

**Welcome to the
26th Meeting of the
International Herpetological Symposium**



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4054 Victoria Ct.
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**INTERNATIONAL HERPETOLOGICAL SYMPOSIUM
26TH ANNUAL MEETING**

PROGRAM

Thursday, July 18th

5:00 - 8:00 p.m. Registration – Sheraton West Port Hotel
7:00 p.m. - ? Ice Breaker – Hospitality Room

Friday, July 19th

8:30 a.m. - 3:30 p.m. Open Registration – Sheraton West Port Hotel

9:00 - 9:15 a.m. Open Remarks and Introductions

9:15 - 10:00 a.m. **Dr. Charles Daugherty**
“The Fall and Rise of New Zealand Herpetofauna”

10:00 - 10:45 a.m. **Dr. Nicola Nelson**
“Temperature-dependent Sex Determination in Natural
Nests of Tuatara”

10:45 - 11:00 a.m. *Morning Break*

11:00 - 11:45 a.m. **Dr. Jonathon Losos**
“Diversity and Natural History of Caribbean Anolis
Lizards”

11:45 a.m. - 12:30 p.m. **Jon Coote**
“Lies, Damned Lies and Statistics the Global Fight for the
Reptile Industry”

12:30 - 2:00 p.m. *Lunch Break*

2:00 - 2:45 p.m. **Mark Mitchell, D.V.M.**
“Arboviruses and the Reptile”

2:45 - 3:30 p.m. **Dan Wentz, D.V.M.**
“Adenovirus in Bearded Dragons an Emerging Threat”

3:30 – 3:45 p.m. *Afternoon Break*

3:45 – 4:30 p.m. **Charles Painter**
“A Review of the Commercial Trade in the Western
Diamondback Rattlesnake, *Crotalus atrox*. Are
Rattlesnake Roundups as Bad as you Think – or Worse?”

4:30 – 5:30 p.m. **WORKSHOPS**

Open Forum “Ask The Vets”
Drs. Boyer, Mitchell and Wentz

“ The Vipers a Pictorial Review”
John H. Tashjian

Saturday, July 20th

9:00 a.m. - 3:30 p.m. Open Registration – Sheraton West Port Hotel

9:00 - 9:15 a.m. Remarks and Announcements

9:15 - 10:00 a.m. **Dr. Robert Aldridge**
“The Reproductive Cycle and Estrus in Colubrid Snakes of
Temperate North America”

10:00 - 10:45 a.m. **Dr. Robert Powell**
“West Indian Lizards: Ecological Release, Melanism and
Systematic Problems”

10:45 - 11:00 a.m. *Morning Break*

11:00 - 11:45 a.m. **Vicky Poole**
“Proyecto Rana Dorado/Project Golden Toad”

11:45 a.m. - 12:30 p.m. **Patrick Nabors**
“The Strawberry Poison Dart Frog, *Dendrobates pumilio*:
Observations on Care and Reproduction in Captivity”

12:30 - 2:00 p.m. *Lunch Break*

2:00 - 2:45 p.m. **Thomas Boyer, D.V.M.**
“Paramyxovirus and Herpes Virus”

2:45 - 3:30 p.m. **Mark Mitchell, D.V.M.**
“Epidemiology of *Salmonella* at a commercial green iguana
(*Iguana iguana*) farm in El Salvador”

3:30 - 3:45 p.m. *Afternoon Break*

- 3:45 - 4:30 p.m. **John Brueggen**
 “Crocodilians: Fact vs. Fiction”
- 5:30 p.m. Shuttle Buses leave for **Field Trip to St. Louis Zoo
 and Hosted Dinner at the River Camp**
- 8:00-10:00 p.m. **St Louis Zoo Reptile Department Open House**
- 10:00 p.m. Shuttle Buses Return to Hotel

Sunday, July 21st

- 9:00 a.m. - 12:00 p.m. Open Registration
- 9:00 - 9:15 a.m. Remarks and Announcemen
- 9:15 - 10:00 a.m. **John Hollister**
 “The Trans-Pecos Region of Texas from a Herper’s
 Perspective”
- 10:00 -10:45 a.m. **Alan Kardon**
 “The Quest for Arboreal Alligator Lizards and Lance-
 headed Rattlesnakes”
- 10:45 – 11:00 a.m. *Morning Break*
- 11:00 – 11:45 a.m. **Dr. David Lazcano**
 “Rattlesnakes and Vegetation, Their Distribution in the
 State of Nuevo Leon, Mexico”
- 11:45 a.m. – 12:30 p.m. **Adam Marfisi**
 “Management of Venomous Reptiles at the St. Louis Zoo”
- 12:30 – 2:00 p.m. *Lunch Break*
- 2:00 – 2:45 p.m. **Jon Coote** (presenting for Alan Botterman)
 “The Pet Industry and Herpetoculture”
- 2:45 – 3:30 p.m. **Norman Haskell**
 “The Many Uses of Plastic in Herpetoculture”
- 3:30 – 3:45 p.m. *Afternoon Break*
- 3:45 – 4:30 p.m. **Richard Mastenbroek**
 “Captive Husbandry and Propagation of Elapid Snakes”

4:30 – 5:30 p.m.

John Tashjian
“Herp Mystery Quiz”

6:30 p.m. - ?

Banquet Dinner – Sheraton West Port Hotel

Banquet Speaker – **William W. Lamar**
“Fangs for the Memories: Working with Pitvipers in the Americas”

Presentation of the Joseph Laszlo Memorial Award

Closing Remarks

Auction
(Proceeds benefit next year’s IHS!)

Abstracts

DR. ROBERT D. ALDRIDGE, AND ANGELO P. BUFALINO

Department of Biology, Saint Louis University, St. Louis MO 63103 USA

Tel:(314) 977-3916, Fax:(314) 977-3658, E-mail: aldridge@slu.edu, bufalino@slu.edu.

The Reproductive Cycle and Estrus in Colubrid Snakes of Temperate North America

Snakes in the family Colubridae are diverse and widespread. In temperate North America, the reproductive cycle of both sexes is conserved. Females begin vitellogenesis in the spring and ovulate in late spring. In both oviparous or viviparous species, the young are hatched/born in the summer. In males, spermatogenesis occurs in the summer and sperm are stored in the vas deferens. Estrus, the period of time when females are sexually attractive and receptive, occurs in the summer/fall in some species and in the spring in all species. The age of the sperm at fertilization is identical in both mating patterns. The difference is where the sperm is stored during the winter; in the oviduct in summer/fall breeding snakes and in the vas deferens in spring breeding snakes. The sexual segment of the kidney, a secretory structure which contributes to the ejaculate, is hypertrophied during the mating season. Elevated plasma testosterone levels coincide with the mating seasons. The terms post-nuptial spermatogenesis and dissociated reproductive cycle are synonymous and refer to species which have summer spermatogenesis and spring fertilization. The terms are independent of the mating season. Pre-nuptial spermatogenesis is synonymous with associated reproductive cycle and describes species in which spermatogenesis immediately precedes fertilization, a pattern not described for any North American colubrid.

ALAN BOTTERMAN

President T-Rex, Corporate Office: 1124 Bay Blvd. Suite A, Chula Vista, CA 91911

Tel:(619) 424-1050, Fax:(619) 424-1051, E-mail: alan@t-rexproducts.com

The Pet Industry and Herpetoculture

In the early 1990's, reptiles became very popular in the pet sector. Many pet shops jumped at the opportunity to increase their sales, even if they had no prior experience or knowledge of reptiles. On the rare occasion that a pet shop had trained staff and a legitimate reptile section in their store, there just weren't the products available on the market to support this fast-growing category.

In fact, in 1993, approximately 1,000,000 iguanas were imported for the pet trade into the United States alone; and there wasn't even a prepared diet for iguanas available on the market for pet shops to sell. With this obvious market demand facing the pet shops, as well as the lack of support products for a reptile hobbyist to succeed, I started T-Rex Products. I wasn't the only entrepreneur who recognized the potential market. By 1997, 15 companies produced an iguana diet for the pet trade. The pet industry had never seen such an explosion in a category before the reptile proliferation. At its peak in 1996, the frenzy for reptile products produced hundreds of companies worldwide who manufactured, re-packed, or somehow marketed products for reptiles to the pet trade.

Today, the pendulum has swung back toward the center line. There are a few core companies who have remained committed to the reptile market. With the market stabilized at approximately 3,000,000 households owning reptiles, it proves to be a very competitive category amongst the pet trade manufacturers.

It is in my opinion however, that the so-called fad of keeping reptiles for pets has not pinnacled, but is experiencing a tremendous bottleneck in the availability of quality livestock. It is my contention, that with the development of the captive breeding of appropriate pet trade reptiles, we could be on the verge of another growth spurt in the reptile pet industry.

T-Rex is actively supporting the efforts of captive breeders to supply quality reptiles to pet shops. This strategy will ensure a sustainable reptile market for the pet industry.

THOMAS H. BOYER, D.V.M.

Pet Hospital of Penasquitos, 9888-F Carmel Mountain Road, San Diego, CA 92129

Tel: (858) 484-3490, Fax: (858) 484-3499

Paramyxovirus and Herpes Virus

Two major viral diseases of reptiles are paramyxovirus and herpes virus. Paramyxovirus was originally thought to be a viperid disease, but is now known to infect elapids, colubrids, boids, and even some lizards. Paramyxovirus should be suspected in any large die-offs of snakes, outbreaks are more common in the first half of the year. Mortality usually peaks one month following the initial deaths, then declines over the next two to three months. Paramyxovirus primarily affects the lungs, liver and pancreas. Aerosol transmission is thought to be responsible for the large number of cases within a collection; virus may persist in water and be shed in feces (thus fomites may also be involved in transmission). Histopathology with experienced pathologists will often yield a diagnosis. Hemagglutination inhibition titers (through the University of Florida) are useful in screening for paramyxovirus during three to six months quarantine. No new snakes should be introduced in an active outbreak until two months after the last death. Clinically affected snakes should be isolated and air movement minimized.

Herpes virus is a relatively new contagious virus primarily affecting tortoises. The actual chelonian host spectrum remains unknown. Clinical signs can be confused with mycoplasmosis in that rhinitis and nasal discharge are often present. However, herpes virus typically causes necrotizing stomatitis, glossitis, and paryngitis. Small whitish plaques develop at the back of the mouth and quickly coalesce. Herpes virus attacks epithelial cells in the oral cavity, lower respiratory tract, liver, kidney and brain. Untreated animals often die, antiviral drugs, such as acyclovir, as well as antibiotics, may save some patients. Direct transmission between tortoises likely allows spread; environmental contamination is also possible. Diagnosis is via histopathology and/or serologic testing (University of Florida). Outbreaks are much more common in Europe than the United States, we must be vigilant to prevent herpes virus from becoming common in the U.S.. Dilute bleach is an effective disinfectant for both viruses.

JOHN BRUEGGEN

General Curator, St. Augustine Alligator Farm,

999 Anastasia Blvd. St. Augustine, FL32080

Tel: 904-824-3337 ext. 37, Fax: 904-829-6677 E-mail: Jbrueggen1@aol.com

Crocodylians: Fact vs. Fiction

This is a discussion of crocodylian behaviors witnessed at the St. Augustine Alligator Farm. There are four specific topics within the talk: Crocodylians have the ability to swallow prey underwater, crocodylians may eat more vegetable material than we are willing to admit (video), Siamese crocodiles as parents, and crocodylians feeding their young? (video).

Crocodylians have the ability to swallow prey under water: We have witnessed both *Crocodylus johnsoni* and *Tomistoma schlegelii* swallowing their food without coming to the surface.

Crocodylians eating their vegetables: It is possible that biologists have been assuming too much when doing stomach content surveys on crocodylians. We have compelling evidence that alligators, at least, seek out vegetation in their diet.

Siamese Crocodiles as parents: A two-year account of a pair of *Crocodylus siamensis* raising young on exhibit at the St. Augustine Alligator Farm.

Crocodylians feeding their young?: Video of *Crocodylus siamensis* allowing her young to feed from a piece of meat in her mouth.

JOHN COOTE

Director of Research T-Rex, Units 1 & 2 Belton Road West, Loughborough Leicestershire
England LE11 0TR Tel: 1509-610-310, Fax: 1509-610-304
E-mail: Jgcoote@aol.com

Lies, Damned Lies and Statistics, the Global Fight for the Reptile Industry

Recent statistically based reports from animal rights groups masquerading as animal welfare groups, both in the USA and Europe, call for a ban on reptiles in captivity. These reports have deliberately hijacked and mixed conservation, trade and wildlife management issues with animal welfare philosophy to both misinform, and gain credibility, with naïve legislators and the general public. These groups prey upon the public, and governments, general ignorance about reptiles, conservation, and trade, to gain support for their misguided goals. The realization that sustainable use can be a powerful conservation tool is being buried by biased misinformation posing as facts. Also ignored is the principle concern for wildlife, namely habitat loss due to development, unless it can be blamed on collectors. The considerable advances made in information, education, and the captive care and reproduction of reptiles are generally ignored, unless they can be twisted into negative welfare concerns. Any increase in the positive perception of reptiles by the general public is being systematically undermined. Proposals by these groups to adopt a policy of releasing captive reptiles back into the wild do not take account of the serious consequences of introducing pathogens, gene pool pollution and unknown ecological interactions. These groups are seemingly unaccountable for the misinformation that they publish or feed to the media. The reality of the reptile trade is a far cry from the sordid picture painted by them. Herpetoculture is facing its darkest hour. These reports, and associated unwarranted media exposure, give completely unbalanced views that are not supported by scientific fact. The challenge for us all is to make the general public and politicians aware of the true situation if we are to ensure a future both for ourselves, and those who would follow us.

DR. CHARLES H. DAUGHERTY, Professor of Ecology

DR. NICOLA J. NELSON, San Diego Zoo Millennium Post-doctoral Fellow

School of Biological Sciences, Victoria University of Wellington

P.O. Box 600, Wellington, New Zealand

Ph: (64-4) 463-5339; fax: (64-4) 463-5331

Charles.Daugherty@vuw.ac.nz Nicola.Nelson@vuw.ac.nz

The Fall and Rise of the New Zealand Herpetofauna

Pre-human New Zealand abounded with tuatara, lizards, primitive frogs, and giant flightless birds and insects. After New Zealand separated from Gondwana late in the Cretaceous, a highly distinctive and largely endemic fauna evolved in the absence of two types of terrestrial predators that shaped biotas elsewhere: mammals and snakes.

The arrival of humans with dogs and the Pacific rat about 1800 years ago ended 80 million years of evolutionary isolation and initiated an ecological catastrophe that was amplified by European colonisation in the nineteenth century, with many further introductions of mammalian predators. The consequences included extinction for many large indigenous species and range reductions for others. About 30% of lizard species, 50% of frogs, and all tuatara survive only on mammal-free offshore islands, many of which are small and vulnerable to rat invasion.

First efforts to protect the herpetofauna were mainly legislative and of limited effectiveness, but increasingly interventionist approaches in the past two decades offer new hope of turning the tide in favor of many threatened species. Mammal eradications, sometimes combined with captive propagation to bulk up numbers, have allowed establishment of new populations of rare species. A major landmark will be the re-colonisation of the mainland by tuatara when they are introduced to a secure mammal-free reserve adjacent to Wellington city in the near future.

NORMAN HASKELL

Senior Herpetarium Keeper, St. Louis Zoological Park: St.Louis, Mo. 63110

Tel: (314) 781-0900, E-mail: nhnaja@swbell.net

The Many Uses of Plastic in Herpetolculture

The term, "Plastics", refers to an organic polymeric material consisting of giant organic molecules which can be formed into various shapes through extrusion, spinning, casting or molding. The molecular composition is either natural,(wax, cellulose, and natural rubber), or,synthetic,(polyethylene and nylon). The base materials consists of resins which are in the form of pellets,powders,or solutions and are used to form the finished products. Plastics were first developed in the mid 1800's. Since then plastics have improved in quality and variety and are now used in almost every household the world over. The herpetological community has embraced the science of plastics and has made it their own. What I propose to show, is how plastics have been altered and adapted for use by the herpetological community. I will begin with the demonstration of an aquarium rack that I developed several years ago for use with our *Peltophryne lemur* & *Bufo baxteri* SSP projects. I will next show some of the other uses that I have found for plumbing PVC. We are all familiar with the many plastic household items that occur in all of our homes. I will try to show how we, (the herp community), have altered these to fit our special needs. I will then show some of the commercially produced plastic products that were developed specifically for our interests. I will finish by showing some products modifications that were made to common items for various reasons such as safety, easy accessibility and practicality. Not all ideas are original, but may be found to be quite useful to those who have never seen them used before.

JOHN HOLLISTER

1781 N. 10th Abilene, Texas 79603

Phone (915) 677-5141

The Trans-Pecos Region of Texas from a Herper's Perspective.

John Hollister first crossed the Pecos River in 1972 and fell in love with the area. He has since spent at least part of every year touring the area and looking for its herps. He has driven over 500,000 miles in the area and has many photographs of the area and its animals.

This tour will cover five counties of west Texas - an area of approximately 12,400 square miles. It is primarily Chihuahuan Desert scrub brush with elevations from under 1,000 feet to over 7,000 feet. It has a wealth of reptile and amphibian species. The talk will include pictures of the habitats in the five counties, but will concentrate on the reptile life, including variations across the range of the talk. Mr. Hollister is a life-long amateur naturalist who, for the last thirty-five years, has concentrated on reptiles.

ALAN KARDON

Curator, Reptile/Amphibian/Aquarium, San Antonio Zoo

3903 N. St. Mary's Street, San Antonio, Texas 78212

ph: (210) 734-7184 x112, fax: (210) 734-7291 E-mail: reptiles@sazoo-aq.org

The Quest For Arboreal Alligator Lizards And Lance-Headed Rattlesnakes

San Antonio Zoo's herpetological staff began traveling and conducting fieldwork in Mexico in 1978. Mexico has one of the richest assemblages of herpetofauna in the world with 1000 ± species of reptiles and amphibians. The year, 1982, marked the beginning of a continuing collaboration between the San Antonio Zoo and the Universidad Autonoma de Nuevo Leon.

Husbandry and reproduction of endemic Mexican herpetofauna have become primary foci of the San Antonio Zoo's herpetological department. The San Antonio Zoo was granted a Mexican scientific collecting permit for the year 2001. Targeted species included plethodontid

salamanders, anguid, phrynosomatid, helodermatid, xantusid, and xenosaurid lizards, as well as select colubrid and viperid snakes.

This presentation will focus on the natural history, husbandry, and captive reproduction of three species of arboreal alligator lizards: *Abronia graminea*, *Abronia mixteca*, *Abronia taeniata*, and the lance-headed rattlesnake, *Crotalus polystictus*.

DR. DAVID LAZCANO AND ANTONIO MORENO

Universidad Autonoma de Nuevo Leon,

Facultad de Ciencias Biologicas, Laboratorio de Herpetologia,

Apartado Postal – 513, San Nicolas de los Garza, Nuevo Leon, C.P.66450 Mexico

ph:(81) 8376-2875, lab:(81) 8332 – 2889 E-mail: dvlazcano@hotmail.com

Rattlesnakes and Vegetation, Their Distribution in the State of Nuevo Leon, Mexico

Even though the state of Nuevo Leon, located in the northeast corner of Mexico possesses only 5 species of rattlesnakes: *Crotalus atrox*, *C. lepidus* (*lepidus* and *morulus*), *C. molossus* (*molossus* and *nigrescens*), *Crotalus scutulatus*, and *Crotalus pricei miquihuanus* of the 29 or more species of rattlesnakes of Mexico, very few studies other than distribution information have been obtained. After the severe forest fires of 1998, intensive studies on the distribution and presences of plant communities in the state are being conducted. When traveling with plant experts our herpetological group has benefited. We now encounter more frequently rattlesnakes in areas that in the past had not been accessible.

We have noticed that there is an existing growing relationship with the presence of native plant communities and all herps in general. But montane rattlesnakes like *C. lepidus* (*lepidus* and *morulus*), *C. molossus* (*molossus* and *nigrescens*), and *Crotalus pricei miquihuanus* are sensitive to the presence of different plant elements or species within the plant communities. We are still not sure if the areas that we have had access to, have inadvertently affected the distribution of these species in a positive or negative order. If forest fires and droughts persist, as has been predicted by climatologists, undoubtedly monitoring these species will be of great value to continue understanding the biology of these Mexican Rattlesnakes. A subject that with decades has lost interest, within the international herpetological community.

DR. JONATHAN B. LOSOS

Director, Tyson Research Center and Professor, Department of Biology

Campus Box 1137, Washington University St. Louis, MO 63130-4899

ph: 314-935-6706 fax: 314-935-4432

<http://www.biology.wustl.edu/~lososlab/> <http://www.biology.wustl.edu/tyson/>

Ecological and Evolutionary Determinants of Anolis Lizard Biodiversity

Anolis lizards occur on almost any Caribbean island with vegetation, as well as throughout Central America and Amazonia. All told, nearly 400 species of anoles are known, with more being described yearly, which makes this genus the most species-rich genus of reptile, larger than any mammalian or bird genus, and second to Eleutherodactylus among terrestrial vertebrates. On Caribbean islands, anoles are ubiquitous. As many as 11 species can occur at one locality and as many as 60 species exist on a single island (Cuba). Within a community, species differ in the ecological requirements, each occupying a distinct ecological niche. Comparisons among islands indicate that species have independently evolved the same adaptations to occupy the same habitats. Thus, for example, the twig specialists that occur on the four islands of the Greater Antilles (Cuba, Hispaniola, Jamaica, and Puerto Rico), are nearly identical morphologically, behaviorally, and ecologically, yet each has evolved independently. All told, six types of habitat specialists, termed ecomorphs, have evolved independently, making this the best known case of convergence of entire ecological communities.

ADAM MARFISI

Herpetarium Keeper, Saint Louis Zoo
1 Government Drive, St. Louis, MO 63110
ph: 314-781-0900, ext. 255 fax: 314-647-7969

Management of Venomous Reptiles at the St. Louis Zoo

Well-written safety and husbandry protocols, with associated training, are of paramount importance to captive management of venomous reptiles in zoological institutions. The St. Louis Zoo has a large diverse collection of reptiles and amphibians. Of the 250+ herp species in the collection venomous reptiles make up 24% (7 elapids, 52 viperids and 2 helodermatids). This presentation will outline emergency preparedness, equipment, general working guidelines and an overview of the species comprising the collection. The techniques and safety issues outlined are applicable not only to zoological institutions, but to anyone who works with venomous reptiles.

RICHARD D. L. MASTENBROEK

Boeierstraat 50, 8937 BR, Leeuwarden, The Netherlands
Phone +31 58 844 27 27 or +31 6 288 41 839, E-mail: rdl.mastenbroek@chello.nl

Care and Husbandry for Elapid snakes

Since the age of twelve I have kept a collection of Elapid snakes, many of which I have reproduced over the past 12 years. Currently I maintain a private collection of 38 species of Elapid snakes, with a special interest in the genera, *Naja* (cobras) and *Dendroaspis* (mambas).

I'm a student pursuing a degree in Wildlife Management. I'm also curator of reptiles at Pantera (<http://www.pantera.nl>) a big cat and reptile centre, in the Netherlands. This centre is one of the largest in Holland. We have space for over a hundred big cats such as lions, tigers and cougars but also have a large reptile exhibit with over 500 terrariums and an official reptile quarantine facility.

In the past I have spent one whole year in Australia, where I had the opportunity to work Venom Supplies Laboratories as one of the snake keepers. Currently I'm working with the Dutch government to write a snakebite protocol, establish antivenom bank and prepare a new law on the maintenance venomous snakes in the Netherlands. This law might be adopted for use by the entire European Union.

I will elaborate the husbandry and breeding methods used in my private collection emphasising safety. The snakes are maintained in naturalistic enclosures, which allow one to observe a variety of natural behaviours. To build these types of enclosures we need to look at lightning, heating, decoration and hiding places. All of these factors combined will aid in the successful reproduction of a variety of species. This talk will also focus on the varied techniques used to breed, hatch the eggs and rear the offspring. For additional information on husbandry and to view my facilities or specimens visit my website: <http://www.kingsnake.com/elapids/index.htm>

MARK A. MITCHELL, D.V.M., M.S., Ph.D. and TIFFANY WOLF D.V.M.

Louisiana State University, School of Veterinary Medicine, Department of Veterinary Clinical Sciences, Baton Rouge, LA 70803 USA

Arboviruses and the Reptile

Eastern Equine Encephalitis is an arboviral disease endemic to North, South, and Central America. The eastern equine encephalitis virus (EEEV) is a new world alphavirus that is transmitted by mosquitoes. Epidemiological studies have demonstrated that birds, small mammals, and reptiles are susceptible to this virus with birds serving as the North American reservoir host. The role of reptiles in the epidemiology of EEEV is unclear. Experimental infection of two species of turtles resulted in seroconversion in one species. However, experimentally infected snakes and chelonians may remain viremic for periods up to 2-3 weeks, which is significantly longer than in other vertebrates. Reptiles have been implicated as a possible over-wintering reservoir for EEEV and western equine encephalitis virus, as they may remain viremic throughout hibernation. West Nile virus (WNV), a flavivirus, was apparently introduced into the United States in the late 1990's. An epizootic occurred in a population of birds in New

York City during 1999. Since that time, the WNV has spread west through the United States. In 2001, the WNV was as far west as Illinois and as south as Louisiana. West Nile virus, like other arboviruses, can also affect humans, resulting in severe encephalitis and death. Other than occasional reports of WNV in snakes from the former Soviet Union, the role that reptiles play in the dissemination of this virus is unknown. This study was designed to determine the seroprevalence of EEEV and WNV in chelonians from Louisiana. Hemagglutination Inhibition Assay (HI) and Reverse Transcriptase Polymerase Chain Reaction (RT-PCR) were used to determine exposure to or the presence of EEEV and WNV in a population of Louisiana chelonians captured for the pet trade.

MARK A. MITCHELL DVM, MS, Ph.D.

Louisiana State University, School of Veterinary Medicine, Department of Veterinary Clinical Sciences, Baton Rouge, LA 70803 USA

Epidemiology of *Salmonella* at a commercial green iguana (*Iguana iguana*) farm in El Salvador

Salmonella infection was first identified in snakes in 1944, and in turtles and lizards in 1946. Until the 1960's, reports of reptile-associated salmonellosis were rare. During the 1970's, approximately 4% of US households owned pet turtles and these animals accounted for 14% (280,000) of all reported cases of salmonellosis in children under ten years of age in the USA. In 1975, the US Food and Drug Agency implemented an interstate ban on commerce in turtles. This effectively halted the sale and ownership of turtles within the continental US and markedly reduced the number of turtle-associated cases of salmonellosis.

Recently, reports of salmonellosis from non-turtle reptile reservoirs have gained national attention. In most documented cases, the strain of *Salmonella* isolated from the patient was common to a pet reptile, confirming the source of infection. The US Center for Disease Control and Prevention has estimated that in 1996 there were over 50,000 cases of reptile-associated salmonellosis.

The increased popularity of the green iguana, with attendant risks of salmonellosis in owners and contacts of both clinically affected and normal green iguanas, merits study. There have been no documented epidemiological investigations to demonstrate when and how the commercial green iguana becomes infected with *Salmonella*.

PATRICK NABORS

Saurian Enterprises, Inc., P.O. Box 650, Chesterfield, MO 63006 USA
Internet: www.Saurian.com

Observations on care and reproduction in captivity *Dendrobates pumilio* (Schmidt, 1857)

Dendrobates pumilio are found on the eastern watershed of Central America, in the lowland rainforest of the countries of Nicaragua, Costa Rica, and Panama. In Panama they also occur on a group of islands, the Bocas del Toros, located off the eastern coast. Over most of the mainland range of *D. pumilio*, populations consist of a bright red frog, with blue legs, but in the southern portion of their range they occur in a profusion of colors and patterns. In particular the insular forms show high levels of diversity in both size and colors.

For a variety of reasons this species is of particular interest, and has been heavily studied, in particular in the wild. It is also commonly seen in the pet trade, for which it is imported annually by the thousand. In spite of these facts, the breeding of this frog has remained rare in both hobbyist and institutional collections.

This presentation will discuss some of the experiences I have had while keeping this fascinating frog. I have used bits of information I picked up from other hobbyists, as well as information in print, to develop a method of breeding these frogs, which has been fairly successful. Frogs are paired in small terrariums, and with appropriate husbandry, produce between ten and twenty offspring a year. While initial results have been good, and some F-2 offspring have been produced, more work will be required to perfect husbandry of the offspring

to adulthood. The captive-bred females produced here so far seem less inclined reproduce than the imported frogs, and there also seems to be a high ratio of male frogs produced.

NICOLA J. NELSON^{1*}, MICHAEL B. THOMPSON², SHIRLEY PLEDGER¹, SUSAN N. KEALL¹,

BRYAN M. GARTRELL³ AND CHARLES H. DAUGHERTY¹

¹ Victoria University of Wellington, P. O. Box 600, Wellington, New Zealand;

² School of Biological Sciences and Wildlife Research Institute, Heydon-Laurence Building (A08), University of Sydney, NSW 2006, Australia;

³ Karori Veterinary Clinic, 20 Parkvale Road, Karori, Wellington, New Zealand.

*Speaker

Temperature-dependent sex determination in natural nests of tuatara, *Sphenodon*

Tuatara (*Sphenodon punctatus*) are threatened New Zealand reptiles with temperature-dependent sex determination (TSD) when incubated at constant temperatures. We investigated the occurrence of TSD in natural nests on Stephens Island by recording natural nest characteristics, including temperature, and ascertaining the gonadal sex of all juveniles from those nests using laparoscopy. Twenty-five nests were selected to encompass the diversity of nest characteristics. Most nests had a northeasterly aspect, and mean depth from the top egg to the soil surface was 103 mm. Eggs were laid in clusters of between one and three layers; mean clutch size was 9.2 eggs. Mean number of days for incubation was 365, and hatching success was 65%. Incubation temperatures throughout the year ranged from 2.9 to 34.4°C, with daily fluctuations of between 0.5 and 15.6°C in summer (December to March). The overall proportion of male hatchlings was 0.64, and sex ratios varied significantly among nests. Sex ratios of nests were correlated with incubation temperature and nest depth, indicating that TSD occurs in nature. As this study represents data from only one nesting season, future research will investigate whether female tuatara select nest sites according to environmental cues and whether global warming is likely to skew the hatchling sex ratio towards males.

CHARLES W. PAINTER

Herpetologist, New Mexico Dept. Game and Fish

P.O. Box 25112, Santa Fe, NM 87504

Phone: 505-476-8106; E-mail: cpainter@state.nm.us

A Review of the Commercial Trade in the Western Diamondback Rattlesnake, *Crotalus atrox*. Are Rattlesnake Roundups as Bad as You Think -- or Worse??

While at least four species of rattlesnakes are commercially traded at Rattlesnake Roundups in North America, the Western Diamondback Rattlesnake represents over 95% of the total trade. These snakes are often locally abundant and are exploited to supply an international trade in skins, meat, gall bladders, and curios. This trade is linked to the unique social phenomenon of Rattlesnake Roundups, which often generate large amounts of money for the sponsoring organization and community. Because the commercial trade in rattlesnakes is largely unregulated and fluctuates widely according to the market demand for skins and meat, it is practically impossible to quantify. Data collected during the 1990's indicate that probably <125,000 rattlesnakes of all species entered the trade yearly.

Critical problems with Rattlesnake Roundups are the unethical and inhumane treatment of snakes, and snake shows that provide inaccurate information about the natural lives of these secretive and solitary predators. State wildlife agencies where Rattlesnake roundups are held should develop management strategies and monitoring programs to help address these problems.

VICKY A. POOLE & ANTHONY WISNIESKI

Curators, The Baltimore Zoo, Department of Herpetology

Druid Hill Park, Baltimore, MD 21217 E-mail: vapoole@aol.com & bzherps@aol.com

Project Golden Frog/Proyecto Rana Dorada

Project Golden Frog (PGF) is a comprehensive, multi-institutional conservation, research, and education initiative with strong range-country involvement. Simply stated, the primary goal of PGF is to ensure against the extinction of one of the world's most recognizable, culturally significant, and charismatic amphibians, the Panamanian golden frog, *Atelopus zeteki*. Once abundant, populations of this Panamanian endemic dwindled due to over-collection and deforestation. As a result, the golden frog was listed as an Appendix I species by C.I.T.E.S. on July 1, 1975, and as Endangered by the USFWS on June 14, 1976. It has also been protected under Panamanian law since 1967, but lack of enforcement continues to be a problem. Current trends in land use, illegal collection, and an incurable fungal disease (chytridiomycosis), seriously threaten the few remaining viable populations. The chytrid epizootic is presently 30-160 Km from the westernmost extent of the limited range of the golden frog. All available data from impacted amphibian populations in Costa Rica and western Panama indicate that this will result in the golden frog's extinction. Support has enabled the initiation of field studies, training, educational and captive propagation programs, a bilingual website (www.projectgoldenfrog.org), a Project Golden Frog Fund, and the purchase of a dedicated field vehicle. The continuance of these initiatives will not only help secure the golden frog's survival, it firmly establishes a model program that benefits all conservationists dedicated to mitigating the global amphibian crisis.

For further information, please check out our website.

DR. ROBERT POWELL

Department of Biology, Avila College, 11901 Wornall Road

Kansas City, MO 64145-1698 USA Tel:(816) 501-2440 Fax:(816) 501-2457

E-mail: powellr@mail.avila.edu

West Indian Lizards: Ecological Release, Melanism, and Systematic Problems

Using a variety of West Indian lizards as models, I examine hypotheses suggesting that an anole exhibiting a particular ecomorph will experience ecological release in the absence of congeneric competitors, that a melanistic lizard on a small island will exhibit differences in thermal regimes when compared to a close relative with "normal" coloration, and that an isolated population of a widely distributed species might warrant full species status. If *Anolis monensis*, the only anole on Isla Mona and closely related to trunk-ground ecomorphs on nearby Puerto Rico, is capable of niche expansion it should: (1) exhibit characteristics of an ideal solitary anole, (2) exhibit less constraint in structural habitat use and thermal biology than its relatives, and (3) exhibit an ancestral display action pattern. Melanistic *Ameiva corax*, found only on Little Scrub Island off Anguilla, should exhibit differences in thermal biology in the field and different heating and cooling rates under controlled laboratory conditions than "normally" pigmented *A. plei* from Anguilla and adjacent Scrub Island. Iguanas from Isla Mona are closely related to *Cyclura cornuta* and have been subspecifically allied with Hispaniolan populations. Recent evidence based on mtDNA sequences reveals two distinct haplotypes among main-island populations, and indicates that the Isla Mona population clearly falls within one clade. Pertinent questions ask whether the isolated population warrants recognition as a full species and whether a "species" can evolve in what apparently was a relatively short period of time.

DANIEL WENTZ, DVM

Ferguson Animal Hospital, Ferguson, Missouri

E-mail: Reptiledoctor@att.net

Adenovirus in Bearded Dragons (*Pogona vitticeps*)

Little is known about the pathogenesis of adenovirus in the bearded dragon. Like other viral diseases in reptiles, adenoviral infection is difficult to diagnose antemortem. A better understanding of the disease process and its detection is necessary if we are to treat the animals affected and prevent this virus from spreading throughout the captive population. This discussion will examine the clinical presentation of the affected patient and my work on determining viral presence antemortem, as well as understanding its pathogenesis.

It is sometimes difficult to differentiate virally infected animals from animals suffering from calcium deficiency or coccidiosis. Fecal examination can rule out coccidiosis, and a thorough review of husbandry can rule out calcium deficiency. Diagnosis becomes complicated when multiple disorders present at the same time. While there are no specific signs of adenovirus infection, a good history, physical exam, and fecal can yield some strong suspicions.

Detection of viral presence in the patient while alive would be a useful tool for the veterinarian. Antemortem and postmortem histopathology and electron microscopy were performed on tissues taken from three symptomatic clutches of dragons including the mother. Samples were collected on random animals from ages one day old to one year old and the mother. Electron microscopy was also performed on fresh stool samples from this population. A review of these findings will be presented.

Detecting the presence of the virus is important, but preventing its spread is essential. By understanding the pathogenesis we can better accomplish this. Originally, it was believed that the virus was passed vertically. More recently, some have proposed that the virus is passed by the fecal-oral route. The goal of my work is to help better define this process.

Notes/Autographs