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HERPETOLOGICAL REVIEW

The Quarterly News-Journal of the Society for the Study of Amphibians and Reptiles

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SOCIETY FOR THE STUDY OF AMPHIBIANS AND REPTILES

WWW: http://falcon.cc.ukans.edu/~gpisani/SSAR.html

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

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

ANNUAL DUES AND SUBSCRIPTIONS: Annual membership dues for the year 1997 in the Society for the Study of Amphibians and Reptiles are as follows: Individual membership US$40; Student membership $30; Family membership $55. $16 of the amount of a membership pays for a subscription to *Herpetological Review* for one year. $21 of the amount of a membership pays for a subscription to *Journal of Herpetology* for one year. Remaining funds help support Society activities. Additional fee for air mail postage outside USA $35 for one year. Institutional subscriptions for *Herpetological Review* are $70 and individual subscriptions may be purchased for $24. All members and institutions receive the Society's primary technical publication, the *Journal of Herpetology,* and its news-journal, *Herpetological Review*; both are published four times per year. Members also receive pre-publication discounts on other Society publications, which are advertised in *Herpetological Review*. Subscription to the *Catalogue of American Amphibians and Reptiles*: Individuals $20; Institutions $20.

Payment must be made in USA funds, payable to "SSAR," or by International Money Order, or with VISA or MasterCard (account number and expiration date must be provided). Payment should be sent to: Robert D. Aldridge, SSAR Treasurer, Department of Biology, Saint Louis University, St. Louis, Missouri 63103, USA. Fax: (314) 977-3658; e-mail: ssar@sluvca.slu.edu.

Future Annual Meetings

1997 — University of Washington, Seattle, Washington, USA, 25 June–2 July (Theodore Pietsch, Chair).
1998 — University of Guelph, Guelph, Ontario, Canada, 16–22 July (James P. Bogart, Chair).

Society for the Study of Amphibians and Reptiles
1997 Annual Meeting
together with
American Society of Ichthyologists and Herpetologists
and
The Herpetologists' League
26 June – 2 July 1997
University of Washington, Seattle, USA

Keynote Address: "Frogs, Unpredictability, Flexibility, and the Future," by Martha Crump (Northern Arizona University).

Symposium: "Nuclear DNA and the Evolutionary Genetics of Fishes, Amphibians and Reptiles." *Organizer*: Andrew M. Shedlock, University of Washington, FTR, Box 355100, Seattle, Washington 98195, USA; e-mail: shedlock@u.washington.edu.

Symposium: "Ecological Processes: Insights from Field Experiments and Natural History." This symposium celebrates the career and contributions of Margaret McBride Stewart in honor of her 70th birthday. *Organizer:* Kiisa C. Nishikawa, Department of Biological Sciences, Northern Arizona University, Flagstaff, Arizona 86011-5640, USA; e-mail: Kiisa.Nishikawa@nau.edu.

Symposium: "Comparisons and Current Uses of Phylogenetic Approaches to Ichthyology and Herpetology." *Organizer*: Mark Pyron, Illinois Natural History Survey, Center for Biodiversity, 607 East Peabody Drive, Champaign, Illinois 61820, USA; e-mail: Pyron@uiuc.edu.

Symposium: "Chemical Ecology of Predator/Prey Relationships Among Fishes, Amphibians, and Reptiles." *Organizer*: Alicia Mathis, Department of Biology, Southwest Missouri State University, Springfield, Missouri 65804-0095, USA; e-mail: sam477f@vma.smsu.edu.

Symposium: "Life History and Ecology of Chelonians." *Organizer*: R. Bruce Bury, National Biological Service, 3080 SE Clearwater Driver, Corvallis, Oregon 97333, USA; e-mail: buryb@mail.cor.epa.gov.

Symposium: "Biosystematics, Behavioral Ecology, and Conservation of Iguanas." *Organizer:* William K. Hayes, Department of Natural Sciences, Loma Linda University, Loma Linda, California 92350, USA; e-mail: whayes@ccmail.llu.edu.

Conservation Forum: Point-Counterpoint. "Sustainable Use of Amphibian and Reptile Resources." *Organizer:* C. Kenneth Dodd, Jr., SSAR Conservation Committee, 5222 NW 56th Court, Gainesville, Florida 32653, USA; e-mail: kdodd@nervm.nerc.ufl.edu.

Contributed Paper and Poster Presentations: There will be several concurrent sessions each day in or near the University of Washington's Husky Union Building. Poster sessions will be held at the HUB.

Student Paper Awards: Seibert Prizes will be awarded to the two best student-presented papers at the meeting ($250 first prize, $150 second prize).

Multimedia Presentations: "Herps of the West" and "Amphibians of the Appalachians" by David Dennis and Eric Juterbock; "Herpetological Namesakes" by Kraig Adler and David Dennis.

Social Activities: General Reception at Seattle Aquarium, Auction, Salmon Barbecue, Graduate Student Reception, Banquet.

Live Exhibit: Live herps of the Pacific Northwest, sponsored by the Society for Northwestern Vertebrate Biology and the Pacific Northwest Amphibian and Reptile Consortium. As usual, a diverse array of animals will be available for viewing and photography.

Vendors: Books, carvings, jewelry, T-shirts, and equipment of interest to herpetologists.

Field Trips: Mount Saint Helens National Volcanic Monument and Snoqualmie Pass–Ellensburg.

Costs: Pre-registration US $120 regular, $60 student, $60 accompanying person. After March 15, costs are $145 regular, $75 student, and $75 accompanying person.

Further Details: Contact T. W. Pietsch, School of Fisheries, University of Washington, Box 355100, Seattle, Washington 98195-5100, USA. Tel. (206) 543-8923; e-mail: twp@fish.washington.edu. Meeting Announcement and Call for Papers were mailed to all U.S., Mexican, and Canadian members of SSAR in late November 1996. Other persons wishing to receive this information may do so by contacting Ted Pietsch at the address above. A World Wide Web page devoted to meeting information may be found at: http://artedi.fish.washington.edu/asih/asih97.html.

SSAR BUSINESS

SSAR Grants-in-Herpetology Committee Annual Report (1997)

Six awards of $500 each were made this year, as follows:

Conservation.—**Jennifer L. Mook**, Clemson University. Project title: "Determining paternity and genetic diversity of radiated tortoises (*Geochelone radiata*): utilizing randomly amplified polymorphic DNAs in the zoo."

Laboratory Research.—**Sharon Downes**, University of Sydney. Project title: "Effects of incubation environment on the vulnerability of scincid lizards to predation by snakes: a test of foraging theory and the ecological significance of phenotypic plasticity."

Field Research.—**Louise M. Armstrong**, University of Massachusetts. Project title: "Patterns and processes of speciation in desmognathine salamanders."

Travel.—**Maureen Kearney**, George Washington University. Project title: "Evolution of the Order Amphisbaenia based on evidence from fossil and recent forms."

Education.—**Matthew R. Chapman** and **Peter K. Ducey**, SUNY, Cortland. Project title: "Distribution and conservation of amphibians and reptiles in New York."

International.—**Sergius L. Kuzmin**, Russian Academy of Sciences. Project title: "Eastern range margin of the Semirechensk salamander (*Ranodon sibiricus*)."

1997 Grants-In-Herpetology Committee.—Dr. Carole L. Hom, University of California, Davis; Dr. Julian C. Lee, University of Miami (chair); Joseph Mendelson, III, University of Kansas; Janice Perry, Arizona-Sonora Desert Museum; Dr. Barbara Savitzky, Christopher Newport University; Dr. Kelly Zamudio, University of California, Berkeley.

NEWSNOTES

Charles Stearns Grant-in-Aid for Herpetological Research at the California Academy of Sciences

The Department of Herpetology is pleased to provide limited financial aid—mostly to cover round trip transportation and limited per diem expenses—to graduate students who wish to visit our collections to support research in systematics.

Proposals should include a short—no more than one page—description of the research project, a budget, and a letter of support from the student's faculty advisor.

Proposals are due by 15 October 1997, with notification by 1 December 1997. Grantees are expected to complete their Academy visit by 15 September 1998. Please call 415-750-7037 for further information.

Send proposals to: *Herpetology Research Grants, Department of Herpetology, California Academy of Sciences, Golden Gate Park, San Francisco, California 94118-4599, USA.*

About Our Cover

There are nine species of snakes in the genus *Leptophis*, and they range, collectively, from México south to central Argentina. Nearly all are arboreal and diurnal, hunting for frogs, which constitute their primary prey. Parrot snakes, as they are called, are not considered venomous in the traditional sense, although their bite is known to cause symptoms of envenomation in humans (Minton 1978. Nat. Hist. 9:56–60).

During the 1940's, James A. Oliver published a series of papers and a generic revision of *Leptophis* (1948. Bull. Amer. Mus. Nat. Hist. 92:157–280), and his arrangement generally has been followed since. In fact, the only systematic novelties involving *Leptophis* subsequent to Oliver's monograph are the resurrection of *L. cupreus* (Peters and Orcés-V. 1960. Beitr. Neotrop. Fauna 2:139–141), the revalidation of *L. modestus* (Hoyt 1964. Copeia 1964:214–215; Mertens 1973. Stud. Neotrop. Fauna 8:141–154), and the description of *L. stimsoni* (Harding 1995. Trop. Zool. 8:221–226).

Brightly colored, alert, and graceful, parrot snakes are well known to people in rural Latin America. Frequently, their green coloration and tendency to gape defensively earn them a death sentence. This is unfortunate because parrot snakes are inoffensive creatures, often unwilling to bite when provoked. The snake depicted on the cover is *Leptophis ahaetulla*, with eleven races ranging from México to Argentina.

America lost one of its most outstanding herpetological artists on October 6, 1996, with the death of **Philip E. Sims**. His unique style—focusing on the symmetry and patterns of reptilian scales, skin, and especially eyes—immediately is recognizable and had won him widespread recognition among artists and herpetologists alike. His work hangs in several public galleries and he was awarded numerous prizes for his work. Phil grew up in Colorado, where he learned to appreciate reptiles under the guidance of his father, a high school biology teacher. He earned his bachelor's and veterinary medicine degrees at Colorado State University and later went on for a Master of Science degree in biomedical illustration. He generally painted in watercolors applied with airbrushes. The iridescent scales are created by applying acrylic paint and the edges are sharpened using colored pencils. The overall result is a stunning image, at once accurate natural history and fine art. Phil most often depicted snakes, which he felt were so unappreciated, despite his encounter with a 20-foot long reticulated python, an erstwhile patient, that had swallowed his arm up to the shoulder! His art studio was shared with many terraria filled with lizards and snakes. Although he was a practicing veterinarian, natural history art was increasingly occupying his time—at the time of his death he was spending three weeks out of four doing art—and his goal was to become a full-time artist. He had nearly completed a book, "Atlas of Comparative Reptile Anatomy," and planned to issue limited-edition prints of his artwork, in order to promote the conservation of these creatures he so deeply respected and enjoyed. Through the courtesy of his father, SSAR is honored to reproduce this drawing as a tribute to the memory of Phil Sims.

Separation and imaging of Sims's artwork is by **Jim Bridges** of Herpeto Inc., Hollywood, Florida, USA.

African Herpetofaunal Biodiversity Programme (AHBP)

The interim committee of the AHBP invites you to participate in an e-mail discussion (on the Afriherp-L list) of the mission, aims, and objectives of the AHBP. We also will discuss the possibilty of a workshop and election of a new committee to be held at the 3rd World Congress of Herpetology in Prague in August. This invitation is particularly directed toward everyone interested in the herpetofauna of Africa and its islands (including the Malagasy region).

For those of you who are not already subscribers to Afriherp-L, you can subscribe by sending a message to listproc@wcmc.org.uk with only the text "subscribe afriherp-l (your name)" in the body of the message. Remember to leave the subject line blank and to switch off your signature. To receive a copy of your own postings, set mail to "ack." You can also subscribe in digest form.

The AHBP Interim Committee consists of Michael Lambert (Chairman), Ivan Ineich (Deputy Chairman), Lynn Raw (General Secretary), Neil Burgess (Mapping Coordinator), Preston Hardison (Data Management Coordinator), and Craig Hassapakis and Martin Kundrat (Publicity and Public Relations Coordinators). For additional information contact: *Lynn Raw (using gdr@iafrica.com) P.O. Box 200 (also on raw@zoology.unp.ac.za) Merrivale 3291, South Africa. Tel. +27-331-431360.*

Carettochelys Studbook Information Needed

Information is needed for inclusion in a new American Zoo Association-approved studbook for the North American Region on currently living or historically held pig-nosed turtles, *Carettochelys insculpta*, also known as pitted shell turtles, Fly River turtles, or New Guinea plateless turtles. If you or your institution currently or historically held individuals of this species or received/used tissue, blood, or other samples, I would like to hear from you. Turtles that never reproduced or were turned over to a museum collection are valuable inclusions to studbooks. Likewise, if your institution would be interested in receiving a deceased pig-nosed turtle or a living specimen, I will include your interest in the studbook. All participants will receive a copy of the studbook when completed. Contact: *William H. Espenshade III, The Zoological Society of Philadelphia, 3400 West Girard Avenue, Philadelphia, Pennsylvania 19104-1196, USA. Tel. (215) 243-1100 ext. 3262; Fax (215) 243-5385; e-mail: WHE3@aol.com.*

NSF Grant for SIUC Collection

The 300,000-specimen Zoology collection at Southern Illinois University at Carbondale has received a two-year grant from the National Science Foundation to sustain the largest collection of fishes, amphibians, and reptiles in Illinois, Indiana, Missouri, and Kentucky. Ron Brandon (herpetologist) and Brooks Burr (ichthyologist) individually have managed the collections of herps and fishes until now. The grant will permit the hiring of a full-time collections manager. The collection is housed in a newly-opened 3500-square-foot Fluid Vertebrate Collection Center in SIUC's year-old Life Science III Building. For collection information contact: *Ronald A. Brandon, Departement of Zoology, Southern Illinois University, Carbondale, Illinois 62901, USA; e-mail: Brandon@Zoology.siu.edu.*

Herpetologist, The University of Kansas

The Natural History Museum and Department of Systematics & Ecology, The University of Kansas, invite applications for an open-rank position as a faculty-curator in herpetology. Successful applicant will serve as a museum curator in the Division of Herpetology and as a faculty member in the Department, will be able to teach reptile biology and other courses, direct undergraduate and graduate research, and have an active, specimen-based research program with potential for extramural funding. Preference will be given to individuals who specialize in reptile biology, conduct herpetological field studies, have a strong commitment to research and education at undergraduate and graduate levels, and show commitment to service to the discipline, and evidence of administrative skills and ability to interact with the public. Submit curriculum vitae; statements of (1) teaching philosophy, experience, and interests, including preferred courses to teach, (2) research interests, goals, and current research activities, and (3) curatorial philosophy and experience, including perceptions of the roles of systematic collections and museums in biological pursuits; 2 copies of selected publications or manuscripts; and names, addresses, voice and FAX numbers, and e-mail addresses of 3 persons to be contacted as references. Forward materials to Dr. Linda Trueb, Chair, Search Committee, Natural History Museum, The University of Kansas, Lawrence, Kansas 66045-2454, USA. Review of applications will begin 01 September 1997 and continue until the position is filled. Position availability is contingent on budgetary approval. EO/AA Employer.

New Journal Announced

The IUCN/SSC/DAPTF/Regional Group for the Commonwealth of Independent States and the Institute of Ecology and Evolution of the Russian Academy of Sciences have launched a new journal, *Advances in Amphibian Research in the Former Soviet Union*. The journal will publish papers (in English) on all aspects of amphibian research by authors from the former Soviet Union as well as papers by foreign authors that concern amphibians within this territory. All topics of batrachology are desired, including systematics, distribution (including new records, maps, and atlases), ecology, behavior, conservation, morphology, evolution, paleontology, physiology, biochemistry, parasitology, genetics, and herpetoculture. For manuscript format requirements, subscriptions, or other information, contact: *Dr. Sergius L. Kuzmin, Editor, Institute of Ecology and Evolution, Russian Academy of Sciences, Leninsky Prospect, 33, Moscos 117071, Russia. Tel. (7095) 954-32-62; Fax (7095) 954-55-34; e-mail: sevin@glas.apc.org.*

Gopher Tortoise Council Awards

The Gopher Tortoise Council annually presents the J. Larry Landers Student Research Award to the best student research project concerning the biology of the gopher tortoise, *Gopherus polyphemus*, or any aspects of its sandhill community. Last year two awards were presented to Melissa Dills of Auburn University ("Coloniality in the gopher tortoise, *Gopherus polyphemus*") and Karl Studenroth ("A survey of the occurrence of *Gopherus polyphemus* on the campus of the University of Mobile"). Recent awards

have averaged $500. Students interested in applying should submit a concise description of their project with a detailed budget and a brief curriculum vitae to: *Bob Herrington, Research Advisory Committee, Department of Biology, Georgia Southwestern State University, Americus, Georgia 31709, USA.* Deadline for receipt of proposals to be considered for the 1997 award is 31 August 1997.

Iguanas of the West Indies Poster

The Fort Worth Zoo announces the publication of a beautiful new poster highlighting the conservation of iguanas of the West Indies. Featuring rare and exceptional color photographs of 14 of the 18 *Cyclura* and *Iguana*, this high-quality poster measures 20 x 26 in. and is printed on a heavy-duty paper stock suitable for framing. Produced to assist the IUCN/SSC West Indian Iguana Specialist Group in promoting the preservation of these endangered lizards, all proceeds from the sale of this poster will help to fund critical iguana research and conservation projects throughout the Caribbean. Posters can be obtained in the U.S. for $13.00 including postage and mailing tube; international orders are $16.00. Checks or money orders (in U.S. currency) should be payable to the Fort Worth Zoo. Mail requests to: *Rick Hudson, Fort Worth Zoo, 1989 Colonial Parkway, Fort Worth, Texas 76110, USA.*

REGIONAL HERPETOLOGICAL SOCIETIES

Slovenian Herpetological Society Formed

The Drustvo za gojenje in proucevanje plazilcev in dvozivk [Society for Breeding and Research of Reptiles and Amphibians] was founded on 7 September 1995 in Ljubljana, Slovenia. It is the first society of its kind in Slovenia. The Slovenian herpetofauna is very diverse for such a small area, but is still poorly known and needs to be thoroughly researched. Most of the Society members are young people with a special interest in herps. As the name states, we are involved in keeping, breeding, and research of reptiles and amphibians. Meetings are held once each month, with lectures, discussions, and field trips in the summer. We now have about 40 members. The Society recently published the first issue of their newsletter *Zelenec* (Zelenec is the Slovenian common name for the green lizard, *Lacerta viridis*, our largest lacertid). Currently, *Zelenec* is written in the Slovene language, but an English edition is planned for the future. The first issue features articles on reptiles and amphibians of Slovenia, matamata turtles, and keeping and breeding of chameleons (with emphasis on *C. calyptratus*). Regular columns include: Editorials, Field Reports, Herp News, and Advertisments. The second issue is scheduled to be published in Spring of 1997. It will be a "Madagascar special issue." Two issues of *Zelenec* are planned for 1997. The society's address is: *Drustvo za gojenje in proucevanje plazilcev in dvozivk, c/o Matjaz Rojc, Reska 9, 1000 Ljubljana, Slovenia; e-mail: matjaz.rojc@siol.net.*

Kansas Herpetology Award Established

The Kansas Herpetological Society has announced the establishment of the Suzanne L. & Joseph T. Collins Award for Excellence in Kansas Herpetology. The Award is established in recogntion of the scientific and artistic achievements of Suzanne L. Collins and Joseph T. Collins, whose life-long study and conservation of the native amphibians and reptiles of Kansas is amply demonstrated in their extensive and excellent writings and photography, both academic and popular, about these animals. The Award will be presented once each year on the occasion of the annual meeting of the Kansas Herpetological Society before its assembled membership. The Collins Award is funded by a trust in perpetuity, and will increase in amount each year through reinvestment. During its initial year the award will minimally be $700, and may be as much as $1000. The Collins Award recipient will be chosen by the Executive Council of the KHS or a committee approved and appointed by the Council. The first Collins Award will be presented at the Silver Anniversary Meeting of the KHS in Lawrence in November 1998. For further information, contact: *Karen L. Toepfer, 303 West 39th Street, Hays, Kansas 67601, USA; e-mail: fmkt@fhsuvm fhsu edu.*

MEETINGS

Meetings Calendar

25 June–2 July 1997—40th Annual Meeting, Society for the Study of Amphibians and Reptiles; 45th Annual Meeting of The Herpetologists' League; 77th Annual Meeting, American Society of Ichthyologists and Herpetologists. Hosted by the University of Washington, Seattle, Washington, USA. *Refer to meeting announcement in this issue for details.*

2–10 August 1997—Third World Congress of Herpetology, Prague, Czech Republic. Contact: Zbynek Rocek, Congress Director, Department of Paleontology, Geological Institute, Academy of Sciences, Rozvojová 135, 165 00 Praha 6 – Suchdol, Czech Republic. Tel. (++42-2) 24311421; Fax (++42-2) 24311578; e-mail: rocek@gli.cas.cz. *Refer to meeting announcement in* Herpetological Review *27(1):4–5, March 1996 for details.*

4–7 August 1997—IV Regional Latin American and Caribbean Meeting of the Crocodilian Specialist Group, Villahermosa, Tabasco, México. Hosted by the Autonomous University Juarez of Tabasco "UJAT" (and other institutions). Contact: Biol. Beatriz Figueroa Ocana, Av. Gregorio Mendez 2006, Col. Rovirosa, Villahermosa, Tabasco 86000, México. Fax: (91) (93) 54 38 54. ; e-mail: sarriago@tukan.ujat.mx or Dr. James Perran Ross, Executive Officer, Crocodilian Specialist Group, Florida Museum of Natural History, P.O. 117800, Gainesville, Florida 32611-7800, USA. Tel: (352) 392-1721; Fax: (352) 392-9367; e-mail: prosscsg@flmnh.ufl.edu.

13–14 September 1997—Mid-Atlantic Reptile Show, Maryland State Fairgrounds. Contact: Tim Hoen, P.O. Box 201, Jarrettsville, Maryland 21084, USA. Tel. (410) 557-6879; http://www.pythons.com/mars.html.

26–28 September 1997—Midwest Regional Animal Behavior Conference, The Ohio State University, Columbus, Ohio, USA. Co-sponsored by the Zoology and Entomology Departments. Con-

tacts: Dr. Patricia G. Parker (614-292-0378; fax 614-292-2030; parker.3@osu.edu) and Brian H. Smith (614-292-0465; fax 614-292-2180; smith.210@osu.edu). Visit the meeting's site at http://www.biosci.ohio state.edu/~zoology/MRABSC97//index.htm

3–5 October 1997—Second Annual Meeting of the Canadian Amphibian and Reptile Conservation Network and the 7th Annual Meeting of the IUCN/SSC Task Force on Declining Amphibian Populations in Canada (DAPCAN), Acadia University, Wolfville, Nova Scotia. Contact: Stan A. Orchard, Chairman, CARCN/RCCAR, 1745 Bank Street, Victoria, British Columbia, Canada V8R 4V7. Tel./Fax: (250) 595-7556; e-mail: sorchard@islandnet.com.

18–19 October 1997—First International Symposium on Snakebite. Zhanjiang, People's Republic of China. Contact: Organizing Committee of the First International Symposium on Snakebite, No. 2 Cunjin Road, Zhanjiang City, Guangdong Province 524037, People's Republic of China. Tel./Fax 0086-759-3316724.

18–19 October 1997—Snake Ecology for the 21st Century. Texas Herpetological Society Fall Symposium, Camp Tyler, Texas, USA. Contact: Neil B. Ford, Department of Biology, University of Texas at Tyler, Tyler, Texas 75799, USA. Tel. (903) 566-7249; e-mail: nford@mail.uttyl.edu.

25 October 1997—Conservation Ecology of the Amphibians of the Mid-Atlantic Region, Jug Bay Wetlands Sanctuary, Lothian, Maryland, USA. Contact: Karyn Molines, Conference Chair, Jug Bay Wetlands Sanctuary, 1361 Wrighton Road, Lothian, Maryland 20711, USA. Tel. (410) 741-9330; Fax (410) 741-9346; e-mail: cswarth@umd5.umd.edu.

25–26 October 1997—Fourth Annual Conference of the Association of Reptilian & Amphibian Veterinarians. Sheraton Astrodome, Houston, Texas, USA. Contact: Wilbur Amand, VMD, P.O. Box 605, Chester Heights, Pennsylvania 19017, USA. Fax (610) 892-4813.

October 1997—III Congreso Argentino de Herpetologia, Corrientes - Argentina Asociacion Herpetologia Argentina Contact: Blanca B.A. de Avanza/Maria E. Tedesco Organizing Committe - Departamento de Biologia Anatomia Comparada - Facultad de Ciencias Exactas y Naturales y Agrimensura. Universidad Nacional del Nordeste 9 de Julio 1449 - 3400 Corrientes, Argentina.

1–3 June 1998—Biodiversity and Conservation of Amphibians and Reptiles of Tropical Forests: An International Symposium. Hanoi, Vietnam. Contact: Natalia Ananjeva (St. Petersburg, Russia), e-mail: nbanorus@glas.apc.org.

June 1998—Highlands Conference on Plethodontid Salamanders. *Refer to announcement below for further details.*

1–5 September 1998—Third International Asian Herpetological Meeting, Almaty, Kazakhstan. To receive the First Announcement and Preliminary Registration Form, please contact one of the meeting organizers: Dr. Tatjana Dujsebayeva, Department of Biology, Kazakh State University, Al-Farabi Prospect, 71, Almaty, 480078, Kazakhstan; Tel. (3272) 472677, Fax (3272) 472609, e-mail: zool@plague.almaty.kz; Dr. Natalia Ananjeva, Department of Herpetology, Zoological Institute, Universitatskaja nab., 1, Saint-Petersburg, 199034, Russia; Tel. (812) 2180711, Fax (812) 2182941, e-mail: anb@zisp.spb.su; or Dr. Theodore Papenfuss, Asiatic Herpetological Research, Museum of Vertebrate Zoology, University of California, Berkeley, California 94720, USA; Tel. (510) 642-3567, Fax (510) 643-8238, e-mail: asiaherp@uclink2.berkeley.edu.

The Highlands Conference on Plethodontid Salamanders

The Highlands Conference on Plethodontid Salamanders will be held in June 1998 in Highlands, North Carolina (USA), and is sponsored by the Highlands Biological Station. This meeting will follow the tradition of the First (1972), Second (1982), and Third (1992) Conferences in exploring new directions in plethodontid research. The Conference will feature invited papers, evening poster sessions, and a Symposium. All interested are encouraged to participate. Future announcements concerning Conference dates, a call for papers, and registration information will be sent only to those on our mailing list. If you attended the 1992 Conference, and if your address has not changed, you will receive announcements automatically. To be placed on the mailing list, or to update your address, please send your name, address, and numbers (phone, FAX, e-mail) to: *Plethodontid Conference, Highlands Biological Station, P.O. Box 580 Highlands, North Carolina 28741, USA or send an e-mail message to Judy Hill (HBS Admin. Asst.) at: JHILL@wpoff.wcu.edu.*

CURRENT RESEARCH

The purpose of **Current Research** is to present brief summaries and citations for selected papers from journals other than those published by the American Society of Ichthyologists and Herpetologists, The Herpetologists' League, and the Society for the Study of Amphibians and Reptiles. Limited space prohibits comprehensive coverage of the literature, but an effort will be made to cover a wide variety of taxa and topics. To ensure that the coverage is as broad and current as possible, authors are invited to send reprints to the Current Research section editor: Breck Bartholomew, 195 West 200 North, Logan, Utah 84321-3905, USA; e-mail: herpbooks@sisna.com. Comments and suggestions are also welcome.

The current contents of several herpetological publications can now be found on the World Wide Web. At present, more than 20 publications are being listed. The Web site address is:

http://www.sisna.com/users/Herpbooks/Contents.html

Microevolutionary Change in *Nerodia*

Color pattern variation in Lake Erie island populations of *Nerodia sipedon* provide a classic example of microevolutionary change in which the effects of selection, gene flow, inheritance, and population history are unusually well understood. King and Lawson present a nice review of microevolution in the species in a recent paper in BioScience.

KING, R. B., AND R. LAWSON. 1997. Microevolution in island water Snakes. BioScience 47(5):279–286.

Habitat and Colonization

M'Closkey et al. studied the colonization of habitats by four species of phrynosomatid lizards (*Urosaurus ornatus, Sceloporus graciosus, S. undulatus*, and *Uta stansburiana*) to determine differences among the species in colonization, differences among habitat types in colonization, and the time trajectory of coloniza-

tion. Their study indicates there were significant habitat and census period differences in saturation.

M'Closkey, R. T., et al. 1997. Colonization and saturation of habitats by lizards. Oikos 78(2):283–290.

Crocodilian Evolution

Poe used published systematic data on crocodilians to test hypotheses of data set incongruence and phylogeny. Both molecular and morphological data sets were examined and comparisons yield interesting results.

Poe, S. 1996. Data set incongruence and the phylogeny of Crocodilians. Syst. Biol. 45(4):393–414.

Phenotypic Variation

Why some species exhibit remarkable variation among populations whereas closely related species are relatively uniform remains unclear. Summers et al. examined color variation in four species of dendrobatid frogs with different reproductive strategies. Their results suggest that strong sexual selection associated with female parental care may be a factor in the variation in *Dendrobates pumilio*.

Summers, K., et al. 1997. Phenotypic and genetic divergence in three species of dart-poison frogs with contrasting parental behavior. J. Hered. 88:8–13.

Phylogeny of Desmognathine Salamanders

Using both molecular and morphological data, Titus and Larson studied the phylogeny of desmognathine salamanders. Their results suggest that desmognathine evolution includes transformations in the direction of largest body sizes, lengthened larval periods, and greater use of aquatic habitats.

Titus, T. A., and A. Larson. 1996. Molecular phylogenetics of desmognathine salamanders (Caudata: Plethodontidae): a reevaluation of evolution in ecology, life history, and morphology. Syst. Biol. 45(4):451–472.

New *Boophis* from Madagascar

Glaw and Vences reviewed advertisement calls, morphology, diet, and reproductive characteristics of the *Boophis goudoti* group of Madagascan frogs. Their data revealed a new species, *Boophis rufioculis*, as well as other interesting aspects of the biology of these frogs.

Glaw, F., and M. Vences. 1996 (1997). Neue Ergebnisse zur *Boophis gudoti*-Gruppe aus Madagaskar: Bioakustik, Fortpflanzungsstrategien und Beschreibung von *Boophis rufioculis* sp. nov. [New results on the *Boophis goudoti*-group from Madagascar: Bioacoustics, reproductive strategies, and description of *Boophis rufioculis* sp. nov.]. Salamandra 32(4):225–242.

Heterochrony

Confusion exists with the current model and terminology of heterochrony because the model is explicitly limited to phylogenetic patterns (interspecific comparisons), but has been used for intraspecific comparisons. Because heterochrony may underlie all morphological variation and possibly is *the* developmental phenomenon producing all morphological change, it is important that descriptions of heterochronic patterns and processes be clear and precise over all levels of analysis. To this end, Reilly et al. discuss and clarify the previous model for heterochrony, reject some of the terminology and suggest alternatives, and then expand the model to include a new nomenclature for intraspecific heterochronic phenomena.

Reilly, S. M., E. O. Wiley, and D. J. Meinhardt. 1997. An integrative approach to heterochrony: the distinction between interspecific and intraspecific phenomena. Biol. J. Linn. Soc. 60:119–143.

Ecology of *Bombina bombina*

The Deutsche Gesellschaft für Herpetologie und Terrarienkunde recently published the proceedings of a symposium on the ecology and conservation of *Bombina bombina* in their journal *Rana*. The contents include 13 papers on the species' status and ecology. Listed here is the only title of the issue.

Krone, A., and K. -D. Kühnel. 1996. Die Rotbauchunke (*Bombina bombina*) Ökologie und Bestandssituation. Natur & Text, Rangsdorf, Germany. 132 pp.

Hemipene Terminology

Recent advances in the study of lizard hemipenes as a systematic character has introduced some confusion over hemipene terminology. Savage has published a paper intended to clarify definitions, resolve inconsistencies, and integrate the terminology applied to hemipenial variation for lizards and snakes into a broader scheme applicable to all squamates.

Savage, J. M. 1997. On terminology for the description of the hemipenes of squamate reptiles. Herpetol. J. 7(1):23–25.

Neural Control in Autotomized Tails

Most previous studies of tail autotomy in lizards have emphasized the energetic costs rather than the consequences for neural control of movement. Rumping and Jayne found that autotomized tails with one or more spinal segments moved longer and more vigorously than autotomized tails consisting entirely of regenerated (unsegmented) tissue.

Rumping, J. M., and B. C. Jayne. 1996. Muscle activity in autotomized tails of a lizard (*Gekko gecko*): a naturally occurring spinal preparation. J. Comp. Physiol. A. 179:525–538.

Asiatic Herpetological Research

Volume 7 of *Asiatic Herpetological Research* was recently published. This journal is recommended to anyone interested in any aspect of Asian herpetology. For more information write AHR, Museum of Vertebrate Zoology, University of California, Berkeley, California 94720, USA (e-mail: asiaherp@uclink.berkeley.edu).

Cedhagen, T. 1997. Anurans collected in West Malaysia. Asiatic Herpetol. Res. 7:1–5.

Chikin, Y. A. 1997. A catalogue of non-metrical variations in skull bones of *Vipera lebetina* (Reptilia, Viperidae). Asiatic Herpetol. Res. 7:6–18.

DAREVSKY, I. S., AND N. N. SZCZERBAK. 1997. A new gecko of the genus *Gonydactylus* (Sauria: Gekkonidae) with a key to the species of Vietnam. Asiatic Herpetol. Res. 7:19–22.

DAS, I. 1997. Rediscovery of *Lipina Macrotympanum* (Stoliczka, 1873) from the Nicobar Islands, India. Asiatic Herpetol. Res. 7:23–26.

DUJSEBAYEVA, T., ET AL. 1997. On the distribution of diploid and tetraploid green toads of the *Bufo viridis* complex (Anura: Bufonidae) in southern Kazakhstan. Asiatic Herpetol. Res. 7:27–31.

FU, J., A. LATHROP, AND R. W. MURPHY. 1997. Phylogeny of genus *Scutiger* (Amphibia: Megophryidae): A re-evaluation. Asiatic Herpetol. Res. 7:32–37.

FU, J., AND R. W. MURPHY. 1997. Phylogeny of Chinese *Oreolalax* and the use of functional outgroups to select among multiple equally parsimonious trees. Asiatic Herpetol. Res. 7:38–43.

GOLDBERG, S. R., C. R. BURSEY, AND Q. A. TRUONG. 1997. Helminths of Tago's brown frog, *Rana tagoi* (Ranidae), from Japan. Asiatic Herpetol. Res. 7:44–47.

INGER, R. F., M. LAKIM, A. BJUN, AND P. YAMBUN. 1997. A new species of *Leptolalax* (Anura: Megophryidae) from Borneo. Asiatic Herpetol. Res. 7:48–50.

KHAN, M. S. 1997. Taxonomic notes on Pakistani snakes of the *Coluber karelini-rhodorachis-ventromaculatus* species complex: a new approach to the problem. Asiatic Herpetol. Res. 7:51–60.

KHAN, M. S., AND M. R. Z. KHAN. 1997. A new skink from the Thal Desert of Pakistan. Asiatic Herpetol. Res. 7:61–67.

LATHROP, A. 1997. Taxonomic review of the Megophryid frogs (Anura: Pelobatoidea). Asiatic Herpetol. Res. 7:68–79.

LAZELL, J., M. LAU, AND W. LU. 1997. A brief herpetological excursion to Wai Ling Ding, Wanshan Islands, South China Sea. Asiatic Herpetol. Res. 7:80–84.

MAMET, S., AND S. KUDRYAVTSEV. 1997. Captive propagation of the Mandarin rat snake (*Elaphe mandarina*) at Moscow Zoo. Asiatic Herpetol. Res. 7:85–86.

MOHANTY, A. K., N. SINGH, AND S. K. DUTTA. 1997. Population dynamics and growth in a natural population of *Limnonectes limnocharis* (Anura: Ranidae). Asiatic Herpetol. Res. 7:87–92.

RAO, D. -Q., AND D. -T. YANG. 1997. The karyotypes of Megophryinae (Pelobatidae) with a discussion on their classification and phylogenetic relationships. Asiatic Herpetol. Res. 7:93–102.

RAO, D. -Q., AND D. -T. YANG. 1997. The variation in karyotypes of *Brachytarsophrys* from China with a discussion of the classification of the genus. Asiatic Herpetol. Res. 7:103–107.

TSELLARIUS, A. Y., AND E. Y. TSELLARIUS. 1997. Behavior of *Varanus griseus* during encounters with conspecifics. Asiatic Herpetol. Res. 7:108–130.

Published by the Society for the Study of Amphibians and Reptiles

CATALOGUE OF AMERICAN AMPHIBIANS AND REPTILES

THE CATALOGUE OF AMERICAN AMPHIBIANS AND REPTILES (CAAR) represents one of the most important long-term cooperative activities undertaken by the American herpetological community. The *Catalogue* is issued as loose-leaf accounts of taxa (1–17 letter-size pages in length). Each account, authored by a leading herpetologist, serves as a complete and current summary of the knowledge of each taxon. Further, the CAAR is not restricted to those taxa occurring within the United States, but covers the entire Western Hemisphere (North, Central, and South America, as well as the Caribbean Basin). The *Catalogue of American Amphibians and Reptiles* sets the standard for archival taxonomic publications and has been emulated by biological societies worldwide.

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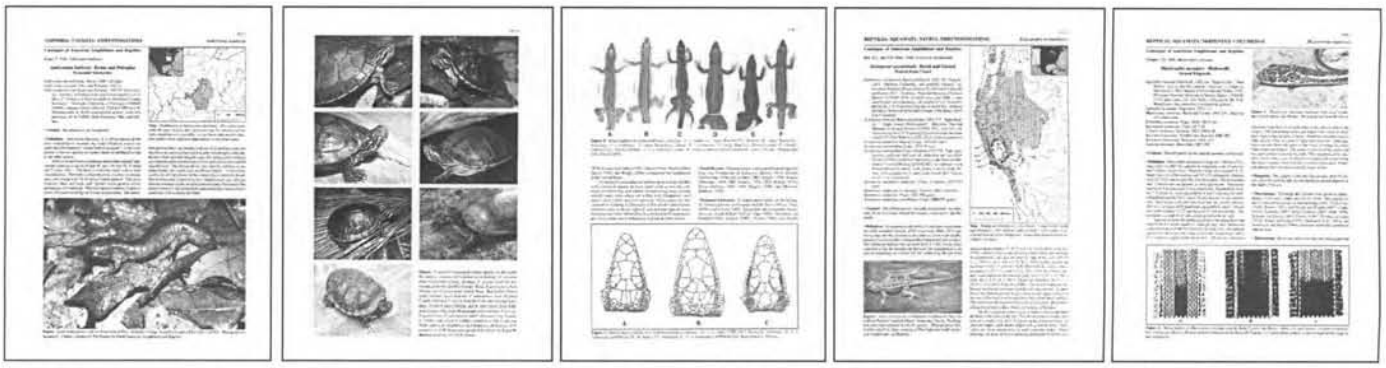
- Taxonomic keys to species or subspecies
- Audiospectrograms



Selected pages from some 1996 accounts: *Ambystoma barbouri, Pseudemys, Cnemidophorus sexlineatus, Sceloporus occidentalis,* and *Masticophis taeniatus.*

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Selected authors:

Kraig Adler, Ronald Altig, James D. Anderson, Walter Auffenberg, Aaron Bauer, Edmund D. Brodie Jr., R. Bruce Bury, Janalee P. Caldwell, Jonathan A. Campbell, Charles J. Cole, Joseph T. Collins, James R. Dixon, C. Kenneth Dodd, William E. Duellman, Harold A. Dundee, Carl H. Ernst, Henry S. Fitch, Oscar Flores-Villela, Carl Gans, J. Whitfield Gibbons, L. Lee Grismer, Laurence M. Hardy, Robert W. Henderson, Richard Highton, John B. Iverson, Mark R. Jennings, Julian C. Lee, Ernest A. Liner, Jeffrey E. Lovich, John D. Lynch, William E. Magnusson, Bernard S. Martof, Clarence J. McCoy, James R. McCranie, Roy W. McDiarmid, William S. Parker, Clifford H. Pope, F. Harvey Pough, Robert Powell, Andrew H. Price, Peter C. H. Pritchard, Douglas A. Rossman, Albert Schwartz, Wilmer W. Tanner, Jaime D. Villa, David B. Wake, Larry David Wilson, George R. Zug, Richard G. Zweifel.

TUNIYEV, B. S., C. A. ATAYEV, AND S. M. SHAMMAKOV. 1997. On the distribution of *Coluber ravergieri* and *Coluber nummifer* in Turkmenistan and the possible evolutionary reasons for their polymorphism. Asiatic Herpetol. Res. 7:131–136.

VASHETKO, E. V., A. N. GANIEVA, AND A. S. NURIDZHANOV. 1997. Anomalies of gonads in *Bufo viridis* from Uzbekistan. Asiatic Herpetol. Res. 7:137–138.

WANG, P. -C., W. MA, B. LU, AND W. -H. YOU. 1997. Egg components and utilization during incubation in the turtle, *Chinemys reevesii*. Asiatic Herpetol. Res. 7:139–146.

WANG, P. -C., AND X. JI. 1997. A comparison of embryonic metabolic rates in two lizards. Asiatic Herpetol. Res. 7:147–152.

WERNER, Y. L., ET AL. 1997. Varied and fluctuating foraging modes in nocturnal lizards of the family Gekkonidae. Asiatic Herpetol. Res. 7:153–165.

ZHAO, E. -M. 1997. A new species of *Rhabdophis* (Serpentes: Colubridae) from Hainan Island, China. Asiatic Herpetol. Res. 7:166–169.

ZHAO, E. -M. 1997. Infraspecific classification of some Chinese snakes. Asiatic Herpetol. Res. 7:170–172.

Zeitschrift für Feldherpetologie

Westarp Wissenschaften recently published Volume 3 of *Zeitschrift für Feldherpetologie*. The papers in this volume cover a wide variety of field studies. The geographic coverage appears to be greater than for previous volumes in this series. More information about this journal may be obtained by writing Westarp Wissenschaften, Kirchstraße 5, D-39326 Hohenwarsleben, Germany (e-mail Westarp@t-online.de).

GÜNTHER, E. 1996. *Salamandra salamandra bernardezi* Wolterstorff, 1928 in Oviedo, Spanien: Ein Schwanzlurch als Stadtbewohner [*Salamandra salamandra bernardezi* Wolterstorff, 1928 in Oviedo, Spain: A tailed amphibian species inhabiting urban areas]. Zeitschr. Feldherpetol. 3(1/2):1–18.

KUZMIN, S. L., V. V. BOBROV, AND E. A. DUNAEV. 1996. Amphibians of Moscow Province: distribution, ecology, and conservation. Zeitschr. Feldherpetol. 3(1/2):19–72.

HENLE, K. 1996. Möglichkeiten und Grenzen der Analyse von Ursachen des Artenrückgangs aus herpetofaunistischen Kartierungsdaten am Beispiel einer langjährigen Erfassung [Potentials and limitations of casual inferences on declines in the herpetofauna from mapping data illustrated by long-term mapping example]. Zeitschr. Feldherpetol. 3(1/2):73–101.

LEISI, C., ET AL. 1996. Die Verbreitung der Amphibien im Stadgebeit von Hannover [The distribution of amphibians in the city of Hannover]. Zeitschr. Feldherpetol. 3(1/2):103–122.

MUTZ, T., AND S. DONTH. 1996. Untersuchungen zur Ökologie und Populationsstruktur der Zauneidechse (*Lacerta agilis*) an einer Bahnlinie im Münsterland [Studies about ecology and population structure of the sand lizard (*Lacerta agilis*) at railway embankments in Münsterland, Western Germany]. Zeitschr. Feldherpetol. 3(1/2):123–132.

SCHRÖER, T. 1996. Morphologie und Ploidiegrade von Wasserfröschen aus unterschiedlichen populationssystemen in Nordost-Polen [Morphology and ploidy levels of water frogs from different population systems in Northeast Poland]. Zeitschr. Feldherpetol. 3(1/2):133–150.

KRONSHAGE, A. 1996. Beobachtungen an einer Kolonie der Geburtshelferkröte (*Alytes obstetricans*) im südwestfälischen Bergland (Nordrhein-Westfalen) [Observations on a colony of mid-wife toads (*Alytes obstetricans*) in the South Westphalian mountainous region (Northrhine-Westphalia). Zeitschr. Feldherpetol. 3(1/2):151–165.

TARKHNISHVILI, D. N. 1996. The distribution and ecology of the amphibians of Georgia and the Caucasus: a biogeographical analysis. Zeitschr. Feldherpetol. 3(1/2):167–196.

BÜLOW, B. V. 1996. Vorkommen des Fadenmolches (*Triturus h. helveticus*) im Hünxer Wald bestätigt [Occurrence of the palmate newt (*Triturus h. helveticus*) in Hünxer Wood area (Germany) confirmed]. Zeitschr. Feldherpetol. 3(1/2):197–198.

LETTERS TO THE EDITOR

CITES: A Boon, Not a Boondoggle

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In his article on the dendrobatid trade, Gorzula (1996. Herpetol. Rev. 27:116–123) notes that "many scientists who claim to be affected by CITES have a less than adequate knowledge of the workings and purposes of the convention." Lamar's letter (1997. Herpetol. Rev. 28:10) in response to Gorzula displays just such an inadequacy. I am not a herpetologist, but I have had considerable experience with CITES, including attendance at CITES conferences since 1987, and I would appreciate an opportunity to clear up some of the misconceptions in Lamar's letter.

Lamar states that "CITES was never intended to be a conservation treaty." On the contrary, that is exactly what it was intended to be. The stimulus for CITES came directly from decisions taken by IUCN at meetings in the early 1960's to draft an international instrument to deal with the depradations of unregulated wildlife trade on a number of species, including spotted cats. The CITES Preamble states clearly "that international cooperation is essential for the protection of certain species of wild fauna and flora against overexploitation through international trade."

Lamar appears to be under the impression that listing decisions are made by the CITES Secretariat. This is not the case. The Secretariat, though it certainly has opinions on many issues before the Parties, is an administrative body. There is no such thing as a central council that decides listing issues. Instead, any individual Party (there are now 136 member states) can submit a proposal to add a species to either Appendix I or Appendix II, to delete a species, or to transfer it from one Appendix to another. This proposal is then voted on by the Conference of the Parties, normally at its conferences held roughly every two and one half years, with each country receiving one vote. A two-thirds majority is necessary to carry the proposal, which then enters into force ninety days after the vote.

In the case of the dendrobatid frogs, the Secretariat actually opposed the listing and asked the Parties to reconsider it after the vote was taken at the 1987 meeting. The Parties, however, refused to do so. As for the anguid lizard genus *Abronia*, there is no proposal pending to list this taxon, and CITES can hardly be held accountable for unfounded rumors.

Lamar also appears to be confused about the effect of CITES on domestic laws. CITES does not give countries power to pass domestic bans or restrictions on wildlife trade that they did not already possess. The power to pass such laws is a sovereign right. CITES merely recognizes, in Article XIV, that states signing the treaty retain the right to pass stricter laws than those necessary to carry out the treaty itself. If CITES were to disappear tomorrow, these laws would still stand, and in fact might become even more draconian. They would certainly be even less coordinated than they are now, when the CITES conferences at least provide an opportunity for country representatives to get together to discuss issues of common concern.

While I can understand the frustration some scientists may feel on having to deal with paperwork resulting either from CITES or from domestic wildlife laws, I cannot feel too sorry for the scientists Lamar refers to, who import collections into the United States without realizing that the species involved are listed as endangered under American law. The Endangered Species Act is not a secret document, any more than CITES is, and surely it is reasonable to expect importers to make the extra effort to find out what it says before bringing their specimens home.

CITES already recognizes the difference between scientific specimens and specimens in commercial trade. Appendix I species may not be traded for "primarily commercial purposes" but may be imported and exported, with the proper permits, for bona fide scientific research.

Finally, Lamar seems to view CITES as serving no greater function than to impede his research or the research of his colleagues. This short-sighted view ignores the beneficial effects of CITES on the conservation of many species, including reptiles such as sea turtles and crocodiles. These beneficial effects were recognized by an independent study of the effectiveness of CITES prepared in 1996 by the British firm Environmental Resources Management under contract to the Secretariat. CITES certainly has its flaws, but it has proven to be, on the whole, a highly beneficial and flexible instrument, and scientists would do far better working to improve its operation than carping at it from the outside. Certainly, before they express their opinions in print, they should at least make an effort to find out what the treaty is actually about.

Response to Orenstein

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It is obvious from his letter, deft and lawyerly, that Mr. Orenstein has garnered extensive knowledge of CITES, no doubt pursuant to his career. By contrast, my letter, written in a fit of pique 15 years in the making, displays considerable naiveté. For instance, I believed the various CITES officials who have told me and my colleagues the convention was a monitoring device rather than a conservation treaty. I didn't realize they, too, were confused. And I took seriously the CITES official who expressed interest in listing *Abronia*, forgetting that it remains hearsay until acted upon.

It is also obvious from his letter that Mr. Orenstein, like so many of those who decide on these issues, has never been on the receiving end of the process. The disclaimer that CITES has no effect on domestic laws is misleading. Look what happened when that local CITES office unilaterally decided that ALL fauna exported from their country required a (costly) CITES permit. At that point, their wishes—not even reflective of that country's governing body—effectively stymied local institutions and became doctrine to the universe, garnering backing from signatory countries (like the U.S., Canada, and Great Britain) whose legal systems bear no semblance to that of the initiating country. It is extraordinarily arrogant and ethnocentric, if well intended, to attempt to mate these unrelated systems. I would welcome Mr. Orenstein's "more draconian" alternative.

CITES of Honduras, responding belatedly to wanton commercial overharvesting of its herpetofauna, sought to list several pitviper species. They were competently advised that none of the suggested species, all common and unthreatened by trade, merited listing. They were also urged to look closely at the one spe-

cies they had excluded...a critically threatened endemic. Ignoring this, they proceeded with their plan.

Enter the Terciopelo, *Bothrops asper*, Central America's leading cause of snakebite and a creature so abundant it may rightly be considered a pest in many areas. Because of its listing by Honduras, you simply cannot imagine the problems encountered by one U.S. institution assisting a different Central American country that is establishing a reference collection. In order to send them a preserved Terciopelo, collected legally in that same country many years before the listing by Honduras, a "Certificate of Origin" must be obtained. Sounds easy until you try it. Of course, that also depends on the interpretations of the local USFWS office—this varies widely—but that's another story. The specimen in question has yet to make the trip back home. Anyone care to bet on its chances?

A proposed network of CITES-approved institutions pretended to ease this plan. Theoretically, any two such institutions could "traffic" more easily in museum loans, etc. In fact, many countries lack approved institutions, and in at least one case the governing authority of a country became incensed by the Secretariat's draconian procedures and declined to seek authorization. And who says the Secretariat lacks authority?

Orenstein's comments about the confusing array of non-to-slightly overlapping laws neatly dodge the issue. In fact the system is ill-coordinated, rife with pitfalls (by design?), and in need of repair. I resent the undercurrent in Orenstein's letter implying that scientists ignore positive conservation implications of the CITES treaty. In addition to generating the only solid data on which the conservation movement can rely, field biologists must witness the daily erosion not only of their careers, but also their passion—there are no truer conservationists on the planet.

I note that CITES' efficacy has been attested to by a firm under contract to...CITES. Since the Secretariat continues to duck responsibility under guise of respecting the autonomy of the 136 signatory countries, why not let EACH of them evaluate the efficacy of the treaty? That would be pretty chaotic—just like the morass scientists must deal with at present. Why not administer a test to all CITES and related officials worldwide to see how well they understand things? Orenstein has shown convincingly that CITES is all about conservation, so let's see an evaluation of how the areas it affects stack up in importance to the massive habitat destruction and internal harvesting that are depleting the species we can't even investigate. Perhaps all that money and effort could be better directed.

The crudeness of my first letter notwithstanding, I have received overwhelmingly positive response from the community. To those of you who were kind enough to have written me, I implore you to continue this dialogue, but publicly—those in power have tin ears. Maybe some day CITES will lose some of their clubbiness and seek the advice of APPROPRIATE scientists rather than expecting scientists to come to them. Oh yes, and one last thing—CITES doesn't impede my research and that of my colleagues—it virtually stops it.

POINTS OF VIEW

Scinax pedromedinai: An Unjustified Emendation of *Ololygon pedromedinae* Henle, 1991

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In 1991, Henle named a small species of hylid frog *Ololygon pedromedinae* in honor of Pedro Medina, the collector of the type material in the Departamento Madre de Dios, Peru. He included it in the *O. boulengeri* group. Without comment, Duellman and Salas (1991) listed the species as *O. pedromedinai*. When resurrecting the generic name *Scinax* for species formerly known as *Ololygon*, Duellman and Wiens (1992) listed the species as *S. pedromedinae*. In 1993, Duellman listed the species as *Scinax pedromedinai*, briefly stating that "The specific name was incorrectly spelled *pedromedinae* in the original description." Revising the genus *Scinax* from Amazonian Ecuador and Peru, Duellman and Wiens (1993) listed the species again as *Scinax perdomedinai*. In this publication, they justified the changed spelling of the specific name by pointing out that Pedro Medina is a man and thus the specific epithet must be masculine. To achieve this, they believed that the name must be mascularinized by emendating the name to pedromedinaus. As this action is not warranted and may contribute to nomenclatural confusion, I would like to briefly outline why this emendation has to be rejected.

The most common Latin endings of masculine words are indeed *-us* and *-is*. However, exceptions exist. For example, the Latin word for farmer, agricola, is masculine; its genetive is agricolae not agricolai. Medina is a widespread Latin name that was and still is very common in Italy, and the same rules for agricola apply to it. Whereas the emendation *-us* for a species name may be acceptable in cases in which it is derived from a non-Latin name (e.g., in *Hyla brongersmai*), such an emendation is definitely incorrect for cases derived from Latin names. For example, *Python sebae* is named in honor of the famous naturalist Seba, a man. The correct spelling for the large African python was never questioned. Meirte (1992) cites further similar cases. Clearly, the correct name of the taxon is *Scinax pedromedinae* (Henle 1991).

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ARTICLES

The Distribution of *Pituophis melanoleucus* and *P. vertebralis* in Northern Baja California, México

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Klauber (1946), Welsh (1988), and Sweet and Parker (1990) recognized four subspecies of *Pituophis melanoleucus* distributed in Baja California as follows: *P. m. annectens* ranging throughout northwestern Baja California west of the Lower Colorado Valley Desert (Sweet and Parker 1990) to 42 km east (by Mexican Highway 1) of El Rosario (Grismer and Mahrdt 1996); *P. m. affinis* ranging throughout most of the Lower Colorado Valley Desert, westward to at least Paso de San Matías (Welsh 1988; Welsh and Bury 1984); *P. m. bimaris* (= *P. vertebralis* sensu Grismer 1994a) ranging from 43 km east (by Mexican Highway 1) of El Rosario (Grismer 1994a), southward throughout central Baja California to the Isthmus of La Paz (Sweet and Parker 1990); and *P. m. vertebralis* (= *P. vertebralis* sensu Grismer 1994a) ranging throughout the Cape Region (Sweet and Parker 1990). Grismer and Mahrdt's (1996) report on a specimen of *P. m. annectens* from 42 km east of El Rosario and Grismer's (1994a) report on a specimen of *P. vertebralis* (sensu lato) from 43 km east of El Rosario in a region of homogeneous habitat, indicated that these two species were likely to be sympatric.

Surprisingly, Sweet and Parker (1990), Grismer (1994a), and Grismer and Mahrdt (1996) overlooked a specimen of *Pituophis vertebralis* (USNM 37536) collected in 1905 from El Álamo in northwestern Baja California and reported on by Klauber (1946) as part of the type series of *P. melanoleucus bimaris*. Welsh (1988) reported on the specimen but did not comment on the fact that at the time, the two "subspecies," *P. m. annectens* and *P. m. bimaris*, overlapped for ca. 173 km with no sign of intergradation. El Álamo is a small town ca. 180 km north of the northernmost record of *P. vertebralis* (Grismer 1994a; Fig. 1). As noted by Stull (1940) and Klauber (1946) and confirmed here by examination of the specimen, USNM 37536 is an "undiluted" specimen, having all the diagnostic characteristics of *P. vertebralis* and none of those of *P. m. annectens* (Table 1). The inland areas between El Álamo and the next northernmost record for *P. vertebralis* at 43 km east of El Rosario lie along the foothills of the Sierra San Pedro Mártir, and with the exception of Rancho San José (Fig. 1), are difficult to access. Therefore, it is not too surprising that a museum search (CAS, LACM, MVZ, SDSNH, USNM; museum acronyms follow Leviton et al. 1985) revealed that no additional specimens of *P. vertebralis* have been collected in this intervening region within the last 90 years, even though *P. m. annectens* is known to be present (Klauber 1946). It is possible that the locality of USNM 37536 was mislabeled and the specimen actually was collected further south as was alluded to by Klauber (1946) in his reference to this specimen being "somewhat of an anomaly" in regard to its distribution. However, other evidence does not support this. The specimen was collected by Charles Nelson and Alfonso Goldman during their overland exploration of the Baja California peninsula from March, 1905 to February, 1906. Both reported being in El Álamo on 11–12 June 1905 (Goldman 1951:37; Nelson 1922:16), which is the collection date (11 June 1905) of USNM 37536 listed in their field catalogue. During this same period, they also collected *Callisaurus draconoides* (USNM 37642; 12 June 1905) at El Álamo, a species currently known from this locality (Grismer 1994b). These observations suggest that the entry into the Nelson-Goldman field catalogue was not erroneous.

Additional evidence for the validity of the locality of USNM 37536 comes from characteristics of the specimen itself. *Pituophis vertebralis* from the northern portion of its range, beginning in the vicinity of Bahía de Los Ángeles, often lack the reddish-orange coloration on the head and in the interspaces between the black, anterior, body blotches that is prominent and always present in specimens south of Bahía de Los Ángeles. Specimens from La-

TABLE 1. Distribution of discrete diagnostic charactersitics used to distinguish *Pituophis melanoleucus annectens*, *P. m. affinis*, and *P. vertebralis*. Data were taken from Klauber (1946) and Sweet and Parker (1990).

	affinis	*annectens*	*vertebralis*	El Álamo USNM 37536	Valle de Trinidad FMNH 1394
Blotches					
shape	biconcave	rounded	biconcave	biconcave	rounded
number on body	34-63	57-90*	34-51	33	60
number on tail	9-21	17-29	8-15	—	15
Anterior interblotch interspaces mottled (+) or unmottled (0)	+	+	0	0	+
Black subcaudal stripe present (+) or absent (0)	0	0	+	+	0
Anterior blotches black (+) or rusty brown (0)	0	+	+	+	+

* Sweet and Parker (1990) list the lower limit as 65 whereas 57 comes from Klauber (1946).

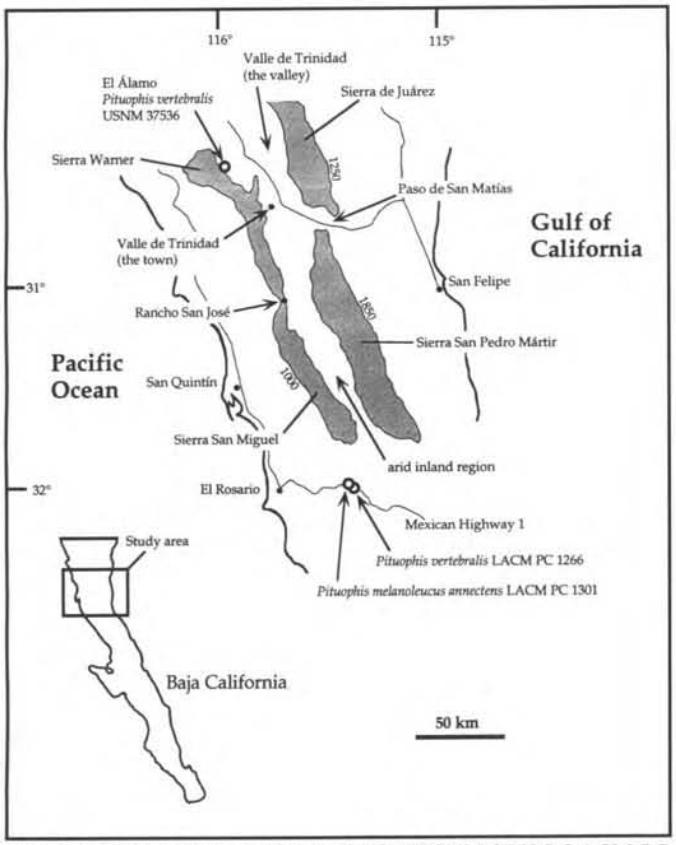

FIG. 1. Location of *Pituophis vertebralis* (USNM 37536; LACM PC 1266) and the southernmost specimen of *P. melanoleucus annectens* (LACM PC 1301) in northern Baja California, México in relation to major geographic features. Elevations are in meters.

guna Chapala (ca. 80 km northwest of Bahía de Los Ángeles) and northward lack this reddish-orange coloration, and the head and the interspaces between the anterior blotches are straw-colored. USNM 37536 also has a straw-colored head and anterior interspaces, indicating that it is at least from the northern portion of the distribution of *P. vertebralis*. (It should be noted that the reddish coloration in *P. vertebralis* is observable after many years of preservation).

Klauber (1946) was ambiguous in his suppositions concerning the possibility of intergradation between *Pituophis melanoleucus annectens* and *P. vertebralis*. He stated that it was "very doubtful" (p. 11) that the two taxa would intergrade, but that a specimen from Valle de Trinidad (FMNH 1394; = CNHM 1394) was "possibly" an intergrade (p. 28) between the two. Welsh (1988) and Sweet and Parker (1990) cited Klauber (1946:11) in stating that the two did not intergrade in northwestern Baja California. I have examined FMNH 1394 and find that it lacks the diagnostic characteristics of *P. vertebralis* but falls well within the range of the diagnostic characteristics reported for *P. m. affinis* and *P. m. annectens* (Table 1), and I suspect it may be an intergrade between these two forms. Welsh and Bury (1984) reported on a probable intergrade between *P. m. affinis* and *P. m. annectens* from 9.1 km east of Paso de San Matías. Additionally, I have made field observations on two putative intergrades between these two forms in the same region, and I currently am examining a large series of *Pituophis* from throughout Valle de Trinidad (on which I will report later), which also contains what appear to be intergrade specimens.

The ecogeography of other species also supports the presence of *Pituophis vertebralis* at El Álamo. Many xerophilic taxa occurring in the more arid, central regions of the peninsula are able to extend northward into cismontane, northwestern Baja California through a narrow, arid, inland zone lying immediately west of the Sierra San Pedro Mártir and east of the Sierra San Miguel (Fig. 1). The Sierra San Miguel runs parallel to the Sierra San Pedro Mártir for ca. 47 km where it converges in the north with the Sierra Warner. Together, these ranges comprise the southwestern margin of Valle de Trinidad and at which point the latter narrowly merges with the arid, inland regions to the south. The Sierra San Miguel buffers this zone from the maritime influence of the Pacific Ocean, which leaves much of coastal, northwestern Baja California cool, foggy, and windswept for much of the year. As such, many xerophytic plants of the more arid, southerly Vizcaíno Region extend into cismontane, northwestern Baja California through this corridor (Shreve 1936). Similar distribution patterns have been noted in birds (Short and Crossin 1967) and reptiles (Grismer 1994c; Welsh 1988). Reptiles that fit this general pattern are *Crotaphytus vestigium,* which extends northward to at least Rancho San José (Welsh 1988); *Gambelia copeii*, which extends northward into Valle de Trinidad and continues on into southern San Diego County (McGuire 1996); *Xantusia vigilis,* which extends northward to at least Mike's Sky Rancho (Welsh 1988); and *Chilomeniscus cinctus,* which ranges as far north as Valle de Trinidad (Welsh 1988). Welsh (1988) stated that the presence of *C. cinctus* in Valle de Trinidad may be indicative of its occurrence in sandy habitats of the southern Colorado Desert east of the Peninsular Ranges. It is more likely that this area is occupied instead by *Chionactis occipitalis*, as based on a specimen reported by Grismer (1989) from south of San Felipe, three specimens I observed in Paso de San Matías, and the fact that no specimens of *Chilomeniscus cinctus* have been collected from northeastern Baja California (Grismer 1994b).

Therefore, based on all the evidence presented above, the most logical conclusion is that *Pituophis vertebralis* occurs at El Álamo in the western end of Valle de Trinidad, and that it is probably sympatric with *P. melanoleucus annectens* for ca. 180 km along the western foothills of the Sierra San Pedro Mártir. Only additional collecting in this poorly explored area will reveal the geographic nature of the distribution of *P. vertebralis* (allopatric or continuous) in this portion of its range.

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Courtship Behavior Provides Additional Evidence for a Monophyletic *Pseudemys*, and Comments on Mesoamerican *Trachemys* (Testudines: Emydidae)

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The southeastern United States has a rich diversity of aquatic turtles in the family Emydidae. Gaffney and Meylan (1988) assigned to the subfamily Deirochelyinae six closely related, and often sympatric genera (*Deirochelys*, *Graptemys*, *Malaclemys*, *Chrysemys*, *Trachemys*, and *Pseudemys*), from this region. However, relationships among these turtles have remained controversial. The generic arrangement of painted turtles (*Chrysemys*), sliders (*Trachemys*), and cooters and red-bellied turtles (*Pseudemys*) has had an especially eventful history that has variously seen them recognized as one, two, or three genera (see Seidel and Smith 1986, for a review). Recently, however, most authors have returned to Agassiz' (1857) concept of three genera following the broad-based analysis of Seidel and Smith (1986). This arrangement has received nearly universal acceptance (Ernst et al. 1994), but see Legler (1990). Phylogenetic relationships among these genera are currently being examined by nucleic acid analysis (Bickham et al. 1996; Starkey et al. 1995) and morphological comparisons (Seidel and Meylan, ms.). Observations of courtship behavior, summarized here, provide further evidence that species of *Pseudemys* (sensu stricto) constitute a single evolutionary lineage, separate from *Trachemys*, *Chrysemys*, or map turtles—*Graptemys* (Fritz 1991).

Despite their differences, *Pseudemys* and *Trachemys* possess many morphological and ecological similarities. Both are moderate-sized (200–450 mm carapace length) aquatic turtles with well developed basking habits. Their food preferences are similar but cooters and red-bellied turtles are more herbivorous than sliders, especially as adults. *Pseudemys* and *Trachemys* also share with *Chrysemys* and *Graptemys* an elaborate pattern of aquatic courtship involving "titillation" in which a male extends his forelimbs and vibrates his elongated claws near or against a female's eyes. Anecdotal or rudimentary evidence of this also has been observed in *Malaclemys* (Sachsse 1984) and juvenile *Deirochelys* (Krefft 1955).

Titillation courtship behavior tends to be stereotypic within species, but subtle differences in claw vibration or head movements may occur between species (Vogt 1993). The widespread presence of this behavior in the Deirochelyinae suggests that its absence or reduction in some species is a degenerate (derived) condition. It probably has "regressed" independently in at least two separate lineages, including map turtles (e.g., *G. geographica*: Vogt 1980; *G. ernsti*: Shealy 1976) and sliders (*T. scripta* sensu lato). Several authors have reported absence of titillation courtship in mesoamerican and South American sliders (Davis and Jackson 1973; Fritz 1990; Legler 1990; Medem 1975; Moll and Legler 1971; Pritchard and Trebbau 1984; Rosado 1967). This, along with morphological differences, has prompted some authors to propose that neotropical *Trachemys* be separated from *T. scripta* into one or more additional species (Fritz 1990, 1991; Seidel 1989; Vanzolini 1995; Ward 1984; Wermuth and Mertens 1977). It is noteworthy that residual titillation behavior may persist in these turtles in another form. One of us (UF) has made extensive observations on captive courtship behavior in *T. ornata venusta*[1] collected at Tlacotalpan, Veracruz, México. Over a period of seven years, six males used only intensive head-nodding motions when courting a female. However, on several occasions, males were observed vibrating their foreclaws at each other during apparent aggressive encounters. Male-male or juvenile interactions such as this have previously been viewed as courtship or play (Cagle 1955; Kramer 1989; Morris 1976; Petranka and Phillippi 1978), whereas they may actually represent displacement or threat gestures related to aggression. In any case, observations on *T. o. venusta* behavior further suggest that reduced titillation is a degenerate condition.

In most emydid turtles known to utilize foreclaw titillation, the male faces the female head-to-head and extends his forelimbs. This has been observed at least in *Chrysemys picta bellii* (Taylor 1933); *C. p. picta* (Ernst 1971); *Trachemys s. elegans* (Jackson and Davis 1972a; Molina 1992); *T. s. scripta* (Fritz 1991; Lovich et al. 1990); *T. s. troostii* (Fritz 1991); *T. stejnegeri*, *T. decussata*, *T. terrapen*, *T. decorata* (Seidel 1988, and pers. observ.); *Graptemys barbouri* (Wahlquist 1970); *G. ouachitensis*, *G. pseudo-geographica* (Ernst 1974; Vogt 1980, 1993); *G. flavimaculata* (Vogt,1978); *G. nigrinoda* (Vogt 1978; but see Lahanas 1982); and *Malaclemys terrapin* (Sachsse 1984).

A major variant of foreclaw titillation is seen in *Pseudemys*. In cooters and red-bellied turtles, the male does not approach the female from the front or face her during forelimb vibration; instead, he positions himself above the female, facing the same direction while extending his head and forelimbs down near her eyes and then vibrating his claws. This has been reported for *P. nelsoni* (Kramer 1986; Kramer and Fritz 1989), *P. concinna suwanniensis* (Jackson and Davis 1972b), *P. c. concinna* (Fahey 1987), *P. c.*

[1] Application of the name *T. ornata* here is the decision of U. Fritz.

hieroglyphica (= *concinna*) (Carpenter 1979), *P. c. mobilensis* (= *concinna*) (Cagle 1950), *P. c. floridana* (Obst 1985), *P. peninsularis* (White and Curtsinger 1986), and *P. texana* (Fritz 1989). Obst (1988) reported this variant in *P. rubriventris*, but that may be a reference to *P. nelsoni* because he treated the two forms as conspecific.

In all species of *Pseudemys* for which courtship behavior has been reported, the male vibrates his foreclaws toward the female from above; this behavior has not been reported for any other genus of deirochelyine. Therefore, this may be considered a shared derived character (synapomorphy) for the species of *Pseudemys*. This condition may have evolved more than 20 million years ago (Miocene) when *Pseudemys* presumably diverged from a basal ancestor related to *Trachemys*, *Graptemys*, *Malaclemys*, and/or *Chrysemys* (Fritz 1991; Seidel and Jackson 1990). It may have been an important step in maintaining reproductive isolation in an area of frequent sympatry. Species within *Pseudemys* appear to be closely related (Seidel 1994), but examination for subtle courtship differences within this genus could be informative. In conclusion, the authors would welcome communication from anyone who has observed courtship (in nature or captivity) of deirochelyine turtles not reported here. Observations of courtship in *P. rubriventris*, *P. gorzugi*, *P. alabamensis*, and *Deirochelys* would be especially interesting.

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FIG. 1. Juvenile Jamaican boa foraging for bats as they emerge from Windsor Great Cave. Photo by R. C. Gibson.

Observations on the Foraging Behavior of the Jamaican Boa, *Epicrates subflavus*

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Documenting a snake species' diet and foraging behavior is often the first step in the development of an understanding of its ecology (Greene 1992). The significance of diet and foraging data lies in what they may convey regarding habitat use (Reinert et al. 1984), movement and activity patterns (King and Duvall 1990), reproductive ecology (Keenlyne and Beer 1973), and community structure (Gregory 1978). With respect to endangered species, this information may be particularly valuable (Greene 1994).

We report observations on the foraging behavior of free-ranging Jamaican boas (*Epicrates subflavus*). Regarded as "vulnerable" (Groombridge 1993), the endemic Jamaican boa persists in 8–9 isolated local populations occupying forested habitat distributed across the breadth of the island (Gibson 1995; Oliver 1982). As part of a pilot study of the species' behavioral ecology, we conducted fieldwork at Windsor on the northern periphery of the Cockpit Country, Trelawny, western Jamaica. Between 22 October and 11 November 1995 we searched for snakes daily in the surrounding wet limestone forest and coffee and banana fields. In the evening we surveyed the main entrance to Windsor Great Cave (150 cm wide by 200 cm high) and another large cave opening (ca. 10 m by 10 m) where boas have been reported foraging on emerging bats (R. Kerr, pers. comm., Vareschi and Janetzky, *in press*).

We visited Windsor Great Cave at 1750 h on 22 October and found a juvenile (95 cm SVL, 320 g) female boa hanging from vegetation growing on the cliff above the mouth of the cave. About two-thirds of her length was hanging straight down in the flight path of emerging bats. Her ventral or lateral surfaces faced the entrance (never the dorsal surface) and the head was cocked very slightly dorsally with the mouth closed (Fig. 1). Goodwin (1970) reported three species of bats (*Chilonycteris* [*Pteronotus*] *macleayi grisea, C.* [*Pteronotus*] *p. parnellii, Monophyllus r. redmani*), totaling many thousands, from this cave. Neither the snake nor the bats seemed disturbed by our presence and the use of dimmed headlamps. Over the next hour, the snake made many attempts to capture bats that were either emerging from, or re-entering the cave. We carefully searched the vegetation around the cave mouth but found no other snakes. At 1850 h we captured the boa for examination and temporary marking with paint. She was released at the capture location at 1000 h the following day.

We surveyed Windsor Great Cave each evening between 23 and 28 October but saw no other boas. On 29 October at 1825 h we found the same individual *E. subflavus*, again hunting for bats at the cave. We carefully monitored her foraging behavior for the next 1 h 45 min. Throughout the observation period she exhibited the same foraging posture we had witnessed the first evening. No tongue flicking was observed. When bats passed very close or actually collided with her, she actively attempted to capture them by swinging upward with her mouth open wide. Bat activity fluctuated over the period of our observation and this was reflected by the number of capture attempts made by the snake. During the first 40 min of observation she made 100 capture attempts (2.5 attempts/min), whereas she took 60 min to make the next 100 capture attempts (1.6 attempts/min). Despite making over 200 attempts she never captured a bat during our observation period. We visited both cave openings five more times, but saw no other boas.

During our fieldwork we made three additional observations relating to the foraging behavior and diet of Jamaican boas. On 27 October we found a fresh boa scat deposited on a rock pile located in wet limestone forest habitat. Upon close inspection, the scat appeared to be composed almost entirely of rat (*Rattus rattus*) hair. On the morning of 28 October we captured an adult (132 cm SVL, 920 g) female boa who was apparently foraging for rats in the home of a local resident. Finally, at 1500 h on 2 November we captured an adult (185 cm SVL, 2040 g) male boa in an overgrown banana field. The snake was perched 2 m off the ground in a sapling (2 cm DBH), with its head and neck in a typical "S-shaped" striking posture. We believe that the snake was waiting to ambush birds, which we noted had been feeding nearby on ripe bananas. We captured this snake and returned to the field station where it was force-fed a 10 g radio-transmitter. The snake was then released at the capture site at 1400 h the following day. We relocated this snake in forest habitat daily over the next eight days. On three of these days we found the snake in an ambush foraging posture coiled among terrestrial tank bromeliads (*Aechmea paniculigera*) on the forest floor or perched in a sapling (2 cm DBH) 1.5 m off the ground. Bird species that we commonly en-

countered in this habitat included *Saurothera vetula, Turdus aurantius*, and *Dendroica caerulescens*.

Bat predation by West Indian *Epicrates* boas has been documented on a number of occasions (e.g., *E. angulifer* and *E. inornatus*, Hardy 1957; Rodriguez and Reagan 1984, respectively) but rarely for the Jamaican boa (Vareschi and Janetzky, *in press*). However, according to residents of the Windsor area and other visiting researchers, it is a behavior that is not uncommon. Indeed, we have received reports of boa sightings in at least three separate cave systems (Windsor Caves, Trelawny; Green Grotto Caves, NW St. Ann; St. Clair Cave, N St. Catherine) and have observed boas at two of these locations ourselves.

Large permanent bat roosts represent predictable, high density, but localized prey sources, which at least three species of *Epicrates* exploit. It is therefore quite plausible that other members of the genus (e.g., *E. striatus*) also forage in this manner. Nevertheless, in the vicinity of Windsor Cave, Jamaican boas also appear to prey upon birds and rodents (Cruz and Gruber 1981) which, superficially, appear less reliable sources of prey than roosting bats. The relative costs and benefits of prey choice by Jamaican boas are unclear.

The ease with which boas may be observed foraging on bats suggests that these predator-prey systems could prove to be fruitful models for researching foraging theory. In addition, the susceptibility of such systems to human disturbance warrants further investigation of the importance of bat predation for endangered West Indian boas.

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Abnormalities in Embryos from a Wild American Alligator (*Alligator mississippiensis*) Nest

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Congenital malformations in crocodilians have been summarized by Ferguson (1985) and include skeletal, visceral, color, CNS, and craniofacial anomalies, plus double yolks, twinning, and axial bifurcation/partial twinning. Abnormalities in crocodilian embryos may be due to the female (usually very young or old) producing damaged embryos or to incubation conditions such as extreme temperatures, unsuitable hydric or gaseous environments within the eggs, or the eggs not being oriented at the proper axis (Ferguson 1985).

While conducting a study on American alligator (*Alligator mississippiensis*) nests at the J. D. Murphree Wildlife Management Area, Jefferson Co., Texas, USA, for the purpose of correlating nest temperatures with resulting sex ratios, we discovered one nest with extremely high temperatures. An examination of the young from the nest revealed that all possessed externally visible deformities.

The nest was composed of common reed (*Phragmites communis*) and soil. Nest temperatures were monitored on an hourly basis from 30 June–22 July 1988, using a self-contained temperature recording device placed within the nest with a probe leading to the center of the nest cavity. The mean temperature recorded by the device during this period was 32.0°C, but the values for the individual temperatures, and the high and low temperatures were lost due to problems encountered when transferring the data into a computer. However, immediately before opening the nest to insert the temperature recording device, a Miller and Weber cloacal thermometer was slid into the unopened nest cavity and registered at 36°C. (The temperature recording device and cloacal thermometer were known to be accurate to the nearest 0.5°C of each other). Eight other nests being monitored during this study had mean temperatures ranging from 26.0–31.0°C and high temperatures of 30.0–32.5°C. The eggs were removed from the nest four days prior to the onset of hatching, and were numbered consecutively from top to the bottom of the nest in a clockwise direction. All eggs appeared normal externally with the exception of two rotten eggs (one with a concretion on the end of the shell and the other flat on one side). Several eggs began to hatch on 15 August 1988, and the remainder were opened the following day. Of 48 eggs, six were rotten, 19 contained early dead embryos (embryos too small to be seen), two contained late dead embryos (visible, usually 25 days of incubation or more), four contained full-term dead embryos (fully developed, but found dead when the egg was opened), and 17 contained full-term live embryos.

TABLE 1. Individual measurements (cm) on deformed *Alligator mississippiensis* hatchlings from 1988, Nest 7 at the J. D. Murphree Wildlife Management Area, Texas. UJAW (Upper Jaw): 1 = normal, 2 = deformed. LJAW (Lower Jaw): 1 = slight deformity, 2 = intermediate deformity, 3 = extreme deformity. Tail: 1 = straight, 2 = deformed; L = twisted to left, R = twisted to right. Mean value for UJAW = 1.8 (SD = 0.1); mean for LJAW = 1.5 (SD = 0.1).

Egg#	TL	SVL	UJAW	LJAW	SEX	LJAW	UJAW	DIR	TAIL	DIR
7-4	19.4	9.8	1.8	1.7	2	2	1		1	
7-5	18.8	9.6	1.7	1.5	2*	1	1		1	
7-6	14.7	7.9	1.7	1.5	2	2	2	R	2	L
7-8**					1	2	1		2	R
7-14	15.8	8.6	1.8	1.4	2	3	2	L	2	L
7-16	18.2	9.6	1.8	1.6	1	2	1		1	
7-19	14.2	8.1	1.5	1.2	2*	3	2	L	2	L
7-21	16.6	8.7	1.8	1.4	2	3	1		1	
7-22	19.8	9.9	1.9	1.4	1	2	1		1	
7-26	19.8	9.8	1.8	1.6	1	2	1		1	
7-32	18.7	9.6	1.8	1.6	1	2	1		1	
7-32A	17.2	8.8	1.8	1.5	2	3	1		2	L
7-34	19.8	9.6	1.8	1.6	1	1	1		1	
7-36	17.2	9.4	1.9	1.5	2*	3	1		2	L
7-38	18.8	9.8	1.7	1.5	2	2	1		2	L
7-40	19.6	9.8	2.0	1.5	2	3	1		1	
7-41	12.0	7.5	1.8	1.4	2	3	2	R	2	R
7-45	20.1	9.9	2.0	1.7	1	2	1		1	
7-46	18.6	9.5	2.0	1.7	2	3	1		2	L
7-47	18.9	9.3	1.9	1.7	2	2	1		1	

* undifferentiated or unable to determine due to poor condition.
** kept alive.

All full-term alligators had varying degrees of mandibular hypoplasia, an abnormally short lower jaw. Nine animals had caudal scoliosis, and four of these also possessed unilateral maxillary hypoplasia in which one side of the upper jaw was shorter than the other. Sixteen of the live hatchlings were sacrificed (one was kept alive), and these and the four full-term dead alligators were examined internally and had one of their gonads removed for histological confirmation of sex. The animals possessed normal looking thoracic and abdominal organs, and a thymus and all aortic arches were present and in appropriate locations. The most deformed individuals were females or were more "female-like" in terms of histological gonad appearance; they were runts and had all of the upper jaw and the most extreme lower jaw abnormalities. The gonads identified as male in this clutch were definitive, but some of those denoted as female were largely undifferentiated. Sex, degree and/or presence of jaw and tail deformities, direction that deformed tails or upper jaws were twisted, and measurements of total (TL), snout-vent (SVL), upper jaw (UJAW), and lower jaw (LJAW) lengths are listed in Table 1.

The alligator kept alive was a male (confirmed by the presence of a penis) with an intermediate mandibular deformity, normal maxillae, and a kinked tail. When he was several days old, he was placed in an outdoor enclosure with several yearling alligators. He exhibited normal behavior, with the exception of being slightly off balance when diving into the water. He fed well on an insect diet, but often was unsuccessful grabbing the prey on the first attempt due to the jaw abnormality. By 1990, the deformities had lessened in severity of appearance, his clumsiness in diving and feeding was no longer apparent, and he began feeding on young mice. The following year he began feeding on adult mice and had no difficulty in quickly swallowing them whole. In June 1994, he began bellowing. His growth was stunted and his total length was only 84.5 cm as of July 1996.

The type of anomalies present in the alligators, coupled with the temperature data, suggest that they were heat induced (Ferguson 1985). The females found in this nest had the most severe anomalies. Alligators have been found to have temperature sex determination displaying a female-male-female pattern with females occurring at the low and high temperatures (Lang and Andrews 1994). Hence, it is unclear why there were males in the nest, presumably exhibiting high temperature induced abnormalities, when all females might be predicted to occur. One possible explanation is that sex was determined prior to high nest temperatures. If the females were produced in the warmest portions of the nest, then these areas might be expected to overheat to a greater extent than the male producing areas, thus causing more severe deformities in the females.

We doubt that the most severely deformed alligators (those with a maxillary deformity) from this clutch would have been capable of surviving in the wild. They were the smallest (<16 cm TL), weakest individuals, and had caudal scoliosis and at least an intermediate degree of mandibular hypoplasia. Because the animal with the intermediate mandibular deformity and caudal scoliosis is thriving, it seems possible that such an individual could survive in the wild. However, due to its stunted growth, we think it unlikely that it will ever become reproductively active. The sacrificed specimens were deposited in the Texas A&M Wildlife Research Collection.

Acknowledgments.—The temperature measuring and recording device was designed for this project by students in the Texas A&M University Department of Engineering Technology under the supervision of R. Puckett. Thanks is extended to D. Owens for the use of his lab and supplies for the histological preparation and sharing his knowledge of histological techniques. T. Wibbels and H. Austin shared their time and expertise regarding histological identification of reptile gonads, and R. Robinson

examined the specimens at the macroscopic level. K. Wood assisted in taking the various measurements and recording associated data. R. A. Odum offered suggestions on the manuscript. Partial funding for this research was provided via a grant from the Texas Herpetological Society. All research was approved by the Texas A&M University Animal Welfare Committee and was conducted under the provisions of a Texas Parks and Wildlife Department scientific permit.

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TECHNIQUES

Scanning Electron Microscopy of High Resolution Casts for the Study of Tooth Surface Morphology in Snakes

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Scanning electron microscopy (SEM) has been used to visualize detail in tooth surface morphology for studies of snake systematics (e.g., Jackson and Fritts 1995, 1996; Rasmussen 1975) and functional morphology (e.g., Kochva and Meier 1986; Mebs et al. 1994; Savitzky 1981). Although SEM allows the morphology of snake teeth to be examined at high magnifications, it has the disadvantage of being destructive; maxillae or individual teeth must be removed from the specimen, mounted on stubs, and sputter-coated with gold. The destructive nature of this technique limits its usefulness for the study of type or rare material and for studies involving large series of specimens.

The following technique was developed by Myers et al. (1995) for the study of mammalian taste papillae, but may be applied equally well to the study of snake teeth. Here, I will describe its use to make a high resolution cast of the grooved posterior fang of the brown tree snake (*Boiga irregularis*).

The mouth of a fluid-preserved specimen (*B. irregularis*, THF 9709) was blotted dry, and the left posterior fangs were exposed. A droplet of Reprosil hydrophilic vinyl polysiloxane impression material (light body) (Dentsply International Inc., Milford, Delaware 19963-0359, USA) was applied to the corner of the mouth (so as to completely cover the fangs) and allowed to dry (Reprosil is mixed with a catalyst immediately prior to application, and takes approx. 7 min to harden to a rubbery consistency). The solidified Reprosil impression was then peeled off the fangs and stored at room temperature for 24 h to allow for degassing. A cast of the fangs was made by filling the impression with Spurr's low viscosity embedding medium (firm mixture) (Bozzola and Russell 1992), using a $23G^3/_4$ hypodermic needle and a 1cc syringe. After the cast had been allowed to cure for 24 h at 70°C, the Reprosil impression was peeled off.

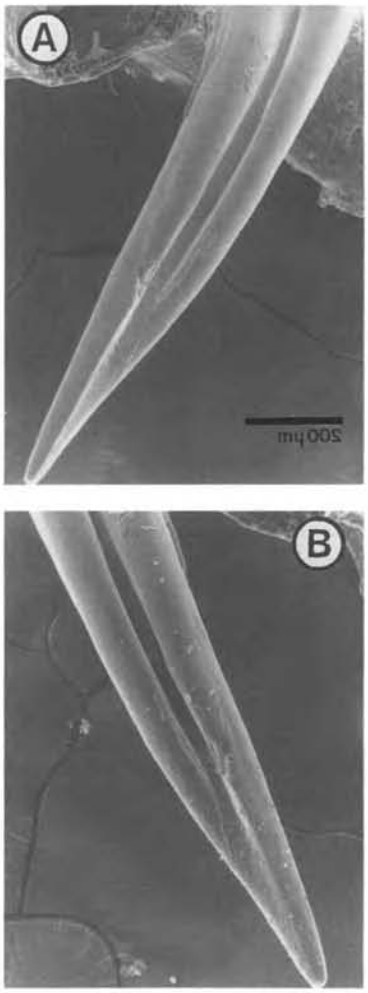

FIG. 1. SEM image of (A), the grooved posterior fang of *Boiga irregularis*, and (B) a high resolution cast of the same specimen.

For the purpose of comparison between cast and original fang, the left maxilla was later dissected out of the specimen. Both the cast and the original fang from which it was made were mounted on a stub, sputter-coated with gold, and examined using a JEOL 6400 scanning electron microscope at an acceleration voltage of 15 kV. The resulting SEM images of the original fang (Fig. 1A) and of the high resolution cast of the same fang (Fig 1B) are shown below. This technique has many potential applications beyond the study of snake teeth, and could be used for the non-destructive study of the surface morphology of any hard or soft tissue (e.g.. scales, hemipenes, etc.).

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Effective Predator Excluders for Turtle Nests

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In 1983, alarmed by the destruction of redbelly turtle *(Pseudemys rubriventris)* eggs by marauding mammals, I sought a means of physically "excluding" these predators from access to turtle nest chambers. The method of nest cage construction and installation that I describe has been extremely effective over the past 13 years.

Cages are made of black or dark green 1.2 cm x 2.5 cm vinyl-coated wire mesh that can be purchased in 30 m rolls about 45–50 cm wide. Using metal shears, wire sufficient to produce a one-piece rolled cylinder 50 cm in diameter is cut. The cut edges of the mesh are then fastened together with 1.2 cm stainless steel hog rings, forming an open-ended cylinder. Finally, another piece of mesh just large enough to fit the area of one open end is cut and hog-ringed into place. After this square top piece is ringed securely around the circular edge of the mesh cylinder, its four overhanging corners are bent downward out of the way. Smaller mesh is preferred for protecting the nests and retaining the young of smaller species (e.g., mud and musk turtles).

FIG. 1. Circular trench and trenching tool.

A circular imprint of the cage rim is obtained by placing the cage down over the nest, after first aligning the center of the cage with the nest. The cage is then pressed into the soil and twisted so as to leave a clear imprint of the perimeter. This imprint serves as a template for digging a circular trench 30 cm deep around the nest (Fig 1). A good trenching tool for this job is a small mattock (available in military surplus stores). Care must be exercised in digging to avoid disturbance to the cylinder of substrate containing the nest chamber. In sandy soils this digging can be accomplished in 10–15 min, but in gravelly or rocky soils the time required will be longer. Large rocks and tree roots can be especially troublesome and difficult to remove without disturbing the integrity of the nest chamber. It is sometimes impossible to remove them safely, so it is recommended that such obstacles be left in place and that the bottom edge of the cage be cut to fit over them. The mesh cage is lowered into the trench, which is then backfilled with loose soil to ground level. The surface soil around the cage can then be tamped down by stepping firmly on it all around. If excavation and cage installation are done properly, the depth, surface, and overall integrity of the nest will not be compromised.

FIG. 2. Completed cage installation; pair of steel cage extractors to the right.

The completed installation (Fig. 2) leaves about 20 cm of the cage exposed to act as an above-ground holding pen for emerged hatchlings. Young can be removed through the top if the mesh cover is first unringed along one side, and then folded back. Finding it somewhat difficult and time consuming to open cages, I devised cage removal tools that allow me to extract the intact cage from the ground. A pair of steel hooks, on the idea of stevedore's hooks, were fashioned from 0.7 cm rod (30 cm long) welded to the center of a 12 cm piece of heavier (1.8 cm) rod serving as a handle. The rod tip was then heated, hammered flat for about 3 cm, and bent in a "U" to form a hook. Gripping opposite edges of the cage top with two of these hooks, I am able to withdraw the cage from the ground by applying a steady, upward pull. In cases where cages refuse to budge, I pull on one hook until the cage is loosened and then pull alternately on each hook, rocking the cage back and forth out of the ground. Because the vinyl coating prevents the buried mesh from rusting, these cages can be stockpiled and reused.

Finally, if these nest cages cannot be checked frequently during the period of emergence, a shaded refuge for the young must be provided inside. A piece of burlap or other coarse fabric can be ringed to the side of the cage to block the midday sun. If this awning shades the center where the nest is situated, it may cool the nest and alter hatchling development, sex ratio, and emergence. Another approach might be to install a hatchling hiding box in each cage, but the simplest strategy is to check the cages frequently to prevent heat and dessication stress to emerged young.

Acknowledgments.—I thank Bob Alberghini for fabricating my cage extractors, and am indebted to Paul Lefrancois, Norman Bell, Andy Graham, Paul Metcalf, and Bruce Ericson for assembling and installing dozens of these cages over the past decade. Wire mesh for the cages was provided by the Massachusetts Division of Fisheries and Wildlife.

An Improved Technique for Formalin Fixation of Large Vertebrates

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While injection of formalin solution by hand-held syringe (Anderson 1965; Simmons 1987) is easy and effective, it can be both inefficient and laborious when preserving larger specimens. Turtles are especially difficult to prepare and they are often inadequately preserved because of the difficulty with injecting sufficient preservative into the body cavity. Turtles preserved using hand-held syringes seldom have everted penes and the head and limbs often remain tightly enclosed within the shell. We improved this method by using a modified garden sprayer for the pressurized injection of formalin (Fig. 1). Using our technique, the preservation of 173 previously frozen turtle specimens required only 4 h, an average of 3 min per turtle. We estimate the time required by manual injection would have approached 22 h. Our technique resulted in the successful eversion of nearly 80% of the penes and produced effective limb and neck extension in 95% of specimens.

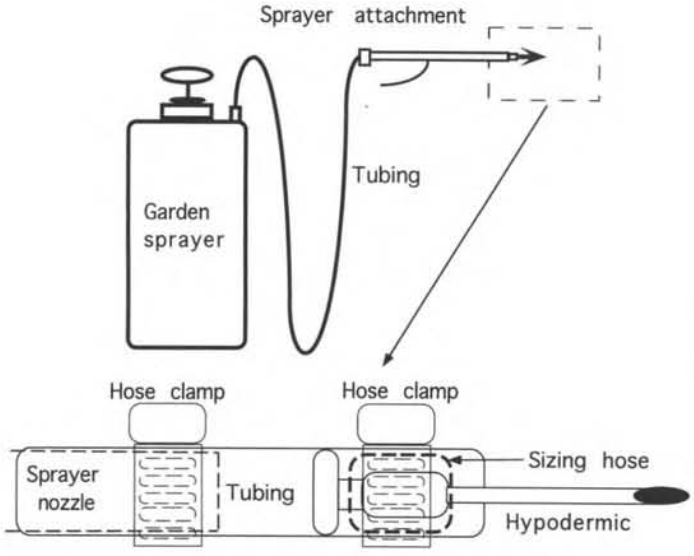

FIG. 1. Pressurized formalin injection sprayer. Dashed box provides alignment and assembly component detail for the hypodermic attachment.

The sprayer (Fig. 1) is available at most hardware stores; currently we use a Root:Lowell Heavy Duty Model (No. 1996) with a brass nozzle. Other materials required include tubing (Fisher 14-176 series), injection needles (stainless steel Fisher 14-825 series), and an assortment of hose clamps (Fisher 14-198 series). The needle assembly consists of clear, chemical-resistant, tubing (12–16") with an appropriate gauge needle inserted and clamped at one end. This assembly may require additional smaller-diameter tubing for accurately "sizing" smaller gauge needles and assuring a pressure-tight seal (Fig. 1). Assembly is straightforward: clean the sprayer tank with a hot water rinse, remove the nozzle from the sprayer delivery wand, and attach the hose assembly.

The entire apparatus can be modified from one gauge needle to the next in a few minutes. We have found that an assortment of hose and needle combinations, chosen to fit a variety of vertebrates, is most useful. The entire cost of the unit is less than US $50. All museum and field assistants must wear proper eye and clothing protection when using the formalin sprayer.

Acknowledgments.—We thank K. Vaughn, the staff of the Texas Cooperative Wildlife Collection, and S. K. Davis for their contributions to the development of this apparatus.

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Surgical Procedure for Radio Transmitter Implantation into Aquatic, Larval Salamanders

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Radiotelemetry has become an important technique for studying species movements and, while externally-attached transmitters have been used on amphibians (Richards et al. 1994), our initial experiments with harnesses on *Dicamptodon tenebrosus* resulted in harness slippage and skin irritations. Transmitters have been implanted effectively in several amphibian species (Richards et al. 1994) and implantation methods for large aquatic salamanders have been described (*Cryptobranchus alleganiensis*; Stouffer et al. 1983). Here we describe the surgical method (modified from Stouffer et al. 1983) we used for larval *D. tenebrosus*, translocated to the upper Sacramento River from connecting tributaries in Siskiyou and Shasta counties, California, USA, and discuss factors affecting the incision healing rate of an aquatic salamander.

During May and June, 1995, 19 *D. tenebrosus* larvae (156–233 mm total length, 39.5–72.0 g) were captured; transmitter weight (2.5 g) was limited to < 6.5% of body weight. All 19 salamanders were implanted with SM1 transmitters (2.5 g, 8 mm x 10 mm 21 mm, AVM Instrument Co.) that had been potted in dental acrylic. Salamanders were anesthetized by submersion in a 0.01% solution of benzocaine. Anesthetized animals were then placed right side down in a foam-lined plastic tray saturated with 0.01% benzocaine solution. The foam lining kept the salamander's skin moist and prevented the animal from sliding during surgery. To keep the

skin moist and ensure continued anesthetization, several pieces of anesthetic-soaked cotton gauze were placed over the animal's body so that only the flank was exposed.

An 8–10 mm incision was made mid-laterally in the left flank to reduce the incision site's contact with substrate or moving limbs during normal locomotion while healing. To initiate the incision, a pinch of skin was raised with forceps from underlying muscle and cut cranio-caudally with sharp-tipped scissors. A small hole was then punctured through the muscle and peritoneal membrane using the tips of the closed scissors and widened by opening the scissors slightly. Lifting the muscle with forceps, we extended the incision with scissors, being careful to avoid any internal organs. Sterile cotton applicators were used to absorb fluid from the body cavity or to apply pressure to bleeding vessels.

Each transmitter was dipped in molten paraffin 3 times prior to implantation to create an inert surface and to reduce the possibility of an inflammatory response. Then each transmitter was soaked for 24 h in a 5% Chlorhexidine solution (Novisan, Fort Dodge) to ensure sterility, rinsed in sterile saline solution to remove the disinfectant, and placed within the coelomic cavity (parallel to the spine) with battery oriented anteriorly and helicoil antenna dorsally.

The muscle was closed by continuous suture of 4-O or 5-O polyglactin 910 (Vicryl, Ethicon) with a taper needle; suture material was soaked in 12.9% Benzalkonium chloride (Benz-all, Xttrium Laboratories) for ca. 24 h before surgery (to soften the thread) and rinsed in saline at time of use. The skin was closed using approximately 3 horizontal mattress sutures (ca. 2 mm wide and 2 mm apart) of 4-0 or 5-0 polyglactin 910 with a cutting needle. Skin sutures were not drawn as tightly as those in muscle tissue to prevent necrosis. The closed incision site was wiped clean with gauze. Mean surgery time per individual was 21 minutes.

While nonabsorbable 4-O silk suture material has been recommended because of its cost and handling characteristics (Boothe 1985), our earlier experiments with silk suture material resulted in severe fungal infection in *D. tenebrosus* unable to shed the sutures. Silk suture material causes greater tissue reaction (Boothe 1985) and a higher frequency of infection (Sugarman and Musher 1981) than nylon suture material. We used absorbable Polyglactin 910 sutures and found them to be compatible with larval salamanders.

To resuscitate animals, recovering individuals were placed in a 5-gallon bucket of cold spring water and the water was stirred and changed frequently to increase the exchange of oxygen and dilution of the anesthetic. Recovery time averaged 27 minutes and the total procedure (anesthesia, surgery, recovery) time per individual averaged 62 minutes.

Salamanders were then held in tubs for 10–20 days to monitor their behavior and to assure that the sutures remained intact; failing sutures were replaced immediately as described above. At the time of release, we remeasured weight and snout-vent length, documented incision status, and applied malachite green, an anti-fungal agent, to the incision site.

During June and July, 1995, nine of the salamanders were translocated to the upper Sacramento River and ten were released at their points of capture. Fourteen salamanders were recaptured between September and mid-October, 1995. Incisions in 8 of the 14 recaptured salamanders were completely healed (4 each from tributaries and river), 4 were partially healed (3 from tributaries and one from river), and two were not healed (both from tributaries). Incision healing time may be affected by water temperature. Higher metabolic rates and faster healing times are associated with higher temperatures in fish (Anderson and Roberts 1975) and snakes (Smith et al. 1988); larval *Dicamptodon* body temperatures are the same as the water temperature (Brattstrom 1963) and their metabolic and healing rates are assumed to increase with increasing water temperatures.

Our observations of individuals radiotracked for a few weeks during 1994–1995 indicate that these salamanders remain fairly sedentary in winter when water temperatures are colder. One individual, implanted with a transmitter in October, 1994, and maintained in cold spring water in the lab, took six months to heal. While healing time may have been influenced by the suture material (silk), it may also have been increased by cold water temperature and the animal's inactivity during winter. Most incisions healed within three months during summer. Individuals implanted with transmitters in the summer were more active, and the water temperature was also generally warmer; we recommend timing implant surgery for aquatic salamanders to correspond with the organism's most active season. Maintaining or releasing animals in waters at the higher end of the salamander's preferred temperature range may accelerate healing.

Acknowledgments.—We thank Kelly Kawsuniak for assistance with the surgery and Patrick Hendrix, Leslie Hubbard, Kelly Kawsuniak, Christine Sousa, and Vincent Whitman for assistance with the field work. Bruce Deuel, Mark Stopher, and Angela Stringer made editorial comments on earlier drafts of this manuscript. This study was supported by the California Department of Fish and Game as part of the Cantara Spill Natural Resource Damage Assessment.

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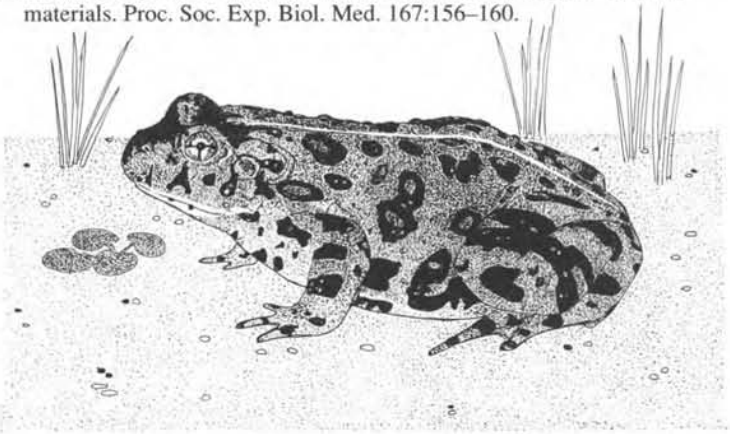

Bufo boreas halophilus (California Toad). USA: California: San Diego Co., Santa Margarita River. Illustration by Dan Holland.

A New Trap for the Live Capture of Large Lizards

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Large, wide-ranging lizards are often difficult to catch (Auffenberg 1978). Drift fence-pitfall trapping, the use of rubber bands, and noosing (Simmons 1987) may be ineffective for large lizards.

In a recent investigation (Doan, unpubl.), *Tupinambis teguixin* home range was studied in remote Peruvian rainforest. Although large wire mesh traps (e.g., Havahart™ and Tomahawk™) may be used to catch large lizards (King et al. 1994), it was not possible for me to transport large traps to the field. H. B. Sherman Traps, Inc. (P.O. Box 20267, Tallahassee, Florida 32316, USA; tel. 904-575-8727) constructed collapsible aluminum traps similar to Sherman™ mammal traps but composed of solid aluminum on three sides and expanded metal on one side (for viewing the contents of a closed trap), that measure 88.5 cm x 31.0 cm x 31.0 cm when in use and collapse to 88.5 cm x 31.0 cm x 5.0 cm for transport.

In the field I camouflaged the traps by laying green mosquito netting over the trap, tucking it underneath. Fallen branches and leaves were placed on top of the trap and inside on the spring door. I tried live and dead rats, hen eggs, canned cat food, and bananas as bait, but all captures of *T. teguixin* were made in traps baited with hen eggs. Cracked eggs were placed in wire mesh suspended in the back of the trap. When camouflaged and baited appropriately, this new trap was successful in capturing *T. teguixin* and did not appear to influence the possibility of recapture.

These new, collapsible Sherman traps are easy to transport and effective for catching large lizards. Incidental captures during my study included *Ameiva ameiva*, *Didelphis marsupialis* (common opossum), *Sylvilagus brasiliensis* (Brazilian rabbit), and *Proechimys* spp. (spiny rats). The mammals were captured with various bait types, demonstrating the potential of the new trap for studies where larger animals are sought and trap portability is important.

Acknowledgments.—I thank G. Phillips of H. B. Sherman Traps, Inc. for designing, building, and shipping the traps; without his help this study would not have been possible. I also thank C. Galvez-Durand and P. van Ipenburg for battling Peruvian customs to retrieve the traps, and H. Mushinsky for guidance and support.

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HERPETOLOGICAL HUSBANDRY

Artificial Brooding of Salamander Eggs

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Maternal brooding of salamander embryos has been shown to increase embryonic survival (Forester 1979; Harris et al. 1995; Salthe and Mecham 1974; Tilley 1972). However, a variety of different experimental protocols require that eggs be isolated from the brooding female. Experimental designs involving quantitative genetics (Falconer 1989) and kin discrimination (Waldman 1991) involve separating eggs from each female into groups of various sizes for rearing in order to remove the effect of "female brooding" from an experiment. In addition, it is impossible for one female to brood more than one isolated cluster of her eggs. Unfortunately, previous attempts at artificial brooding of salamander eggs have met with limited success. Forester (1979) removed brooding *Desmognathus ochrophaeus* and used an artificial brooding technique in the laboratory that yielded more than 90% mortality due to fungal infection within 28 days. In an attempt to increase the survival of four-toed salamander embryos, *Hemidactylium scutatum* (Caudata: Plethodontidae), in the absence of the brooder, we developed a novel method of artificial brooding.

Eggs were placed into 6 x 8 x 4 cm hard plastic containers containing a single layer of filter paper dampened with artificial pond water (modified Provosoli medium, no vitamins, not autoclaved: Wyngaard and Chinnappa 1982). All containers were covered with a hard plastic lid and coated with Parafilm to prevent desiccation of the eggs. Young embryos were maintained on a 24:0 h (light:dark) photoperiod at 16°C. This photoperiod was convenient for us because it allowed animal care to be scheduled at any time. When the neuromuscular system began to function, embryos were placed on a 14.5:9.5 h photoperiod at 18°C to mimic natural conditions. Container arrangements were systematically changed within the incubators to eliminate effects of temperature and light gradients.

Containers were checked under the dissecting scope to assess developmental stage and to check for fungus. Any infected eggs were teased away from the cluster and removed to reduce the likelihood of infection of the other eggs. All viable eggs were cleaned as follows. Eggs in their container were rinsed with a squirt jar containing artificial pond water (modified Provosoli medium), removed with a plastic spoon, and placed in a petri dish to be rinsed again. While the eggs were out of the container, the containers were rinsed and swabbed with 70% EtOH and rinsed five times with hot tap water. Fresh filter paper was placed in the container. The eggs were then spooned out of the petri dish, rinsed a third time while in the spoon, and placed gently on the fresh dampened filter paper. The petri dish and the plastic spoon were sterilized with 70% EtOH after each use. Containers were cleaned daily during the first third of the embryonic period, every third day in the second third of the embryonic period, and every seventh day in the last third of the embryonic period. As the embryos approached hatching, the cleaning scheme was modified to avoid premature hatching. The embryos were rinsed in their container with a squirt jar containing modified Provosoli and rolled daily. Eighty-two percent of the embryos survived 4–6 weeks to hatching (467 eggs hatched out of 570). We have had less experience raising eggs of *D. ochrophaeus* and *D. monticola* from the earliest embryonic stages with this method, but results obtained were comparable to those obtained for *H. scutatum*.

Acknowledgments.—We thank Carrie Carreno for help with raising embryos. This research was supported by National Science Foundation grant DEB 92-07186 to Reid N. Harris and Ivor T. Knight.

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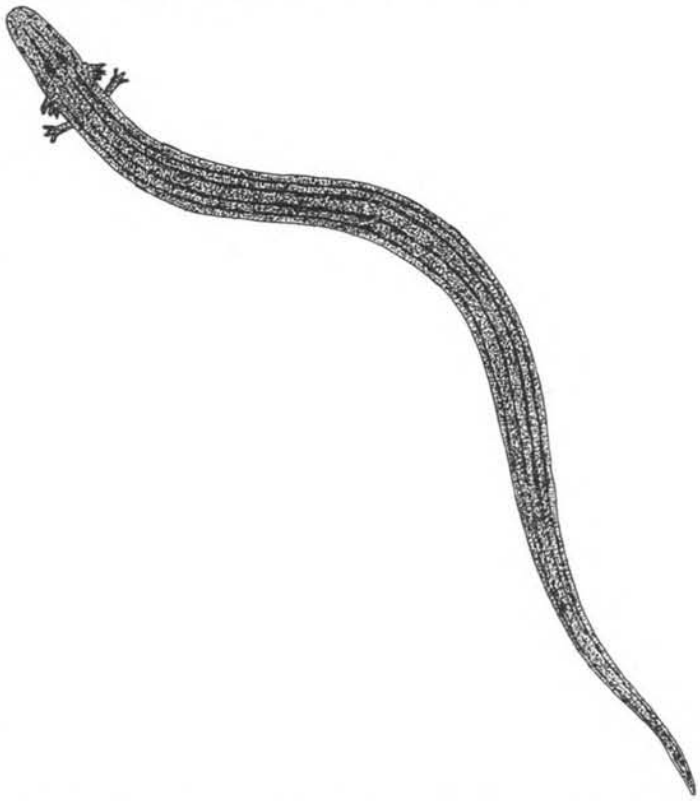

Pseudobranchus striatus axanthus (Narrow-striped Dwarf Siren). Illustration by Dan Holland.

NATURAL HISTORY NOTES

Instructions for contributors to Natural History Notes appear in Volume 28, Number 1 (March 1997).

CAUDATA

AMBYSTOMA TIGRINUM MELANOSTICTUM (Blotched Tiger Salamander). **PREDATION**. Predators of salamanders in the Pacific Northwest are poorly known. Leonard et al. (1993. Amphibians of Washington and Oregon. Seattle Audubon Soc., Seattle. viii + 168 pp.) reported that aquatic salamanders may be eaten by other salamanders, garter snakes, and certain species of mammals and birds. On 13 March 1996 at ca. 1500 h PST, a mink (*Mustela vison*) was observed on the shore of a small pond adjacent to a second pond that is a known breeding site for *Ambystoma tigrinum melanostictum, A. macrodactylum columbianum,* and *Pseudacris regilla*. Both ponds are located on the south edge of the Washington State University campus in Pullman. Several minutes after diving into the water the mink reappeared, carrying a branchiate tiger salamander ca. 175–200 mm TL. The mink then disappeared into a den behind some small boulders carrying the salamander.

Submitted by **JULIE A. FRONZUTO**, Department of Zoology, Washington State University, Pullman, Washington 99164-4236, USA.

ANEIDES LUGUBRIS (Arboreal Salamander). **PREDATION.** There are few published records of predation on terrestrial salamanders. Antipredator defense mechanisms (e.g., noxious skin secretions, tail undulation), in addition to nocturnal, secretive habits, serve to protect these species from potential predator encounters (Brodie 1983. *In* N. S. Margaris, M. Arianoutsou-Faraggitaki, and R. J. Reiter (eds.), Plant, Animal, and Microbial Adaptations to Terrestrial Environments, pp. 109–133. Plenum Publ. Corp., New York). Herein we report the predation of an adult *Aneides lugubris* by a southern Pacific rattlesnake (*Crotalus viridis helleri*).

On 12 May 1975 at 0745 h a *C. v. helleri* (325 mm SVL, 19.5 g) was collected in Carroll Canyon on Carroll Canyon Rd, 0.6 km S El Camino Memorial Park, San Diego County, California, USA (T15S R3W NW1/4 Sec 10; 65 m elev.). The hillside vegetation was dominated by coast live oak (*Quercus agrifolia*). The rattlesnake was brought to the laboratory, caged, and on the following day a partially digested *A. lugubris* (81 mm SVL, 9.1 g) was found regurgitated. It appeared that the salamander was swallowed head first. It is not known if the salamander was active on the surface when encountered, or if regurgitation was the result of noxious skin secretions. This is the first published record of predation of *A. lugubris* by a snake.

The only previous record of predation is by the California scrub jay (*Aphelocoma coerulescens*) (Rubinoff 1996. Herpetol. Rev. 27:135). Colubrid snakes (*Diadophis punctatus, Contia tenuis, Thamnophis* spp.), frogs (*Rana aurora, R. catesbeiana*), and Jerusalem crickets (*Stenopelmatus* spp.) are known to eat *Ensatina* and *Batrachoseps* (Stebbins 1954. Univ. California Publ. Zool. 54:47–124), plethodontid salamanders sympatric with *A. lugubris*. Mahrdt (unpubl. field notes) observed an adult *Diadophis punctatus* from La Mission, Baja California Norte, México regurgitate a juvenile *A. lugubris* in March 1975.

We thank Steven P. Sandberg for collecting the specimen and Kent R. Beaman for commenting on the manuscript. A photograph of the *A. lugubris* was deposited at the San Diego Museum of Natural History.

Submitted by **CLARK R. MAHRDT** and **BENJAMIN H. BANTA**, Southwest Biological Associates, 9847 Willow Lane, Escondido, California 92029, USA.

BATRACHOSEPS ATTENUATUS (California Slender Salamander). **PREDATION.** On 2 April 1996 at ca. 0800 h I observed a California shrub jay (*Aphelocoma coerulescens*) predate the tail of a 50 mm SVL *Batrachoseps attenuatus*. The sky was clear, temperature was ca. 30°C, and it had rained the previous night. Predation occurred on Stanford University campus on a live oak-lined sidewalk bordered by mown grass and a parking lot. The shrub jay seized the salamander by the tail, which promptly abscised, and proceeded to swallow the wriggling appendage without further processing. The salamander continued ca. 7 m down the sidewalk to the observer where it was picked up, examined, and measured. Jaeger (1981. Am. Nat. 117:835–837) regarded birds as being inefficient predators on terrestrial salamanders. His conclusions were based on evidence that birds avoid feeding on aposematic species and their mimics (Brodie and Brodie 1979. Science 208:181–182), and that forest birds are most efficient at catching salamanders in dry periods when the prey items are scarce. Rubinoff (Herpetol. Rev. 27:135) observed predation by *A. coerulescens* on a diurnally active *Aneides lugubris*. It is possible that such events are only uncommon due to temporal separation in predator-prey activity cycles; *A. coerulescens* is diurnal and all salamanders in the region are typically nocturnal. *Aphelocoma coerulescens* are often abundant where they occur, aggressive, and opportunistic. Urban populations of the species are increasing, particularly in winter months (Marzluff et al. 1994. Stud. Avian Biol. 15:202–220) when many amphibians are breeding and most actively foraging. Predation by this avian species may place significant pressure on co-occurring amphibian populations and explain, in part, why so many amphibians in this region are active at night even in the winter when moisture is not a nocturnally-defined resource.

Submitted by **JAMIE KRISTINE REASER**, Center for Conservation Biology, Department of Biological Sciences, Stanford University, Stanford, California 94305 USA.

DESMOGNATHUS MONTICOLA (Seal Salamander). **OOPHAGY**. As part of a study of oviposition in *Desmognathus monticola* in Banks County in the Georgia Piedmont (USA) during 1995, I measured females that were attending clutches and counted their eggs. As the favored nesting site was horizontal crevices in wet cliffs, I captured each female by enticing her out with bait (Camp and Lovell 1989. Herpetol. Rev. 20:47). On 17 August 1995 I removed a 65 mm SVL female associated with a clutch of 14 eggs from a crevice that she shared with at least two other females attending clutches, as well as several males and non-attending females. Upon attempting to return her ca. 15 min later, I noted only 3 of her eggs remained, and an adult conspecific had its head among the remains of the clutch. I collected and preserved this specimen, a 67 mm SVL adult female with ova in an intermediate state of development. Dissection revealed the missing 11 eggs (mean diameter = 4.8 mm) in her stomach and esophagus. This is the first report of conspecific oophagy in this species, al-

though it has been reported for *D. ochrophaeus* and *D. fuscus* (Polis and Myers 1985. J. Herpetol. 19:99–107). This report also emphasizes the importance of attending female *Desmognathus* in protecting clutches from predation (Forester 1988. J. Herpetol. 12:537–541). The specimen will be deposited in the University of Georgia Museum of Natural History.

Submitted by **CARLOS D. CAMP**, Department of Biology, Piedmont College, Demorest, Georgia 30535, USA.

EURYCEA QUADRIDIGITATA (Dwarf Salamander). **COLORATION**. On 20 March 1995, I captured a xanthic *Eurycea quadridigitata* larva, along with numerous normally pigmented larvae, in a 1.5 ha pond cypress (*Taxodium ascendens*) swamp on Cecil Field Naval Air Station, Duval County, Florida, USA. In life, the dorsum and eyes of the larva were golden yellow, the venter translucent pink, the gills pink (due to presence of erythrocytes), and the anterior and posterior margins of each orbit bordered by patches of melanin. The larva was maintained in captivity through metamorphosis (21 mm SVL), then preserved in the vertebrate collections at Southern Illinois University at Carbondale (SIUC H-5193). To my knowledge, this is the second report of an abnormally pigmented *Eurycea quadridigitata* (Dyrkacz 1981. SSAR Herp. Circ. 11. 31 pp.).

This larva was collected while conducting amphibian surveys for the Jackson, Mississippi office of the U.S. Fish and Wildlife Service. I thank L. V. LaClaire for funding and R. A. Brandon for loaning me the Dyrkacz reference.

Submitted by **JOHN G. PALIS**, 529 North Main Street, Jonesboro, Illinois 62952, USA.

GYRINOPHILUS PORPHYRITICUS PORPHYRITICUS (Northern Spring Salamander). **PREY.** Many amphibians secrete noxious or toxic substances from their skin rendering them unpalatable to some predators. Among these is the red eft, the terrestrial juvenile stage of *Notophthalmus viridescens viridescens*, which produces neurotoxic tetrodotoxin (Duellman and Trueb 1994. Biology of Amphibians. McGraw-Hill Book Co., New York. xvii + 670 pp.; Wakely et al. 1966. Toxicon 3:195–203). We report predation upon a red eft by *Gyrinophilus p. porphyriticus*.

Gyrinophilus p. porphyriticus is typically found in cool springs, mountain streams, or in wet areas under rocks and logs (Conant and Collins 1991. A Field Guide to Reptiles and Amphibians of Eastern and Central North America. Houghton Mifflin, Boston, Massachusetts, 450 pp.), but are known to wander large distances to more terrestrial habitats (Dunn 1926. The Salamanders of the Family Plethodontidae. Smith College, North Hampton, Massachusetts, 441 pp.; J. Secki and A. Queral-Regil, pers. obs.). This salamander is characteristically active and aggressive (Dunn 1926, *op. cit.*). Previous reports on the stomach contents of *G. p. porphyriticus* include earthworms, snails, spiders, fly larvae, ground beetles, millipedes, and crustacea (Smith 1913 *in* Dunn 1926, *op. cit.*). Predation by *G. p. porphyriticus* on salamanders (*Hemidactylium scutatum, Eurycea bislineata* and their larvae, *Desmognathus fuscus* and their larvae), a young wood frog (*Rana sylvatica*), and two larvae of its own species has also been reported (Wright and Haber 1922 *in* Dunn 1926, *op. cit.*). To our knowledge, there are no published accounts of predation upon *N. viridescens* by *G. porphyriticus*.

On 12 June 1995 at ca. 2200 h, we captured a female *G. p. porphyriticus* (110 mm SVL, 66.6 mm TL, 17.9 g) at Mountain Lake Biological Station, Giles County, Virginia, USA. During handling for measurements the following morning, the salamander regurgitated a red eft (20.43 mm SVL, 19.10 mm tail length). The red eft was partially digested but the characteristic red spots were distinguishable, making identification certain.

Studies of *N. v. viridescens* suggest that its toxicity is related to individual size of the eft (Brodie et al. 1974. Copeia 1974:506–511), which may explain the lack of ill effects on the spring salamander. Alternatively, some *G. p. porphyriticus* may not be affected by the neurotoxin produced by *N. v. viridescens*. Tetrodotoxin tolerance has apparently arisen in other predators of newts (Brodie and Brodie 1990. Evolution 44:651–659). *Notophthalmus v. viridescens* is known to be eaten by *Thamnophis sirtalis*, shrews (*Sorex* spp.), and some birds (E. D. Brodie, III, pers. comm.). Our observations suggest that tetrodotoxin tolerance may be more widespread among terrestrial predators than previously thought.

We thank R. B. King and E. D. Brodie, III for assistance with earlier drafts of this report.

Submitted by **JENNIFER A. SECKI**, Department of Biology and Mountain Lake Biological Station, University of Virginia, Charlottesville, Virginia 22903, USA, and **ALEJANDRO QUERAL-REGIL**, Department of Biological Sciences, Northern Illinois University, DeKalb, Illinois 60115, USA.

TARICHA GRANULOSA (Roughskin Newt). **TOXICITY.** Three dead fledgling pied-billed grebes (*Podilymbus podiceps*) were discovered between 31 July and 7 August, 1996 floating on the surface of a pond in Pacific County, Washington, USA, along the North River 3.5 km E of Brooklyn. As each was discovered, it was retrieved and frozen. During necropsy a single, partially digested *T. granulosa* was found in each bird's stomach. A pathologic examination revealed severe pulmonary congestion and edema with no other gross or microscopic pathological findings. The grebes appeared in good condition and no parasites were noted. Brodie (Copeia 1968:307–311) demonstrated the susceptibility of birds to *Taricha* skin toxin in a laboratory environment. Isolation and identification of small amounts of tetrodotoxin is currently not practicable and E. D. Brodie, Jr. (pers. comm.) expected little toxin to be present in tissue samples. Brodie further commented that a grebe having eaten a newt would die within minutes, even before the newt was dead. Our observations strongly suggest mortality of wild pied-billed grebes due to ingestion of *T. granulosa*. One of the recovered *T. granulosa* was deposited in the University of Texas at Arlington Collection of Vertebrates (A-48993).

Submitted by **KELLY R. MCALLISTER, JEFF SKRILETZ**, and **BRIGGS HALL**, Washington Department of Fish and Wildlife, 600 Capitol Way N, Olympia, Washington 98501-1091, USA, and **MICHAEL M. GARNER**, Northwest ZooPath, 15326 Broadway Ave SE, Snohomish, Washington 98290-7042, USA.

TARICHA TOROSA (California Newt). **RESPONSE TO FIRE.** On 10 April 1996, a prescribed burn was ignited on a steep, south-facing hillside dominated by chamise (*Adenostoma fasiculatum*) on the Hastings Natural History Reservation, Carmel Valley, Monterey Co., California, USA. Scattered coast live oaks (*Quercus agrifolia*) grow along the lower reaches of this hillside. One large live oak on a SW exposure had an accumulation of 10–20 cm of leaves below the canopy that likely offered dry-season refugia for newts. This litter was ignited at ca. 1400 h and was still

Pseudacris crucifer (Spring Peeper). Illustration by Mark C. Erelli.

burning at 1700 h when attempts were made to extinguish the flames, which were 5–10 cm high and moving ca. 1–5 cm/min. I noticed a pair of *Taricha torosa* moving over the unburned litter. They both appeared very shiny and wet and were moving rapidly (ca. 5 cm/sec). Each newt walked directly into the flame front and did not pause while walking through the burning leaves. The slime covering their bodies foamed up, resembling an egg meringue. Within 20–30 s they were through the flames and on the cool, black ashes of the litter. Upon close examination, the now crusty white coating easily wiped off their wet bodies. I did not observe any skin blisters and the skin color looked normal. The newts were returned to the forest litter and they continued to walk downhill. They did not stop or curl up but walked normally, proceeding at near-record newt speed. As they walked through patches of unburned grass, the leaves and litter removed almost all of the thin, white crust. They walked under a rotting log in dense litter and I did not follow them further.

Fires are frequent in central, coastal California where *T. torosa* is common. Foaming of the skin secretions would dissipate heat and may be a mechanism used by this species to escape wildland fires.

Submitted by **MARK R. STROMBERG**, Hastings Natural History Reservation, University of California, Berkeley, 38601 East Carmel Valley Road, Carmel Valley, California 93924, USA.

ANURA

BUFO AMERICANUS (American Toad). **REPRODUCTION**. In many anuran species with a male-biased operational sex ratio, alternative male mating strategies have been reported (Arak 1983. *In*. P. Bateson (ed.), Mate Choice. Cambridge Univ. Press, Cambridge,. 462 pp.). For prolonged breeders, such as *Rana catesbeiana*, satellite males have been described (Howard 1978. Evolution 32:850–871) and Arak (*op. cit.*) found that small males of the explosive breeders *Bufo bufo* and *R. temporaria* searched for females away from the communal spawn site. Here I report a new alternative mating behavior in the explosive breeder *B. americanus*.

FIG. 1. Small male *Bufo americanus* in contact with an amplectant pair.

This behavior was observed in Lincoln Pond on the E.N. Huyck Preserve, Rensselaerville, New York, USA (42°10'N, 74°10'W; ca. 550 m elev.). At 1700 h on 4 June 1996, two small males were seen in separate incidences sitting with their cloacal region against the cloacal region of females that were in amplexus with larger males (Fig. 1). During 10 min of observation, the small males called repeatedly and maintained contact with the females even when the amplectant pairs were moving. This form of matesneaking may be an alternative for males that have a low probability of winning contests against other males due to their smaller body size, since size-dependent mating has been described for *B. americanus* when male density is high (Gatz 1981. Anim. Behav. 29:1004–1012.).

This observation was made during research funded by a grant from the E.N. Huyck Preserve, Rensselaerville, New York. I am thankful for the opportunity to do research at this site. I thank Margaret Stewart and Jennifer Frank for reviewing this manuscript.

Submitted by **STEFAN K. KAMINSKY**, Department of Biology, State University of New York, Albany, New York 12222, USA.

HYLA CREPITANS (NCN). **PREDATION**. On 6 May 1992, at a small permanent pool 13 km (by road) S of Las Bocas village, going to Pueblo Nuevo de la Sierra, Municipio Colina, Estado Falón, north-midwestern Venezuela, 245 m elev., one of us (JMH) observed a giant water bug (total length 61.6 mm) (Belostomatidae, *Belostoma* sp.) that had captured an adult male *Hyla crepitans* (SVL 57.2 rnm) by its hindlimbs. The frog had a small wound near the anal opening on the posterior surface of the hind limb. When collected the frog was very weak and could not move its hindlimbs; it later died. The specimen is deposited in the Regional Collection of Reference, Centro de Investigaciones en Ecologia y Zonas Aridas (CIEZAH 321), Universidad Francisco de Miranda, Coro, Venezuela.

Although we did not observe the capture, we suspect that predation by giant water bugs is related to the frog's habit of calling on the surface of the water, thus attracting the attention of the predator as reported for other hylid frogs including *Hyla versicolor* and *Pseudacris crucifer* (Hindshaw and Sullivan 1990. J. Herpetol. 24:196–197).

Submitted by **ABRAHAM MIJARES-URRUTIA, ALEXIS ARENDS**, Centro de Investigaciones en Ecología y Zonas Aridas (CIEZA), Universidad Francisco de Miranda, Coro, Venezuela, and **JEAN-MARC HERO**, Department of Zoology, James Cook University, Townsville, Queensland 481 1, Australia.

LEPTODACTYLUS PENTADACTYLUS (Rana Ternero, Smoky Frog). **PREDATION**. Anurans possess a number of defense mechanisms that discourage predators, but the effectiveness of these mechanisms is rarely observed in the field. *Leptodactylus pentadactylus*, a large frog of Central America, emits loud shrieks when caught (Villa 1969. Rev. Biol. Trop. 15:323–329) perhaps to startle a mammalian predator into dropping it, or to attract caiman, which might prey on the predator, thus freeing the frog (Scott 1983. *In* D. H. Janzen (ed.), Costa Rican Natural History, pp. 405–406. Univ. Chicago Press, Chicago, Illinois). *Leptodactylus pentadactylus* also secretes leptodactylin, a neuromuscular block and a nervous system stimulant (Scott and Limerick 1983, *In* D. H. Janzen (ed.), Costa Rican Natural History, pp. 351–367. Univ. Chicago Press, Chicago, Illinois), which might deter predation. On 14 June 1992 I heard grunts from a southern river otter (*Lutra*

longicaudis) and found it digging deep under a *Pentaclethra macroloba* tree on the edge of the Research Swamp at the La Selva Biological Station, 32 m elev., Heredia Province, Costa Rica. I watched the otter from a distance of 3 m as it dug into a burrow of *L. pentadactylus*. At night I had frequently observed an adult *L. pentadactylus* just outside this burrow. At 1053 h I heard the loud squeal emitted by *L. pentadactylus* when seized by a predator. The otter rapidly swam out from under roots on the far side of the tree holding in its paws an adult *L. pentadactylus* with only one hindleg. The otter stuffed the frog into its mouth and severed the remaining leg at the body, it then appeared startled by my presence and swam to the far side of the tree where I could not see it. I heard loud crunching sounds for ca. 3 s after which the otter swam back into view. It was not holding the frog and I did not see the *L. pentadactylus* again, nor was it present outside its burrow that evening. I assumed the river otter had completely consumed the frog. I could detect no startle response by the otter when the frog screamed, nor any reaction by the otter to noxious skin secretions. After at least 10 min of vigorous digging to extract the frog from its burrow, the otter consumed the frog completely in less than 30 s.

Submitted by **WENDY E. ROBERTS**, Mountain Research Center, 408 Traphagen Hall, Montana State University, Bozeman, Montana 597173490, USA.

LYSAPSUS LIMELLUS (NCN). **PARASITISM.** *Lysapsus limellus* is restricted to the areas adjacent to the Paraguay and Parana rivers, from Rondonia and Matto Grosso (Brazil) to central Argentina. In Argentina *L. limellus* occurs in the provinces of Formosa, Chaco, Corrientes, Santa Fe, and north of Buenos Aires (Cei 1980. Amphibians of Argentina. Monit. Zool. Ital. (NS) Monog. 2:609 pp). They are extremely aquatic, occurring in semipermanent and permanent ponds. On 23 May 1994, as part of an investigation of the trematode guild structure in a natural population of *L. limellus,* we collected 14 frogs; 8 females (SVL 14–20 mm; mean 16.25; SD = 1.98) and 6 males (SVL 11–19 mm; mean = 15.67; SD = 1.98). These specimens were collected in a permanent pond 15 km NE of Corrientes Capital (27°28'S, 58°50'W), province of Corrientes, Argentina. Thirteen frogs (93%) were infected by trematodes: l) adult parasites, *Catadiscus* aff. *propinquus* Freitas and Dobin 1956 localized in the large intestine, prevalence was 64%, intensities ranged from 1–13 (mean = 4.6, SD = 3.8/host, N = 41); and *Glypthelmis* aff. *vitellinophilum* Dobin 1958 localized in the small intestine, prevalence was 36%, intensities ranged from 1–12 (mean = 4.2, SD = 4.5/host, N = 21); 2) larval stages (metacercariae) Diplostomidae (aff. *Lophosicyadiplostomum* Dubois 1936), 1 localized in the kidney, prevalence was 57%, intensities ranged from 2–50 (mean = 31.3, SD = 16.2/host, N = 250); and Echinostomatidae (species l), localized in the lung, prevalence was 21%, intensities ranged from 5–10 (mean = 6.7, SD = 2.9/host, N = 20). In general, the prevalence and mean intensity by trematodes was high. This high incidence of infection could be related to: l) the type of host diet, 2) the abundance of definitive and intemmediate hosts, and 3) the limnological features of the habitat. The importance of the biotic or abiotic factors influencing the parasite community organization in amphibians has been reviewed by Aho (1990. *In* G. W. Esch, A. O. Bush, and J. M Aho (eds.), Parasite Communities: Pattems and Processes, pp. 157–195. Chapman and Hall, New York). It is likely that *L. limellus* is the principal intemmediate host for metacercariae Diplostomidae, considering the prevalence and intensity of these trematodes in most of the frogs we collected.

Submitted by **MONIKA I. HAMANN** and **ARTURO I. KEHR**, Centro de Ecologia Aplicada del Litoral, C.C. 140, (3400) Corrientes, Argentina.

RANA AURORA DRAYTONII (California Red-legged Frog). **BEHAVIOR.** This frog was recently listed by the U.S. Fish and Wildlife Service as Threatened (Fed. Reg. 23 May 1996. 61(101):25813–25833). Organizations wanting to create or modify wetlands may need to control movements of frogs to reduce incidental mortality during construction, or to prevent breeding attempts in unsuitable habitats. The Cambria Community Services District, in anticipation of federal protection, wanted to prevent red-legged frogs from breeding in four newly constructed sewage percolation ponds adjacent to San Simeon and Van Gordon creeks, San Luis Obispo County, California, USA. To exclude frogs, the District attached a 1.2 m high plastic barrier (Tensar Polygrid Windbreak) to the outside of a 1.8 m high chain-link fence surrounding the 6.8 ha compound during the summer of 1995.

In January 1996, two radio-tagged frogs (Rathbun and Murphey 1996. Herpetol. Rev. 27:187–189) that we had been following outside the compound near Van Gordon Creek appeared in the only percolation pond with water. During a night survey of the pond on 14 March, we saw or heard at least 10 adult frogs, and captured two calling males (No. 1, 94 g, 99 mm SUL [snout-urostyle length] and No. 2, 84.5 g, 95 mm SUL). We found three gaps in the frog barrier at ground level (associated with gates and pipes entering the compound) where the frogs could have entered; they also could have climbed or jumped over the barrier.

To determine if frogs could pass over the barrier, we designed a simple test. We built a three-sided plywood enclosure on the outside of the Tensar/chain-link fence, ca. 20 m from the watered percolation pond. The walls were buried ca. 15 cm and were ca. 1 m high. The enclosure was tightly attached to the fence so that there were no gaps, and the top was covered with one-inch mesh (2.5 cm) chicken wire to exclude predators. We left a gap between the chicken wire and the Tensar barrier of 45 cm; if the frogs made it to the top of the barrier they could easily go through the chain-link fence into the compound. The vegetation was cleared from the inside of the test enclosure, water dishes were provided, and cement construction blocks were put in for cover.

On 18 March at ca. 1500 h, we radio-tagged frog Nos. 1 and 2 and introduced them into the enclosure. We observed them for ca. 5 h. During this time, they jumped and clung to the barrier, but they did not get higher than ca. 30 cm. When we checked on 19 March at 1730 h, we found frog No. 1 in the watered percolation pond. On the night of 18 March we captured, radio-tagged, and released two adult females in the pond (No. 3, 167 g, 119 mm SUL and No. 4, 144 g, 113 mm SUL). In addition, we caught another male (No. 5, 99 g, 100 mm SUL); he was radio-tagged and released into the test enclosure on 20 March at 1200 h. At 1000 h on 21 March, frog No. 2 was back in the percolation pond, and at 1000 h the next day frog No. 5 was found in the pond. The three male frogs passed over the frog barrier within three days.

For operational reasons, the percolation pond was drained between 16–28 April 1996, when frog Nos. 1–5 were present. On 24 April we found the damaged radio of frog No. 1 at the base of the fence, inside the compound, suggesting that he was eaten by a predator. Radio contact with frog No. 2 was lost on 27 April. Frogs 3 and 5 were found dead and desiccated at the base of the fence on the inside of the compound on 2 May and 26 April. Female frog No. 4 left the pond on 24 April and was found outside the compound, near Van Gordon Creek, on 27 April.

We do not know whether the frogs that entered or left the compound passed through the ground-level gaps in the barrier or passed over it; our experiment demonstrated that they are able to climb or jump the Tensar/chain-link barrier from the outside. Based on frog mortality we documented, it is possible that *R. a. draytonii* was unable to climb the Tensar/chain-link barrier from the inside. Our experiment demonstrates the necessity of designing, testing, and installing barriers carefully, and the possibility that barriers may cause mortality.

We thank the Cambria Community Services District, San Simeon State Park, and California Department of Transportation for their support and cooperation. Brian Hatfield, Dan Holland, and Mark Jennings reviewed early drafts of the manuscript. This work was done under Permit No. 9593 from the California Department of Game and Fish.

Submitted by **GALEN B. RATHBUN, NORMAN J. SCOTT, JR.,** and **THOMAS G. MURPHEY**, National Biological Service, California Science Center, Piedras Blancas Research Station, San Simeon, California 93452-0070, USA.

RANA PRETIOSA (Spotted Frog). **PREDATION**. During climax metamorphosis anurans can neither swim as well as a tadpole nor leap as well as a frog, and are at increased risk of predation (Wassersug and Sperry 1977. Ecology 58:830–839; Arnold and Wassersug 1978. Ecology 59:1014–1022), yet predators actively foraging on transforming frogs are rarely observed in the field. On 6 August 1996 I watched three northern river otters (*Lutra canadensis*) feed on metamorphosing *Rana pretiosa* at Buck Lake, 2116 m elev. in the Northern Range of Yellowstone National Park, Park Co., Wyoming, USA. From 1621–1626 h the otters (one adult and two large juveniles) caught and consumed three transforming frogs. I observed the otters feeding on a rock ca. 10 m from shore. They caught the transforming frogs in the water within an 8 m radius of the rock, and returned to the rock to consume the frogs. Each metamorphosing frog had a long complete tail, hindlegs, and in one case forelegs; I estimated they were Gosner stages 41 or 42 (Gosner 1960, Herpetologica 16:183–190). The length of the transforming frogs was ca. 6–7 cm from snout to tip of tail; the only frogs of that size inhabiting alpine ponds of Yellowstone National Park are *R. pretiosa* (Koch and Peterson 1995. Amphibians and Reptiles of Yellowstone and Grand Teton National Parks, Univ. Utah Press, Salt Lake City. 188 pp.). After five minutes of feeding the otters stopped foraging and swam to another part of the lake. I searched the lake shore and found two otter latrines, one fresh and one several days old. The scat was black and mushy, and did not contain identifiable food items, neither fish bones nor the crayfish parts I have seen in otter scat. The lack of identifiable hard fish or crustacean components in their scat suggests the river otters may have been feeding exclusively on transforming frogs for several days. The partly ossified bones of metamorphosing frogs may not be apparent in scat.

Submitted by **WENDY E. ROBERTS**, Mountain Research Center, 408 Traphagen Hall, Montana State University, Bozeman, Montana 597173490, USA.

RANA PRETIOSA (Spotted Frog). **BEHAVIOR and REPRODUCTION**. On 2 February 1996, we (WPL and LAH) observed three *R. pretiosa* beneath a 5-6 cm layer of translucent ice completely covering a seasonal pond in a grazed pasture adjacent to Dempsey Creek, Thurston County, Washington, USA (T17N R3W Sec. 13) at 43 m elevation. We observed a gravid female swim a distance of 5 cm and nuzzle the bottom. We found a second female under the ice less than 2 m from the first frog. We presumed it dead because it was motionless and floating upside-down. When we removed it from beneath the ice, a male fell from its back, suggesting a pair in amplexus. All three individuals moved sluggishly when removed from the frigid (-0.5°C), shallow (9-14 cm) water. We (WPL and KRM) returned to the site at 1106 h on 4 February and observed another male *R. pretiosa* swimming beneath the ice for a distance of 0.5 m. The water temperature was 1.0°C. All four individuals were in breeding condition as evidenced by the prominent nuptial pads on the males' thumbs and the obviously distended abdomens of the females. These individuals were found in the same location where we (WPL and KRM) found 41 *R. pretiosa* egg masses between 23 February and 12 March 1995.

All surface water in the vicinity of the breeding pool is seasonal, drying in the early summer and refilling in the late fall. During the summer months *R. pretiosa* are found in a permanent emergent marsh 50–100 m from the breeding pond. At the Dempsey Creek site, *R. pretiosa* apparently undergoes seasonal movements between permanent summer habitat and ephemeral breeding habitat.

We thank Neal Wilkins and Port Blakely Tree Farm for allowing access and for other assistance in conducting field studies on *R. pretiosa* at the Dempsey Creek site.

Submitted by **WILLIAM P. LEONARD** and **LISA A. HALLOCK**, Washington Natural Heritage Program, Department of Natural Resources, P.O. Box 47016, Olympia, Washington 98504-7061, USA, and **KELLY R McALLISTER**, Wildlife Diversity Program, Washington Department of Fish and Wildlife, 600 Capitol Way N, Olympia, Washington 98504-7600 USA.

TESTUDINES

CHELYDRA SERPENTINA (Common Snapping Turtle). **REPRODUCTION**. Twinning is rarely reported in egg-laying reptiles (Aguilar and Casas-Andreu 1991. Herpetol. Rev. 22:98; Petch 1990. Herptile 15:13–16; Castano-Mora 1985. Lozania 52:1–5). Morever, eggs containing twin yolks or developing embryos rarely produce viable hatchlings. There are at least two exceptions (Petch 1990, *op cit.*; Kinkaid 1996. Herpetol. Rev. 27:26), both involving snakes. Twinning has been reported once in turtles (Castano-Mora 1995, *op cit.*) but has never been reported in the common snapping turtle.

As part of an experiment concerning temperature-dependent sex determination, I collected six clutches of snapping turtle eggs from Carrol and Whiteside Counties, Illinois, USA during June 1994. One egg contained two living embryos. This egg, at 10.54 g, was within the mass range of the other eggs in that clutch (8.97–12.4 g). This egg was laid on 5 June 1994 and incubated at ca. 26°C. Living twins hatched on 12 August 1994. The larger hatchling measured 29.1 mm carapace length (CL), 19.8 mm plastron length (PL), and weighed 8.0 g; the smaller measured 16.4 mm CL, 10.5 mm PL, and weighed 1.29 g (clutch mean: 31.6 mm CL, 20.7 mm PL, 9.65 g). The smaller turtle died within a few days of hatching, but the larger is still alive at almost two years post-hatching. This is the first known case of live twins being hatched from one egg in any species of turtle. Both turtles will be deposited in the University of Texas at Arlington Collection of Vertebrates.

Submitted by **DANIEL J. O'CONNELL**, Department of Biology, Box 19498, The University of Texas at Arlington, Arlington Texas 76019, USA; e-mail: oconnell@albert.uta.edu.

CHELYDRA SERPENTINA (Snapping Turtle). **REPRODUCTION**. The maximum reported clutch sizes from snapping turtles in Florida (USA) are only 20 and 21 eggs, both from the peninsular Florida subspecies, *C. s. osceola* (Iverson 1977. Herpetologica 33:205–212; Punzo 1975. J. Herpetol. 9:207–210). Here, we report several larger clutches from northwestern Florida (*C. s. serpentina*) as well as additional ones from *C. s. osceola*. A large female *C. s. serpentina* was observed laying 54 eggs (excavated for counting) in early May 1995 adjacent to a natural wetland in Tallahassee, Leon County (Bob Walker, pers. comm.). The ten largest clutches that we have recorded from *C. s. serpentina* during our ongoing studies of chelydrid nesting ecology along the lower Apalachicola River, Franklin County (Ewert and Jackson 1994. Florida Game and Fresh Water Fish Comm. Nongame Wildl. Prog. Final Rept. NG89-020), were 52, 51 (female maximum carapace length [CL] 320 mm), 46, 44(2), 43, 42(3), and 41.

The maximum known clutch size of *C. s. osceola* remains well below 50 eggs. From Dixie County in northern Florida we dissected 31 eggs (32 corpora lutea) from a female (278 mm CL) collected on 2 March 1979, and 30 eggs from a second female collected on 13 March 1988. Farther south, a female (274 mm CL) collected on 16 March 1988, just south of Lake Jessup in Seminole County, yielded 23 eggs. Another clutch of at least 23 eggs (UF 1090) was collected in 1930 in Alachua County. However, female *C. s. osceola* can grow considerably larger than indicated above; a series of large specimens collected in 1928–1929 from Lake Apopka (Orange County) includes three females (UF 53706, 65675, 53705) measuring 368, 352, and 348 mm CL. Given that female body size and clutch size in snapping turtles are correlated (Iverson et al. 1996. Herpetologica, *in press*; Yntema 1970. Am. Midl. Nat. 84:68–76), this suggests the potential for much larger clutches in *C. s. osceola* than are reported here.

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Submitted by **DALE R. JACKSON**, Florida Natural Areas Inventory, 1018 Thomasville Road, Suite 200-C, Tallahassee, Florida 32303, USA, and **MICHAEL A. EWERT**, Department of Biology, University of Indiana, Bloomington, Indiana 47405-6801, USA.

GOPHERUS AGASSIZII (Desert Tortoise). **DIET.** On 2 August 1996 (0815 h) I observed an adult male *Gopherus agassizii* foraging on an isolated desert hill in Pinal County, Arizona, USA. Closer inspection of the food item revealed it to be a raptor pellet lying in the middle of a disarticulated turkey vulture (*Cathartes aura*) carcass. Verification that the actual food item was the vulture pellet was given by the presence of clumps of hair on the tortoise's beak and nose. The pellet was deposited in the University of Arizona herpetological collection (UAZ 50336).

Extensive literature exists on the diet of *G. agassizii*, which consists primarily of native and exotic grasses, forbs, flowers, and fruits (Grover and DeFalco 1995. Gen. Tech. Rep. INT-GTR316, Ogden, Utah: U.S. Dept. Agriculture, Intermountain Research Station. 134 pp.). Esque (1994. M.S. Thesis, Colorado State Univ., Fort Collins, USA. 243 pp.) and Hansen et al. (1976. Herpetologica 32:247–251) reported mammalian feces, hair, and bones; bird feathers; rocks and soil; reptile scales; and arthropods as small components of *G. agassizii* diets. This is the first reported observation of *G. agassizii* foraging on a raptor pellet. Ingestion of bones in the pellet may have provided supplemental minerals to the tortoise (Esque and Peters 1994. *In* Bury and Germano (eds.), Biology of North American Tortoises, pp. 105–111. Natl. Biol. Surv., Fish Wildl. Res. 13, Washington, D.C.).

I thank Jeffrey M. Howland for his comments on the manuscript.

Submitted by **ROY C. MURRAY**, Nongame Branch, Arizona Game and Fish Department, 2221 West Greenway Road, Phoenix, Arizona 85023, USA.

GOPHERUS POLYPHEMUS (Gopher Tortoise). **NESTING.** On 30 May 1996 at 1145 h, we observed an adult female gopher tortoise (straight line carapace length 293 mm, mass 4.3 kg) atop a recently disturbed pocket gopher (*Geomys pinetis*) mound (circumference 2.5 m) at Naval Air Station Cecil Field in western Duval County, Florida, USA. We probed the mound with the wire shaft of a survey flag and located five eggs approximately 16 cm from the top of the mound, laid in two layers with three eggs on the bottom. We recovered the eggs with soil and released the tortoise on the mound. After approximately five minutes, the tortoise left the mound and walked to a burrow 25.8 m east of the nest site. To the best of our knowledge, this is the first documented use of a *Geomys pinetis* mound as a nest site by *G. polyphemus*.

The burrow was located in disturbed sandhill habitat replanted with longleaf pine (*Pinus palustris*) in 1988 with an estimated canopy cover of 7%. The pocket gopher mound was located in an area of slash pine (*Pinus elliottii*) planted in 1954 with an estimated canopy cover of 38%.

Gopherus polyphemus prefers sandy unshaded areas as nesting sites (Hallinan 1923. Copeia 1923:11–20; Landers et al. 1980. Herpetologica 36:353–361) and in north Florida may nest primarily in or near burrow aprons (Diemer and Moore 1994. *In* Bury and Germano (eds.), Biology of North American Tortoises, pp. 129-137, U.S. Fish and Wildl. Serv., Fish and Wildl. Res. Rep. 13). Conversely, Smith (1995, Bull. Florida Mus. Nat. Hist. 37 Pt. 1(4):97-126) found few nests in or near burrow aprons in north Florida. Data presented here indicate *G. pinetis* mounds may provide alternative nesting sites when available. Researchers conducting surveys for *G. polyphemus* nests should include *G. pinetis* mounds in their sampling.

Submitted by **DEBORAH M. EPPERSON** and **LORI D. WENDLAND**, Florida Game and Fresh Water Fish Commission, Route 7, Box 440, Lake City, Florida 32055, USA.

MALACLEMYS TERRAPIN TERRAPIN (Northern Diamondback Terrapin). **PREDATION.** On 2 May 1996 an adult male *Malaclemys terrapin terrapin* was found near Milford Point in Milford, Connecticut, USA. This turtle was being attacked by at least two unidentified gulls (*Larus* sp.). A local resident interrupted this predation event and immediately brought the turtle to the Connecticut Audubon Coastal Center for potential rehabilitation. All four legs had been severed—the forelimbs at carpal level and the hind limbs slightly proximal to the tarsi, so that tibia and fibula were protruding. The tail had a slight laceration. Head, neck, and shell lacked any obvious injuries. The animal died 28 August 1996 after refusing food. The skeleton currently is retained by the Center for use in education programs. Klemens (1993. Amphibians

and Reptiles of Connecticut and Adjacent Regions. State Geol. Nat. Hist. Surv. Connecticut Bull. 112:1–318) reported that immature terrapins are eaten by a variety of vertebrate and invertebrate predators, but human activities are the prime cause of adult mortality. This may be the first documented case of bird predation on an adult *M. t. terrapin*.

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STERNOTHERUS ODORATUS (Common Musk Turtle). **MORTALITY.** The most common macrobiological source of mortality for turtles is predation by various large vertebrates (Ernst et al. 1993. Turtles of the United States and Canada. Smithsonian Inst. Press, Washington, D.C., 578 pp.). Mortality caused by invertebrates is rare but is known to occur in hatchling and juvenile turtles as a result of predation by decapod crustaceans and hemipteran insects (e.g., Stancyk 1982. *In* Bjorndal (ed.), Biology and Conservation of Sea Turtles, pp. 139–152. Smithsonian Inst. Press, Washington, D.C.; Gotte 1992. Herpetol. Rev. 23:80). Here we describe an apparent accidental case of adult mortality caused by a bivalve mollusk.

On 18 June 1996, a dead female *Sternotherus odoratus* (Kinosternidae; carapace length 62.4 mm) was found by M. Henderson in Salado Creek at Camp Tahkodah near Floral, Independence County, Arkansas, USA. The turtle's head was inside the closed shell of a living, gravid female *Ligumia subrostrata* (Unionidae; maximum shell length 73.2 mm; Fig. 1), apparently trapped at the point where the mussel's siphon emerges. We opened the mussel and found the turtle to be unmarked other than the neck being laterally compressed to a width of 2.4 mm by the margin of the mussel's shell. There was no mussel tissue in the turtle's mouth and no obvious damage to the soft tissues of the mussel. The apparent scenario is that the turtle was attracted to the siphon or other soft tissue and put its head (width = 14.3 mm) inside the open mussel, which then closed, resulting in the turtle either drowning or suffocating.

We thank H. Riley and B. Fouts for bringing the specimens to our attention, and J. Harris for identifying the mussel and for discussions on mussel biology.

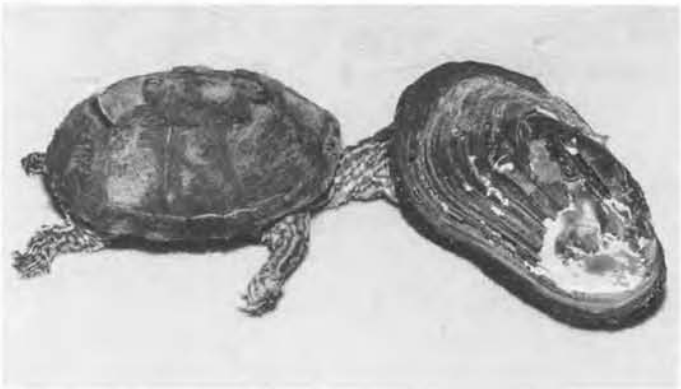

FIG. 1. A common musk turtle, *Sternotherus odoratus*, with its head trapped inside a pondmussel, *Ligumia subrostrata*.

Submitted by **MICHAEL V. PLUMMER** and **JOSEPH W. GOY**, Department of Biology, Box 2251, Harding University, Searcy, Arkansas 72149, USA.

SAURIA

CNEMIDOPHORUS LEMNISCATUS (NCN). **HERBIVORY.** On 16 April 1996 at 1130 h near Las Bocainas, on the road to Adícora, on the eastern coast of the Paraguaná Peninsula, Falcón, Venezuela, one of us (BC) observed two young *Cnemidophorus lemniscatus* eating petals of the flowers of the cactus *Opuntia wentiana*. The flowers were located at ground level; the lizard did not climb the cacti. Paulissen and Walker reported herbivory in *C. arubensis* from Aruba Island, *C. murinus* from Curacao Island, (both Netherlands Antilles) and *C. nigricolor* from Isla La Blanquilla, Venezuela (1994. J. Herpetol. 28:524–526). This is the first report of herbivory in a non-insular species of *Cnemidophorus*.

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SCELOPORUS BICANTHALIS (Transvolcanic Bunchgrass Lizard). **PATTERNLESSNESS.** Usually all members of the *Sceloporus scalaris* and *S. aeneus* complexes (of the *S. scalaris* group) of México are marked with two paravertebral series of 6–9 more or less U-shaped dark spots between two distinct dorsolateral light lines 7–8 scale rows apart, and similar but smaller markings in a row between the dorsolateral and lateral light lines. The distinctness of the pattern varies from dull (especially in the *aeneus* complex) to bright (especially in the *scalaris* complex). However, some individuals of some of the included taxa are unicolor above and on sides, or with only faint evidence of the dorsolateral light lines. Unicolor individuals have long been known in populations of *S. s. scalaris* westward from the longitude of Guanajuato (Thomas and Dixon 1976. Southwest. Nat. 20:531) and Zacatecas (HMS, pers. obs.), as well as in *S. s. slevini* (Anderson 1972. J. Herpetol. 6:80), *S. s. unicanthalis* (HMS, pers. obs.), *S. a. aeneus* (Guillette and Smith 1985. Bull. Maryland Herp. Soc. 21:4) and *S. a. subniger* (Smith and Brandon 1971. J. Herpetol. 5:60). They are thought not to occur in *S. bicanthalis* (Guillette and Smith, op. cit.), *S. chaneyi* (Liner and Dixon 1992. Texas J. Sci. 44:426), *S. goldmani* (Smith 1939. Zool. Ser. Field Mus. Nat. Hist. 26:350–353), *S. s. scalaris* east of the longitude of Guanajuato (Thomas and Dixon, loc. cit.) or *S. s. samcolemani* (Liner and Dixon, loc. cit.).

Thus two patternless adult female *Sceloporus* of the *scalaris* group from La Molina, 3 mi E Perote, 8000 ft., Veracruz, are of special interest. They were taken 30 July 1955 along with four juveniles from the same locality, all now under the number UMMZ 112972. All have 2-2 canthals, thus eliminating *S. aeneus* from consideration, but both *S. s. scalaris* and *S. bicanthalis* occur nearby and both possess two canthals although neither is known elsewhere to exhibit patternlessness (except westward from Guanajuato in *S. s. scalaris*). However, that these six represent *S. bicanthalis* is assured by two facts. For one, UMMZ 172753, from nearby at 25 km E Perote on the road to Jalapa, is an adult male with the sharply defined, prominent black gular streaks, sublateral semeions and small size (37 mm SVL) typical of that species (gular streaks less prominent and less well defined, semeions on sides of abdomen, SVL greater at maturation, in *S. scalaris*). Secondly, the larger (48 mm SVL) of the two patternless females contains fully formed

eggs that lack shells, as is consistent with the known viviparity of *S. bicanthalis*. In the oviparous species *S. scalaris*, eggs in a comparable stage of development have a well developed shell, as exemplified by UMMZ 118556, from 2 mi SE Laguna Valderrama, 7800 ft., Zacatecas, 19 June 1957.

On these bases we add *S. bicanthalis* to the list of species of the *scalaris* group of *Sceloporus* in which patternlessness occurs. It remains unknown in the wide-ranging eastern component of *S. s. scalaris*, extending from Tamaulipas to Puebla and westward along the transvolcanic zone to (but not including) Guanajuato.

Submitted by **GREGORY J. WATKINS-COLWELL**, Department of Biology, Sacred Heart University, Fairfield, Connecticut 06432-1000, USA; and **HOBART M. SMITH** and **DAVID CHISZAR**, University of Colorado Museum, Boulder, Colorado 80309-0315, USA.

SCINCELLA LATERALIS (Ground Skink). **PREDATION.** Although birds are often acknowledged as feeding on lizards (Pearson 1917. Birds of America, Doubleday & Co., New York), direct observations of predation are relatively rare under natural conditions. On 22 June 1996, we witnessed a barred owl (*Strix varia*) attack an adult ground skink as the lizard crawled through mixed leaf litter composed of deciduous hardwood leaves and pine needles. The weather was cloudy and the air was warm (27°C) and humid. Prior to attacking the lizard, the owl had perched on a narrow white ash (*Fraxinus americana*) limb 3.5 m above the litter surface for about 15 min. During this time, it alternately scanned the forest understory and ground surface, presumably searching for prey. At 1635 h, it cocked its head toward the ground and flew silently to the litter surface where it captured the ground skink in its talons. After eating the lizard on the ground, the owl flew to a nearby perch and resumed scanning the forest understory.

Barred owls have been reported to prey upon a variety of small herpetofauna (Ross 1989. Amphibians and Reptiles in the Diets of North American Raptors. Wisconsin Endangered Species Report 59), however lizards were not included among the prey listed. To our knowledge, the only previous record of avian predation on ground skinks was by Beane and Trail (1991. Herpetol. Rev. 22:99) who reported a pair of nesting bluebirds (*Sialia sialis*) feeding ground skinks to their young. Based on qualitative observations, ground skinks are extremely abundant in the leaf litter of the mixed mesophytic forest where the observations took place (a residential forested area west of the Devil's Millhopper State Geological Site, Gainesville, Alachua County, Florida, USA; Brooks 1967. Ecol. Monog. 37:71–87 for estimates of abundance in similar habitat). As such, it is possible that small lizards could form an important component in the diet of these non-passerine avian predators.

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XANTUSIA VIGILIS (Desert Night Lizard) and ***SCELOPORUS MAGISTER*** (Desert Spiny Lizard). **PREDATION and DIET.** Here, we report evidence of predation on *Xantusia vigilis* by *Sceloporus magister*. We collected a yearling female *S. magister* (71 mm SVL, mass = 13.6 g) on 24 July 1996, 5 km SE of Llano, Los Angeles County, California, USA (34°29'N, 117°46'W, elevation 1120 m). In the laboratory, on 29 July, the *S. magister* deposited a fecal pellet that contained part of a *Xantusia vigilis* body, including sections of dorsal and ventral integument and both hind limbs. Based on the knee-to-knee length of the prey specimen (14 mm) and a sample of living *X. vigilis* (N = 24) from the same locality, we estimate that the *Xantusia* prey would have measured 42 mm SVL and weighed 1.2 g when alive, and therefore was an adult.

Sceloporus magister and *X. vigilis* are abundant at this site, and commonly inhabit Joshua trees (*Yucca brevifolia*) throughout the western Mojave Desert. However, *S. magister* typically climbs Joshua trees and is a diurnal heliotherm and ambush predator, whereas the reclusive *X. vigilis* inhabits fallen branches and other debris, and is rarely observed in the open. This *S. magister* was perched in a Joshua tree when first observed. *Sceloporus magister* sometimes take shelter beneath fallen Joshua tree branches. Despite their common name, night lizards are apparently sometimes active during the day, beneath debris (Stebbins 1954, Amphibians and Reptiles of Western North America. McGraw-Hill, New York. 536 pp.). A daytime encounter beneath fallen Joshua tree branches seems to be the most likely explanation for this instance of predation.

Zweifel and Lowe (1966. Am. Mus. Novit. 2247:1–57) do not mention *S. magister* as a potential predator of *X. vigilis* at their study site, which was within 4 km of our collection site. Likewise, Parker and Pianka (1973. Herpetologica 29:143–152) do not mention *Xantusia* in their analysis of the diet of *S. magister* from the Mojave Desert.

Submitted **by MARC PERKINS, STEPHEN C. ADOLPH, STEPHEN GRANITE**, and **WENDY HEIN**, Department of Biology, Harvey Mudd College, Claremont, California, 91711, USA.

SERPENTES

CROTALUS CERASTES CERASTES (Mojave Desert Sidewinder). **LONGEVITY**. *Crotalus cerastes cerastes* is known to live in captivity up to 11.7 years (Snider and Bowler 1992. Longevity of Reptiles and Amphibians in North American Collections. Herpetol. Circ. No. 21. Society for the Study of Amphibians and Reptiles. 40 pp.). Here we report on a captive *C. c. cerastes* that is presently 28 years old.

In June 1968 Thomas Moisi collected a gravid *C. c. cerastes* from just east of Whitewater Canyon, Riverside County, California, USA. In September 1968 this snake gave birth to five offspring. Today, one of the offspring is still alive in the collection at California State Polytechnic University. This female *C. c. cerastes* is presently 629 mm SVL, 53 mm tail length, and 378 g. It has several tumors, but feeds regularly and apparently is still reproductive, producing unfertilized eggs in 1994 and 1995.

Submitted by **ROBERT H. GOODMAN, JR., GLENN R. STEWART**, and **THOMAS J. MOISI**, Department of Biological Sciences, California State Polytechnic University, Pomona, 3801 West Temple Avenue, Pomona, California 91768, USA.

DENDRELAPHIS CALLIGASTRA (Northern Tree Snake). **DIET**. As is the case for the majority of Australia's snakes, the diet of *Dendrelaphis calligastra* is known only from dissection of a relatively small number of museum specimens (Shine 1991. Copeia 1991:120–131). These dissections revealed that the species preys on frogs (families Hylidae and Myobatrachidae) and lizards (families Scincidae and Gekkonidae).

While conducting fieldwork in rainforest near Paluma in northern Queensland, I caught an actively foraging *D. calligastra* (SVL

= 83 cm, tail length = 35 cm) at ca. 1200 h on a sunny day (25 September 1995). Examination of the snake revealed a prominent bulge, and palpation led to the snake regurgitating two microhylid frogs (*Sphenophryne robusta*). Both were almost completely intact, suggesting that they had been ingested recently, possibly on that day. This is the first record of *D. calligastra* preying on frogs of the family Microhylidae.

Submitted by **GEORDIE A. TORR**, Department of Zoology, James Cook University, Townsville, 4811, Australia.

DIADOPHIS PUNCTATUS VANDENBURGHI (Monterey Ringneck Snake). **DIET**. Ringneck snakes are known to prey on salamanders, small frogs, lizards, small snakes, slugs, and earthworms (Stebbins 1985. A Field Guide to Western Reptiles and Amphibians. Houghton Mifflin Co., Boston, Massachusetts. 336 pp.). On 14 July 1996 (1921 h) we collected a male *Diadophis punctatus vandenburghi* (343 mm SVL, 9.5 g) on the Indian Creek trail in the Los Padres National Forest, Santa Barbara County, California, USA. During the 1.5 h hike back to our vehicles, the snake regurgitated a neonate two-striped garter snake (*Thamnophis hammondii*, 188 mm SVL, 5.0 g). To our knowledge this is the first report of a *D. p. vandenburghi* preying upon *T. hammondii*.

The *T. hammondii* was deposited in the Department of Biological Sciences collection at California State Polytechnic University, Pomona (CSPU Pomona 02245).

Submitted by **ROBERT H. GOODMAN JR.**, Department of Biological Sciences, California State Polytechnic University, Pomona, 3801 West Temple Avenue, Pomona, California 91768, USA, and **DON TATE**, 527 West Alamar Avenue #50, Santa Barbara, California 93105, USA.

ELAPHE OBSOLETA LINDHEIMERI (Texas Rat Snake). **PREY**. At 2345 h on 29 July 1995 at Houma, Terrebonne Parish, Louisiana, USA, I found an *Elaphe obsoleta lindheimeri* (ca. 46 cm TL) at the top of a brick wall wedged along the mortar connections. The snake's body was bulging from having eaten a number of Mediterranean geckos, *Hemidactylus turcicus turcicus*, one of which was partially engulfed in its mouth. The snake was examined and released. The introduced *Hemidactylus* can usually be found on brick walls at night, and retreat under the molding in the upright mortar connections. Although young *E. obsoleta* are known to eat lizards, I am unaware of any reports of feeding on *H. turcicus*. Further, this note documents nocturnal foraging in an otherwise diurnal snake.

Submitted by **ERNEST A. LINER**, 310 Malibou Boulevard, Houma, Louisiana 70364-2598, USA.

LAMPROPELTIS TRIANGULUM CELAENOPS (New Mexico Milk Snake). **MAXIMUM SIZE**. An adult female *Lampropeltis triangulum celaenops* collected in May 1996, 2 mi E of Eunice, Lea Co., New Mexico, USA measured 720 mm SVL and 119 mm tail length. This exceeds the previous record, 641 mm total length (Tennant, A. 1984. The Snakes of Texas. Texas Monthly Press, Austin. 561 p.), by 198 mm. The specimen is deposited in the University of New Mexico Museum of Southwestern Biology, Herpetology Division (MSB 60390). Thanks to Douglas Lynn for providing this specimen.

Submitted by **CHARLES W. PAINTER**, Endangered Species Program, New Mexico Department of Game and Fish, P.O. Box 25112, Santa Fe, New Mexico, 87504, USA and **TOBY J. HIBBITTS**, 602 Hilltop Circle, Wylie, Texas 75098, USA.

MASTICOPHIS FLAGELLUM (Coachwhip). **PREY.** Feeding behavior in the genus *Masticophis* has been studied by Cunningham (1959. Herpetologica 15:17–19), Hamilton and Pollack (1956. Ecology 37:519–526), and Jones and Whitford (1989. Southwest. Nat. 34:460–467). *Masticophis flagellum* is known to take a wide variety of prey (Stebbins 1985. A Field Guide to Western Reptiles and Amphibians. Houghton Mifflin Company, Boston, Massachusetts. 336 pp.; Jones and Whitford, *op. cit.*). Here we report on the active pursuit of the lizard *Dipsosaurus dorsalis* and the finding of *Crotalus viridis* in the gut of *M. flagellum*, two prey not previously reported for this species.

On 7 August 1991 in the western Mojave Desert just north of Barstow (San Bernardino Co., California, USA), we observed a small *Masticophis flagellum piceus* (ca. 100 cm total length) moving slowly upslope while flicking its tongue many times within a few seconds. After the snake progressed forward several cm, it would raise its head 6–8 cm and rapidly and repeatedly strike (4–5 strikes observed seven times) its rostrum into the substrate. After each bout of striking, the snake would raise its head ca. 10–12 cm above the ground and observe the area it had struck. We observed this behavior for 11 min. After the seventh striking episode, the snake, while observing the substrate from the raised position, suddenly lunged forward, narrowly missing a desert iguana (*Dipsosaurus dorsalis*) that flushed from the area of the final striking episode. The lizard ran off with the snake in pursuit. After pursuing the lizard for ca. 5 m, the snake aborted the chase and returned to its previous foraging pattern. These observations occurred at about 1000 h and the air temperature was 40.5°C. The snake was engaged in active pursuit of a lizard at relatively high temperatures, in contrast to the change to sit-and-wait tactics at high temperatures noted by Jones and Whitford (*op. cit.*) in the Chihuahuan Desert.

On 25 April 1996 we found a small (ca. 45 cm TL) decomposing western rattlesnake (*Crotalus viridis oreganus*) in the esophagus of a road-killed adult (140 cm TL) male *Masticophis flagellum ruddocki*, on Mocal Road, 0.2 miles southeast of the junction with Crocker Springs Road, Kern Co., California. We do not know if the rattlesnake was taken alive or eaten as carrion (Cowles 1946. Herpetologica 3:121-122; Small et al. 1994. Herpetol. Rev. 25:28).

Submitted by **STEPHEN P. TABOR**, BioEnvironmental Associates, 4209 Landatos Ave, Bakersfield, California 93307, USA, and **DAVID J. GERMANO**, Department of Biology, California State University, Bakersfield, California 93311, USA.

REGINA ALLENI (Striped Crayfish Snake). **SIZE**. The record total body length for *Regina alleni* is 65.4 cm (Conant and Collins 1991. A Field Guide to Reptiles and Amphibians, 3rd ed. Houghton Mifflin Co., Boston, Massachusetts. 450 pp.). On 1 July 1996, I caught a female *R. alleni* with a total body length of 70.5 cm (SVL = 53.7 cm). She weighed 141.0 g, was not gravid, and no prey items were evident from palping. The snake was captured in a minnow trap, which is part of a standard array of 20 traps. The array is located at Happy Creek Swale (Brevard County, Florida, USA) and is used as part of a long-term monitoring program for amphibians and reptiles of the Kennedy Space Center. Because

the animal is part of an ongoing study, it was given a cohort mark, photographed, and released at the point of capture. Photographs remain in possession of the author. Measurements were verified in the lab by Rebecca B. Smith

Submitted by **JEFFERY P. DEMUTH**, Department of Biological Sciences, Southeastern Louisiana University, Box 814, Hammond, Louisiana 70402, USA.

SONORA SEMIANNULATA (Ground Snake). **ANTIPREDATION.** A *Sonora semiannulata* 30 cm in total length, taken near Mesa, Arizona, USA, was introduced into a terrarium containing a *Micruroides euryxanthus* (Sonoran coral snake), 36 cm in total length, taken in Pinal Co., Arizona. The *Sonora* immediately began to explore the cage. Upon contacting the coral snake, the *Sonora* flung itself wildly as far as possible from the other snake. After a few moments the *Sonora* continued exploring the cage. Three times, as the coral snake detected the rear part of the *Sonora*'s body, it bit that part, but each time the *Sonora* freed itself by a quick jerk. The *Micruroides* eventually secured a firm bite on the *Sonora* about four cm posterior to its head. The *Sonora* thrashed about vigorously, but the coral snake entwined their bodies until they were in a tight ball. Other than a few muscle spasms on the part of both animals, no further movements occurred for several min. Then again the *Sonora* began to struggle violently, untangling itself and resorting to rapid twisting on its own axis. The coral snake nevertheless retained its hold, allowing itself to be dragged around, but was not, however, completely passive during this phase, gradually working its jaws toward the head of its prey by quick, jerky release of its grip and instant purchase of a new grip a short distance in advance. It thus worked its way to a point about 1.3 cm from the prey's head.

Now the *Sonora* executed a remarkable maneuver by gripping itself with its jaws about five cm back of its head, forming a complete loop. The *Micruroides* continued its grip-release-grip advancement over the head of the *Sonora* and around the loop onto its body, whereupon the *Sonora* released its grip upon itself and renewed its struggle to escape. The *Micruroides* continued undeterred its advancement toward the *Sonora*'s head, which again bit itself as before when the coral snake reached its neck. The predator was again "derailed" by the maneuver, and continued on to a third enactment of the scenario, briefly losing its grip before doing so. Upon the fourth enactment, the coral snake chewed violently on the prey's head as it reached that point, whereupon the *Sonora* released its grip upon itself. Instantly its entire head was engulfed by the coral snake, although the *Sonora* continued to writhe vigorously for several min. Only after ingestion of most of its body did the *Sonora* seem to weaken.

The looping behavior of the *Sonora* may be a widespread antiophiophagous resort not only in that genus but also in others that serve as prey for coral snakes and other ophiophages. Behavior similar to this has been observed (pers. obs.) in lizards preyed upon by snakes. Confined to cages, prey are unable to escape, but under natural conditions looping might sometimes be effective in disorienting predators so that prey can take advantage of being released or of having directed the predator to the prey's tail.

Submitted by **VERN VEER**, Denver Zoo, City Park, 2300 Steele Street, Denver, Colorado 80205-4899, USA, **DAVID CHISZAR**, Department of Psychology, University of Colorado, Boulder, Colorado 80309, USA, and **HOBART M. SMITH**, Department of EPO Biology, University of Colorado, Boulder, Colorado 80309,USA.

TANTILLA HOBARTSMITHI (Southwestern Black-headed Snake) and ***TANTILLA NIGRICEPS*** (Plains Black-headed Snake). **COLORATION.** Reports of albinism in snakes are common in the herpetological literature. Hensley (1959. Michigan St. Univ. Biol. Ser. 1:135–159) reported albinism in 16 species, Dyrkacz (1981. Recent instances of albinism in North American amphibians and reptiles. SSAR Herp. Circ. 11:1–31) reported on 28 species, and Bechtel (1995. Reptile and Amphibian Variants Colors, Patterns, and Scales. Krieger Publ. Co., Malabar, Florida. xvii + 206 pp.) illustrated 27 species.

On 5 July 1996 we (BRT, JHG) collected an adult *Tantilla hobartsmithi* (SVL 154 mm, tail 57 rnm, 1.7 g), a partial albino with erythrophores (Dyrkacz, *op. cit.*). This snake was collected from a 18.9 L pitfall trap placed along a road in Guadalupe Canyon, ca. 1.1 rd km E the New Mexico/Arizona state line, Hidalgo Co., New Mexico, USA. In life the eyes and tongue were bright pink. The dorsal coloration was cinnamon (Color 39) and the ventral color was peach red (Color 94) (Srnithe 1975. The Naturalist's Color Guide. Am. Mus. Nat. Hist., New York). The specimen was deposited into the Division of Herpetology, Museum of Southwestern Biology, University of New Mexico (MSB 60389).

A search of the MSB collection yielded two additional partial albino *Tantilla*. MSB 26019 is an adult male *T. nigriceps* (SVL 177 mm, tail 52 mm). This specimen was collected on 11 May 1973 by S. Ivey, ca. 1 air mi N New Mexico Hwy 44 bridge over the Rio Grande, Sandoval Co., New Mexico. The specimen is completely pink in preservative with no differentiation of color on the dorsal or ventral surfaces. The eyes and tongue are pink. MSB 38536 is a juvenile (sex undetermined) *T. hobartsmithi* (SVL 87 mm, tail 26 mm) collected on 20 April 1980 by B. Pietruszka from 27 km N and 1.6 km E of Whites City (T22S R25E SW1/4 SS1/4 Sec 1), Eddy Co., New Mexico. The specimen is a pale straw-color in preservative. There is a small, faded, light-brown spot that covers the posterior edge of the parietals, and no differentiation of color on the dorsal or ventral surfaces is evident. It is likely that both preserved specimens have faded somewhat in preservative. This is the first report of albinism in the genus *Tantilla* (Dyrkacz, *op. cit.*).

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Gyalopion quadrangulare (Desert Hooknose Snake). Illustration by Dan Holland.