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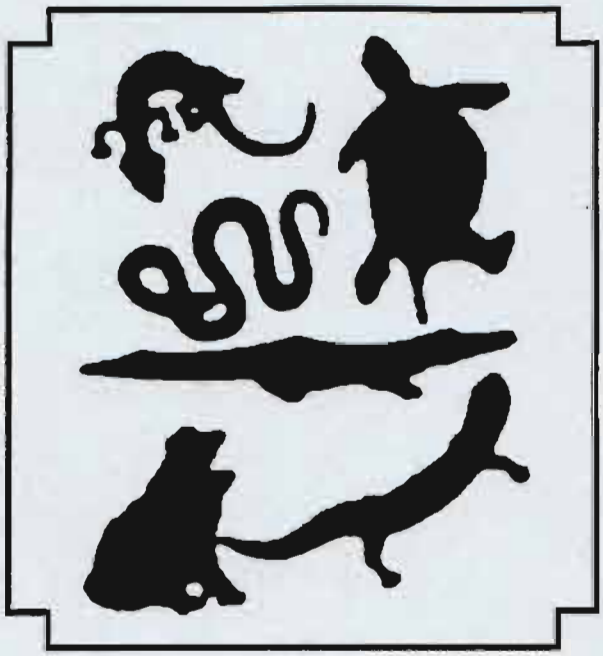
INTERNATIONAL HERPETOLOGICAL SYMPOSIUM

HOSTED BY THE DENVER ZOOLOGICAL GARDENS



DENVER, COLORADO, U.S.A.

JUNE 14-17, 1995

PROGRAM AND ABSTRACTS

Herpetological Natural History is a peer-reviewed journal published by the International Herpetological Symposium, Inc., and devoted to all aspects of natural history (e.g., behavior, biodiversity surveys, conservation biology, disease, ecology, evolution, geographic distribution, paleontology, reproduction) of free-ranging amphibians and reptiles. U.S. subscriptions to *Herpetological Natural History* are $25.00/yr.; subscriptions to institutions are $50.00/yr. International subscriptions are mailed by surface and require an additional $7.00 for postage. Air Mail quotes will be provided upon request. Back issues (Volume 1, Numbers 1 & 2) are available for $34.00 a set (postpaid). All other back issues are available for $17.00 each (postpaid). Payment by check or money order and in U.S. dollars should be made to: International Herpetological Symposium, Inc.

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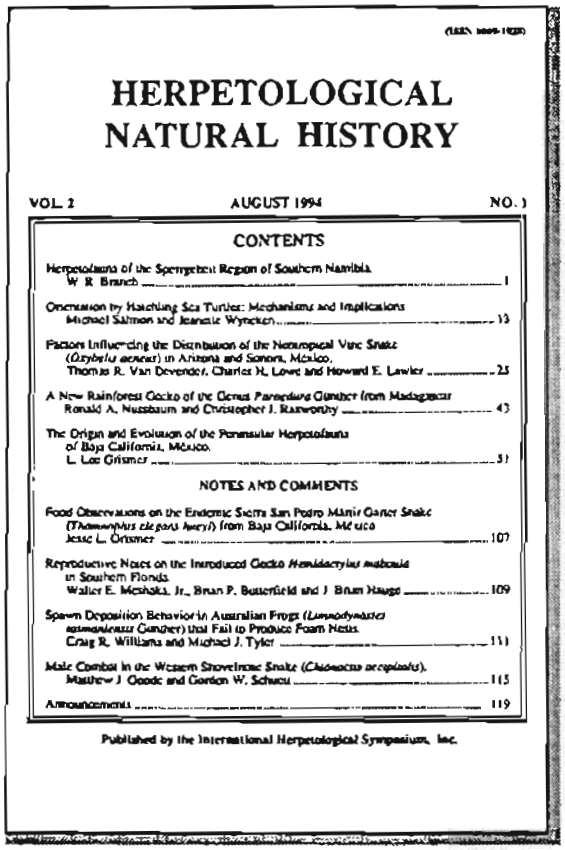

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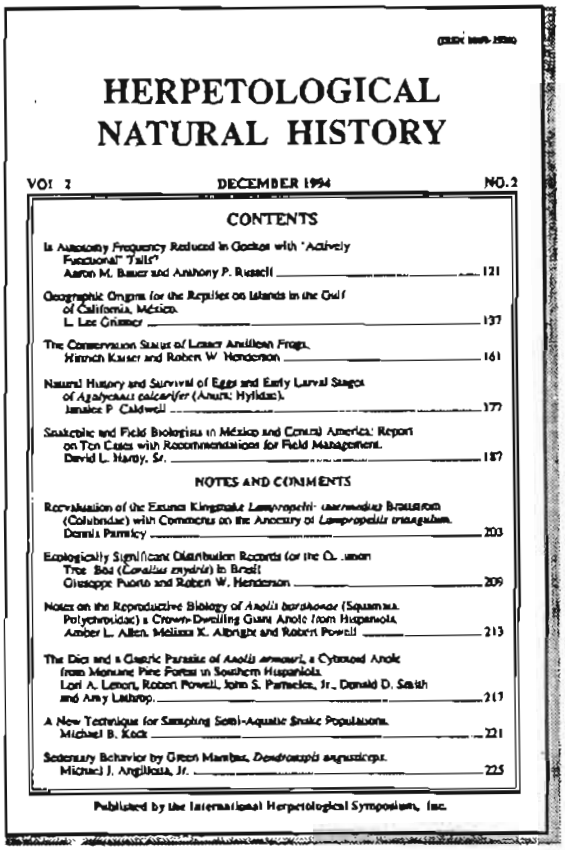

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INTERNATIONAL HERPETOLOGICAL SYMPOSIUM, Inc.

1995 Meeting

Denver, Colorado

PROGRAM

WEDNESDAY, 14 JUNE

7:00 pm - 10:00 pm Registration - Lobby - Stapleton Plaza Hotel

THURSDAY, 15 JUNE

8:00 am - 5:00 pm Registration - Lobby - Stapleton Plaza Hotel
Paper sessions & workshops - Ballroom(s)

8:00 am - 8:15 am **OPENING REMARKS**

HOWARD E. LAWLER, President
International Herpetological Symposium, Inc.

8:15 am - 9:00 am **KEYNOTE ADDRESS**
Herpetological Conservation - A Global Perspective

RUSSELL MITTERMEIER, President
Conservation International

9:00 am - 10:00 am Ecology of the Turtle Community in Freshwater Habitats of Neotropical Mexico

RICHARD C. VOGT

10:00 am - 10:30 am Behavior of Captive-Born and Wild-Caught Rattlesnakes

DAVID CHISZAR, CHARLES W. RADCLIFFE, & HOBART M. SMITH

10:30 am - 11:00 am Herpetology of the Yucatan Peninsula

JULIAN C. LEE

11:00 am - 11:30 am Natural History and Captive Management of Mexican Salamanders (no abstract)

ED MARUSKA, Director
Cincinnati Zoo, Cincinnati, Ohio USA

11:30 am - 12:00 pm Reproductive Biology of Brazilian Turtles (*Phrynops geoffroanus* and *Trachemys dorbignyi*) at the Sao Paulo Zoo (two abstracts)

FLAVIO DE BARROS MOLINA

12:00 pm - 1:00 pm **LUNCH**

THURSDAY, 15 JUNE

1:00 pm - 1:45 pm Historical Biogeography of the Chihuahuan Desert and the Evolution of the Graybanded Kingsnake

THOMAS R. VAN DEVENDER

1:45 pm - 2:00 pm Biology and Conservation of the Desert Tortoise (*Gopherus agassizii*)

CECIL R. SCHWALBE

2:00 pm - 2:30 pm Amphibians and Reptiles of the Alamos, Sonora, Area

CECIL R. SCHWALBE

2:30 pm - 3:00 pm Natural History of the Green Tree Python

KARL H. SWITAK

3:00 pm - 3:30 pm Reptilian Egg Incubation: A Review of Incubation Techniques and Egg Care

DONAL M. BOYER & STEPHEN H. HAMMACK

3:30 pm - 4:00 pm Galapagos Reptiles: Peril in Paradise

FRED CAPORASO

4:00 pm - 4:30 pm The Great American Deception: Animal Rights or Animal Welfare?

GAYLON LECOY HOLMES

4:30 pm - 5:30 pm **WORKSHOP: Legislative Issues**

Gaylon Holmes
Ernie Cooper
Alan Salzburg

7:00 pm - 10:00 pm **ICEBREAKER**
SPECIAL AV SLIDE PRESENTATION

David Dennis & Eric Juterbock:

(1) HERPS OF THE WEST
(2) AMPHIBIANS OF APPALACHIA

**** SPECTACULAR - DON'T MISS THIS *** ****

FRIDAY, 16 JUNE

8:30 am - 9:00 am Contribution of the Laboratorio de Herpetologia "VIVARIO" from the UNAM Campus Iztacala to Mexican Herpetology: The Role of Captive Husbandry

AMAYA GONZALEZ-RUIZ & ENRIQUE GODINEZ-CANO

9:00 am - 9:30 am The Potential Effect of Commercialization of Reptiles from the Peninsula of Baja California, Mexico, and its Associated Islands

ERIK MELLINK

9:30 am - 10:00 am Seri Indian Ethnoherpetology: Multiplying Means of Passing on Folk Biological Knowledge to Future Generations

GARY PAUL NABHAN, HOWARD LAWLER & ERIK MELLINK

10:00 am - 10:30 am Taxonomic Relationships between *Trimorphodon biscutatus* Complex Members Near the Arizona-New Mexico Border

TRAVIS J. LADUC, ALAN MABRY & JERRY D. JOHNSON

10:30 am - 11:00 am Herps and Their Habitats in Southeastern Mexico

JERRY D. JOHNSON

11:00 am - 12:00 pm **PANEL DISCUSSION & DEBATE**: Are Captive-Born Reptiles Suitable For Release?

David Chiszar
Andrew Odum
James B. Murphy

12:00 pm - 1:00 pm **LUNCH**

1:00 pm - 2:00 pm Treatment of Metabolic Bone Disease in Green Iguanas (*Iguana iguana*) Using Synthetic Salmon Calcitonin

DOUGLAS R. MADER

FRIDAY, 16 JUNE

2:00 pm - 2:30 pm Wood Turtle (*Clemmys insculpta*) Populations are declining throughout Their Range: A 22 Year Study (1974-1995)

STEVEN D. GARBER

2:30 pm - 3:00 pm Iguana Reproductive Evaluations and Therapy

MICHAEL KIEDROWSKI

3:00 pm - 3:30 pm Ecological Aspects and Captive Management of Two Urban Rattlesnakes (*Crotalus mitchelli pyrrhus* and *Crotalus tigris*)

BRYAN L. STARRETT

3:30 pm - 4:00 pm Salamander Husbandry and Captive Propagation at the Tennessee Aquarium (No Abstract)

GREG GEORGE
Tennessee Aquarium, Tennessee, USA

4:00 pm - 5:00 pm **WORKSHOP**: Veterinary Issues

Thomas Boyer
Douglas Mader
Roger Klingenberg

5:00 pm BUSES LEAVE FOR DENVER ZOO

6:30 pm - 10:00 pm DINNER AT DENVER ZOO

SATURDAY, 17 JUNE

8:30 am - 9:00 am Is Private-Sector Captive Breeding of Reptiles and Amphibians Conservation? An Introduction to ISIS, Studbooks, and the Future Potential for Information Exchange

STEPHEN B. PORTER

9:00 am - 9:30 am Noninfectious Problems of Captive Amphibians

KEVIN WRIGHT

SATURDAY, 17 JUNE

9:30 am - 10:00 am	Nutritional Problems of Reptiles THOMAS H. BOYER
10:00 am - 10:30 am	Reptile Health Evaluation JAMES L. JARCHOW
10:30 am - 11:00 am	Principles and Techniques of Emergency First-Aid in Reptiles for the Non-Veterinarian: Trauma and Prolapses ROSS M. PREZANT
11:00 am - 11:30 am	Researching the Nutritional and Lighting Needs of the Panther Chameleon, *Chamaeleon* (= *Furcifer*) *pardalis*: A Progress Report GARY W. FERGUSON
11:30 am - 12:00 pm	Ultraviolet-B Radiation and Vitamin D in Chameleon Husbandry: An Experimental Study JON R. JONES
12:00 pm - 1:00 pm	LUNCH
1:00 pm - 2:00 pm	Naturalistic Vivarium Design PHILIPPE DE VOSJOLI
2:00 pm - 2:30 pm	Reproductive Husbandry of the Gila Monster DAVID GROW & JOE BRANHAM
2:30 pm - 3:00 pm	Overview of Captive Reptile Diets THOMAS H. BOYER
3:00 pm - 3:30 pm	Relation of Venom Composition to Diet and Potential Activity Patterns STEPHEN P. MACKESSY
3:30 pm - 4:00 pm	Observations on the Ecology of New Caledonian Reptiles FRANK FAST

SATURDAY, 17 June

4:00 pm - 4:30 pm An Overview of the Neotropical Ratsnake (*Elaphe flavirufa*), With Notes on Husbandry, Incubation, and Neonate Care

ANTHONY J. BAUM

4:30 pm - 5:30 pm **WORKSHOP:** Husbandry Issues

Donal Boyer
David Grow
Richard Ross

7:00 pm - 10:00 pm **DINNER/BANQUET**

ANNOUNCEMENTS and TRIBUTES
Howard E. Lawler, President of IHS, Inc.
David Chiszar
Thomas R. Van Deveneder

PRESENTATION OF THE JOSEF LASZLO MEMORIAL AWARD
James B. Murphy

AUCTION
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*** CONCLUSION ***

SEE YOU NEXT YEAR!

ABSTRACTS

(Alphabetized By Last Name of First Author)

AN OVERVIEW OF THE NEOTROPICAL RATSNAKE *Elaphe flavirufa* WITH NOTES ON HUSBANDRY, INCUBATION, AND NEONATE CARE

ANTHONY J. BAUM
Oklahoma City Zoo, Oklahoma City, Oklahoma 73111, USA.

Despite the recent increased interest in Mexican reptiles and amphibians, and the number of herpetologists doing work in this area, there is still a scarcity of information about its unique and diverse herpetofauna. This is certainly true of the neotropical ratsnake, *Elaphe flavirufa* (Conant 1965), commonly called the nightsnake (Mertens 1950) or the nightwalker (Wilson & Hahn 1973). This species inhabits the Caribbean and Gulf Coastal Plains and lowlands of Mexico and Central America, from Tamaulipas, Mexico to Guatemala. It is found from elevations of 0-500 m (1500 ft) above sea level, in moist forests as well as tropical dry forests. The species *E. flavirufa* is represented by five subspecies: *E. f. flavirufa*, *E. f. matudai*, *E. f. pardalina*, *E. f. phaescens*, and *E. f. polysticha*. The validity of two of these subspecies (*E. f. matudai* and *E. f. polysticha*), is questionable. I will describe the husbandry and successful breeding techniques in this species.

REPTILIAN EGG INCUBATION: A REVIEW OF INCUBATION TECHNIQUES AND EGG CARE

DONAL M. BOYER
Department of Herpetology, Dallas Zoo, Dallas, Texas 75203, USA.

STEPHEN H. HAMMACK
Department of Herpetology, Fort Worth Zoo, Ft. Worth, Texas 76110, USA.

Our presentation is a general review of information available in the literature which has been compiled and condensed in a more useable format. Many aspects of reptilian egg incubation techniques, egg anatomy, and physiology will be discussed. The topics of oviposition, nest sites, species-specific preferences, and maternal versus artificial incubation will be covered. A wide variety of incubators from homemade types to expensive commercial models are used in herpetoculture, and their utility is reviewed. Equally as varied are the variety of incubation media used. Egg care during incubation including diapause, water potential, incubation temperature and temperature-determinant sex ratios will be elaborated on. From here we will discuss the topic of hatching eggs, including how and when to assist neonates or eggs which fail to hatch. We will conclude with a discussion of current and future research directions in this area.

NUTRITIONAL PROBLEMS OF REPTILES

THOMAS H. BOYER, DVM
Clinical Instructor

Veterinary Teaching Hospital, College of Veterinary Medicine and Biomedical Sciences, Colorado State University, 300 W. Drake, Ft. Collins, Colorado 80523, USA. Office: (303) 491-1257 or (303) 221-4535.

Nutritional problems of reptiles vary between carnivores, insectivores, and herbivores, except for metabolic bone disease (MBD) which is common to all three. MBD is a frequent sequelae to a calcium or vitamin D deficiency from a lack of dietary diversity, feeding calcium deficient vegetables, fruits, animal parts, or insects and/or provision of multivitamins as the source of calcium. One must elucidate the cause of MBD to avoid recurrence. In carnivores, visceral and articular gout are thought to arise from dehydration, renal tubular disease and excessive or too frequent consumption of purine-rich meals. Steatitis arises from inadequte dietary fats (in rancid fish) increasing requrements for vitamin E. Thiamin, or vitamin B_1, deficiency is uncommon, but has been reported in snakes and aquatic turtles fed fish with a high thiaminase content. Biotin deficiency may resutl from feeding unfertilized eggs exclusively. Protozoal gastroenteritis causes dramatic weight loss with continued appetite in reptiles that feed upon amphibians, lizards, or fish. Live prey, including insects, can maim, infect, or kill reptiles. In herbivores, protein-rich foods and multi-vitamin over-supplementation are thought to induce metastatic calcification in adult herbivorous reptiles. Treatment is generally unrewarding; therefore, prevention is paramount. Mammalian diets should be restricted to less than 5% of the total diet; avoid concurrent multivitamin usage. Uric acid cystic calculi are thought to arise from purine-rich foods and are common in iguanas and desert tortoises. Fatty liver degeneration or hepatic lipidosis occurs in tortoises secondary to starvation, obesity (from excess fat in the diet), diabetes or toxic insult. Pyramidal shell growth is common in captive-raised tortoises and can result from excess dietary protein, too rapid growth, vitamin or mineral imbalance (MBD is often present) or individual or species susceptibility. Hypovitaminosis A is common in box turtles secondary to anorexia or carotenoid-deficient diets. Iatrogenic hypervitaminosis A results from overzealous administration of parenteral vitamin A.

OVERVIEW OF CAPTIVE REPTILE DIETS

THOMAS H. BOYER, DVM
Clinical Instructor

Veterinary Teaching Hospital, College of Veterinary Medicine and Biomedical Sciences, Colorado State University, 300 W. Drake, Ft. Collins, Colorado 80523, USA. Office: (303) 491-1257 or (303) 221-4535.

Reptile diets can be generalized as carnivorous, insectivorous, omnivorous, or herbivorous.

Dietary deficiencies, excesses and unbalance are currently the major cause of disease in captive reptiles. Formulated reptile diets are often disastrous because of dramatic differences in protein, fat. fiber and vitamin requirements. Water is required by all reptiles and is the most essential of all nutrients. All diurnal reptiles, with the exception of snakes, seem to require ultraviolet light (UV) for vitamin D synthesis. Dietary requirements for vitamin D are unknown for all reptiles thus it seems prudent to minimize dietary vitamin D and maximize UV light. sunlight is undoubtedly the best source of UV light. However, artificial UV lights have been empirically successful for decades and have recently been shown to support vitamin D synthesis. Carnivorous diets are generally well balanced without mineral or multivitamin supplementation if whole animals, fed a balanced diet, are used. An exception are newbory rodents which are marginal with respect to calcium (Ca). Gutted or boned animals, or parts, such as organs or meat, are severely calcium deficient. Freezing for 3 days may substantially reduce parasitic transfer but not entirely eliminate it. Frozen animals should be rapidly thawed in warm water to prevent bacterial overgrowth. All insects have a negative Ca to phosphorous (P) ratio and are deficient in vitamins A and D. Insects should be fed Ca-rich diets exclusively for at least 3 days prior to becoming prey. In addition insects can be dusted with vitamin-D and phosphorous-free Ca just prior to becoming prey, substitute multivitamins for Ca once or twice a month. Multivitamins are not an adequate source of Ca. Herbivorous diets tend to be high in P and deficient in Ca. Basic herbivore salads should inclue 85% vegetables (primarily dark leafy greens), 10% fruits and less than 5% protein-rich foods. Vitamin D and phosphorus-free Ca should be lightly sprinkled on each salad, substitute multivitamins for Ca once or twice a month. Once again, multivitamins are not an adequate source of Ca. The future of commercial reptile production will be closely tied to commercial reptile feed, for for herbivores, but eventually for carnivores and insectivores. Commercial diets are convenient but their long-term safety remains to be see. Long-term feeding trials under controlled conditions are needed. Simply growing, maintaining, or reproducing reptiles on a given diet is not adequate. Clinicopathologic follow-up is essential. Commercial feed producers are eager to assist studies by independent breeders or institutions. Wtih cooperation among all parties, major advances are possible within 5-10 years. There is an urgent need to report on captive diets, successes or failures. We can learn from deaths assumed to result from diet if we perform thorough necropsies, including histopathology. We also need more field studies to determine natural diets, what species are being consumed and when, and their nutritional content.

GALAPAGOS REPTILES: PERIL IN PARADISE

FRED CAPORASO, Ph.D.
Assistant Professor

Food Science & Nutrition Department, Chapman University, Orange, California 92666, USA. Office: (714) 997-6638. Home: (714) 559-0842.

I will discuss current concerns and conservation efforts for Galapagos reptiles, including the effects of a 1994 fire on Isabela Island, severe threats of commercial fishing, the positive and negative effects of tourism, natural selection changes in the diet of marine iguanas

(*Amblyrhynchus cristatus*) and conservation programs (Charles Darwin Research Station and Galapagos National Park Service) for giant tortoises (*Geochelone nigra*) and the land iguanas (*Conolophus subcristatus*).

BEHAVIOR OF CAPTIVE-BRED AND WILD-CAUGHT RATTLESNAKES

DAVID CHISZAR, Ph.D.

CHARLES W. RADCLIFFE, Ph.D.

HOBART M. SMITH, Ph.D.

Department of Psychology, University of Colorado, Boulder, Colorado 80309-0345, USA. Office: (303) 492-4283. FAX: (303) 492-2967 (**DC**); Department of Herpetology, Denver Zoo, Denver, Colorado 80205, USA (**CWR**); E.P.O. Biology, University of Colorado, Boulder, Colorado 80309-0334, USA (**HMS**).

Although several reintroductions of captive-raised reptiles into nature have been successful, most have either failed or have not yet proven successful. Many factors contribute to this situation, including the probability in some cases that habitat degradation intially leading to the decline in herptile populations was still problematic when the captive-raised animals were released. Among other contributing factors is the possibility that captive-raised animals did not possess necessary levels of skill in finding food or avoiding predators. We will present empirical evidence along these lines for captive-raised rattlesnakes. While captive-raised snakes exhibited several important deficits, also we have evidence that at least some of these can be remediated.

REPRODUCTIVE HUSBANDRY OF THE GILA MONSTER

DAVID GROW
Curator of Herpetology

JOE BRANHAM
Animal Technician II

Oklahoma City Zoo, Oklahoma City, Oklahoma 73111, USA.

The boldly contrasting pink and black coloration of the Gila monster (*Heloderma suspectum*) and its comparatively large size, make it a popular animal in captivity. ISIS and F. Slavens report over 300 individuals in captivity at nearly 80 institutions. While a few institutions and individuals have established successful breeding programs, this large captive population produced less than 25 individuals in 1994 with nearly half of that number hatching at a single institution. We will summarize current techniques employed to stimulate reproduction in the Gila monster

with the hope of facilitating broader reproduction in the captive population. Most institutions reporting reproduction provide their Gila monsters with thermoregulatory opportunities during the warm months and a winter cool period. Ambient day temperatures range between 25-29 C with a 2-3 C drop at night. Radiant hot spots range between 32-38 C. The winter cool period typically is from December to March, with low temperatures ranging from 13-18 C. Aggression between males occurs during the breeding season (May-June), while gravid females become aggressive with cagemates as time of oviposition nears (May-July). Adults are fed mice once a week, though some institutions supplement the diet with egg. Gravid animals are isolated for oviposition as they will eat each other's eggs. Water-moistened vermiculite is typically the incubation medium with a 1:1 to 1:4 water to vermiculite weight ratio. The incubation medium is permitted to dry significantly during the last 4-6 weeks of incubation. Incubation is usually 130-140 days at 27-29 C with hatching occurring in October through December. Reported hatchling range from 130-170 mm in length and weigh 27-52 g, averaging 47 g at Oklahoma City Zoo. Hatchling Gila monsters fed mice once a week will attain adult size in 14 months. Captive-born Gila monsters have successfully reproduced at 5 years of age.

OBSERVATIONS ON THE ECOLOGY OF NEW CALEDONIAN REPTILES

FRANK FAST
Director, International Gekkonid Research Group

P.O. Box 22146, Lincoln, Nebraska 68542, USA. FAX: (402) 466-3656.

During the past four years, I have led three field expeditions (two with Philippe de Vosjoli) to survey and study the ecology of the geckos of new Caledonia, including Grande Terre and surrounding islands. Surprisingly, several small islands with relatively low forests had populations of the New Caledonian giant gecko *Rhacodactylus leachianus*. In the course of the survey I also found the rare and poorly known New Caldedonian crested gecko *R. trachyrhynchus* and the very rare giant skin gecko *Phoboscincus garnieri*. I will present slides of the above mentioned species and their habitats, as well as information on their feeding habits and ecology. Slides of several insular variants which I suspect may be new subspecies will be shown for the first time.

RESEARCHING THE NUTRITIONAL AND LIGHTING NEEDS OF THE PANTHER CHAMELEON, *Chamaeleo* (= *Furcifer*) *pardalis*: A PROGRESS REPORT

GARY W. FERGUSON, Ph.D.
Texas Christian University, Ft. Worth, Texas 76129, USA.

The Malagasy panther chameleon (*Furcifer pardalis*) is a large, spectacularly colored, arboreal lizard that has generated a great deal of interest among the herpetocultural community. Since 1990, laboratory studies at TCU and the Fort Worth Zoo, in collaboration with a number of

investigators at several other institutions, have increased our understanding of the captive life-history and husbandry requirements of this chameleon. Under ad libitum food availability and the appropriate thermal environment, juvenile panther chameleons eat the equivalent of their body mass each week and mature at less than six months of age. Males continue to grow and reach full size in about one year. Growing juveniles and reproductive females have a high vitamin A requirement. Also, they have a substantial vitamin D requirement. Research will continue to increase understanding and improve captive husbandry of this species, making it a preferred chameleon for captive propagation. I will summarize current recommended husbandry.

WOOD TURTLE (*Clemmys insculpta*) POPULATIONS ARE DECLINING THROUGHOUT THEIR RANGE: A 22 YEAR STUDY (1974-1995)

STEVEN D. GARBER, Ph.D.
Wildlife Biologist

Department of Biological Sciences, Rutgers University, Piscataway, New Jersey 08855-1059, USA.

This study documents the detrimental effects of human recreation on the North American wood turtle (*Clemmys insculpta*). Two North American wood turtle populations were observed for 22 years, from 1974 to 1995. One hundred and thirty-three different wood turtles were captured a total of 1,176 times. During the first half of the study there was no human recreation at our study site. During the second half, hiking and fishing were allowed. Human and wood turtle demographics were monitored throughout this period. The wood turtle populations remained stable during the first nine years of the study when people were denied access to the property. When this area was opened to human recreation both wood turtle populations declined steadily; the total number of turtled in both populations declined 87% in nine years and by almost 100% in 10 years. Data documenting the cause and effect relationship of this decline are presented. Throughout this study the size of the forest remained the same, road building and vehicular traffic were restricted, and the quality of the air and water were constant. Recreation in parks and preserves could threaten the long-term survival of this species. As wilderness areas become mixed use recreation areas, wood turtle populations will suffer. Without proper management, the increasing human recreational use of parks, reservoirs, and wildlife reserves will adversely affect the long-term survival of the North American wood turtle.

CONTRIBUTION OF THE LABORATORIO DE HERPETOLOGIA "VIVARIO" FROM THE UNAM CAMPUS IZTACALA TO MEXICAN HERPETOLOGY: THE ROLE OF CAPTIVE HUSBANDRY

AMAYA GONZALEZ-RUIZ

ENRIQUE GODINEZ-CANO

Laboratorio de Herpetologia, Universidad Nacional de Mexico Campus, Iztacala UNAM Campus, Jefatura de Biologia, A.P. 314, Tlalnepantla 54090, Mexico, MEXICO.

The "Laboratorio de Herpetologia," best known as "VIVARIO," is devoted to captive husbandry of Mexican amphibians and reptiles. It was founded in 1979 by biology students that wanted a possibility to study this poorly known group of vertebrates. Since then, it has had continuous growth to the facility it is today. As a result of being on a university campus, this laboratory has been involved with various aspects of both field and studies and labortaory studies on husbandry. We can view the contribution to Mexican herpetology from four points-of-view that, in fact, represent the main goals of its work. First, the labortatory generates continuous information on the biology and husbandry of the organisms it maintains. Each one of more than 900 captives are periodically measured and weighed. Further, the details concerning longevity, molting, diseases, reproduction (we have achieved reproduction in various species, ranging from the easily-bred *Boa constrictor* to the difficult *Heloderma horridum*, as well as other species of snakes and lizards), and so on, are individually recorded. All animals with field data that die are dposited in the Museum of Zoology at Facultad de Ciencias of the UNAM so their particular information can be used. Second, the laboratory has dedicated an important effort to public education. One-third of its space has been designed to public exhibition, showing the animals in conditions as natural as possible to show the public a realistic approach to this extremely misunderstood group of animals in this country. We offer helpful information and proximity to animals to people of all ages. In addition, there is an exhibition that we take to the road. By this means we have been able to bring a sample of our collection to people who would otherwise not be interested in seeing or touching these animals. This experience is very helpful and productive, and we have seen incredible changes in positive attitude by these people toward amphibians and reptiles. Third, we, being part of a UNAM campus, have had an important role in training people, allowing students of general zoology and herpetology access to live specimens. We are proud to see that some students are seriously involved in herpetology, which is a vast field in Mexico, but one of the poorest supported. Last, since we do not collect or buy, this laboratory works as a recovery center, and most of the animals were received from the wild as donations.

THE GREAT AMERICAN DECEPTION: ANIMAL RIGHTS OR ANIMAL WELFARE?

GAYLON LECOY HOLMES
Legislative Action Coordinator for the American Federation of Herpetoculturists

P.O. Box 1907, Casper, Wyoming 82602, USA. Office: (307) 266-2941. FAX: (307) 237-7157.

The animal rights movement became solidified following the publication of Peter Singer's book, *Animal Rights: A New Ethics for Our Treatment of Animals*, in 1975. Since then, the movement has gained many allies and proponents from high visibility sectors. Actors and actresses, public school teachers, and the national media are but a few of the vocations that have rallied to the agenda. The basis of the agenda is that animals have the same innate rights as those attributed to humans. They make no distinction between domestic and wild creatures. There are over three hundred organizations in the United States dedicated to this platform. They vary in their intensity and behaviour from simple advocacy to outright terrorism. One group in particular, the Animal Liberation Front (A.L.F.), has resorted to bombings, industrial and scientific destruction, and bodily harm. they are credited with laboratory and research destruction totalling more than ten million dollars. A.L.F. has been classified by the F.B.I. as an extremely dangerous terrorist group. Most of the animal rights groups support an agenda that includes the total prohibition of animal use by humans. This would include the keeping of pets, researcy of any nature, domestic cultivation for food, etc. The largest of these organizations have annual budgets that exceed 10 million dollars. The administrative officers receive salaries well about $150,000 per year. This money is generated largely through direct mail campaigns targeted at the average citizen. the animal rights organizations depend on the ignorance of the public regarding their true agenda. The mailer typically presents a color photograph of a forlorn kitten or puppy. Included is a dramatic plea for financial aid to help prevent the abuse and over abundance of unwanted animals. The average citizen seldom questions the material and sends in his/her contribution. Other direct mail pieces include photographs of animals supposedly used in medical research facilities that imply horrific procedures and treatment. These pictures are often altered or staged. Again, the effect is emotional, and the recipient responds with a contribution. Never before in the history of the United States has there been a more successful or more deceptive fund raising movement. The initial targets of the animal rights movement were the medical research community. Shortly after that, the entertainment industry, food animal industry, and wildlife hunters fell victim to the rightist's sights. With support from the sensationalist seeking media, the animal rights soldiers continued their assault with programs directed against zoological gardens, pet shops, natural history museums, etc. Interest in herpetology, and its offspring herpetoculture, has increased and now our vocation/avocation is threatened. I will discuss the true agenda of the animal rights movement and its machinations. Further, I will suggest various methods of combatting this well funded deception through responsible public educationand organized coalitions.

REPTILE HEALTH EVALUATION

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Successful treatment of any ill patient is dependent on an accurate diagnosis of the disease process. The failure of many reptile patients to respond favorably to treatment may result from an inaccurate identification of the causes responsible for their debility. Theisolation of a pathogenic bacterium or parasite alone may not account for the patient's condition; many of these pathogens are opportunists, affecting debilitated hosts. Physical examination and husbandry evaluation procedures are presented with an emphasis on identifying physiologically impaired individuals. The roles of water deprivation, malnutrition, inappropriate temperature, lighting, shelter and population composition in the pathogenesis and course of disease are discussed and remedial measures are presented. The goals of my presentation are first to provide the reptile keeper with methods to detect adverse situations in their early stages so that appropriate husbandry adjustments can be made, and second, to help the reptile keeper determine which situations require professional medical assistance.

HERPS AND THEIR HABITATS IN SOUTHEASTERN MEXICO

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The geographic region referred to as southeastern Mexico is comprised of portions of that country east of the Isthmus of Tehuantepec, exclusive of the Yucatan Peninsula. The region includes the state of Chiapas and surrounding areas of Veracruz, Oaxaca, and Tabasco. There are seven recognized physiographic regions within southeastern Mexico, two of which contain mountain ranges that attain elevations over 2500 m, with some peaks of the Sierra Madre approaching 4000 m. Southeastern Mexico also has 10 major vegetation formations that are found in either humid, semihumid, or subhumid environments. The great diversity of enfironmental parameters within southeastern Mexico, in addition to a long geologic history, has led to the development of a diverse herpetofauna. Currently, 304 species of amphibians and reptiles are known from the region (99 amphibians; 205 reptiles). I will present a slide program depicting selected species of the herpetofauna and their inclusive habitats.

ULTRAVIOLET-B RADIATION AND VITAMIN D IN CHAMELEON HUSBANDRY: AN EXPERIMENTAL STUDY

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There is growing interest in keeping Old World chameleons in captivity (e.g. pets, education, research, conservation), but the propagation of these chameleons for multiple generations in captivity has generally had poor success. The nutritional requirements of chameleons have not been previously determined, and nutritional imbalances have been implicated in this husbandry problem. Little scientific data exists on the effectiveness of the numerous dietary supplements and lamps available for herpetoculturalists. For instance, while it is known that ultraviolet-B radiation (UVB) promotes cutaneous biosynthesis of vitamin D_3 which regulates calcium metabolism, neither the relative importance of diet vs. UVB as sources of vitamin D nor the ability of UV lamps to replace natural sunlight as a UVB source have been previously verified. In collaboration with other investigators, I experimentally manipulated the dietary intake of vitamin D_3 and the UVB dose for captive, female panther chameleons, *Chamaeleo* (= *Furcifer*) *pardalis*, from hatching through one year of age. Various reproductive, developmental, pathological and behavioral variables were measured. The results indicate a statistically significant increase in the hatch success of eggs (2nd generation captives) from mothers who received a high UVB dose from either sunlamp (FS40) or sunlight. However, 100% success was not achieved and we hypothesize this was due to independent problems with vitamin A or mycotoxins. Neither high dietary vitamin D_3 nor low UVB treatments had significant hatch success. Surprisingly, there was little correlation between vitamin D treatments and other measures of development or pathology. I also demonstrate for the first time that animals can adjust their basking behavior and UVB dose in repsonse to their vitamin D status; panther chameleons with highter vitamin D requirements basked more. Additionally, the first blood profile report for the panther chameleon, and potential trends in various physiological indicators will be presented. Finally, I will provide recommendations for diet, lighting, and other aspects of chameleon and reptile husbandry.

TAXONOMIC RELATIONSHIPS BETWEEN *Trimorphodon biscutatus* COMPLEX MEMBERS NEAR THE ARIZONA-NEW MEXICO BORDER

TRAVIS J. LADUC

ALAN MABRY

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Gehlbach (1971) considered *Trimorphodon biscutatus vilkinsonii* a subspecies of *T. biscutatus* because eight male specimens from SE Arizona and SW New Mexico were thought to be taxonomically intermediate (= intergrades) between 15 male *T. b. lambda* examined from Arizona-Sonora, Mexico, and 16 male *T. b. vilkinsonii* inspected from Texas, USA-Chihuahua, Mexico. We examined, using the same taxonomic characters, a much larger sample size for both supposed subspecies than did Gehlbach (192 versus 39 specimens, respectively). Our data indicate that Gehlbach's zone of intergradation represents the end of a taxonomic cline (for several characters) within the *lambda* populations, leaving a sharp demarcation between the end of the *lambda* cline and the averages for the *vilkinsonii* populations in New Mexico, Texas, and Chihuahua, Mexico. Therefore, the subspecific relationships between both forms is questionable when based on the previous evaluation.

IGUANA REPRODUCTIVE EVALUATION AND THERAPY

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Cases of a reproductive nature are common in the veterinary field with the green iguana (*Iguana iguana*). This is a retrospective study of a random selection of seven hundred iguana exams performed in a private veterinary facility over a six year period. Twenty-percent of examinations were adult females undergoing ovarian activity at the time of presentation. Average age was 2.5 years (range 1-7 years). Radiographic evaluation with kodak casettes containing Lanex medium screens and 3M Ultra Detail No. 1416 rare-earth system film was used to differentiate between eggs and follicle production. Various treatments attempted include proper home care, calcium/oxytocin induction, and surgical ovariohysterectomy. Discussion is designed to guide the veterinarian statistically through which treatment options may be optimal under given situations.

HERPETOLOGY OF THE YUCATAN PENINSULA, MEXICO

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Approximately 180 species of amphibians and reptiles, representing 101 genera and 33 families, occur in the Yucatan Peninsula, defined as that area lying to the north and the northeast of alta Verapaz, Guatemala and the Meseta Central of Chiapas, Mexico, respectively. Several historical biogeographic patterns are apparent in the herpetofauna of the Yucatan Peninsula. In comparison with other Neotropical herpetofausans, that of the Yucatan Peninsula is depauperate. However, at the species level, the number of endemics is unusually high (ca. 14 percent), and endemic species are concentrated at the north end of the peninsula. This pattern is attributable to fluctuations in climate and vegetation during the Pleistocene. A second historical pattern involves discontinuous distributions of forest avoiding species within the peninsula. This pattern likely reflects the activities of the Pre-Columbian human inhabitants of the Yucatan Peninsula -- the Maya -- who are know to have transported some species, especially snakes and turtles, substantial distances. Of greater importance was habitat alteration due to deforestation by Classic Maya farmers. With much of the peninsula under cultivation, forest avoiding species would have been widely and perhaps continuously distributed. Subsequent to the collapse of Maya civilization, forest regeneration would have fragmented the distributions ofthese species, producing the pattern of disjunctions that we see today. Timing of this transition from agricultural to frest vegetation is uncertain. Some claim that it was directly associated with the Maya collapse in the ninth century AD. More recent interpretations suggest that it was approximately contemporaneous with the arrival of Europeans in the early 16th century.

RELATION OF VENOM COMPOSITION TO DIET AND POTENTIAL ACTIVITY PATTERNS

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Snake venoms are complex biological products consisting primarily of proteins. These proteins have a myriad of activities: some are specific toxins, such as ion channel blockers and myotoxins, and others are enzymes. Venoms vary extensively in overall composition, but several patterns are revealed. In general, crotalid and viperid venoms contain many hydrolytic enzymatic components and relatively few neurotoxic components, while elapid and hydrophiid venoms often have several neurotoxic components and relatively few enzymatic components; these compositional features often lead to dominant pharmacological symptoms upon envenomation but

do NOT label a venom as a "neurotoxin" or a "hemotoxin". In addition, overall venom compositional complexity is much greater in crotalid/viperid venoms, as revealed by SDS-PAGE and other electrophoretic techniques. Venoms are trophic adaptations which greatly facilitate prey handling and decrease handling time, and composition is generally correlated with specific features of diet and habitat use/activity patterns. Highly toxic venoms (low LD_{50}) are frequently associated with a greater dependency on ectothermic prey with high surface/volume ratios, and less toxic venoms correlate with a greater utilization of endothermic prey with lower surface/volume ratios. However, LD_{50} values alone obscure much of the complexity of venoms, since these two extreme venom types (high/low toxicity) are directly related to the mechanisms by which prey quiescence/death occurs. Crotalid/viperid venoms produce prey immobilization via disruption of numerous homeostatic mechanisms of prey, including blood pressure and clotting regulation and several hormone-mediated responses, while injection of elapid/hydrophiid venoms into prey results in rapid paralysis, often initally via blockade of the acetylcholine receptors of muscle endplate. Venoms with high general protease activities, typical of many crotalid/viperid venoms, likely expand potential foraging activity patterns. Digestion is temperature-dependent, and production of a venom rich in highly lytic components will aid digestion and thus allow for activity within a wider range of temperatures. *Crotalus cerastes* (sidewinders), most of the subspecies of the *Crotalus viridis* complex (and many other rattlesnakes), northern European *Vipera* and montane *Bothrops* (*sensu lato*) have activity/foraging patterns which are less temperature-dependent than many other non-venomous snakes, at least partly due to the production of lytic venoms. Elapids and hydrophiids, much more abundant in tropical and semi-tropical regions with less fluctuating daily temperatures, typically produce venoms which lack most proteolytic components but which are highly lethal. A lack of numerous venom components whcih promote predigestion may have limited the expansion of elapids into higher montane and temperate habitats. Convergence by rattlesnakes on typically elapid/hydrophiid patters and ontogenetic variation in composition in rattlesnake venoms will also be discussed.

TREATMENT OF METABOLIC BONE DISEASE IN GREEN IGUANAS (*Iguana iguana*) USING SYNTHETIC SALMON CALCITONIN

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An undersized juvenile green iguana (*Iguana iguana*) presented for anorexia and an inability to ambulate. The diet consisted of romaine lettuce and crickets dusted with a commercial vitamin supplement. The patient was depressed, in poor color, dehydrated and would tremor when provoked with a toe pinch. The body was dorso-ventrally flattened when compared to a normal age-matched juvenile. The scapulae were rotated medially and aligned horizontally instead of their normal vertical position. The limbs were visibly swollen and the long bones were palpably thickened. The mandible and maxilla were both maleable upon light digital pressure. Radiographs showed a generalized osteopenia, gas and a lack of ingesta in the gastrointestinal

tract and a periosteal proliferations with an increased porosity of the long bones. There was a lack of definable cortices anywhere in the boney skeleton. Based on the history and radiographic findings a diagnosis of NSHP was made. Therapy was initiated and aimed at stabilizing the patient. Antibiotics, vitamin and calcium supplements, fluids and tube feedings were administered. Synthetic salmon calcitonin at a dose of 50 I.U., i.m. twice per week for two weeks was given to stimulate osteogenesis. The patient was walking and eating within two weeks. Subsequent experience with calcitonin in over 50 clinical cases has led to a refined low of 50 I.U.kg once per week for a minimum of two weeks. These normal physiological actions of calcitonin can be beneficial to the treatment of NSHP. A synthetic form of calcitonin, called salmon calcitonis (SCT), is frequently used to treat osteoporosis, a metabolic bone disease in post-menopausal women. Calcitonin lowers circulating calcium and phosphate by inhibiting bone resorption. There is a decrease in osteoclast activity and number, as well as a stimulatory effect on osteoblast bone formation. The key factor when using this drug is the importance of assuring adequate blood calcium levels prior to and during calcitonin treatment. This case represents the adaptation of an established drug used in a common disease in human medicine, that has been applied to a related disease in an animal patient. Although favorable results were obtained here, further research is warranted in this promising treatment for this common condition.

THE POTENTIAL EFFECT OF COMMERCIALIZATION OF REPTILES FROM THE PENINSULA OF BAJA CALIFORNIA, MEXICO, AND ITS ASSOCIATED ISLANDS

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As a result of tectonic activity and ecological transformations, the peninsula of Baja California and its associated islands have many endemic species and subspecies of reptiles. These unique forms have attracted reptile hobbyists and commercial breeders for some time now, and at least 20 species and subspecies have been recorded for sale in the U.S. pet market. Prices range between $100 each and $975 pair. In addition to being based on illegally collected animals (according to the Mexican Wildlife Law), this activity has several real or potential effects. These include habitat destruction by overturning of rocks, prying or breaking open fissures and rock-cracks, and removing large exfoliations and rock caps from granite builders. Overcollection is a risk since many species of interest have restricted ranges and populations and live in a highly fluctuating environment. Although it is often argued that captive breeding is beneficial to species, this seems not to be the case with Baja California reptiles. Most species probably do not need a captive breeding program to maintain their population viability. Further, the offspring of captive breeding would be of little conservation value, as they are usually derived from reduced parental stock or have been selectively crossbred. At this point, few reptiles of Baja California and its islands are threatened with extinction due to commercial capture, now is the appropriate time to begin thinking about conservation efforts.

NESTING BEHAVIOR OF THE BRAZILIAN SLIDER TURTLE (*Trachemys dorbignyi*) IN CAPTIVITY, WITH COMMENTS ON BEHAVIORAL ENRICHMENT

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Trachemys dorbignyi occurs in southern Brazil, Uraguay, and northeastern Argentina, being the only member of the *Chrysemys* complex found in Brazil. Little is known about its reproductive biology and behavior, and its natural populations are subjected to negative human impacts, including the intense and illegal Brazilian pet trade. Since studies of turtle behavior in nature are difficult, studies in captivity are considered critical. Unfortunately, almost no effort is being directed to turtle conservation and research in Brazilian zoos. We started a captive breeding program for *T. dorbignyi* at Sao Paulo Zoo in 1985 aiming to better understand its biology and behavior, to start a large scale breeding, and to develop management techniques that could be applied to the breeding of endangered or rare species that could be used in other Brazilian zoos. In this talk, I will discuss some aspects of *T. dorbignyi* nesting behavior. After the adults' outdoor enclosure was remodeled with the simulation of different natural environments, females were able to select the proper nest site and improve their behavioral performance. Also, this was useful in diminishing the breakage of eggs and in allowing us to better understand nest site selection by females of this species plus two other Brazilian species (*Phrynops geoffroanus* and *Geochelone carbonaria*) sharing the same enclosure. Nesting occurs from August to January in *T. dorbignyi*, and females show a strong preference for nesting in sandy areas devoid of vegetation. Nesting behavior is divided into five phases that I will describe. Clutch size ranges from 1-18 eggs. Some females deposit two clutches in the same year.

REPRODUCTION AND MANAGEMENT OF THE GEOFFROY'S SIDENECK TURTLE (*Phrynops geoffroanus*) AT SAO PAULO ZOO

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The biology of South American turtles is still poorly know. *Phrynops* is the least known chelid genera, and is regarded as threatened in Brazil. Almost nothing is known on the ecology and natural history of *P. geoffroanus*. Its natural populations are subjected to negative human impact. This specie is found from Colombia to southern Brazil. As the study of turtle behavior in nature is difficult, studies in captivity are considered critical. Unfortunately, almost no effort is being directed to turtle conservation and research in Brazilian zoos. In 1985, we started a captive

breeding program for *P. geoffroanus* at Sao Paulo Zoo with the following objectives: (i) to study its biology and behavior (ii) to start large scale breeding; (iii) to develop management techniques that could be applied to the maintenance and breeding of related endangered species; and (iv) to develop management techniques that also could be used in other Brazilian zoos. In this presentation I will discuss some aspects of the reproductive biology of *P. geoffroanus*. Mating occurs from October to April. Nesting is from March to November, and females deposit 7-26 eggs per clutch. Relative clutch mass varies from 8.23% - 11.92%. There is a positive correlation between certain measures of females and clutch size, as well as mean egg width, mass, and volume. Incubation time varies from 149-331 days, and there is a negative correlation between these values and the nesting dates. There is a positive correlation between certain measures of hatchlings and mean width, mass, and volume of eggs. The neonates undergo ontogeny related to morphology and color pattern. It shows sexual size dimorphisms: females are larger in shell measures, head width, and body mass, but males have longer tails. It is estimated that males attain sexual maturity in 3-4 years of age and females between 6-8 years.

SERI INDIAN ETHNOHERPETOLOGY: MULTIPLYING MEANS OF PASSING ON FOLK BIOLOGICAL KNOWLEDGE FOR FUTURE GENERATIONS

GARY PAUL NABHAN

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The Seri Indians or Kunkaak are dwellers of the Sea of Cortez coast who have detailed knowledge of both marine and terrestrial herpetofauna, which includes several endemics in their homelands. This knowledge is not confined to species formerly used as food - such as sea turtles and chuckwallas - but extends to non-utilitarian species as well. Although we have routinely collected detailed ethnotaxonomies from Seri elders, we have also documented their knowledge of animal behavior, habitat preferences, biogeography and morphology/anatomy. In particular, we have documented which traits the Seri elders use to distinguish one species from another, and the extent to which this knowledge is shared among their communities as a whole. Like many cultural communities of indigenous hunter-gatherers around the world, coastal villages of the Seri have undergone dramatic environmental and socioeconomic change within this last century. The frequence with which some Seri encounter certain reptiles is diminishing, due to overhunting by outsiders, habitat destruction, altered economic activities, and changed patters of youth education. The Seri have expressed concern that younger generations are not being sufficiently exposed to the native animals, nor to traditional knowledge about them, and have requested help in preparing educational materials for their schools. In addition, they have requested training in desert tortoise monitering and habitat monitoring to aid them in their management of Tiburon Island, a Mexican

National Biosphere Reserve. Opportunities exist for a reciprocal exchange between Seri "folk herpetologists" and visiting herpetologists trained in Western science.

IS PRIVATE-SECTOR CAPTIVE BREEDING OF REPTILES AND AMPHIBIANS CONSERVATION? AN INTRODUCTION TO ISIS, STUDBOOKS, AND THE FUTURE POTENTIAL FOR INFORMATION EXCHANGE

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To what extent can private-sector breeding of reptiles and amphibians be equated with species conservation? The answer seems to depend upon record keeping and information exchange. ISIS (International Species Information System) is a non-profit zoological organization with 461 member institutions in 53 countries. ISIS produces software (ARKS, SPARKS & MEDARKS) which is used by member institutions to record specimen information, and maintains a central database (ISIS 3) with information on over 858,000 specimens (220,000 living). A studbook is a database containing the known history of a captive population. In order to be useful for demographic analysis and captive management; a studbook must record births, deaths, relationships, and information on all holding facilities. There are currently approximately 650 global or regional studbooks for approximately 500 species bred in captivity in zoological institutions. for species kept in zoological institutions without a regional or global studbook, the ISIS central database is the default studbook. Recently ISIS has been approached by avicultural organizations regarding the feasibility of using ISIS software to maintain studbooks on privately bred captive birds, and incorporating data from their member private breeders into the central ISIS database. I will summarize these experiments and propose founding a herpetocultural organization devoted to maintaining studbooks on taxa privately-bred.

PRINCIPLES AND TECHNIQUES OF EMERGENCY FIRST AIT IN REPTILES FOR THE NON-VETERINARIAN: TRAUMA AND PROLASES

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Emergency situations, by definition, require immediate action to increase the likelihood of survival and optimize healing. I will discuss two common emergency scenarios--trauma and prolapses--and suggest basic first aid for initial management. The unique anatomical,

physiological, and species-specific characteristics of reptiles require modifications of techniques founded in mammalian medicine. I will cover basic principles of first aid as applied to reptile traumas including controlling hemorrhage, and decreasing and minimizing wound contamination. Optimal transport and housing until further treatment is available will also be addressed. Specific techniques involving wound types, bandaging options, and examples of selected cases will be covered. Cloacal prolapses are a relatively common but serious condition occurring in reptiles. Prolapses most often occur secondary to a variety of medical conditions. Straining due to mechanical blockage of the gastrointestinal or urogenital tract, or hypermotility of muscular tone of these same systems also can result in prolapse. Diagnosis and treatment of the underlying cause of the prolapse must be achieved for long term successful management of a prolapse. specific techniques of prolapse care and optimal management prior to replacement will be illustrated.

AMPHIBIANS AND REPTILES OF THE ALAMOS, SONORA, AREA

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Research Ecologist

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The southeastern corner of the state of Sonora, Mexico, is an extremely diverse area biologically. Forty-five percent of the amphibian and reptile species that occur in the entire state can be found in the Sierra Alamos, a small mountain range between the Rio Mayo tothe north and the Rio Cuchujaqui to the south and east comprising only 14% of the area of Sonora, about 2750 km^2. A primary reason for this high diversity is the overlap here of many species of tropical affinities that reach their northernmost limits in the area iwth species of more temperate, arid affinities that occur near their southern range boundaries. Biotic communities range from riparian evergreen forest and woodland along the rivers, up through thornscrub, tropical deciduous forest, and evergreen oak woodland, into pine-oak woodland near the top. I will discuss the distributions and biogeography of the terrestrial vertebrates of the area, with comments on the ecology and natural history of the herpetofauna and the beliefs of the local people regarding those animals. I will address conservation issues affecting the biota in that and other areas in northwestern Mexico.

BIOLOGY AND CONSERVATION OF THE DESERT TORTOISE (*Gopherus agassizii*)

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The desert tortoise ranges from southern Nevada and southwestern Utah, south through southeastern California and western and southern parts of Arizona, through Sonora, into northern Sinaloa, Mexico. It is found from sea level to 1615 m elevation (ASL), occurring primarily in desert scrub and thorn scrub habitats, but extending in places into semi-desert grassland, interior chapparral, tropical deciduous forest, and the lower edge of evergreen oak woodland. The desert tortoise varies genetically, morphologically and ecologically across its range to such an extent that some investigators suggest that designation of several species may be warranted. In 1990 the Mojave "population" (all tortoises north and west of the Colorado River) were listed as threatened by the U.S. Fish and Wildlife Service. Primary reasons for this listing included loss and degradation of habitat, collection for pets or other purposes, elevated levels of predation, mortality from disease, and the inadequacy of existing regulatory mechanisms to protect desert tortoises and their habitats. I will present recent research on ecology and life history of the desert tortoise and discuss conservation measures needed throughout its range.

ECOLOGICAL ASPECTS AND CAPTIVE MANAGEMENT OF TWO URBAN RATTLESNAKES (*Crotalus mitchelli pyrrhus* and *Crotalus tigris*)

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Animal Caretaker

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The southwestern speckled rattlesnake (*Crotalus mitchelli pyrrhus*) and tiger rattlesnake (*C. tigris*) are saxicolus crotalines occurring sympatrically and syntopically in the Phoenix Mountains, Phoenix, Arizona. The Phoenix Mountain Preserve encompasses a rugged and relatively pristine series of fragmented Sonoran Desert mountain islands amidst the urban sprawl of metropolitan Phoenix. Multiple observations of various growth stages of both species suggest good recruitment and the sustained viability of these isolated populations within a densely populated urban setting. I will discuss aspects of the ecology of these seemingly similar rattlesnakes in the Phoenix mountains. Additionally, both species have been maintained in captivity at the Phoenix Zoo for over two decades, *C. m. pyrrhus* having been bred to multiple generations. Also, I will discuss observations on the reproductive biology and captive management.

NATURAL HISTORY OF THE GREEN TREE PYTHON

KARL H. SWITAK
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The genus *Chondropython* has recently been done away with and combined with *Morelia*. But due to the continued restructuring of the nomenclature by taxonomists I shall contine to use *Chondropython* until this re-naming syndrome has stabilized itself. The green tree python, *C. viridis*, is one of the most beautiful serpents. It occurs on the island of New Guinea, both the Papuan and Irian Jaya sides, plus some of the outlying islets. It is not found on New Ireland nor New Britain. An isolated colony is found in the northeast of Australia's Cape York Peninsula, Queensland. Adults reach a maximum length in excess of five feet, but captivity has produced obese specimen near the seven foot mark. It is a rather slender python, arboreal in habit, and it does venture to the ground in search of food. I have never see one on the move during the day, only at night. It is found from sea level to an elevation of at least 5,400 feet. Those found near or at sea level experience much warmer temperatures, while those from a montane habitat are subjected to dense fog, often chilling rain, and temperatures as low as 55 degrees Fahrenheit. Subtract from this the wind-chill factor and you are looking at a low of even less than 50 F. Adults are various shades of green, with either a white, cream or even yellow abdomen. There are white dots dorsally and/or white blotches and white striations arranged in no predictable fashion. The young, in contrast, hatch either lemon yellow or a dark brown; some almost reddish brown. I do not know of a single neonate that was green. The color transformation from young to adult varies greatly. Some individuals remain yellow into the adult stage, others change to green in as early as 5-6 months. There is no set pattern to this, only a continued variance. Some of the adults have been known to turn sky blue in captivity, and some have been collected in the wild depicting this striking coloration. But no blue juveniles have ever turned up, nor are they likely to do so. In this respect I am left with a dream. One day in the future I would like to witness an emerald green python, neatly coiled around her clutch of pearly white eggs, overseeing the hatching of her lemon yellow, reddish brown, and sky blue neonates. After that the devil can take tomorrow. However, such a dream borders on the realm of improbability, but on the other hand, I would not go as far as calling it impossible either.

HISTORICAL BIOGEOGRAPHY OF THE CHIHUAHUAN DESERT AND THE EVOLUTION OF THE GRAYBANDED KINGSNAKE (*Lampropeltis mexicana*)

THOMAS R. VAN DEVENDER, Ph.D.
Research Scientist

Arizona-Sonora Desert Museum, 2021 N. Kinney Rd., Tucson, Arizona 85743, USA.

In the early Tertiary, broadleaf evergreen and tropical forests were widespread across the continent. The uplifts of the Sierra Madres Oriental and Occidental in Mexico and the Rocky Mountains from the late Oligocene to the middle Miocene formed the Mexican Plateau,

leucostomum fills the space of *Sternotherus minor* or *S. carinatus*, and *K. acutum* occupies the place of *Sternotherus odoratus*. *Claudius* does not appear to have a niche equivalent in the US; perhaps it is occupying the space of young *Chelydra* and for this reason their populations are never dense in the tropics with two different species competing for their space and resources. Despite the diversity of species of turtles and diversity of habitats still available, all species of freshwater turtles in Neotropical Mexico are threatened with extirpation. It is on a grim not that fter 15 years studying turltes in Mexico I realize that my studies will be the history of turtle population ecology in Mexico not just their natural history.

NATURALISTIC VIVARIUM DESIGN

PHILIPPE DE VOSJOLI
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The third wave of herpetoculture focuses on naturalistic vivarium design and places emphasis on the relationships between animal, captive environment, and human observer. This is an eco-approach to keeping amphibians and reptiles. Animals and their natural environments form structural couplings, and to omit them in captivity prevents animals from expressing a normal range of behaviors, and, further, conveys false information which gives inaccurate impressions of the mental and "evolutionary depth" of these animals. From an educational point-of-view, the labor- and time-effective systems that were developed during the second wave of herpetoculture (captive-breeding) have taken amphibians and reptiles out of their normal context and conveyed a message that these animals are living commodities. I will present a brief overview of naturalistic vivarium design with an emphasis on basic criteria, landscaping principles, and the design and control of environmental variables, such as relative humidity and ventilation. In the near future, a revolution in herpetoculture will affect the way we keep amphibians and reptiles, and this impact will be comparable to that of the mini-reef systems in the saltwater aquarium industry.

NONINFECTIOUS PROBLEMS OF CAPTIVE AMPHIBIANS

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Captive amphibians are subject to a variety of medical problems that are not associated with infectious disease agents such as viruses, bacteria, protozoa, and helminths. Traumatic injuries are often associated with husbandry. Abrasions and lacerations may require antibiotic therapy

to prevent infection. Extensive lacerations may require closure with tissue glue (Nexaband^R), or in an emergency, a commercial methacrylate adhesive can be substituted (Superglue^R). Morbidity and mortality may be associated with toxi compounds in the environment. Iodine-containing products should not be used to disinfect cage items as plastic and organics may absorb the iodine and then release it into the enclosure. Chlorine and chloramine levels in tap water may prove irritating or toxic to many species of amphibians. Other common pollutants include ammonia and nitrites (as a result of insufficient biological filtration), heavy metals, tobacco smoke, and PVC glues. Common signs of poisoning include but are not limited to excitement, lethargy, hyperemia, excess slime production, dyspnea, and skin discoloration. Therapy should include immediate removal of the toxin and administration of specific antidotes if available. Artificial slime (Poly-Aqua^R) may soothe irritated skin. Metabolic bone disease may result from inappropriate levels of calcium, phosphorous, vitamin D. Excessive levels of vitamin A in prey items, such as domestic mice, may prevent uptake of vitamin D and promote development of metabolic bone disease in the face of an otherwise adequate diet. Common signs of metabolic bone disease in anurans include mandibular deformities, scoliosis, long bone deformities, pathologic fractures, and abdominal bloating. Therapy should include calcium globionate (Neocalglucon^R) at a dosage of 1 ml/kg PO SID x 28 days. The cause of corneal lipidosis is poorly understood but may be a result of ingesting inappropriate diets. The nutritional analysis of invertebrates and vertebrates is significantly different when comparing fats, fatty acids, and amino acids, and certain species of amphibians may lack the metabolic pathways to properly assimilate "foreign" nutrients. This may result in the deposition of cholesterol in inappropriate tissues, such as the cornea. Treatment has been unrewarding at present. Abdominal bloating or wasting may be the result of internal tumors. Ovarian, hepatic, and renal adenocarcinomas are the more common malignancies detected. Surgery has been used to treat benign tumors, such as papillomas and fibromas.