

THE VIVARIUM

American Federation of Herpetoculturists Vol. 4 No. 4 \$7.00

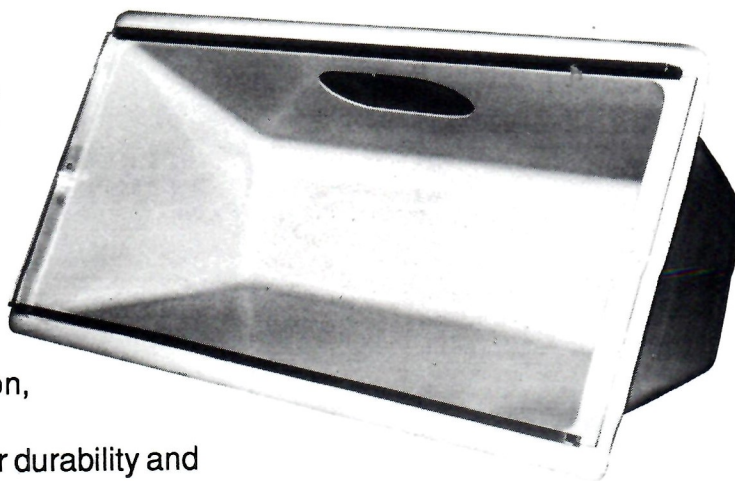
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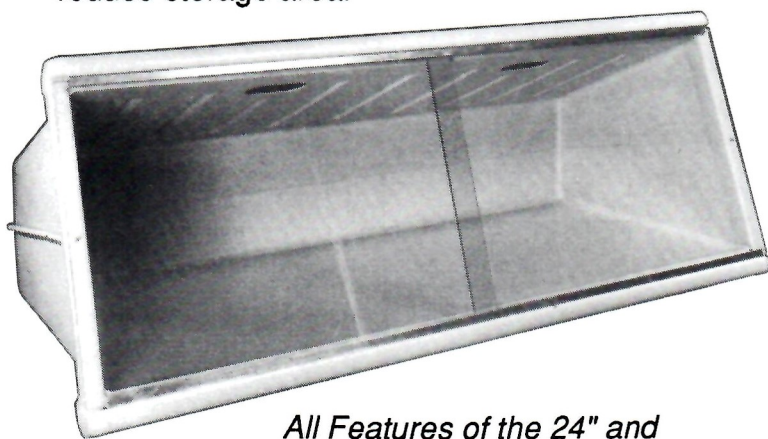
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THE VIVARIUM

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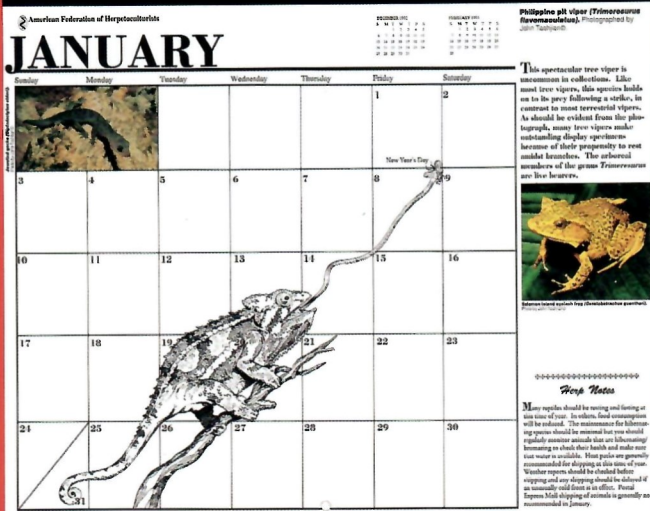
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Front Cover: Two immature albino ball pythons (*Python regius*). Photo by Jim Bridges.

January/February 1993



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Herp News

from Around the World

by
Ellin Beltz

FATAL YEAR FOR HERPETOCULTURISTS

- The clippings keep coming in about the 25-year-old man who died after being bitten by his pet cobra. He had wide experience with various herps, and was vice president of the Western Maryland Herpetological society. The man also presented programs concerning herps to the general public and served as a volunteer for the local ambulance corps. Even so, one mistake with a venomous animal unfortunately cost him his life.

- In a second, frighteningly similar incident in Vancouver, Canada, a snake handler who founded a group to dispel the fear and misunderstanding of snakes was bitten by his pet Egyptian cobra and died as he pleaded for help. Larry Moor of suburban Langley reportedly asked pedestrians to take him to the hospital before collapsing on the sidewalk. Moor was the 45-year old founder of the British Columbia Association of Reptile Owners and had frequently visited schools to teach children about the proper care and handling of reptiles. [August 3, 1992, Memphis, TN, *Commercial Appeal*, sent by Bill Burnett; and The Hammond, IN, *Times*, sent by John Mac Leod.]

- Another death, that of 17-year-old Quincy Calaway, resulted from an electrical short in the attic of his home in East Memphis, TN. The attic was home to several snakes, four dogs and many birds and was fitted out as an animal lab. Several animals were killed in the fire, those that survived were taken to the zoo. Most of the snakes were in their cages when firefighters arrived, however, one loose rattlesnake was killed by a fireman with an axe. Neither the house nor the reptile room had smoke detectors. [Memphis *Commercial Appeal*, April 30, 1992. Sent by Bill Burnett.]

- Add these to the death of Mark Nevilles, who was crushed by his pet python in Brampton,

Ontario, and it has been a bad year for herpetologists with what are considered by non-herpetologists to be dangerous animals in home captivity. [San Francisco *Chronicle*, April 7, 1992. Contributed by Elyse Duckett.]

DESERT TORTOISES STOP CONSTRUCTION

- Bob Pierson of Las Vegas is one of the most dedicated clipping collectors contributing to this column. His most recent contribution is from the Las Vegas *Review-Journal* [June 29, 1992], and details how five tortoises have halted construction of a 90-home subdivision in Utah. The tortoises appeared at the site in early May of this year, but cannot be removed from the area. The developer is understandably upset and claims he stands to lose his \$1 million investment in the project. [Also from the Orlando, FL, *Sentinel*, May 28, 1992, sent by Bill Burnett.]

RARE SHELL GAME ALLEGED

- A lawsuit was filed in Lantana, Florida, accusing an airport concession owner of secretly moving rare gopher tortoises onto a plot of land to try and keep a competitor from expanding. Merely disturbing gopher tortoises is a second-degree misdemeanor. [June 2, 1992, *USA Today* and Orlando *Sentinel*, both sent by Bill Burnett.]

MAYBE IT WAS AN EMISSIONS MONITOR

- A 6-foot Asian water monitor lizard was discovered wrapped around the engine of a car in Miami, FL. The owner of the car called state game authorities who called Todd Hardwick of Pesky Critters Nuisance Wildlife Control. The lizard was sedated and part of the engine had to be removed to extract it. [Sacramento *Bee*, July 9, 1992, sent by Bruce Hannem. From other

papers, thanks to Wendy Carter and Sandra Barnes.] Bob Pierson of Las Vegas subsequently sent a clipping from the Miami *Herald* which continues the tale of the lost lizard... It was adopted by Todd Hardwick, and will now be the mascot of a local movie film company, Gecko Films. Hardwick said, "He went from almost being killed inside this car to living a life of caviar dreams and champagne wishes. He gets anything he needs." Only in America...

ADDERS MULTIPLYING

- A Swedish research team found that when female Swedish adders, *Vipera berus*, mate with four to eight males they have fewer still-born young. The scientists suggest that females set up a "sperm competition" by storing semen from her various partners and enabling the sperm to compete with each other to fertilize her eggs. Thus, the siblings in a brood may have different fathers. The research may have implications for those breeding reptiles in captivity. [New York *Times*, February 4, 1992, contributed by P.L. Beltz.]

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INVASION OF PARADISE

• The Nature Conservancy and the Natural Resources Defense Council have joined forces to urge the state of Hawaii to close its borders to foreign plant and animal species. As in other tropical areas of the U.S., including Louisiana and Florida, high international traffic and proper climate permit animals to become established far from the original - and proper - ranges. However, Hawaii is presumed to be more susceptible to pest damage because of its smaller land area and lack of predators. In 1992, customs inspectors in Hawaii seized 37 piranhas, 32 snakes and several intentionally imported scorpions. Wildlife officers have captured piranhas that had been released into Oahu reservoirs. Non-native insects have, so far, had the most devastating economic impact. Fruit flies, cornstalk borers and yellow sugar cane aphids are the worst invaders, although non-native plants and vertebrate animals have contributed to the damage. [USA Today, August 10, 1992. Sent by Bill Burnett.]

REEFER TO THIS DECISION IF YOU'RE TEMPTED

• An iguana's alleged passion for pot, *Cannabis sativa*, ended when its owner was arrested for possession. However, the case was dropped by the prosecutor due to improper search procedures used by the police who had posed as condo buyers and peeked into every nook and cranny after receiving a tip. The iguana refused to eat any other kind of food, after the officers confiscated the pot plants, and it subsequently died. [The Grand Junction, CO, *Daily Sentinel*. Contributed by Larry Valentine.]

WE KNEW THIS...

• A survey taken by Dale Marcellini, a reptile curator who has done a study of zoo visitation, found that visitors to the National Zoological Park in Washington, D.C. spent more time in the Reptile House than in observing the monkeys and great apes. He also found that visitors spent twice as much time watching a Burmese

python lying motionless in a sterile concrete enclosure as they did watching active poison-dart frogs in a more natural display. Male visitors preferred venomous snakes, but females were more attracted to hatching eggs and baby animals. [International Wildlife Magazine, March/April, 1992. Sent by Fred Buettell.]

LETTER OF THE MONTH

• "We have enclosed ads from "The Sportsman's Guide" 1991 year-end clearance catalog. These people are truly sick because they advertise rattlesnake head ornaments and python skin boots. That's bad enough! But it's their attitude that is truly repulsive. They describe the rattlesnake head as "something straight out of a Voodoo Village!" They also state that reticulated pythons are "so plentiful in Indonesia that they are considered pests!" How can we stop habitat destruction and protect wildlife with these ignoramuses hanging about? We thought you might find this type of arrogance of some interest. The address, fax, and phone number of this company are as follows: The Sportsman's Guide, 965 Decatur Avenue North, Golden Valley, MN 55427-4398, fax 1-800-333-6933, phone 1-800-888-3006. Sincerely, Mark and Adela Zimmerman."

ASKLEPIOS' STAFF EXPLAINED

• As anyone who has been to a doctor knows, the various branches of the medical professions have as their logos designs based on the physician's staff entwined with snakes. The original of this design dates back to Asklepios, a healer in Greek mythology, who was posthumously worshipped as the god of medicine. Although the legends vary, many agree that the healing ritual apparently consisted of a visit to a sacred cellar. There a priest with a serpent would receive the patient, whose wound would be healed after contact with the snake's mouth. Researchers in Italy have found evidence that this snake healing may have been more than legend. In the July 25 issue of the *Lancet*, a British medical journal, they wrote that a chemical in the saliva of the four-lined snake of southern Europe, contains epidermal growth factor (EGF) which promotes growth in the outer layer of skin cells. Ironically, mice have more EGF than many other animals, and have traditionally been associated with disease - not healing. [Wall Street Journal, July 24, 1992, contributed by P.L. Beltz.]

IGUANA C-SECTION IN MIAMI SPRINGS

• Dr. Leslie Gerson of Miami is treating a four-foot iguana found in the middle of a suburban street for a mouth infection and a cataract in the right eye. The animal is estimated to be about 10 years old. It is also pregnant, but it

appears that one egg is malpositioned and will not permit the rest to come out. At last notice of this story, Gerson was planning a Caesarean section to remove the eggs. [Birmingham News, May 3, 1992, sent by Todd Moore; Orlando Sentinel, May 3, 1992, contributed by Bill Burnett; and Lakeland, FL, *Ledger*, sent by Melody Smith.] Several days later (May 9), the Leesburg, FL *Daily Commercial* reported that the mother died after 25 viable eggs were removed and placed in an incubator to be hatched. Dr. Gerson said the iguana's uterus was twisted and blocked. She was provided with painkillers and proper medical attention until her death according to the doctor. [Contributed by Bill Burnett.]

IGUANAS AND SALMONELLA

• While it is commonly known that baby turtles carry the *Salmonella* bacteria, recently cases of this infection have been detected in iguanas. Several people have sent me clippings from around the world, all apparently derived from an initial article or press release. The most recent was received from Aaron C. Fisher. The article appeared in *Infectious Disease News*, May 1992, and recapitulates the known iguana case reports from the Center for Disease Control (*MMWR* 1992;41:38-39 and *Salmonella Surveillance Report*, 1989, Atlanta) as well as a review article in the *American Journal of Epidemiology* (1981;113:494-499). Mr. Fisher stated his desire to learn more about *Salmonella* in iguanas and wondered if there was anything he could do to protect himself and his animals against this bacterial infection. How about it, readers? The two most recent cases were both about iguanas from different pet stores, but from the same pet distributor. Are the iguanas becoming infected in transit, or in the dealer's possession, in much the same way as the poor baby turtles were being made sick by the unsanitary conditions in which they were kept and shipped? I'm looking forward to hearing from readers knowledgeable on this subject.

FLORIDA HERP BILL DIES

• The Compromise Bill (HB 1476) written by herpetologists and state legislators in June died in the Florida House of Representatives, a victim of a deadline for new legislation. The bill would have raised fees for wildlife permit holders, and allocated additional funds for the Florida Game and Freshwater Fish Commission for increased inspections. The League of Florida Herp Societies members were effective in communicating opposition to the law as originally written, but it is expected that the American Humane Society will lobby for restrictive legislation and fee increases next year in an effort to reduce individuals rights to maintain live collections of amphibians and reptiles. [Pet Product News, July 1992, contributor un-

known but appreciated.]

LOOSE REPTILES, CONTINUED...

- The press seems to particularly appreciate loose snake stories, and - as usual - the slow summer news brings a slew of slithery escape tales from around the nation. Bruce Hannem sent a clipping from the July 9, Sacramento *Bee* which describes how a "150-pound snake" frightened campers near the Salton Sea in California. Officials at the camp ground said the snake escaped from a camping trailer two weeks ago. Its owner returned home to Tennessee after he was unable to find it.

- The next story from the Orlando *Sentinel*, April 28, 1992 contributed by Bill Burnett reports on every reptile owner's nightmare - an escaped snake injured while AWOL. It seems as though a 10-foot python escaped or was stolen from a pen in Longwood, Florida. Eight days later, a neighbor awoke to her daughter's screams, and discovered the snake with a death grip on the family cat. Her husband beat the snake with a broom and a shovel until it let go of the kitty, then threw it out into the yard. The cat survived, but lost its vision after the encounter. The snake also lived, but was covered in scars and burns as well as having mouth rot and losing a tooth. Its owner speculates that it stayed someplace too hot while gone.

- An unsuspecting car renter had the surprise of her life when she discovered a 4.5-foot python wrapped around the steering wheel of her rental car. She turned the animal over to the New York State Police and rented a different car for her return to Florida. The previous renters of the car had purchased the snake while on vacation. It had been left in a covered aquarium near the car, but had disappeared before they left for the airport. How they planned to get a covered aquarium with a 4.5-foot python on an airplane was not mentioned in any of the stories. The snake losers did not call police or search for the animal before they left Florida. Fortunately, a New York State trooper, Daniel G. Tordy, also keeps pythons and was making arrangements to ship the snake to the owners in Michigan. [News Herald, Port Clinton, OH, July 10, 1992, contributed by Kathryn Bricker; the Orlando *Sentinel*, July 11, 1992 and the Leesburg *Daily Commercial*, July 10, 1992, sent by Bill Burnett.]

- The final story, from the Memphis *Commercial Appeal*, July 23, 1992, from Bill Burnett mentions that a 5-foot ball python pushed the lid off its cage and slithered away. The report is careful to say that the animal is neither dangerous to humans or venomous and will only survive on its own until freezing weather arrives. At this point, I would like to remind all herpetologists that there is no such thing as an "escape-proof" cage, unless it is properly closed and secured. The screen tops sold in pet stores

are useless and people who leave snake tanks with two boards and a brick on top ought not to have snakes. (They probably won't either, if they don't get proper lids.) I do not usually plug products, but if you are concerned about keeping your snakes where they belong, the molded plastic cages with the sliding fronts often advertised in herp journals are just about the best design ever sold. You can put bolts with wing nuts or locks in the little holes in the cages and then - if the tanks are properly closed - they may be considered reasonably escape-proof. The only escape which occurred under my roof was occasioned by a guest not properly securing a cage after he had - without permission - removed and handled a milk snake. The snake vanished, the guest later secured the tank, and we were left with a "locked room mystery" until the guest finally (two years later) confessed in shame. The milk snake did reappear about two and a half years later, much longer and plumper than it had been when it escaped. We also no longer had a wild mouse problem in the house!

Thanks to everyone who contributed to this column! In addition to the articles used, super stuff was received from: Bob Sears, Melody Smith, Tom Corp, Scott Haynes, Philip S. Venditto, Gordon M. Burghardt, Mike McNeil, and Kellie Houston. If you'd like to contribute to this column, please send clippings with the name and date of publication as well as your name and address (firmly attached to the clipping) to me in care of the AFH. I apologize to the unknown contributor. When the clippings are forwarded to me from the AFH

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office, sometimes they become separated from notes, envelopes or whatever had the contributor's name attached. (I think it is from being banged around by the Post Office.) If you recognize your clipping, drop me a line and I'll acknowledge you more properly in my next column.



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Romulus Whitaker

by
Roy Pinney

Romulus Whitaker was one of the most charismatic individuals to ever speak before the New York Herpetological Society. His scheduled appearance meant standing room attendance, and with good reason. He is the acknowledged expert on Indian herpetology which he describes with rare enthusiasm and charm.

Born in America, he went to live in Bombay with his American mother, who had remarried an Indian. Rom returned to America at age 24 in 1967 as a nearly penniless free spirit, to renew his relationship with the country he had known as a child. Always intrigued with reptiles, he worked at the Miami Serpentarium and was trained by the renowned snake handler, Bill Haast. During his apprenticeship, Rom roamed the Everglades of Florida to learn more about the snakes and alligators that abound in the region.

After several years in the States and a stint in the military during the Vietnam War era, Rom returned to India where he settled down among the Irula tribe of Tamil



Rom Whitaker. Photo by Shekar Dattatic.

Nadu. The Irula are known for their skill in capturing venomous snakes. Rom helped organize the Irula Tribal Cooperative in 1981 to help these wandering hunters collect snakes from which they extract venom for sale to medical institutions. They also offer a contract rat-catching service. For a fee, the Irula Cooperative will send a team to find and capture rodent pests, destroying their burrows after checking them for caches of grain or nuts. Rat nests can contain enough stored food to sustain a poor family for several days. At the end of a day of a rat hunt, the teams return to their base at the Madras Crocodile Bank, a research and breeding reserve for reptiles, where the hunters sell the rats.

Rom Whitaker has been living close to the Irulas for almost two decades, watching their territory and their livelihood shrink under well-intended laws to protect reptiles from the lucrative trade in skins. The snake-skin trade still flourishes, as the plight of the Irulas, who are no longer permitted to collect most snakes, worsens. Two of the four species of snakes used at the small venom-extraction center, the cobra and Russell's viper, are now protected in India (but this only effects their exportation).

The Irulas are producing less anti-snakebite serum, and are no longer allowed to respond to calls for help in capturing cobras and other endangered snakes that wander into inhabited areas. Instead, these serpents are often beaten to death by villagers, property owners or the police.

Affectionately called *Pambukaran* or *Snakeman*, Rom Whitaker has become an integral part of the conservation movement in both south India and the Andaman Islands in the bay of Bengal. He has written several books, and one book has been written about him. *Snakeman*, by his wife, Zai Whitaker, vividly describes his encounters with the reptile world, handling the awesome king cobra in the rainforests, his significant success in protecting the endangered turtles of the Coromandel Coast, his struggle to stop wanton destruction of crocodiles across the country and the establishment of a viable venom production co-operative.

Rom Whitaker has been the Director of the Madras Snake Park since 1969, and has been Honorary Director of the Madras Crocodile Bank Trust that he started in 1974. His plans to set up a conservation, research, and education base in India's

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The Madras Crocodile Bank. Photo by Rom Whitaker.

Andaman and Nicobar Islands have been given a boost with grants from the World-wide Fund for Nature, the Indo-German Social Service Society and the Swedish Society for Nature Conservation. He is also actively involved with turtle studies that monitor the fate of turtle nests and hatching rates. Another project is a four-year study on the human impact on coral reefs in the archipelago which is close to Burma, Thailand and Sumatra, while surveying the venomous sea snakes found in its waters. The Australian High Commission gave his team a grant to buy a new diesel engine for a 30-foot converted trawler that is used as a research vessel. He named the craft 'Aka Bea,' after a South Andaman Island negrito tribe that became extinct 50 years ago, "due to 'friendly' contact with the outside world."

Rom and his wife Zai are also involved with a specialized eco-tourism project initiated with a group from the Harvard Museum of Comparative Zoology and a non-formal environmental education program sponsored by the Department of Environment, in India.

As if all this responsibility wasn't enough, Rom continues to keep an eye on his key project involving some 10,000 crocodiles, consisting of ten species. He is petitioning the government of India to allow limited commercial farming. His struggle for conservation funds here in the midst of immense human problems would be largely alleviated if surplus crocs could be sold to tribal cooperatives once they are allowed to start farms for skin and meat.

The staff includes two Ph.D.'s who are developing their research program from an existing 8-year-old crocodile study sponsored by the Smithsonian, the National Science Foundation and National Geographic Society. Projects already in progress include work on freshwater turtles on the Chambal and Ganges rivers, wild mugger crocodiles, breeding of Indian



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snakes of potential medical importance, and behavioral ecology of the water monitor lizard. Future plans include king cobra and python breeding, herp surveys in the wetlands of the Eastern Ghats for the Asian Wetlands Bureau, and a study of the breeding ecology of Indian amphibians.

"Me?" He answers, to my letter questioning what else he has been doing of late. "I just kind of flit in and out, spend as much time as possible with my wife Zai and our two sons Nikhil (14) and Samir (10), teaching now at Kodai International School up here at 2000 metres in the Palni Hills. We are still active with the Irula Snake Catchers Cooperative and an Irula Women's

Society involved in planting trees on the vast wastelands very recently created by 'human termites'.

"Since we made our first documentary, *Snakebite!* I've become very keen on films, producing half a dozen additional documentaries and one children's environmental feature. I'm now also working on a film for National Geographic on rats in India.

Editors Note: Roy Pinney will arrange a low-cost two week herpetological mini-expedition™ starting from Madras in India to be led by Rom Whitaker if there is sufficient interest for such a group. [Roy Pinney • 325 W. 45 Street • New York, NY 10036 • (212) 246-1349].

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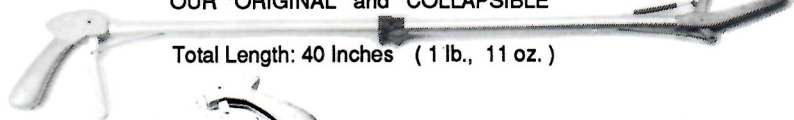
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THE VIVARIUM MAILBAG

Dear Editor:

I would like to thank you for your assistance and encouragement last winter in our dealings with the Quebec (Canada) provincial government over a proposed ban on exotic animals. Thanks to thorough planning based on *The Vivarium* and the legislative information kit, hard work by a number of OARA members and a surprisingly cooperative attitude (for bureaucrats) on the part of Quebec's fish and game officials, we succeeded in stalling the legislation. The Ministère du Loisir, de la Chasse et de la Pêche invited delegations from the major herp clubs, the pet industry council and major zoos to join them in re-writing the law to permit serious herpetoculturists to continue their work. We also asked that consideration be given to licensing the keeping of endangered, large and/or difficult-to-keep species. Generally speaking, we supported the concept that herp ownership be restricted to older adolescents and to adults prepared to demonstrate at least basic familiarity with the needs of captive herps. We do not yet know the final result, the government was astounded at the volume of informed reaction to their original proposal. Although they were not well informed on the subject, they showed willingness to listen and learn. We had the most negative reaction

from the veterinarians at the meeting, although none of them were really experienced on herps. Perhaps it is significant that most vets in our area only have the opportunity to see herps in poor conditions such as emaciated boas, parasite-ridden monitors, deformed red-eared sliders or limp anoles...no wonder they take a dim view of private individuals keeping reptiles and amphibians. It might be a smart move for herp clubs to invite the local vets to their meetings once in a while, not just those interested in reptiles, but others, so that they can see healthy animals successfully kept by skilled and caring people. Vets have considerable influence when governments are considering legislation bearing on our hobby.

Keep up the good work...and thank you.

Mike Raukin, Ottawa, Ontario Canada

Dear Editor:

I enjoyed Monique Halloy's article on False Water Cobras, having maintained, bred, hatched, and raised them for more than twelve years. She calls them "essentially non-venomous". I have yet to be bitten by any but extremely young animals, but a good friend was recently bitten by an adult - one fang in the thumb. Her thumb and part of the hand were painful and swollen although not discolored, for two days. The wound also bled much more freely than a similar cut would have. I have also been told by George Van Horn, owner of Reptile World in St. Cloud, Fla., that tests on their venom were run, but have not been completed. The first attempt to establish an LD 50 in mice killed all the mice.

These are good sized, powerful opisthoglyphous constrictors that can exceed seven feet and could possibly reach

nine feet in length. They are worthy of the respect due any venomous snake.

I've found that *H. gigas* is not difficult to breed. Once they decide to do it, don't get in their way. My first pair totally ignored each other until the age of seven. The female hooked up every year after that, but only laid eggs every two years.

I incubate eggs at 80°F in a Styrofoam® container with water heated by an aquarium heater and a wire mesh rack above the water upon which the eggs rest. This setup gives 100% humidity and whatever temperature you set the heater at. You can do it small scale in a bait bucket container or as big as you want. I've successfully hatched not only False Water Cobras, but *Heterodon*, *Micrurus* and *Chrysemys* in this homemade incubator.

Greg Longhurst, Loxahatchee, Florida

Dear Editor:

With the advent of modern herpetoculture, a potentially serious threat has been created for our herps. With the advances in captive breeding techniques and the rising popularity of snakes as pets, comes the unique desire man seems to have to produce designer animals. I am sure we are all aware of "fad" animals like Albino Burmese, corns, kings, and tri-colors. I don't believe that there is anything wrong with this; it's kind of like the Fish Hobbyist Industry. Where we are now, however, is a critical period, as the genetic integrity of our hobby animals may be jeopardized. Several species of snakes are now routinely hybridized with other subspecies and even other species! Even though some subspecies level intergradation occurs in the wild I believe we have a moral obligation to maintain the purity of our animals as best as we can.



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There is a persisting opinion that by the turn of the century much native habitat will be gone. If captive gene pools have been polluted by crossbreeding, we will have lessened the opportunity to release reptiles into portions of their range where they no longer occur.

Patrick A.D. Wise, Calgary, Alberta, Canada

Dear Editor:

While thumbing through my issue of *The Vivarium*, Vol. 4, No. 1, one of the excerpts in Ellin Beltz column caught my eye. *Cobra Kills Owner* was the title of the piece. After reading it through and feeling the sorrow of having lost a fellow herper, I inspected it more closely and was aghast to see the *Washington Post* using the word "pet" in conjunction with the word cobra.

After some contemplation and soul searching, I came to the realization that I should not have been surprised. Even an upscale publication like the *Washington Post* cannot be expected to critique each phrase or sentence for its ethical content. Beside, this was not something I felt was printed with intentional malice.

What did come to mind though was the high incidence of herpers (myself included) referring to their animals as "pets."

I've done frequent educational programs with the Minnesota Herpetological Society and have probably spoken with thousands of people. I have not been to one program where someone hasn't said "Is that your pet?" In the past, I've responded affirmatively. Lately however, I've been very emphatic to explain that these were animals I worked with, bred, and kept in my home, but no, they were not my pets.

It may seem like quite a trivial point, but I feel it is not. The word "pet" gives people the connotation of a herp being a companion animal like a dog or a cat, which it is not.

Some people can argue that their green iguana will eat out of their hand, recognizes them and is a member of the family. I do not contest this. However, will the person to whom you are singing the praises of your iguana differentiate between your lizard and the newly imported Nile monitor at the local pet store? They're both lizards, right? I have also had my wrists clawed by my adult green iguana. Each animal is different, and to categorize them all as "pets" is irresponsible. Often, what you say about one herp to a member of the public will be interpreted as one applicable

to all.

Herpetoculture, I feel, is a discipline in its infancy. We, as herpetoculturists, need to define and establish ethics which will be passed on to others coming into the field.

By omitting the word "pet" from our "interpreting to the public" vocabulary, I feel we can do a collective service.

Instead of people seeing us as individuals who keep a lot of pets, maybe John Q. public will see us as dedicated people who work with a number of species. Perhaps someone purchasing their first herp will understand that captive care requirements exceed those of their golden retriever.

We in the private sector must take small positive steps to insure that the decision to keep and work with reptiles and amphibians is a responsible one.

Drew Newman, St. Paul, Minnesota



NOTE

The AFH has compiled a 99 page Legislative Packet for sale to all members for \$16.00 (includes shipping). It contains extensive information and arguments for the rights of herpetoculturists and will come in handy for anyone challenging legislative matters. Send your check to AFH, P.O. Box 1131, Lakeside, CA 92040-0905.



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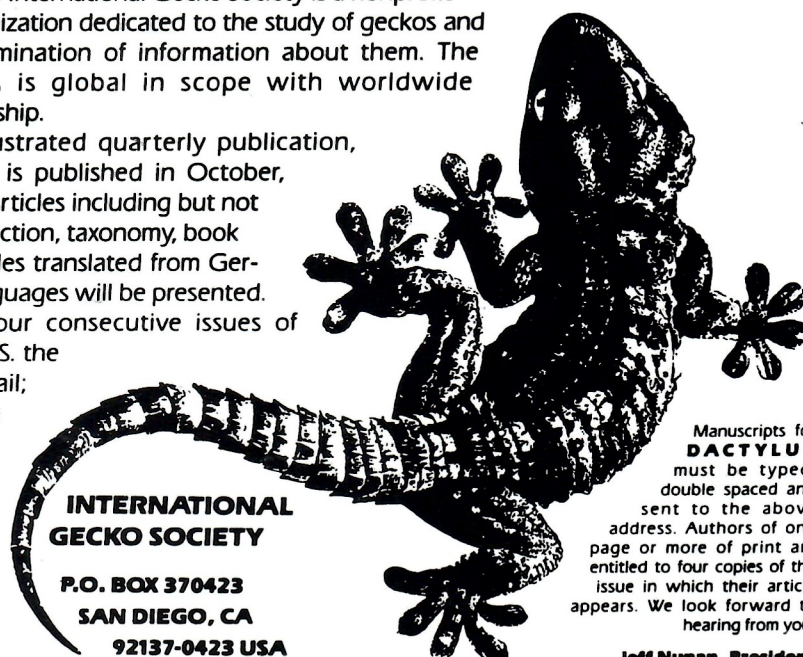
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Jeff Nunan, President

Salmonellosis in Reptiles

by
**Douglas R. Mader, M.S.,
D.V.M., Dipl. A.B.V.P.
and
Kathleen DeRemer, M.M.S.,
M.D., Dipl. A.B.I.M.**

Recently the Center for Disease Control in Atlanta, Georgia, published a warning to green iguana owners to be on the lookout for salmonellosis in their pet iguanas. Since this article came out, our hospital has been inundated with calls from pet iguana owners wanting to know more about the disease. Some have called in a panic, wanting to euthanize their iguanas for fear their children might contract the deadly salmonella bacteria and die.

Fortunately, although salmonellosis is a very serious disease, with proper understanding of the problem it is one that can be managed without the necessity of euthanizing cherished family pets. Knowledge of the disease, its symptoms and its control will help reptile owners better care for their animals.

General Considerations

Salmonella is perhaps the single most infamous zoonotic disease associated with reptiles. A zoonotic disease is any disease which can pass from an animal host to a human. There are approximately 2,000 serotypes of this gram-negative bacteria. There are three different species within the genus *Salmonella*. *Salmonella typhi* and *S. choleraesuis* have only one serotype each. The serotypes which are considered pathogenic to both man and animals belong to the species *S. enteritidis*. Over 200 different serotypes have been isolated from reptiles, including aquatic turtles, land tortoises, lizards, snakes and crocodilians.

The red-eared slider (*Trachemys scripta elegans*) was the turtle that received the majority of the negative publicity. At the time that salmonellosis was a major disease concern, the slider was the most common type of turtle kept as pets in the United States. In the early 1970's it was estimated by the *Journal of Infectious Diseases* that about 280,000 cases of human salmonellosis had been contracted from pet turtles. In 1975, the Food and Drug Administration passed a law stating that it was illegal to sell viable turtle eggs or live turtles with a carapace, or shell length, of less than four inches in the United States. It was felt that animals larger than four inches in length did not pose the same threat, since human infants would probably not try to and fit them into their mouths; these remained legal for trade.

Salmonellosis in Reptiles

In reptiles salmonellosis is usually asymptomatic, meaning that it does not produce outward signs. On occasion, an animal may develop a loss of appetite, become lethargic or have diarrhea. Usually, the animal appears healthy one day, and then is found dead the next. The diagnosis of salmonellosis is made at the time of necropsy (an animal autopsy). In cases of severe salmonellosis overt disease may be manifested as skin abscesses, a generalized skin rash and septicemia, or bacteria in the animal's blood. Salmonella can also get into the reproductive tract and affect egg production, thus causing sterility or drastically affecting the number of fertile eggs. Those offspring that are born from infected females are likely to be carriers of the salmonella organism.

Salmonella organisms are ubiquitous in nature and are transmitted by the fecal-oral

route. An example of animal to animal transmission occurs when two animals are housed together, and one of the two has the salmonella bacteria in its feces, which then contaminates the food or water supply that the other cagemate is consuming. This occurs frequently in small, crowded cages. In people, contamination occurs when a person places objects or food in their mouths after handling salmonella contaminated material without utilizing proper hygiene (e.g., washing their hands with soap and water). Animals which appear healthy can act as carriers of the salmonella organism. These carriers can infect other animals and people for up to twelve months by shedding the salmonella bacteria in their feces.

Salmonellosis is best diagnosed by a veterinarian. Microbiological cultures of the animal's feces, cloaca, or blood may identify the organism. A positive test result is diagnostic for the disease, but a negative salmonella culture can be misleading as the organism may not always be identified, even from a known positive animal. It is wise to recheck all negative animals two or three times, with a two week waiting period between each test, to be certain that the salmonella organism is not present. Concerned owners are encouraged to set up a screening program with their veterinarian for salmonellosis and other important reptilian diseases.

Salmonellosis in People

Salmonellosis in people can manifest in many different ways. Perhaps the most frequent presentation is a severe gastroenteritis. The affected person develops a profuse, sometimes bloody, diarrhea. The rapid loss of fluids and electrolytes resulting from the diarrhea can lead



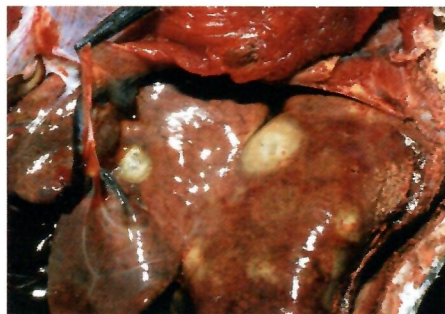
Salmonella abscesses in the skin of a green iguana.

to dehydration and death, especially in young children and persons already in poor health. Human salmonellosis can also be present as a dermatitis, or skin disease where the patient develops a red rash all over the body. If the salmonella bacteria enters the blood stream it can cause a salmonella septicemia. One of the potential sequelae to this is the invasion of the salmonella organism into the patient's bone causing a serious bone infection called osteomyelitis. A potentially fatal meningitis/encephalitis can also develop if the bacteria leave the blood stream and penetrates into the central nervous system.

This is a very serious disease in humans. All salmonella positive patients are maintained in isolation while in the hospital, and hospital personnel attending to the salmonella positive patients must follow strict quarantine techniques and procedures.

Once a person has been diagnosed with salmonellosis, the diagnosis must be reported to the Public Health Department. If the person has been treated and is found to be a carrier of the organism, he or she must then be registered with the Public Health Department, even after discharge from the hospital.

Since this is such a dangerous disease, it



Diagnosis of Salmonellosis in reptiles is often made after the animal has died. It may appear healthy one day, and then die suddenly the next. When a necropsy, or animal autopsy is done, large internal abscesses, such as this one seen in the liver, are sometimes found.

is wise for all reptile and amphibian owners to use meticulous hygiene when handling or working with their animals. The following guidelines are given to all clients with questions regarding salmonellosis, and especially to those clients where salmonellosis has been diagnosed on a bacterial culture from one of their animals.

A Guide to Salmonella Prevention/Control for Reptile Owners

1. Never eat or put anything in your mouth when working with your animals.
2. Never clean cages in the kitchen or anywhere you prepare food for human consumption.
3. Always wash your hands with a disinfectant soap after handling your animals. Iodine based soaps are available from any pharmacy. Trade names such as Betadine, Wescodyne, Prepodyne are some of the more common brands available.
4. Have your veterinarian examine sick



A salmonella dermatitis in a Chinese water dragon which had been misdiagnosed as a case of mites.

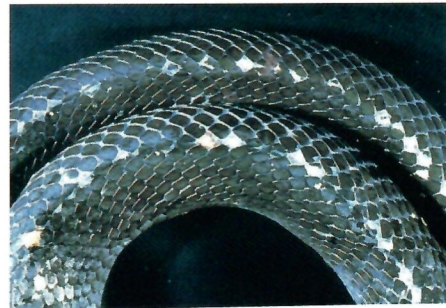
animals, or perform necropsies (animal autopsies) on animals which die suddenly, to check for salmonella.

5. Make it a practice to keep cages clean. Proper husbandry and hygiene are fundamental to keeping healthy animals and minimizing disease transmission (this is true for all diseases, not just salmonella).

6. Young children, immunocompromised individuals, and people on medical care from their physicians (such as antibiotic therapy, immunosuppressive drugs, etc.), should not handle reptiles and amphibians while taking the medications.

7. If you feel that you have been exposed to the salmonella bacteria, or if you have any questions regarding human salmonellosis, you are encouraged to see your family physician immediately.

Salmonellosis is not a disease to be taken lightly. It is very serious and can cause



Salmonella dermatitis in an Eastern Indigo snake.

death in animals and people. Since this is a zoonotic disease, and there are really no proven treatments in reptiles, our hospital usually suggests euthanizing the clinically affected animals. Although this may seem harsh, it is often a better alternative than potentially risking exposure of this disease to other animals in the household, or worse yet, to humans which come in contact with the infected pet.

The real dilemma, whether or not to treat, arises when a clinically healthy pet tests positive on routine health screens. Since many reptiles can act as carriers, and treating these animals can often result in resistant organisms, inapparent carriers, and/or the full-blown disease developing, I usually recommend **not treating** the positive animals. I do, however, recommend strict adherence to quarantine procedures and isolation of the positive animal.

Many different antibiotics against *Salmonella* have been tried. What usually happens with treatment is that the animal will temporarily stop shedding the bacteria through its feces, and will harbor the disease internally, only to begin shedding it again at a later date. The misuse of antibi-

continued on page 22



These are cross-sections of intestinal tract from a leopard tortoise. The section on the left is thickened from chronic infection by the *Salmonella* bacteria. The section on the right is normal.

A Century of Confusion: Asiatic Cobras Revisited

by
Wolfgang Wüster

Herpetoculturists often question the value and importance of taxonomic work done by museum herpetologists. In this paper a systematic herpetologist demonstrates how such work may not only enhance captive breeding programs, but also save lives.

The popular image of a cobra rearing out of a wicker basket, hood spread, revealing the spectacle marking on its neck and "dancing" to the music of a turban-wearing Indian snake charmer has made Asiatic cobras the most widely recognized snakes in the world. The fact that cobras are among the most venomous of all snakes, and are responsible for a good proportion of Asia's exceedingly high snakebite mortality, has further contributed to their notoriety.

Considering how well-known these highly impressive animals are, one would expect their basic systematics, meaning the nature and distribution of the species involved, to be thoroughly studied and understood. Until now, nothing could have been further from the truth. Since science first became aware of the diversity of cobra "forms" inhabiting the various parts of Asia, the problems posed by the classification of these snakes have elicited expressions of bewilderment from generations of herpetologists, from Boulenger (1896) to Golay (1985). All populations of Asiatic cobra are traditionally lumped within a single species, *Naja naja*, with ten subspecies recognized by most recent authorities. However, there is no agreement on subspecies definitions, and no one has felt able to produce a key to these subspecies.

Many herpetologists not involved in the study of taxonomy profess disdain for taxonomists and systematists, who are often regarded as rather pompous individuals,



Chinese cobra (*Naja atra*) from near Hong Kong.

sitting in museums, counting scales all day, confusing everyone by changing scientific names for no good reason, and probably drinking the alcohol from their specimen bottles. While a few taxonomists probably do fit this image, it would be a mistake to condemn the entire science of taxonomy as a waste of time. Taxonomy, the study of biological diversity, provides the basis for all other biological research by answering this simple, but fundamental, question: "What's what?" All further research on any aspect of a group of animals, including captive breeding and conservation, depends ultimately on sound taxonomic information being available and applied.

Because of the snakebite problem, the systematics of dangerously venomous snakes are of applied as well as academic interest. Venom composition may differ between snake species or populations. Consequently, an antivenin against one "form" may not be effective in the treatment of bites by another. Understanding the systematics of venomous snakes there-

fore becomes a priority when devising treatment strategies for venomous snakebite. A lack of understanding of the systematics of a group of venomous snakes can lead to the inadvertent use of ineffective antivenins. In some cases, such as the carpet vipers (*Echis*), this has led to greatly increased fatality rates.

Our research team at Aberdeen University launched a research program into venomous snake systematics because of the medical importance of such a study. The Asiatic cobra complex was identified as an ideal trailblazing project, because these snakes are of undoubted medical importance, their taxonomy was widely acknowledged to be unsatisfactory, and they are common enough to be well represented in museum collections. The Asiatic cobras therefore became the pioneer project for our venomous snake research program, which has since expanded to cover many other venomous snake groups.

The approach used modern statistical methods to analyze morphological characters (scalation, color pattern, position of internal organs, body proportions, dentition) recorded from preserved museum specimens. In old-fashioned taxonomic practice, workers would separately analyze each character recorded from their specimens, and problems would occur if different characters told different stories, which is of course very common. In those cases, entirely arbitrary decisions had to be made as to which characters were to be regarded as reliable. Modern, computerized, multivariate statistical analysis can analyze large numbers of characters simultaneously, and reveal the pattern of variation in the overall morphology of the animals. Results obtained by this method are naturally much more reliable than the outdated approach of looking at a few arbitrarily chosen characters.

This strategy also has several advan-

tages over the currently much more fashionable molecular techniques. By making use of the museum specimens collected over the last two centuries, which often have not been looked at by anyone since they were collected, the multivariate approach avoids the need to kill or traumatize large numbers of living specimens for the purposes of obtaining tissue or blood samples. This allows the inclusion of specimens of rare, endangered, or extinct taxa, which would be difficult or impossible to obtain alive for tissue sampling. It is also much cheaper and faster to do than molecular systematics (although in the bizarre world of academic finance, this can in fact be a disadvantage).

In our Asiatic cobra project, this mixed approach was extremely successful, and totally revised our understanding of the population systematics of these snakes. Far from consisting of a single species, the Asiatic cobra complex comprises at least *nine full species* (Wüster and Thorpe, 1989, 1990, 1991, 1992):

Naja naja - Indian spectacled cobra.

Distribution: India, Sri Lanka, Pakistan, Nepal, Bangladesh.

Naja oxiana - Central Asian cobra. Dis-

tribution: (Turkmenia, Uzbekistan, Tadzhiki-stan), Iran, Afghanistan, Pakistan, N. India.

Naja kaouthia - Monocled cobra. Distribution: north-eastern India, Bangladesh, Burma, Thailand, Cambodia, Laos, southern Vietnam, northern Malaysia, China (Yunnan), the Andaman Islands, Nepal.

Naja atra - Chinese cobra. Distribution: southern China, northern Vietnam, Laos.

Naja cf. atra - Indochinese spitting cobra. Distribution: Thailand, Cambodia, southern and western Laos, southern Vietnam*.

Naja sumatrana - Equatorial spitting cobra. Distribution: extreme southern Thailand, Malaysia, Indonesia (Sumatra, Borneo, Bangka, Belitung and the Riau Islands) and the Philippines (Palawan and Calamianes group).

Naja sputatrix - Southern Indonesian spitting cobra. Distribution: southern Indonesia (Java, Bali, Lombok, Sumbawa, Komodo, Flores, Lombok, Alor)

Naja philippinensis - Northern Philippine cobra. Distribution: northern Philippines (Luzon, Mindoro, Marinduque, Masbate, possibly also on the Calamianes and/or on Palawan).

THE VIVARIUM

Naja samarensis - South-eastern Philippine cobra. Distribution: southern and eastern Philippines (Mindanao, Samar, Leyte, Bohol and Camiguin).

(* Provisionally regarded as conspecific with *N. atra* by Wüster and Thorpe (1991) on the basis of morphological data, but recently revealed major differences in DNA sequence suggest it is a different species. The status of this form is still under study.)

The degree to which the population systematics of this group had until now been misunderstood is little short of stunning. The conventional subspecies of *Naja naja* were largely unrepresentative of these nine species. Some turned out to be insignificant color variations, others consisted of populations of more than one species. For instance, *Naja naja sputatrix* included not only the populations I recognize as *Naja sputatrix*, but also some (but not all!) populations here assigned to *Naja sumatrana*.

In many parts of southeastern Asia, where only a single subspecies of *Naja naja* had been recognized, there are in fact two sympatric cobra species. In some cases, such

"Because of the differences in venom composition, the bites of different Asiatic cobra species result in very different symptoms in humans."

sympatric species are strikingly different at first sight. Figure 1 and 2 shows specimens of the monocellate cobra (*N. kaouthia*) and the Indochinese spitting cobra (*N. cf. atra*) from western central Thailand. The differences in color pattern could not be more obvious, and they are matched by differences in scalation. Differences in behavior and ecology are just as striking: the monocellate cobra is a large (often 150 cm or more), generally very placid snake, which never, or only very exceptionally, spits, and occurs mainly in very wet, low-lying, irrigated rice fields; on the other hand, the Indochinese spitting cobra is a smaller (90-120 cm), highly-strung cobra, which will rarely miss an opportunity to cover an adversary with venom, and occurs primarily in slightly higher, drier areas. Thai farmers and snake catchers are of course well aware of the differences between these species. Indochinese spitting cobras are handled with some caution, while monocled cobras are often handled like pet corn snakes. The occasional irritable specimen only seems to add to the fun. My use of a grabstick to manipulate these snakes was generally regarded as rather unsporting

by the Thais. In comparison, Thai snake catchers manipulating Russell's vipers in my presence usually asked to borrow my grabstick. Despite these very obvious differences, the presence of two different cobra species in much of Thailand had been missed by a number of eminent herpetologists working in Thailand, including Malcolm Smith (1943) and Edward H. Taylor (1965).

However, any reader contemplating free-handling a *Naja kaouthia* should remember that risk assessment includes (1) the probability of things going wrong, and (2) the price one has to pay for getting it wrong. While the probability of getting bitten while free-handling an adult monocellate cobra is quite low, the price could be an unpleasant death, or the loss of an appendage.

Although the two species in western central Thailand are easily distinguishable, superficial resemblance alone tends to be a very poor guide to relationships of Asiatic cobras. Figure 3 shows some of the color pattern variation found in the three cobra species from Thailand and Malaysia, and demonstrates the extent to which specimens of different species can look much more alike than

specimens of the same species.

Before this study, venom researchers had already noticed marked differences between the venoms of different Asiatic cobra "forms". However, no sound systematic framework existed to make sense of the venom results. In fact, the research into snakebite symptoms and venom composition was hampered by the lack of an understanding of the systematics of these snakes.

Because of the differences in venom composition, the bites of different Asiatic cobra species result in very different symptoms in humans. There is a widespread belief among herpetologists that all cobras cause primarily neurotoxic bites, with symptoms such as drooping eyelids, speech difficulties, and respiratory paralysis. However, for some Asiatic cobra species neurotoxic symptoms are very rare, whereas severe tissue damage, usually thought to be characteristic of viper bites, is a common problem.

In a mixed series of *N. kaouthia* and *N. sumatrana* bites reported from northwestern Malaysia (Reid, 1964 - unfortunately, it is not possible, from the information



Fig 1. An Monocellate cobra (*Naja kaouthia*) from western central Thailand.

given in that paper, to separate the bites by species), only 12% of the victims developed neurotoxic symptoms; on the other hand, 44% of the victims developed local tissue destruction (necrosis), generally believed to be characteristic of viper bites; many patients did not develop any significant symptoms. In complete contrast, in a recent series of *N. philippinensis* bites in the Philippines (Watt et al., 1988), no fewer than 97% of patients developed neurotoxic symptoms, often with frightening rapidity, whereas necrosis was exceptional, occurring in only 7% of patients. Clearly, this variation in bite symptoms between the various species is of great importance for the treatment of human cobra bite victims.

These enormous differences in venom composition affect the usefulness of the antivenins produced to treat cobra bites in humans. Antivenins are produced by injecting snake venom into horses, which react by producing antibodies that give them immunity against the venom. The antibodies are then extracted from blood samples taken from the horse, purified, bottled, and used as antivenin. The problem is that if the venom of the snake that bit a human patient is very different from the venom used for antivenin production, then the antivenin will not neutralize the venom of the offending snake, and the treatment will be useless. It is therefore essential to know how the venoms of the various cobra species differ.

There are two possible ways of circumventing problems caused by sympatric species with different venoms. One is the production of a polyvalent antivenin, which is effective against all local species. The

other is the use of ELISA test kits, which can detect and identify the offending snake from venom traces at the bite site or in the patient's urine, allowing the correct monovalent antivenin to be used. These test kits are necessary for the identification of the offending species, because snakebite patients and the medical practitioners dealing with them are usually unable to correctly identify the various venomous snakes occurring in their area. However, these test kits are only as good as the manufacturer's knowledge of the systematics of the snakes involved: the production of test kits which can distinguish the venoms of two closely related species requires that the manufacturer is aware of the existence of the two species. Here again, understanding the systematics of the snakes involved is essential for further progress.

Understanding the systematics of dangerously venomous snakes is an absolute prerequisite for the effective treatment of their bites. Polyvalent antivenins need to be produced and distributed so as to cover all the cobra species occurring in the relevant area.

One point to bear in mind is that cobras are by no means the only venomous snakes with a confused taxonomy, and a complex pattern of variation in venom composition. Many venomous snake groups have never been comprehensively reviewed. Other genera of venomous snakes are known to pose serious problems with regard to antivenin compatibility (e.g., the carpet vipers, *Echis* spp.), and furthermore, significant venom variation can occur even within some species, such as Russell's viper (Warrell, 1989; Wüster et al., 1992a,b) or the Neotropical rattlesnake (*Crotalus durissus*).

This has serious consequences for the herpetoculturist. Anyone planning to keep or breed dangerously venomous snakes should investigate the literature on the systematics and venoms of their animals. They need to be sure which species they are actually about to acquire, and they need to make sure that they are buying the correct antivenin. For instance, buying Iranian antivenin for a Nigerian *Echis*, or Thai *N. kaouthia* antivenin for *N. sumatrana*, could quite literally be a fatal mistake. In the case of widespread species, such as Russell's viper, it is always preferable to buy an antivenin produced as near to the snake's origin as possible. If you are about to acquire Thai Russell's vipers, you should



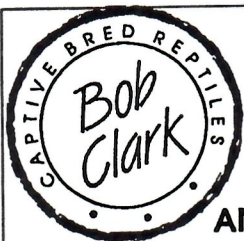
Fig 2. An Indochinese spitting cobra (*Naja cf. atra*) from western central Thailand. Despite the obvious differences between the *Naja kaouthia* and *Naja cf. atra* their sympatric occurrence in central Thailand had so far been overlooked.

Which is which? Your life may depend on it.

Fig 3. These six photographs show two color morphs of each of the three cobra species occurring in Thailand (*Naja kaouthia*, *Naja sumatrana* and *Naja cf. atra*). This shows how superficial resemblance can be a very poor guide to taxonomic affinities. Can you guess which is which? Answers below.



Solution. Top left: Monocellate cobra (*Naja kaouthia*) normal color morph. Top right: Indochinese spitting cobra (*Naja cf. atra*) brown color morph. Center left: Equatorial spitting cobra (*Naja sumatrana*) black color morph (Photo courtesy Francis Lim). Center right: Indochinese spitting cobra, black-and-white color morph. Bottom left: Monocellate cobra, cream-colored morph. Bottom right: Equatorial spitting cobra, golden morph.)



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Of course, the relevance of taxonomic studies such as this is not restricted to snakebite and venom research. Correct taxonomic information is essential for all fields of biological research, pure or applied. It is required by herpetoculturists who wish to develop breeding programs to raise genetically pure wild-type populations, rather than artificial, biologically and scientifically worthless hybrids, albinos or other designer forms.

Most of all, sound systematic information is needed for the conservation of what is left of the Earth's biodiversity, the main

aim of current conservation strategy. The relevance of taxonomic research can be summed up by stating that if we are to make coherent efforts to preserve the diversity of animal and plant life, we need to be aware of it in the first place. The case of the Asiatic cobras illustrates one potential disastrous consequence of insufficient systematic understanding: until now, all these cobras were thought to belong to one single species, so that if these animals were under severe threat of extinction in one part of their range, this would not necessarily ring many alarm bells, since there are plenty of cobras left in other areas. However, if there are nine different species, some with very restricted ranges, relatively localized threats could wipe out endemic species for good. In a hypothetical scenario, if cobras throughout the Philippines were to be exploited to the edge of extinction, we now know that we would lose two endemic species, *N. samarensis* and *N. philippinensis*, and we could therefore make the appropriate efforts to prevent their extinction. Wolfgang Wüster, Ph.D., Department of Zoology, University of Aberdeen, Tillydrone Avenue, Aberdeen AB9 2TN, Scotland, U.K.

Acknowledgements

Many people have helped enormously with the cobra work. Particular mention must go to Roger Thorpe and William Jordan in Aberdeen, Merel J. Cox, Jarujin Nabhitabhata and Piboon Jintakune in Bangkok, and Anselm de Silva and Sarath Kotagama in Sri Lanka. Numerous museums in Europe, North America and India loaned me the specimens on which the morphological work was based. I also thank Robert George Sprackland (San Francisco) for persuading me to write this paper.

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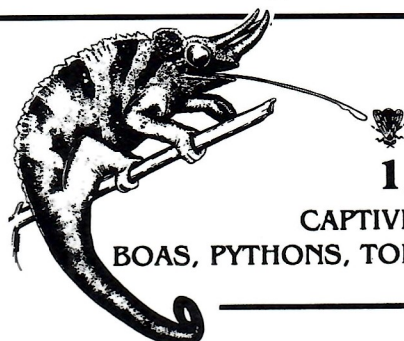
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Coming Events

by
Dorothy DeLisle

Events Wanted

The number of major herpetological events has increased dramatically in recent years, and they now span a range of topics, including academic herpetology, conservation, zoo professional meetings, herpetoculture, exhibitions, dinosaur exhibits, and sales bazaars. In the past, the herp event enthusiast used to be able to attend them all. Now, there are far too many to be able to afford the time and money to attend but a fraction of them. Alas, we must now make the painful decisions of which events we can attend, knowing that most events are worth attending and that the people who became our friends at past meetings will make their own independent decisions.

But wait, you say. If there are truly this many events, then why doesn't *The Vivarium* include more of them in their Major Herp Events section? *The Vivarium* would like to include all herp related events above the level of a regular monthly meeting in our Major Herp Events, but we are not psychic. We need to be informed of these events so that we can pass the information along to our readers.

The Vivarium is sent very few notices of upcoming events from their organizers. It gets most of its events information from word of mouth and from scouring newsletters and other magazines. Unfortunately, many of these are received or come across too late to use. Although we will usually try to insert an important event notice up to almost the last moment before going to press, there still remains the lead time of printing *The Vivarium*, preparing it for mailing and having it travel through the mail to our readers. Overseas mailing has been reported by some foreign members to take up to four months. Thus, we won't use an event notice unless it's for at least one or two months beyond press time.

The preceding scenario assumes the event notice arrived at the last moment. If it arrived earlier than that, then we must add on the time between arrival and press time which can be two months or more. Even local monthly society newsletters can have

a two month lead time!

One of the most important measures of an event's success is its attendance. However, some event organizers seem to be unaware of the importance of publicity in generating attendance. As I eluded to above, it's not just publicity, but *early* publicity that is critical. Most people can't leave for an event at a moment's notice; they have to schedule vacation time, get pet sitters, reserve airline tickets and hotel rooms, convince their spouses to let them go, and somehow come up with the money.

So, remember conference and event organizers, send notices of your event to *The Vivarium* and other media well in advance. Six months lead time would be good (but still short of ideal). If plans are still vague then, just send us the details you have, and we will print what there is. We have printed vague dates (such as "Spring 1992") in the past and are more than willing to start the announcement two years in advance. Be sure to include a contact address and phone. Remember, we can update the announcement as you send us updates.

The rest of you out there in the herp world can help by sending *The Vivarium* notice of any events you happen to become aware of. The event need not be exclusively dedicated to herps, but should have an obvious tie-in. Just clip it out or jot it down and send it in so that we all can have the opportunity to experience the trauma of having to decide among the multitude of major herp events out there of which to attend.

Major Herp Events

February 13-15, 1993: Sixth Conference on the Captive Propagation and Husbandry of Reptiles and Amphibians will be held in Davis, California. For info, contact: Rick Staub (707) 553-9739 or Mark Olin (707) 449-6425.

March 3-7, 1993: North American Wildlife and Natural Resources Conference will include a technical session on Ecology and management of Urban Habitats. For info, contact: Dr. Lowell Adams, National Institute for Urban Wildlife, 10921 Trotting Ridge Way, Columbia, MD 21044, ph.(301) 596-3311.

April 25-29, 1993: Third Aquarium Congress will be held in Boston, Massachusetts. For info, contact: John Prescott, Executive Director, New England Aquarium, Central Wharf, Boston, MA 02110.

May 27-June 2, 1993: Joint Meeting of the American Society of Ichthyologists and Herpetologists and the Herpetologists' League will be held in Austin, Texas and will include a special session on *Sceloporus*. For info, contact: Diana Dobson, Thompson Conference Center, P.O. Box 7879, University of Texas, Austin, TX 78713-7879, ph. (512) 471-3123, fax (512) 471-0647.

June 9-12, 1993: Seventh Annual Meeting of the Society of Conservationists will be held in Tempe, Arizona. For info, contact: Dr. W. L. Minckley, Department of Zoology, Arizona State University, Tempe, AZ, 85287-1501, ph. (602) 965-6518, fax (602) 965-2012.

June 17-20, 1993: 17th International Herpetological Symposium will be held in Miami Beach, Florida. For info, contact: Dr. Richard Ross, Institute for Herpetological Research, P.O. Box 2227, Stanford, CA 94309.

July 11-17, 1993: Second International Symposium on Turtles and Tortoises - Conservation, Restoration and Management will be held at the State University of New York. For info, contact: Craig Vitamenti, New York Turtle and Tortoise Society, 163 Amsterdam Avenue, Suite 365, New York, NY 10023; ph. (212) 459-4803.

September 12-16, 1993: Annual Conference of the American Association of Zoological Parks and Aquariums will be held in Omaha, Nebraska. For info, contact: Randy Wisthoff, Henry Doorly Zoo, 3701 South 10th Street, Omaha, NE 68107, ph. (402) 733-8401.

December 12-18, 1993: Third Latin American Congress of Herpetology will be held in Campinas, Sao Paulo, Brazil. For info, contact: Comissao Organizadora 3 CLAH, Departamento de Zoologia, IB, Universidade Estadual de Campinas, 13081 Campinas, SP Brazil

December 29, 1993 - January 5, 1994: Second World Congress of Herpetology will meet in Adelaide, South Australia. For info, contact: Dr. M. J. Taylor, University of Adelaide, Department of Zoology, Box 498, GPO, Adelaide, South Australia 5001, Australia.

Bold Confidence and White Boas

by
David G. Barker

Some snake species get more attention from snake fanciers than do others. Ever present in our collective consciousness are those snakes that form our common experience. These are the species that, at some point in our personal histories as evolving snake fanciers, ophiophiles and herpetoculturists, we mentally designate as *desirable*. For some, these shared species of desire were just passing fancies, a notch on the stick of herpetological experience; for others, the species hold the attention and interest of a lifetime.

There are few snake fanciers who do not or have not admired the boa constrictor. The name alone, *Boa constrictor*, stood for all that is tropical and exotic to us in those years past when we grew more obsessed with our interest. The boa is a lovely snake, large enough to fulfill our giant snake fantasies, yet sufficiently modest-sized to

pass our mothers' scrutiny. Boas possess a muscular grace and symmetry unique to themselves, with which none of the available local snakes could compare. And who has not long stared at the beautiful but subtle facial markings, the stripe that passed through the eye, the eyelash markings, the black rostral? Those of us now in our late thirties or older remember when boas were both inexpensive and in plentiful supply.

In 1983 the news ricocheted across the country that four newborn albino boas, imported from Colombia, were in California. The first photos of these babies were treasured as if they were valuable baseball trading cards. Those people lucky enough to have received photos were seldom seen without them in hand, and all the snake fanciers they encountered wanted a glimpse. These snakes, three males and one female, were purchased by a consortium of well-known snake breeders for a tremendous sum; the price paid for the boas (reportedly \$10,000.00 each) was, in 1983, the greatest amount ever spent to

purchase snakes.

Six years passed. The albinos quickly grew to adult size. They became sexually active as they grew larger, but no offspring had resulted. The owners came to the decision to sell one of the male albinos. In an act of bold confidence, Pete Kahl of Baltimore, Maryland flew to California in August, 1989, inspected the three males, selected one and flew it home.

It took bold confidence. The albino male cost \$25,000.00, probably the largest amount ever paid for a single snake. It had not sired any offspring while in the care of experienced snake breeders. And Pete Kahl had never successfully reproduced boas in his life.

Pete Kahl then acquired a group of six female Colombian boas and quarantined them from the albino male for several months. In late November the seven animals were placed together in a large cage in the basement of Pete's home. Overall the cage remained about 65° F (18° C) but an infrared heat lamp kept a small area of the floor at one end of the cage a warm 85° F (30° C). The animals usually stayed in a big pile under the warm light. During the months of December and January the albino male repeatedly bred each female. By April and May two of the female boas looked gravid. Both of these females produced clutches of healthy babies in June of 1990.

The babies, heterozygous for the albino trait, were normal in appearance and resembled their mothers rather than their famous father. One year later those babies were nearly six feet (two meters) in length and, because of their surprisingly large size Pete made the decision to include them in the coming winter breeding projects. As with the adults, the young boas were fed heavily in the fall. Feeding was stopped in



Clutch of 22 neonates at birth. Three of these were albinos. Photo by Peter Kahl.

mid-November and, in early December, the group of heterozygous albino boas were introduced together in a cage set up similar to that of the adults.

The eighteen month old animals were quite sexually active. Many copulations were witnessed during December through February. On 16 February 1992, Pete noticed that one of the females had a distinct large mid-body swelling. He took her from the group and placed her with the albino male. The pair copulated for two days, and then the albino male ceased to show any sexual interest in her.

Pete nearly camped by this female's

cage during her gestation. She did look and act gravid and now, because of her breed-

cipherable number of live babies.

At three in the afternoon of 17 June

continued on next page



One of three albino boa constrictors born on June 17, 1992. Photo by Ira Swadow.

ing with the albino male, there was the possibility that many of her offspring could be albino. Of course, as anyone with any knowledge of boa breeding knows, there is always a chance that nothing more than infertile egg masses will result from any captive boa breeding. Pete was admittedly frantic with anticipation, even after a sonogram done in early May revealed the movement of an inde-



Albino male parent of 1992 offspring, imported from Colombia in 1983 as a neonate. Photo by David G. Barker.

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White Boas *continued from page 21*

1992, while showing a visiting friend through his collection Pete noticed a pile of baby boas in the cage of the gravid heterozygous female. It was a large pile, 12 babies, all alive and healthy. None were albinos.

It is difficult to imagine just what must have run through Pete's mind in the moments after his discovery. Twelve babies seemed like a large clutch for the young female. His visiting friend made a worried inquiry about a refund on the heterozy-

gous babies that he had earlier purchased. Then they noticed the female pushing out another, again a normally colored baby. Pacing back and forth in front of the cage, the two of them started a watch. During the next very long two hours several more normal babies made their appearance and then, finally, an albino was delivered. In the final count, there were three albinos born in the clutch of 22 babies. They were the sixteenth, seventeenth and eighteenth babies to be delivered.

So the albino project, while still in its early stages, now can be counted as a success among the many other albino projects; corn snakes, western diamond-back rattlesnakes, California kingsnakes, bullsnakes, Florida watersnakes, checkered gartersnakes, Burmese pythons and other albino varieties of snakes now available all constitute definite captive lineages of animals, animals not taken from the wild. They are our domestic species, the living proof of our successes as herpetoculturists. Each of these projects was accomplished by people with strong interests and incentives, such as Pete Kahl.



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Salmonellosis *continued from page 13*

otics in both human and veterinary medicine has lead to the emergence of antibiotic-resistant strains of salmonella bacteria. Even animals which have microbiologically tested negative on three separate occasions can potentially harbor and shed salmonella organisms under certain circumstances.

Our veterinary hospital treats a wide variety of exotic and non-domestic pets every day. It appears that one of our staff members came down with salmonellosis from handling a sick animal brought to our clinic. The individual became so dehydrated from the associated diarrhea that she had to be hospitalized and placed on intravenous fluids.

Even though we are extremely careful in handling sick animals, this incident points out that the potential disease threats from animals are real, and everyone who works with reptiles and amphibians should be extremely careful.

To put this whole problem in perspective, veterinarians, veterinary staff and owners are at a greater risk of contracting salmonellosis from uncooked chicken and other meat products than they are from handling reptiles, if good hygiene is practiced. In 1990, the estimated health care costs for treating human salmonellosis exceeded 50 million dollars. A conscious effort at maintaining a sanitary work place and animal quarters, with proper attention to personal hygiene, will minimize the risk of infection with the salmonella bacteria.

For a comprehensive reference list on salmonellosis see: Fox, J.G. *Campylobacter infections and salmonellosis*. In Marcus, L.C. *Seminars in Veterinary Medicine and Surgery (Small Animal): Zoonotic Diseases*. 6:212-218;1991. Douglas R. Mader, M.S., D.V.M., Kathleen DeRemer, M.M.S., M.D. Long Beach Animal Hospital, 3816 E. Anaheim St., Long Beach, CA 90804

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Thank you.

Husbandry and Breeding of Collared Lizards

by
**Robert George
Sprackland**

Collared lizards are large headed, squat bodied residents of rocky habitats in dry areas, ranging from Kansas to California, and from Idaho and Nebraska south into Mexico. They were long classified in the family Iguanidae, but were removed by Frost and Etheridge in 1989 into a new family, the *Crotaphytidae*. This new taxonomy, accepted by most students of lizard relationships, combines the leopard lizards (*Gambelia*, which were long placed in the genus *Crotaphytus*) with collared lizards. Both genera are noted for their strong predatory natures, feeding upon large insects and other lizards, for which reason they must only be caged with animals of similar size. They also share the loss of the ability to regrow a lost tail, and possess the ability to run at high speed on the hind legs. Artists' renditions of this habit have suggested a mild similarity between collared lizards and the predatory Cretaceous dinosaur *Tyrannosaurus rex*.

Collared lizards remain popular with herpetoculturists in the U.S. and Europe, and captive breedings, including multiple generations, are fairly easy to achieve. However, few, if any, people commercially breed these lizards, and most animals available through dealers and pet shops remain wild-caught. The two taxa most frequently seen are the eastern collared lizard (*Crotaphytus c. collaris*) from much of Kansas, Oklahoma, Texas, and New Mexico, with the distinct green dorsum and orange throat of males, and the thinner, larger black collared lizard (*C. bicinctores*) of Nevada and parts of adjacent states. The latter lacks green coloring, has a dark throat, and numerous light spots on the dorsum. Collared lizards include at

least five species with an additional five subspecies assigned to *Crotaphytus collaris*. The relative flurry of taxonomic rearrangements of the genus published between 1970 and 1989 may understandably leave all but the serious student confused about how to differentiate collared lizards from each other. Adding to the confusion, only two or three taxa have been ecologically studied in any detail, while other taxa are all but unknown aside from their formal descriptions. It seems probable that new taxa remain to be discovered.

While observing these lizards in Kansas, Oklahoma, California, and Idaho, I have frequently seen them snatch large flying insects from out of the air, or intercept locusts in mid-jump. When feeding, they are indeed voracious, but I have never observed a wild specimen attack or eat another vertebrate. Collared lizards have a relatively short life span in the wild, about two to five years. Young hatch in the autumn, and they feed voraciously before finding shelter for winter brumation. Lizards find burrows or rocky crevices that extend beneath the frost line, and may spend up to seven or eight months in dormancy. Come spring, they emerge as active, drab-colored juveniles that resume eating everything they can catch and swallow. By their second fall, males begin to assume the coloration distinct for their sex, while females remain colored much as juveniles. Mating follows the second spring. Females receptive to mating sport bright orange spots along their sides, and these disappear shortly after copulation. In June-July, females deposit between two and twenty oval eggs into shallow holes they excavate in the soil, and hatching follows about six weeks later.

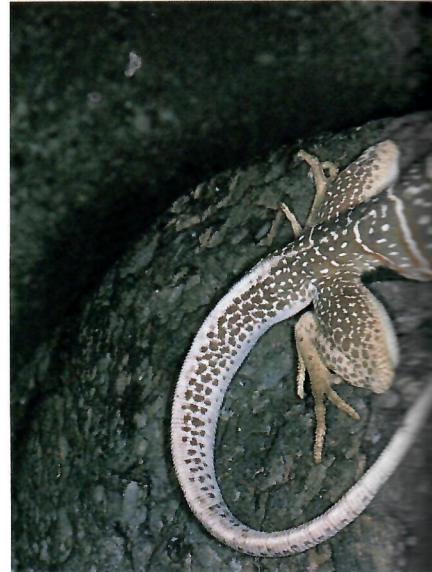
Captive animals may consume smaller lizards in the same terrarium, but I suspect that this is in response to insufficient offer-

ings of insect food. It had long been thought that female praying mantids routinely ate males during the mating process, because of the results of observations on captive mantids during the late 19th century. However, in the 1980s, zoologists at the University of California at Santa Cruz never observed such behavior because, they concluded, the females had been given a sufficient diet in their studies, while little if any food had been provided during their predecessor's work. In similar fashion, lizard predation and cannibalism by collared lizards may be more a symptom of shoddy husbandry, including inadequate vitamin/mineral supplementation, rather than natural tendencies of the lizards.

Collared lizards are relatively simple to maintain in captivity if their environmental and feeding needs are properly met. Wild-caught specimens are frequently covered with red mites (which are sometimes confused with small spots on the dorsum), so quarantine and treatment, if appropriate, are necessary when acquiring new animals. Because these lizards are active, highly territorial, and excellent jumpers, the terrarium for a trio (one male, two females) must be large—I suggest a minimum 3 feet X 2 feet (91 X 61 cm) groundspace, and a height of at least 2 feet (61 cm). In preparing a terrarium, give both floorspace and height (for rock piles) a high priority, because you cannot give these active lizards too much room. The substrate may consist of smooth gravel, sand, or a sand and soil mixture, and should be at least 4 inches (101 mm) in depth. When lizards are cool, or when they need to cool down from excessive heat, they are likely to burrow into the substrate, so if gravel is used, be sure to include adequate sandy areas as well. Collared lizards are rock dwellers (saxicolous), so a pile of stones (or better, the plastic aquarium "stones," which cannot crush lizards under them) is



A male reticulate collared lizard (*Crotaphytus reticulatus*). Photographed in Laredo, Texas.



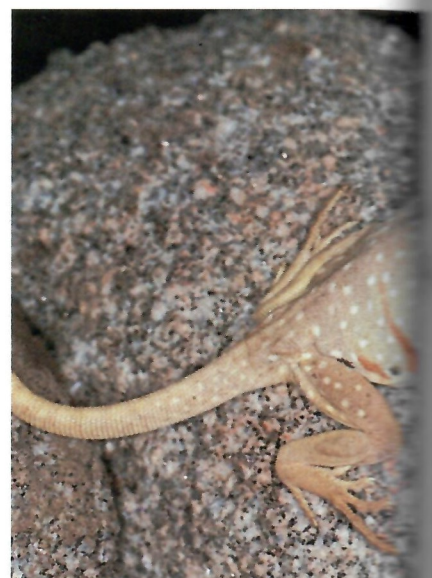
A male Baja black collared lizard (*Crotaphytus*).
San José de Comondú, Baja, California Sur



A male eastern collared lizard (*Crotaphytus c. collaris*). Photographed in Eddy County, New Mexico.



A male Mojave black collared lizard (*Crotaphytus bicinctores*). Photographed in Yuma County, Arizona.



A gravid female Mojave collared lizard (*Crotaphytus*).
Yuma County, Arizona.

Coll Liz Crota



stigium). Photographed 17 miles south of
co.



A male Chihuahuan collared lizard (*Crotaphytus collaris fuscus*). Photographed in Coahuila, México.

red rds hytus



A male black collared lizard (*Crotaphytus insularis*). Photographed in Isla Ángel de la Guarda, Mexico.



ytus collaris nebrisus). Photographed in Yuma



A male *Crotaphytus dickersonae*. Photographed in Sonora, México.

needed at each end of the cage. This allows the dominant male to choose a favored perch, and provides distance for a female to have a similar basking site. Animals that must cluster on a single rock site are subject to great stress, and subordinate specimens (usually the females) may quickly go off feed under these circumstances.

The territoriality of these reptiles is well documented. In a terrarium of the above dimensions, you should keep no more than one adult male and two females or subadult males. Few other lizards make good cagemates, and those that do will have different microhabitat preferences. For example, desert iguanas (*Dipsosaurus*) and leopard lizards (*Gambelia*) prefer flat, open, sandy areas to rocky arroyos. If the cage is large enough, they will stay in the sandy areas much of the time, leaving the rocks to the collared lizards. However, leopard lizards are also quite territorial, and at least as aggressive as collared lizards, so cohabitation by these two genera may result in mutual cage stress. Smaller saxicolous species, such as side-blotched lizards (*Uta*) and fence lizards (*Sceloporus*) are not likely to fare well in the company of collared lizards. They will either have difficulty in finding basking sites and obtaining food, or become food themselves.

Temperature is critical to successfully keeping collared lizards healthy and in full color. Daytime highs in the summer may reach 102° F (39° C) at 30-90% humidity, while nighttime lows may drop to 68° F (20° C). A heat lamp over basking sites is important, and should include a 250 watt lamp and a full-spectrum bulb for the terrarium described above. The heat lamp should be several inches above the screen mesh of the ceiling to avoid overheating the metal screen itself. Collared lizards are excellent jumpers and are frequently seen crawling inverted along such screens. Spacing of the lamp thus reduces the likelihood of burns to the lizards. Provision of shaded, cooler shelters (hence the deep substrate) is also essential. Lizards will retreat under rocks for general cooling, but tend to burrow a bit when avoiding excessive heat. If winter cooling is done, you may hibernate the lizards in deep substrate for a few weeks to several months.

The potential breeder of collared lizards must be sure of the taxonomy of specimens acquired. Many failed captive breeding attempts can be traced to mismatching a male of one species to a female of another

(or vice versa). Familiarity with the specific taxon to be bred is therefore paramount to success. In my experiences with *Crotaphytus collaris*, captive reproductive activity has followed cooling periods as brief as three weeks. Lizards are fed regularly until about 2 weeks before intended cooling. I have gradually reduced temperature by about 2 degrees per day over a two week period, at which point the lizards tend to bury themselves in the substrate beneath the rock piles. I have never chilled collared lizards below minimum house room temperature, about 60° F (16° C), enough to induce dormancy and allow mating behavior upon resuming a summer temperature regime. My specimens were cooled during March, for 2-4 weeks; no mating activity was observed after cooling periods of less than three weeks.

In captivity, eggs are laid in deep, slightly moist substrate that the female excavates and reburies in a noticeable mound. Eggs must be removed and should be incubated in vermiculite or sand in a plastic container or clear plastic bag such as the kind used to transport tropical fish. Incubate eggs at a temperature of 85-88° F (30-31.5° C) at about 60% humidity. Juveniles may be safely housed together during their first year, but should be paired once adult coloration becomes evident.

Juveniles and adults are active, and should be fed daily, though adults may be adequately fed on alternate days. Include as broad a variety of insects as possible, including grasshoppers and locusts and other orthopterans (crickets and roaches), as well as moths and beetles that are readily caught during spring and summer months. Supplement this with commercially available crickets, king mealworms, and mealworms, along with an occasional dandelion flower, or orange section. Collared lizards require frequent feedings to accommodate their high activity levels, and are prone to rapid starvation if neglected. Any activity taking you away from the lizards for more than four days requires you to find someone to feed the lizards for you during your absence. Because of their large gape, young collared lizards are relatively simple to feed, and are capable of consuming all but the largest crickets. These lizards do drink water, mainly in the form of dew drops in the morning, so they should be lightly sprayed with water daily. They rarely take water from a dish, which typically becomes a repository for sand and

debris, and can safely be omitted by the herpetoculturist.

Despite their huge heads, collared lizards do not bite nearly as hard as, say, an equivalent-sized crocodile lizard (*Shinisaurus*) or many herbivorous iguanids. Still, they may break the skin and cause bleeding, so care should be exercised when handling these animals and wash off any bitten area with soap and water. Collared lizards seem to still be common in parts of their range, and with the increase in captive breeding, it is hoped that their place among reptile enthusiasts will be secure for years to come. Robert Sprackland, Professor of Biology, Skyline College, San Bruno, CA.

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Desert Tortoise

(*Gopherus agassizii*)

Nesting Behavior

by
Breck Bartholomew

Several authors have observed nesting behavior of captive desert tortoises (*Gopherus agassizii*) (Miller 1932, 1955; Stuart 1954; Nichols 1957; Booth 1958; Lee 1963). But, nesting behavior in the wild has been reported only twice and these observations are quite limited (Hampton 1981; Roberson, et al. 1985). Miller (1955) presented the only illustration of *G. agassizii* nesting behavior in a photograph of a captive tortoise laying eggs. Observations of animals from Utah indicate that some behavioral aspects of nesting have been overlooked by previous authors.

The following observations of desert tortoise nesting behavior occurred on the Beaver Dam Slope, Washington County, Utah (37°03'N, 113°57'W), in the north-eastern Mojave desert. The conspicuous vegetation is creosote (*Larrea tridentata*) and Joshua tree (*Yucca brevifolia*).

On 24 May 1989, gravid tortoise designated BDS #559 (MCL 8.35 in; 212 mm) dug a burrow ca. 3.28 ft (1 m) deep, opening west, beneath a creosote bush. This was unusual behavior for this tortoise which had previously used existing burrows. At 1120 h on 25 May 1989 she was found excavating a nest next to a *L. tridentata*, approximately 32.8 ft (10 m) N. of the burrows dug the day before. The nest was dug by extending hind-limbs forward and downward, then swiftly kicking back causing dirt to clear the edge of the hole. (Fig. A). The tortoise alternated use of the hind limbs after every two or three scoops. The final nest cavity was a covered chamber with a sloped floor (Fig 1). The



A female desert tortoise from Washington County, Utah.

excavation of the nest continued for 45-50 minutes, until it was interrupted by the first egg. The tortoise tried to continue digging, but each time it extended a hind limb, it appeared unable to, and would lift the leg and the posterior part of the plastron. After trying to continue digging for a few minutes she placed her hind legs on either side of the nest and positioned the cloaca above the center of the nest cavity.

At 1210 h, the tortoise began a sequence of extending its head, inhaling, then holding its breath and retracting its head into the shell (Fig. B). Egg movement (cloacal swelling) was noticed while the tortoise was holding its breath with its head retracted. After about 30 seconds the tortoise exhaled, then repeated this sequence until the egg was laid. The first egg rolled down the slope into the nest chamber (Fig. C). When the remaining three eggs were laid, the tortoise

pushed the eggs with her hind limbs (Fig D), apparently packing them into the covered part of the nest. The tortoise laid her entire clutch (4 eggs) in about 30 minutes.

Immediately after the fourth egg was laid, the tortoise pushed the eggs into the nest cavity, then began to cover the eggs in a manner similar to excavation, i.e., the hind limbs were alternated after every two or three scoops (Fig. E). Nest burial was observed until the eggs were barely covered (1305 h). On 26 May 1989, the nest was completely covered.



Desert tortoise habitat on the Beaver Dam Slope. Notice the tortoise at the base of the creosote bush digging a nest.



Figure A.

An area ca. 1 X 1.6 ft (0.33 X 0.5 m) had been disturbed (Fig. F).

A second tortoise, designated BDS #1000 (MCL 271 mm), was observed during the final stage of nest burial on 2 May 1989. The tortoise walked back and forth around one-third of a creosote bush moving dirt with all four legs. The tortoise was also observed sniffing the ground frequently. The nest was indistinguishable from the surrounding area when the tortoise finished. The nest cavity was in the center of the disturbed area in BDS #1000's nest, but BDS #559's nest cavity was in the left third of the disturbed area. Of fifteen nests examined during 1989, none showed signs of being urinated on, as reported by Miller



Figure C.



Figure B.

(1955), Booth (1958), Lee (1963), and Hampton (1981).

From these observations, and those of previous authors, several generalizations can be made about desert tortoise nesting behavior: pre-nesting behavior consists of an increase in digging activity and this digging behavior is not limited to the hindlimbs (Stuart 1954; Miller 1955; Booth 1958; Lee 1963; Hampton 1981). Once the nest site has been selected, the hindlimbs are used exclusively (Stuart 1954; Miller 1955; Nichols 1957; Booth 1958; Lee 1963; Hampton 1981). The nest cavity is a covered chamber with a sloped floor (Miller 1955; Lee 1963) (Fig. 1). The hindlimbs are used to "pack" the eggs within the nest cavity (Miller 1955; Lee 1963) (Fig. C) and to fill in the nest (Stuart 1954; Miller 1955; Lee 1963). Tortoises occasionally void on the nest (Miller 1955; Booth 1958; Lee 1963; Hampton 1981). In addition to these observations, egg laying in *G. agassizii* may be facilitated by the retraction of the head while the lungs are expanded; final nest burial may involve both the fore and hind limbs and ground sniffing.

The observations of final nest burial may not be typical of *G. agassizii*, since nests at lower latitudes are primarily found within at the base of burrows (Roberson, et al. 1985). Nests on the Beaver Dam Slope and in St. George Valley are commonly found under vegetation, away from pallets or burrows (B. Bartholomew, R. Bezette, and M. Coffeen pers. obs.). This may be due to the incubation requirement(s)-weather interaction being different in the northern Mojave than in the southern regions.

I would like to thank Mike Coffeen and the Utah Division of Wildlife Resources for funding the research which allowed these observations to be made. Mike also commented on a draft of this manuscript. James A. MacMahon and Cynthia Bartholomew provided helpful comments and suggestions during the writing process. Breck Bartholomew, Synergy Research & Consulting, 195 west 200 North, Logan, Utah 84321-3905.

Editors Note: While Breck was working on the Beaver Dam Slope, the population density stood at approximately 75 tortoises/mi². Few dens were found with more than two tortoise in them. Of the twenty or so

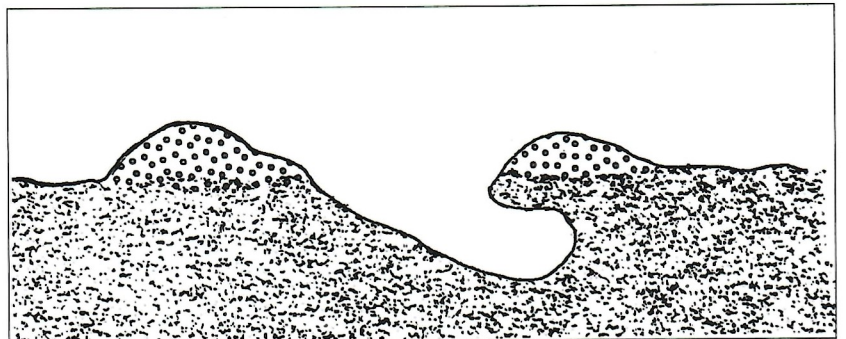


Fig 1. Cross-section of a desert tortoise (*Gopherus agassizii*) nest. Dots represent soil which was displaced by the tortoise.



Figure D.



Figure E.

female tortoises monitored during the study, 12 laid eggs at least once, two double-clutched, and one triple-clutched. The average clutch size was 5.1 eggs. Nests were protected from predators and approximately 90% of the eggs hatched. Unfortunately, the project has not been funded since 1989, so reasons for the tortoise decline on the Beaver Dam Slope remain unknown.

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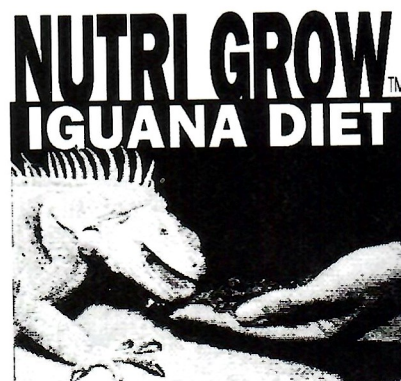
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Figure F.

Federal Government Pushing State Level "Exotic Animal Legislation"

by
Phil Jones

Are you worried that pending state legislation will take away your reptiles and amphibians? Do you know who is behind this? Do you know who is pushing this legislation year after year? The Federal Government is in the "crusade" to legislate hundreds of species into extinction through the United States Department of Agriculture and the Department of Interior, Division of Fisheries and Wildlife.

In a 48 page document entitled "The Southeastern Cooperative Wildlife Disease Study," dated November 10, 1988, from Department of Parasitology, College of Veterinary Medicine, The University of Georgia, Athens, is the "National Model Legislation" for each state. This document is addressed to the State Fish and Wildlife Agencies; State Agriculture Departments; State Public Health Departments; and Individuals and Associations Interested in Captive Wild and Exotic Animals.

In the State of Missouri the Conservation Commission has pre-filed a 17-page bill that is written in language that is directly quoted from the "Proposed Model Legislation." Mr. Joe Damke, of the St. Louis Herpetological Society, and myself solicited and attended a meeting in early October 1992 with Ollie Torgeson, State Director of Fisheries and Wildlife. We were promised that there would be a public meeting to "utilize the input of the Exotic People to come up with a bill that we can all live with." No such meeting took place and furthermore the bill was pre-filed in the Missouri House of Representatives in EARLY December 1992!

The following statements are direct quotes from the "National Model Legislation" and the "Missouri Pending Legislation." This language will, in all likelihood,

become important to you and your animals in the very near future. Please be aware of the following legislative language:

Section II Jurisdiction

(A) The Missouri Department of Conservation is the lead regulatory agency for entry and intrastate movement, sale, transfer, exhibition, possession, and release of captive wild and exotic animals. Determination of adverse environmental and disease consequences posed by captive wild and exotic animals to free living native wild animals is the responsibility of the Missouri Department of Conservation. In regard to disease implications, the Missouri Department of Conservation will consult with other agencies and authorities.

(B) The Missouri Department of Agriculture reserves the right to immediate examination and testing of captive wild or exotic animals when there is probable cause that the animals are harboring diseases or parasites suspected of endangering domestic animals. Measures deemed necessary to protect domestic animals and agricultural, horticultural, and forestry interests including quarantine, seizure, indemnification, and destruction within the legislative authority of the Missouri Department of Agriculture may be carried out independently of other state agencies. The Missouri Department of Conservation and the Missouri Department of Health will be advised of such activities.

(C) Same as above. Missouri Department of Agriculture is removed and the Missouri Department of Health is inserted in its place.

Section IV. Permits

(A) Decision to Require Permit:

(1) Advisory Regulation Review Board (ARRB).

There shall be created an Advisory Regulation Review Board.

(a) The ARRB shall determine the per-

mit requirements for ownership and possession of captive wild and exotic animals. The decision regarding permit requirements will be made by the ARRB after receiving comments from the general public through a public hearing procedure. It will not be the purpose of the ARRB to handle each individual permit application.

(2) Criteria for Assigning Permit Requirements.

(a) The Department of Conservation has the authority to develop the criteria and promulgate regulations for all types of permits for the ownership, transfer or possession of any species of captive wild or exotic animals.

(c) Inherently Dangerous to humans: Assignment of permit requirements to insure the physical safety of humans should be determined by the Missouri Department of Conservation and Missouri Department of Health for these animal species considered capable of inflicting severe bodily harm to humans. Permits to possess animals inherently dangerous to humans must be obtained from the Missouri Department of Conservation prior to transfer of ownership within the state on receipt of a shipment of animals from outside the state. Animals defined as inherently dangerous to humans are:

2) Class Reptilia:

Gavials (Family *Gavialidae*)

Crocodiles (Family *Crocodylidae*)

Alligators, caimans (Family *Alligatoridae*)

Cobras, coral snakes (Family *Elapidae*)

Sea Snakes (Family *Hydrophiidae*)

Adders, vipers (Family *Viperidae*)

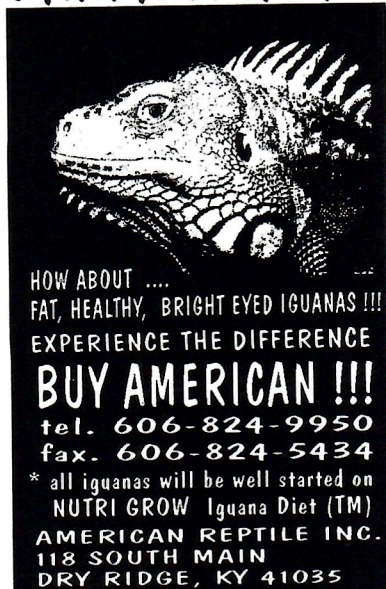
Pit vipers (Family *Crotalidae*)

All venomous rear-fanged species (Family *Colubridae*)

Gila monsters and beaded lizards (Family *Helodermatidae*)

Komodo dragon (*Varanus komodoensis*)

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Rock python (*Python sebae*)

If these regulations have not already been adopted in your state they could be in the VERY near future. As one of your AFH Legislative Representatives, I can only advise you that it is very important that we all stand together as an organization regarding this problem, which is not limited to our areas of interest. You must understand that it is not just the herpetocultural hobby that is in jeopardy regarding this matter. The aquarium, cage bird, ostrich, zebra, etc., hobbyists are all in this with us. We must stop this legislation at the city, county, state and national levels. Please help fight this travesty of constitutional freedom before this is quietly passed as law and we lose the rights to keep our pets. Do not be apathetic on this issue.

Take a few moments of your time to write us a paragraph stating your objections to this legislation. These letters are very important tools as we represent your interests in the capitals across the U.S.A. Please do your share... to show you care! Mail all responses at your earliest possible convenience to:

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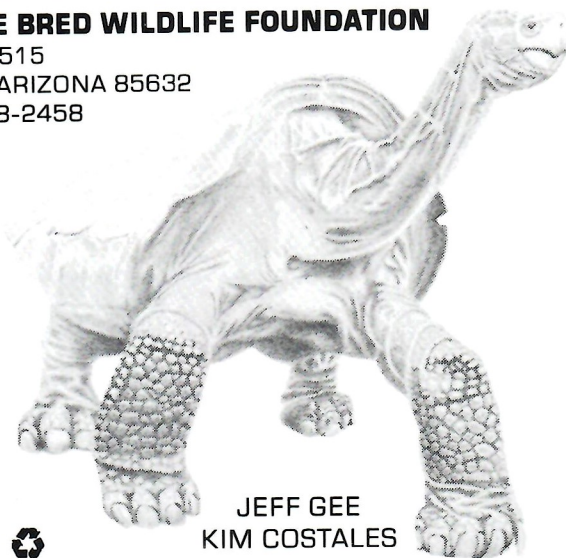
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The Pacific Treefrog

(*Hyla regilla*)

by
Mark Baumann

I think it is the rare person in the Pacific Coast states that has not heard the loud kreck-ek of the Pacific treefrog (*Hyla regilla*). It is one of the, if not the, most common anurans in its range. This treefrog ranges from southern British Columbia to northern Baja California, east to western Montana, Idaho, and eastern Nevada. It also occurs on the Channel Islands off the coast of southern California.

The Pacific treefrog is found from below sea level to around 11,600 feet (3500 m) and frequents a variety of habitats. It can be found in grasslands, chaparral, woodlands, forests, desert oases, farmland, and back yard gardens. Chiefly a ground dweller, this "treefrog" can be found among low plant growth near water or suitably moist environments far from water. Some taxonomists consider this species to be a cricket frog and place it in the genus *Pseudacris* rather than *Hyla*.

Adult Pacific treefrogs can reach a total snout-vent length of two inches (5 cm). Despite a ground dwelling inclination, these frogs do have toe pads.

A black or dark brown eye-stripe is almost always present, although it can be difficult to distinguish on dark individuals. The dorsal coloration is highly variable, and can be tan, reddish, grey, brown, black or green, the last being my personal favorite. Individual frogs may change from light to dark in a matter of minutes. This is influenced by the amount of light, environmental changes or stress. Color change is limited to a lightening and darkening of the basic color, not to switching among the colors listed above. A dark triangular spot may be present on the head. Dark spots on the back and legs vary in distinctness, depending on the color phase. The ventral



The habitat of the Pacific tree frog (*Hyla regilla*) in Baja California, México. Photo by Jimmy A. McGuire.

region is cream, and the hind legs yellow.

Males can be distinguished by their slightly smaller size and wrinkled gray throat. The female's throat is smooth and matches her venter in color.

The tadpoles are blackish, dark brown, or olive brown, usually heavily spotted dorsally. The ventral side is whitish with a bronze or copper sheen. They attain lengths of up to 1 3/4 inches (4.4 cm).

Breeding occurs from November through

July, depending on climate and elevation. Marshes, lakes, ponds, roadside ditches, reservoirs, slow streams, back yard water gardens, and neglected pools are all utilized. The vocalization of the males around a favored breeding site can be deafening. Many Hollywood movies or television programs, sometimes depicting an exotic foreign location, have had the sound of Pacific treefrogs as background noise.

I have been enamored of Pacific treefrogs since I was five years old, when my father caught one and built a cage to keep it in. This sparked my interest in herptiles.

These frogs make great vivarium pets. A pair can be kept in a five gallon terrarium with a tightly fitting screened lid. Suitable natural plants and branches can be used to create a simulated natural setting. A bowl of water should be provided. Although UV lighting does not seem to be essential to the survival of these frogs, a Vita-lite® can be used, especially if live plants are present.

My Pacific treefrogs reside in a large community vivarium with California treefrogs (*Hyla cadaverina*), grey treefrogs,



A Pacific tree frog (*Hyla regilla*) from the Baja California Sur region of México. Photo by Jimmy A. McGuire.



A pair of Pacific tree frogs in amplexus in Arroyo Calamajue, an isolated oasis habitat surrounded by desert in Baja California, México. Photo by Jimmy A. McGuire.

(*Hyla versicolor*), green treefrogs (*Hyla cinerea*) and canyon treefrogs (*Hyla arenicolor*). Artificial grass carpet, tree branches, large bark pieces for hiding and a large shallow bowl are utilized in the tank. The artificial grass makes for a quick and easy cleanup.

As I live in the San Diego (California) area, I do not provide any artificial heat. The Vivarium actually stays on my shaded patio year round. For those of you not so fortunate, daytime temperatures of 64 - 77° F (18 - 25° C) and nighttime temperatures of 54 - 64° F (12 - 18° C) are ideal. These frogs can be overwintered at 50° F (10° C).

Captive reproduction is not difficult, although it can be time consuming. I have had numerous successful breedings using

a rain chamber, including fifth generation captive breeding and offspring. The idea is to create a rainy season which usually triggers a breeding response, providing the frogs have been properly conditioned first. My rain chamber consists of a 55 gallon fish aquarium tank with a wire screen lid to which was fixed a large plastic tray with small holes in it to allow water to flow out it to simulate a rain shower. Several large rocks were placed in the aquarium. These served as perching sites for the frogs in amplexus to properly fertilize their eggs. An overflow drain was put into the side of the aquarium to allow for the retention of dry land above the water level.

Initially, the frogs that were to be bred were placed into the rain chamber with a

bowl of water. Over a period of a week to ten days, artificial rain was created daily until eggs were observed. A single female may lay over 600 eggs in loose irregular clusters of 9 - 80. The eggs were removed to shallow trays with aerated water. Being careful not to disturb the eggs, half of the water was drained off each day and replaced. The larvae emerge from the eggs in about five days. The tadpoles' back legs become visible in 15 - 18 days, with front legs breaking through approximately 15 days later. About three days after that, the first of the juvenile frogs, still having a tail remnant, will venture onto land. The froglets are usually 0.6 - 0.8 inches (1.5 - 2.0) SVL.

In captivity, Pacific treefrogs will eat crickets, meal worms, and wax worms. Freshly metamorphosed froglets will eat fruit flies and pinhead crickets. All food should be liberally dusted with a powdered calcium, vitamin/mineral mix. Tadpoles can be fed algae or garden greens (spinach, dandelion, beet tops, leaf lettuce). I do not feed head (iceberg) lettuce. The greens should be parboiled or frozen, as these processes break down the plant cells enough to enable the larvae to digest them. Juveniles and tadpoles should be fed daily. Adults need to be fed only two or three times a week. Be careful not to overfeed as adults will become sedentary and overweight, shortening their lives, and making them less inclined to breed.

The most common disease associated with captive Pacific treefrogs is red-leg, which is caused by the bacterium *Pseudomonas hydrophilia*. Typically, it can appear largely as a result of overcrowding, or an unclean cage. The symptoms are a reddening of the skin with hematomas along the legs and abdominal region. For treatment, consult a qualified herpetile veterinarian immediately. As a preventative measure, I clean the terrarium weekly with a dilute bleach solution (1 part bleach to 20 parts water), being sure to rinse away all the bleach before putting the frogs back into the enclosure. Water bowls are cleaned daily. I treat the water with methylene blue, an anti-bacterial agent.

The Pacific treefrog is an attractive and interesting amphibian. If the opportunity to acquire a few of these frogs arises, do so. I am sure that they will provide for you as much enjoyment in a planted vivarium as they have provided for me.



A pair of Pacific treefrogs (*Hyla regilla*) in amplexus in a coastal stream in central California. Although the male in this photo is yellowish-green and the female brown, this species is not sexually dimorphic. Photo by Sean McKeown.

THE VIVARIUM

In Support of the Keeping of Boas and Pythons by the Private Sector

by
Philippe de Vosjoli

One of the most important legislative issues for herpetoculturists today involves the increase in legislation restricting the right to keep amphibians and reptiles, particularly snakes in the family Boidae. The basis for this legislation is often biased, supported by ill-founded arguments, and reflects a general ignorance and underlying fear of reptiles (particularly snakes) by members of the public, including some in government.

The recent case of a man killed in Canada by his Burmese python has further fueled this controversy. The following is a presentation of the author's personal views on this topic. It concludes with updated AFH guidelines for the responsible keeping of large boas and pythons by the private sector. The issue of the responsible keeping of large boas and pythons in schools was recently addressed by Dan McCarron, AFH Education Coordinator (see *The Vivarium* 4.1).

The Issue of Individual Rights

In the preamble to the U.S. Constitution, we are given the right to the pursuit of happiness. We also have the right to life and liberty. In theory, we should have the

right to keep amphibians and reptiles to enrich our lives, as long as we do it in a responsible manner which does not cause injury, or threaten the welfare of the general public. The right to include animals in our lives is one that fulfills deep needs for relationship with the natural environment. It is a precious, increasingly threatened right that should not be abused through irresponsible animal keeping and exploitation. A key associated issue which needs to be addressed by the pet industry and all animal keepers is that of responsible animal keeping which takes into consideration the welfare of the animals.

I am choosing not to dwell on the issue of animal rights or the anti-exotic pet position supported and sponsored by organizations such as the Humane Society of the United States and various animal rights organizations. I have presented, in other articles, arguments in favor of the responsible keeping of

animals and the critical role this can play in providing a sense of meaning, perspective and connectedness with the natural world (see *The Vivarium*, 3.4 and 4.2).



The Colombian variety of *Boa constrictor imperator* tends to be very docile when captive-raised and is a relatively safe pet compared to other domestic animals kept by humans. They are not, however, recommended for minors, who should always be supervised by an adult during handling. Photo by Wendell Leopard, courtesy of Reptile Haven.

What About Regulations?

There appears to have been a trend in the last few years for cities or states to draft ordinances or regulations to control or restrict ownership of large snakes. Various agencies or organizations directly or indirectly support these regulations, particularly with regard to the ownership of large constrictors (typically, boas and pythons which can achieve an adult length of over 8 feet). They contend that the public should be protected from the remote possibility of danger from these animals. Most of these proposed regulations conceal the underlying persistent bias against snakes which to this day permeates the attitudes of many people.

One would assume from these regulations that potentially dangerous things should not, as a matter of course, be possessed by the general public. One could also be led to believe that these various agencies look out for our welfare. In fact, our lives are routinely affected by much greater probabilities of danger than those presented by large constrictors -- dangers condoned by numerous agencies, as well as the federal government. Dogs raised and kept by irresponsible owners are clearly dangerous, as plenty of statistical data indicates (12 - 15 deaths per year, millions of dollars spent in treating bites). Cats can be dangerous; they can claw (many people don't seem to mind). They also account for a significant percentage of reported animal bites and can carry some nasty diseases. Living near other human beings can be very dangerous. In fact, based on available statistics, a human being has a far greater chance of being seriously injured from a bite by a fellow human than by a large constrictor.

The cars we drive are potentially dangerous, as approximately fifty thousand deaths and several hundred thousand injuries per year indicate. Smoking is hazardous not only to the smoker's health but also to the health of others. Private ownership of guns is also clearly dangerous and life-threatening. Horses, if one were to look at available data in the U.S., are one of the most dangerous of domestic animals and many times more dangerous than snakes, in terms of deaths and injuries (see Table 1). The electrical appliances in our homes are dangerous, as is the use of natural gas. Drinking alcohol, when done in an irresponsible

SOME FACTS ON HUMAN DEATHS IN THE U. S.

HUMAN DEATHS CAUSED BY ANIMALS

	Per Year
Horses ₁	219
Dogs ₂	14
Reticulated pythons ₃	0.3
Burmese pythons ₃	0.1
Other pythons ₃	0
Boa constrictors ₃	0
Other boas ₄	0

HUMAN DEATHS BY ACCIDENTS

	Per Year (Average between 1986-1988)
Motor vehicles ₅	48,411
Firearms ₅	1464
Drowning during sports or recreation ₅	1030
Domestic wiring and appliances ₅	131

1991 ESTIMATED HUMAN INJURIES BY HORSES IN THE U.S.

Horses ₆	71,490
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1 NEISS estimated 105 deaths per year, but this would be low because many horse related injuries do not go to emergency rooms but to morgues (Bixby-Hammett 1990). The figure of 219 was determined using medical examiner figures and population. (Bixby-Hammett 1987).

2 National Safety Council, Accident Facts 1991 Edition, average between 1986 and 1988.

3 Average between 1978 and 1988 (see McCarty, et. al. 1989). There may have been one additional death by a Burmese python during that time period which would raise the figure for the Burmese python to 0.2.

4 There is a rumor of one individual killed in the U.S. by a green anaconda but we have not yet been able to substantiate this.

5 Compiled from the National Safety Council, Accident Facts 1991 Edition, average between 1986-1988.

6 Figures from National Electronic Injury Surveillance System (NEISS), a part of the U.S. Consumer Product Safety Commission. NEISS recorded horse related accidents that go to emergency rooms at identified hospitals. The majority of the accidents occurred at home (48.6%).



Some Burmese pythons (*Python molurus bivittatus*), when interacted with, will demonstrate an unusual degree of awareness. Although captive-raised individuals can be one of the most rewarding of the large snakes, they warrant sound management procedures because of their size. Photo by David Barker.



Juvenile green tree pythons (*Chondropython viridis*) rank among the most beautiful of the land vertebrates. This species is now bred in some numbers in the U.S. and has proven very adaptable to captivity. It is an ideal display animal. Photo by David Barker.

manner, can be very dangerous.

In the midst of such numerous potential dangers which are an intrinsic part of life, poorly informed and biased state and local agencies regularly propose laws and ordinances which would attempt to ban ownership of large constrictors. **If one relied on hard data rather than bias, one could make a much better case for banning ownership of dogs, horses, guns, automobiles, etc.**

The Issue of Avocational Risks

The case of Mark Nevilles, recently killed by his Burmese python in Canada, is a sad incident that could have been avoided by responsible herpetocultural practices. Many details of this case raise several questions about this incident, including a) the relatively small size of the snake. b) The fact that Mr. Nevilles was intoxicated, c) bite marks were found on the hand, and d) the snake in question was said to be in shed with eyes completely opaque. But to generalize from that incident to outlaw the keeping of boas and pythons by the private sector is an extreme overreaction. An issue that needs to be addressed is that of avocational risks when an avocation does not present a significant risk to the general public. The notion of avocational risk is fairly well established in American society. Many individuals have avocations which have associated with them a significant degree of risk. The risks involved are generally accepted by society because the avocations have a minimal risk probability of endangering the uninvolved public. These avocations run from sports, including car racing, motorcycle racing, hang gliding, to pastimes such as horseback riding, white water rafting, skiing, scuba diving, the use of certain tools, etc. Though regulations are passed to assure responsible practice of these avocations, there are no laws making them illegal. On weekends, in fact, thousands of people spend hours watching, on television and in various stadiums, individuals exposing themselves to these avocational risks. The death of an adult individual killed by his python, sad an incident as it is, is an example of an avocational risk. Compared with many human activities, the avocational risks of keeping a large python is relatively small and with responsible maintenance practices can virtually always be prevented.

Are members of government allowing their biases against snakes prejudice their judgment in their interpretation of such an incident? Think about it.

AN OVERVIEW OF THE PYTHONS AND BOAS

All boas and pythons are snakes belonging to the family Boidae, which has been subdivided into the following distinct sub-families (Kluge 1991):

Boinae (typical boas, includes species most frequently sold in the pet trade)

Erycinae (sand boas, rosy boas, rubber boas)

Pythoninae (pythons)

Distribution

The Boinae are distributed in the New World, Madagascar and the Pacific Islands. The Erycinae have a wide distribution that includes North America, Europe, Africa, the Middle East and Asia. All Pythoninae are Old World species being found in Africa, Australia, Asia and Indonesia.

General Information

The size and potential dangers presented by snakes of the family Boidae are the issues relevant to this article. The following general information will focus on content pertaining to those issues.

BOAS (Boinae)

There are currently 25 recognized species of boas. All boas are live-bearing. Of the various species of boas, more than half grow to a maximum length under eight feet. Only the five largest species are likely to exceed 30 lbs. The larger species of boas include the boa constrictor (*Boa constrictor*), the Madagascar ground boas (*Acrantophis dumerilii* and *Acrantophis madagascariensis*) the green anaconda (*Eunectes murinus*), the yellow anaconda (*Eunectes notaeus*), and the Cuban boa (*Epicrates angulifer*). Slender body proportions and a disinterest in constricting any organism they will not feed on, including humans, make the smaller boas relatively harmless. The larger boas, except for the anacondas tend to become docile, particularly when raised from newborns. The only boa for which there are a very small number of authenticated reports of human deaths from constriction resulting

in asphyxiation is the green anaconda.

Potential Dangers of Boas

Most boas will strike defensively when threatened and the bites will result in multiple, often pinpoint, puncture wounds. These are seldom of medical significance, unless large specimens are involved such as large boa constrictors, anacondas or the Cuban boas. In the U.S., bites from large snakes are generally considered to be statistically of little medical importance. Aggressive specimens particularly wild caught boas, often give plenty of forewarning before striking and most bites are readily avoided. In contrast, bites and injuries caused by familiar domestic animals, such as dogs and cats and horses are of much greater medical significance, resulting in annual medical costs of millions of dollars a year. In spite of the false impression that various anti-pet lobbies and organizations have tried to perpetuate, the popular boa constrictor, particularly *Boa constrictor imperator* from Colombia, is one of the most docile, safest and most recommended as a pet of the large snakes, presenting much less of a threat to human life and limb than the domestic dog. Of the large boas, only the green anaconda has been implicated in human death by constriction leading to asphyxiation.

SAND BOAS (Erycinae)

Because of their small size (the largest *Eryx johnii* does not exceed four feet), the sand boas are of no relevance to the issues involving the potential dangers of boas and pythons.

PYTHONS (Pythoninae)

There are currently 26 recognized species of pythons. All pythons are egg layers. A few species exceed five feet but the majority of species will range between six and nine feet with adult weights under 30 lbs. Four species are giant snakes and can exceed twenty feet in length and/or weigh more than 100 pounds.

Potential Dangers of Pythons

The great majority of pythons do not present a significant danger to humans. Although most pythons will strike and bite in defense, they will not constrict humans, for the simple reason that humans are within a size range where they are threatening rather than a potential prey. As with boas, python bites will result in multiple punc-

ture wounds, which can be of medical significance if large specimens are involved, but these bites are usually easily avoided. The most frightened and aggressive specimens, through an undeniable defensive display, typically forewarn humans of their readiness to bite. Only the largest species have been implicated in human deaths: the Indian/Burmese python (*Python molurus*), the African python (*Python sebae*), the reticulated python (*Python reticulatus*) and one case (reported from the country of origin) which apparently involved an amethystine python (*Morelia amethystina*). Nonetheless, the total number of authenticated human deaths by large pythons reported or recorded worldwide in the last fifty years is relatively small, probably less than twenty (it is difficult to obtain an accurate number worldwide; see Minton, 1973). To put this in perspective, one must consider that the domestic dog kills 10 - 14 people a year in the United States alone.

Why are Boas and Pythons so Popular?

Boas and pythons are among the most popular of the snakes kept as pets. They have certain characteristics which make them more appealing to many snake keepers than other types of snakes. One of the most appealing aspects of the most popular boas and pythons is that, compared to snakes of the colubrid family (another group which ranks among the most popular snakes kept as pets), boas and pythons can provide a significantly greater interactive experience. Indeed, many boas and pythons are remarkably easy and enjoyable to handle. Popular snakes, such as boa constrictors and Burmese pythons, are comparatively heavy bodied, slow moving and generally hesitant to dash out of their owners hands and fall to the ground, compared to the usually more restless colubrids.

Few large snakes can be more recom-

mended as pets than baby Colombian boa constrictors. As this variety of *Boa c. imperator* gets older, it usually retains the calm and docile qualities that made it appealing as a baby. Rainbow boas and ball pythons, popular species that do not attain a very large size, have similar characteristics and are also highly recommended as snake pets. In addition to the above mentioned qualities, the aesthetic appeal of boas and pythons is undeniable, from their fine scaled, often shiny and beautifully patterned and colored skins, to their elongated, intricate and relatively expressive heads. In addition, some of the larger pythons, including the Burmese, Papuan and reticulated pythons, can sometimes demonstrate an unusual degree of awareness and responsiveness, and some specimens rank among the most intelligent of the snakes. For many herpetoculturists, the boas and pythons are significantly different enough in appearance, and above all in psychological characteristics, that they have little interest in other kinds of snakes.

TYPICAL SIZE RANGES ACHIEVED BY ADULT BOAS AND PYTHONS KEPT IN CAPTIVITY

SPECIES	SIZE
Dumeril's boa (<i>Acrantophis dumerilii</i>)	5 - 9 ft
Pacific ground boa (<i>Candoia carinata</i>)	3 - 4 ft
Bibron's tree boa (<i>Candoia bibroni</i>)	3 - 6 ft
Boa constrictor (<i>Boa constrictor</i>)	5 - 13 ft
Emerald tree boa (<i>Corallus caninus</i>)	4 1/2 - 6 1/2 ft
Amazon tree boa (<i>Corallus enhydris</i>)	4 - 6 1/2 ft
Cuban boa (<i>Epicrates angulifer</i>)	6 - 10 ft
Rainbow boas (<i>Epicrates cenchria</i>)	3 - 6 1/2 ft
Green anaconda (<i>Eunectes murinus</i>)	10 - 20 ft
Yellow anaconda (<i>Eunectes notaeus</i>)	7 - 10 1/2 ft
Green tree python (<i>Chondropython viridis</i>)	4 - 6 ft
White-lipped python (<i>Liasis albertisii</i>)	5 1/2 - 7 ft
Children's python (<i>Liasis childreni</i>)	2 - 2 3/4 ft
Spotted python (<i>Liasis maculosus</i>)	3 - 4 1/2 ft
Amethystine python (<i>Morelia amethystina</i>)	11 - 18 ft
Carpet python (<i>Morelia spilotes</i>)	4 1/2 - 9 ft
Blood python (<i>Python curtus</i>)	6 - 9 ft
Burmese python (<i>Python molurus</i>)	10 - 18 ft
Ball python (<i>Python regius</i>)	3 1/2 - 5 ft
Reticulated python (<i>Python reticulatus</i>)	10 - 23 ft
African rock python (<i>Python sebae</i>)	10 - 18 ft

The sizes indicated do not reflect maximum sizes attainable by the respective species. Almost all adult captive specimens will fall somewhere in between the size ranges presented. As with humans, there will be occasional larger or giant specimens, as well as dwarfs. For many of the species there will be subspecific and geographical variations that may include size parameters.

Understanding Constriction in Boas and Pythons

The primary purpose of constriction in boas and pythons is to subdue and kill prey prior to swallowing. Thus, constriction in boas and pythons is primarily a component of feeding behavior. Snakes do not share the particular antagonism that they are subjected to by most humans, and boas and pythons have no interest in killing humans for the sake of it. When threatened, boas and pythons usually adopt a defensive posture and strike out, usually followed by immediate release and readoption of the defensive posture unless flight becomes a possible alternative. If a large python or boa is grabbed behind the head, it may resort to forming body coils around whatever it can hold on to if it feels threatened. Though the type of force applied during the formation of these coils is constrictive this is not the "fixed action pattern" (ethological term) constriction associated with feeding.

Incidents involving constriction of humans by large pythons fall into the following:

a) **Misinterpreted constriction:** the result of allowing a large snake to form one or more complete loops around one's neck. In the process of moving or stabilizing itself, a large snake could exert enough constrictive pressure to cut blood flow

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through the carotid arteries and cause loss of consciousness. Under very unusual circumstances, prolonged constriction could lead to death. There is a risk when allowing 40 or more pounds of muscle to wrap around one's neck. This possibility has led to one of the basic rules of handling large snakes. Never allow any large constricting snake to form a complete loop around the neck or thoracic area.

b) Defensive and incidental constriction during restraint: The more common cases here involve holding a nervous or aggressive snake behind the head during treatment or during a process as harmless as sexing with a probe. The snake feels threatened and attempts to form coils with whatever part of its body is free. The purpose is usually to grip onto a surface so that it can exert enough pull to free itself. What one must remember is that large snakes are very powerful and the constrict-

No store should be allowed to sell large boas and pythons without providing local regulations and guidelines for responsible maintenance.

tive strength of a section of the body coiling around whatever surface is available can be significant. Because one is holding the head, one is in a good position to unwrap a snake but a large snake could prove dangerous if coils are wrapped around the neck or thoracic area, preventing movement of arms. In cases where large snakes have to be held for these purposes, at least one other individual should be assisting. With a very large snake, over 15 feet, a third individual should be present.

c) Feeding accidents: These are more common than realized, and it is critical that individuals be educated as to the proper way to feed large snakes. Typically, individuals do something stupid, like holding a dead rat or rabbit in the hand and waving it in front of a large snake before it strikes. The hand accidentally gets struck and the snake, believing it has the food in its mouth (it sure smells right), constricts the prey, the hand and even the arm. The result is usually a serious bite injury, bruising and a

traumatized keeper. Poking one's head into the entrance of a cage, while holding a prey item, can lead to more serious trouble. Often when a large snake picks up the smell of prey, it strikes whatever object in the foreground that moves. Another cause of feeding accidents is classical conditioning of snakes to expect food as soon as the cage is opened (see later section).

Finally, in extremely rare cases, humans, particularly children, can become prey (only the very large pythons and possibly the green anaconda are likely to consider this). With captive animals (there are only two such cases reported in the U.S. involving reticulated pythons, one of which is questionable), two factors have been involved; usually underfed animals and inadequate enclosures for keeping snakes that allowed for escape. The parents in these cases were irresponsible and negligent in not assuring the safety of their children, and were guilty of irresponsible herpetocultural practices. The risk of any such incidents are easily prevented by keeping large snakes in secure and locked cages, as well as in secure and locked rooms.

Facts about the Potential Danger of Large Boas and Pythons

The media and popular superstitions have played key roles in distorting information regarding the real dangers of the giant snakes. To this day, there are rumors, as well as written articles, concerning deaths by large constrictors which, upon further investigation, prove to be false or greatly misinformed.

When available, the most reliable sources for this type of information are coroner's reports of the victims, although there are cases where a coroner's conclusion may have derived from lack of a thorough enough investigation (or of sufficient knowledge or background) of an incident involving a human killed by a giant snake. A human death resulting from constriction by a giant snake has associated with it certain tell-tale signs. They include such things as snake skin particles attached to the area being constricted, petechial hemorrhages at the site of constriction and multiple puncture wounds at the site of the bite. Bite marks by themselves do not necessarily imply subsequent constriction leading to asphyxiation.

From data available, there were four

HELP!

The AFH is currently striving to acquire a database on the weight to length ratios of captive boas and pythons. Any accurate measurements accompanied with the scientific names of your animals would be greatly appreciated.

**The AFH is also seeking any data or information on humans injured or killed by domestic animals. Send Info to: AFH
PO Box 1131
Lakeside, CA 92040-0905 or
Fax (619) 561-5339.**

confirmed cases of human deaths caused by large constricting snakes in the United States between 1978 and 1988 (see McCarty, et al., 1989). In three of these cases, reticulated pythons were implicated; one involved a Burmese python. There is possibly an additional case involving a Burmese python, concerning which we have not yet been able to obtain data.

The AFH is currently seeking autopsy reports confirming the deaths of any other humans in the United States caused by asphyxiation by snakes. There is a persistent rumor of an individual killed in the U.S. by a green anaconda, but we have not been able to verify this. The author has been unable to find a single case of a human killed by a boa constrictor in the U.S., or anywhere else for that matter. Even if a single case were to be found, the boa constrictor, considering the several hundred thousand sold over the last fifteen years, and the very large numbers currently kept in captivity, is a remarkably non life-threatening species compared with other domestic animals, such as the domestic dog or the horse.

These are some of the facts with regards to human deaths associated with large boas and pythons. It would behoove legislators and animal control agencies to consider these facts before suggesting blanket legislation banning the right to keep all large snakes.

continued on next page

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Permits

There are current trends in legislation to propose bills and regulations that would require owners of boas and pythons to obtain permits from local or state agencies to be allowed to keep these snakes. At a time of supposed budgetary constraints and trimming, the need to legislate the keeping of boas and pythons is unnecessary and unwarranted, based on the statistical evidence relating to the potential dangers they pose. Relatively little is accomplished by a permit system, except for a lot of red tape and expense. Most boas and pythons simply do not present an animal control problem. If agencies have unusual pressures to institute a permit system, then only the giant pythons (*M. amethystina*, *P. molurus*, *P. reticulatus*, *P. sebae*) and the green anaconda (*Eunectes murinus*) should be regulated. The decision that many agencies make of considering the boa constrictor a dangerous snake is simply not warranted by the existing data, and this popular species does not require this type of regulation.

A wiser course would be for agencies to enact a cage and housing requirement regulation that would preclude the possibility of escape by captive snakes. Agencies should also impose on sellers a regulation

whereby they would be required to inform customers of caging regulations and responsible guidelines for keeping large boas and pythons, such as the AFH guidelines. No store should be allowed to sell large boas and pythons without providing local regulations and guidelines for responsible maintenance.

THE RESPONSIBLE KEEPING OF LARGE BOAS AND PYTHONS

Before Buying a Large Boa or Python

Before buying a large boa or python (adult size of 8 feet or more), it is recommended that any prospective owner go to a zoo, or to another site, where they can observe adult specimens of their prospective purchase. It is worth noting that most pet stores selling large boas and pythons seldom have adult specimens on display. If you know of a herpetoculturist who has a tame specimen, ask if it is possible to hold the animal. If possible, ask to see the animal feed. Look at its cage. This will be the end result of raising the cute little python you buy in a store or from a breeder. Is this what you really want, or would a smaller snake, such as a boa constrictor or ball python, be preferable?

Check local or state laws. Unfortunately some state and local agencies have unreasonable and biased regulations restricting the ownership of boas and pythons. Others have permit systems. Check with your local animal control agencies and state Fish and Game Departments about the legality of owning boas or pythons before purchasing the animals.

If you have small children, ask yourself about whether you can assure that the snake will be housed securely, without any possibility of the kids deciding to take the snake out while you're gone, or the snake accidentally escaping.

The Problem with Burmese Pythons

The Burmese python is considered by many snake keepers to be one of the most docile and rewarding of the large snakes when captive-raised. This species has been highly recommended for those who aim to have a large snake pet because of their calmness, ease of handling and docile tem-

perament, sometimes demonstrating an unusual awareness, even recognition of their owners. Yet it is the very same nature of Burmese pythons which may make them one of the more problematical snakes in herpetoculture.

How does one account for the fact that one of the most docile of large snakes may present a threat to human beings? Of the very small number of human deaths attributed to Burmese pythons in the last twenty years in the U.S., (probably less than three, though we have not been able to obtain all reports) it should be made clear that in virtually all cases the snake involved was considered unusually tame. It is the docility of the Burmese python, combined with lack of reasonable caution by their owners, that lead to accidents involving these snakes. Owners relax their sense of caution and attribute to their pythons a degree of intelligence of which they are incapable. Because Burmese pythons are such large animals, an error in human judgment can, under very unusual circumstances, prove fatal. This is not much different than the judgment needed by humans involved with other large animals such as horses. A lack of judgment can lead to very serious injury or death, as reported statistics indicate on horse-related injuries and deaths.

During the course of handling a large Burmese python, an individual will usually be impressed by the strength and muscular vigor of the animal. When feeding a Burmese python, that strength will become even more apparent when observing its effectiveness at constricting and suffocating prey. Yet many owners of Burmese pythons feed their animals in a manner which could lead to injury or endanger their lives. The author has also seen, at some of the reptile shows held annually in various areas of the U.S., reptile sellers with an eight to ten foot Burmese python, allowing the snake to form a complete loop around their neck. Owners should realize that no constricting snake should ever be allowed to form a complete loop around a human's necks. Blood flow through the carotid arteries can be easily blocked by such procedures, resulting at the very least in unconsciousness. There are at least two cases, one of which is mentioned in Karl Kauffeld's "The Keeper and the Kept" of *Pituophis* (Bull and pine snakes) exerting enough constrictive strength to lead to unconsciousness or near unconsciousness. The issue of bites by Burmese pythons

during feeding is another one to be addressed. Injuries to hands of owners when offering prey by hand are not that uncommon. Injuries to other parts of the body, including the face, have occurred. The bottom line is that, in most cases, the injury or very rare death of a herpetoculturist by a large python is invariably because of lack of judgment during handling or feeding.

How Accidents often Happen

Unintentional classical conditioning of large boas and pythons

When you initially purchased your baby Burmese python, you were enthralled by it. You handled it and took it out frequently, until baby got too big to handle easily and you just happened to become too busy. The result: most of the time you simply open the cage and throw food in and change the water while your python is feeding, and scoop up shavings and feces. Weeks go by, sometimes months. Finally, you decide to take your snake out and reach, as you often have in the past, and the snake strikes out at you and may even decide to constrict. You are there, possibly bleeding and bruised, wondering why your snake is no longer tame.

This is not an uncommon scenario. The fact is that your snake may still be tame, but you have unintentionally classically conditioned your snake to expect food and prepare to strike at any object entering the cage, following the opening of the cage. Changing maintenance procedures can play a key role in preventing these types of accidents.

A procedure, which Chris Hernan, who works at the Bronx Zoo as a special projects coordinator, informed me of, is to never feed a snake in the same cage it is maintained in, but instead to implement another classical conditioning association; the snake should only be fed after it has been moved to a separate cage with a unique scent and texture, to which the snake is transferred only when it is going to be fed. As a result, the snake learns that when its maintenance cage door is opened, it will never be fed, but it can expect to be fed after being transferred to the feeding cage. The wisdom of this approach is so obvious that when I read Chris Hernan's recommendations, I thought, "Why didn't I think of this?" The procedure also requires some regular handling, instead of the extensive lack of handling that many captive-raised larger pythons may be subjected to. The drawbacks to this procedure are the need to

have an alternate enclosure and the fact that very large pythons may be difficult to move.

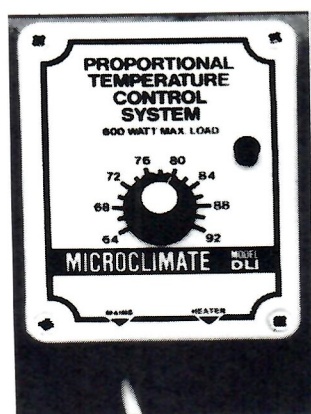
An alternative classical conditioning procedure used by many breeders for whom transferring a snake during feeding would be time consuming and problematical is to "hook train" pythons. With this procedure, when a snake is not going to be fed, a snake hook is used to displace the anterior part of the body. With regular use of this method, many snakes tend to learn that being displaced by a hook is not associated with feeding and the probability of a misplaced feeding response greatly diminished. The use of a hook when initially removing a large snake from its enclosure for handling is generally a recommended procedure.

Even with these procedures, the AFH guideline, whereby any large python or boa over 8 feet should only be fed, maintained and handled with another individual present, should always be followed.

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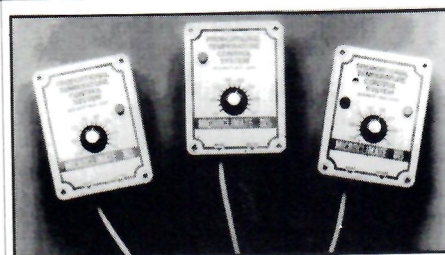
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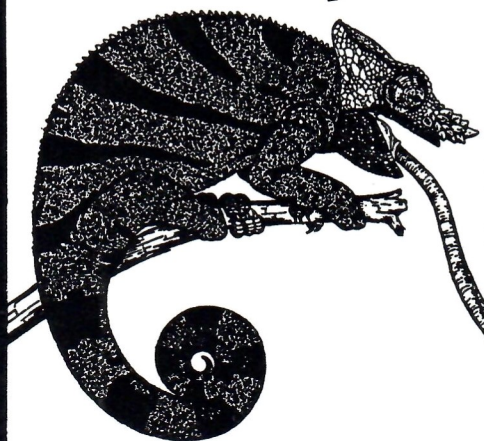
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Establishing a Procedure whereby another Person is Always Available for Assistance.

When handling, or feeding, or during the course of maintenance of any large boa or python over 8 feet, another person should always be in the same room or within easy hearing range. This is a procedure which should be abided by no matter how tame a large snake may be. The risks of any life-threatening incident is relatively insignificant, but the AFH and other herpetological organizations are advocating a philosophy of no mistakes and no irresponsible practices.

A Philosophy of Impeccability and no Mistakes

Increasingly, as an animal keeper, the notion of acting in an impeccable manner becomes one of growing importance in the development of a personal philosophy. This implies making conscious and responsible choices when selecting animals, taking responsibility for ethical and humane behavior once those choices are made, and acting in a way that is socially responsible.

In the case of the keeping of large boas and pythons, this means:

1) Taking careful consideration before making the decision to purchase a snake that will reach a large size.

2) Housing and maintaining it properly while in your care.

3) Adopting impeccable maintenance procedures that protect one's personal safety, because what happens to us invariably affects not only ourselves, but usually our families, friends and others involved in the same field.

4) Assuring that no harm can come to others as a result of keeping that animal.

The AFH guidelines contain the essential components for an impeccable approach to the keeping of large boas and pythons. (See below.)

The Responsibility of Sellers

The AFH cannot force breeders and sellers of large pythons to abide by its standards; nonetheless, the AFH urges all sellers and breeders of these snakes to adopt the following procedures:

1) All sellers of large boas and pythons will refuse the sale of these animals to

minors, unless their parents or persons responsible for their welfare agree to assume responsibility for the care of the animal, and supervision at all times during maintenance or handling. The AFH does not consider the giant snakes to be suitable pets for minors.

2) All buyers of large boas and pythons should be informed as to their proper care and handling and given a copy of the AFH guidelines on the keeping of large boas and pythons at the time of purchase.

The Disposal of Large Boas and Pythons

An issue which will need to be addressed in the future is the disposal of large boids, particularly Burmese pythons. Snake keepers have a series of recourses for the disposal of their snakes. The alternatives are usually as follows:

1) Sell the snake to another individual, a procedure often done through word of mouth or through advertising in a newspaper or herpetological publication.

2) Sell to a specialized pet store or a reptile dealer. In a critical situation, where an animal needs to be gotten rid of as quickly as possible, consider selling at an unreasonably low price or donation, because your alternatives are going to become limited.

3) If the above fails, contact a local herpetological society and inquire whether they have an adoption program.

4) If the above fails, contact an animal control agency and inquire whether they will take large boas or pythons.

5) Hypothetically, you should have been able to dispose of your large snake before this last step, but we have heard of individuals being in a bind and at their wits end, needing to be rid of an animal because they are moving the next day, or some other reason. If worse comes to worst, consider euthanasia when all other recourses fail, and you do not have the time or ability to pursue other possibilities. Consult a veterinarian for the humane euthanasia of a large snake. Hopefully, next time you'll think more carefully before deciding to assume the responsibility of an animal that you are incapable of taking care of in the long term.

Note: As a rule, zoos are not a good alternative for disposal of Burmese pythons. The zoos which keep Burmese pythons get offered many more than they

need. If the snake is unusually large or unique, a zoo might possibly be interested.

An alternative which should never be considered, and which is illegal, is to release a captive snake in the wild. This action threatens the rights of all of us interested in keeping reptiles. It is irresponsible and, in many states, is punishable by law.

Should large boas and pythons be made illegal? No, but regulations requiring secure housing and being informed of the requirements for safe maintenance of the species should be implemented. Just as there are leash laws, there should be secure snake housing laws. We would all benefit from it.

THE AFH GUIDELINES FOR THE KEEPING OF LARGE BOID SNAKES

Introduction

The American Federation of Herpetoculturists (AFH) emphasizes responsible herpetoculture as the backbone of its position on the keeping of amphibians and reptiles. With regard to the ownership of large boas and pythons, the AFH guidelines approved by the AFH Board of Directors and presented at several hearings in Southern California are as follows:

Responsible Large Constrictor Ownership

A. In consideration of the right of the general public not to be exposed unexpectedly to snakes such as large boas and pythons and in consideration of the irresponsible behavior of certain snake owners, the AFH recommends that snakes not be openly displayed in a public setting outside of proper and established forums for such practices such as herpetological shows, educational displays, pet stores and presentations, and other special displays whereby members of the public are forewarned that a snake(s) may be displayed in the open.

B. The AFH recommends that all snakes be transported in a manner that precludes escape: In a sturdy cloth bag free of holes or tears which is then placed inside a box or similar container with holes for aeration. The box or container should then be sealed or locked shut. Another alternative is to double bag snakes. Care must be taken to

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use sturdy cloth bags with a weave that allows for adequate air flow. Airlines should be consulted as to their requirements when shipping snakes by air.

C. For the keeping of large boas and pythons eight feet or more, the AFH recommends general caging regulations whose effects are similar to those which require dog owners to keep their pets within the confines of their property. Caging regulations for large snakes should require owners of such snakes to house them in secure cages with hinged top or doors or a sliding glass front which include a locking mechanism. Such enclosures should preferably be contained in a large room modified to prevent snake escapes and with a door which shall be kept shut or locked when not occupied by the owners. This recommendation is made to require responsible herpetocultural practices by individuals in consideration for the animals, for family members and for members of the general public. As herpetoculturists we will all benefit by adopting these responsible practices.

D. When handling any of the giant snakes (Green anaconda, Indian and Burmese python, African rock python, reticulated python and amethystine python) over 8 feet, the AFH recommends that another individual be present or at the very least within calling reach. The probability of any serious problem occurring when handling such snakes is very remote but the AFH position is that herpetoculturists, out

of responsibility to themselves, to family members and to other herpetoculturists, should handle and maintain large snakes in a manner that significantly prevents the likelihood of any accident or incident.

E. The AFH does not recommend the ownership of the above mentioned giant constrictors as well as other large (adult size over seven feet) boid snakes by minors without parental consent to assume responsibility for proper housing, maintenance and supervision when handling.

F. The AFH recommends that safe procedures be adopted during handling and feeding. These would include the use of a snake hook prior to removing a large python or boa from an enclosure. When feeding, food should never be offered by hand.

G. As with any other animals such as dogs, owners of large constrictors should remember that they can be liable for the medical costs of treating injuries as well as additional financial damages for traumas or damage caused by their animals.

Note: The eight foot guideline requiring special precautions is not based on any research indicating that snakes eight feet or larger are potentially dangerous. Muscle

mass, and therefore the weight of a snake would be a better criterion for establishing regulations. However, weight will be generally more difficult to assess without having available measuring equipment and snake keepers or snake sellers are not likely to carefully monitor the weights of their snakes. If weight were to be used as a criterion, an arbitrary guideline of 30 pounds would probably be reasonable. The eight foot cutoff point was established to provide a wide margin of safety and to facilitate measurement. This was enacted by the AFH as a working model and should in no way be interpreted as a statement with regards to the potential dangers of snakes. The goal of the AFH guidelines is primarily to establish standards for impeccable reptile keeping.

Special thanks to David and Tracy Barker for their invaluable comments, insights, and information provided, to Dr. Richard Ross for his review of the article and to Sean McKeown for his editing and support.

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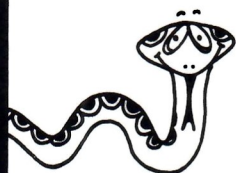
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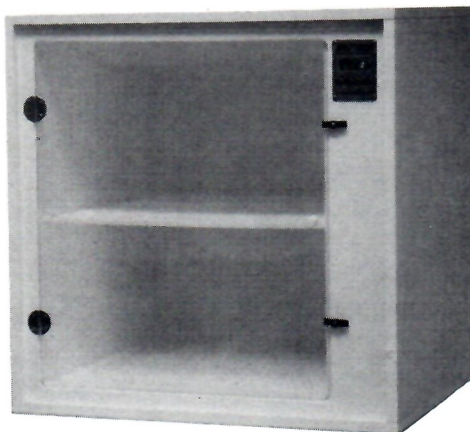
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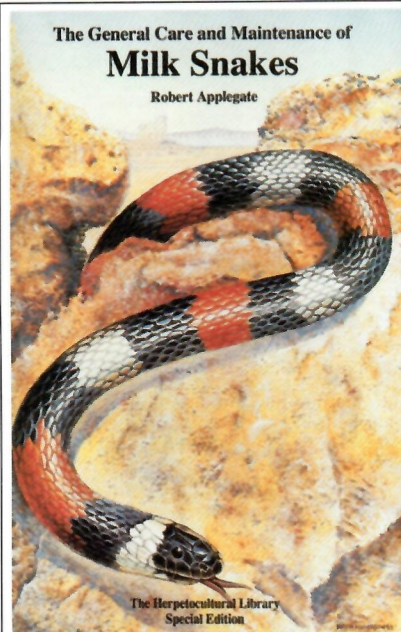
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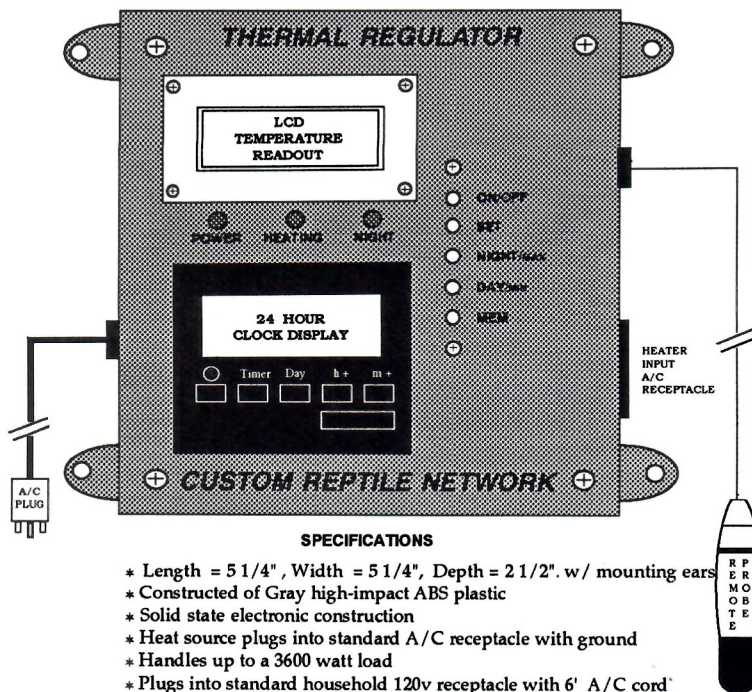
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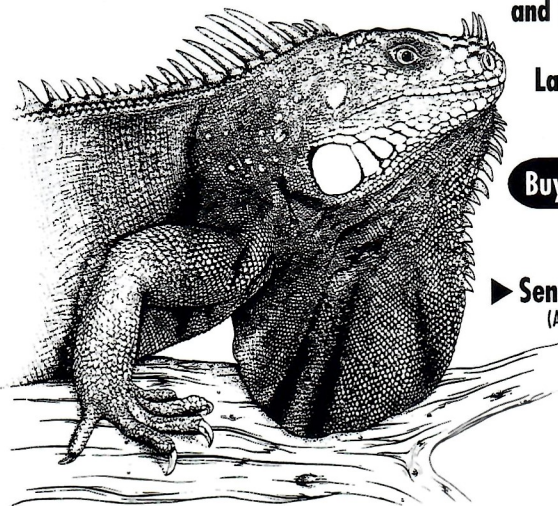
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