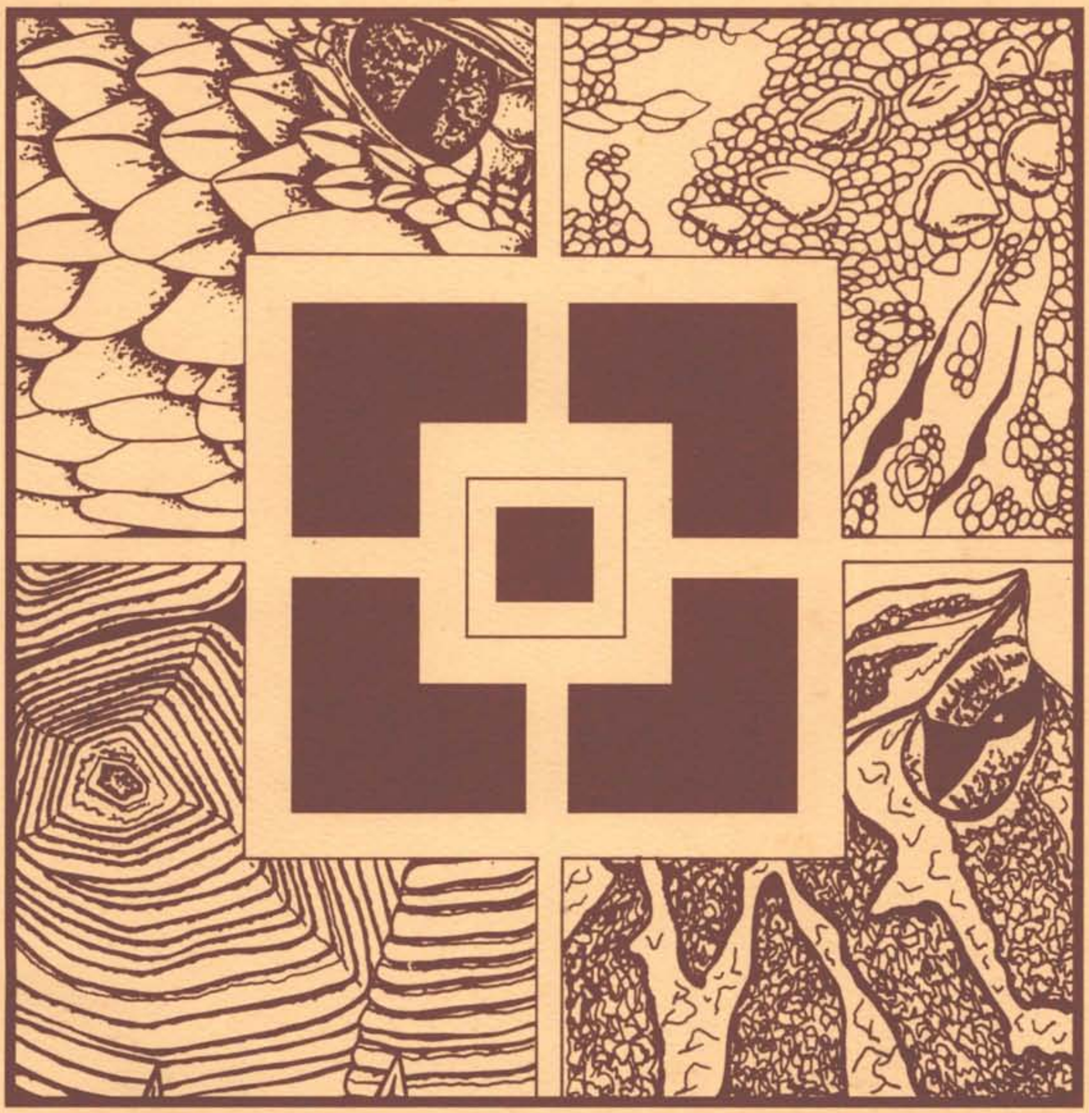
Herpetological Review



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The Society for the Study of Amphibians and Reptiles

Volume 23, Number 1 — March 1992

SOCIETY FOR THE STUDY OF AMPHIBIANS AND REPTILES

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

ANNUAL DUES 1992

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1992 SSAR MEETING HIGHLIGHTS

Dates: 2-6 August 1992.

Place: University of Texas at El Paso (El Paso, Texas).

Co-host: El Paso Community College.

Co-sponsor: Sociedad Herpetología Mexicana.

Keynote Lecture: "A Random Walk Among the Anura," concerning the evolution and phylogenetics of frogs, by Linda R. Maxson (Pennsylvania State University).

Symposium: "Chelonian Systematics, Evolution and Zoogeography." *Organizers:* Edward O. Moll and John Carr. *Speakers:* John Bickham, Brian Bowen, John Carr, Charles Crumley, Brian Hanks, J. Alan Holman, John Iverson, John M. Legler, Jeff Lovich, Samuel B. McDowell, Peter Meylan, Pat Minx, Edward O. Moll, Anders G. J. Rhodin, and Roger Conant Wood.

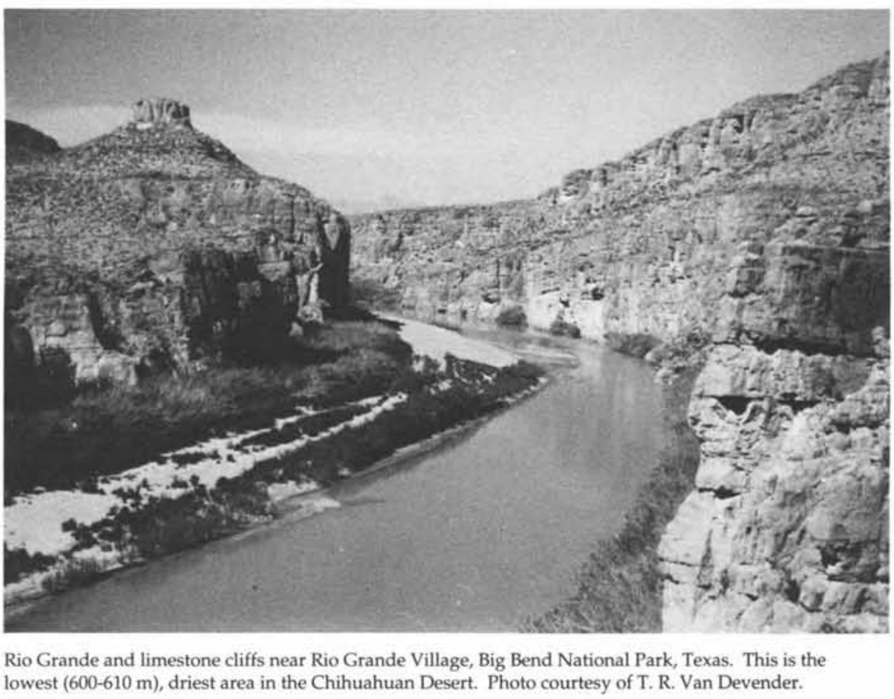
Symposium: "Conservation of Amphibians and Reptiles." *Organizers:* Tom R. Johnson and Paul Moler.

Herpetological Travelogue Slide Shows: James R. Dixon (Venezuela), Aaron M. Bauer (Pacific Ocean and Australia), Aurelio Ramirez-Bautista (México), and Edward O. Moll (Turtles of South Asia).

Oral and Poster Presentations: Several concurrent sessions each day.

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

Herpetological Art Show: A juried herpetological art show, at the Centennial Museum. $200 awards in each category: Best Painting, Best Drawing, Best Photo, and Best Sculpture. (Entry Form in the December 1991 *Herpetological Review*, p. 108).



Rio Grande and limestone cliffs near Rio Grande Village, Big Bend National Park, Texas. This is the lowest (600-610 m), driest area in the Chihuahuan Desert. Photo courtesy of T. R. Van Devender.

Audiovisual Shows: "Herps of the West," "Amphibians of the Appalachians" (updated), and "Herpetology Past and Present."

Field Trips: Chihuahuan Desert Research Institute in Alpine, Texas, including a BBQ cookout. Trips to Franklin Mountains Wilderness State Park (hiking trip) or an all-day visit to Indio Mountains Research Station.

Social Activities: Welcoming Reception; "Fajita Fiesta"; the annual SSAR Auction; trip to Ciudad Juarez, México (optional).

Live Exhibit: Collection of local and southwestern amphibians and reptiles, arranged by the El Paso Herpetological Society and Chihuahuan Desert Herpetological Society (set-ups for photography will be provided).

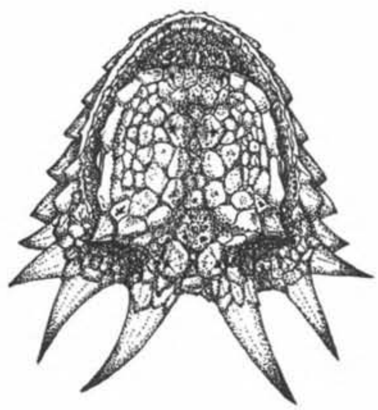
Regional Herpetological Societies Conference: "Federal and State Wildlife Laws and Regulations and How They Affect Regional Herpetological Societies." *Organizer* Eric M. Rundquist.

Toad (horned) burgers—a gastronomic highlight and conservation lowpoint to mark annual SSAR meeting. Photo courtesy of T. R. Van Devender.

Costs: Registration fee, regular $60, students $35. Housing: On campus dormitory $15 per night single, $8 per night double; Off campus hotels, ranging from $40 to $55 per night (details in Meeting Announcement to be mailed to SSAR members in March 1992).

Further details in the December 1991 issue of *Herpetological Review* (pages 107-109) or on request from Carl S. Lieb, Department of Biological Sciences, University of Texas at El Paso, El Paso, Texas 79968-0512, USA *(Telephone 915-747-5844)*.


Succulent desert scrub with ocotillo, blind prickly pear, and chino grass on limestone slopes near Rio Grande Village. Photo courtesy of T. R. Van Devender.



SSAR BUSINESS

SSAR Election Results

Results of the recent SSAR election are as follows:

President-elect (to serve as president for 1993): Thomas H. Fritts.

Secretary: J. Eric Juterbock (unopposed).

Treasurer: Douglas H. Taylor (unopposed).

Directors: Robin M. Andrews, Bern W. Tryon.

SSAR El Paso Meeting— Conservation Symposium Announcement and Extended Call for Papers

This is the third Conservation Symposium announcement to appear in HR and extends the deadline for abstracts until 15 June 1992. The SSAR Conservation Committee is planning a one-day symposium dedicated to conservation efforts for amphibians and reptiles. A number of papers have been selected but fall short of the number needed to warrant a one-day session.

The Conservation Symposium will be devoted to specific topics such as the conservation of taxonomic groups (sea turtles, iguanid lizards, high elevation frogs), regions (desert, rain forest, wetlands), and conservation/management methodology. Papers of particular interest will be those dealing with "hands on" projects directly related to habitat improvement, mitigation, reproductive enhancement, and restocking or relocation of rare or endangered amphibians and reptiles.

To be considered for participation in the Symposium at the El Paso meeting, send a typed abstract (200-300 words) with a cover letter, by 15 June 1992, to:

Tom R. Johnson
Herpetologist
Missouri Department of Conservation
P.O. Box 180
Jefferson City, Missouri 65102-0180, USA.

Notice: Request to Amend Constitution

The SSAR Board expects to discuss amending the Constitution and Bylaws to make them gender-neutral at the Board and Business Meetings conducted at the 1992 Annual Meeting in El Paso, Texas, 2-6 August.

New Regional Society Section Editor for HR

The new Section Editor for Regional Society News is Eric Rundquist. Information concerning regional society news, activities, address changes, etc. should be sent to him (address on inside front cover).

IN MEMORIAM

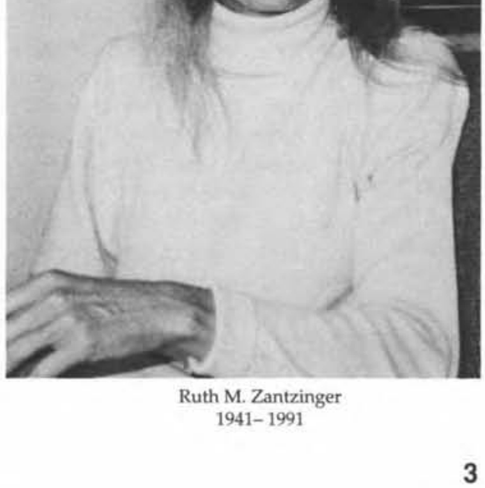
Ruth M. Zantzinger

On 8 November 1991 the herpetological community lost one of its most ardent and beloved members, Ruth M. Zantzinger, of Philadelphia. Ruth lost her fight against a hepatic carcinoma which was diagnosed late in September 1991. Many were stunned by the suddenness of Ruth's passing and deeply saddened for the loss to SSAR and the herpetological community, for Ruth had truly become, in the words of one colleague, the "Grand Lady of the Society."

A self-taught biologist and herpetoculturist, Ruth attended many national and regional meetings, and participated in numerous workshops and field trips. The national conferences of the American Association of Zoological Parks and Aquariums (AAZPA) and the International Herpetological Symposium (IHS) allowed Ruth to become acquainted with prominent leaders of the zoo and husbandry communities across the country. Thus, she aptly described her professional role as a liaison person between zoos, museums, and universities for programs in herpetological research and education. Her favorite, and the one professional society with which Ruth was most closely allied, was SSAR. The 1983 SSAR/HL meeting in Salt Lake City, Utah, was the first national herpetological meeting Ruth attended, and this was to become the main meeting she subsequently would look forward to attending with great excitement.

Ruth Barnes Mull was born in Philadelphia on 2 June 1941, the only daughter and second child of John Barnes Mull of Philipsburg, Pennsylvania, and Helen Carlin of Philadelphia. Ruth is survived by her mother, four children, two grandchildren, her brother, sister-in-law, and six nieces and nephews. Following a memorial service, a reception was held in the Library of The Academy of Natural Sciences of Philadelphia, attended by a large number of Ruth's friends and colleagues. The reception was a fitting tribute to Ruth who was tremendously committed to the Academy. For years she volunteered her considerable intellect and organizational skills to support the Academy's scientific and educational missions.

After attending high school at Notre Dame Academy in Philadelphia from the first grade through her graduation in 1958, Ruth enrolled at Rosemont College, outside Philadelphia, and at Catholic University in Washington, D.C., majoring in drama. In 1960, when she was nineteen years old, Ruth married an ethno-



Ruth M. Zantzinger
1941– 1991

graphic film-maker, and over the next several years she traveled to many countries in Asia and Africa on filming excursions. During one of these trips, Ruth's first-born daughter was taken fatally ill and was interred in Malaysia. Following her divorce in 1977, Ruth raised her four additional children, born between 1963 and 1970, in a rural house in Chester County, southeastern Pennsylvania.

Ruth was a master at working with people in a number of civic and service organizations. In 1990, she was elected Chairperson of the Womens' Committee of The Academy of Natural Sciences, and she effectively gave it leadership and coordinated its large membership. The Womens' Committee is an active organization of women volunteers that plans and sponsors a number of fund-raising events on behalf of the Academy's scientific programs. In Philadelphia, one of the largest and most successful of the annual events put on by the Womens' Committee is "Super Sunday," a day-long street fair held in October along the beautiful Benjamin Franklin Parkway and which the *New York Times* in the late 1970s described as "the nation's biggest block party." In 1991, as she had for several years since 1982, Ruth led the planning committee for "Super Sunday" and was instrumental in conducting the business negotiations that made it a success, both for the people of all racial and ethnic groups that attended and the City of Philadelphia, and for The Academy of Natural Sciences.

Another of Ruth's dedications was her volunteer work at the Zoological Society of Philadelphia. Her membership in the Docent Council, where she conducted many guided tours of the Philadelphia Zoo for the public, made her well versed in the natural history and behavior of vertebrates. In recent years, she devised training classes on the biology of amphibians and reptiles for new docents at the zoo. In late October 1991 Ruth received a rarely-awarded commendation by her peers for outstanding service to the Docent Council and to the Zoo. Each Saturday since 1981, whenever she could squeeze in a few hours during times when staff were not in evidence and she could work uninterrupted, she made entries into the animal ledgers. These large books contain historical data on every specimen of every species that became a part of the Philadelphia Zoo's animal collection from around 1874 to the present, and the modern ledgers are used to report pedigree data for global management. Ruth continued a long tradition by restoring beautiful handwriting to the ledgers, but more importantly she made many taxonomic and indexing revisions to them.

Within SSAR, Ruth served as a member of the Zoo Liaison Committee for several years. She presented the results of her survey of zoo snakebite procedures on behalf of the committee at the Missouri meeting in 1986. For the past three years she held the position of Elector, a presidential appointment. She showed eagerness and dedication in her committee work and in voluntarily attending many of the annual Board of Directors' meetings, a classic example of the society's openness in welcoming contributions from the full breadth of its membership. Although she did not have the usual academic credentials that would be considered the norm for entry to positions of responsibility in a scientific society, SSAR later entrusted her with the very heart of its democratic traditions in appointing her as Elector.

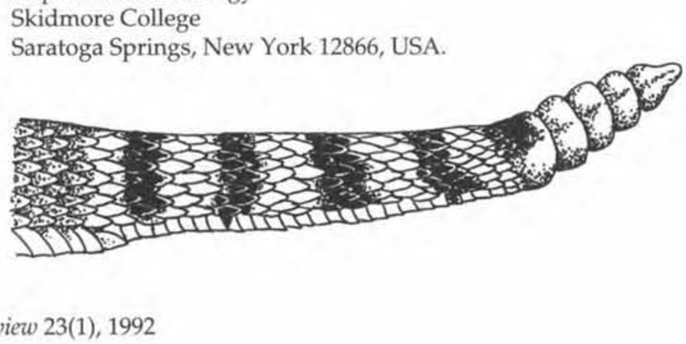
A straightforward and honest person, Ruth quickly won the affections of many who would become her most loyal friends. Half amused by this quality in herself, and somewhat proudly complaining of it, when her young nephew and his friend brought home some spring salamanders they had caught in a small stream and the boys begged Ruth to go salamander hunting with them, she said "*Why is it that 14-year old boys are always wanting me to go out in the woods with them? It's been like that all my life!*" Indeed, Ruth had the rare quality of being able to establish a close rapport with nearly everyone whom she respected, young and old alike.

Ruth especially looked forward to SSAR's annual meeting in August of each year. Her contribution to the Society's auction was her most public activity, yet the word 'auction' does not begin to convey the great social extravaganza that these events have become at the annual meetings. As the co-organizer with the auctioneer, Ruth was an elegant hostess, unafraid to take charge in the limelight. She purposely dressed beautifully and was attractively visible to the large gathering of assembled herpetologists. Far beyond her public visibility, however, she devoted much time to pre-selecting the order of items, assisting in displaying them, and, with her typical good humor, elevating the auction to an EVENT. Ruth frequently prepared little prompt cards for various items to be auctioned, and her rapport with the auctioneer was such that she often had only to write a single word on the card to clue Joe Collins as to how best to extract money from the somewhat besotted and pliable audience. Her suggestions (e.g., using credit cards, relegating small duplicate items to a "silent auction," having plenty of beer flowing throughout the evening) accounted in no small way for its technical improvements as well as its success as a major fund-raising event for the Society.

Completing yet another important project for the herpetological community, in 1987 Ruth began compiling an index to the international quarterly publication, *Herpetological Review*. This task, begun innocently enough with her co-author George Pisani, was to consume much of her "spare" time over four years. The publication, *General Index to Herpetological Review*, will be published in 1992. Her work on the *Index* was to her an adventure in which she could learn while performing a useful task in a field she loved. The meticulous nature of the work soon became all too apparent, and as Ruth eschewed computers she carefully hand-typed all records on some 3500 index cards.

Ruth Barnes Mull Zantzinger is loved deeply by her family members and many close friends, and we miss her dearly. Her loss has been devastating in its untimely prematurity. She is irreplaceable. Ruth was warm and joyous, and had a wonderful sense of humor. Who could not recall Ruth's hearty laughter whenever an irreverent comment might have been made by a speaker, and later that same unmistakable laugh as she mingled through the crowd at the evening social functions? Her generosity was appreciated by those to whom she gave her level-headed and candid analyses, donations of material goods, or even financial assistance, in some cases. In mid-October 1991, just weeks before her passing, she displayed her inner strength and her realistic, direct approach to her illness when she wrote: "*I am very much at peace with all of this. I have had a life full of everything and find very few days without some small treasure in them. My regrets are few and I certainly don't feel cheated in any way.*" Ruth's deep sense of loyalty to others, her caring about people and about what they did, and her remarkable courage through her final illness serve as model guideposts for our own lives.

WILLIAM S. BROWN
Past President (1990), SSAR
Department of Biology
Skidmore College
Saratoga Springs, New York 12866, USA.



NEWSNOTES

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

The Department of Herpetology has established a program that provides limited financial aid to graduate students who wish to visit our collections to support their research in systematics.

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

For this fiscal year only, proposals will be due on 15 April, 1992, and grantees will be notified by 15 May, 1992. Grantees will be expected to complete their Academy visit by 15 September, 1992. Proposals submitted for ensuing academic years will be due on 15 October, with notification by 1 December.

Send proposals to:

Herpetology Research Grants
Department of Herpetology
California Academy of Sciences
Golden Gate Park
San Francisco, California 94118-4599, USA
Tel. (415) 750-7037.

Request for Assistance

We are investigating the genetics of threatened populations of black rat snakes (*Elaphe o. obsoleta*) and eastern massasauga rattlesnakes (*Sistrurus c. catenatus*) in Ontario in order to develop appropriate genetic management strategies. Our findings will be of direct value to resource managers and conservation biologists concerned with recovery or protection of these species.

For comparative purposes we require blood samples from populations located outside Ontario. We wish to hear from persons able to assist us in the field collection of blood or identification of local populations. For further information please contact:

Kent Prior
Department of Biology
Carleton University
Ottawa, Ontario K1S 5B6 Canada
Tel. (613) 788-2600 ext. 3862
(613) 230 5991.

MEETINGS

Turtle and Tortoise Symposium

The New York Turtle & Tortoise Society will sponsor the Second International Symposium on Turtles & Tortoises: Conservation and Management, to be held in August 1992.

The three-day event will include lectures and workshops by turtle scientists, conservationists, zookeepers, and veterinarians from all over the world. There will also be a room for vendors.

For further information, contact the Society at (212) 459-4803 or write to 163 Amsterdam Avenue, Suite 365, New York, New York 10023, USA. All persons requesting information on the Symposium will be put on a special mailing list to be notified when details are final.

II Congreso Luso-Español y VI Congreso Español de Herpetologia

The Second Portuguese and Spanish Meeting and the Sixth Spanish Meeting on Herpetology will be held in the city of Granada (southern Spain) 24-27 September 1992, under the auspices of the Spanish Herpetological Society (A.H.E.). It will include plenary lectures, posters, and working groups concerning amphibians and reptiles, mainly of the western Mediterranean area.

On the final day, a full-day excursion will be arranged to the Sierra Nevada Natural Reserve. We may travel by four-wheel drive vehicles, climbing to more than 3,000 m above sea level.

We will welcome anyone working on or interested in Iberian and Mediterranean herptiles. Persons interested in making paper or poster presentations should correspond with the organizing committee by 30 March 1992. Please send your name, address, institution, type of presentation (oral and/or poster) and title(s) to:

Dr. J. M. Pleguezuelos (Organizing Committee)
Departamento de Biología Animal
Facultad de Ciencias
Universidad de Granada
18071 Granada, Spain
FAX: 34-58-243238.

15th Annual All Florida Herpetology Conference

The All Florida Herpetology Conference will be held on 18 April 1992 on the campus of the University of Florida at Reitz Union Auditorium. The Conference is cosponsored by the Florida Museum of Natural History and the Gainesville Herpetological Society. Speakers include David Chiszar (University of Colorado, Boulder), James Gillingham (Central Michigan University, Mt. Pleasant), William Haast (Punta Gorda, Florida), Dale Marcellini (National Zoological Park), Sherman A. Minton, Jr. (Indiana University Medical Center, Indianapolis), Edward Moll (Eastern Illinois University), Ron Tremper (Reptile Breeding Center, Inc., Fresno, California), Trooper Walsh (National Zoological Park), and Peer Zwart (University of Utrecht, The Netherlands).

Other events include a panel discussion, exhibition and sale of herpetological books, art, etc., a workshop for young herpetologists, and an evening barbeque and auction at the Florida Museum of Natural History. For registration material or additional information, contact:

David Auth
Division of Herpetology
Florida Museum of Natural History
University of Florida
Gainesville, Florida 32611, USA
Tel. (904) 392-1721.

Symposium on Eastern Massasauga

Metro Toronto Zoo is hosting a two day International Symposium and Workshop on the Conservation of the Eastern Massasauga Rattlesnake, 8-9 May 1992. Papers on conservation, status, and field research will be presented from all states and provinces within the range of this threatened species. Keynote speaker will be a European researcher who will provide an update on similar conservation programs for viperids in Europe. A post conference trip to view *Sistrurus catenatus catenatus* in the wild is planned. The workshop will address the international conservation efforts required to protect populations throughout the range in Canada and the U.S.

Papers are solicited. For further information contact Bob Johnson, Curator of Amphibians & Reptiles, Metro Toronto Zoo, P.O. Box 280, West Hill, Ontario, Canada M1E 4R5, Tel. (416) 392-5968, FAX (416) 392-4979.

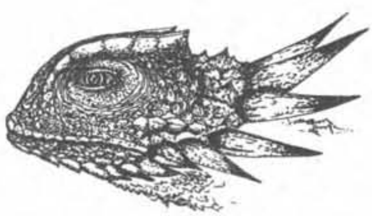
REGIONAL SOCIETIES

International Iguana Society

The International Iguana Society (IGS), a non-profit corporation filed with the Secretary of State of Florida, is dedicated to the preservation of the biological diversity of iguanas. Many species of iguanas are in immediate danger of extinction, especially the West Indian rock iguanas of the genus *Cyclura*. IGS believes that the best way to protect iguanas and other native faunas and floras is to preserve natural habitats and encourage the development of sustainable economies, i.e., those compatible with the maintenance of biodiversity. IGS hopes to influence and help governments and agencies to protect the unique natural heritage of the West Indian region before it is lost. They also hope to garner the support of other conservation groups and the scientific community to accomplish their mission. IGS encourages the dissemination and exchange of information of all aspects of the ecology, population biology, behavior, captive husbandry, taxonomy, and evolution of iguanas.

Membership dues are $25 US Regular and $30 US Organizational. Dues support active conservation projects and members receive a subscription to the *Iguana Times*, a quarterly newsletter. Those interested in joining IGS or receiving information about the group should contact:

International Iguana Society
Finca Cyclura
Route 3, Box 328
Big Pine Key, Florida 33043, USA
Tel. (305) 872-9811.



LEGISLATION & CONSERVATION ALERT

This column serves to update the herpetological community on the regulatory status and protection measures implemented for rare, threatened, and endangered herps. We are in need of more information, especially at state and regional levels. Please send pertinent information to the Section Editor.

The following final and/or proposed listings, regulations, and general information have been announced by governmental regulatory agencies. Pertinent Federal Register (FR) citations are given for U.S. notices.

USA, Virginia: *Crotalus horridus atricaudatus* (canebrake rattlesnake). On 1 January 1992, the Virginia Department of Game and Inland Fisheries (VDGIF) listed the subspecies as Endangered. *Clemmys insculpta* (wood turtle), *Ophisaurus ventralis* (eastern glass lizard), *Ambystoma mabeei* (Mabee's salamander), and *Hyla gratiosa* (barking treefrog) were listed as Threatened by VDGIF on 1 January 1992. All five threatened species have restricted geographical ranges within Virginia and all are suffering reductions in populations and loss of habitat due to development. For further information contact the Virginia Department of Game and Inland Fisheries, 4010 West Broad Street, Richmond, Virginia 23230, USA.

USA: *Clemmys marmorata* (western pond turtle) and *Rana aurora draytoni* (California red-legged frog). The U.S. Fish and Wildlife Service, Region 1, Portland, Oregon has been sent a petition from Dan C. Holland, Mark R. Jennings, and Marc P. Hayes to list *R. aurora draytoni* as federally Endangered throughout its range and *C. marmorata* as federally Endangered in Washington, Nevada, Oregon (Columbia, Willamette, and Klamath drainages), and California (Klamath River downstream to confluence with Scott River, Clear Lake drainages, Central Valley drainages from Mokelumne River south, Mojave River and all desert drainages, and all southern California drainages including the Santa Clara River and south), and as federally Threatened in Oregon (Umpqua, Rogue, and coastal drainages) and California (Klamath River from downstream of Scott River confluence, all north coast drainages, Central Valley drainages from Mokelumne River north, all non-Central Valley drainages from San Francisco Bay south to Santa Clara River). For further information contact: Dan C. Holland, 2310 Alturas, Bakersfield, California 93305, USA.

USA: *Conraua goliath* (goliath frog). The U.S. Fish and Wildlife Service proposes to determine Threatened status for the goliath frog of Central Africa. This amphibian is rare and narrowly distributed, and is threatened by habitat loss, commercial trade, and local hunting. If listed, permits would be available to enhance propagation or survival of the species and for scientific purposes that are consistent with the purposes of the Endangered Species Act of 1973 (FR 56, no. 177, 12 September 1991, pp. 46397-46400).

Japan: *Eretmochelys imbricata* (hawksbill sea turtle). Japan has agreed to end all hawksbill imports by 31 December 1992, and to sharply reduce its imports until that time (Endangered Species Tech. Bull. 16, nos. 7-8, July/August 1991).

USA: The U. S. Fish and Wildlife Service has produced an updated compilation of amphibian and reptile taxa native to the United States that are being reviewed for possible addition to the List of Endangered and Threatened Wildlife under the ESA (FR 56, no. 225, 21 November 1991, pp. 58804-58836). In revising this compilation the USFWS relied on information from status surveys, State Natural Heritage Programs, other State and Federal agencies, knowledgable scientists, and comments received in response to previous notices of review. Taxa are assigned to one of several categories. For example, C1 = taxa for which there is substantial information on biological vulnerability and threats to support proposals to list them as Threatened or Endangered; C2 = taxa for which information indicates that proposing to list them as Threatened or Endangered is probably appropriate; 3C = taxa that have proven more abundant or widespread than previously believed, but may be re-evaluated for C1 or C2 status if declines are documented; 3A = taxa for which the USFWS has persuasive evidence of extinction.

TABLE 1. Number of species and subspecies of amphibians and reptiles native to the U.S. that are being reviewed for possible addition to the List of Endangered and Threatened Wildlife under the Endangered Species Act of 1973.

	C1	C2	3C	3A
Salamanders	2	35	1	0
Anurans	3	20	0	2
Lizards	1	24	0	0
Turtles	1	12	0	0
Snakes	3	29	0	0
TOTAL	10	120	1	2

Grand Total = 133 taxa

The SSAR Conservation Committee strongly urges those herpetologists with conservation interests to obtain a copy of the above mentioned Federal Register and scan it for taxa of interest. The USFWS hopes that their review notice will encourage necessary research on vulnerability, taxonomy, and/or threats for these taxa. Federal Register vol. 54, 6 January 1989, pp. 554-579 contained the previous review of this list.

KURT A. BUHLMANN
SSAR Conservation Committee.

Gopher Tortoise Council Initiates Upland Habitat Protection Project

The Gopher Tortoise Council, a conservation organization based in the southeastern United States, has launched an effort to protect the Southeast's rapidly disappearing xeric upland habitats. Host to an array of uniquely adapted reptilian, mammalian, and avian faunas and floras, these dry, well-drained sandy habitats are sought equally by development, agriculture, forestry, and mining interests. Although the Council's activities focus on the gopher tortoise, the organization's goal is to preserve the entire spectrum of plants and animals—from scrub morning glories to fox squirrels and indigo snakes—in these native upland communities.

Gopher tortoises belong to a group of land tortoises that originated almost 60 million years ago in North America. Of the 23 species that once existed on our continent, only four are alive today; the gopher tortoise (*Gopherus polyphemus*) is the only species found in the eastern United States. Gopher tortoise populations are scattered throughout the southeastern coastal plain from South Carolina to Florida and west to Mississippi. The highest concentrations are located in north-central Florida and southern Georgia. Gopher tortoises have been greatly reduced throughout their range; in Florida alone populations have dwindled to an estimated 30% of their historical levels.

The burrow system of the gopher tortoise provides refuge to more than 360 other species of animals. For this reason, the gopher tortoise has been designated as a keystone species in upland communities. Other reptilian species such as the eastern indigo snake (*Drymarchon corais couperi*), gopher frog (*Rana areolata*), and short-tailed snake (*Stilosoma extenuatum*) are on state and federal threatened or endangered species lists due to severe declines in their numbers, resulting from destruction of their habitat. Although a decade of effort by the Council has given the gopher tortoise legal protection in the six states in which it occurs, neither federal nor state laws protect the habitat on which the tortoise and hundreds of other species depend for survival. The delusion that legal protection of animals implies species preservation is epitomized by continued decline of tortoise populations.

In the face of this threat, the Council has created the Upland Habitat Protection Project (UHPP), the only land conservation effort which specifically targets uplands. The central focus of the UHPP is to identify and monitor specific upland sites most in need of preservation. The UHPP will coordinate a region-wide inventory effort that will culminate in the production of a list of priority sites in need of protection. The Council will prepare proposals to submit to agencies and organizations which have funds earmarked for environmental land acquisition. In Florida alone, more than $600 million per year are potentially available for this. The Council will work closely with state natural heritage programs, governmental agencies, academic institutions, and private individuals to provide a comprehensive review and analysis of existing information, which will be supplemented by focused field investigations.

GTC is seeking additional contributions in any amount from individuals and organizations. These funds will subsequently be used to solicit matching funds from appropriate agencies. Tax-deductible donations may be sent to the Gopher Tortoise Council c/o 1018 Thomasville Rd. Suite 200-C, Tallahassee, Florida 32303, USA. For additional information or a copy of GTC's brochure, contact Leslie HaySmith at the above address (tel. 904/224-8207).

ARTICLES

Intraspecific Oophagy in Stream-breeding California Newts (*Taricha torosa*)

The jelly coat on the egg mass of many aquatic breeding salamanders is thought to protect developing embryos from predation (Semlitsch 1988, Ward and Sexton 1981). In addition to having a firm jelly coat, eggs of California newts (*Taricha torosa*) are believed to be unpalatable to many predators because they contain a potent toxin (Buchwald et al. 1964, Mosher et al. 1964). Two studies have shown that pond-breeding adult California newts will cannibalize newly deposited egg masses (Kaplan and Sherman 1980, Marshall et al. 1990). While studying the microsite (runs, riffles, or pools) oviposition preferences of female newts in a California stream, we documented oophagy by adult newts over a five week period.

Our study site is a first order stream in the Santa Monica Mountains (Los Angeles Co., California). This is a fishless, perennial stream. We began weekly surveys of a 1.5 km stretch of the stream for adults and egg masses on 25 March 1991. Breeding adults were observed on the first week in April and egg masses were present by the second week in April. No new egg masses were observed after 25 April. Although the stream consisted of runs, riffles, and pools, most oviposition occurred in stream pools (unpublished data). We carefully counted the number of egg masses in seven stream pools between 1 and 10 May and compared these data to the number of masses present in the same pools five weeks later (masses counted between 10-12 June) just as larvae were hatching. A few larvae had hatched from some masses. Pools were small (generally $<10 m^2$). Adults and egg masses were relatively easy to observe and count. On 11 visits to the stream between 1 May and 21 June we recorded and observed all oophagic events. In addition, we used water lavage to examine the stomach contents of 15 adult newts between 6 and 17 June.

We observed adult newts feeding on newt egg masses on five occasions. We observed one adult preying on egg masses on 8 May, 6 June, and 10 June. On 18 June six adults were observed in a pool and three of the six were observed eating eggs. On 21 June nine adults were observed in a stream pool and four individuals consumed egg masses. All masses being eaten contained embryos and all embryos were Harrison stage 38 or older. Between 6 June and 17 June, we flushed the stomachs of 15 adult newts and found newt embryos or egg mass remnants in six of them. Sexes of the animals were difficult to determine since by this time of the year adults had lost their conspicuous secondary sex characteristics. We elected not to sacrifice any animals for sex determination.

We found a significant reduction in the number of egg masses present in the seven stream pools between May and June (paired t-test, $t=3.46$, $P=0.013$, $df=6$; Table 1). Although hatching had begun in some egg masses there were no empty egg masses (where hatching was complete) found in the June survey even in sections of the stream that did not contain adult newts. Thus, all masses consumed by the adults likely contained embryos.

The significant reduction in egg masses in stream pools was likely caused by oophagic adults. In over 40 different visits to the stream pools in the spring and summer no other egg mass predators were observed in the stream. *T. torosa* egg mass jelly is very firm and appears to be quite resistant to predation by stream invertebrates (unpublished data). Invertebrates in this stream are capable of damaging the egg masses, but there is no indication that they are capable of completely removing egg masses. Stream current in May and June was 20-25 l/min and was incapable of dislodging attached egg masses or even relocating the few masses that were unattached.

TABLE 1. A comparison of the number of California newt egg masses present in stream pools in May, 1991 and five weeks later.

Pool #	# masses in May	# masses in June
1	30	13
2	5	2
3	43	30
4	50	20
5	5	0
6	7	1
7	45	34

Although oophagy is apparently not rare in amphibians (see for example Baldauf 1947, Marshall et al. 1990, Wood and Clarke 1955), previous observations on pond-breeding *T. torosa* noted that oophagy only occurred within a few hours after oviposition and before egg mass jelly hardened (Kaplan and Sherman 1980, Marshall et al. 1990). In addition, adults typically leave the aquatic habitat soon after breeding (Stebbins 1972). In our stream system, adults stayed in the stream long after breeding and oophagy occurred throughout the developmental period. Egg masses were still being consumed six to seven weeks after oviposition. Our direct observations of oophagy revealed that adults are very persistent in ripping off pieces of egg mass. Adult newts were observed biting egg masses and then completely twisting their bodies in attempts to tear off portions of the masses.

Given that cannibalism was observed in 45% of the visits to the stream (5 occasions out of 11 visits) and stomach flushes produced remnants of egg masses or larvae 40% of the time, we feel that cannibalism is a strong selective force on this population of California newts. In subsequent years we will investigate variation between adult tendencies to cannibalize and whether oophagic adults can discriminate between their own eggs and eggs that are unrelated. Since causes of cannibalism are often uncertain or varied (Polis and Myers 1985), we plan to continue tracking potential changes in the intensity of cannibalism with each breeding season.

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Observations on the Tolerance to Freezing by the Lizard, *Sceloporus grammicus*, from Iztaccihuatl Volcano, México

Five species of vertebrates (four anurans and one turtle) are known to tolerate intercellular freezing during winter by producing cryoprotectant chemicals (Storey and Storey 1988, Storey et al. 1988). Recently, freeze tolerance was reported in the lizard, *Podarcis muralis* (Claussen et al. 1990). We provide preliminary observations on the freeze tolerance in a high altitude lizard, *Sceloporus grammicus* from the slopes of Iztaccihuatl Volcano on the border between the states of Puebla and México, México.

On 29 June 1991, seven adult specimens of *Sceloporus grammicus* (collected at 3600 m in the Campo Experimental Forestal de San Juan Tetla, Puebla, 17 km W of San Felipe Teotlatzingo) and seven specimens (one juvenile and six adults) of *S. mucronatus* (from 3000 m altitude from KM 41 on Mex. Hwy. 15, Edo. de México) were placed in a home freezer (ca. 0°C) to kill them prior to preservation. The following day (after 28 h) the specimens were removed from the freezer. They appeared solidly frozen, some ice was evident on the external body scales, but after approximately one half hour of warming at room temperature (25°C), movement was noticed among the *Sceloporus grammicus*. After thawing completely, all seven *S. grammicus* were alive and active whereas all *S. mucronatus* were dead.

Additional preliminary experiments were conducted with *S. grammicus* to substantiate these field observations. Specimens from the Iztaccihuatl Volcano location were collected (14 August 1991) and transported to Lincoln, Nebraska. On 6 September 1991, four *S. grammicus* (two adult males, 52 and 55 mm SVL, and two adult females, 47 and 49 mm SVL) were placed in a freezer at -2.5°C for 37 h. These specimens were checked periodically during this time and all appeared to have frozen solidly within a few hours. Upon removal from the freezer, these lizards warmed rapidly (5-10 min) while being held, and all survived. Three additional specimens (two adult males and one adult female) were placed in a freezer at -6.5°C until solidly frozen. After 3 h these specimens were removed from the freezer to thaw; none survived. On 27 October, after approximately ten weeks in captivity, two of the above males were placed in a freezer at -1.7°C and survived for 32 h and then at -2.3°C; these two survived to 6 h but were dead at 20 h.

These observations are consistent with the general phenomenon of freeze tolerance reported in vertebrates (Storey et al. 1988). *Sceloporus grammicus* naturally encounters freezing temperatures frequently during the year. We recorded (with max-min thermometers) temperatures as low as -3°C in the summer of 1991 at a high altitude site of 4400 m on Iztaccihuatl Volcano where population studies are underway. Temperatures of 0°C were recorded twice at 3600 m where the above specimens were collected between late May and late August (typically the hottest months of the year). Because *Sceloporus grammicus* may be exposed to frequent low temperatures its tolerance to freezing is not surprising.

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POINTS OF VIEW

Commentary on a Proposed Taxonomic Arrangement for Some North American Amphibians and Reptiles

Collins (1991) believes that a relatively large number of North American species of amphibians and reptiles are camouflaged by the subspecies taxonomy currently in use. He considers this taxonomic concept out-dated, and presents a list of 55 allopatric subspecies which he proposes should be elevated to the rank of full species. My purpose here is to comment and take issue with some of the views expressed in his paper.

Collins offers no explanation or supporting evidence for his contention that the subspecies concept is outdated. In fact, there is little evidence to suggest that this is so. Subspecies are used in all major field guides for reptiles and amphibians, and new subspecies continue to be named and described in the primary literature. There is no doubt that the concept has been abused, that cases of character discordance, polytopic characters, and smooth clinal variation have limited its application (Wilson and Brown 1953), and that some subspecies are, in fact, good "biological" or evolutionary species. Despite such problems, the concept retains its usefulness in taxonomic practice (Mayr 1982).

The subspecies concept persists for theoretical reasons as well. The allopatric speciation model (models I and II of Wiley 1981) explains, by far, the majority of recognized species. The formation of geographical races (subspecies) is considered to be a common early stage in the speciation process, and the pervasiveness of geographical variation supports this theory. An extensive literature documents geographical variation in the vast majority of vertebrate and invertebrate species. These variational patterns, in most cases, lend themselves to the recognition of geographical subdivisions. Although recent revisionary studies of the herpetofauna have shown some widespread, polytypic species to consist really of several evolutionary or "biological" species (see Frost and Hillis 1990, for cases), this does not invalidate the theoretical concept of how these species arose.

Collins refers to his listed taxa as "camouflaged" or "hidden" species, but these terms are misleading, implying that the taxa are somehow lost and unavailable for study. On the contrary, the Latinized trinomial calls attention to the fact that the taxon is considered distinctive in some way. Publication of the subspecific name with designation of type and paratype material ensures that the taxon remains available for systematic reassessment. Use of the trinomen in any information storage and retrieval system ensures the accessibility of such taxa for various studies, e.g., faunal surveys, biodiversity studies, and listings of endangered and threatened taxa.

Collins is critical of the taxonomy in use by herpetologists today, calling it arbitrary and lacking historical reality. But, in my opinion, his proposed taxonomic arrangement is no less arbitrary than the existing taxonomy. The specific status of his listed taxa is "revealed," he claims, by their allopatric distributions and morphological distinctness. Several points need to be made concerning allopatry. Some of his listed taxa are separated by tremendous distances, but others show varying degrees of proximity, and in some cases, the hiatus may be an artifact of collecting effort, not biological reality. The absence of records in the distributional gap by no means confirms the absence of populations there. Furthermore, the distributional boundaries of species are not static, but exceedingly dynamic (MacArthur 1972). The existence of peripheral isolates, far removed from the main distribution of a species, is evidence of profound changes in the range boundaries having occurred during the past. Etheridge (1958), Holman (1977), and others cite examples of distributional changes in the North American herpetofauna since the Pleistocene. The condition of allopatry, therefore, does not preclude the possibility, or even the likelihood, of interactions occurring through time.

In reviewing the diagnostic comparisons between listed forms and the nominate taxa of the species, I find considerable variation in the level of morphological distinctness. In some cases, the allopatric taxa differ strongly by a single, conservative character, or combination of traits (e.g., morphology, color pattern, behavior), so that identification is possible 100 percent of the time or nearly so (e.g., *Scaphiopus h. holbrookii* and *S. h. hurterii*). At the other extreme, the differentiation is patently trivial, involving mean values of meristic characters that overlap considerably and which are not likely to meet the accepted level of statistical significance. In other cases, slight differences in color pattern are noted between populations that show considerable individual variation, dorsal pattern polymorphism, and/or ontogenetic variation (e.g., *Masticophis b. bilineatus* and *M. b. lineolatus; Eumeces g. gilberti* and *E. g. arizonensis*). Approximately 32 to 38 of the 55 taxa listed by Collins are, in my judgement, weakly differentiated.

Frost and Hillis (1990:93) caution "As a practical matter, no one wants to name weakly differentiated or undifferentiated allopatric populations if there is no phylogenetic reason . . . to do so. In fact, to start down this path is to end up imposing the 'phylogenetic' species concept with its possible over-reductionism." Unfortunately, I believe this is the path Collins is taking. Considering the highly dynamic property of organismal distributions, and the modest levels of differentiation exhibited by many of these allopatric taxa, it is reasonable to assume that most are interacting or likely to interact with other members of the binomial taxon, and are therefore conspecific. The burden of "proof" that these allopatric taxa are distinct evolutionary species rests with the advocates. Smith (1990) noted that the evolutionary species concept championed by Frost and Hillis (op. cit.) requires certain standards to justify the assumption of attainment of an independent evolutionary trajectory. He proposed as a suitable standard for allopatric populations 100 percent recognizability by some character or suite of characters. Few of the taxa listed by Collins meet this standard.

I believe that it is inappropriate for Collins to encourage the herpetological community to accept his proposed taxonomic arrangement in toto. Some of the listed taxa have been named and described in a piecemeal fashion, while others have been described following the study of geographical variation and phylogenetic analysis. In my opinion, the only reasonable position on this matter is to review these taxa on a case by case basis. Reassessment is a normal part of systematics, and systematists should do the job using all the technology now available. While I support the rigorous application of the evolutionary species concept, I would rather wait for specialists to evaluate these taxa tomorrow than commit taxonomic mayhem today.

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Viewpoint: Reconsider Suggested Systematic Arrangements For Some North American Amphibians and Reptiles

Collins (1991) recently proposed that 55 allopatric, morphologically distinct subspecies of amphibians and reptiles be raised to species rank because "a relatively large number of species . . . have been camouflaged by the 'subspecies' taxonomy that I think is an outdated viewpoint." Apparently, field or museum specimens were not examined and changes were based on distribution maps and current subspecific status. Responding to Collins' taxonomic proposals necessarily involves discussion of concepts, methods, and assumptions that cannot be addressed here in full. Here we discuss various aspects including (1) unsubstantiated taxonomic changes based primarily on our knowledge of the animals, and the literature, (2) the significance of geographic isolation as a criterion for recognizing species, (3) the antiquity of species and subspecies, and (4) the validity and importance for taxonomy of several assumptions in cladistic analysis.

Collins' "outdated viewpoint" is the Biological Species Concept (BSC)—species are groups of actually or potentially interbreeding natural populations reproductively isolated from other such groups (Mayr 1942, 1963, and elsewhere). The "actually or potentially" is often left out by BSC critics; the allopatric populations in Collins (1991) are, of course, potentially interbreeding populations. Simpson (1961) defined the species in the Evolutionary Species Concept (ESC) as "an ancestral-descendent sequence of populations evolving separately from others and with its own unitary role and tendencies." His ESC species are BSC species moving through time. For cladistic purposes Wiley (1981) embraced the ESC and would restrict its application to populations defined by "recovered historical relationships"—i.e., cladistic analyses of morphological characters. Collins (1991) stated that "a rigorous application of the evolutionary species concept (as discussed in Frost and Hillis 1990) would also reduce the number of arbitrarily defined subspecies dramatically." Frost and Hillis (1990) state that "intelligent use of trinomials could only follow phylogenetic analyses; otherwise their application in alpha taxonomy would be precluded." A cladistic analysis of characters is claimed necessary to recognize subspecies, but not to elevate them to species.

Collins' proposed taxonomic changes reflect populations that have been isolated for different lengths of time and have varying degrees of morphological differentiation. He raised the western subspecies, *mormon*, of the widespread polytypic *Coluber constrictor* to a species, apparently following Fitch et al. (1981). However subsequent papers by Greene (1984) and Corn and Bury (1986) provided evidence for intergradation in New Mexico and western Texas south of the Rocky Mountains, and in Colorado, Wyoming, and Utah to the north. They concluded that the elevation of *mormon* to species status was not supported by morphological, reproductive, or zoogeographical evidence. If the predicted global warming of 2°C mean annual temperature by 2000 comes to pass, the intermediate relict populations could well disappear, qualifying the newly isolated *mormon* as a species only under Collins' system. There is no reason to think that widespread subspecies such as *mormon* or *flaviventris* will acquire new characters through natural selection in response to such a climate change or to being separated from each other. In this case, range fragmentation would not be coupled with evolutionary change.

The subspecies of *Tantilla rubra* (*cucullata* and *diabola*) in the United States were elevated to species rank. Degenhardt et al. (1976) have already reported an intermediate population in the Chisos Mountains of Big Bend National Park with the distinctive nuchal collar absent (*cucullata*), complete (*diabola*) or partially present. The intergrade zone actually covers much of the Big Bend from Black Gap to Terlingua (H. K. McCrystal, unpubl. data). With further collecting, the Trans-Pecos populations of these secretive snakes will undoubtedly prove to be continuous, as desertscrub populations tend to be. Using Collins' criteria, would the Big Bend population with characters of both *cucullata* and *diabola* warrant full species status? In contrast, we suspect that if enough specimens were available to assess geographic variation, only a single subspecies would be recognized in Texas.

Collins (1990) and Conant and Collins (1991) followed Gartska (1982) in elevating *Lampropeltis mexicana alterna* to a species using characters (iris color, head shape) that could as well reflect infraspecific adaptive responses (subterranean crevice dwelling, nocturnal activity) to the Chihuahuan Desert. In this case, *alterna* freely interbreeds in captivity with other *L. mexicana* subspecies but not sympatric *L. triangulum*. The presence of alternating reduced markings in Gartska's captive-bred offspring of *L. m. thayeri* from Nuevo Leon could be interpreted as gene flow from *alterna* rather than invalidating the use of color pattern in recognizing subspecies. Gelbach and McCoy (1965) reported *alterna* x *mexicana* (including *greeri*) intergrades from Durango. Collecting bias cannot be neglected when discussing secretive, widely distributed polymorphic taxa; intergrades between *alterna* and *thayeri* were subsequently found in southeastern Coahuila (S. F. Hale, pers. comm. 1989). Would Collins' "species" revert to "subspecies" when intermediate specimens are found in intervening areas?

Lampropeltis pyromelana infralabialis, the subspecies isolated north of the Grand Canyon in Arizona, Nevada, and Utah, is a barely distinguishable population raised to species by Collins. Tanner's (1953) description separated *infralabialis* from other subspecies on one less infralabial scale and white annuli complete across the ventrals in 50% or more of the body annuli. A careful study of *L. pyromelana* specimens throughout the species' range (independently by W. H. Woodin and C. H. Lowe, unpubl. data) reveals that color pattern is highly variable throughout the range with *knoblochi* and, *infralabialis* more weakly so, the only populations divergent at the subspecific level. The would-be elevation in rank of little-differentiated subspecies (as by Collins, and by Frost and Hillis) dilutes and weakens our understanding of species while only appearing to increase biodiversity. Strangely, according to these authors, subspecies are apparently not included in biodiversity. As Cole (1990) correctly pointed out, overestimating the number of species for ulterior motives including conservation will only injure the image and credibility of systematists. We are impressed only that *infralabialis* differs so little from other *L. pyromelana* after 10,000 yrs of isolation and over 2000 generations in the present interglacial; stabilizing selection is very strong.

The subspecies of *Lampropeltis zonata* raised to species (*multifasciata, parvirubra, pulchra*) in Collins (1991) are examples of slightly differentiated kingsnake populations in isolated mountain ranges with which we are again familiar. An intergrade specimen between *multifasciata* and *zonata* from an intermediate range cited by Zweifel (1952) was overlooked or disregarded, and others are unreported. The extensive fossil record of plants and animals preserved in ancient packrat (*Neotoma* spp.) middens throughout the southwestern United States and northern Mexico have shown that most montane populations have been isolated for about 9000 yrs (Betancourt et al. 1990, Van Devender et al. 1991a). During each of 15 to 20 glacial periods during the Pleistocene, montane woodlands were reconnected in the intervening lowlands. Glacial climates with widespread woodland biotas were the typical situation for perhaps 90% of the last 1.8 million yrs (Imbrie and Imbrie 1979).

Packrat middens have provided records of presently montane reptiles in lowlands in ice age woodlands in Texas: e.g., *Gerrhonotus liocephalus* (Texas alligator lizard) in the Big Bend (Van Devender and Bradley, in press), and *Phrynosoma douglassi* (short-horned horned lizard) near Van Horn (Montanucci 1987). The middens also record montane animals in Arizona ranges where they no longer occur: e.g., *Gerrhonotus kingii* (Arizona alligator lizard) at 29,000, 14,500, and 9570 yrs B.P. (radiocarbon years before 1950) in the Ajo Mountains, and *Tamias* sp. (chipmunk) at 21,840 and 13,500 yrs B.P. in the Ajos, and 12,430 yrs B.P. in the Tucson Mountains (Van Devender et al. 1991b).

Prediction based on clear patterns in data is an integral part of science; a new glacial could begin any millenium unless man alters the earth's climate system too drastically. Would *multifasciata, parvirubra*, and *pulchra* then be reduced to subspecies status again when their ranges reconnect with each other and with *zonata* as they undoubtedly have many times in the past? Reticulate evolution, a common evolutionary mechanism in plants, has occurred in many animal populations currently recognized as subspecies. Cladistics cannot reconstruct the phylogeny of groups with reticulate evolution (Donoghue 1985).

Hundreds, if not thousands, of isolated, slightly and clearly differentiated populations in woodlands and forests on southwestern mountaintops have *not* been described as subspecies or plant varieties. The divergence may have occurred in the last 10,000 yrs or represent the cumulative natural selection of many Pleistocene interglacials. Under the Phylogenetic Species Concept (PSC) proposed by Donoghue (1985) where species are defined on the basis of monophyletic lineages, isolated populations with *any* discernible differences whatever are species (see discussion in Echelle 1990). This dubious definition frees the cladist from making troublesome taxonomic decisions—most infraspecific groups including demes, forms, varieties, subspecies, and semispecies become species. The montane populations noted above would become "species" regardless of how slightly differentiated.

Crotalus lepidus (rock rattlesnake) is widespread in the southwestern United States and much of northern Mexico. Four subspecies have been described (*klauberi, lepidus, maculosus, morulus*) in broad biogeographic regions. In the United States the ranges of *klauberi* and *lepidus* span 1030 km from Arizona to Texas. A complex mosaic of modestly differentiated populations in various habitats, rock types, and elevations makes rigorous definition of *klauberi* and *lepidus* difficult, raising the question of whether they should be combined (H. K. McCrystal, unpubl. data). Under Wiley's ESC and the PSC, two variable subspecies of *C. lepidus* would be immediately divided into 20 or 30 species in the United States alone with greater geographic than genetic differences! Again, most of the populations have undoubtedly been isolated only 9000 yrs or less and are likely to be reconnected in the future.

In fact, over 400 species of animals and plants have been identified from packrat midden deposits radiocarbon dated 10,000 to 50,000 yrs B.P. Although species were described on obvious distinctive characters such as color pattern and scalation in snakes, or flower and fruit structure in plants, many other structures are usually distinctive. Teeth, bones, scales, heads, elytra, seeds, fruits, leaves, twigs, spines, etc. in middens are readily matched to modern reference specimens with virtually no differences. Even if a few cryptic species were missed, the last major glacial/interglacial climatic change (the Wisconsin/Holocene) did not produce many new species in the southwestern United States. There is little reason to believe that earlier Pleistocene climatic changes were of greater magnitude with more speciation.

The rich fossil record of beetles in Europe (Coope 1991) and the Rocky Mountains (Elias 1991) has challenged the idea that most living species evolved continuously throughout the Pleistocene with rapid speciation during massive environmental perturbations. All insect fossils dating to the last million years are morphologically identical down to details of the genitalia to existing species. Beetles responded to ice age climatic cycles through great shifts in geographical range rather than evolution of new adaptive types or extinction.

Many reptilian subspecies are mostly restricted to major biogeographical regions, e.g., the Great Plains: *Crotalus viridis viridis, Elaphe guttata emoryi, Lampropeltis calligaster calligaster, L. getulus splendida, L. triangulum gentilis, Pituophis melanoleucus sayi*; the Chihuahuan Desert: *Lampropeltis mexicana alterna, Trimorphodon biscutatus vilkinsoni*; mainland Mexico Sonoran Desert: *Masticophis flagellum cingulum*; Baja California Sonoran Desert: *Arizona elegans pacata, M. f. fuliginosus, Pituophis m. bimaris, Salvadora hexalepis klauberi*; Sinaloan thornscrub and tropical deciduous forest: *Lampropeltis g. nigritus, Rhinocheilus lecontei antoni*; Great Basin Desert: *Crotalus v. lutosus, C. v. nuntius, Pituophis m. deserticola*; Mediterranean chaparral: *Crotalus v. cerberus, C. v. helleri, Pituophis m. annectens*. These distributions strongly reflect adaptive responses of species to geologic events and their climatic consequences predating the Pleistocene. The most important geologic events were the uplifts of the Rocky Mountains and the Sierras Madre Occidental and Oriental resulting in regional weather patterns and the modernization of North American biotic provinces—mostly 8 to 20 million years ago in the Miocene (Axelrod 1979).

Pleistocene climates mostly shifted biotic provinces southward with increased species richness under equable climates. Except for tortoises there are very few extinct species of amphibians and reptiles described from the Pleistocene of North America. *Phrynosoma josecitensis*, a problematic species known from a single squamosal bone from late Pleistocene sediments in San Josecito Cave, Nuevo Leon, México, may be an aberrant specimen of a living species (Montanucci 1987). Even in tortoises, species such as *Gopherus flavomarginatus* (Bolson tortoise) may have evolved in the Pliocene at least two million years ago (Bramble 1982). Thus, subspecies in widespread continental species are more likely to be millions of years old than to have formed in response to the most recent glacial/interglacial climatic change. Subspecies are undoubtedly much more stable than their geographic ranges—one of Collins' main criteria for species.

We view modern species as fundamental, stable, long-lived evolutionary entities that usually do not evolve or go extinct in response to environmental fluctuations; most species simply shift their ranges. When speciation in isolated populations does occur, the fate of the parent population (extinction, stasis, speciation) is independent of its descendants' fate, and would rarely, if ever, be coupled as they are in the divaricate branching of shared, derived (apomorphic) characters in cladistic analyses (Wiley 1981). In spite of cladistic assumptions, the temporal coexistence of ancestral species or subspecies in older habitats with their descendants in derived habitats is the normal state of affairs. With the first glacial climates about two million years ago, boreal forests moved almost to the Gulf of Mexico, disrupting the Gulf Circumferential Corridor between the southeastern United States and northeastern México (Auffenberg and Milstead 1965), splitting the range of *Drymarchon corais* (indigo snake). There is no reason to believe that the natural selection that formed the southeastern *D. c. couperi*, elevated to species rank by Collins (1991), had any affect on the parental populations in south Texas or northeastern México. Barring other information, *D. c. erebennus* could be the living ancestor of *couperi*.

The subspecies concept has been very useful in describing patterns of geographic variation within species. While concurring, O'Neill (1982) nevertheless incorrectly viewed Mayr's (1963) definition of a subspecies ("an aggregate of local populations of a species inhabiting a geographic subdivision of the range of the species, and differing taxonomically from other populations of the species") to be that of a taxonomic unit rather than an evolutionary one.

Johnson (1982) argues correctly as has Mayr from 1942 onward that a great deal of information on evolutionary variation in species is already cast in a subspecies framework, and that the names call attention to distinctive populations with significant research potential. Difficulty in delineating subspecies in widespread complex species like *L. triangulum* with 25 subspecies (Williams 1988) would in no way justify the elimination of all subspecies with little if any gain in knowledge. *Lampropeltis* would change from a genus with six species with variable numbers of subspecies to over 50 so-called species!

Actually the naming of populations with discontinuous clinal or allopatric variation inherently expresses inferred relationships. We use the concept of "related" in the traditional sense to mean the degree of genetic similarity between two taxa rather than the limited cladistic redefinition of sharing a derived character (Wiley 1981). Because species are as stable and long-lived as the fossil record indicates, the most closely related species are ancestor and descendent(s) that differ only in the new characters evolved by the descendent(s). A single species could be the closest relative of any number of descendents with the same degree of divergence. An ancestor and its descendent will always have a greater genetic similarity and fewer character changes than paired descendents of the same ancestor.

Cladistics or phylogenetic systematics is a methodology guided by rules outlined in an extensive body of literature accumulated in the last two decades. We encourage herpetologists to learn enough about the methodology to be able to evaluate these basic assumptions: (1) all characters are equally important and potentially species characters, (2) the degree of genetic similarity or divergence is irrelevant, (3) most ancestors are assumed to become extinct at the time of speciation, and (4) the most closely related species are paired descendents sharing their ancestors' derived characters. The new "species" proposed by Collins

(1991) reflect a methodology that cannot separate subspecies from species; the species concepts derived from cladistic methodology have an inherent bias toward narrowly defined taxonomic units (Donoghue 1985, Echelle 1990, Wiley 1981).

In practice, populations designated as "species" using Wiley's ESC and Donoghue's PSC are essentially derivatives of the original typological species concept—i.e., groups of organisms that differ from others in constant characters. In the nineteenth century Linnaeus had the advantage of using the degree of divergence to recognize different species. As O'Brien and Mayr (1991) point out "typological species concepts are fraught with interpretive difficulties such as . . . full species assignment to reproductively compatible (BSC) subspecies, arbitrary selection of diagnostic characters, and numerous species designations that err in the direction of excessive taxonomic splitting." Phillips (1982) notes that "subspecies, despite all misleading attacks, remain basic units in ornithology" and "if we cease recognising subspecies, we must elevate all notable ones, at least, to species rank, thus destroying the biological species and plunging our classification back toward the early 19th century."

We encourage examination of Collins' proposed taxonomic changes on a case by case basis using knowledge of the animals concerned rather than accept such changes wholesale, and to consider the assumptions that they reflect. Regardless of the philosophy embraced by the systematist, a thorough analysis of a taxon with documented evidence should precede any proposed taxonomic change.

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Taxonomic Tyranny and the Exoteric

The vast majority of readers of this journal are not broad-based general biologists steeped in the arcane theories and esoteric practices of systematic biology. That certainly includes most professional herpetologists of my acquaintance. There are today three major schools of taxonomic thought (and uncounted splinter factions) promulgating mutually exclusive, irreconcilable principles and methodologies. Adherents of any one school—evolutionary, phenetic, or cladistic—tend to regard the proponents of the others as hopelessly old-fashioned, insane, and/or dishonest, often with excellent reasons. There is simply no hope that any unified consensus, resulting in a stable scientific nomenclature, will evolve in the foreseeable future. We are in for decades of taxonomic turmoil.

There are no "official," binding lists of "correct" or "accepted" names, and most name-change proposals stand or fall on the basis of the popularity of the animals (big, flashy animals and snakes are split; little, inconspicuous creatures are not) or the popularity of the proposal's author. Almost no one ever critically reviews proposed changes. No journal in herpetology publishes reviews of articles printed in its own pages. There is, therefore, little recourse for those who disagree with a taxonomic change, or who know of proof that facts have been misstated in print.

The burgeoning plethora of taxonomic changes—especially splits—in the last decade or so has gone virtually unanswered by those of us with more classical, broad-based biological or evolutionary points of view. Nevertheless, I have personally questioned and sought to verify statements and judgments made, with dismally disappointing results. Most of the split papers I have read contain faulty observations and simple untruths. I determine these by examination of museum specimens, finding character states are frequently not as reported in the splitting literature.

A great deal of real work—specimen examination, more collecting in geographically critical areas, and use of techniques like mt-DNA and electrophoresis—will have to go into determining the real evolutionary status of dichopatric, geographically replacing forms. My word to the exoteric is beware. Just because somebody publishes a new taxonomic arrangement does not mean anyone has to follow it. Consider carefully the source of opinions and pronouncements, and—whenever possible—try to review the facts. Especially, do not blindly accept proposed changes because you imagine there is some "law" that says you have to. There is none. You do not. For a long time to come we will have to live with taxonomic chaos, which means we will have to constantly make judgments.

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Editor's Note: An in-depth rebuttal by J. T. Collins to the commentaries by Montanucci, Van Devender et al., and Lazell will be published in the June issue of *HR*.

On Races, Clines, and Common Names in *Opheodrys*

It is not the purpose of this note to enter the long standing debate about the preferred criteria for designating subspecies in systematic herpetology. Rather, a more limited consideration is addressed: how should the interpreters of the herpetological literature present the findings of that literature in their field guides and lists of common names?

Two questions provide the focus for the present discussion. (1) Should reptiles differing only by having distinctive color patterns that are associated with identifiable geographic ranges be recognized as nominal forms in field guides and lists of common names? (2) Should reptiles differing only by having distinctive scutellation patterns that are associated with identifiable geographic ranges be recognized as nominal forms in field guides and lists of common names? Some current authors have responded affirmatively to the first question and negatively to the second. An examination of the reasons proposed by those authors for the difference in their responses is the basis for this note.

In the first edition of *Standard Common and Current Scientific Names for North American Amphibians and Reptiles*, Collins et al. (1978) give common names for the two races of *Opheodrys vernalis* that had been described previously (Grobman 1941) and do so in the second edition (Collins et al. 1982). In the third edition, however, Collins (1990) does not provide common names for the two races of *O. vernalis* nor for the four races of *O. aestivus* that had been described in the interim (Grobman 1984). The reason given was that the racial differences found in those two species are based on clinal variations in scutellation characteristics (Collins 1990).

Presumably the precedent established in Collins (1990) was followed in the third edition of *A Field Guide to Reptiles and Amphibians of Eastern and Central North America* (Conant and Collins 1991). Conant and Collins explain that the races of *Opheodrys vernalis* and of *O. aestivus* are not included because the differences in scutellation patterns are not correlated with color pattern differences. Thus, they suggest, it would be difficult for a user of the book to identify the races of *Opheodrys* without counting scales. Elsewhere they recommend that the forms of *Trachemys, Pseudemys*, and *Chrysemys* (p. 64), of *Cryptobranchus* (p. 241), of *Acris* (p. 218), and of the Plethodontidae (p. 259), could best be identified by reference to geography. That recommendation would appear to be equally appropriate for unicolored snakes.

For the recognition of races of snakes, differences in scutellation patterns presumably are as systematically significant as are differences in color patterns. The uneven treatment of the two groups of morphological characters, as indicators of racial differences, misleads readers of the third edition of the *Field Guide*.

The related reasons are faulty, both in fact and philosophy. There are north/south clines, associated with ambient temperature gradients, in scutellation characteristics in the two races of *O. vernalis*, but the scutellation differences between the two races are associated with vegetational differences and are not clinal

(Grobman 1941:27). A considerable number of statistical details are given about *O. aestivus* (Grobman 1984:155-157) demonstrating that there are north/south, not east/west, clines in scutellation and that the metameric variation, upon which the four races are partially based, is not primarily clinal.

The example given by Frost and Hillis (1990) in support of their reasonable position that, "... the subspecies category has been long abused for use in naming arbitrarily defined 'slices' of clines (e.g., the arbitrary delimitation of a number of 'subspecies' in *Opheodrys aestivus* by Grobman, 1984)..." is therefore inappropriate. In the paper referred to it is clearly indicated (p. 155) that the clinal variation in ventrals and caudals is north/south whereas the races (except for *O. a. carinatus*) are east/west divisions. The data are exhibited in Tables 1 and 2 (pp. 156-157). *O. a. carinatus* is separated from the other races (p. 165) by the degree of keeling and Figure 2 (p. 169) indicates that *O. a. majalis* is a relatively short-tailed race and that *O. a. conanti* is a diminutive subspecies. The described races are not arbitrary slices of clines.

Smith (1990) found that five male hatchlings of *O. aestivus*, incubated at ca. 27.8°C, had a mean ventral count of 155.6 and three male hatchlings, from the same clutch of eggs, incubated at ca. 24.8°C had a mean ventral count of 159.0. That observation led him to suggest that "... if many ophidian species respond to temperature during development, these counts may not be satisfactory criteria of gene flow..." The demonstrated effect of the north/south temperature gradient (Grobman 1984:155) would appear to be sufficient to account for Smith's observation. His study does not provide an adequate basis for his extended suggestion that ventral counts are not indicative of racial differences. Furthermore, as indicated above, the races of *O. aestivus* are distinguishable on other characteristics as well.

The readers of the third edition of the *Field Guide* would be better served had the races of *Opheodrys* been identified and the users of common names would be better served had the third edition of Collins (1990) supplied such names for those races. The underlying reason for those omissions apparently was the assumption that the scutellation clines in *Opheodrys* were used to define the described races. A more careful reading of the descriptive accounts would have made it clear that the north/south clines in *Opheodrys* are not the basis for recognition of the essentially east/west races.

A demonstration that color patterns (used in classification schemes) are primarily under genetic control and that scutellation patterns are not, would provide a reasonable basis for questioning the use of the latter as indicators of taxonomic distinctions. I know of no such demonstrations, however.

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Reply to Grobman on Variation in *Opheodrys aestivus*

Grobman (this issue of *Herpetological Review*) disagrees with the taxonomic arrangements for the green snakes, *Opheodrys aestivus* and *O. vernalis*, in Collins (1990) and Conant and Collins (1991). He points out that, in the first two editions of *Standard Common and Current Scientific Names for North American Amphibians and Reptiles*, Collins et al. (1978, 1982) initially recognized the races of *Opheodrys vernalis*, but did not do so in the third edition (Collins 1991), and questions why neither these races nor those proposed by him (Grobman 1984) for *Opheodrys aestivus* were recognized.

With respect to Collins (1990), the decision to not recognize races of the snake genera *Opheodrys* (and *Tropidoclonion*) was made by vote of a committee of snake systematists (see p. 2), an action initiated by the publication of Grobman's (1984) taxonomic proposals for *O. aestivus*. Conant and Collins (1990) had independently decided to not recognize races for *Opheodrys* because the diagnoses for the subspecies were suspect. Nothing in Grobman's paper (this issue) dispels that concern.

Grobman (1984) proposed four new races of *Opheodrys aestivus*, presenting his data in tabular form (Tables 1–10). None of the scutellation data contained in those tables was tested for statistical significance, nor were they subjected to univariate or multivariate analysis, and all are suspect. Further, the main characteristics defining his races reside in his key (p. 167), in which he created a situation whereby intergrades between his proposed four populations would, minimally, have to exhibit 127.5 ventral scales—in other words, his statements in this issue to the contrary, he has arbitrarily sliced clines, whether they be east-west or north-south. Grobman (this issue) attempts to discredit Smith (1990), who incubated the eggs of *O. aestivus* and varied the ventral counts by varying the temperature, when in fact this phenomenon was earlier revealed by Fox et al. (1961), when they sounded the death knell for defining subspecies based on ventral and subcaudal scale count variation over 30 years ago.

Grobman (this issue) further questions the continued recognition of subspecies based on pattern and color in both Collins (1990) and Conant and Collins (1991). With respect to Collins (1990), a committee of snake systematists evaluated all taxonomic changes proposed *between* editions. These proposals, published from 1982 to 1989, were submitted to the snake subcommittee, and they voted not to recognize the races of *Opheodrys* and *Tropidoclonion*. The decision was not an arbitrary one—Grobman just doesn't like the result. If, in the same time frame, articles had been published proposing the elimination of races based on color and/or pattern, the snake subcommittee would have evaluated and voted on those also. With respect to Conant and Collins (1991), the decision not to recognize subspecies of *Opheodrys* and *Tropidoclonion* was reached early (in the mid-1980s), was a personal decision, and was unrelated to the list published by Collins (1990).

In conclusion, it is my opinion that Grobman (1984) presented no evidence that justifies the recognition of subspecies in *Opheodrys aestivus* and, for that reason, I recommend that the herpetological community not recognize his subspecies and hold future such proposals to standards of analysis designed to divulge evolutionary (historical) reality.

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The Adoption of the Poison-arrow Frogs of the Genera *Dendrobates* and *Phyllobates* in Appendix II of CITES

Conservation of amphibians and reptiles involves scientific herpetology in many ways. One of these is that species protection must be based on scientific investigations. The inclusion of *Dendrobates* spp. and *Phyllobates* spp. in Appendix II of CITES (Convention on International Trade in Endangered Species) is being discussed widely among herpetologists. In Hoogmoed's (1990) book review the protection of dendrobatids is emphasized in a singular way. Since there is obviously a general interest in protection, I will in the following give comments on that subject.

The inclusion of *Dendrobates* spp. and *Phyllobates* spp. in Appendix II of CITES was decided upon at the biennial meeting in Ottawa during July 1987. Its basis has been strongly criticized (cf. Mrosovsky 1988; Pickett 1987). After Hoogmoed's (1990) review I feel there is more than ever a need to cast light on this inappropriate action. The Appendix II listing means a regulation of the trade; however, for these common and abundant frogs it will merely mean a regulation for the sake of regulation. The proponents (Surinam and The Netherlands) were unable to provide any indication of decreasing populations; in the supporting material it was merely stated: "Population data are scarce." Scattered statistics on the international trade in various species were given.

Prior to the Ottawa meeting the proposals were analyzed in two reports by the IUCN Trade Specialist Group. These were largely based on the work of Charles Myers (American Museum of Natural History), one of the few herpetologists who has studied dendrobatids extensively in the wild. The other reviewers were Stephen Edwards, Stefan Gorzula, and Marinus S. Hoogmoed. The reports contain many interesting comments; I shall quote or summarize a few of these factual details.

1. The species are easy to identify (only Hoogmoed comments on the small genus *Phyllobates* comprising 5 species: ". . . some species are likely to be confused with others").
2. Those dendrobatids that most often appear in international trade have generally large ranges and are among the most abundant vertebrates in their habitats—e.g., species densities of up to 10 adults per m^2.
3. There is no knowledge of range contractions in historic times.
4. No species are threatened.
5. *D. histrionicus* occurs in countless dense populations throughout many thousands of km^2 of undisturbed rain forest in western Colombia and Ecuador; however, in Surinam's proposal *histrionicus* is just described as "relatively common."
6. The few heavily collected populations of *D. auratus* and *D. pumilio* remain as dense as ever.
7. There is no evidence that dendrobatids are dependent on primary forests. Certainly they are to be found in undisturbed forest, but the highest densities are frequently in disturbed areas, such as mixed secondary growth.
8. Myers reports that during a four-year study on *D. histrionicus*, during which he collected 7600 specimens from one population for scientific purposes, the population actually increased rather than decreased. This number greatly exceeds the imports of all dendrobatids into the U.S. in 1985 and The Netherlands in 1984-1985. Similar cases are known. In no single instance has collecting appeared to adversely influence the population.

TRAFFIC Network (funded by WWF and coordinated by IUCN) gave a clear recommendation to each of the two proposals before the CITES meeting in Ottawa: "This proposal should be rejected as it does not provide any evidence of a threat arising from trade."

The decision at the Ottawa meeting was evaluated by Mrosovsky (1988): "The proposal . . . was passed largely with the support of the South American countries who may have voted more in a spirit of regional solidarity than on the basis of scientific evidence." Also, the EEC countries as a whole supported the proposals. Again, indiscriminate block voting undermines the credibility of CITES in such cases. Mrosovsky (op. cit.) fears that this "could turn CITES into a circus for political exhibitionism."

As soon as *Dendrobates* spp. and *Phyllobates* spp. had been included in Appendix II of CITES, they were also adopted in Annex C part 2 of the EEC Regulation (accomplishing the Convention within the European Community). WWF-Denmark protested in a letter by Arne Schiøtz (former Director of Conservation of WWF-International) to the Danish National Forest and Nature Agency; Peter Kramer (Director of Conservation, WWF-International) and all WWF National Organizations within EEC received copies. Schiøtz stated:

> "One of WWF's consistent arguments for conserving natural habitats is that they can, if exploited sustainably, benefit local people and the countries in which they occur. The argument is of course difficult to maintain if, equally consistently, groups with other interests prevent such sustainable utilization."
> "There are many well-founded reservations about keeping wild

animals in captivity or against the exploitation of wild animals at all, based on animal welfare, but we must be aware that they are contrary to one of the strongest arguments for conservation of the natural habitats."

Hoogmoed (1990) states that all species of *Dendrobates* and *Phyllobates* were listed for look-a-like reasons as this would facilitate the protection of an endangered species which may be confused with other species. Firstly, according to the IUCN reports there are no real look-alike problems. Secondly, no dendrobatid species has been demonstrated or suggested to be endangered. Thirdly, if one should manage to find an endangered dendrobatid species which may be confused with another species, it would be fully sufficient merely to protect these two species. This has been done with the Asian look-alike species *Rana tigerina* and *R. hexadactyla*, which were included in Appendix II in 1985—although it is especially *R. tigerina* that has been over-exploited for the export of frog legs. It would have been senseless to adopt the entire genus *Rana* in Appendix II just because *R. tigerina* needs protection and may be confused with another species!

In addition to the issue of conservation, Hoogmoed (1990) also expresses an undertone of disapprobation of terrarium-keeping. By maintaining non-threatened species (e.g., poison-arrow frogs) properly in a rain forest terrarium and reading literature on how to fulfill their captive requirements, the terrarium-keeper may gain valuable insight in rain forest ecology. What may be even more important is the personal engagement in the ecological world crisis and the awareness and understanding of the natural world. In professional journals the amateurs seldom meet a forum to defend their activities or to take positions against unfounded imputations of being the culprits of destruction. Böhme (1990) has stressed the important role of amateur terrarium-keeping to herpetology (although in a discussion of national German legislation). That issue deserves a separate forum.

For the larger public, unjustified CITES protection impugns the reputation of the Convention. In the case of *Dendrobates* spp. and *Phyllobates* spp., the only way to improve the reputation and to clear this embarrassing issue will be to remove these frogs from CITES as soon as possible.

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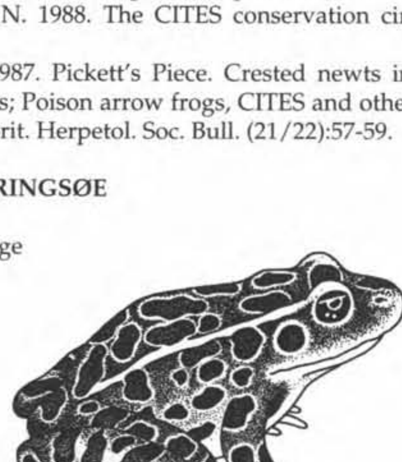

TECHNIQUES

Methods of Sampling Snake Populations and Their Relative Success

Snakes are difficult subjects for field study because of their secretive habits. During 43 seasons of continuous field work on the University of Kansas' Fitch Natural History Reservation (FNHR), northeastern Kansas, several sampling methods used have had variable degrees of success. Here I compare the numbers of captures, by species, using (1) live-traps (LT), (2) artificial shelters (AS), and (3) random encounters (RE) during the decade of the 1980s, through May 1991.

Three areas sampled included the 240-ha FNHR, the University's 175-ha Nelson Environmental Area adjoining the Reservation's north side, and Chester Fitch's property of 4.2 ha, 0.8 km west of the Reservation. Various types of woodland occurred on the FNHR, with former pastures and cultivated fields undergoing invasion by trees and shrubs. The Nelson Environmental Area, and the Chester Fitch property at the edge of the Kaw River Valley mainly consist of naturally vegetated fields kept in an early stage of succession by periodic mowing. My snake sampling operations were scattered over an area of several hundred hectares, but were relatively concentrated within 28 sampling units in all, each limited to only a few hectares. Only a few of these units were sampled in any one year, with occasional testing of new units and abandonment of the less productive units.

The live-traps used have been described elsewhere (Fitch 1951, 1987). Most were of quarter-inch (6 mm) wire "hardware cloth" shaped into cylinders ca. 370 mm long and 125 mm diam, with funnel openings 25 mm diam, but some were larger and some were of finer mesh wire. On the FNHR each spring and early summer through 1989, about 100 of these traps were used in pairs—one at each end of a drift fence 4–7 m long. In the fall, the same traps were used at hilltop limestone outcrops where many snakes came to hibernate, and the exposed vertical rock faces provided natural barriers that served as drift fences. Fourteen such outcrops with total linear extent of 3.25 km were sampled. In 1990-91 trapping operations were transferred to the Nelson Experimental Area where there were six enclosures of several hectares each, fenced with fine wire mesh to confine or exclude small mammals. Traps were placed in linear patterns along the hilltop outcrops and enclosure fences, but in three upland fields and one lowland field they were used in random patterns.

Artificial shelters (AS), 300 in all, consisted of corrugated roofing metal or wood; many were 0.6 X 1.2 m, while others were of irregular sizes. They were placed in seven series with 25–100 AS in each. Two arrays were at the edge of the Kaw River Valley and five were in adjacent uplands. Three of the latter were arranged linearly and were checked at irregular intervals. Three series (installed in 1989) that were relatively unproductive were seldom checked. By far the most productive were 40 in "Quarry Field," an upland 3.7-ha area on the northern edge of the FNHR. A series of 100 AS in the southeastern corner of the Nelson Environmental Area and 30 on the Chester Fitch property also yielded substantial numbers of records and a variety of species. Shelters had the advantage of avoiding injury or mortality to snakes, whereas live-traps caused occasional injuries and some mortality when temperatures were extreme, when predators such as raccoons tore open the traps, when trapped snakes became stuck between the wires, or when confined snakes were attacked by shrews and rodents caught with them. Another important advantage of AS was that snakes using them often were digesting meals and a relatively high percentage of them had stomach items that could be palped and identified. Thus 23 of 90 *Agkistrodon contortrix* (25.6%) had food in their stomachs whereas only 34 of 559 from LT (6.1%) had such items.

The random encounter (RE) category included all captures that were not from LT or AS. Some snakes were found in open places including roads and driveways (DORs were not counted), some were beneath natural shelters, and some in thick cover were revealed by the scolding of birds, but overall, RE constituted only 3.2% of the total captures.

Numbers and proportions of snakes captured by the three different methods are given in Table 1. The most productive method, accounting for slightly more than 67% of the total records, was AS, while the LT method comprised 29% of the captures. Four species were obtained only from shelters, and for two others shelters provided the majority of records. Snakes obtained mainly or exclusively from shelters included the small, secretive species *Carphophis amoenus, Diadophis punctatus, Storeria dekayi, Tantilla gracilis,* and *Tropidoclonion lineatum*. These snakes are too small to be retained in traps with quarter-inch wire mesh. The two largest snakes on the area, *Pituophis catenifer* and *Crotalus horridus*, were the only species for which RE was the most productive method.

Live trapping was most successful with snakes of intermediate size (0.4–1 m SVL): *Agkistrodon contortrix, Coluber constrictor, Elaphe obsoleta, Lampropeltis calligaster, L. getula,* and *Thamnophis sirtalis*. For each of these, LT yielded more records than AS and RE combined. Snakes much longer than 1 m SVL may have been too large to pass through a funnel's entrance, and those that were much less than 0.4 m SVL could pass through the mesh of the traps unimpeded. Such relatively large or small snakes could have been caught by adjusting the size of the trap body, the type of material used, and the diameter of the funnel opening. For instance, in the 1960s, with effort concentrated on catching small snakes such as *Carphophis* and *Diadophis*, traps were made using one-quart (0.95 l) glass "Mason" jars as bodies and eighth-inch (3 mm) wire for funnels, with entrances 1 cm diam (cf. Clark 1966). In the 1966 season, when about 50 such traps were used, a total of 1639 *Diadophis* captures were recorded; 698 (42.6%) were in the small funnel traps, and, simultaneously these traps also caught numbers of *Carphophis amoenus, Storeria dekayi,* and first-year young of *Thamnophis sirtalis, Nerodia sipedon,* and *Coluber constrictor*.

For the 16 species of snakes captured during the 1980-1991 sampling, the three methods (LT, AS, and RE) combined yielded the following capture percentages:

Diadophis punctatus	59.1%
Coluber constrictor	12.2%
Thamnophis sirtalis	10.5%
Agkistrodon contortrix	9.6%
Elaphe obsoleta	3.1%
Elaphe guttata	1.4%
Lampropeltis triangulum	1.4%
Lampropeltis calligaster	1.1%
Nerodia sipedon	0.6%

The seven rarest species, *Pituophis catenifer, Carphophis amoenus, Crotalus horridus, Storeria dekayi, Lampropeltis getula, Tantilla gracilis,* and *Tropidoclonion lineatum* combined were less than one percent of the total captures.

The incidence of recaptures from the three sampling methods combined differed among the various species, as follows:

Lampropeltis triangulum	85.0%
Elaphe guttata	58.0%
Coluber constrictor	42.5%
Lampropeltis calligaster	36.9%
Agkistrodon contortrix	29.6%
Thamnophis sirtalis	27.0%
Pituophis catenifer	25.0%
Elaphe obsoleta	23.0%
Nerodia sipedon	13.3%

There were no recaptures of *Carphophis amoenus, Crotalus horridus, Lampropeltis getula, Storeria dekayi, Tantilla gracilis,* or *Tropidoclonion lineatum*. The high ratio of recaptures in *Lampropeltis triangulum* and *Elaphe guttata* stems from their relatively low vagility and tendency to return to the same cover; few individuals of each were captured but most of these were taken on several or many occasions. No *Diadophis* were individually marked during the decade of the 1980s, so the ratio of recaptures in the 4179 records of Table 1 is unknown. However, in 1969, the year after marking was discontinued, 503 captures included 79 (15.7%) of marked snakes.

TABLE 1. Snakes captured by three methods, 1980-1991, on three areas in Douglas, Jefferson, and Leavenworth Counties, northeastern Kansas.

Species	Total Number of Captures	Percentage Captured by Method: Live-Traps (LT)	Artificial Shelters (AS)	Random Encounters (RE)
Agkistrodon contortrix	678	83.0	13.3	3.7
Carphophis amoenus	16	0.0	100.0	0.0
Coluber constrictor	862	87.5	12.1	0.4
Crotalus horridus	13	38.5	15.4	46.2
Diadophis punctatus	4,179	0.0	98.4	1.6
Elaphe guttata	100	0.0	100.0	0.0
Elaphe obsoleta	218	54.6	24.3	21.1
Lampropeltis calligaster	76	55.4	26.4	18.2
Lampropeltis getula	2	100.0	0.0	0.0
Lampropeltis triangulum	99	18.2	78.8	3.0
Nerodia sipedon	45	35.5	57.8	6.9
Pituophis catenifer	20	25.0	25.0	50.0
Storeria dekayi	7	0.0	100.0	0.0
Tantilla gracilis	1	0.0	100.0	0.0
Thamnophis sirtalis	744	71.5	23.0	5.5
Tropidoclonion lineatum	2	0.0	100.0	0.0
Totals	7,062	29.0	67.7	3.3

In summary, a twelve-year record of 16 snake species on an area of several hundred hectares demonstrated that each species differed in abundance, distribution, and probability of capture by three different methods. The data demonstrate that each method of sampled used was successful to varying degrees, depending on the species, and was totally ineffective for some species. The most effective method of sampling for eight species was AS, followed by LT for six species, and RE for two species (Table 1). One advantage of AS over LT was that shelters greatly reduced the risks of mortality or injury, and they yielded a high percentage of snakes with food in their stomachs that could be identified. Installation of AS involved relatively little time and effort (and expense) compared with installation of LT with drift fences. Also, AS are less restrictive for the investigator as they can be checked when convenient or left untended, whereas LT need to be tended regularly and involve a major commitment of time. Effective use of AS requires, however, that they be checked at the time of day when snakes are most likely to take shelter beneath them. I found it was futile to check shelters when they were too hot or too cold to be attractive. In most community studies of snakes, a combination of field sampling methods may be desirable in order to ameliorate the biases that arise from sexual, seasonal, and ontogenetic differences in behavior among the local assemblage of species.

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Blood Collection From *Macroclemys temmincki* (Troost)

Several methods are available for the collection of blood samples from turtles, including heart puncture through the plastron (Dessauer 1970; Maxwell 1979), toenail clipping (Frye 1991), and cutting off the end of the tail or sacrificing the animal (Duguy 1970). Blood samples also can be obtained from the femoral vein, jugular vein, or the carotid artery (Maxwell 1979). Microliter amounts of blood can be obtained from orbital vessels (Maxwell 1979), and blood can be collected from the dorsal cervical sinus of hatchlings (Bennett 1986). Blood sampling from alligator snapping turtles (*Macroclemys temmincki*) by heart puncture, however, presents several difficulties, especially in larger individuals with thick plastrons. The size and aggressiveness of these turtles make the use of limbs or neck vessels difficult. Sacrificing the animal is not desirable as they are rare, and toenail or tail clipping often does not provide a blood sample sufficient for multiple analyses. Following the methods suggested by Galbraith (pers. comm.), we have adapted his procedure for obtaining blood samples from the ventral caudal vein of *Chelydra serpentina* for use in *Macroclemys temmincki*.

To obtain a blood sample, the turtle was placed on its carapace. We found one or two metal crates (47 cm x 32 cm x 27 cm) to provide an adequate work surface upon which to balance the turtle. When handling turtles over 20 kg it was safer to use two persons to position the animal. The limbs were left unrestrained and the head allowed to hang free. The elevation of the work area was such that the turtle could not use its head for leverage. In this position, the turtle remained docile. Precautions were taken to avoid the immediate area of the head and claws of the hind limb, and movement in the vicinity of the head agitated the animal and provoked snapping.

After positioning the turtle, the ventral surface of the tail posterior to the cloaca was washed with Betadine (Povidone-iodine 10%, Purdue Frederick Co., Norwalk, Connecticut) solution. The tail was then grasped firmly with one hand, and a 1 inch, 22-gauge, Luer-Lok hypodermic needle attached to a 5-cc syringe (rinsed with sodium heparin) was used to obtain the blood sample. The ventral midline of the tail was palpated until the protrusions of the adjacent chevron bones which descend from the caudal vertebrae and form the haemal arches were felt (Galbraith 1991). The needle was inserted at a right angle into the space between the fourth and fifth chevron bones, and the caudal vein punctured. Gentle vacuum was applied until blood appeared in the syringe, then stronger vacuum applied until a sufficient sample of blood was drawn (usually 1-3 ml). The needle was withdrawn and pressure applied to the area until bleeding stopped. Excess blood was washed off the tail, and the area was swabbed with Betadine. Use of a syringe rather than Vacutainer blood collection tube was found to give better control of the process.

After collection, the blood was transferred to sterile tubes (Monoject Blood Collection Tubes/143 USP units sodium heparin) for storage until analyzed. Heparin was used as the anticoagulant instead of EDTA because hemolysis of the red blood cells is known to occur with EDTA (Dessauer 1970). Although not available for this study, it should be noted that lithium heparin is now the anticoagulant of choice for chelonian blood studies (Frye 1991).

Using this technique, blood samples have successfully been collected from 25 alligator snapping turtles ranging in size from 14 to 56 cm carapace length and weighing 2 to 45 kg (Powell and Knesel 1991). Repetitive blood sampling from these turtles over a six-month period has not produced visible harm to the animals.

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An Alphanumeric Code for Toe Clipping Amphibians and Reptiles

Toe clipping is one of the most widely used techniques for individual marking of anurans and lizards. The system proposed by Martof (1953), and other systems cited by Ferner (1979), require the amputation of four or more toes to obtain several two or three-digit numbers. Hero (1989) proposed a system that

Table 1. All codes possible by clipping one, two, or three toes. The codes available only for animals with five fore toes are printed in bold.

ONE	A4B2	**B5C5**	A1A3D4	A3A4C2	B1B4D5	**B3B5C3**	C2C3A1	C4C5B4	D2D4A2	A1B1D5	**A2B5C3**
TOE	A4B3	**B5D1**	A1A3D5	A3A4C3	**B1B5A1**	**B3B5C4**	C2C3A2	**C4C5B5**	D2D4A3	A1B2C1	**A2B5C4**
	A4B4	**B5D2**	A1A4B1	A3A4C4	**B1B5A2**	**B3B5C5**	C2C3A3	C4C5D1	D2D4A4	A1B2C2	**A2B5C5**
A1	**A4B5**	**B5D3**	A1A4B2	A3A4C5	**B1B5A3**	**B3B5D1**	C2C3A4	C4C5D2	**D2D4A5**	A1B2C3	**A2B5D1**
A2	A4C1	**B5D4**	A1A4B3	A3A4D1	**B1B5A4**	**B3B5D2**	**C2C3A5**	C4C5D3	D2D4B1	A1B2C4	**A2B5D2**
A3	A4C2	**B5D5**	A1A4B4	A3A4D2	**B1B5A5**	**B3B5D3**	C2C3B1	C4C5D4	D2D4B2	A1B2C5	**A2B5D3**
A4	A4C3	C1C2	**A1A4B5**	A3A4D3	**B1B5C1**	**B3B5D4**	C2C3B2	C4C5D5	D2D4B3	A1B2D1	**A2B5D4**
A5	A4C4	C1C3	A1A4C1	A3A4D4	**B1B5C2**	**B3B5D5**	C2C3B3	D1D2A1	D2D4B4	A1B2D2	**A2B5D5**
B1	A4C5	C1C4	A1A4C2	A3A4D5	**B1B5C3**	**B4B5A1**	C2C3B4	D1D2A2	**D2D4B5**	A1B2D3	A3B1C1
B2	A4D1	C1C5	A1A4C3	**A3A5B1**	**B1B5C4**	**B4B5A2**	**C2C3B5**	D1D2A3	D2D4C1	A1B2D4	A3B1C2
B3	A4D2	C1D1	A1A4C4	**A3A5B2**	**B1B5C5**	**B4B5A3**	C2C3D1	D1D2A4	D2D4C2	A1B2D5	A3B1C3
B4	A4D3	C1D2	A1A4C5	**A3A5B3**	**B1B5D1**	**B4B5A4**	C2C3D2	**D1D2A5**	D2D4C3	A1B3C1	A3B1C4
B5	A4D4	C1D3	A1A4D1	**A3A5B4**	**B1B5D2**	**B4B5A5**	C2C3D3	D1D2B1	D2D4C4	A1B3C2	A3B1C5
C1	A4D5	C1D4	A1A4D2	**A3A5B5**	**B1B5D3**	**B4B5C1**	C2C3D4	D1D2B2	D2D4C5	A1B3C3	A3B1D1
C2	**A5B1**	C1D5	A1A4D3	**A3A5C1**	**B1B5D4**	**B4B5C2**	C2C3D5	D1D2B3	D2D5A1	A1B3C4	A3B1D2
C3	**A5B2**	C2C3	A1A4D4	**A3A5C2**	**B1B5D5**	**B4B5C3**	C2C4A1	D1D2B4	D2D5A2	A1B3C5	A3B1D3
C4	**A5B3**	C2C4	A1A4D5	**A3A5C3**	B2B3A1	**B4B5C4**	C2C4A2	**D1D2B5**	D2D5A3	A1B3D1	A3B1D4
C5	**A5B4**	C2C5	**A1A5B1**	**A3A5C4**	B2B3A2	**B4B5C5**	C2C4A3	D1D2C1	D2D5A4	A1B3D2	A3B1D5
D1	**A5B5**	C2D1	**A1A5B2**	**A3A5C5**	B2B3A3	**B4B5D1**	C2C4A4	D1D2C2	**D2D5A5**	A1B3D3	A3B2C1
D2	**A5C1**	C2D2	**A1A5B3**	**A3A5D1**	B2B3A4	**B4B5D2**	**C2C4A5**	D1D2C3	D2D5B1	A1B3D4	A3B2C2
D3	**A5C2**	C2D3	**A1A5B4**	**A3A5D2**	**B2B3A5**	**B4B5D3**	C2C4B1	D1D2C4	D2D5B2	A1B3D5	A3B2C3
D4	**A5C3**	C2D4	**A1A5B5**	**A3A5D3**	B2B3C1	**B4B5D4**	C2C4B2	D1D2C5	D2D5B3	A1B4C1	A3B2C4
D5	**A5C4**	C2D5	**A1A5C1**	**A3A5D4**	B2B3C2	**B4B5D5**	C2C4B3	D1D3A1	D2D5B4	A1B4C2	A3B2C5
	A5C5	C3C4	**A1A5C2**	**A3A5D5**	B2B3C3	C1C2A1	C2C4B4	D1D3A2	**D2D5B5**	A1B4C3	A3B2D1
TWO	A5D1	C3C5	**A1A5C3**	**A4A5B1**	B2B3C4	C1C2A2	**C2C4B5**	D1D3A3	D2D5C1	A1B4C4	A3B2D2
TOES	A5D2	C3D1	**A1A5C4**	**A4A5B2**	B2B3C5	C1C2A3	C2C4D1	D1D3A4	D2D5C2	A1B4C5	A3B2D3
	A5D3	C3D2	**A1A5C5**	**A4A5B3**	B2B3D1	C1C2A4	C2C4D2	**D1D3A5**	D2D5C3	A1B4D1	A3B2D4
A1A2	A5D4	C3D3	**A1A5D1**	**A4A5B4**	B2B3D2	**C1C2A5**	C2C4D3	D1D3B1	D2D5C4	A1B4D2	A3B2D5
A1A3	A5D5	C3D4	**A1A5D2**	**A4A5B5**	B2B3D3	C1C2B1	C2C4D4	D1D3B2	D2D5C5	A1B4D3	A3B3C1
A1A4	B1B2	C3D5	**A1A5D3**	**A4A5C1**	B2B3D4	C1C2B2	C2C4D5	D1D3B3	D3D4A1	A1B4D4	A3B3C2
A1A5	B1B3	C4C5	**A1A5D4**	**A4A5C2**	B2B3D5	C1C2B3	C2C5A1	D1D3B4	D3D4A2	A1B4D5	A3B3C3
A1B1	B1B4	C4D1	**A1A5D5**	**A4A5C3**	B2B4A1	C1C2B4	C2C5A2	**D1D3B5**	D3D4A3	**A1B5C1**	A3B3C4
A1B2	**B1B5**	C4D2	A2A3B1	**A4A5C4**	B2B4A2	**C1C2B5**	C2C5A3	D1D3C1	D3D4A4	**A1B5C2**	A3B3C5
A1B3	B1C1	C4D3	A2A3B2	**A4A5C5**	B2B4A3	C1C2D1	C2C5A4	D1D3C2	**D3D4A5**	**A1B5C3**	A3B3D1
A1B4	B1C2	C4D4	A2A3B3	**A4A5D1**	B2B4A4	C1C2D2	**C2C5A5**	D1D3C3	D3D4B1	**A1B5C4**	A3B3D2
A1B5	B1C3	C4D5	A2A3B4	**A4A5D2**	**B2B4A5**	C1C2D3	C2C5B1	D1D3C4	D3D4B2	**A1B5C5**	A3B3D3
A1C1	B1C4	C5D1	**A2A3B5**	**A4A5D3**	B2B4C1	C1C2D4	C2C5B2	D1D3C5	D3D4B3	**A1B5D1**	A3B3D4
A1C2	B1C5	C5D2	A2A3C1	**A4A5D4**	B2B4C2	C1C2D5	C2C5B3	D1D4A1	D3D4B4	**A1B5D2**	A3B3D5
A1C3	B1D1	C5D3	A2A3C2	**A4A5D5**	B2B4C3	C1C3A1	C2C5B4	D1D4A2	**D3D4B5**	**A1B5D3**	A3B4C1
A1C4	B1D2	C5D4	A2A3C3	B1B2A1	B2B4C4	C1C3A2	**C2C5B5**	D1D4A3	D3D4C1	**A1B5D4**	A3B4C2
A1C5	B1D3	C5D5	A2A3C4	B1B2A2	B2B4C5	C1C3A3	C2C5D1	D1D4A4	D3D4C2	**A1B5D5**	A3B4C3
A1D1	B1D4	D1D2	A2A3C5	B1B2A3	B2B4D1	C1C3A4	C2C5D2	**D1D4A5**	D3D4C3	A2B1C1	A3B4C4
A1D2	B1D5	D1D3	A2A3D1	B1B2A4	B2B4D2	**C1C3A5**	C2C5D3	D1D4B1	D3D4C4	A2B1C2	A3B4C5
A1D3	B2B3	D1D4	A2A3D2	**B1B2A5**	B2B4D3	C1C3B1	C2C5D4	D1D4B2	D3D4C5	A2B1C3	A3B4D1
A1D4	B2B4	D1D5	A2A3D3	B1B2C1	B2B4D4	C1C3B2	C2C5D5	D1D4B3	D3D5A1	A2B1C4	A3B4D2
A1D5	**B2B5**	D2D3	A2A3D4	B1B2C2	B2B4D5	C1C3B3	C3C4A1	D1D4B4	D3D5A2	A2B1C5	A3B4D3
A1A3	B2C1	D2D4	A2A3D5	B1B2C3	**B2B5A1**	C1C3B4	C3C4A2	**D1D4B5**	D3D5A3	A2B1D1	A3B4D4
A1A4	B2C2	D2D5	A2A4B1	B1B2C4	**B2B5A2**	**C1C3B5**	C3C4A3	D1D4C1	D3D5A4	A2B1D2	A3B4D5
A2A5	B2C3	D3D4	A2A4B2	B1B2C5	**B2B5A3**	C1C3D1	C3C4A4	D1D4C2	**D3D5A5**	A2B1D3	**A3B5C1**
A2B1	B2C4	D3D5	A2A4B3	B1B2D1	**B2B5A4**	C1C3D2	**C3C4A5**	D1D4C3	D3D5B1	A2B1D4	**A3B5C2**
A2B2	B2C5	D4D5	A2A4B4	B1B2D2	**B2B5A5**	C1C3D3	C3C4B1	D1D4C4	D3D5B2	A2B1D5	**A3B5C3**
A2B3	B2D1		**A2A4B5**	B1B2D3	**B2B5C1**	C1C3D4	C3C4B2	D1D4C5	D3D5B3	A2B2C1	**A3B5C4**
A2B4	B2D2	THREE	A2A4C1	B1B2D4	**B2B5C2**	C1C3D5	C3C4B3	D1D5A1	D3D5B4	A2B2C2	**A3B5C5**
A2B5	B2D3	TOES	A2A4C2	B1B2D5	**B2B5C3**	C1C4A1	C3C4B4	D1D5A2	**D3D5B5**	A2B2C3	**A3B5D1**
A2C1	B2D4		A2A4C3	B1B3A1	**B2B5C4**	C1C4A2	**C3C4B5**	D1D5A3	D3D5C1	A2B2C4	**A3B5D2**
A2C2	B2D5	A1A2B1	A2A4C4	B1B3A2	**B2B5C5**	C1C4A3	C3C4D1	D1D5A4	D3D5C2	A2B2C5	**A3B5D3**
A2C3	B3B4	A1A2B2	A2A4C5	B1B3A3	**B2B5D1**	C1C4A4	C3C4D2	**D1D5A5**	D3D5C3	A2B2D1	**A3B5D4**
A2C4	**B3B5**	A1A2B3	A2A4D1	B1B3A4	**B2B5D2**	**C1C4A5**	C3C4D3	D1D5B1	D3D5C4	A2B2D2	**A3B5D5**
A2C5	B3C1	A1A2B4	A2A4D2	**B1B3A5**	**B2B5D3**	C1C4B1	C3C4D4	D1D5B2	D3D5C5	A2B2D3	A4B1C1
A2D1	B3C2	**A1A2B5**	A2A4D3	B1B3C1	**B2B5D4**	C1C4B2	C3C4D5	D1D5B3	D4D5A1	A2B2D4	A4B1C2
A2D2	B3C3	A1A2C1	A2A4D4	B1B3C2	**B2B5D5**	C1C4B3	C3C5A1	D1D5B4	D4D5A2	A2B2D5	A4B1C3
A2D3	B3C4	A1A2C2	A2A4D5	B1B3C3	B3B4A1	C1C4B4	C3C5A2	**D1D5B5**	D4D5A3	A2B3C1	A4B1C4
A2D4	B3C5	A1A2C3	**A2A5B1**	B1B3C4	B3B4A2	**C1C4B5**	C3C5A3	D1D5C1	D4D5A4	A2B3C2	A4B1C5
A2D5	B3D1	A1A2C4	**A2A5B2**	B1B3C5	B3B4A3	C1C4D1	C3C5A4	D1D5C2	**D4D5A5**	A2B3C3	A4B1D1
A3A4	B3D2	A1A2C5	**A2A5B3**	B1B3D1	B3B4A4	C1C4D2	**C3C5A5**	D1D5C3	D4D5B1	A2B3C4	A4B1D2
A3A5	B3D3	A1A2D1	**A2A5B4**	B1B3D2	**B3B4A5**	C1C4D3	C3C5B1	D1D5C4	D4D5B2	A2B3C5	A4B1D3
A3B1	B3D4	A1A2D2	**A2A5B5**	B1B3D3	B3B4C1	C1C4D4	C3C5B2	D1D5C5	D4D5B3	A2B3D1	A4B1D4
A3B2	B3D5	A1A2D3	**A2A5C1**	B1B3D4	B3B4C2	C1C4D5	C3C5B3	D2D3A1	D4D5B4	A2B3D2	A4B1D5
A3B3	**B4B5**	A1A2D4	**A2A5C2**	B1B3D5	B3B4C3	C1C5A1	C3C5B4	D2D3A2	**D4D5B5**	A2B3D3	A4B1C1
A3B4	B4C1	A1A3D5	**A2A5C3**	B1B4A1	B3B4C4	C1C5A2	**C3C5B5**	D2D3A3	D4D5C1	A2B3D4	A4B2C2
A3B5	B4C2	A1A3B1	**A2A5C4**	B1B4A2	B3B4C5	C1C5A3	C3C5D1	D2D3A4	D4D5C2	A2B3D5	A4B2C3
A3C1	B4C3	A1A3B2	**A2A5C5**	B1B4A3	B3B4D1	C1C5A4	C3C5D2	**D2D3A5**	D4D5C3	A2B4C1	A4B2C4
A3C2	B4C4	A1A3B3	**A2A5D1**	B1B4A4	B3B4D2	**C1C5A5**	C3C5D3	D2D3B1	D4D5C4	A2B4C2	A4B2C5
A3C3	B4C5	A1A3B4	**A2A5D2**	B1B4A5	B3B4D3	C1C5B1	C3C5D4	D2D3B2	D4D5C5	A2B4C3	A4B2D1
A3C4	B4D1	**A1A3B5**	**A2A5D3**	B1B4C1	B3B4D4	C1C5B2	C3C5D5	D2D3B3	A1B1C1	A2B4C4	A4B2D2
A3C5	B4D2	A1A3C1	**A2A5D4**	B1B4C2	B3B4D5	C1C5B3	C4C5A1	D2D3B4	A1B1C2	A2B4C5	A4B2D3
A3D1	B4D3	A1A3C2	**A2A5D5**	B1B4C3	**B3B5A1**	C1C5B4	C4C5A2	**D2D3B5**	A1B1C3	A2B4D1	A4B2D4
A3D2	B4D4	A1A3C3	A3A4B1	B1B4C4	**B3B5A2**	**C1C5B5**	C4C5A3	D2D3C1	A1B1C4	A2B4D2	A4B2D5
A3D3	B4D5	A1A3C4	A3A4B2	B1B4C5	**B3B5A3**	C1C5D1	C4C5A4	D2D3C2	A1B1C5	A2B4D3	A4B3C1
A3D4	**B5C1**	A1A3C5	A3A4B3	B1B4D1	**B3B5A4**	C1C5D2	**C4C5A5**	D2D3C3	A1B1D1	A2B4D4	A4B3C2
A3D5	**B5C2**	A1A3D1	A3A4B4	B1B4D2	**B3B5A5**	C1C5D3	C4C5B1	D2D3C4	A1B1D2	A2B4D5	A4B3C3
A4A5	**B5C3**	A1A3D2	**A3A4B5**	B1B4D3	**B3B5C1**	C1C5D4	C4C5B2	D2D3C5	A1B1D3	**A2B5C1**	A4B3C4
A4B1	**B5C4**	A1A3D3	A3A4C1	B1B4D4	**B3B5C2**	C1C5D5	C4C5B3	D2D4A1	A1B1D4	**A2B5C2**	A4B3C5

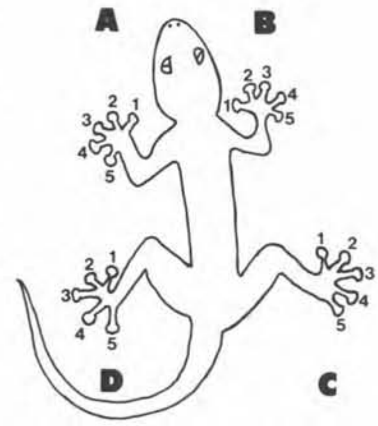

Fig. 1. Labeling system for feet and toes.

A4B3D1	**A5B5C1**	C2D1B1	C3D3A1	C4D4B3
A4B3D2	**A5B5C2**	C2D1B2	C3D3A2	C4D4B4
A4B3D3	**A5B5C3**	C2D1B3	C3D3A3	**C4D4B5**
A4B3D4	**A5B5C4**	C2D1B4	C3D3A4	C4D5A1
A4B3D5	**A5B5C5**	**C2D1B5**	**C3D3A5**	C4D5A2
A4B4C1	**A5B5D1**	C2D2A1	C3D3B1	C4D5A3
A4B4C2	**A5B5D2**	C2D2A2	C3D3B2	C4D5A4
A4B4C3	**A5B5D3**	C2D2A3	C3D3B3	**C4D5A5**
A4B4C4	**A5B5D4**	C2D2A4	C3D3B4	C4D5B1
A4B4C5	**A5B5D5**	**C2D2A5**	**C3D3B5**	C4D5B2
A4B4D1	C1D1A1	C2D2B1	C3D4A1	C4D5B3
A4B4D2	C1D1A2	C2D2B2	C3D4A2	C4D5B4
A4B4D3	C1D1A3	C2D2B3	C3D4A3	**C4D5B5**
A4B4D4	C1D1A4	C2D2B4	C3D4A4	C5D1A1
A4B4D5	**C1D1A5**	**C2D2B5**	**C3D4A5**	C5D1A2
A4B5C1	C1D1B1	C2D3A1	C3D4B1	C5D1A3
A4B5C2	C1D1B2	C2D3A2	C3D4B2	C5D1A4
ARB5C3	C1D1B3	C2D3A3	C3D4B3	**C5D1A5**
A4B5C4	C1D1B4	C2D3A4	C3D4B4	C5D1B1
A4B5C5	**C1D1B5**	**C2D3A5**	**C3D4B5**	C5D1B2
A4B5D1	C1D2A1	C2D3B1	C3D5A1	C5D1B3
A4B5D2	C1D2A2	C2D3B2	C3D5A2	C5D1B4
A4B5D3	C1D2A3	C2D3B3	C3D5A3	**C5D1B5**
A4B5D4	C1D2A4	C2D3B4	C3D5A4	C5D2A1
A4B5D5	**C1D2A5**	**C2D3B5**	**C3D5A5**	C5D2A2
A5B1C1	C1D2B1	C2D4A1	C3D5B1	C5D2A3
A5B1C2	C1D2B2	C2D4A2	C3D5B2	C5D2A4
A5B1C3	C1D2B3	C2D4A3	C3D5B3	**C5D2A5**
A5B1C4	C1D2B4	C2D4A4	C3D5B4	C5D2B1
A5B1C5	**C1D2B5**	**C2D4A5**	**C3D5B5**	C5D2B2
A5B1D1	C1D3A1	C2D4B1	C4D1A1	C5D2B3
A5B1D2	C1D3A2	C2D4B2	C4D1A2	C5D2B4
A5B1D3	C1D3A3	C2D4B3	C4D1A3	**C5D2B5**
A5B1D4	C1D3A4	C2D4B4	C4D1A4	C5D3A1
A5B1D5	**C1D3A5**	**C2D4B5**	**C4D1A5**	C5D3A2
A5B2C1	C1D3B1	C2D5A1	C4D1B1	C5D3A3
A5B2C2	C1D3B2	C2D5A2	C4D1B2	C5D3A4
A5B2C3	C1D3B3	C2D5A3	C4D1B3	**C5D3A5**
A5B2C4	C1D3B4	C2D5A4	C4D1B4	C5D3B1
A5B2C5	**C1D3B5**	**C2D5A5**	**C4D1B5**	C5D3B2
A5B2D1	C1D4A1	C2D5B1	C4D2A1	C5D3B3
A5B2D2	C1D4A2	C2D5B2	C4D2A2	C5D3B4]
A5B2D3	C1D4A3	C2D5B3	C4D2A3	**C5D3B5**
A5B2D4	C1D4A4	C2D5B4	C4D2A4	C5D4A1
A5B2D5	**C1D4A5**	**C2D5B5**	**C4D2A5**	C5D4A2
A5B3C1	C1D4B1	C3D1A1	C4D2B1	C5D4A3
A5B3C2	C1D4B2	C3D1A2	C4D2B2	C5D4A4
A5B3C3	C1D4B3	C3D1A3	C4D2B3	**C5D4A5**
A5B3C4	C1D4B4	C3D1A4	C4D2B4	C5D4B1
A5B3C5	**C1D4B5**	**C3D1A5**	**C4D2B5**	C5D4B2
A5B3D1	C1D5A1	C3D1B1	C4D3A1	C5D4B3
A5B3D2	C1D5A2	C3D1B2	C4D3A2	C5D4B4
A5B3D3	C1D5A3	C3D1B3	C4D3A3	**C5D4B5**
A5B3D4	C1D5A4	C3D1B4	**C4D3A5**	C5D5A1
A5B3D5	**C1D5A5**	**C3D1B5**	C4D3B1	C5D5A2
A5B4C1	C1D5B1	C3D2A1	C4D3B2	C5D5A3
A5B4C2	C1D5B2	C3D2A2	C4D3B3	C5D5A4
A5B4C3	C1D5B3	C3D2A3	**C4D3B5**	**C5D5A5**
A5B4C4	C1D5B4	C3D2A4	C4D4A1	C5D5B1
A5B4C5	**C1D5B5**	**C3D2A5**	C4D4A2	C5D5B2
A5B4D1	C2D1A1	C3D2B1	C4D4A3	C5D5B3
A5B4D2	C2D1A2	C3D2B2	C4D4A4	C5D5B4
A5B4D3	C2D1A3	C3D2B3	**C4D4A5**	**C5D5B5**
A5B4D4	C2D1A4	C3D2B4	C4D4B1	
A5B4D5	**C2D1A5**	**C3D2B5**	C4D4B2	

requires less amputation and allows the individual marking of 736 anurans by removing up to three toes. However, this system does not use all available combinations of toes because it assigns numerical series to the digits. Also, one must remember which combinations are not available.

I propose a system that assigns letters to the feet and numbers to the toes (Fig. 1). Therefore, all the combinations available for two and three toes can be obtained, with the single condition of not amputating more than two toes for each limb (Table 1). Using this code, clipping up to three toes allows marking of a maximum of 959 individual anurans (4 toes/forelimb, 5 toes/hindlimb), and 1310 lizards (5 toes/forelimb, 5 toes/hindlimb). The researcher can discard combinations that require the amputation of more than one toe on the same limb, or avoid other inappropriate combinations, such as those that involve clipping thumbs in species that use these for amplexus or fighting.

A number can be assigned to each code without the necessity of discarding codes. This also minimizes the mistakes due to two numbers having the same code in Hero's system (e.g., 708 and 807). However, with the ready availability of microcomputer spreadsheets that can sort and find codes on any alphanumeric system, most researchers will probably simply scratch each toe code off the list as it is used rather than risk the added complication of parallel numeric and alphanumeric systems. The code system can be photocopied and used by any researcher with the assurance that, within any self-imposed restrictions, the maximum number of two and three toe combinations are being utilized.

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RECENT POPULATION CHANGES

Return of *Cyclura carinata* to Pine Cay, Turks and Caicos Islands, BWI

One of the most interesting examples of local extirpation by introduced human pets gone feral is that of the rock iguana

Cyclura carinata from Pine Cay, Turks and Caicos Islands, British West Indies (Iverson 1978, 1979). Iverson (1979) recorded the systematic decline from 1973 to 1976 of a very large population to a relatively small one, that ended in total extirpation by 1978 (Iverson 1978). This extirpation was believed to have been caused by feral cats and dogs introduced during modern human settlement of the island. Nearby undeveloped islands lacking feral mammals (Ft. George and Little Water Cays) apparently have maintained relatively large iguana populations.

During a visit to Pine Cay from 13 to 28 July 1991, I searched for evidence of a return of *Cyclura carinata* to the island. Of 107 h spent walking the entire island, 22 h were spent on two study sites (see Fig. 1). Iguana tracks were found at several locations on the island. At one location opposite Ft. George Cay, many tracks were found, whereas at other locations only a single set of tracks was found. No iguanas were directly observed. However, residents of Pine Cay informed me that there are at least two individuals on the island, one of which is a large male. Indeed, sightings by residents occurred during my stay on Pine Cay. Residents also reported that these sightings began only within the previous year, and that no iguanas had been seen in the preceding ten years.

Two observations lead me to believe that the tracks and sightings were of *Cyclura carinata*. First, the tracks consisted of a single, continuous tail track bracketed by claw marks similar to other iguana tracks previously observed by the author (photographic slides were taken of several sets of tracks), and second, I believe that the sightings by the residents are reliable. All residents reporting iguanas were present when the iguanas previously inhabited the island, and all have also seen iguanas on the nearby Ft. George and Little Water Cays. Finally, *Cyclura carinata* is the only large lizard found in the Turks and Caicos Islands (Schwartz and Henderson 1988).

Therefore, it appears as though the rock iguana has returned to Pine Cay, although the source(s) of the recolonizing individuals is unknown. Three possible sources of iguanas exist: 1) Ft. George Cay, which is consistent with numerous tracks on the northeast end of the island; 2) Little Water Cay, a doubtful source because it would necessitate dispersal across Water Cay (an island approximately the same size as Pine Cay); and 3) reintroduction by humans.

Prospects for survival of the returning iguanas are tenuous. The size of the current population is probably very small (< 10). Human development on Pine Cay continues and may present some future danger to the continued presence of the iguanas. At present, however, iguana habitat is being preserved and human disturbance appears minimal. Finally, the initial cause of the extirpation from the island (i.e., feral cats) is still present. Cat tracks were seen on all parts of the island, and cats were observed twice during my fieldwork (see Fig. 1). These cats may reduce the likelihood of successful repopulation of Pine Cay by iguanas.

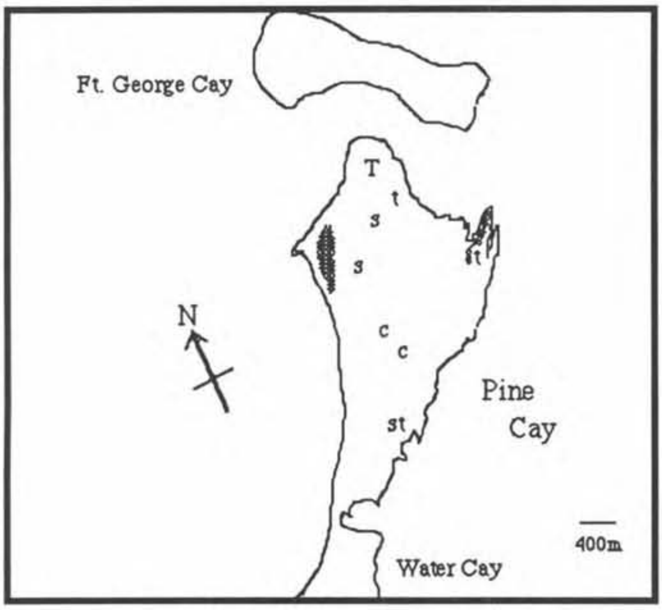

FIG. 1. Map of Pine Cay, British West Indies, showing locations of reported sightings (s) and tracks (T or t) of *Cyclura carinata*. The capital 'T' indicates area where several tracks were found on many occasions. Sightings of feral cats or presence of cat tracks are shown by the 'C's. Shaded areas indicate locations of the main study sites. Little Water Cay is found to the southwest of Water Cay. For a more detailed map see Iverson (1979).

Acknowledgments.—I thank J. Garis, manager of the Meridian Club, and the residents of Pine Cay (especially W. and Z. Brewer and G. Nipanich) and P. Neis for their assistance and hospitality during my stay on Pine Cay. Support was provided by an NSF predoctoral fellowship, an ASIH Gaige Fund award, the H. Holck fund of the University of Nebraska School of Biological Sciences, and T. and J. Smith. J. Iverson, R.

Ballinger, and J. Rowe provided useful comments on early drafts of this manuscript.

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GEOGRAPHIC DISTRIBUTION

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

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

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

Please submit any geographic distribution records in the **standard format only** to the Section Co-editors, Joseph T. Collins (USA & Canadian records only), Museum of Natural History — Dyche Hall, The University of Kansas, Lawrence, Kansas 66045–2454, USA, or Darrel Frost (the rest of the world), American Museum of Natural History, Central Park West at 79th Street, New York, New York 10024, USA. Short manuscripts are strongly discouraged, and are only acceptable when data cannot be presented adequately in the standard format.

Recommended citation for new distribution records appearing in this section is: Phillips, C. A. 1991. Geographic Distribution. *Ambystoma maculatum*. Herpetol. Rev. 22:133.

CAUDATA

AMBYSTOMA MACULATUM (Spotted Salamander). USA: TENNESSEE: Rutherford Co: Fall Creek Road, 1.5 km N jct. Mona Road (36°00'42"N, 86°26'18"W). 5 February 1991. B. T. Miller (Tennessee Scientific Study Permit 418). Verified by D. E. Metter. Middle Tennessee State University (MTSU 46C). County record (Redmond 1985, A biogeographic study of amphibians in Tennessee, Doctoral Dissertation, Univ. Tennessee, Knoxville, 290 pp.).

Submitted by **BRIAN T. MILLER**, Department of Biology, Middle Tennessee State University, Murfreesboro, Tennessee 37132, USA.

CRYPTOBRANCHUS ALLEGANIENSIS ALLEGANIENSIS (Eastern Hellbender). USA: TENNESSEE: Marion Co: Little Sequatchie River at new Rt. 28 crossing. 7 June 1991. J. L. Miller & B. T. Miller. Middle Tennessee State University (MTSU Photograph 48-C). New county record that verifies suspected distribution in the Cumberland Plateau physiographic region of middle Tennessee (Redmond 1985, A biogeographic study of amphibians in Tennessee, Doctoral Dissertation, Univ. Tennessee, Knoxville, 290 pp.); Warren Co: Collins River at Rt. 127 crossing. 6 June 1991. J. L. Miller & B. T. Miller. MTSU 47-C. Found dead along shoreline two days after heavy rains and flash floods. New county record that verifies suspected distribution in the eastern Highland Rim physiographic region of middle Tennessee (Redmond op. cit.). Both collected under Tennessee Scientific Study Permit 418 and both verified by D. E. Metter.

Submitted by **BRIAN T. MILLER** and **JOYCE L. MILLER**, Department of Biology, Middle Tennessee State University, Murfreesboro, Tennessee 37132, USA.

PSEUDOTRITON RUBER (Red Salamander). USA: TENNESSEE: Coffee Co: small spring-fed creek off Lyndell Bell Road, 2.9 km S Blantons Chaple Road. 20 March 1991. B. T. Miller (Tennessee Scientific Study Permit 418). Verified by D. E. Metter. Middle Tennessee State University (MTSU 43C). County record (Redmond 1985, A biogeographic study of amphibians in Tennessee, Doctoral Dissertation, Univ. Tennessee, Knoxville, 290 pp.).

Submitted by **BRIAN T. MILLER** and **JOYCE L. MILLER**, Department of Biology, Middle Tennessee State University, Murfreesboro, Tennessee 37132, USA.

ANURA

BUFO BRONGERSMAI (Brongersma's Toad). MOROCCO: Prefecture of Marrakech: Skhour-des-Rehamna, 137 km S Casablanca on road to Marrakech (32°30'N, 07°55'W). 29 March 1991. Ignacio de la Riva. Verified by M. Garcia Paris. Museo Nacional de Ciencias Naturales, Madrid, Spain (MNCN 16616). Second extra-Saharan record, 120 km NE from the first one by Distre et al. (1989 Bull. Soc. Herp. Fr. 51:19–26).

Submitted by **IGNACIO DE LA RIVA**, Departamento de Biologia, Facultad de Veterinaria, Universidad de Las Palmas, C/Francisco Inglott Artiles 12A, 35016 Las Palmas de Gran Canaria Islands, Spain.

BUFO COGNATUS (Great Plains Toad). USA: NEBRASKA: Cherry Co: ca. 30 km N Mullen, Nebraska on State Hwy. 97, Sec. 15, T27N, R32W. 27 July 1991. A. T. Holycross. Verified by John Lynch. University of Nebraska State Museum (UNSM 15062). New county record, fills significant gap in known distribution in Nebraska. (Lynch 1985, Trans. Nebraska Acad. Sci. 13:33–57).

Submitted by **ANDREW T. HOLYCROSS**, Department of Biology, University of Nebraska at Omaha, Omaha, Nebraska 68182–0040, USA.

BUFO COGNATUS (Great Plains Toad). USA: NEBRASKA: Otoe Co: Camp Creek Cemetery, Sec. 13, T7N, R14E. 26 May 1991. John Lokke. University of Nebraska State Museum (UNSM 15053); Nemaha Co: ca. 4 km S of Little Nemaha River on Nebr. Rt. 67, Sec. 25, T4N, R15E. 1 June 1991. K. B. Malmos and A. T. Holycross. UNSM 15061; Washington Co: ca. 2 km NW Nathan's Lake, Sec. 17, T17N, R13E. 26 April 1991. K. B. Malmos. UNSM 15054. All verified by John Lynch. New county records, fill significant gap in known distribution in Nebraska (Lynch 1985, Trans. Nebraska Acad. Sci. 13:33–57).

Submitted by **ANDREW T. HOLYCROSS** and **KEITH B. MALMOS**, Department of Biology, University of Nebraska at Omaha, Omaha, Nebraska 68182–0040, USA.

GASTROPHRYNE CAROLINENSIS (Eastern Narrowmouth Toad). USA: TENNESSEE: Rutherford Co: cedar glade along northern border of Fall Creek Road (36°00'42"N, 86°26'18"W). 4 May 1991. B. T. Miller (Tennessee Scientific Study Permit 418). Verified by D. E. Metter. Middle Tennessee State University (MTSU 36A, 37A). County record (Redmond 1985, A biogeographic study of amphibians in Tennessee, Doctoral Dissertation, Univ. Tennessee, Knoxville, 290 pp.).

Submitted by **BRIAN T. MILLER**, Department of Biology, Middle Tennessee State University, Murfreesboro, Tennessee 37132, USA.

HYLA GRATIOSA (Barking Treefrog). USA: TENNESSEE: Warren Co: Pigeon Hill Road, 1 km N Rt. 70-S near Centertown. 27 May 1991. J. L. Miller and B. T. Miller (Tennessee Scientific Study Permit 418). Verified by D. E. Metter. Middle Tennessee State University (MTSU 42A). New county record that extends the known distribution into the eastern Highland Rim physiographic region of middle Tennessee (Redmond 1985, A biogeographic study of amphibians in Tennessee, Doctoral Dissertation, Univ. Tennessee, Knoxville, 290 pp.).

Submitted by **BRIAN T. MILLER** and **JOYCE L. MILLER**, Department of Biology, Middle Tennessee State University, Murfreesboro, Tennessee 37132, USA.

PSEUDACRIS REGILLA (Pacific Chorus Frog). USA: ALASKA: Alexander Archipelago, Revillagigedo Island: 11 km NW of Ketchikan adjacent to Ward Creek Recreation Area (55°40'N, 131°75'W). 22 June 1991. R. Hauver (U. S. Forest Service). Verified by Nora Foster. Five frogs were observed (incl. 2 females, 1 male) in a muskeg pond, probably breeding. Two specimens were deposited at the University of Alaska, Fairbanks. Liver and leg muscle tissue are in ultracold storage (AF 0010–11) and the carcasses are in 95% ethanol (UAF 1992–5). These specimens represent the first observation of this species within the state of Alaska. The nearest known populations of this species are from a locality on Graham Island (North Queen Charlotte Island, British Columbia), 185 km SW, where they may be native, and at Eutsuk Lake (B. C.), 380 km SE, where they were introduced (Stebbins 1985, A Field Guide to Western Reptiles and Amphibians. Second Ed. Houghton Mifflin Co., Boston, 336 pp.). It is uncertain whether the Ketchikan population was introduced. Other species of herpetofauna with similar distributions in British Columbia (e.g., *Thamnophis elegans, Elgaria coerulea, Ascaphus truei*) occur in disjunct populations, notably at Kitimat and in the Skeena River (Stebbins, op. cit.). This species was previously placed in the genus *Hyla*.

Submitted by **DANA L. WATERS**, U. S. Fish and Wildlife Service, California Cooperative Fishery Research Unit, Humboldt State University, Arcata, California 95521, USA.

RANA CATESBEIANA (Bullfrog). USA: TENNESSEE: Warren Co: jct. Rts. 127 & 30. 27 May 1991. J. L. Miller and B. T. Miller (Tennessee Scientific Study Permit 418). Verified by D. E. Metter. Middle Tennessee State University (MTSU 38A). County record (Redmond 1985, A biogeographic study of amphibians in Tennessee, Doctoral Dissertation, Univ. Tennessee, Knoxville, 290 pp.).

Submitted by **BRIAN T. MILLER** and **JOYCE L. MILLER**, Department of Biology, Middle Tennessee State University, Murfreesboro, Tennessee 37132, USA.

RANA SYLVATICA (Wood Frog). USA: WISCONSIN: Waukesha Co: Menomonee Falls Tamarack Swamp, Sec. 22, T8N, R20E. 22 October 1991. Donald M. Reed & Rachel E. Lang. Verified by G. S. Casper. Milwaukee Public Museum (MPM 25307). New county record (Vogt 1981, Natural History of Amphibians and Reptiles of Wisconsin, Milwaukee Public Museum, 205 pp.)

Submitted by **DONALD M. REDD** and **RACHEL E. LANG**, Environmental Planning Division, Southeastern Wisconsin Regional Planning Commission, P. O. Box 1607, Waukesha, Wisconsin 53187, USA.

RANA UTRICULARIA (Southern Leopard Frog). USA: TENNESSEE: Coffee Co: small spring-fed creek off Lyndell Bell Road, 2.9 km S Blantons Chapel Road. 5 May 1991. B. T. Miller (Tennessee Scientific Study Permit 418). Verified by D. E. Metter. Middle Tennessee State University (MTSU 35A). County record (Redmond 1985, A biogeographic study of amphibians in Tennessee, Doctoral Dissertation, Univ. Tennessee, Knoxville, 290 pp.).

Submitted by **BRIAN T. MILLER**, Department of Biology, Middle Tennessee State University, Murfreesboro, Tennessee 37132, USA.

SPEA BOMBIFRONS (Plains Spadefoot). USA: ARIZONA: Navajo Co: Partnership Tank on F. R. 88, 4.8 km E, 6.4 km N of Heber. 3 July 1988. J. Boundy. SJSU A3330–3332. Verified by D. L. Martin. Extends range ca. 60 km SW from NE Arizona Colorado Plateau range (Stebbins 1985, A Field Guide to Western Reptiles and Amphibians. Second Ed. Houghton Mifflin Co., Boston, 336 pp.).

Submitted by **JEFF BOUNDY**, 113 South U Street, Apt. 46, Lompoc, California 93436, USA.

SPEA BOMBIFRONS (Plains Spadefoot). USA: NEBRASKA: Nemaha Co: ca. 2 km S of Honey Creek on Nebr. Rt. 67, Sec. 3, T5N, R15E. 1 June 1991. K. B. Malmos & A. T. Holycross. University of Nebraska State Museum (UNSM 15059); Otoe Co: ca. 5 km SE of Nebraska City, Sec. 35, T8N, R14E. 1 June 1991. K. B. Malmos and A. T. Holycross. UNSM 15058. Both verified by John D. Lynch. New county records, fill significant gap in known distribution in Nebraska. (Lynch 1985, Trans. Nebraska Acad. Sci. 13:33–57).

Submitted by **ANDREW T. HOLYCROSS** and **KEITH B. MALMOS**, Department of Biology, University of Nebraska at Omaha, Omaha, Nebraska 68182–0040, USA.

TESTUDINES

MACROCLEMYS TEMMINCKII (Alligator Snapping Turtle). KANSAS: Labette Co: Neosho River at Oswego. Summer 1886. W. S. Newlon. KU 197329. County record and earliest record for the state. Montgomery Co: Onion Creek, Sec. 9, T15E, R34S. 10 April 1986. C. D. Blex. KU 204668 (scute from carapace) and KU Color Slide 7406. County record. Both verified by Joseph T. Collins. The Labette County record had never been verified by voucher (Collins 1982, Amphibians and Reptiles in Kansas, Second ed., Univ. Kansas Mus. Nat. Hist. Pub. Ed. Ser. 8:1–356) until I discovered its skull in a study collection at Washburn University, Topeka, Kansas.

Submitted by **KELLY J. IRWIN**, 2861 West 32nd Avenue, Manhattan, Kansas 66502, USA.

TERRAPENE CAROLINA TRIUNGUIS (Three-toed Box Turtle). USA: GUAM (Mariana Islands): Mangilao Municipality: Mangilao. May 1991. Anonymous donation to DAWR. Verified by Thomas H. Fritts. Michael J. McCoid Private Collection (MJM 2956); deposited at USNM. First verified record for the island. This is the fourth adult individual seen by DAWR officials although there have been unverified sightings of 'hatchlings' in Mangilao. Other sightings include the Nimitz Hill area of Guam. The status of this turtle on Guam is uncertain. It is likely that this species has been repeatedly brought to Guam because high numbers of military and civilian personnel are transferred to Guam from the mainland USA where this reptile is a commonly kept pet.

Submitted by **MICHAEL J. MCCOID**, Guam Department of Agriculture, Division of Aquatic and Wildlife Resources, P.O. Box 2950, Agana, Guam 96910.

TERRAPENE ORNATA ORNATA (Ornate Box Turtle). USA: COLORADO: Elbert Co: 5.6 km E & 0.8 km N Agate (SE 1/4, Sec. 3, T7S, R58W). June 1990. David Chiszar, Adam Chiszar & Kevin Fitzgerald. Verified by Todd Gleeson. University of Colorado Museum of Natural History (UCM Color Slides 61–62). First county record (Hammerson 1982, Amphibians and Reptiles in Colorado. Colorado Division of Wildlife, Department of Natural Resources, Denver, 131 pp.).

Submitted by **DAVID CHISZAR**, Department of Psychology and Museum of Natural History, and **HOBART M. SMITH**, Department of EPO Biology and Museum of Natural History, University of Colorado, Boulder, Colorado 80309, USA.

TRACHEMYS SCRIPTA ELEGANS (Red-eared Slider). USA: GUAM (Mariana Islands): Mangilao Municipality: Lalo Mangilao. 11 March 1991. Anonymous donation to DAWR. Verified by Thomas H. Fritts. Michael J. McCoid Private Collection (MJM 2955); deposited at USNM. First verified record for the island. Individuals of this species have been observed in southern Guam in the Ugum, Namo, and Talofofo Rivers. Other sightings have been made in the Fena Valley Reservoir and the Agana Swamp. It is certain that the species is well established in Guam and should be expected in central and southern Guam where permanent and semi-permanent bodies of water exist. Nesting of this species has been observed along the Ugum River (G. Davis, DAWR, pers. comm.). Sightings of this species have also been made on Saipan (Commonwealth of the Northern Mariana Islands) in Lake Susupe, but it is unknown if this population is established. It is likely that this species was established on Guam due to releases or escapes from turtles present in the pet trade.

Submitted by **MICHAEL J. MCCOID**, Guam Department of Agriculture, Division of Aquatic and Wildlife Resources, P.O. Box 2950, Agana, Guam 96910.

LACERTILIA

FEYLINIA ELEGANS (NCN). CENTRAL AFRICAN REPUBLIC: Bouar. MNHN 1991-389; hill of Bangui: behind President's House. MNHN 1991-390; Zimba: 50 km downstream from Bangui. MNHN 1991-391 & 392. 27 January 1991 MNHN 1991-389; 6 March 1991. MNHN 1991-390; 23 May 1991. MNHN 1991-391 & 392. L. Chirio. Verified by Edouard R. Brygoo. First record for Central African Republic (Joger 1990. *In* Peters and Hutterer, eds. Vertebrates in the tropics. Museum Alexander Koenig, Bonn, 1990:85–102). Known before from N Zaïre (Brygoo and Roux-Esteve 1983, Bull. Mus. Natl. Hist. Nat., Paris, 4e Ser., 5, Section A, n° 1:307–341).

Submitted by **LAURENT CHIRIO**, 14 rue des Roses, F-06130 Grasse, France, and **IVAN INEICH**, Muséum National d'Histoire Naturelle, Laboratoire de Zoologie (Reptiles et Amphibiens), 25 rue Cuvier, F-75005 Paris, France.

OPHISAURUS ATTENUATUS (Slender Glass Lizard). USA: ILLINOIS: Jersey Co: Elsah, Sec. 17, Elsah Twp. 15 April 1962. Robert C. Brown. Southern Illinois University at Edwardsville Collection (SIUE 2537). Verified by Ralph W. Axtell. Lee Co: Green River Hunting Area. 19 April 1979. W. E. Southern. Northern Illinois University-H. D. Walley Collection (NIU-HDW 1449). Verified by Peter Merserve; 6 mi N Ohio, Thomas Ernot Farm. 12 July 1972. Michael D. Johnson. INHS 9842. Verified by Kevin S. Cummings. Madison Co: Melville, Sec. 29, Godfrey Twp. 4 May 1963. R. E. Adams. SIUE 2535. Verified by Ralph W. Axtell; Melville. 7 August 1964. R. E. Adams. SIUE 1536. Verified by Ralph W. Axtell. All the above represent new county records and/or extensions of range in Illinois. Will Co: Braidwood Dunes, Sec. 16, Reed Twp. 15 May 1987. John Levell. INHS 10779. This record helps substantiate a former record of this lizard from Custer Park, collected by Seymour Levy on 27 June 1956 (FMNH 75340). In addition, Smith (1961, Illinois Nat. Hist. Surv. Bull. 28(1):164) noted that this lizard was "more common in the dissected hills of Calhoun and Pike counties than elsewhere in the state," but he plotted only one locality for Calhoun County and none for Pike County on his distributional map. We herein report three specimens (UIMNH 50736–738) from near Pearl, Sec. 10, Pearl Twp., collected on 7 September 1951 by Robert Schroder. These specimens, verified by Christopher Philips, as well as a fourth (Western Illinois University Collection 14094 DOR) collected by Gordon R. Thurow from Napoleon Hollow Canyon, substantiate this lizard's presence in Pike County.

Submitted by **HARLAN D. WALLEY**, Department of Biology, Northern Illinois University, DeKalb, Illinois 60115, USA and **JOHN LEVELL**, 1454 West Grace Street, Chicago, Illinois 60613, USA.

SERPENTES

AMBLYODIPSAS UNICOLOR (NCN). CENTRAL AFRICAN REPUBLIC: Bangui: found dead and dried on the parking lot of the French Embassy. 28 November 1990. Laurent Chirio. Verified by Hidetoshi Ota. MNHN 1991–325. A second specimen is present in MNHN collections; area of Gribingui river, south of Chad. 1921. Baudon. Verified by Hidetoshi Ota. MNHN 1921–27. First record for Central African Republic (Joger 1990. *In* Peters and Hutterer, eds. Vertebrates in the Tropics. Museum Alexander Koenig, Bonn, 1990:85–102). Known before from NE Zaire, SW Sudan and N Cameroon (Broadley 1971, Occ. Pap. Nat. Mus. Rhodesia B4(33):629–697).

Submitted by **IVAN INEICH**, Muséum National d'Histoire Naturelle, Laboratoire de Zoologie (Reptiles et Amphibiens), 25 rue Cuvier, F-75005 Paris, France, and **LAURENT CHIRIO**, 14 rue des Roses, F-06130 Grasse, France.

CROTALUS HORRIDUS (Timber Rattlesnake). USA: LOUISIANA: Washington Parish: between Ards and Fords Creeks, 5.6 km E Angie, crossing a gravel road 50 m off La. Rt. 438 (30°58'39"N, 89°45'31"E), Sec. 46, TIS, R14E. 2 October 1991. W. Glen Knight. Verified by Richard A. Seigel. Southeastern Louisiana University Vertebrate Museum (SLU-1004). First documented record for Washington Parish (Dundee and Rossman 1989, The Amphibians and Reptiles of Louisiana. Louisiana State University Press, 300 pp.) and extends the Louisiana range ca. 96.5 km W Grangeville and 67.6 km N Mandeville.

Submitted by **WILLIAM I. LUTTERSCHMIDT**, Department of Zoology, University of Oklahoma, Norman, Oklahoma, 73019, USA.

DRYMARCHON CORAIS COUPERI (Eastern Indigo Snake). USA: FLORIDA: Pasco Co: north of Land-O-Lakes. 27 October 1990. Verified by Ronald A. Brandon. Four color slide vouchers, Southern Illinois University at Carbondale herpetology collection (SIUC R-2303). Fills a gap between Hernando, Sumter, Polk, Hillsborough, and Pinellas counties (Moler 1985, Distribution of the eastern indigo snake, *Drymarchon corais couperi*, in Florida. Herpetol. Rev. 16(2):37–38). On 5 November 1990, the Illinois Department of Conservation contacted me and asked if I would hold an eastern indigo snake they had confiscated. It had been collected illegally in Florida and brought into Illinois. The collector provided information on the collection locality. On 8 November 1990, the IDOC issued me a temporary holding permit for the 68-inch male. On 2 January 1991, the IDOC issued a letter authorizing the snake's return to Florida. The snake was shipped back to Florida on 9 September 1991, where regional nongame biologist Nancy D. Joiner of the Florida Game and Fresh Water Fish Commission released the animal at its capture site. The fourth ventral scale anterior to the cloaca was clipped with two V-notches so that the snake may be identified if recaptured.

Submitted by **SCOTT R. BALLARD**, Department of Zoology, Southern Illinois University at Carbondale, Carbondale, Illinois 62901–6501, USA.

ELAPHE OBSOLETA LINDHEIMERII (Texas Rat Snake). KANSAS: Barber Co: Sec. 13, T32S, R12W. 19 July 1983. J. T. Collins, K. J. Irwin, F. B. Cross, & R. E. Moss. KU 193399; Sec. 6, T35S, R12W. 14 May 1987. L. Miller & G. Trott. KU 207295; Sec.9, T35S, R14W. 19 May 1988. L. Miller. KU 211379; Cowley Co: 6.4 mi S & 6.4 mi E Winfield along Walnut River. 1 April 1978. L. Miller & M. Capron. KU 179036; Sec. 21, T32S, R3E. 24 May 1989. D. Phipps. KU 216190; Harper Co: 4.8 km W Anthony on Ks. Rt. 14. 25 May 1980. H. Guarisco. KU 186004; Kingman Co: 100 yards W jct. Rt. 14 & Rt. 42. 1 June 1990. C. Mammoliti. KU 216080; Sumner Co: 3 mi N Oxford. 23 September 1934. A. B. Leonard & W. S. Long. KU 18886; 8 km E Caldwell. 10 May 1986. L. Miller. KU 206231; Caldwell. 15 May 1986. L. Miller. KU 206232; Sec. 27, T34S, R3W. 8 June 1986. L. Miller. KU 206233; Caldwell.10 June 1986. L. Miller. KU 206234; Caldwell. 1 August 1986. L. Miller. KU 206400; Sec. 12, T35S, R3W. 8 October 1986. S. Schmidt. KU 206490. All verified by Joseph T. Collins. These 14 specimens all exhibited color and pattern variations typical of *E. o. lindheimerii*, as per Conant and Collins (1991, A Field Guide to Reptiles and Amphibians of Eastern and Central North America, Houghton Mifflin Co., Boston, 450 pp.). Two other specimens, one from Cowley County (KU 206174) and the other from Harper County (KU 22209), exhibited the color and pattern typical of the nominate race, and thus we consider this south-central Kansas population to be intergrades between the two subspecies.

Submitted by **KELLY J. IRWIN**, 2861 West 32nd Avenue, Manhattan, Kansas 66502, USA, **LARRY MILLER**, 920 SW 33rd Street, Topeka, Kansas 66611, USA, and **TRAVIS W. TAGGART**, 2302 Donald Drive, Hays, Kansas 67601, USA.

LAMPROPELTIS GETULA (Common Kingsnake). KANSAS: Morton Co: Cimarron National Grasslands, SE 1/4 Sec. 20, T34S, R43W. 12 May 1991. Robert L. Ball. KU 218810; Cimarron National Grasslands, NE 1/4 Sec. 16, T33S, R43W. 20 May 1991. Robert L. Ball. KU 218811. Verified by Joseph T. Collins. First records for county (Collins and Collins 1991, Reptiles and Amphibians of the Cimarron National Grasslands, Morton County, Kansas. U.S. Forest Serv. Publ. viii + 60 pp.).

Submitted by **ROBERT L. BALL**, HCR 2, Box 70, Brewster, Kansas 67732, USA.

LAMPROPELTIS TRIANGULUM AMAURA (Louisiana Milk Snake) USA: TEXAS: Rockwall Co: FM 550, ca. 4.8 km SW jct. FM 205 and I-30. 14 October 1991. Stacy Burnett. Verified by Jonathan A. Campbell. UTA R-30283. New county record. (Dixon 1987, Amphibians and Reptiles of Texas, Texas A&M University Press, College Station, Texas, 434 pp.).

Submitted by **CLAY M. GARRETT**, Department of Herpetology, Dallas Zoo, 621 East Clarendon Drive, Dallas, Texas 75203, USA.

NATRICITERES OLIVACEA (Banded Olive Snake). CENTRAL AFRICAN REPUBLIC: Zimba: 50 km aval of Bangui. 30 December 1990. Laurent Chirio. Verified by Hidetoshi Ota. MNHN 1991–329. First record for Central African Republic (Joger 1990. *In* Peters and Hutterer, eds. Vertebrates in the Tropics. Museum Alexander Koenig, Bonn, 1990:85–102). Known before from far NW Zaïre, Zongo (Loveridge 1958, Bull. Mus. Comp. Zool. Harvard Univ. 119(1):25–49).

Submitted by **LAURENT CHIRIO**, 14 rue des Roses, F-06130 Grasse, France, and **IVAN INEICH**, Muséum National d'Histoire Naturelle, Laboratoire de Zoologie (Reptiles et Amphibiens), 25 rue Cuvier, F-75005 Paris, France.

REGINA SEPTEMVITTATA (Queen Snake). USA: TENNESSEE: Stewart Co: Land Between The Lakes (LBL), LBL Road 227, 2.0 km E LBL 100 (The Trace). 19 July 1991. Eugene Zirkle (Tennessee Permit 482). Verified by David H. Snyder, Austin Peay State University (APSU 4308). Female (750 mm TL, 580 mm SVL), with 14 near-full-term young (mean TL = 215.2 mm, SD = 32.9; mean SVL = 164.9 mm, SD = 28.5) in body cavity, found DOR in wooded area near Lake Barkley (impounded Cumberland River). First record for Stewart County and LBL (Snyder 1972, Amphibians and Reptiles of Land Between The Lakes, Tennessee Valley Authority, Golden Pond, Kentucky); extends known range in Tennessee 35 km NW of nearest known voucher (SW Montgomery County, APSU 3666), to W edge of the Highland Rim, and slightly NW of that shown by Conant and Collins (1991, A Field Guide to Reptiles and Amphibians of Eastern and Central North America. Third ed. Houghton Mifflin Co., Boston, 450 pp.).

Submitted by **A. FLOYD SCOTT** and **EUGENE ZIRKLE**, Department of Biology and Center for Field Biology, Austin Peay State University, Clarksville, Tennessee 37044, USA.

SONORA SEMIANNULATA (Ground Snake). USA: NEW MEXICO: Socorro Co: DOR US Rt. 60, 7 km E jct. I-25, ca. 33 km NNE Socorro. 15 August 1984. Paul W. Hyder. Verified by Michael A. Williamson. University of New Mexico Museum of Southwestern Biology (MSB 51882). Extends range approximately 56 km NE from the central New Mexico population (Conant and Collins 1991, A Field Guide to Reptiles and Amphibians of Eastern and Central North America. Third ed. Houghton Mifflin Co., Boston, 450 pp.).

Submitted by **PAUL W. HYDER**, Department of Biology, New Mexico State University, Las Cruces, New Mexico 88003, USA.

STORERIA DEKAYI (Brown Snake). USA: NEBRASKA: Webster Co: Wilma and Boyd Jones Native Prairie, Sec. 35, T1N, R10W. 13 July 1991. A. T. Holycross. Verified by John Lynch. University of Nebraska State Museum (UNSM 15014). New county record, extends range ca. 80 km W in Nebraska (Lynch 1985, Trans. Nebraska Acad. Sci. 13:33–57). This specimen probably represents a population contiguous with Kansas populations to the south as opposed to Nebraska populations to the east.

Submitted by **ANDREW T. HOLYCROSS**, Department of Biology, University of Nebraska at Omaha, Omaha, Nebraska 68182–0040, USA.

THAMNOPHIS CYRTOPSIS (Blackneck Garter Snake). MÉXICO: SONORA: Caborca, Rancho La Bachata, 2 km NE of railroad station El Coyote. 27 July 1991. Sialia Karina Mellink. Centro Ecológico de Sonora (CES 670). Verified by C. H. Lowe. Four additional individuals were seen by E. Mellink on 29 July 1991. The site is a seasonal cattle tank, surrounded by mesquite (*Prosopis juliflora*) trees, close to a ranch house and cattle corral. The species was previously reported as "throughout Sonora (except extreme western part . . ." (Smith and Taylor 1945, An annotated checklist and key to the snakes of Mexico. U. S. Natl.

Mus. Bull. 187). The locality reported herein is in western Sonora, and is likely that of a small disjunct population, similar to those occurring in western Arizona (Lowe 1964, Amphibians and reptiles of Arizona. *In* Lowe (ed.), The Vertebrates of Arizona. Univ. Arizona Press, Tucson, pp. 153–174).

Submitted by **ERIC MELLINK**, Centro de Investigación Científica y Educación Superior de Ensenada, Apartado Postal 2732, Ensenada, Baja California, México.

THAMNOPHIS SIRTALIS ANNECTENS (Texas Garter Snake). USA: KANSAS: Meade Co: 2.4 km S Meade County State Park on Ks. Rt. 23. 13 June 1980. K. J. Irwin (KU 187499); 0.4 km E Meade County State Park dam, Sec. 24, T33S, R29W. 21 May 1986. K. J. Irwin (KU 206182); Meade County State Park headquarters. June 1991. M. Goldsberry (KU 218777). All verified by Joseph T. Collins. First records for state (Collins 1982, Amphibians and Reptiles in Kansas. Second ed. Univ. Kansas Mus. Nat. Hist. Pub. Ed. Ser. 8:1–356). None of the specimens shows evidence of intergradation with *T. s. parietalis*.

Submitted by **KELLY J. IRWIN**, 2861 SW 32nd Avenue, Manhattan, Kansas 66502 USA.

TYPHLOPS HYPOMETHES (Culebrita Ciega Universitaria). PUERTO RICO: Isabela, Punto Sardina: 2.7 km E of intersection with PR 466. 20 November 1991. Manuel S. Leal. Verified by R. Thomas. Museum of Biology, University of Puerto Rico, Rio Piedras, UPRRP 5744 (adult female), and UPRRP 5745 (juvenile). First record for the NW part of the island; extends the range about 45 km W (airline) from the prior most western locality (7 km W Palmas Altas). This species was described by Hedges and Thomas (1991, Herpetologica 47(4):448–459).

Submitted by **MANUEL S. LEAL**, Department of Biology, P. O. Box 23360, University of Puerto Rico, Río Piedras, Puerto Rico 00931–3360.

Graptemys kohnii in the Pearl River: An Alternative Explanation

Jones et al. (1991) reported the Mississippi map turtle, *Graptemys kohnii* (*G. pseudogeographica kohnii* sensu Vogt 1978) from the Pearl River in the vicinity of Jackson, Mississippi. They attributed the presence of this species, previously found only in the Mississippi River Drainage in Mississippi, to introduction by release of captives. This is a plausible explanation, as hatchling *Graptemys* are commonly sold and kept as aquarium pets and equally commonly released into the nearest aquatic habitat when no longer wanted. However, on the basis of our field work during 1978 and 1979 we suggest an alternative explanation for the occurrence of this species in the Pearl River.

During the summers of 1978 and 1979 we conducted a turtle population study (McCoy and Vogt, in prep.) on the Pearl River near Georgetown, Copiah Co., Mississippi. We trapped turtles using non-selective techniques (Vogt 1980) during 21 days between 1 July and 13 August 1978, and 25 days between 10 June and 4 August 1979. A total of 716 turtles were taken in 1978 and 851 in 1979. Most of the turtles were marked and subsequently released at the original site of capture.

The natural turtle fauna of the Pearl River at the study site conslsts of 10 species. The seven most abundant (both years) were *Sternotherus carinatus, Pseudemys concinna, Trachemys scripta, Graptemys oculifera, G. pulchra, Apalone mutica*, and *A. spinifera*. *Macroclemys temminckii* was present in small numbers, and one or two specimens of *Chelydra serpentina* and *Sternotherus odoratus* were caught each year. In 1979 a single specimen of *G. kohnii* was taken, a subadult female (CM 95653), carapace length 58.7 mm, in its third year (from growth rings). The animal appeared healthy, and showed no signs of having been in captivity.

In April 1979, between the two trapping seasons, the most extensive flood in the history of the Pearl River occurred, surpassing even the great flood of 1874 (Edelen et al. 1986). Maximum discharge at the gauging station at Monticello, Mississippi, 64 river km below the study site was 3,424.3 m^3/sec, more than 60 times summer normal ($x = 56\ m^3$/sec, 1978 and 1979 trap days combined). The river at the study site, usually 15-20 m wide at summer low water, was several kilometers out of banks.

At normal river levels tributaries of the Pearl River (Copiah Creek and Little Copiah Creek) approach Mississippi River tributaries (Bayou Pierre) within 3 km in central Copiah County. At maximum flood stage in April, 1979 these watersheds may have been in communication. We suggest that an explanation for the appearance of *Graptemys kohnii* in the 1979 samples, and an alternative explanation for the presence of the species in the Pearl River, is natural dispersal into the Pearl River from Mississippi River tributaries during the April 1979 flood.

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BOOK REVIEWS

A Field Guide to Reptiles and Amphibians of Eastern and Central North America, by Roger Conant and Joseph T. Collins. 1991. Houghton Mifflin Company, Boston, Massachusetts. Peterson Field Guide Series Number 12. Third edition. xviii + 450 pp., 48 color plates, 333 maps. Hardcover $24.95, Softcover $16.95.

What can one say about a field guide that has withstood the test of time? It is the best source of accurate identification of the amphibians and reptiles of eastern North America. This new edition, like its predecessors, will inspire and educate those already committed to natural history and many who will become our future herpetologists. Accuracy, attention to detail, and the illustrations set this book apart from the other field guides on the market. In many respects the third edition is similar to the second, but it does contain some substantial differences.

The first paragraph of the introduction to the second and third editions identifies three groups for whom the book was written, professional herpetologists, herpetoculturists, and field naturalists. Accurate identification of amphibians and reptiles is central to the activities of these people. This field guide has become an overwhelming success because its primary focus is accurate identification. Almost anyone can take this book into the field and properly identify adults and juveniles of most species encountered.

The chapter sequence remains the same. A thorough introduction is followed by chapters on capture and transportation techniques and care in captivity. An important new contribution is the reminder in the beginning of the techniques chapter to check with state authorities for lists of protected species and laws regulating collecting. Many states have enacted laws that restrict collecting native species and owning certain others. This trend will likely continue. The chapter on snakebite was carefully rewritten under the direction of Drs. S. A. Minton and D. L. Hardy. There is a short but useful glossary, a completely revised list of general, regional, and state references, and an index that allows one to find any species by common, scientific, and many vernacular names. The latter is especially important for the layman.

Each species account follows a rigid format established in the first edition. The common name is given before the scientific name, and the number of the plate on which its illustration appears is noted. The range of adult body length is listed in inches and centimeters, followed by known maximum total length. Head-body length (snout-vent length, SVL) is also given for lizards, but not salamanders and snakes. The comment (p. 12) that lizards often possess shorter than normal tails due to partial regeneration is well taken, but salamanders and snakes often possess partial tails. SVL is a standard measure used in the scientific literature and this information should be provided for all appropriate groups.

The verbal descriptions are the most accurate of those in field guides currently on the market. Adults and juveniles, where appropriate, are included in the description. The habitat and some aspects of behavior are noted for most species. Additional notes on unique aspects of the biology of each species and preferred prey are provided in some cases. Similar species are listed with brief descriptions to allow accurate comparisons, and the geographic distribution is described and the corresponding map number indicated.

The second edition covered 331 species and 574 subspecies, whereas the third edition includes 379 species and 595 subspecies. The increase stems from three sources: new discoveries, systematic changes, and introduced species. Several new species have been discovered outright since 1975 (e.g., *Rana okaloosae*, Moler 1985; *Ophisaurus mimicus*, Palmer 1987; *Plethodon petraeus*, Wynn et al. 1988), cryptic species have been discovered in what were formerly single widespread species (13 species in the *Plethodon glutinosus* complex, Highton et al. 1989; *Ambystoma barbouri*, Kraus and Petranka 1989), and subspecies have been elevated to specific status (e.g., *Eurycea bislineata*, *E. cirrigera*, *E. wilderae*, Jacobs 1987; *Nerodia floridana*, Lawson 1987). Fourteen introduced species were described in the second edition compared to 27 in the third edition. Most have become established in southern Florida. Unfortunately, introduced species often adversely affect native species and communities. It remains to be seen if the amphibian and reptile introductions are benign.

A substantial number of taxonomic changes have occurred since the publication of the second edition. Most have been incorporated into this book, but some have not. For example, emydid turtles formerly lumped into the single genus *Chrysemys* are now in the genera *Chrysemys*, *Pseudemys*, and *Trachemys*, water snakes formerly in *Natrix* are now *Nerodia*, *Regina*, and *Clonophis*, and the spring peeper *Hyla crucifer* and the little grass frog *Limnaoedus ocularis* are now in the genus *Pseudacris*. Conant and Collins have rejected several proposed changes, such as dividing *Gopherus* into *Gopherus* and *Xerobates* for the gopher and desert tortoises, and *Scaphiopus* into *Scaphiopus* and *Spea* for the spadefoot toads. They reject outright the suggested synonymy of *Sternotherus* into *Kinosternon* for the musk turtles and *Thamnophis* into *Nerodia* for garter snakes. A substantial taxonomic modification above the generic level was the recent splitting of the large lizard family Iguanidae into eight families, following Frost and Etheridge (1989). Members of six of the families occur in eastern North America. Where are the explanations for these decisions? Readers unfamiliar with systematic herpetology will wonder why these names were changed. The authors missed an opportunity to educate the general public about the importance and dynamics of systematics. It would have taken only a few paragraphs, and it would have helped readers understand that names are not cast in stone.

Any reader familiar with the second edition will quickly see that many common names have been changed substantially. The new ones follow Collins (1990). Collins is a proponent of standardization of common names for North American amphibians and reptiles. Unfortunately for the herpetological community and the reader, some of the names used are controversial and will not be used by everyone. For example, the red-bellied turtle (*Pseudemys rubriventris*) is now the redbelly turtle, the plains black-headed snake (*Tantilla nigriceps*) is the plains blackhead snake, and the shovel-nosed salamander (*Leurognathus marmoratus*) is the shovelnose salamander. On first glance hyphenated names ending in -ed have been changed to single names with the ending dropped. However, we still find black-striped snake, broad-banded copperhead, red-eared slider, bird-voiced treefrog, and broken-striped newt. One has to wonder what criteria were used to select these standard common names. Unlike bird watchers, amateur and professional herpetologists have long used scientific names instead of common names. Because of the controversy, readers should make their own choice of whether to use scientific names, the common names in the third edition, or the common names in the second edition. It remains to be seen whether the controversy will be settled by the time the fourth edition appears.

Tom Johnson followed in the footsteps of Isabelle Hunt Conant by providing accurate and beautiful illustrations of many species. These include many not seen in the second edition. He hand-colored all of the previously black and white plates and provided several new ones. He deserves our accolades for his important contributions to this book.

The second edition contained a plate on capture and handling techniques and one on first aid for snakebite. The first plate now appears in the techniques chapter, and the second one was omitted. Thus, the 48 plates found in the center signature contain color illustrations of most of the species and subspecies covered in the text. Excellent drawings of tadpoles of 14 species of frogs appear on pages 348-353. I hope this sampling will tantalize some readers to learn more about this fascinating life history stage. Perhaps Tom Johnson can provide illustrations of aquatic salamander larvae in the next edition of the book.

As Conant and Collins point out (p. 9), accurate identification of many of the subspecies of amphibians and reptiles is quite possible. Conant resolved the question of whether to include them or not in the first edition. Those subspecies that could be distinguished visually without a microscope, recourse to scale counts, internal anatomy, or sophisticated laboratory techniques were illustrated in the plates. This was an important decision, for it increased the utility of the field guide. It also made readers pay more attention to geographic variation in these animals. Treating subspecies in the text is another matter, but was resolved by including each of those illustrated in the color plates under a separate main entry. Despite the discussion of the subspecies category, clinal variation, and some of the problems with delineation of this taxon, separate main entries have, in my experience, led amateurs to equate subspecies with species. On numerous occasions I have found myself explaining that subspecies are races of the same species and members of those subspecies can freely interbreed. In one instance an amateur herpetologist collecting salamanders for someone conducting a reproductive study in a zone of overlap retained only those specimens that looked like the subspecies in which the researcher said she was interested. The other phenotype, and presumably some intergrades, were not collected. When queried, the collector found it difficult to understand the concept of population variation, especially in areas of contact between subspecies. The subspecies was in his mind a separate entity. I do not know how widespread this problem is, but I wonder if there may be a way of arranging the descriptions in the text of the field guide so that there is little confusion over the relationship between subspecies and species.

A difficult and largely thankless task in the preparation of a field guide is the construction of distribution maps. Collins took over this job for the third edition of this book and spent several years accumulating information. The 333 shaded range maps are reasonably accurate for most species. I understand from the authors that several errors have been brought to their attention. They and the book's readers should realize, however, that it is nearly impossible to make all shaded range maps completely error-free. These maps reflect the philosophy of their maker: areas without confirmation (museum specimens or slides) are unshaded to stimulate collectors to obtain scientific vouchers to prove him wrong. Hence, maps of riverine species (e.g., *Graptemys kohnii*, *Apalone mutica*) are shown with shaded fingers instead of illustrating broad sweeps of geography where they may occur. There are also more open areas in the distribution maps of the third edition than in the second edition (see for example *Necturus maculosus* and *Elaphe guttata*). The subspecific problem rears its head here as in the text (see above). Most maps containing subspecies are shown with distinct lines indicating ranges abutting those of adjacent subspecies. Only a few, such as the maps for *Agkistrodon contortrix* and *Desmognathus fuscus*, show overlap zones. Illustrating contact zones with overlapping shading would help reduce some of the misunderstandings about subspecies.

The book is well-written, well-bound for long term wear, and attractive. I found only a few minor errors and problems, and no misspellings. Figure 20 refers to *C. texana* when the text uses *Cophosaurus texanus*. The family for *Rhinophrynus dorsalis* was left out of both editions, whereas all other species fall under a family heading. In the Index, under "moccasin," one finds "see cottonheads and coppermouths." Names for turtle scutes on the inside of the front cover reflects outdated terminology; nuchal should be cervical and costal should be pleural (see Ernst and Barbour 1989). The illustrations in Plate 3 are considerably darker in my hardbound copy than in my softbound copy. In the review copy Plate 3 has a green spot on the plastron of *Emydoidea blandingii* and on the carapace of *Kinosternon subrubrum*.

It should be clear from this review that a few improvements can be made in this book. I remain concerned about some of the common names, and how difficult it is for books such as these to convey to the general public the concepts and dynamics inherent in the fields of systematics and taxonomy. I also fear that some readers will come away thinking that there is little left to do with North American species, when in fact there are huge information gaps.

These concerns not withstanding, I highly recommend this book to anyone seriously and even casually interested in the amphibians and reptiles of eastern North America. Buy a copy for yourself and additional copies for friends interested in natural history. The price is reasonable, especially for a softbound copy. Obviously much can be said for the best field guide on the market.

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A Field Guide to Reptiles and Amphibians of Eastern and Central North America.

Because of its enormous importance to herpetologists and naturalists alike, the editors of *Herpetological Review* thought it advisable to have the new edition of Roger Conant's famous *Field Guide* reviewed by two people with somewhat different approaches to herpetology. Joseph Mitchell, the author of the preceding in-depth review, emphasizes natural history and ecology in his research; my own field is systematics, with an emphasis on biochemical techniques.

Mitchell has done a fine job of describing the contents of this updated field guide, and he has provided many useful comments and criticisms, all of which I agree with. Much of what I would have written in my review therefore has been said already. I will not repeat the points Mitchell has covered, except to emphasize topics that I feel are particularly important.

The third edition of Conant's field guide, updated with the help of his new co-author, Joseph T. Collins, follows essentially the format of the previous editions. There are several changes, however. Some of these are improvements, some are not.

The most obvious improvement, and undoubtedly the major reason for producing a new edition, is the updating of species diagnoses and taxonomy to reflect the results of systematic work conducted since the second edition appeared in 1975. The 1975 edition was published just as biochemical techniques were beginning to be used in the analysis of geographic variation and species boundaries in reptiles and amphibians, and the ever-expanding use of biochemistry in the intervening 16 years has demonstrated the existence of numerous cryptic species. This is particularly true among the salamanders. In the second edition, there were 72 recognized species of salamanders. By the third edition the total is 98, of which only a few (e.g., *Plethodon petraeus*) were newly discovered since 1975. Others were deleted from the third edition because they turned out to be parthenogenetic hybrids (*Eurycea latitans* and *E. troglodytes*) or synonymous with another species (*Plethodon longicrus* with *P. yonahlossee*). Significantly, 27 of the newly included species (27.6% of the total) were identified largely on the basis of biochemical methodologies. This upward trend in the number of identified species continues and this third edition soon will be out of date. I personally am aware of data suggesting that there are probably further unrecognized species of *Siren*, *Pseudobranchus*, *Desmognathus*, *Aneides*, and *Eurycea*. Nothing, of course, can be done about this; the authors cannot document future knowledge.

The use of biochemical techniques has allowed us to better understand the diversity of reptiles and amphibians. It has also allowed us to recognize units in nature, including species, that are only identifiable using biochemical characters. This, although it is a boon to herpetology as a whole, is a problem when one is trying to produce a guide to field identification. Most biochemical techniques cannot be used in the field, and in any case such techniques are not available to the vast majority of potential users of the guide. The authors have handled this problem in a variety of ways. In some cases (e.g., *Desmognathus santeetlah* and *D. fuscus*) recognition of the appropriate units in nature has allowed for the identification of minor morphological differences that were previously unrecognized. In these cases the species are listed separately using the standard format. In cases in which species are morphologically indistinguishable, the authors are inconsistent in their format. For example, *Ambystoma barbouri* and *A. texanum* are morphologically identical, but they are listed separately. Alternatively, *Plethodon glutinosus* recently has been divided into 13 essentially morphologically indistinguishable species. Unlike *A. barbouri*, these are listed under the single heading "*Plethodon glutinosus* complex."

Problems with the way species, subspecies, and species complexes have been presented in this field guide are discussed at length in the preceding review. I would, however, like to add my voice to Mitchell's in his criticism of this format. Subspecies are sometimes presented as distinct entries apparently with the same "weight" as species while others are simply listed within the species entry. Hence, to the layman some of the subspecies come across as somehow more "important" than others. Admittedly, Conant and Collins explain their formatting criteria in the introduction to the book (readily identifiable subspecies are accorded separate accounts, more obscure ones are listed within species accounts), but unfortunately very few users of the guide will read the introduction (I probably never would have read it if I had not been asked to do this review).

The range maps in the third edition have been updated and much improved. The edges of the distributions of many species are much more dissected than in the second edition, and this undoubtedly reflects an improved knowledge of exact distribution patterns. In some cases, however, distributional margins appear to have been drawn to reflect accurate knowledge where such knowledge does not exist. For example, several species (e.g., *Rana septentrionalis* and *Thamnophis sirtalis*) have ranges that extend northward into northern Ontario and Quebec where herpetological reconnaissance has been minimal. Yet these margins are drawn as wavy lines suggestive of great accuracy. The current knowledge of distribution patterns in this part of the world would be better displayed as straight lines (which better suggest a lack of knowledge), or perhaps with a series of question marks.

Something that I think would be very useful to many users of this field guide would be the inclusion of at least minimal literature citations. The example Mitchell cited in his review was the division of the Iguanidae into multiple families. This is liable to be very confusing to many users, but this confusion would be cleared up by the inclusion of a citation to Frost and Etheridge (1989). Another example can be seen in *Acris crepitans*. Conant and Collins accept the subspecies *A. c. paludicola* for populations in southeastern Texas and southwestern Louisiana although Dundee and Rossman (1989) were unaware of the use of the name for Louisiana populations. I think the book would be much improved if statements such as "subspecific taxonomy according to . . ." or "familial designations according to . . ." were included. A single citation in each case would be sufficient.

One of Mitchell's major criticisms, and one I wish to emphasize as well, is the modification of the common names in the third edition of the field guide to follow Collins (1990). I have no problem with standardizing common names but I do not understand why the "standard" common name chosen in many cases differs from the one most commonly used for a given species. Why, to use Mitchell's example, change "red-bellied turtle" to "redbelly turtle"? "Redbelly" sounds like a blues musician. I hesitate to suggest what the "blackhead" in "blackhead snake" brings to mind. Neither Mitchell nor I are by any means the first to make this complaint (e.g., Huheey 1978; Rossman et al. 1978).

I have discussed a number of criticisms of the new edition of the *Field Guide to the Reptiles and Amphibians*, but in truth none of these criticisms is really very important. The book is excellent and I cannot imagine that anyone even remotely interested in herpetology or in natural history in general can do without a copy. It, like the previous two editions, is head and shoulders above any of the other amphibian and reptile guides currently on the market.

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DUNDEE, H. A., and D. A. ROSSMAN. 1989. The Amphibians and Reptiles of Louisiana. Louisiana State Univ. Press, Baton Rouge. 300 pp.

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ROSSMAN, D. A., H. R. MUSHINSKY, and H. C. DESSAUER. 1978. Letter to the editor regarding common names list. Herpetol. Rev. 9:146.

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PUBLICATIONS RECEIVED

Annotated Checklist and Bibliography of Amphibians and Reptiles of Tennessee (1835 through 1989), by William H. Redmond, Arthur C. Echternacht, and A. Floyd Scott. 1990. Miscellaneous Publications of The Center for Field Biology, Austin Peay State University, Number 4. Center for Field Biology Publications, Department of Biology, Austin Peay State University, Clarksville, Tennessee 37044, USA. (no ISBN No.) $4 + $1 s&h. iii + 173 pp.

A review and update of information on distributions, taxonomy, and habitats of Tennessee's herpetofauna, plus an extensive (1124 titles) annotated list of literature dealing with herpetology in the state.

ERRATUM

In the first complete paragraph on p. 6 of Ritke and Babb (1991. Herpetol. Rev. 22(1):5-6,8) the third sentence should read: "These frogs may have been waiting to ambush prey; we once observed (22 Oct., 1343 h, 27.3°C) male #2 leap ca. 0.3 m from his resting position and consume a prey item." This correction in the time of observation of feeding behavior by *Hyla chrysoscelis* is significant because it indicates that a nocturnal species such as the gray treefrog may feed during the day to facilitate the production of energy reserves before the onset of winter dormancy.

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No. 2. *The Turtles of Venezuela*, by Peter C. H. Pritchard and Pedro Trebbau. 1984. An exhaustive natural history covering half of the turtle species of South America, with worldwide checklist of turtle genera and species. 414 p., 48 color plates (25 watercolor portraits by Giorgio Voltolina and 165 photographs of turtles and habitats) measuring 8½ x 11 inches, keys, 16 maps. Regular edition, clothbound $45.00; patron's edition, two leatherbound volumes in cloth-covered box, signed and numbered by authors and artist $300.00; set of 25 color prints of turtle portraits, on heavy paper stock and in protective wrapper $30.00.

No. 3. *Introduction to the Herpetofauna of Costa Rica / Introducción a la Herpetofauna de Costa Rica*, by Jay M. Savage and Jaime Villa R. 1986. Bilingual edition in English and Spanish, with distribution checklist, bibliographies, and extensive illustrated keys. 220 p., one color plate, map. Clothbound $30.00.

No. 4. *Studies on Chinese Salamanders*, by Ermi Zhao, Qixiong Hu, Yaoming Jiang, and Yuhua Yang. 1988. Evolutionary review of all Chinese species with keys, diagnostic figures, and distribution maps. 80 p., 7 plates (including 10 color photographs of salamanders and habitats). Clothbound $12.00.

No. 5. *Contributions to the History of Herpetology*, by Kraig Adler, John S. Applegarth, and Ronald Altig. 1989. Biographies of 152 prominent herpetologists (with portraits and signatures), index to 2500 authors in taxonomic herpetology, and academic lineages of 1450 herpetologists. International coverage. 202 p., 148 photographs, 1 color plate. Clothbound $20.00.

No. 6. *Snakes of the* Agkistrodon *Complex: A Monographic Review*, by Howard K. Gloyd and Roger Conant. 1990. Comprehensive treatment of 33 taxa of pitvipers included in four genera: *Agkistrodon* of Asia and America, *Calloselasma* of Southeast Asia and Java, *Deinagkistrodon* of China, and *Hypnale* of India and Sri Lanka. Also includes nine supplementary chapters by leading specialists. 620 p., 33 color plates (247 photographs of snakes and habitats), 20 uncolored plates, 60 text figures, checklist and keys, 6 charts, 28 maps. Clothbound $75.00; separate set of the 247 color photographs of snakes and habitats (in 32 plates), in protective wrapper $30.00.

No. 7. *The Snakes of Iran*, by Mahmoud Latifi. 1991. Review of the 60 species of Iranian snakes, covering general biology, venoms, and snake bite. Appendix and supplemental bibliography by Alan E. Leviton and George R. Zug. 167 p., 22 color plates of snakes (66 figures), 2 color relief maps, 44 species range maps. Clothbound $22.00.

No. 8. *Handbook of Middle East Amphibians and Reptiles*, by Alan E. Leviton, Steven C. Anderson, Kraig Adler, and Sherman A. Minton. 1992. Checklist, key, and identification manual covering 150 species and subspecies found in region from Turkish border south through the Arabian Peninsula (including Bahrain, Qatar, and United Arab Emirates) and the Arabian (Persian) Gulf. Chapters on venomous snakes and snakebite treatment plus extensive bibliography; appendix by John E. Simmons on collecting and preserving techniques. About 250 p., 32 color plates (220 photographs), maps, text figures. Clothbound $28.00.

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BELL, T. 1842–1843. *Herpetology of the "Beagle."* Part 5 of Charles Darwin's classic, "Zoology of the Voyage of H.M.S. Beagle," containing descriptions of amphibians and reptiles collected on the expedition. Introduction by Roberto Donoso-Barros. 100 p., 20 plates (measuring 8½ x 11 inches), map. Paperbound $13.00, clothbound $18.00.

BOJANUS, L. H. 1819–1821. *Anatome Testudinis Europaeae.* The standard atlas of turtle anatomy. Introduction by Alfred Sherwood Romer. 200 p., 40 foldout plates. Out-of-print.

BOULENGER, G. A. 1877–1920. *Contributions to American Herpetology.* A series of collected papers from various journals covering North, Central, and South American species; complete in 18 parts totalling 880 p., numerous illustrations. Paperbound.

Table of Contents: Parts 1–10, 1877–1897, introduction by James C. Battersby. 20 p., $2.00.

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CAMP, C. L. 1923. *Classification of the Lizards.* The foundation of modern lizard systematics. New preface by the author and an introduction by Garth Underwood. 220 p., 112 figures, index. Out-of-print.

CHANG, M. L. Y. 1936. *Amphibiens Urodèles de la Chine.* The classic work on Chinese salamanders, with a new checklist by Arden H. Brame. 168 p., illus., 5 plates. Out-of-print.

COPE, E. D. 1864. *Papers on the Higher Classification of Frogs.* Reprinted from Proceedings of the Academy of Natural Sciences of Philadelphia and Natural History Review. 32 p. Paperbound $3.00.

COPE, E. D. 1871. *Catalogue of Batrachia and Reptilia Obtained by McNiel in Nicaragua; Catalogue of Reptilia and Batrachia Obtained by Maynard in Florida.* 8 p. Paperbound $1.00.

COPE, E. D. 1892. *The Osteology of the Lacertilia.* An important contribution to lizard anatomy, reprinted from Proceedings of the American Philosophical Society. 44 p., 6 plates. Paperbound $4.00.

COWLES, R. B. and C. M. BOGERT. 1944. *A Preliminary Study of the Thermal Requirements of Desert Reptiles.* The foundation of thermoregulation biology, with extensive review of recent studies by F. Harvey Pough. Reprinted from Bulletin of American Museum of Natural History. 52 p., 11 plates. Paperbound $5.00.

DUNN, E. R. 1926. *Salamanders of the Family Plethodontidae.* A recognized classic treatment of the plethodontid salamanders, including tropical and European species. Introductions by David B. Wake and Arden H. Brame. 480 p., illus., 3 plates, 86 maps, index. Paperbound $20.00.

ESCHSCHOLTZ, F. 1829–1833. *Zoologischer Atlas* (herpetological sections). Descriptions of new reptiles and amphibians from California and the Pacific. Introduction by Kraig Adler. 32 p., 4 plates (measuring 8½ x 11 inches). Paperbound $3.00.

ESPADA, M. Jiménez de la. 1875. *Vertebrados del Viaje al Pacifico: Batracios.* Major taxonomic work on South American frogs. Introduction by Jay M. Savage. 208 p., 6 plates, maps. Clothbound $20.00.

FITZINGER, L. J. 1843. *Systema Reptilium.* An important nomenclatural landmark for herpetology, including Amphibia as well as reptiles; world-wide in scope. Introduction by Robert Mertens. 128 p., index. Paperbound $15.00.

GLOYD, H. K. 1940. *The Rattlesnakes, Genera* Sistrurus *and* Crotalus. Introduction and new checklist by Hobart M. Smith and Herbert M. Harris. 300 p., plus 31 plates of photographs, index. Out-of-print.

GRAY, J. E. 1825. *A Synopsis of the Genera of Reptiles and Amphibia.* Reprinted from Annals of Philosophy. 32 p. Paperbound $3.00.

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GÜNTHER, A. 1885–1902. *Biologia Centrali-Americana. Reptilia and Batrachia.* The standard work on Middle American herpetology with 76 full-page plates measuring 8½ x 11 inches (12 in color). Introductions by Hobart M. Smith, A. E. Gunther, and Kraig Adler. 575 p., photographs, maps. Clothbound $50.00; separate set of the 12 color plates, in protective wrapper $18.00.

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LOVERIDGE, A. 1946. *Reptiles [and Amphibians] of the Pacific*. The standard review of the herpetofauna of the Pacific region including Australia and extending from Indonesia to Hawaii and the Galápagos Islands. 271 p., 7 plates, 1 double-page map, index. Out-of-print.

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ORBIGNY, A. D' [and G. BIBRON]. 1847. *Voyage dans l'Amérique Méridionale*. This extract comprises the complete section on reptiles and amphibians from this voyage to South America. 14 p., 9 plates measuring 8½ x 11 inches. $3.00.

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WILLISTON, S. W. 1925. *Osteology of the Reptiles*. Covers living and extinct forms, with introduction by Claude W. Hibbard. 304 p., 191 text figures, index. Out-of-print.

WRIGHT, A. H. and A. A. WRIGHT. 1962. *Handbook of Snakes of the United States and Canada, Volume 3, Bibliography*. Out-of-print since about 1969, this cross-indexed bibliography is a necessary companion to Volumes 1 and 2. 187 p. Clothbound $18.00.

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No. 2. *Guía de Técnicas de Preservación de Anfibios y Reptiles* por George R. Pisani y Jaime Villa. 1974. 28 p., illus. $3.00.

No. 3. *Collections of Preserved Amphibians and Reptiles in the United States* compiled by David B. Wake (chair) and the Committee on Resources in Herpetology. 1975. 22 p. Out-of-print.

No. 4. *A Brief Outline of Suggested Treatments for Diseases of Captive Reptiles* by James B. Murphy. 1975. 13 p. $3.00.

No. 5. *Endangered and Threatened Amphibians and Reptiles in the United States* compiled by Ray E. Ashton, Jr. (chair) and the 1973–74 SSAR Regional Herpetological Societies Liaison Committee. 1976. 65 p. Out-of-print.

No. 6. *Longevity of Reptiles and Amphibians in North American Collections* by J. Kevin Bowler. 1977. 32 p. $3.00.

No. 7. *Standard Common and Current Scientific Names for North American Amphibians and Reptiles* (1st ed.) by Joseph T. Collins, James E. Huheey, James L. Knight, and Hobart M. Smith. 1978. 36 p. $3.00. [see also numbers 12 and 19].

No. 8. *A Brief History of Herpetology in North America Before 1900* by Kraig Adler. 1979. 40 p., 24 photographs, 1 map. $3.00.

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No. 10. *Vernacular Names of South American Turtles* by Russell A. Mittermeier, Federico Medem and Anders G. J. Rhodin. 1980. 44 p. $3.00.

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No. 12. *Standard Common and Current Scientific Names for North American Amphibians and Reptiles* (2nd ed.) by Joseph T. Collins, Roger Conant, James E. Huheey, James L. Knight, Eric M. Rundquist, and Hobart M. Smith. 1982. 32 p. $3.00. [see also numbers 7 and 19].

No. 13. *Silver Anniversary Membership Directory*, including addresses of all SSAR members, addresses and publications of the herpetological societies of the world, and a brief history of the Society. 1983. 56 p., 4 photographs. $3.00.

No. 14. *Checklist of the Turtles of the World with English Common Names* by John Iverson. 1985. 14 p. $3.00.

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No. 16. *Herpetological Collecting and Collections Management* by John E. Simmons. 1987. 72 p., 6 photographs. $6.00.

No. 17. *An Annotated List and Guide to the Amphibians and Reptiles of Monteverde, Costa Rica* by Marc P. Hayes, J. Alan Pounds, and Walter W. Timmerman. 1989. 70 p., 32 figures. $5.00.

No. 18. *Type Catalogues of Herpetological Collections: An Annotated List of Lists* by Charles R. Crumly. 1990. 50 p. $5.00.

No. 19. *Standard Common and Current Scientific Names for North American Amphibians and Reptiles* (3rd ed.) compiled by Joseph T. Collins (coordinator for SSAR Common and Scientific Names List). 1990. 45 p. $5.00. [see also numbers 7 and 12].

No. 20. *Age Determination in Turtles* by George R. Zug. 1991. 32 p., 6 figures. $5.00.

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Volume 4 (1963–1964), four numbers; double number 1–2, $4.00, numbers 3 and 4 $2.00 each.

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HERPETOLOGY AS A CAREER, by Henri C. Seibert, Ralph W. Axtell, Neil B. Ford, and Martin J. Rosenberg. 1985. 4 p. Brochure developed as an aid to students and counselors. Single copies free of charge; additional copies available for $0.25 each.

GUIDELINES FOR THE USE OF LIVE AMPHIBIANS AND REPTILES IN FIELD RESEARCH, by George R. Pisani, Stephen D. Busack, Herbert C. Dessauer, and Victor H. Hutchison, representing a joint committee of ASIH, HL, and SSAR. 1987. 16 p. Brochure covers animal care, regulations, collecting, restraint and handling, marking, housing and maintenance in field, and final disposition of specimens. $4.00 ($3.00 each in quantities of five or more copies).

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Authors should submit an original and two copies of manuscripts. Manuscripts should be typewritten, double-spaced, on 21.5 x 28 cm (8.5 x 11 inch) white paper. Refer to this issue of *HR* for style and format information, including correct format for literature citations. More detailed information for submissions to Geographic Distribution, Life History Notes, and Recent Population Changes appear in a recent issue of *HR* under their respective headings.

Originals of illustrative material (e.g., tables, photographs, or diagrams) should be submitted with the text, with appropriate precautions taken to ensure delivery without damage. Illustrations should be discussed in the text and numbered sequentially with Arabic numbers. References to illustrations should be placed in parentheses at the end of sentences. Original photographs should be submitted as black and white glossy prints (8 x 10 inch preferred).

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The receipt of a manuscript by an editor will be promptly acknowledged. At present, there is little lag time between acceptance of a manuscript and its publication. Although the advice and assistance of three reviewers will be sought for all feature articles, the Editor has final responsibility for deciding whether a manuscript is suitable for publication. Notes submitted for publication in Geographic Distribution and Life History Notes ordinarily will be reviewed by the Section Editor only. The Editor and Section Editors reserve the right to edit a manuscript, but substantial alterations will not be made without permission of the primary author.

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