Petzing. Verified by Ronald A. Brandon. Southern Illinois University at Carbondale (R-2484). County record; original specimen was a live female found early June 1993. Gave birth to eleven juveniles on 7 August 1993, two of which died and were used as the voucher specimens. Found on gravel road bordered by hardwood forest on west, pasture on east, and 0.3 km S of Lorton's Bridge (Kaskaskia River).

Submitted by **JOHN E. PETZING**, Rural Route 1, Box 87, Beecher City, Illinois 62414, USA.

STORERIA DEKAYI WRIGHTORUM (Midland Brown Snake). USA: ILLINOIS: Fayette Co: SW 1/4 Sec. 26, T5N, R1W, 8 km WSW Shobonier. 21 November 1993. J. B. Hatcher. Verified by C. Phillips. Illinois Natural History Survey (INHS 11110–11111). Adult male and subadult female found in flooded subimpoundment area of Carlyle Lake. New county record (Smith 1961, The Amphibians and Reptiles of Illinois. Illinois Nat. Hist. Surv. Bull. 28:1–298).

Submitted by **JOHN K. TUCKER, JAMES B. HATCHER**, and **DIRK W. SOERGEL**, Illinois Natural History Survey, Long Term Resource Monitoring Program, 1005 Edwardsville Road, Wood River, Illinois 62095, USA.

STORERIA DEKAYI WRIGHTORUM (Midland Brown Snake). USA: MISSOURI: St. Charles Co: NE 1/4 Sec. 26, T48N, R7E, Ellis Island, Riverlands Road. 26 May 1993. J. Tucker. Verified by L. Page. Illinois Natural History Survey (INHS 10990). Adult taken DOR; new county record (Johnson 1987, The Amphibians and Reptiles of Missouri. Publ. Missouri Dept. Conserv., Jefferson City, 368 pp.).

Submitted by **JOHN K. TUCKER** and **CHARLES H. THEILING**, Illinois Natural History Survey, Long Term Resource Monitoring Program, 1005 Edwardsville Road, Wood River, Illinois 62095, USA.

STORERIA OCCIPITOMACULATA OCCIPITOMACULATA (Northern Redbelly Snake). USA: ILLINOIS: Jersey Co: SE 1/4 Sec. 9, T6N, R13W, Pere Marquette State Park. 14 July 1993. R. Maher. Verified by L. Page. Illinois Natural History Survey (INHS 10989). Adult taken DOR. County record; extends documented range 103.2 km WNW from closest Illinois record (Smith 1961, The Amphibians and Reptiles of Illinois. Illinois Nat. Hist. Surv. Bull. 28:1–298) in Bond County (INHS 8655-8658).

Submitted by **JOHN K. TUCKER, ROBERT J. MAHER**, and **JAMES B. HATCHER**, Illinois Natural History Survey, Long Term Resource Monitoring Program, 1005 Edwardsville Road, Wood River, Illinois 62095, USA.

STORERIA OCCIPITOMACULATA OCCIPITOMACULATA (Northern Redbelly Snake). USA: ILLINOIS: Kane Co: Max McGraw Wildlife Foundation, 1.02 km W Rt. 25 and 1.6 km S Rt. 72 (42°5'34"N, 88°16'1"W). 3 October 1993. F. T. Burbrink and A. K. Wilson. Verified by Lawrence M. Page. Illinois Natural History Survey (INHS 10974). New county record (Smith 1961, The Amphibians and Reptiles of Illinois, Illinois Nat. Hist. Surv. Bull. 28:1–298).

Submitted by **FRANK T. BURBRINK** and **ALLAN K. WILSON**, Max McGraw Wildlife Foundation, P. O. Box 9, East Dundee, Illinois 60118, USA.

THAMNOPHIS PROXIMUS (Western Ribbon Snake). USA: NEBRASKA: Richardson Co: NE corner of Sec. 31, T2N, R18E in abandoned quarry on E side of road. 29 May 1993. C. Bridgewater, T. Leonard, J. Lokke, and J. Young. University of Nebraska at Omaha (UNO 350). Verified by James D. Fawcett. New county record; southernmost occurrence of the species in Nebraska and helps fill in a large gap between populations occurring around the mouth of the Platte River in Nebraska and those to the south in Doniphan County, Kansas (Collins 1993, Amphibians and Reptiles in Kansas. Third ed. Univ. Kansas Mus. Nat. Hist. Pub. Ed. Ser. 13:1–397; Lynch 1985, Trans. Nebraska Acad. Sci. 13:33-57.).

Submitted by **T. LEONARD**, 5006 South 36th Avenue, Omaha, Nebraska 68107, USA.

TROPIDOCLONION LINEATUM (Lined Snake). USA: COLORADO: Elbert Co: 100 m S County Road 194, 1 km W jct County Road 29. 19 September 1993. Hobart M. Smith, David Chiszar and Adam Chiszar. Verified by Richard L. Holland. UCM 56849. First county record (Hammerson 1986, Amphibians and Reptiles in Colorado. Colorado Division of Wildlife, Denver. 131 pp.).

Submitted by **HOBART M. SMITH**, Department of EPO Biology, University of Colorado, Boulder, Colorado 80309-0334, USA, and **DAVID CHISZAR**, Department of Psychology, University of Colorado, Boulder, Colorado 90309-0345, USA.

New County Records Of Amphibians And Reptiles From Northeastern Texas

Dixon (1987 Amphibians and Reptiles of Texas. Texas A & M Univ. Press, College Station, Texas. 434 pp.) updated the distribution maps for all Texas amphibians and reptiles. However, documentation for many species common to northeastern Texas is still lacking from various counties within the region.

From 30 April to 2 May 1993, the Texas Herpetological Society held its annual Spring Field Meet on the Caddo National Grasslands north of Bonham, Fannin County, Texas. The purpose of this gathering was to provide the U.S. Forest Service with a list of species occurring on the grasslands. During this meet, ten new county records were documented. In addition, seven records for northeastern Texas were also collected incidentally from 1987 until 1993. Voucher specimens for all species were deposited in the University of Texas at Arlington Collection of Vertebrates (UTACV), and are reported herein.

We herein document seventeen new county records for northeastern Texas and fill distributional gaps for sixteen species of reptiles and amphibians. Specimens from Fannin County were collected by us and other members of the Texas Herpetological Society during the course of the field meet. Records from other counties were collected by or donated to us. Verification of specimen identification was by Jonathan A. Campbell.

ANURA

Gastrophryne carolinensis (Eastern Narrowmouth Toad). Fannin Co: Coffeemill Lake, Caddo National Grasslands. 30 April 1993. UTA-A 40288–40291.

Rana areolata (Crawfish Frog). Hunt Co: 1.3 km SW jct FM 1565 on Grande Verde Road. 13 June 1987. UTA-A 32847.

Rana palustris (Pickerel Frog). Fannin Co: Coffeemill Lake, Caddo National Grasslands. 1 May 1993. UTA-A 40293.

Scaphiopus holbrookii (Eastern Spadefoot). Fannin Co: Coffeemill Lake, Caddo National Grasslands. 1 May 1993. UTA-A 40292.

TESTUDINES

Pseudemys concinna (River Cooter). Fannin Co: Lake Fannin, Caddo National Grasslands. 1 May 1993. UTA-R 34942.

Terrapene carolina (Eastern Box Turtle). Franklin Co: 13.2 km N of Mt. Vernon on SH 37. 9 May 1993. UTA-R 34939.

LACERTILIA

Anolis carolinensis (Green Anole). Fannin Co: Coffeemill Lake, Caddo National Grasslands. 30 April 1993. UTA-R 34932.

Eumeces laticeps (Broadhead Skink). Fannin Co: Lake Fannin, Caddo National Grasslands. 1 May 1993. UTA-R 34933.

Ophisaurus attenuatus (Slender Glass Lizard). Fannin Co: 2.6 km E jct FM 100 on FM 409, Caddo National Grasslands. 30 April 1993. UTA-R 34931.

SERPENTES

Diadophis punctatus (Ringneck Snake). Collin Co: Brockdale Park, Lake Lavon. 25 April 1987. UTA-R 28890; Fannin Co: Lake Fannin, Caddo National Grasslands. 1 May 1993. UTA-R 34795.

Heterodon platirhinos (Eastern Hognose Snake). Red River Co: 1.5 km E jct SH 37 on FM 1159. 18 April 1993. UTA-R 34930.

Nerodia fasciata (Southern Water Snake). Fannin Co: Coffeemill Lake, Caddo National Grasslands. 1 May 1993. UTA-R 34936, 34937.

Regina grahamii (Graham's Crayfish Snake). Delta Co: jct FM 1531 on SH 24. 8 May 1993. UTA-R 34938.

Storeria dekayi (Brown Snake). Collin Co: 4.8 km E of Wylie on Stone Rd., Beaver Creek Estates. 5 August 1992. UTA-R 33784.

Tantilla gracilis (Flathead Snake). Fannin Co: Lake Fannin, Caddo National Grasslands. 1 May 1993. UTA-R 34934, 34935.

Thamnophis sirtalis (Common Garter Snake). Lamar Co: Patonville. 1 September 1991. UTA-R 34929.

Acknowledgments.—We thank Texas Herpetological Society members Terry Hibbitts, Robert Hibbitts, Robert Lang, Charles Swift, Gary Ferguson, and Lynzie Herman for specimens donated. We also thank Jerry Shaffer and Jason Francis for the donation of the specimens of *Storeria* and *Thamnophis*, respectively. Travel expenses were, in part, paid from a grant from the University of Texas at Arlington chapter of Phi Sigma. Collections made on the Caddo National Grasslands were under the authority of a Temporary Special Use Permit granted by the U.S. Forest Service and authorized by District Ranger Ben T. Harbour.

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Thirty-Five New Herpetological County Records For Texas

A review of some of the herpetological material in the West Texas A & M University Museum (WTAMU) has revealed several new county records supplementary to those in Dixon (1987, Amphibians and Reptiles of Texas. Texas A & M Univ. Press, College Station, Texas. 434 pp.) and in more recent entries in *Herpetological Review*. We here report new records for one species of anuran, three of lizards, and ten species and subspecies of snakes. All identifications were verified by Flavius C. Killebrew.

ANURA

Gastrophryne olivacea (Great Plains Narrowmouth Toad). Lamar Co: Blackwater River Park. 9 June 1983. T. James. WTAMU 8994; Randall Co: 19.2 km E Canyon, Rt. 217. 1 July 1987. John Sellers. WTAMU 12494 and southern Amarillo. 23 April 1981. Stacey Foster. WTAMU 14527; Stephens Co: Rt. 717, 11.3 km NNW Rt. 180. 3 May 1969. R. McKown. WTAMU 2374-6. The Randall County records extend the known range of the species about 55 km northwest of the nearest previous records in Briscoe (Dixon 1987) and Donley [Schafer and Kasper 1989, Texas J. Sci. 41(3):337–338] counties.

LACERTILIA

Crotaphytus c. collaris (Eastern Collared Lizard). Deaf Smith Co: 3.2 km E Hereford, Rt. 60. 22 April 1979. S. Grimsley. WTAMU 5006; Gray Co: Pampa city dump. 5 July 1970. A. Clark. WTAMU 1066; Sun Oil Camp, 11.3 km W Lefors. 17 June 1987. Jason Whatley. WTAMU 12358; Grayson Co: Lake Texoma. 25 September 1986. J. Vines. WTAMU 9958; Walker Co: Sam Houston National Forest. 18 March 1972. B. Benson. WTAMU 2516. The Gray and Walker county records extend the known range of the species eastward, the former ca. 40 km, the latter ca. 100 km (Dixon 1987).

Eumeces obsoletus (Great Plains Skink). Carson Co: Skellytown, Skelly golf course. 6 June 1966. Mary Burcham. WTAMU 46; Rt. 60, 8 km E Panhandle. 27 April 1987. Mark and Renae Haiduk, Don Roark. WTAMU 10570-3.

Scincella lateralis (Ground Skink). Karnes Co: Rt. 239, Choate. 16 May 1982. Jay Long. WTAMU 8731; Mills Co: P. K. Caraway Ranch, 6 km E jct Rts. 16 and 3023. 21-23 April 1977. Jeff Bertl, R. Brantley, P. Chance, Janice Geffhen T. Morris, Becky Norton, R. Richardson. WTAMU 2999, 3066, 3196, 3341-2, 3416-7, 3464, 3530; Pecos Co: Rt. 349 near Pecos River. 24 April 1977. T. Ellerbrook. WTAMU 3285. The latter record extends the range of the species in Texas westward from the adjacent county (Crockett) on the east (Dixon 1987).

SERPENTES

Diadophis punctatus arnyi (Prairie Ringneck Snake). Armstrong Co: Methodist Church Camp, Ceta Canyon. 10 October 1978. Burgi Lehmann. WTAMU 5317; Carson Co: Groom, McCoy Farm. 4 May 1985. Jay Vines. WTAMU 13983; Dallam Co: Seagraves ranch, 32 km S Texline. 1 June 1985. M. and J. Smith. WTAMU 13984, 14246; Hansford Co: Gibner ranch, 16.3 km N Spearman, Palo Duro Creek. 21 August 1976, 12 August 1978. Flavius C. Killebrew. WTAMU 5512, 5684; Mills Co: J. M. Wrinkle, Jr. ranch, Rt. 84, 14 km E jct Rts. 16 and 3023. 22 April 1977. M. Tucker. WTAMU 3120; Potter Co: Bishop Hills, off Rt. 1061. 28 September 1973. M. Meriage. WTAMU 2450; Canadian River, 24.1 km N Amarillo. 3 October 1985. B. Loving, G. McDonald. WTAMU 13767; Rt. 1061, 8.7 km W Rt. 66, then 1.25 km N. 15 April 1979. Ken Brewer. WTAMU 5879; Lake Meredith Plum Creek Recreation Area. 21 May 1983. Jim and Jay Vines. WTAMU 14293-4 and Lake Meredith, McBride Canyon, Rt. 136. 28 April

1987. M. Willis. WTAMU 10654; Wheeler Co: Camp M. K. Brown, Rt. 3182, 8.5 km N Rt. 152. 3 and 10 October 1981. T. Green, T Quezada. WTAMU 6823-4.

Diadophis punctatus stictogenys (Mississippi Ringneck Snake). Gonzales Co: Ottine. 10 August 1987. John Ingle. WTAMU 12589. Extends known range of the subspecies southwest ca. 80 km from the nearest previous record in Colorado County (Dixon 1987: 240) and about an equal distance from the nearest records for *D. p. arnyi* in Bexar and Hays counties. (Dixon, *loc. cit.*). The specimen clearly represents *D. p. stictogenys*, having 15 anterior dorsal scale rows and most ventral spots paired. It does not appear to be an intergrade.

Heterodon n. nasicus (Plains Hognose Snake). Foard Co: 3.2 km W Crowell, Rt. 70. 23 October 1983. Tom Adams. WTAMU 9427; Hemphill Co: 16.3 km E Canadian, Forgey ranch. 11 June 1973. Miles Rhea. WTAMU 5272; 6.5 km N Glazier, Rt. 305. 28 October 1981. Jeff Bertl. WTAMU 7954; Lipscomb Co: 8 km E and 1.6 km N Follett. 14 July 1986. Joel Babitzke. WTAMU 10536; Moore Co: Albates Park, 8 km S Fritch. 2 September 1981. T. D. Giovanni. WTAMU 7195; Ochitree Co: 8 km E Perryton. 1 October 1979. William May. WTAMU 6018.

Heterodon platirhinos (Eastern Hognose Snake). Childress Co: 26 km E Memphis, Rt. 256. 19 September 1981. Jay Long. WTAMU 6956; Floyd Co: 16.2 km SW Quitaque, Rt. 1065. 22 October 1985. Clinton Pigg. WTAMU 11595; Karnes Co: 9.4 km W Choate, Rt. 239. 9 October 1982. Jay Long. WTAMU 8780; Moore Co: Lake Meredith, Plum Creek. 8 November 1986. Rod Goodwin. WTAMU 10669.

Lampropeltis getula holbrooki (Speckled Kingsnake). Lee Co: Rt. 21, 6.5 km S Old Dime Box. 6 June 1982. Jay Long. WTAMU 8777. Although the locality lies within the intergrade area (as depicted by Dixon 1987:253) between *L. g. holbrooki* and *L. g. splendida*, this particular specimen agrees fully with the former subspecies.

Lampropeltis getula splendida (Desert Kingsnake). Briscoe Co: Quitaque. 1 November 1981. D. Brooks. WTAMU 7428.

Rhinocheilus lecontei tessellatus (Texas Longnose Snake). Reagan Co: jct and Rt. 137. 20 June 1970. B. Cox. WTAMU 742.

Sonora semiannulata (Ground Snake). Collin Co: western Plano. 5 June 1988. D. Porter. WTAMU 13717. The locality lies on the eastern edge of the range of the species (Dixon 1987:269).

Storeria dekayi texana (Texas Brown Snake). Oldham Co: Boys Ranch, at Elementary School and Junior High Gym. 27-29 July 1991. Eddie Taylor. WTAMU 14417-8; Randall Co: Cleta, Palo Duro Canyon. 24 August 1979. Jeff Bertl. WTAMU 6478. These specimens extend the known range of the species westward in northwestern Texas ca. 150 km, and indicate that the records for Lubbock and Crosby counties, questioned by Dixon (1987:270), may well be valid. We suggest that the range of the species in the area indicated follows major river valleys and does not include much if any of the intervening territory.

Tantilla nigriceps (Plains Blackhead Snake). Carson Co: Brooks ranch, 8 km S Skellytown. 5 April 1985. M. Smith and J. Smith. WTAMU 14267.

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BOOK REVIEWS

Synopsis of the Herpetofauna of Mexico, Volume VII, by Hobart M. Smith and Rozella B. Smith. University Press of Colorado (P.O. Box 849, Niwot, Colorado 80544, USA), 1993, 1089 pp, cloth bound. US $50. ISBN 0-87081-284-x.

The taxonomic and ecological diversity of amphibians and reptiles in the Republic of México is perhaps unequaled in the world, and those herpetofaunal riches have been a major preoccupation of North American, and lately Mexican biologists. In the scant 60+ years since Edward H. Taylor and Hobart M. Smith began to reveal the wonders of Mexican amphibians and reptiles to the herpetological community, there has been continuous and ever increasing study of that marvelous fauna. One result of this massive application of attention from herpetologists, both native and foreign, is a massive literature. The literature on amphibians and reptiles of México is so vast that it seems beyond belief that it could be compiled, much less organized and indexed. But Hobart and Rozella Smith accepted the challenge, and Volume VII of the *Synopsis of the Herpetofauna of Mexico* concludes the most ambitious herpetological bibliography project ever undertaken.

This terminal volume consists of two parts: the fourth addendum to the base bibliography, and taxonomic indices to bibliographic addenda II through IV. The bibliographic addendum lists an additional 6606 titles pertinent to Mexican herpetology, bringing the total of titles compiled to 17,771. The coverage is exhaustive. Many titles are from the "gray literature," works not published in the technical sense of the word. In this category are abstracts of papers presented at meetings, internal research reports of government agencies, and theses and dissertations. It can be argued that these usually inaccessible "publications" should not be listed. However, they can provide clues to the existence of research in progress or completed but not published. The extensive listings of theses from Mexican institutions and titles from relatively obscure Mexican journals is a potentially valuable resource. The bibliography includes literature from 1979 (some 1979 references were included in addendum III) through May, 1991.

Each of the eight order-group taxa of amphibians and reptiles that occurs in México has a separate index chapter. Each of these chapters consists of an introduction, a taxonomic index, and a synonym list. The introduction to each chapter reviews taxonomic innovations in the group since the appearance of the last index in the series (Volume IV, 1976), and states the author's position on them. These positions are varied—from rigid conservatism to ready acceptance of controversial proposals. For example, on the conservative side Smith prefers to retain the genera *Tomodactylus* and *Syrrhophus*; however, he embraces the concept of removing *Pseudacris cadaverina*, *P. crucifer*, and *P. regilla* from *Hyla*. Nevertheless, the introductions are interesting reading. They reveal the thought processes of the author as he views modern taxonomic work on Mexican amphibians and reptiles from the perspective of a long-time major practitioner of the art. But most of the decisions are logically defended, and unreasoned support of the status quo is minimal.

The species indices include some welcome changes. The name of the first author is cited for each entry, along with the identification number of the reference and the page number. Each index entry is identified as being from Bibliographic Addendum II, III, or IV. Each index includes generic names and their synonyms, species, subspecies, and names spelled incorrectly. The synonyms and invalid names are followed in parentheses by the combination accepted in this work. The indices are alphabetical. Cross indices to species combinations, subspecies combinations, and state occurrences, and the valid name list have been omitted. In place of a valid name list the final section of each chapter is a

list of names generated from the index. Surely, as the author notes, each includes all or nearly all the valid names available.

The author states that with this volume their "attempt to summarize in detail knowledge of the herpetofauna of Mexico ends, with the task scarcely started." So ends an era, an era marked by the effort of Hobart and Rozella Smith to provide a solid foundation for further study of the Mexican herpetofauna. The *Synopsis of the Herpetofauna of Mexico* is a fitting memorial to their dedication.

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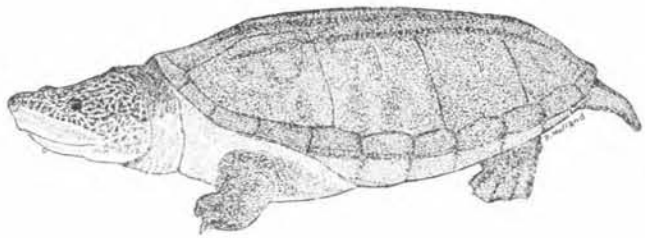

Herpetofauna Mexicana. Annotated List of the Species of Amphibians and Reptiles of Mexico, Recent Taxonomic Changes, and New Species. By Oscar Flores-Villela, edited by C. J. McCoy. 1993. ISBN 0-91-239-42-1. Carnegie Museum of Natural History, Special Publication No. 17, iv+73 pp. US $15 (softcover).

The core of this work is a 23-page list of names of Mexican amphibian and reptile species in a two-column format. The first column lists the scientific names, alphabetized by families, and includes their authors and publication dates. Some of the names are followed by superscript numerals keyed to the section on "Notes to the species list" which follows the checklist. The second column contains a wealth of information about each taxon, including whether it is endemic to México, parthenogenetic or monotypic, plus its general distribution in México, all this condensed in a conveniently-coded system. For example, the entry for the indigo snake (*Drymarchon corais*), reads: "+ N; 1, 2, 3, 4, 5, 6, 7, 9, 10." The "+" means monotypic, the "N" means non-endemic, and the numbers are keyed to the general biogeographic areas discussed in the extensive Introduction and depicted in Fig. 2, a map of México.

This section is followed by a list of species that may (or may not) occur in México but for which there are no actual specimens or reliable published records. A five-page section on notes on the species list follows, which itself is followed by a 25-page list of "Recent taxonomic changes and new species," which includes an 11-page list of species described or first recorded from México since 1966, and a list of taxonomic changes at the species level which occurred since 1976. The last two sections deal with changes above the species level and changes in type-localities; both occupy less than six pages. The Acknowledgments and Literature Cited sections conclude the work.

This is the first attempt to summarize México's herpetofauna in almost 30 years, following the works of Smith and Taylor (1966) and Smith and Smith (1976a, 1976b). The author is to be commended for his courage in undertaking the summary of what amounts to almost 1,000 species, whose literature is scattered in all sorts of little-known journals. The herpetofauna is an extremely interesting one, with over 55% of the species endemic to México, a number that is likely to increase with the exploration of little-known or inaccessible areas. Some of the species, such as the Mexican axolotl, have been extremely well studied, while others are known only from the holotype. Here is a place where much work remains to be done, especially field studies by local or resident naturalists. It is extremely encouraging to see that this trend has been increasing rapidly in the past few years. The bilingual format of Oscar's work certainly makes it easier for exclusively Spanish-speaking Mexicans.

I cannot comment on the accuracy or completeness of the species list since México is not my geographic area of expertise. A sizable number of people reviewed it, however (I saw the first draft in the early 80's), so I assume it is as correct and complete as any checklist can be. The alphabetical (as opposed to phylogenetic) placement of genera under families makes the work easy to use, especially with large families. The author was selective in updating taxonomic changes although one may disagree with his selections. For example, he left all the anoles in one genus, but accepted the splintering of *Bothrops* and the Iguanidae, both of which have generated much controversy, while explicitly not accepting the rearrangement of the Centrolenidae (Ruiz-Carranza and Lynch 1991), which has not been controversial and has even been incorporated in the current herpetology textbook (Zug 1993).

I have two major, and a few lesser, criticisms of this work, and I write this with great hesitation since I respect Oscar's work and dedication, and he is my *compadre*. I do so only in a constructive way, hoping that a second edition can improve upon the first.

My main gripe pertains to the citation of the literature; it looks like the work of a committee rather than an individual. There are actually *three* major forms of literature citation! One is the "formal" Literature Cited, in which references are listed in the standard way. One would expect this to be a rather large section, but it is actually barely over a page long. The second is an in-text citation, which lists the author[s], date, title (in some cases), and journal or book reference. Some of the titles are quite long and pertain to unpublished theses done in México; these citations are duplicated due to the bilingual text, thus a lot of space is wasted. The third type of citation is the *Op. Cit.* type, which I find most problematic. For example, on page 44 I found a reference to "Villa et al. (1988, *op. cit.*: 63)." Because I didn't remember making the statement attributed to me, I had to work backwards through a number of similar "opcits" all the way back to page 39, where my memory was refreshed. My suggestion: make citations uniform to save time and space.

A second gripe is the exclusion of subspecific names. Granted, the list is clearly a *species* list, and including subspecies would have probably tripled the number of taxa listed. I could be accused of criticizing the same decision I myself made (to include or exclude subspecies) when compiling *Middle American Herpetology* (Villa et al. 1986). However, that was before Frost and Hillis' 1990 paper, and before Collins' (1991) proposal to elevate a number of allopatric North American subspecies to specific status. Although this proposal has generated considerable controversy, it may be accepted eventually, and a Mexican equivalent of J. T. Collins, if one can exist, may make a similar proposal for comparable Mexican subspecies. Thus, having the subspecific names available in an updated list becomes important.

One minor complaint pertains to the supposed bilingualism of the *Herpetofauna*. The text is bilingual throughout, except for the three sections on recent taxonomic changes. The introduction and the subtitles to these sections are bilingual, but the text itself is in English only. Some entries can easily be figured out, and

involve only a few lines, but many take up 10 lines or more. What went wrong here? If anything, the *opposite* should have occurred. This section involves some 25 pages, over 30% of the entire work. How will this be received in México?

The work's subtitle is a bit misleading, as it states it contains "Recent taxonomic changes, and *new species*" (my italics). I expected to find a number of new species described from México, but there are none. Either the new species were deleted from the work at the last minute and the subtitle not changed, or the "new species" refers to the listing of "Species described or first recorded from Mexico since 1966." The advertisement mailed by the Carnegie Museum lacks the subtitle, and makes no claims about any new species.

Herpetofauna Mexicana is a work large enough to merit a dedication, but it has none. This would have been an excellent opportunity to honor the two major Mexican herpetologists who recently passed away, Miguel Alvarez del Toro and Rafael Martín del Campo.

My last gripe is the price. Fifteen dollars is a lot of money to pay for an 80-page booklet, even for one as nice as this one, with glossy paper and octavo format. I hope that the Carnegie made some arrangements for a lower price in México, otherwise many local herpetologists will not be able to buy a copy.

Criticisms aside, *Herpetofauna Mexicana* is a major contribution to the knowledge of the herpetology of our neighbor to the south, and should facilitate—if not encourage—the work of others, both local and foreign. Anyone who has put together a checklist of similar magnitude knows how much devotion and work goes into it, how tedious and interminable the work can be, and how thankless the task is. Thank you, Oscar, for undertaking it; I hope your skin is of the squamate sort, rendering you impermeable to criticism.

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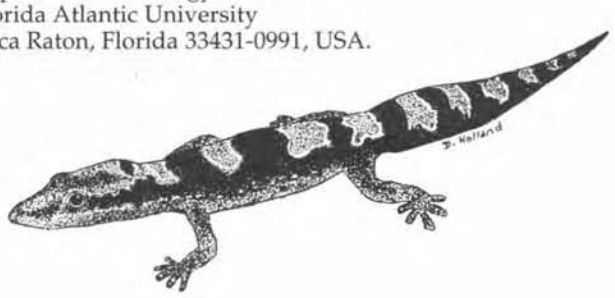

The Amphibians and Reptiles of Maine, by Malcolm L. Hunter, Jr., John Albright, and Jane Arbuckle (editors). 1992. Maine Agricultural Experiment Station Bulletin 838. 188 pp. US $9.95. (Paperback).

The editors claim two motives for producing this book. First, the passage of Maine's Endangered Species Act in 1984, in part, prompted them to determine the status of Maine's amphibians and reptiles. Second, was their hope to increase the appreciation of amphibians and reptiles by the people of Maine.

As you can well imagine, it is no small task to determine the status of all the amphibian and reptile species of any state. The Maine Amphibian and Reptile Atlas Project (MARAP) was, evidently, the first such attempt by biologists in the state. A network of some 250 volunteers was established and enlisted to search for the presence of amphibians and reptiles. After about four years, the editors felt they had sufficient data to begin writing. They recruited volunteers to write individual species descriptions. Range maps were prepared based on the submittal of MARAP forms with three decreasing levels of confidence: a specimen was collected and preserved or photographed, a specimen was handled then released, or a specimen was seen or heard but not captured.

The book opens with two brief introductory chapters on the biology of amphibians and of reptiles. These are followed by a description of Maine's environment as habitat for herps and a summary of how the range maps were prepared. The main body of the text is descriptions of Maine's 18 species of amphibians, 19 species of extant reptiles, and the extirpated timber rattlesnake. The book closes with sections on finding and enjoying amphibians and reptiles; hypotheticals, accidentals, and other oddities; methods used in the MARAP; the distribution and abundance of herps in Maine; and conservation concerns.

There is very little new information about the amphibians and reptiles of Maine in this book. Most of the information comes from previously published sources, and because many different authors provided species accounts, the writing is uneven in content and in the use of citations. There is very little useable information on the density of any species in any one place.

The range maps offer information on the presence or absence of a species in the townships of Maine, but the operating premise (although unstated) is that at least one volunteer would examine suitable amphibian habitats in every township. This was not the case. I noticed that range maps for many of the abundant species were almost identical. The range maps for abundant species appear to this reviewer to be range maps of the locations of volunteers. With few exceptions, we learn from this type of survey that a species either occurs widely in the state or does not. Only the range maps for rare species may contain some kind of useful information for future comparisons, although I am not certain what that information is.

The illustrations are all black and white line ink drawings of generally poor quality and could not be used for identification purposes.

I know that other states in the northeast are using similar procedures to document the status of their herpetofauna. It seems to me for the information to be of use, much greater effort needs to be expended to determine not only whether a species occurs in the state, but we must systematically determine where the various species do and *do not* occur. The problem with MARAP-type surveys is that a species can only be found in an area if a volunteer happens to look there. In addition, as mentioned by the editors, rare species received more attention from volunteers than did common species, thus the data in some unknown way overestimate the abundance of rare species and underestimate the abundance of common species. A useful addition to the range maps would have been the collection location of

previously deposited museum specimens. Perhaps volunteer survey data taken together with more traditional surveys by working herpetologists would have provided more useful range maps.

A very important task for biologists today is to document systematically what are the densities of the region's fauna, because these will be the data needed in 10 or 20 years to determine whether or not a species has declined. It is unlikely that networks of volunteers can accomplish this task working alone. Even systematic surveys that result in unbiased measures of relative abundance provide data that can be used for comparative purposes over time.

The second objective of the book was to increase the appreciation of the state's herps by its citizenry. Because the book does summarize information on the species and is relatively inexpensive it may fulfill that objective.

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PUBLICATIONS RECEIVED

World Checklist of Threatened Amphibians and Reptiles, 5th edition, compiled by the World Conservation Monitoring Centre. 1993. Joint Nature Conservation Committee, Peterborough, U.K. vi + 99 pp. Softcover. £11.00 (approx. US $17). ISBN 1-873701-46-2.

A listing of those species of amphibians and reptiles listed in appendices I, II and III of CITES, and those included in the latest *IUCN Red List of Threatened Animals*. Included are 135 amphibian taxa in 19 families and 570 reptiles in 36 families. Each listing also provides commonly used synonyms (normally alternative generic assignments) and English language common names, when these exist. Countries, and sometimes less inclusive areas such as states, provinces, or mountain ranges where each species occurs are given. Each entry indicates the CITES appendix and/or Red List status of the taxon and references to general and regional literature on distribution, conservation status, and/or nomenclature are listed by number. A total of 738 references are included in the bibliography and the text is indexed by both common and Latin names. This edition includes many additional references and status updates with respect to the 4th edition (1988), but contrary to the previous version, does not provide information on the type of exploitation experienced by the species.

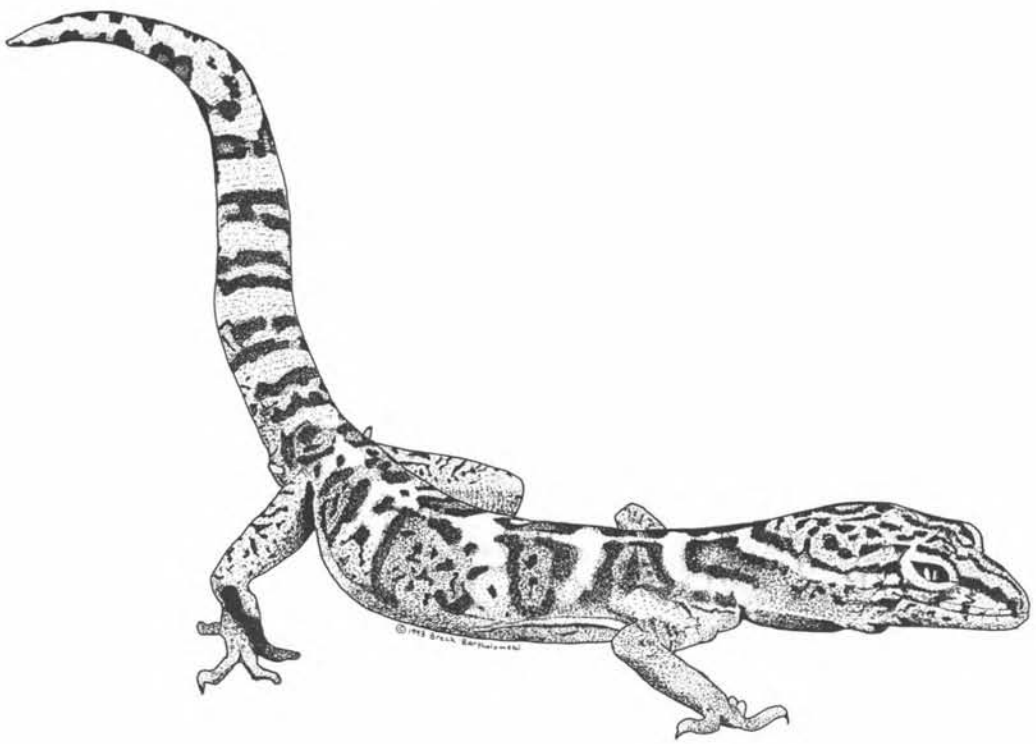
Amphibian Zooculture [in Russian] (many authors). 1990. USSR Academy of Sciences, Moscow. 120 pp. $8.00 + postage.

A collection of 13 papers dealing with a variety of topics associated with the captive breeding and maintenance of frogs and salamanders. Among the contributions included are papers on endocrine control of reproduction, growth in captivity, hybridization, conservation, reintroductions from captive stock, and human utilization of amphibians.

Trophology of Tailed Amphibians: Ecological and Evolutionary Aspects [in Russian] by S. L. Kuzmin. 1992. "Nauka" (Russian Academy of Sciences), Moscow. 168 pp. Softcover. $10.00 + postage. ISBN 5-02-005489-5.

A treatise on salamander feeding and trophic relations. Topics covered include methods of dietary analysis, niche dynamics and niche overlap, prey selection and optimal foraging, ontogenetic and evolutionary changes in diet, food as a limiting resource, and cannibalism. Examples are drawn from a wide variety of (chiefly temperate) salamander species and more than 750 references are cited. Illustrated by 23 figures, graphs, and charts.

Both publications are available from *Dr. Sergius L. Kuzmin, Institute of Evolutionary Morphology and Ecology of Animals, Russian Academy of Sciences, Leninsky Prospect, 33, Moscow 117071, Russia.*



Coleonyx variegatus variegatus. USA: Nevada: Clark Co., ca. 16 km S of Las Vegas. Illustration by Breck Bartholomew.

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