KANSAS HERPETOLOGICAL SOCIETY NEWSLETTER NO. 74

December 1988

ANNOUNCEMENTS

Museum to Show Skin Pics

The exhibit, "Skin" will be on display at the Museum of Natural History at the University of Kansas in Lawrence from 18 February to 2 April 1989. Visitors can take a close look at skin, the largest single organ of the human body, via photographs, electron microscope images, and natural history specimens from the museum's collections.

See Sea Turtles

Earthwatch is again offering their popular work/vacations in the Caribbean helping endangered sea turtles. This is an opportunity to participate in a scientific study of the breeding biology of sea turtles on the beaches of Culebra, Puerto Rico. The long-term study is concerned with population trends, migration, mortality, and developing management plans to save these fabulous animals from extinction. There will be six study periods, beginning the end of April 1989, and continuing through the end of June. Meals and living quarters are provided for the share costs of $1,045 to $1,220. If you have dreamed of a tropical vacation and always wanted to make a real, meaningful contribution to a worthwhile project, contact:

Earthwatch
680 Mt. Auburn Street, Box 403
Watertown, Massachusetts 02272
Phone: (617) 926-8200

New Book on African Reptiles

Up-to-date information on many of the common and not so common reptile species of southern Africa is available in a new 128 page book, with 230 full-color photographs. The 50,000+ word text also covers snakebite and its treatment as well as captive maintenance of African reptiles. The book is Reptiles of Southern Africa, by R. W. Patterson. It is normally available for US $39.95, but under terms of a Special Offer, you can get two or more copies (postpaid) for only $18 each from:

Karl H. Switak
Natural History Photography
1729 Casita Ct.
Santa Rosa, California 95405
Phone (707) 538-7412

The Great Ridley Rescue

The story of the efforts to rescue the Kemp's ridley sea turtle from extinction is told in a new book, The Great Ridley Rescue, by Pamela Phillips, illustrated by Janie Lowe. It recounts the unlikely and sometimes hilarious adventures of biologists, government personnel, conservationists, and individual citizens involved in the cause. A portion of the proceeds from the sale of this book will be used for conservation of sea turtles. It is paperbound with color paintings, 180 pages, and is available for $19.95 plus $2.00 postage from:

Mountain Press Publishing Company
P.O. Box 2399
Missoula, Montana 59806
Phone (406) 728-1900

Books from Thailand

The White Lotus Company, Ltd, is offering some unusual books on the natural history of Thailand, including The Turtles of Thailand by Wirot Nutphand, described as "a complete guide to Thai species with more than 175 photos and drawings," 222 pages for US $18.50. Also in their current catalog is Poisonous Snakes of Thailand and the Cure from Snakebites, by Wirot Nutphand and Bunyuen Tumvipart, 96 snakes illustrated in color, 162 pages, US $14.50. Postage is US $5.00 for 1 kg, $5.50 for 2 kg ("registered sea parcels"). To place orders or obtain their catalog, contact:

White Lotus Co., LTd.
16 Soi 47, Sukhumvit Road
P.O. Box 1141
Bangkok, Thailand

Ornate Box Turtle Celebration 14-16 April 1989 in Caldwell, Kansas

The third anniversary of the signing of the state reptile of Kansas bill will be celebrated between 14-16 April 1989 in Caldwell, Kansas. Several activities are being planned at this time, and the public is invited to attend and enjoy the activities.

First, a large advertisement honoring the state reptile (the Ornate Box Turtle) will be placed in the Wednesday, 12 April 1989 issue of THE CALDWELL MESSENGER. Anyone may have their name, organization, and/or town listed in the ad for a donation of a minimum of $2.00 per listing. Last year the advertisement was nearly a full page! A beautiful drawing of an Ornate Box Turtle will be included in the ad.

Second, one or more field trips are being planned to areas near Caldwell in search of interesting amphibians and reptiles. At least 11 species of amphibians and 42 species of reptiles have been recorded from the Caldwell area. Some of these activities may include groups of Kansas and/or Oklahoma school children.

Third, a display of amphibians and reptiles may be organized if there is interest. These animals would be available for viewing by the public and possible photo sessions for wildlife photographers. There would be no trading or selling of animals at the display.

Fourth, souvenirs such as several different Ornate Box Turtle t-shirt designs, turtle hats, turtle belt buckles, turtle and other Kansas post cards, bumper stickers, and many other items dealing with the Ornate Box Turtle will be available at several Caldwell stores.

Fifth, a camping area is being planned at the edge of town for those wishing to camp. There is also a motel in Caldwell and another motel at the South Haven Turnpike exit located about 15 miles east of Caldwell. There are several eating establishments in Caldwell.

Plan to visit Caldwell this April. Contact the following people for more information:

To have your name listed in the anniversary state reptile advertisement please send your donation along with how you wish to be listed to: VEDA STRUBLE, CALDWELL GRADE SCHOOL TEACHER, ONE NORTH OSAGE STREET, CALDWELL, KS 67022. The money needs to arrive before the 1st of April 1989.

To find out more about possible field trips please contact: LARRY MILLER, SIXTH GRADE TEACHER, U.S.D. #360, CALDWELL, KS 67022

Please contact CLEDA BAKER, CLEDA'S ETC. SHOP, "HOME OF THE ORNATE BOX TURTLE", 3 SOUTH MAIN STREET, CALDWELL, KS 67022 for information about possible camping, the live display of amphibians and reptiles, and Ornate Box Turtle souvenirs. Also, please contact Ms Baker if you might be interested in displaying animals, artwork, and/or photographs of amphibians and reptiles.

-- Larry Miller
Caldwell, Kansas

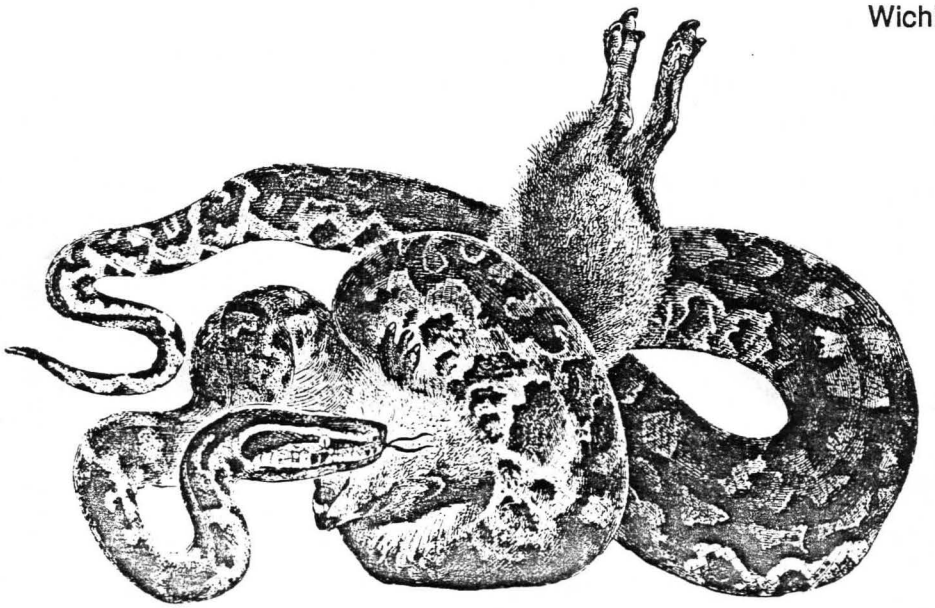
KHS Snakes at Coliseum — Lions are a No-Show

Under the auspices of KHS Membership Chairperson Jack Shumard, the Kansas Herpetological Society will present its second annual live display at the 35th Wichita Sport, Boat, and Travel Show in February 1989. This year's theme will be The Water Snakes of Kansas. It is anticipated that the attending public will receive the exhibit with the same enthusiasm as they did last year's display of live Kansas turtles.

The three species snakes to be exhibited are the Blotched Water Snake (*Nerodia erythrogaster transversa*), the Diamondback Water Snake (*Nerodia r. rhombifera*), and the Northern Water Snake (*Nerodia s. sipedon*). In addition to the live specimens, the display will include photographs of a Western Cottonmouth (*Agkistrodon piscivorus leucostoma*) currently housed at the Sedgwick County Zoo. A major point of the exhibit will be to inform the public that the venomous Western Cottonmouth does not occur naturally in Kansas, and that our resident water snakes are harmless and beneficial to the Kansas environment.

The Show will be held in the Kansas Coliseum (I-35 & 85th Street North) from 15 to 19 February 1989. The KHS booth will be located in the south end of the Coliseum. All KHS members are invited and encouraged to drop by, say hello, and be pressed into service answering the numerous queries from our adoring public. If you want to help at the exhibit (so I can eat every now and then), contact me at the address below or call (316) 684-9675. See you at the Coliseum.

-- Jack L. Shumard
607 Marcilene
Wichita, Kansas 67218



Endangered Species Report Form

If you have seen an endangered or threatened species in Kansas lately, then the Kansas Department of Wildlife & Parks Nongame Program needs your help.

The Department is reviewing the distribution and status of the state's threatened and endangered wildlife species. You can help us by reporting sightings of any of the 44 threatened and endangered species on the state list.

To report a sighting of a threatened or endangered species, contact any Wildlife and Parks office and ask for an Endangered and Threatened Species Reporting Form. On the form, you'll complete information on the species, the legal description of the location where the species was sighted, and a description of the habitat at the location. We use this information to visit the locality and verify the sighting, and to help us learn more about the life history of these species. When you complete the form, return it to: Environmental Services Section, Kansas Department of Wildlife and Parks, Rt. 2, Box 54-A, Pratt, Kansas 67124. Crisp, clear duplicate photographs or slides accompanying the form will aid greatly in verifying the identity of the creature observed.

For information on the state's threatened and endangered species, stop by any Wildlife and Parks Office, or contact the Operations Office in Pratt.

-- Kansas Nongame Notes Vol. 6, No. 4
(July/August 1988)

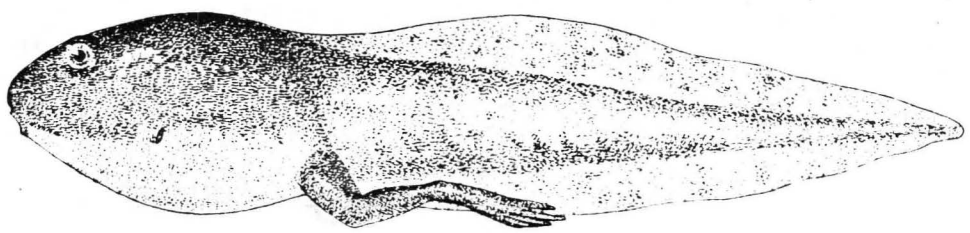
Focus on Nongame Changes

At the June meeting of the Kansas Department of Wildlife & Parks Commission, Assistant Secretary Alan Wentz announced that the Department is developing a new policy for nongame wildlife. Elements of the new policy include the following:

1. The Department of wildlife and Parks is legally responsible for all forms of wildlife in Kansas.
2. Greater emphasis will be given to nongame than in the past.
3. Management actions should benefit as many species as possible.
4. Nongame species will be given equal consideration with game species by the Department's staff.
5. Additional funding sources will be sought to provide enhanced nongame efforts.
6. Nongame is to be seen as an integral function of the Department and this spirit should be adopted by all agency employees.

The Kansas Nongame Wildlife Advisory Council has a new role as a result of this policy. The Council will advise the Secretary and his immediate staff on how nongame efforts should be integrated into all levels of the Department. In addition, the Council will help the Department develop new sources of funding for wildlife programs. The Council will continue to represent a variety of groups that have an interest in nongame species.

-- Kansas Nongame NotesVol. 6, No. 4
(July/August 1988)



KHS BUSINESS

Fifteenth Annual Meeting a Huge Success

It was a brisk and sunny autumn morning as over 100 devoted KHS members from all parts of Kansas came together in Lawrence for the 15th annual meeting of the KHS on 29 October 1988. The group met at the auditorium in the Museum of Natural History atop Mt. Oread and was called to order at 9:30 am by KHS President Jeffrey Whipple. The first speaker was Robert Powell of Avilla College, Kansas City, Missouri, who gave an interesting account of Dominican lizards.

The group photograph on the front steps of the museum was next. It was one of those rare times when we're actually aware of being photographed by Larry Miller. Immediately following the group photo, a coffee break was in order.

When the meeting reconvened, Eric Rundquist (Sedgwick County Zoo, Wichita) presented some great footage of Gila monsters. Next up was Larry Zuckerman (Kansas Department of Wildlife and Parks, Pratt) with his informative account of the Kansas Nongame Wildlife Program. After hearing Jeff Whipple's presentation of drug transport studies using the cast epidermis of the black rat snake, the group broke for lunch.

The KHS general business meeting followed lunch. For his years of dedicated and outstanding service, Larry Miller was presented with a beautiful bronzed salamander on a polished walnut base, handcrafted by KHS member Errol Hooper, Jr. This was Larry's last year as Secretary/Treasurer for the KHS. After the recommendations of the nominating committee, the KHS membership elected Nancy Schwarting (KU Animal Care Unit, Lawrence) as KHS President-Elect. She will automatically serve as KHS President in 1990. Past-President Olin Karch was elected Secretary/Treasurer. The President for 1989 is James Marlett (Sedgwick County Zoo, Wichita). A proposal to have the KHS sponsor a census count for reptiles in selected areas of the state was discussed, and received favorable comment.

Activities for the afternoon included a photo session with the famous Fred the Frog and a free-for-all herp slide show. Darrel Frost (KU Museum of Natural History, Lawrence) was next on the program with a lecture on iguanid lizard families, and Dwight Platt (Bethel College, Newton) then spoke on snakes of the Kansas sand prairie. John F. Lokke, from the Nebraska Herpetological Society, gave a fine presentation on the snakes of our neighboring state to the north. Next was David Kizirian (KU Museum of Natural History, Lawrence), who spoke on gopher snakes in New Mexico.

At 5:00 we adjourned for dinner. The social began at 7:00 and was followed by the auction. The auction is always a greatly anticipated event where members can get some great herp goodies for a fraction of their cost. Thanks to all those who contributed items this year. We raised over $700.00 for our society.

After coffee and doughnuts on Sunday morning, Larry Miller presented a great slide show of the 1988 field trip to Clark County. Next to speak was Nancy Schwarting with a talk on medical case histories of herps.

In the past, all we had to contend with was Larry Miller and his 35 mm camera. Now, on the cutting edge of video technology, comes Olin Karch with his camcorder. He had some great footage of the 1988 field trips. After a short break Joe Collins talked about his experiences in writing (with Roger Conant) the Third Edition of the Peterson Field Guide to Amphibians and Reptiles of Eastern and Central North America. Marty Capron gave us an exciting and humorous account of his trip to Costa Rica and all of the wildlife that he encountered.

The meeting adjourned at noon. See you next spring at the KHS 1989 Annual Field Trip in May!

-- Jeffrey Whipple
KHS President

ALL THE ZOOS THAT'S FIT TO PRINT

The following news items are all from the American Association of Zoological Parks and Aquariums (AAZPA) Newsletter, and were supplied by Ruth Gennrich (Lawrence).

From AAZPA Newsletter 29(10), October 1988:

Vietnamese Box Turtles Hatch at the Bronx Zoo

Two Vietnamese box turtles (*Cistoclemmys galbinifrons*) hatched at the New York Zoological Park on 18 July after a 73-day incubation period. It is believed to be the first zoo hatching of this species. The parents were imported into the United States in 1985 and have been exhibited in Wild Asia JungleWorld. On 6 May, the female laid two 51-56 mm-long china-like eggs on the tan bark substrate of her 40-square-foot enclosure that she shares with the male and two other females. Later the eggs were found covered by a small mound of the substrate material. They were removed and incubated at 27-28°C in vermiculite at a 1:1 by weight ratio with water. The 20 g hatchlings had carapace lengths of 48 and 50 mm. Five previous clutches, four single-egg and one two-egg, laid between December 1987 and May 1988 were infertile.

Little is known of the natural history of this species, and its reported range is restricted to the Tonkin region of Vietnam. The species first became available via Hong Kong dealers four years ago. It appears to be omnivorous, favoring conditions of high humidity and preferring temperatures ranging between 26-31°C.

Southern Appalachian Bog Exhibit Opens at the Knoxville Zoo

As part of a combination field-zoo study of the bog turtle (*Clemmys muhlenbergii*) in Tennessee by Herpetology Department staff in cooperation with the Tennessee Wildlife Resources Agency, a large outdoor, naturalistically planted exhibit was designed and built by Knoxville Zoological Park staff in late summer of 1986. In October 1986, two male and four female Tennessee bog turtles, as well as a pair of spotted turtles (*Clemmys guttata*), were introduced into the exhibit; and in 1988, successful reproduction in this group of bog turtles was achieved.

The basic exhibit, a half-moon shaped and moated structure (ca 45 X 20 feet) was originally designed for alligators but proved inadequate for this purpose. Early renovation included filling the existing pool, digging out the soil base to a depth of from one to two feet, and creating raised areas along the rear front lip of the exhibit that could be utilized as planted areas. All wet areas were then covered over with two tons of peat and crushed sphagnum. The exhibit features three major sections that may be found in nearby bog habitats. On the left is a rocky waterfall that empties into a small pool. This flows into the main rivulet of the bog proper, an open area of water from one- to six-feet wide and one- to four-inches deep overlying up to two feet of peat mud. A raised area on the right along the rear wall depicts an Appalachian woodland scene. Over 30 species of plants, including a variety of ferns, mosses, purple pitcher plants, cranberry and laurel were gathered regionally from natural bog and forested areas.

This project has enabled the zoo to work closely with state wildlife officials on an additional protected species in Tennessee. With the addition of a colorful and educational graphic explaining the importance of bogs, their ecology and some of the plant and animal species found therein, this exhibit helps the general public to gain an appreciation for this rapidly disappearing wetland habitat.

From AAZPA Newsletter 29(11), November 1988:

Second-Generation Turtle Hatchlings Reported At The Columbus Zoo.

A Gaur turtle (*Staurotypus triporcatus*) hatched on 14 June from eggs produced by a female hatched in the zoo collection on 23 March 1980. Courtship and copulations by both sibling males and unrelated wildcaught males had been observed. The egg was partially incubated at the Turtle Laboratory of the Indiana University, and hatching occurred there. This represents the 26th clutch of this form to produce hatchlings in the past nine years. A Geoffroy's side-necked turtle (*Phrynops geoffroyanus*) hatched on 21 June from eggs produced by mating of siblings hatched at the San Antonio Zoo from 16 June through 3 July 1979, which were acquired by the Columbus Zoo on 14 October 1981. Four additional clutches, laid by unrelated specimens, have also produced hatchlings in the past year. These are the sixth and seventh forms of turtle in which progeny have been produced by specimens which were bred and raised in the collection (others include *Phrynops* (*Mesoclemmys*) *gibbus, Kinosternon s. cruentatum, Pelusios castaneus, Rhinoclemmys p. manni* and *Melanochelys t. thermalis)* as part of an integrated program which has produced more than 700 hatchlings of 34 forms of turtles since 1977.

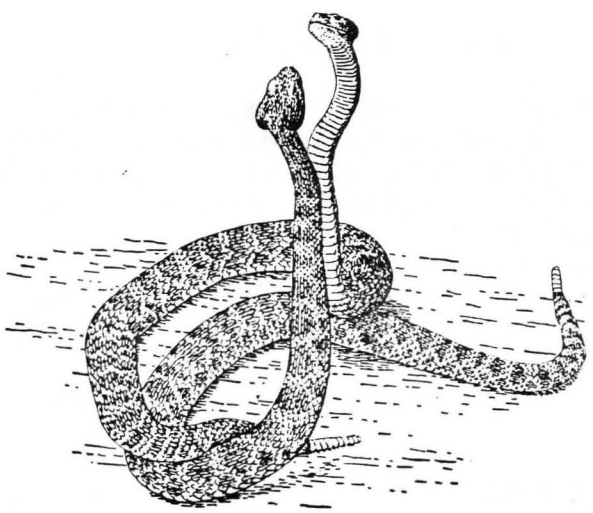
From AAZPA Newsletter 29(12), December 1988:

Significant Crocodilian Hatchings Occur at New York Zoological Park

Five dwarf caimans (*Paleosuchus palpebrosus*) hatched at the New York Zoological Park on 1-2 September. These caiman join six other crocodilians (Chinese alligator, Yacare and broad-snouted caimans, false gharial, and Siamese and Cuban crocodiles) which have hatched at the zoo since 1980. The sire was two years old when collected by Curator John Behler near Paramaribo, Suriname in April 1977. Two females from the same area were received in 1985 as gifts from Joep Moonen, former director of the Paramaribo Zoo. One of these females nested on 4 June, and the eggs were incubated at 32 ± 1°C in a 1:1 ratio of vermiculite:water, by weight. Hatching occurred in 89-90 days.

Fifth Brood of Annulated Boas Born at Fort Worth Zoo

Eight annulated boas (*Corallus annulatus*) were born at the Fort Worth Zoological Park on 10 August, bringing the total viable offspring produced at the zoo since 1975 to 49. Wild-caught adults from Limon Province, Costa Rica produced the original brood of eight on 11 August 1975, and sibling matings from that litter produced two broods totaling 22 progeny in 1982. Additional wild-caught Costa Rican specimens were later integrated into the breeding group and, subsequently, contributed to 1985 and 1988 breedings.



KHS BRINGS YOU MORE NEWS OF THE OTHER WORLD

Finds Rare Snake

Dr. John L. Reid at Towanda formerly of Eureka, this week captured a cabbage snake. It was a foot long and about as thick as a strand of coarse thread. This species of reptile is found only in a head of cabbage and a few years ago caused so much excitement in Missouri because it is deadly poisonous. Persons eating a head of cabbage containing one of these snakes rarely recover. The species is not common and the Monday Wichita Eagle devoted a third of a column to the story its capture. Dr. Reid expects to send the rare find to his old medical school in Kansas City.

-- Eureka (Kansas) Herald, 4 August 1910
(Submitted by Park W Carter, Eureka)

British Columbian Law Limits Number of Snakes in Homes

PORT COQUITLAM, British Columbia - A new law prompted by one man's slithering, squeaking menagerie is forcing him to get rid of 146 of his snakes.

Responding to Larry Moore's neighbors complaints about living next door to a house filled with 150 snakes — and several hundred rats and mice needed to feed them — the municipal council voted Monday to limit to four the number of snakes or rodents in a household.

"They don't belong in a residential neighborhood; in an urban setting, 150 of anything is too much," said Alderman John Keryluk.

-- University Daily Kansan, 15 September1988
(Submitted by Irving Street, Sibleyville)

Turtle to Go on Show

Boston - A world-record snapping turtle, recently captured by a Maine man, will be exhibited this winter at the Bronx Zoo before being returned to the wild, the Massachusetts Division of Fisheries and Wildlife said.

John Rogers caught the turtle, which weighed in at 67 pounds and has a shell length of 19.8 inches, in an undisclosed area in northern Middlesex County. With its head and neck and foot-long tail measured, it was well over 3 feet long.

-- The Wichita Eagle-Beacon, 11 September 1988
(Submitted by Jack Shumard, Wichita)

Toad Invasion Plagues Retirees

New Port Richey, Fla. - A black horde of tiny toads invaded a retirement complex again Saturday, literally blocking doors and conjuring up memories of horror films.

"The whole yard looks like its moving. They just completely cover everything. It's unreal," Donna Abshier, assistant administrator of the Forest Glen Lodge, said of the plague that began Friday.

"It put me in mind of those movies, 'The Bees' and 'The Birds' or something," Ms. Abshier said. "I can't believe how many there were. We couldn't open the doors because they'd hop in."

"It was so bad you couldn't even see the road out here," said her colleague, Bonnie Martakis.

"They're smaller than my fingernail," Ms. Abshier said. "We wonder what their destination is."

Although the invading horde looked like frogs, close inspections showed they were baby toads, a by-product of flooding in parts of Pasco County, said Bob Steiger, county agricultural extension agent.

-- Lawrence Journal-World, 2 October 1988
(Submitted by Irving Street, Sibleyville)

Toads are Hallucinogenic

The old saying, "kiss a frog and it will turn into a handsome prince," may have new meaning to the people of southern Florida, a University of Kansas zoologist said.

The giant toad, which is abundant in Florida, is the same toad that is reportedly being used as a hallucinogen in Australia, said Joseph Collins of the Museum of Natural History.

Some Australians reportedly will boil the toads to obtain a fluid that produces effects similar to those of LSD.

Collins said there was no evidence that people in Florida had been using the toads for that purpose, but that it was cause for concern.

"People who are inclined to (use the toads for hallucinogens) are probably looking at the toads in a different way now," Collins said.

Collins said the hallucinogenic substance was part of the toad's natural defense system against predators. The toad secretes a strong, milky-white substance through two large glands on its back.

When Collins read magazine and Associated Press articles from Australia this spring reporting that people were trying to get high from secretions from the cane toad, he was surprised that the press hadn't realized that they were the same as the giant toads found in Florida. The toads' scientific name is *Bufo marinus*.

"I thought it was very interesting," Collins said. "It was the same as the alien animal we have in Florida that we call the giant toad. I've been wondering when people would put two and two together."

The toads are not native to Australia or Florida. Collins said that they were introduced to both places because people thought they would eat the mosquitos. However, he said the toads grow to be so large — up to 10 inches long — that they don't get enough nourishment from eating small insects.

"It was stupid to introduce them there. It served no purpose," Collins said. "Instead of eating insects, it goes around eating other toads, baby birds, and small rodents."

The toads can be found naturally in Central and South America, and even as far north as Brownsville, Texas, Collins said.

The giant toad was introduced into Florida in the mid-1950's. Since then, it has multiplied and has become a pest, said Maj. Kyle Hill of the division of law enforcement for the Florida Freshwater Fish and Game department.

Hill said that dogs would playfully attack the toads and ingest the secretion or get squirted in the eyes with it. The substance can make the dogs sick, temporarily blind them, or, in some cases, kill them.

Hill said the toads were a nuisance. They lay eggs in backyard swimming pools and can grow to be as heavy as 13 pounds.

But Hill said that so far, no major problems had arisen from the toads and that there had been no reports of people using the toads for hallucinogenic purposes.

Collins said the toads could pose social, political and biological problems.

"Before we introduce alien animals, we should know what diseases it is capable of bringing in and what other problems it may bring in."

-- University Daily Kansan, 20 September 1988
(Submitted by Birnam Wood, Lawrence)

Turtle May Stymie Plans for Highway

The future of a highway project in Delaware may rest on the back of a small turtle.

Federal wildlife officials said they found a bog turtle, an endangered species in Delaware, in the freshwater wetlands path of a major highway relocation project near Christiana, southwest of Wilmington.

State experts looked at photographs of the turtle and said it was not a bog turtle but a more common, non-endangered spotted turtle.

Bogged down, while federal and state specialists on amphibious animals seek to determine the turtle's genealogy, is a 1.5–mile segment of highway expected to cost up to $25 million.

If the identification question is not resolved soon, Delaware may miss the Sept. 30 deadline to qualify the project for a major share of this year's federal highway aid package.

Discovery of an endangered species in the path of the project could force a delay while detailed studies of the animal and its habitat are made. Some federal officials have suggested an extra $6 million bridge to protect the area.

State wildlife officials assert that their search has turned up only an ordinary spotted turtle.

James F. White, staff naturalist with the Delaware Nature Society described the wetland in question as a good home for bog turtles, but acknowledged that "without having a turtle in hand," a positive identification is impossible.

-- Lawrence Journal-World, 25 September 1988
(Submitted by Birnam Wood, Lawrence)

FEATURE ARTICLES

NEW COUNTY RECORDS OF AMPHIBIANS AND REPTILES IN GRAY COUNTY, KANSAS

By

Michael T. Nulton
Biology Instructor, Cimarron High School
Cimarron, Kansas 67835

and

Michael S. Rush
Biology Instructor, Osawatomie High School
Osawatomie, Kansas 66064

Gray County, located in southwestern Kansas, is 24 miles (38.4 km) wide and 36 miles (57.6 km) long. It is bounded on the north by Finney County, on the west by Finney and

Haskell Counties, on the south by Meade County, and on the east by Ford and Hodgeman counties. The Arkansas River, which provides riparian habitat, bisects the county along U.S. Highway 50. The river bed is now dry during most of the year with ephemeral pools present during the spring and fall wet periods. Habitat south of the river is dominated by sandsage prairie, broken by farmland irrigated with center pivot methods. North of the river the elevation rises gradually. The habitat consists of a mixture of irrigated and dry–land farm ground with short to mixed grass prairie interspersed.

Relative to other Kansas counties, little collecting of amphibians and reptiles has been done in Gray County. This lack of attention is evidenced by the absence of records of common species. Collins (1982) reported only fifteen species from Gray County. Since that time the Tiger Salamander (*Ambystoma tigrinum*) has been added to the county list (Collins, 1984).

Herein is new distributional and collection data of specimens from Gray County representing ten new county records. In addition to the specimens reported herein, at least thirteen other unreported species probably occur in Gray County. Two species, the Texas Longnose Snake (*Rhinocheilus lecontei tessellatus*) and the Massasauga (*Sistrurus catenatus*), were collected in close proximity to Gray County (Rush, 1981). All specimens are housed in the Museum of the High Plains (MHP), Fort Hays State University, Hays, Kansas. All common and scientific names are taken from Collins *et. al.* (1982). All records are reported in standardized format from data found on museum tags and collectors' notes.

NEW COUNTY RECORDS

GREAT PLAINS TOAD (*Bufo cognatus*)
GRAY CO: Cimarron, T26S, R28W, NE 1/4 Sec. 11, 14 May 1982, A. Flake (MHP 6406).

WESTERN CHORUS FROG (*Pseudacris triseriata triseriata*)
GRAY CO: Arkansas River, 1/4 mi. (0.4 km) S and 1 1/2 mi. (2.4 km) W Cimarron, T26S, R28W, NE 1/4 Sec. 9, 2 July 1985, P. S. Salm and M. T. Nulton (MHP 6410-6414).

These chorus frogs represent a range extension of at least 45 miles (72 km) west from Edwards and Kiowa counties, and at least 30 miles (48 km) northwest from Clark County (Collins, 1982).

NORTHERN PRAIRIE LIZARD (*Sceloporus undulatus garmani*)
GRAY CO: Sandpit, 1/2 mi. (0.8 km) S Cimarron, T26S, R28W, SW 1/4 Sec. 12, 12 May 1984. P. J. Kramer (MHP 6415).

GREAT PLAINS SKINK (*Eumeces obsoletus*)
GRAY CO: 3 mi. (4.8 km) W Cimarron, T26S, R28W, SE 1/4 Sec. 5, 6 May 1983, M. T. Nulton (MHP 6416).

EASTERN HOGNOSE SNAKE (*Heterodon platirhinos*)
GRAY CO: 1 1/4 mi. (2.0 km) S, 1/4 mi. (0.4 km) W Cimarron, T26S, R28W, SE 1/4 Sec. 14, 4 May 1985, T. A. Unruh (MHP 6417).

KANSAS GLOSSY SNAKE (*Arizona elegans elegans*)
GRAY CO: 6 mi. (9.6 km) S, 1 1/4 mi. (2.0 km) W Cimarron, T27S, R28W, SE 1/4 Sec. 3, 8 September 1982, M. T. Nulton (MHP 6418).

This specimen was collected by hand crossing a sandy access road in sandsage prairie "island" habitat (Rush et. al., 1982) at 1800 hours.

PRAIRIE KINGSNAKE (*Lampropeltis calligaster calligaster*)
GRAY CO: 1 1/4 mi. (2.0 km) S, 1/4 mi. (0.4 km) W Cimarron, T26S, R28W, SE 1/4 Sec. 14, 12 October 1984, T. A. Unruh (MHP 6419).

This locality borders the western edge of the known range of this species and therefore represents a minor range extension (Collins, pers. com.).

LINED SNAKE (*Tropidoclonion lineatum*)
GRAY CO: Cimarron, T26S, R28W, NE 1/4 Sec. 11, 12 May 1983, A. Flake (MHP 6420).

NORTHERN WATER SNAKE (*Nerodia sipedon sipedon*)
GRAY CO: Sandpit, 1/2 mi. (0.8 km) S Cimarron, T26S, R28W, SW 1/4 Sec. 12, 16 May 1982, P. S. Salm (MHP 6405)

This is a juvenile specimen, collected by hand approximately 75 m from standing water in the dry Arkansas River bed.

PRAIRIE RATTLESNAKE (*Crotalus viridis viridis*)
GRAY CO: Cimarron, T26S, R28W, SE 1/4 Sec. 2, 15 October 1980, M. T. Nulton (MHP 6421).

Acknowledgments

We would like to thank Mark L. Sexson and the Kansas Department of Wildlife and Parks (formerly the Kansas Fish and Game Department) for their time and effort in helping to find specimens. The Advanced Biology students of Cimarron High School showed tireless enthusiasm in collecting many of these specimens. We gratefully appreciate the aid of Joseph T. Collins in record verification and locality data searches.

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SNAKEBITE

by

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It was the summer of 1988. I was 15 years old and was going down to H. Roe Bartle Scout Reservation near Osceola, Missouri, to teach Geology at the Nature Lodge. Being gone for months, turning 16 at camp and making a lot of new scout friends sounded like the perfect summer!

It was July 9 and half the summer had gone by. I was in the Nature lodge preparing for my class when a young scout came screaming down the path. He told me about a HUMONGOUS copperhead that was in their campsite. I couldn't resist the invitation! I had 5 minutes to capture the gigantic copperhead then return to the Lodge to teach my 20 students some requirements for their merit badge. In my haste I only grabbed my snakehook. Together, my young friend and I raced to his campsite.

The scoutmaster greeted me with relief. I could tell he was scared to death! He took me over to the tent platform that the snake was seen under, then backed off quickly. I looked under the platform with a flashlight and saw what looked to be a 6-inch copperhead. I pulled him out with my snakehook and hastily reached down to pick him up.

In a flash he was stuck on my left index finger.

I pulled back and to my amazement, the snake came too. One fang was in my finger, the other was not. I quickly pulled him off my finger, then dropped him into the empty water bucket next to the tent. The scoutmaster asked if I had been bitten, and I replied "yes". Luckily, he had his car at the campsite so he drove me to the Health Lodge.

By the time we arrived at the Health Lodge my hand was numb and had started to swell. The nurse put an air splint on my arm, then I was rushed to the hospital in Osceola. The snake came along too so the doctors could verify that it was, in fact, a copperhead.

The trip to the hospital seemed to take forever although I was told it was only 20 minutes. I felt pain about 10 minutes into the trip. I could feel a burning sensation travel through my hand and up my arm. At the hospital they hooked me up to an IV and gave me some pain killer.

We had the snake with us in a cooler. The doctor identified it also as a copperhead but it turned out to be 2 feet long! They asked me if they could kill it but I told them to release it. I'm a Hard-Way Warrior in the Tribe of Mic-O-Say. My Indian name and totem is Silent Spying Copperhead. I guess you could say I have experienced the power of my totem. The copperhead was released near the shores of Truman Lake while I stayed in a hospital bed for the next 5 days. My hand was swollen three times its normal size the my arm was swollen up to the shoulder.

After my hospital stay I returned to camp to finish the summer. By the end of August the discoloration was gone and the crater left by the fang had healed.

All the physical signs of the bite are now gone. It's living up to, and living down, all the copperhead jokes that's going to be tough.

OBSERVATIONS ON THE HABITAT, PERIODS OF ACTIVITY, AND REPRODUCTIVE BIOLOGY IN *ELAPHE GUTTATA EMORYI*, THE GREAT PLAINS RAT SNAKE, IN NEBRASKA

by

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In my ongoing efforts to learn more about the natural history of Nebraska's less common snakes, I have, in more recent times, extended my searches later into summer and autumn as well as earlier in spring. Although the most diligent efforts are placed on the peak periods of activity (roughly mid- to late-April through late May, then, to a lesser extent from mid-September through October), searching during "alternate" months has presented me with specimens and conditions that have added to my knowledge of the periods of activity and reproductive cycles of some of these reptiles.

June usually presents the resident with several climatic phenomena such as rising temperatures as spring fades into summer, thunderstorms, often with fantastic cloud formations, and a variety of air qualities varying from heavy, humid atmospheres to bright, clear, cool days resulting from a front of Canadian air moving over the Plains. In June daytime high temperatures can exceed nighttime low temperatures by as much as 16°C (30°F) in Nebraska. Tornados are possible, but unlikely, and several of our rivers are known to flood after June downpours. During the second week in June 1986, eastern Nebraska was experiencing bright, sunny days with cool, northern air. Spring came very early that year and May temperatures had been above normal. I had noticed a marked decline in snake sightings around Omaha during the third week in May. Several thunderstorms had passed through the area followed by a cool front. On 14 June, my wife Denise and I left Omaha to explore one or two areas along the Kansas-Nebraska border to see if these climatic conditions would allow us to observe any of Nebraska's rare and peripheral reptiles. When we departed Omaha early that morning, the sky was brilliant and cloudless, the countryside was very green. Life was teeming everywhere from hawks soaring in the bright sky to young corn stalks in the dark, moist soil of the fields, to the briskly flowing creeks that meander between the gently rolling hills. Indeed, this was "high noon" to those of us who are cognizant of a seasonal as well as a calendar year.

As we neared the state line it became apparent that either the cool front was fading away or it hadn't reached this far south. A thermometer in Johnson County read 30°C (86°F) at about 10:30 AM, so it promised to be a warm day.

Soon we reached our destination, a series of "prairie pastures," steep, sometimes partially wooded hillsides that were "spared the plow" because of varying amounts of limestone on or near the surface. In several instances the hillsides represent a band of unbroken, more or less original habitat with intensive cultivation both above and below. Some of these hills are overgrazed by livestock but a good number of native floral species can usually be seen on any of them that I have explored.

After visiting for a time with the owner of the property and obtaining permission to look for reptiles, we stepped out onto the prairie hillside and busied ourselves with lifting (and replacing!) pieces of limestone small enough to lift, as well as photographing anything of interest. It soon became apparent that rock lifting exacts a heavier toll on one's stamina in summertime conditions than in spring or autumn. I wished I had carried thermometers on this day as interesting recordings of temperatures in the air and under the rocks could have been made.

Reptiles were few and far between. I searched our first hillside for nearly an hour and uncovered only two prairie ringneck snakes, *Diadophis punctatus arnyi* which can be abundant in such habitat in early spring. I continued to lift rocks with no luck, but Denise had given up and resigned herself to photographing some prairie flowers. This is not the first time she has shown more moderation than I and probably won't be the last. The hills were gorgeous! The new growth of big and little bluestem was a flowing emerald green set against a sprinkling of cedar, burr oak, osage orange, and a few other hardwoods. The bright green grasses made the limestone outcrops appear as if they were scrubbed clean and whitewashed. Purple coneflowers and black-eyed susans were blooming and on the outcrops the occasional clusters of prickly pear cactus were displaying brilliant yellow blossoms. To complete the picture, a large, male red-tailed hawk soared effortlessly through the very blue sky that delineated the unbroken shape of the prairie hills. For a while I stood on an outcrop, drinking in the view, feeling very proud of being a midwesterner.

I had drunk the water from both of the canteens I packed along and worked up quite a sweat lifting rocks. I started working my way back to Denise who was now near the farmhouse. Enroute I stepped across a small rocky gulch between two facets of the hillside and found the energy to lift a few more rocks. As I turned the second or third rock a blur of blotches caught my eye. In the same instant I recognized the form and managed to secure the rear quarter of the little snake as it nearly made good its escape into the limestone substratum. With the snake in my left hand I gently lowered the large, heavy piece of rock into its original position with the right hand. I had a very young female Great Plains rat snake *Elaphe guttata emoryi*, doubtless a hatchling from the autumn of 1985. The snakelet was truly "hot"; her delicate tail vibrating against my gloved hand, she struck at the lens of my camera as I tried to pose her on a flat slab of rock. What an interesting study in contrasts it was: the glistening, graceful gray and olive form resting coiled on the lichen covered, jagged edged limestone. I think I will always revel in these slides! Upon completion of this modeling session I let the young *emoryi* make good its escape under the same rock where I uncovered it. I was in high spirits now, and after some lunch and a big drink of water I would be ready for another hillside.

After lunch we drove to another series of prairie hills a short distance from our first destination. The heat had risen seemingly parallel to my optimism. The sun was now bearing almost directly overhead and both the ground and the rocks were quite warm to the touch. This locality was a bit more extensive than the first with three small hills forming a loose box canyon, offering east, west and south facing exposures. On the west side a beautiful little spring tumbled over large slabs of limestone. On several occasions I have stood beside it, listening to its soothing sounds and trying to imagine it in pristine condition, prior to the introduction of livestock.

Having spoken to the landowners, we drove down a lane, parked and started up the west facing hill. I turned many rocks, Denise disappeared to take more pictures. The west face was in near full exposure to the sun. I turned up no animal life at all beneath the rocks. Conditions on the south face seemed worse. The soil and gravel beneath the rocks was dry, and only abandoned mouse nests and weathered fragments of a shed snakeskin were all I could show for my efforts. I took a long drink from my canteen and thought "vestiges of a predator-prey relationship" as I glanced at the unidentifiable bits of shed skin.

I hiked to the hilltop for a view. I stood for a time admiring a huge, towering thunderhead that was building to the east. We angled down the southfacing slope and crossed the spring mentioned above. Along the spring I surprised several Plains leopard frogs, *Rana blairi*, and uncovered three more prairie ringneck snakes under flat rocks near the stream. It was getting late in the afternoon and another thunderhead was rising to the north. We started onto the east facing hill and found gratifying shade amidst a small copse of cedar and locust, as well as a little moisture remaining beneath the rocks. I spent more

time on this hill than the other two, as I was optimistic that the more moist conditions here would improve our luck. This face was steeper than the others and the stands of young locust trees with their long thorns made our passage somewhat slower than before. About two hours of searching passed without incident. Even the seemingly omnipresent *Diadophis* were not on the surface. I had used all my drinking water and had only 2 or 3 exposures left in my camera as the late afternoon sun was turning the cloud formations light orange. We conceded it was time to leave and began making our way down the hill to walk along the cultivated bottoms back to the car. I kept lifting rocks as we went figuring I would go out with one final effort. Under one of these slabs I uncovered one of my greatest finds to date. As I turned the slab, my eyes fell onto a medium sized blotched snake that, despite the temperature, did not make any quick dash to escape. Instantly it was in my hands; another Great Plains rat snake, this time an adult female. Her slow movement was explained by the fact that she was quite gravid. I could hardly believe my eyes, but there was no mistaking her condition. In all cases I keep my collecting to a minimum, usually content to simply capture herps on film and release them. But I could see a rare opportunity here to learn more about a North American reptile whose natural history is poorly known. I carefully lowered the snake into a sturdy cloth sack and firmly tied the open end shut. Under "her" rock was an intact shed skin. Close examination proved it to be from an *Elaphe guttata emoryi*, but I cannot be entirely sure it came off the snake I just uncovered. With the sun on the horizon we walked back to the car as I tried to absorb the reality of this occasion and the rich and rewarding experiences of the day.

By the time we reached Omaha it was quite dark but I was not ready to sleep. Although bone tired from the long day's activity I quickly hung my pack and camera and set to work housing the new snake. The temporary quarters would be a homemade false floor cage made of two nested plastic storage boxes. The "inside" box has a 2 inch (50 mm) hole in the floor and the numerous, small side ventilation holes register with those of the outer box when they are properly nested. A ventilated plastic lid was secured over both boxes with electrical tape.

This setup has several advantages such as easy sanitation and low initial cost, but I feel its best merit lies in the opportunity for secretive or semifossorial snakes such as *E. g. emoryi* to descend from the top level in a way similar to their taking refuge into rock strata in the soil. This effect is enhanced when several layers of newspaper (my preferred substrate) are used on both levels of the enclosure.

After lining both boxes with newspaper I pressed two handfuls of moistened sphagnum moss into one corner of the lower level. This provided the snake with a temporary egg laying substrate since, in all likelihood, this (egg oviposition) would occur while I was away. A dish of spring water was added and the gravid snake introduced. The entire setup rested on blocks over a heat pad set on the lowest setting with about 75 mm (3.0 inch) between the heat pad and the box. This proved satisfactory and provided daytime high temperatures near 29°C (83°F). I usually turned off the heat pad at night unless the ambient room temperature was below 23°C (70°F).

The next five days passed without incident and the female *emoryi* was seen to flatten her body in a loose coil on the bottom level of the cage, apparently trying to absorb as much heat as possible. In the meantime Denise and I had become all too aware that prairie pastures, besides being beautiful, sometimes rugged places, also harbor (at least in this instance) a chigger population. We both had numerous bites on our legs and widely scattered bites appeared on our upper bodies. No, even the tiny remnants of tall grass prairie are not for weak of heart! Interestingly enough, our new snake showed no evidence of being ectoparasitized. I could find no mites, chiggers or ticks. I wish I could have said the same for ourselves!

Returning home from work on Friday, 20 June 1986, I found the female *emoryi* coiled around seven rather fertile looking eggs! I then removed the eggs and set them up in an

Returning home from work on Friday, 20 June 1986, I found the female *emoryi* coiled around seven rather fertile looking eggs! I then removed the eggs and set them up in an incubator that was already prepared with water saturated vermiculite as a substrate. For a more thorough explanation of this incubation and egg hatching method, see my article in Vol. 6, Number 1, pp. 10-14 of the "Nebraska Herpetological Newsletter", January–February 1985, entitled "1984 Egg Hatching Notes" —I used the same methods here.

The female *emoryi* was in a wakened, depleted condition with the entire posterior half of her body literally flattened and she seemed unable to move at all, save for tongue flicking an short movements of the head and neck. I did not handle the snake, but instead offered her two freshly-killed mice which were instantly accepted. After two weeks she had regained enough energy to constrict live mice, but seemed to require almost eight weeks to regain her average proportions and strength. I have noted this weakened post-oviposition condition in several species of midwestern snakes that I have observed to lay eggs or give birth. Among these are *Agkistrodon contortrix phaeogaster*, Osage copperhead; *Crotalus horridus*, timber rattlesnake; *Diadophis punctatus arnyi*, prairie ringneck snake; *Elaphe vulpina vulpina*, western fox snake; *Pituophis melanoleucus sayi*, bullsnake and *Storeria dekayi texana*, Texas brown snake. The Osage copperhead and timber rattlesnake were field sightings only — not collected. Of the remainder the bullsnakes seemed to "recover" most rapidly, regaining strength and vitality in only two or three feedings. The female Great Plains rat snake described above is to date the most "fragile" postoviposition snake I have seen. I can only wonder if many adult female snakes only live long enough to replace themselves in the wild, as they would appear to be rather easily preyed upon or susceptible to climatic extremes.

During the summer of 1986, in addition to trying to restore strength and energy to our snake through good hygiene and a generous rodent diet, I also set up weekly measurements of the eggs. The measurements of each egg steadily increased as the embryos developed and greater increases were noted in width than in length.

Slits first appeared in the eggs on the morning of 15 August, 1986, 57 days after oviposition. All seven snakes hatched without incident on 15, 16, 17 and 18 August 1986, a total duration of 60 days. The hatchlings were active and robust, without any visible deformities or flaws. It was of interest to note that the snakelets emerged from their eggs in an "opaque" condition (the scales cloudy and dull in preparation for their first shed), but that their eyes were clear. Within two days of hatching all seven snakes were completely opaque and all shed for the first time by 26 August 1986. I then measured each snake and counted the dorsal blotches and tail rings on each snake, including the adult female.

Each hatchling was then maintained in a small plastic storage box, set up the same way as the larger one described above. All of the hatchlings fed aggressively on newborn mice and were splendid miniatures of their mother, each adorned in a light silver ground color with vivid chocolate or olive blotches. Each had a bright porcelain white venter with varying amounts of dark gray checking. Juvenile *E. g. emoryi* are even more goggle-eyed than the adults and this combined with their wide heads and delicate necks made them appear somewhat animated to those acquainted with the proportions of various snake species and perhaps treacherous or even "viperine" to the uninitiated.

On 24 August 1986 I once again headed for the prairie pastures described earlier in this article. I planned to release the adult female *emoryi* and to check some of the same places to see if any herps were active. Upon arrival I released our snake into the same rock pile where I uncovered her. This prairie would most likely appear wild and grand to me on any given day I would visit but I could see that several things had changed since my June field trip. First, that brilliant, sparkling look of both the grass and the sky that was so present in June had faded to a somber, hazy panorama with humidity softened horizons and a thick, almost blanketing atmosphere. The bluestem grasses were easily a meter high

and still looking rather verdant, the thistles were brown and falling into each other, and I did not see any prairie flowers in bloom. I turned about 50 rocks and believed that if the substrate was drying out in June, it was safe to say it was parched in August. I could find no moisture, no old shed snakeskins, mouse nests, or insects under the rocks, just very dry soil or gravel. I walked down to the little spring described earlier and saw the water was very low. The spring barely trickled where it issued from the limestone outcrop and I saw isolated non-flowing pools in the gulch where it courses. I did spy two plains leopard frogs apparently trying to stay cool and avoid the 33°C (90°F) temperature of the day. They sat in one small pool with only their heads above the water and looked as if they did not want to move.

Around 5:00 P.M. I decided to start my journey home and walked out of the gulch and up the rocky hillside. I then crossed a barb wire fence at the top of the hill and carefully walked down the rock outcrop that overlooked the farm lane and our car. This road cut was steep and the rock loose in places. About halfway down something jumped out in front of my feet and onto a slab of limestone. It jumped again, this time into a gravel pile. I ran down to it and saw that it was a very young Plains narrowmouth toad (*Gastrophryne olivacea*)!

Just as I ascertained this the toad descend into the gravel pile. I began to pull out pieces of gravel to find it, but to no avail. After two or three minutes of searching, I gave up and felt these "toads" would be better named "frogs" on the basis of locomotion. Like the Great Plains rat snake, the plains narrowmouth toad is a faunal element of the southern Great Plains and reaches a northern limit on the southern edge of Nebraska. Future field work may well reveal nearly identical ranges of these two peripheral herps in Nebraska.

I drove home through the dark, humid night watching the road for herps but encountered none.

On 14 September 1986 I loaded the hatchling rat snakes into a sturdy cotton sack and once again struck out for this locality I have grown so fond of . This day was sunny and warm, with a high around 30°C (86°F). The previous night was cool, a low around 17°C (63°F). Although it was warm and humid it was a thinner humidity than I had experienced in June or August and when a breeze swept over the hills it was cool, signalling seasonal changes.

These changes were readily apparent. The bluestem grasses were nearly 1.5 meters in height and were changing from a green color to faint pink or pale russet — a wine color (this is best seen in late October). In the draws of the hills the sumac, normally an inconspicuous green in summer, were now scarlet. Walnut trees were changing their leaves from green to lemon yellow and the locust trees were showing yellow tinges in their delicate compound leaves. The spring was once again flowing peacefully thanks to early September rains, with over a dozen plains leopard frogs seen in the pools near the outcrop.

As I approached the correct hillside with this bag of baby snakes in my pack, the forces of predator and prey and natural selection were dominating my thoughts. The first notions came in the form of two sparrow hawks perched on a barbed wire fence near the spot where I needed to release the snakes. I looked skyward to see a red-tailed hawk soaring around this hill. On the hillside, I flushed two adult eastern yellowbelly racers (*Coluber constrictor flaviventris*). Any of these predators could and would not hesitate to make prey of these young rat snakes. I thought to myself: "How long will they last? Will any survive?" But I was not here to protect them but only to replace them. Hawks have eaten snakes long before man with his plow, his saw, his highways, his cattle, fences, pesticides and herpetologists invaded the prairie. The best I could do here would be to observe, record, enjoy the elements and circumstances of this dwindling habitat and try to interpret the experience to those who will listen.

I did make one concession in favor of the young snakes. Atop the hill a herd of cattle was grazing, so I chose a rock formation that I felt the cattle would be reluctant to tread upon, yet still very close to the initial capture site of the adult female. (There's nothing quite like turning a piece of metal, board or rock in some pasture and uncovering a recently crushed snake!) I selected a haphazard rock pile that had fallen from a small escarpment roughly 3 to 4 meters high and perhaps 10 meters long. The rock rubble varied greatly in size and shape from boulders roughly 2 meters in diameter to fist-sized talus. The whole outcrop was overgrown with locust trees and the footing was difficult at best. I sat down on a boulder and slowly removed each snake, one by one, admiring them one last time. An iridescent sheen played over their heads and venters in the September sun and most of them were aggressive; striking and vibrating their tails, no doubt stimulated by the sunlight, fresh air and scent of their natural habitat. Each snake enthusiastically descended into the limestone talus when set free.

Time passes all too quickly in life, but it seems when I am out in the field seeking out snakes the hours elapse even faster than in the workday world that most of us are subject to. It would seem that I had just arrived, just gotten started but, alas, the sun is nearing the western horizon. Its hard to go back to the suburbs, the houses, traffic, clutter and clatter of our civilization after spending a few hours on the few remaining pieces of grassland that once covered this part of our country, a once huge, free, sprawl of ambient wilderness where passing time is not recorded by week or month, but rather by day, night, season and era.

BOOK REVIEW

Frogs and Toads of the World, by Chris Mattison. 1987. Facts On File, Inc., New York. 191 pages, 120 illustrations (60 in full color). Price: $22.95, hardbound. Available from: Facts on File, Inc., 460 Park Avenue South, New York, NY 10016.

"Frogs and toads are fascinating animals," writes Chris Mattison, "...their bulging eyes and hopping gait are the stuff of fairy tales and superstitions..." And also the stuff of this excellent new book. Those who study frogs and toads closely have long maintained that they are among the most fascinating animals on the planet, and this book certainly supports this idea. Mattison has managed to survey the great variety of amphibian adaptations and lifestyles while giving the reader a good general overview of frog and toad biology. In the first pages of the introduction, Mattison takes the reader on an evening stroll through a South East Asian rain forest to look for frogs. The writing remains crisp and clear throughout the remainder of the book as he explains what these animals are all about.

Chapter 1 briefly recounts the origin of frogs and toads, Chapter 2 is "Design — size, shape and colour." It contains the best explanation of the significance of color in animals that I have seen. Chapter 3 is "physiology — interior design and function," and addresses the important subjects of thermoregulation and water balance.

Chapter 5 is "Staying Alive: enemies and defence." Those readers who are familiar only with North American frogs will be surprised by the variety of behaviors and toxins that frogs and toads use for defense. Mattison also covers the usually neglected subject of frog parasites — protozoans, helminths, and ecto-parasites.

"Food and Feeding" is discussed in the next chapter, which begins with hunting strategies, and proceeds through explanations of how frogs swallow and digest prey items. Reproduction is covered in two chapters, the first devoted to mating and the second to the development of eggs and tadpoles. While short, these two chapters are an excellent summary of the incredibly diverse reproductive systems of frogs.

Chapter 8, "Life-histories," tackles a very complex and difficult subject. When most of us think of frog eggs, we think of a surface film of eggs laid in the water. Mattison re-

veals just how complex frog and toad reproductive strategy can be. Eggs are carried in the stomach, in the vocal pouch, on the back or in a pouch. Tadpoles may be carried from a terrestrial nest and released in the water. In some species, the eggs develop in the oviduct of the female. Other frogs stick their eggs on leaves far above the source of water. And on and on.

Chapter 9 is "Distribution and Movement." After briefly mentioning the kinds of habitats where frogs and toads may be found, home ranges and zoogeography are discussed. There are some excellent color photographs of tropical frog habitats.

"Frogs and Man" is covered in Chapter 10. It begins with frog and toad folk tales from around the world, then moves on to touch on frogs as experimental animals and the main course at dinner. Mattison then relates some modern-day horror stories about the introduction of non-native frog species and their resultant impact on native animals.

The last, and longest chapter covers "The Families of Frogs," no small task when you remember there are about 3,500 species of frogs and toads worldwide. The outstanding characteristics and geographic distribution of each family are discussed, and a few examples of particular species given.

The Bibliography is a very good selection of popular works and scientific papers. The Index lists the common and scientific names of the frogs and toads mentioned in the text.

Generally, the photographs in the book are very, very good, although a few of the color reproduction are too dark for my taste. Many of the photographs were taken in the field, which is quite difficult to do, but the results are beautiful, with each creature shown in a natural context. The black & white photographs are not reproduced as well as the color plates, but the line drawings are sharp. The photographs were carefully selected to complement the text. I only noticed one small error — the photo captions on pages 178 and 179 were switched.

Mattison has communicated a lot of information from the scientific literature in this book. This is the first time that I have seen much of it presented for people who don't have a lot of training in biology. Most new information in science is relatively inaccessible to those not accustomed to reading through prodigious amounts of scientific literature. It is refreshing to see someone like Mattison come along who can so clearly and succinctly distill this information down in a fascinating and entertaining book.

I highly recommend this book as an important addition to your library. It is an excellent companion to Mattison's earlier books, The Care of Amphibians and Reptiles in Captivity (reviewed in KHS Newsletter No. 63, pages 19-20) and Snakes of the World (reviewed in KHS Newsletter No. 64, pages 21-22). I am amazed at how much information Mattison has been able to fit into a 191 page book while maintaining a writing style that makes it such a pleasure to read.

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A FINAL WORD FROM THE EDITOR

With this issue, the KHS Newsletter takes another great leap forward — thanks to the efforts of Associate Editor Joseph T. Collins. We are now using the latest in desktop publishing technology to produce the Newsletter. There will be numerous changes in style and format of the Newsletter over the next year as we decide how best to use this system. We would like to thank (as usual) the Museum of Natural History of The University of Kansas for the support KHS receives there, and also Rebecca Alden, Tamara Wallace, and Jeffrey Whipple for various computer wizardry and stamp licking.