20th ANNUAL MEETING OF THE

INTERNATIONAL HERPETOLOGICAL SYMPOSIUM

HOSTED BY

THE SAN ANTONIO ZOOLOGICAL GARDENS

SAN ANTONIO, TEXAS, U.S.A.

JUNE 27-29, 1996

PROGRAM AND ABSTRACTS

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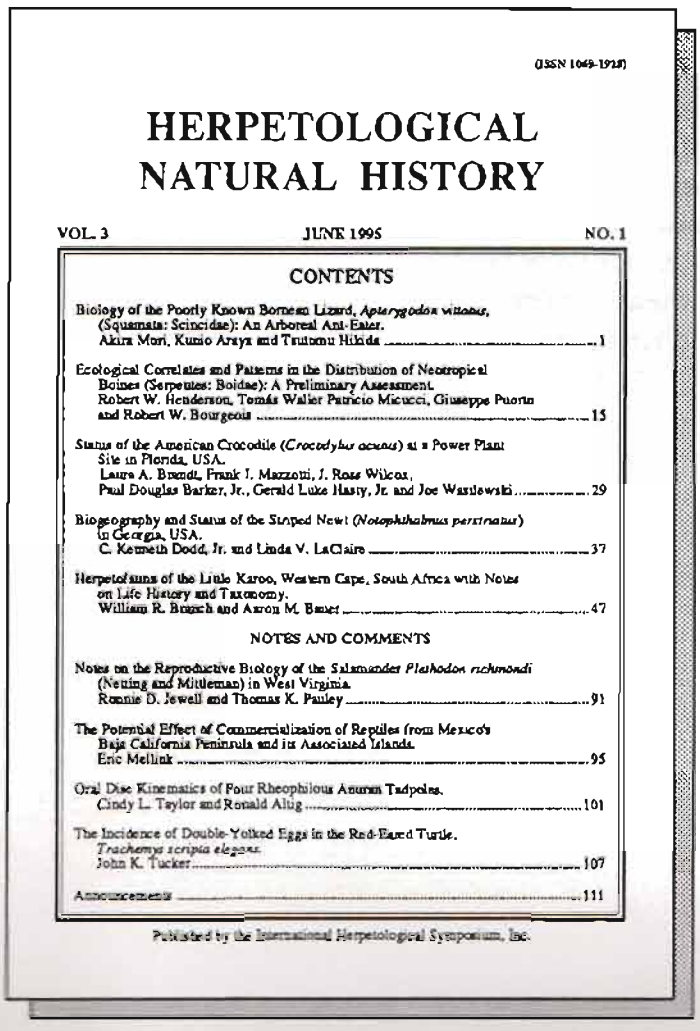

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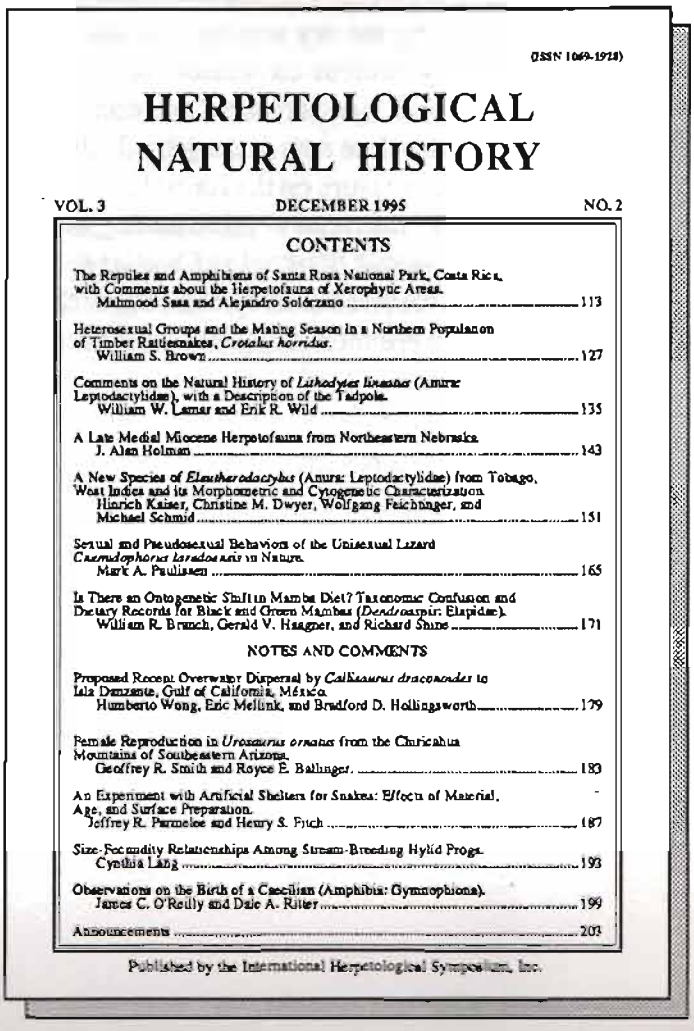

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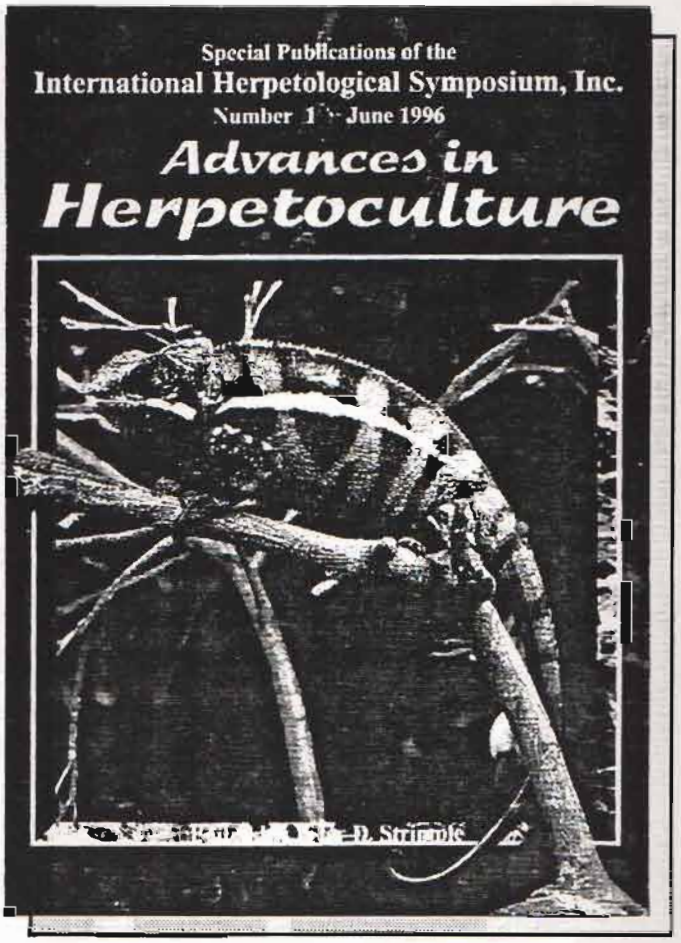
Advances in Herpetoculture

The International Herpetological Symposium, Inc. announces the publication of **Advances in Herpetoculture**, the first in a series of special publications on specific topics in herpetology. **Advances in Herpetoculture** contains 25 articles (by 33 authors), and includes information on husbandry, captive propagation, veterinary medicine, and conservation of amphibians and reptiles.

This 184 page book, edited by Peter D. Strimple, has a stunning cover designed by Jim Bridges; layout and graphic design is by Allen Anderson, and a foreword is provided by Dr. David Chiszar. This publication is generously illustrated with 42 black & white photographs and 30 tables and figures.



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PROGRAM

WEDNESDAY, 26 JUNE

7:00 pm —10:00 pm	Registration — Sheraton Fiesta Hotel
THURDSAY, 27 JUNE	**(Moderator: Donal Boyer)**
8:00 am — 5:00 pm	Registration — Sheraton Fiesta Hotel Paper sessions — Ballroom
8:00 am — 8:15 am	OPENING REMARKS
	Ray Pawley, President International Herpetological Symposium, Inc.
8:15 am — 9:00 am	KEYNOTE ADDRESS Declining Amphibians: A Real Phenomenon?
	W. Ronald Heyer, Ph.D.
9:00 am — 9:45 am	Vicariant Distributions of Amphibians and Reptiles of Madagascar
	Chris Raxworthy, Ph.D., and Ronald Nussbaum, Ph.D.
9:45 am —10:15 am	BREAK
10:15 am —11:00 am	Conservation Status of Endemic Madagascaran Tortoises
	John Behler
11:00 am —11:45 am	Morphological and Ecological Diversity of Malagasy Tadpoles
	Ronald Altig, Ph.D.
11:45 am— 1:00 pm	LUNCH

AFTERNOON SESSIONS (Moderator: David Grow)

1:00 pm — 1:30 pm	Thermoregulatory Behavior, Activity Patterns and Home Range Variation in the Perentie: A Field Study of Australia's Largest Monitor Nancy A. and Thomas G. Heger
1:30 pm — 2:00 pm	Protozoan Parasites in Reptiles Harry Miller, DVM
2:00 pm — 2:30 pm	Ecology of African Monitor Lizards Mark Bayless
2:30 pm — 2:45 pm	BREAK
2:45 pm — 3:45 pm	Temperature-dependent Sex Determination in Reptiles: From Basic Research to Practical Applications David Crews, Ph.D.
3:45 pm — 4:30 pm	Land of the Namib Ronald Tremper
7:00 pm—10:00 pm	ICEBREAKER HERP QUIZ Bill Love

FRIDAY, 28 JUNE **(Moderator: Gary Ferguson)**

8:30 am — 9:00 am	History of the IHS Richard Ross, M.D.
9:00 am — 9:30 am	Seventy Years of Exhibiting Herps at the St. Louis Zoo: from Marlin Perkins to the Present Ronald Goellner

9:30 am —10:00 am	Komodo Dragon Spittle and its Benefit to Mankind Johnny Arnett, Donal Boyer, Rick Hudson, Don Gillespie, DVM and Terry Freddeking
10:00 am —10:30 am	BREAK
10:30 am —11:00 am	Twenty Years of Herpetology: Evolution to Revolution David Grow
11:00 am —11:30 am	Husbandry and Reproduction in the Giant Central American Black Milk Snake (*Lampropeltis triangulum gaigeae*) Alan Kardon
11:30 am —12:15 pm	Conservation Strategy for the Endangered Jamaican Iguana Rick Hudson
12:15 pm — 1:15 pm	LUNCH

AFTERNOON SESSIONS (Moderator: Rick Hudson)

1:15 pm — 1:45 pm	Long-term Changes in Habitat of the Malagasy Tortoise (*Pyxis planicauda*) Stephen Tidd, John Pinder and Gary Ferguson
1:45 pm — 2:15 pm	Geographic Variation of Male Display Colors in the Panther Chameleon: A Progress Report Gary Ferguson, Ph.D., James B. Murphy, D. Sc., Achille Raselemananana and Jean-Baptiste Ramananmanjato
2:15 pm — 2:45 pm	Herpetological Ecotourism in Madagascar Bill Love
2:45 pm — 3:15 pm	BREAK

3:15 pm — 4:00 pm	Conservation Problems of Herpetofauna of Madagascar
	Chris Raxworthy, Ph.D., and Ronald Nussbaum, Ph.D.
4:00 pm — 4:30 pm	Mantella Breeding Program at the John G. Shedd Aquarium
	Lee Jackson
4:30 pm — 5:00 pm	Overview of Herpetological Conservation Projects in the West Indies
	Mark Day

SATURDAY, 29 JUNE **(Moderator: Johnny Arnett)**

8:30 am — 9:15 am	Reptile and Amphibian Expedition to Cameroon, West Africa
	Paul Freed
9:15 am —10:00 am	Gulf of California Island Herpetology: Why Islands are Unique Ecosystems
	L. Lee Grismer, Ph.D.
10:00 am —10:30 am	BREAK
10:30 am —11:15 am	Herpetofauna of Northwestern Costa Rica
	Louis Porras and William Lamar
11:15 am —12:00 pm	Beauty and Diversity of North American Herps
	Suzanne and Joseph Collins
12:00 pm — 1:00 pm	LUNCH

AFTERNOON SESSIONS (Moderator: Ronald Goellner)

1:00 pm — 1:30 pm	The History of N.H.A. (National Herpetological Alliance) Richard Strieber
1:30 pm — 2:15 pm	Pythons of the World David and Tracy Barker
2:15 pm — 3:00 pm	European Herpers and Their Herps John Tashjian
3:00 pm — 3:30 pm	BREAK
3:30 pm — 4:00 pm	Possible Adaptive Significance of Temperature-dependent Sex Determination Turk Rhen
4:00 pm — 4:30 pm	Idiopathic Hepatolipidosis Harry Miller, DVM

EVENING

7:00 pm—10:00 pm

DINNER/BANQUET

ANNOUNCEMENTS

Ray Pawley, President, IHS., Inc.

BANQUET SPEAKER

Wild Herping: From the Ocean to the Amazon
William W. Lamar
University of Texas at Tyler
Tyler, Texas

PRESENTATION OF THE JOSEF LASZLO MEMORIAL AWARD

James Murphy

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Museum of Natural History
University of Kansas

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ABSTRACTS

(Alphabetized By Last Name of First Author)

MORPHOLOGICAL AND ECOLOGICAL DIVERSITY OF MALAGASY TADPOLES

Ronald Altig
Mississippi State University
Mississippi State, Mississippi 39762

The composition of the frog fauna is strange relative to the perspectives of most New World researchers. Ranoid frogs (i.e., hyperoliids, mantelline ranids, and rhacophorids) plus three endemic subfamilies of microhylids predominate. Groups common in New World faunas are absent (e.g., bufonids and hylids) or uncommon (e.g., ranine ranids). All statements and concepts must remain quite speculative because the fauna is so poorly known. Naming of species and documentation of local faunas are currently the primary research activities, and as usual, knowledge of the tadpoles lags far behind. The domination of ranoid and microhylid frogs and the heavy reliance on several microhabitats in flowing water habitats (at least in the eastern rain forests) are important modifying factors to consider. Many of the species in the two mantelline *(Mantidactylus + Mantella)* and two rhacophorine genera *(Boophis + Aglyptodactylus)* form a relatively cohesive morphological and ecological group reflective of their ranoid history, but several notable deviations in breeding biology and/or tadpole ecomorphology occur in each group. Direct development, arboreal morphotypes, umbelliform morphotypes, and two other presumed specialized feeders are the major deviations in the mantellines, and suctorial forms and a specialized sand-ingester occur in rhacophorids. Scaphiophrynine and dyscophine microhylids have exotrophic tadpoles that range from typically microhylid morphology to quite aberrant. All cophyline microhylids have nidicolous development. These patterns of breeding, development and ecomorphology, with an emphasis on morphology, will be illustrated and discussed.

KOMODO DRAGON SPITTLE AND ITS BENEFIT TO MANKIND

Johnny Arnett, Supervisor
Department of Herpetology
Cincinnati Zoo
Donal Boyer, Collection Manager
San Diego Zoo
Don Gillespie, D.V.M.
Kansas City Zoo
Terry Freddeking
Antibody Systems, Inc.,
Ft. Worth, Texas

PYTHONS OF THE WORLD

David and Tracy Barker
Vida Preciosa International, Inc.,
Bourne, Texas

THE ECOLOGY OF THE AFRICAN MONITORS

Mark K. Bayless
1406 Holly Street, Berkeley, California 94703 USA

The continent of Africa separated from Gondwana Land approximately 65 million years ago, evolving into a unique Island full of floral and faunal biodiversity that we are familiar with today. African *Varanus* fossils were recently discovered by Lynne Clos (1995) at Lake Rusinga, Kenya, that indicate that varanids have been living on this continent for at least 14 million years. The African monitor lizards (Varanidae) include the Desert monitor (*V. griseus*) of North Africa; the Savannah monitor (*V. exanthematicus*) of West Africa; the White-Throat monitor (*V. albigularis*) of east, central and south Africa, and the Nile monitor (*V. niloticus*), known throughout Africa south of the Sahara Desert. The Desert monitor can be found in true sandy deserts, and the lizards are more frequently encountered where greater humidity is present during the morning hours. The Savannah, White-Throat and Nile monitor lizards can be found in scrubland, savanna, forest-mosaic and mopane woodland habitats throughout their respective ranges. The Nile monitor is restricted to habitats where water sources, i.e. streams, rivers and lakes are permanent. The African varanids are primarily insectivorous, but have been known to ingest green bananas (except the Desert monitor), invertebrates, small vertebrates, other varanids (= cannibalism), and carrion. The White-Throat monitor is known to prey upon venomous snakes as well. Natural predators of the African varanids include the jackal, caracal, and birds of prey, especially the Martial and Tawny Eagles, who swoop down on these wary animals. During the dry season, when water is scarce, monitor lizards make for an excellent source of water and protein for predators. These varanids court and mate from the months of July to February. As varanids are oviparous, they are known to deposit their eggs in termite mounds, or holes dug into the sides of riverbanks. A clutch can be from three to sixty-four eggs in size. The eggs incubate from six to eight months time, depending upon the temperature and humidity. The neonates remain together within their brood chamber until all of the viable eggs have hatched, whereupon they dig themselves out to begin their lives. In the wild, these lizards are thought to live perhaps eight to ten years, in captivity, they have been known to live from ten to fifteen years or more The greatest threat to their survival in the wild is habitat & burn agriculture,the commercial skin-trade market and pesticide practices, i.e. DDT usage. I began examining the ecology, taxonomy, biogeography, and ethology of these animals in 1987, and with each day, my fascination with these lizards is enhanced. With further record keeping by varanid keepers, and disemination of information via the varanid society newsletter, 'YaraNews', our knowledge of these animals will increase, their captive husbandry practices will (hopefully) be improved, and perhaps the mortality rate of imported animals will decrease.

CONSERVATION STATUS OF MADASCAN TORTOISES

John L. Behler
Chairman, IUCN/SSC Tortoise and Freshwater Turtle Specialist Group,
Wildlife Conservation Society, Bronx Zoo, Bronx, New York, 10460-1099

Madagascar is the home to four endemic tortoise species: *Geochelone yniphora*, *G. radiata*, *Py* *arachnoides*, and *P. planicauda*. The angonoka, or plowshare tortoise (*G. yniphora*), wh distribution is limited to the fry tropical deciduous forest in the vicinity of Maly Bay in the northwe is regarded as one of the world's most imperiled chelonians. It is on Appendix I of CITES. It is risk by virtue of its extremely limited range, and the potential for further habitat degradation a illegal collection. In 1986, a cooperative angonoka research and recovery program was initiat Jersey Wildlife Preservation Trust's captive breeding program at Ampijoroa Forestry Station h been very successful. Recent field studies have yielded valuable natural history information a significant new distribution data. The nearest relative of the endangered angonoka, is the radiat tortoise (*G. radiata*), or sokake. The species is restricted to the xerophytic spiny forests of extre south and southwest Madagascar. It, too, is a CITES Appendix I species. The status of the soka is deceiving. In scattered remore areas *G. radiata* populations flourish. Yet, dramatic changes a occurring in Madagascar. Long considered fady by indigenous peoples, the species was not disturb or eated. Cultural change, influenced by long drought and an infusion of people from outside of t region, have put *G. radiata* in a precarious state. Today, large numbers are being collected for fo markets and for local consumption. Malagasy law is openly ignored. Tortoises are smuggled to Reunion and European markets in increasing numbers. There is increasing pressure from t Malagasy government and its wildlife exporters to downlist the species to Appendix II so that th can reap the profits on international trade. Ill-conceived reintroduction sbhemes could place wild *radiata* stocks at risk from diseases acquired in captivity. Coupled with habitat alteration, the factors create an ominous picture for the long-term survival of this species in nature. Madagasca spider tortoise (*Pyxis arachnoides*), locally known as kapila, is a resident of southern and southwe ern coastal thorn-scrub hasbitat. It is sympatric with *G. radiata* over much of its range. Because its small size, it is rarely eaten, but it is used for barter. Foreign visitors to areas around Tulear or F Dauphin are often offered kapila. It is believed to be declining in status as a result of habi degradation and collection for the pet trade. While protected by Malagasy law, spider tortoises a frequently smuggled to La Reunion and Europe. Until recently, little was known of the flat-tail tortoise, or kapidolo (*P. planicauda*). It is a dimunutive species with a limited distribution on t west-central coast where it is found in dry deciduous forest between the Morondava and Tsirihibi Rivers. Kapidola natural history and staus have been the subject of collaborative JWPT-Wildl Conservation Society projects in recent years. Although the known range of the species h increased, recent and dramatic forest clearing activity is ominous. Conversion of forests in extensive fields of sisal, maize, and peanuts continues as does more subtle forms of for degradatition, woodcutting and selective lumbering. The trade in kapidolo is limited because t habitat is remote from large cities and because the tortoises are exceptionally shy and difficult collect in large numbers. That staus will change if Malagasy laws are relaxed to permit collection f the foreign pet trage. Chelonian taxonomists do not agree on the generic vacillation between the t of *Pyxis* and *Acinixys* during the past 15 years. Current mDNA work by the Wildlife Conservati

Society supports the currently popular view that the kapidolo is a northern representative of the genus *Pyxis*.

BEAUTY AND DIVERSITY OF NORTH AMERICAN HERPS

Suzanne and Joseph T. Collins
Museum of Natural History
University of Kansas
Lawrence, Kansas

TEMPERATURE-DEPENDENT SEX DETERMINATION IN REPTILES: FROM BASIC RESEARCH TO PRACTICAL APPLICATIONS

David Crews
Institute of Reproductive Biology and the Department of Zoology,
University of Texas, Austin, Texas 78712

In many egg-laying reptiles the incubation temperature of the egg determines the sex of the offspring, a process known as temperature-dependent sex determination (TSD). In TSD sex determination is an "all or none" process and intersexes are rarely formed. How the external signal of temperature is transduced into a genetic signal that determines gonadal sex and channels sexual differentiation has been the focus of basic research with the redeared slider turtle. The temperature signal simultaneously activates and suppresses testis- and ovary-determining cascades to result in male or female development. Both are active processes--rather than the organized/default system characteristic of vertebrates with genotypic sex determination. Sex steroid hormones are the physiological equivalent of incubation temperature and serve as the proximate trigger for male and female sex determination. Temperature acts on genes coding for sex steroid hormone receptors and steroidogenic enzymes, thereby modifying the endocrine microenvironment in the embryo. The temperature experienced in development also has long-term functional outcomes in addition to sex determination. Basic research with the leopard gecko indicates that incubation temperature as well as sex steroid hormones organize the adult phenotype, affecting growth, physiology, behavior, and brain activity Practical applications resulting from this work are (i) use of the estrogen-spotting method to ensure female development in conservation and restoration programs oriented to threatened and endangered egg-laying reptiles, and (ii) use of the extreme sensitivity of sex determination to sex steroids as a environmental biomarker to monitor the endocrine disrupter effects of common industrial agents.

OVERVIEW OF HERPETOLOGICAL CONSERVATION PROJECTS IN THE WEST INDIES

Mark Day
Fauna and Flora International

GEOGRAPHIC VARIATION IN DISPLAY COLORS OF THE PANTHER CHAMELEON: A PROGRESS REPORT

Gary W. Ferguson, James Murphy, Achille Raselimanana, and Jean-Baptiste Ramanamanjato

The panther chameleon is a large, spectacularly-colored chameleon from coastal northern and eastern Madagascar. Males show obvious geographic variation in color and metachromatism. While females are more uniform geographically, subtle differences can be recognized. Progress on a quantitative analysis of color variation is reported.

REPTILE AND AMPHIBIAN EXPEDITION TO CAMEROON

Paul Freed, Supervisor
Section of Herpetology
Houston Zoological Gardens
1513 N. McGregor Drive
Houston, Texas 77030
(713) 520-3226

Located amidst the plush tropical rainforests of central-west Africa, Cameroon has long been held as one of the richest countries in terms of its herpetological diversity. And, while it is known for having a great many natural treasures, such as the largest frog species on Earth; its towering majestic mountains; and its diminutive forest elephants, it is still a land of mystery and many surprises. Why is it that few researchers, collectors, and tourists have made Cameroon a "household" name? Get a glimpse of some of their spectacular herpetofauna and see what makes this fascinating country "tick."

FROM FORCE-FEEDING BLONDIE TO CLIMATE-CONTROLLED ENVIRONMENTS . . . A 70-YEAR HISTORY OF THE ST. LOUIS ZOO'S HERPETARIUM

Ronald Goellner, General Curator
St. Louis Zoo
St. Louis, Missouri

The St. Louis Zoo's Herpetarium was first opened to the public in 1927, under the directorship of the Zoo's first curator of reptiles, R. Marlin Perkins. Ornamental reptiles and amphibians highlighted both the exterior and interior of its Spanish style architecture. Since its opening the building has undergone two $1,000,000 renovations. The first update modernized displays and provided for partial climate control ofthe building. The most recent improvements heighten the naturalistic quality of the exhibits and incorporate the latest in computer technology (including climate control throughout), while recapturing the charm and beauty of the building's original ornamentation.

GULF OF CALIFORNIA ISLAND HERPETOLOGY: WHY ISLANDS ARE UNIQUE ECOSYSTEMS

L. Lee Grismer, Ph.D.
Department of Biology
La Sierra University
Riverside, California

TWENTY YEARS OF ZOO HERPETOLOGY: EVOLUTION TO REVOLUTION

David Grow
Curator of Herpetology
Oklahoma Zoological Park
Oklahoma City, Oklahoma

This presentation endeavors to do two things. First, developments in zoo herpetological programs since the mid-1970's will be reviewed, sincerely hoping to avoid offending friends and colleagues by overlooking important contributions. Second, observations on the current and future role of herpetology in zoos within the context ofthe enormous explosion of popularity of amphibians and reptiles will be presented. Significant evolution has occurred in zoo herpetological programs over the last twenty years and seems to organize within ten year periods. The 1970's saw the continued refinement of husbandry and breeding techniques. Zoos began to organize cooperative programs with the advent of the Species Survival Plan in the 1980's. These cooperative programs continued to be refined in the 1990's. However, the focus was shifting from in house programs to conservation efforts in the country of origin. Today there are many fine examples of zoo herpetological departments demonstrating excellent leadership in world conservation programs. There is, however, a problem. Herpetology is losing space in zoos. How can this be at a time when amphibians and reptiles in the private sector are experiencing a revolution in popularity? We have lost track, in a general sense, of our relationship with the rest of the zoo and the public in our zealous pursuit of often narrow purist goals. We have heard this criticism before but evidence in favor of this argument continues to accumulate. We as zoo herpetologists must step outside our comfort zone to more directly engage the public and those who fund our programs. If we do not, the revolution will leave us behind.

THERMOREGULATORY BEHAVIOR, ACTIVITY PATTERN, AND HOME RANGE VARIATION IN THE PERENTIE: A FIELD STUDY OF AUSTRALIA'S LARGEST MONITOR.

Nancy A. Heger and Thomas G. Heger
Department of Zoology, University of Texas
at Austin, Austin, TX 78712

Radiotelemetry techniques were used to study thermoregulatory behavior, activity pattern, and home range variation in the perentie (*Varanus giganteus*) in Western Australia between September 1991 and June 1995. *Varanus giganteus* maintains consistent home areas, although home ranges tended to overlap both within and between sexes. Home range size for males was significantly larger than that of females and may be related to the perceived increase in movement by males during the breeding season (approximately November to January). The activity pattern of *V. giganteus* in the summer months was found to be bimodal with activity in the early morning and late afternoon. During winter, 2/3 of all study animals became inactive for several months, while the remainder (usually males) remained active on a daily basis. Lizards maintained consistent high body temperatures (36°C) throughout most of the day with little variation. The impact of body size on the behavioral and physiological control of body temperature as well as ontogenetic changes in thermoregulation will be discussed.

DECLINING AMPHIBIANS: A REAL PHENOMENON?

W. Ronald Heyer, Ph.D.
Curator of Division of Amphibians and Reptiles
U.S. National Museum of Natural History
Smithsonian Institution
Washington, DC

CONSERVATION STRATEGY FOR THE ENDANGERED JAMAICAN IGUANA

Rick Hudson
AZA Lizard Advisory Group Chair.
Asst. Curator/Herpetology
Fort Worth Zoo
Fort Worth, Texas

Considered extinct for nearly half a century, the Jamaican iguana, *Cyclura collei* was rediscovered in 1990, and is now regarded as one of the world's most endangered large lizards. This paper discusses the ongoing conservation and research efforts underway in Jamaica to prevent this lizards extinction, and presents the results of the Population & Habitat Viability Analysis (PHVA) workshop held there in 1993. The development of the conservation strategy, based on that workshop, is

reviewed with particular emphasis on the headstart program at the Hope Zoo. The implementation of this conservation and recovery plan, and the supporting role that the AZA Lizard Advisory Group and participating zoos play, will be highlighted.

MANTELLA BREEDING PROGRAM AT THE JOHN G. SHEDD AQUARIUM

Lee Jackson
Senior Aquarist
John G. Shedd Aquarium
Chicago, Illinois

In 1994, the Shedd Aquarium undertook a breeding program for the endemic Malagasy frogs of the genus *mantella*. This was done because of the large number of frogs being exported from Madagascar for the pet trade and the relatively low number of animals being kept and bred in both public and private collections.Ten of the twelve recognized species in this group are currently being held by the Shedd and seven of these have been successfully bred on one or more occasions. Most of the breeders are housed in a specially built environmental chamber, and breeding generally occurs after a drop in temperature and a corresponding increase in humidity. The care of eggs and tadpoles present no special problems. However, newly metamorphed frogs require very small foods *(collembda* sp.*)* for 2 to 4 weeks after leaving the water depending on the species of *mantella.*

HUSBANDRY AND REPRODUCTION IN THE GIANT CENTRALAMERICAN BLACK MILKSNAKE (*Lampropeltis triangulum gaigeae*)

Alan Kardon
Assistant Curator of Herpetology
San Antonio Zoo
San Antonio, Texas

The Giant Central American Black Milksnake, *Lampropeltis triangulum gaigeae,* is found in the cool, moist pine forests of highland Panama and Costa Rica. This large, over two meters, colubrid must be kept at cooler temperatures for successful reproduction. Breeding occurs in the spring, with eggs being laid in early summer. The eggs are some of the largest of the *L. triangulum* group and incubation takes a little over seventy days. The neonates are brightly ringed, red, yellow, and black, and start to turn solid black at a year of age.

HERPETOLOGICAL ECOTOURISM IN MADAGASCAR

Bill Love
Blue Chameleon Ventures, Inc.
Alva, Florida

Madagascar is in a position to be "discovered" by nature and ecologically-oriented enthusiasts during the coming decades. It has gone largely unnoticed by English-speaking peoples due to its geographic isolations relatively high expense of going there, and lack of extensive publicity. Modern amenities expected by typical vacation tourists are few and far between. French being the predominant language of commerce there has been a further concern to people worried about being able to communicate their needs. The mass media is starting to feature Madagascar with increasing frequency. Lemurs' endearing features hold huge appeal, but the trend to appreciate whole ecosystems and their varied inhabitants has really focused attention on this mini-continent lately. A special sense of urgency exists to spur this interest because of the escalating degree of forest destruction and land erosion threatening many natural areas. With no dangerous reptiles, but plenty of colorful and bizarre forms like chameleons, tortoises, day and leaftail geckos, twig mimic snakes and boas, the native herpetofauna is gaining recognition as an important aspect of the natural wonders to be viewed by tourists. The fascination with this group can now be promoted as a draw to the island, and as symbols to rally financial support for conservation efforts. Seeing and photographing many species in the wild is not only possible, but quite easily accomplished. This is especially true with the aid of the friendly Malagasy people who welcome visitors to the parks and preserves that have been established-in many habitats. They excel at locating animals and are indispensible as guides. The country is now well aware of the potential profitability of increased tourism and openly encourages it. This presentation will show highlights of three trips to all areas with emphasis on the herps. It will discuss the existing infrastructure and conditions that may affect travelling and herping in Madagascar.

IDIOPATHIC HEPATOLIPIDOSIS

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PROTOZOAN PROBLEMS IN REPTILES

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HERPETOFAUNA OF NORTHWESTERN COSTA RICA

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Sandy, Utah
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POSSIBLE ADAPTIVE SIGNIFICANCE OF TEMPERATURE-DEPENDENT SEX DETERMINATION

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The effect of egg temperature on hatchling growth was determined in the common snapping turtle, *Chelydra serpentina*. In the population of turtles studied, low and intermediate temperatures produce males and high temperatures produce females. Hormone manipulations during embryonic development were used to sex-reverse animals, producing females at normally male-producing temperatures and males at a normally female-producing temperature. Thus, the effects of incubation temperature and sex were separated experimentally. Hatchling growth was strongly affected by incubation temperature but not by gonadal sex. Importantly, growth was greatest at incubation temperatures that normally produce males. In the common snapping turtle, incubation temperature affects growth which may, in turn, affect male and female fitness differently. These results are consistent with the Charnov-Bull hypothesis of temperature-dependent sex determination.

HISTORY OF THE IHS

Richard Ross, M.D.,
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THE HISTORY OF N.H.A. (National Herpetological Alliance)

Richard Strieber
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San Antonio, Rexas

HERPETOLOGICAL CONSERVATION PROBLEMS IN MADAGASCAR

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Habitat loss represents the major threat to amphibians and reptiles in Madagascar. As forests are further fragmented and destroyed, protection of the reserve network becomes increasingly important to prevent extinction. However, even if the reserve network is protected, two major problems remain: 1) many vulnerable herpetological species are not distributed in reserves, and 2) many remote regions have not yet been surveyed, therefore the conservation importance of this biodiversity is unknown. Modifications to the reserve network are clearly needed, and more survey effort is required in poorly known regions of Madagascar. In the most urgent cases, where species appear to be restricted to tiny areas outside reserves, captive breeding may be required to prevent extinction.

VICARIANT DISTRIBUTIONS OF AMPHIBIANS AND REPTILES IN MADAGASCAR: EVIDENCE OF ENVIRONMENTAL CHANGE

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Madagascar was previously thought to have had a stable climate, and to have been almost completely covered in forest. However, palynological data demonstrates significant natural changes in vegetation types, and provides strong evidence for climatic change. Many herpetological species restricted to primary vegetation types show naturally disjunct distribution patterns in Madagascar. These disjunct distributions provide new evidence of prehuman vegetation shifts for montane heathland and rainforest. Both these habitats were previously far more extensive on the island. Vegetation shifts of this scale indicate that Madagascar must have been subject to major climatic changes.

SOME EUROPEAN HERPERS AND THEIR REPTILES

John H. Tashjian
San Marcos, California

In Europe there are probably as many herpetophiles as there are in the United States. This traveler has had the good fortune to have encountered a few of them over the past several years and to be permitted to photograph some of their animals. This presentation will be an introduction to these acquaintances and some of their reptiles representing species which may be a little different than those we are accustomed to seeing commonly here in the U.S.

LONG-TERM CHANGES IN HABITAT OF THE MALAGASY TORTOISE (*Pyxis planicauda*)

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The flat-tailed tortoise, *Pyxis planicauda*, is endemic to pristine, tropical dry forests of the Morondava region of western Madagascar. It is only active during the rainy season which begins in January. During the dry season, it aestivates in the forest leaf matter. The habitat of this tortoise is threatened by human expansion and agricultural development. As the forests become more accessible, more land is cleared and converted into usable agricultural areas. The annual burning of pastures to stimulate new grass growth also burns away the edges of the forest. As the need for cops increases, the pressure on the forest habitat of the tortoise increases. There is no evidence at this time showingn that they can survive in degraded or regrown forest areas. A twenty-year study of the tortoise habitat was done using Landsat MSS satellite data from 1973, 1984, and 1993. The satellite images were rectified and registered to each other and then classified to show the types of land cover. The images were then compared and forest cover and land use changes were determined.

LAND OF THE NAMIB

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