BULLETIN
of the
Chicago Herpetological Society

Volume 33, Number 3
March 1998

BULLETIN OF THE CHICAGO HERPETOLOGICAL SOCIETY
Volume 33, Number 3
March 1998

Cover: Two male western diamondback rattlesnakes, *Crotalus atrox*, engage in combat behavior near their den in southeastern Arizona. Photograph by Roger Repp.

STAFF

Editor: Michael A. Dloogatch
Copy editor: Jill Horwich
Advertising Manager: Ralph Shepstone

1998 CHS Board of Directors

Steve Spitzer, President
Jack Schoenfelder, Vice-President
Gary Fogel, Treasurer
Jennifer Picciola, Recording Secretary
Lori King-Nava, Corresponding Secretary
Michael A. Dloogatch, Publications Secretary
Gino Martinez, Membership Secretary
Ron Humbert, Sergeant-at-Arms
Karen Bielski, Member-at-Large
John Driscoll, Member-at-Large
Audrey Vanderlinden, Member-at-Large
Jenny Vollman, Member-at-Large

The Chicago Herpetological Society is a nonprofit organization incorporated under the laws of the state of Illinois. Its purposes are education, conservation and the advancement of herpetology. Meetings are announced in this publication, and are normally held at 7:30 P.M., the last Wednesday of each month.

Membership in the CHS includes a subscription to the monthly *Bulletin*. Annual dues are: Individual Membership, $22.00; Family Membership, $25.00; Sustaining Membership, $50.00; Contributing Membership, $100.00; Institutional Membership, $38.00. Remittance must be made in U.S. funds. Subscribers outside the U.S. must add $12.00 for postage. Send membership dues or address changes to: Chicago Herpetological Society, Membership Secretary, 2060 N. Clark Street, Chicago, IL 60614. Publications are sent to U.S. members via third class bulk mail; the post office does not forward such mail, even if a special request is made to forward magazines.

Manuscripts published in the *Bulletin of the Chicago Herpetological Society* are not peer reviewed. Manuscripts should be submitted, if possible, on IBM PC-compatible or Macintosh format diskettes. Alternatively, manuscripts may be submitted in duplicate, typewritten and double spaced. Manuscripts and letters concerning editorial business should be sent to: Chicago Herpetological Society, Publications Secretary, 2060 N. Clark Street, Chicago, IL 60614. **Back issues** are limited but are available from the Publications Secretary for $2.50 per issue postpaid. **Visit the CHS home page at <http://www.Chicagoherp.org>.**

The BULLETIN of the Chicago Herpetological Society (ISSN 0009-3564) is published monthly by the Chicago Herpetological Society. Copyright © 1998.

Bull. Chicago Herp. Soc. 33(3):49-56, 1998

Wintertime Observations on Five Species of Reptiles in the Tucson Area: Sheltersite Selections / Fidelity to Sheltersites / Notes on Behavior

Roger Repp
% **National Optical Astronomy Observatories**
950 N. Cherry Avenue
Tucson, AZ 85719
E-mail: repp@noao.edu

The best place to start anything is at the beginning.

The morning of February 16, 1991, found a troop of four people in a vehicle whistling southward out of Tucson, Arizona. To the left of our chariot, the awe-inspiring spectacle of the Santa Rita Mountains was nearly obliterated by low-lying cloud cover. To our right lay the moldering slag heaps indicative of open-pit mining.

The windshield wipers were doing their slowest sweeps, ridding the glass of the few specks of dank drizzle that assailed our viewing pleasure. A glance at the clouds spread from horizon to horizon, and knowledge of such things as low readings on thermometers, barometers, and their effect on ectothermic creatures, told me what I needed to know. Always one to speak my mind in the face of adversity, I felt compelled to pipe the following:

"We ain't going to find *squat* today!"

At this announcement, the countenances of our two passengers dropped noticeably. But our driver, one Candi Gruenwald, remained unaffected.

"I'll bet we find at least one tortoise," came her response.

With this rebuttal, Stuart Bengson and a young man named Troy brightened considerably. As Candi was in a leadership position on this expedition, I remained quietly skeptical. It has always been understood that leadership at times requires whoppers to be told for the betterment of morale in the ranks. There was serious danger that a suggestion to visit a sports bar instead of continuing with this foolish mission would cause a mutiny in the ranks.

Our goal on this miserable day was to locate and remove any encountered reptiles from a tract of land slated for development by a local mining concern. Stuart was there in his official role as reclamations manager for the mine. Troy was his young neighbor/friend who wanted to help, and Candi was the woman who participated in the local tortoise adoption scene. As for my presence, it was a herp trip, a free ride, and I was invited. (The latter statement being an indictment on the difficulties of finding qualified volunteer help for field work.)

To make a long story short, under what I would have considered impossible weather conditions, we not only found two tortoises, but three Gila monsters as well! The tortoises were given up for adoption, and the Gila monsters were relocated to another hillside located out of the range of the bulldozers.

It did not take too long for the events of this day to circulate around the local herpetological community. About two weeks later, a friend by the name of Jim Kane approached me. Unbeknownst to me, Jim and another friend, one Frank Retes, had been quietly studying tortoises, Gila monsters, and rattlesnakes during the colder months of winter. Jim informed me that he thought it unfortunate that we had to remove the reptiles encountered, for he and Frank were finding that some of their reptiles were using some form of homing instinct to return to their winter sheltersites year after year.

This statement intrigued me, and I had several phone conversations with Frank about his findings. One thing that Frank stressed repeatedly was that the impact of human observations must be kept minimal in order for the reptiles to return to their "dens." To handle them, or pester them unduly could drive them away.

In other words, "hands-off herping" needed to be brought into play. As one who had already found most of the local reptiles, fondling each and every find was no longer necessary. The thought of being able to monitor wild reptiles for several years in a row was appealing, and my attitude was one of "Yeah! I'll try it!"

On March 9, 1991, my good friend and constant sidekick Dennis Caldwell found a desert tortoise (*Gopherus agassizii*). This in itself is not newsworthy, as Dennis is quite good at this sort of thing. What *is* newsworthy is what followed with this particular tortoise.

Dennis called me upslope for a look at his find. At my arrival, I was delighted to see a very large female tortoise facing out of an opening beneath a knee-high slab of quartz/limestone bedrock. Her eyes were bright, clear, and inquisitive, the visible front portion of her carapace was weathered and worn, and her scaly forearms pumped in and out of her protective shell ever so slightly. I was touched by the sight of this wonderful matriarch of the desert, and impressed that she seemed to be unafraid of us. In the remote stretch of desert hillside we were roaming, we may very well been the first humans that she had ever seen.

Dennis quietly fumbled with lenses and such, and snapped one quick picture of his otherwise undisturbed subject. While the photographer was thus occupied, his companion took notes on the exact whereabouts of the lair of this tortoise. A one-armed saguaro cactus was located nearby, and the name "Turtle Hill" was assigned to the patch of ground we were exploring. As we quietly turned to leave, we had no way of knowing that we had just discovered our first "repeating" reptile.

On June 1, 1991, I went back to visit my new "subject." As expected, she wasn't there, and her shelter had been filled in by a pack rat. This indicated that the tortoise had not been around for a while. On December 29, 1991, Don Swann and I

assailed Turtle Hill. The one armed saguaro was spotted, and we zeroed in on the spot. The cleared-out pack rat debris at the base of the rock face told me what had developed before e'er I looked in the hole. It came as no surprise to view the posterior of a very large female tortoise within the shallow depths of her winter burrow. The tortoise had returned!

Encouraged by this success, Don, Dennis, Jim, Dan Bell and I began roaming the foothills surrounding the Tucson area in search of more tortoises. By the end of the winter of 1992, we had found 23 individuals, spread out over seven mountain ranges. As if this wasn't enough to drive us manic, we also found the winter lairs of three Gila monsters (*Heloderma s. suspectum*), four chuckwallas (*Sauromalus obesus tumidus*), a Sonoran lyresnake (*Trimorphodon biscutatus lambda*) , and six western diamondback rattlesnakes (*Crotalus atrox*—hereinafter called "*atrox*"). The same "hands-off herping" philosophy was applied, and the decision to regroup to check on these the following winter was unanimous.

During the winter of 1992–93, we were not surprised to note that many of the tortoises had returned. One of the Gila monsters had returned, as did the lyresnake, two of the chuckwallas, and two of the *atrox*. While in the process of checking on these, more tortoises, Gila monsters, chuckwallas, lyresnakes, and *atrox* were discovered. Careful notes were made of the whereabouts of each reptile's den, and each den was visited several times throughout the course of the winter.

The years have rolled past. The winter of 1996–97 is behind me now, and I anxiously await the onset of the winter of 1997–98. A few details should now be clarified, for this Author is about to lay some numbers on the reader.

By "wintertime" I mean astronomical winter—that time period between the winter solstice (December 21 or 22) and the spring equinox (March 20 or 21). The observations from which my data are taken occurred between February 16, 1991, and February 16, 1997. Thus, the following summary draws from exactly six years of information. In all, 158 field trips were included.

All totaled, working from least to greatest, we have found 15 Gila monsters, 23 lyresnakes, 79 chuckwallas, 87 tortoises, and 87 *atrox*. These reptiles were found by careful searches of the hillsides of several mountain ranges around the Tucson area.

It should be noted that it is possible that the occasional reptile was accidentally counted twice. It is also possible that a new reptile was discovered and discounted as a previous find. Your author is doing the best he can in recounting these numbers. Hands-off herping has its disadvantages in trying to relay precise information to discerning herpers. With a few exceptions, these reptiles have been monitored with a strict "hands-off" policy. We do not molest these reptiles in any way, shape or form. We do not weigh, or mark, or measure, or probe, or apply transmitters to any of our animals. We have learned, as did Frank Retes and Jim Kane, that to do so might increase the risk of a reptile not returning the following year.

Having said that, I must admit to a few incidents of human-to-herp interaction. Some tortoises were pulled from their burrows and processed during the late winter periods of 1992 and 1994. This was done while assisting grad students with their projects, under the proper permits. Three lyresnakes were poked at by an overzealous visitor to the plots, who wanted to try to coax them from their crevices so he could handle one. Lastly, a single male *atrox* was manipulated with snake tongs by another visitor who could not restrain himself from doing so.

The results of these intrusions are mixed, and confusing. It would appear that the female tortoises were the most affected: none returned to use their respective sheltersites the following year. Of the lyresnakes molested, two appeared to skip a year, and then returned the year after. The other has yet to return. The male *atrox* also skipped a year, and returned the year following.

Thus far, the chuckwallas and Gila monsters have managed to avoid any such attentions. And the intent now is to adhere to the original plan of hands-off herping for all future winter forays, for all the reptiles that are encountered. In so doing, we eliminate the possibility of human intervention being the cause of a nonreturning herp.

It is important to note that some of the reptiles do not return even if they are not molested. Some skip a year and return the following year, some select other nearby shelters, and some are never seen again. Of the first few herps discovered, very few have continued to return for the entire six years under discussion. For example, my longest-running tortoise dates back to late fall/early winter 1991; she has returned every year since. My longest repeating Gila monster dates back to March 13 of 1992. A lyresnake has returned every year since the same March 13, 1992, date. For *atrox*, we go way back to March of 1991. My champion for repeating behavior is a chuckwalla that has used the same sheltersite since March 9, 1991!

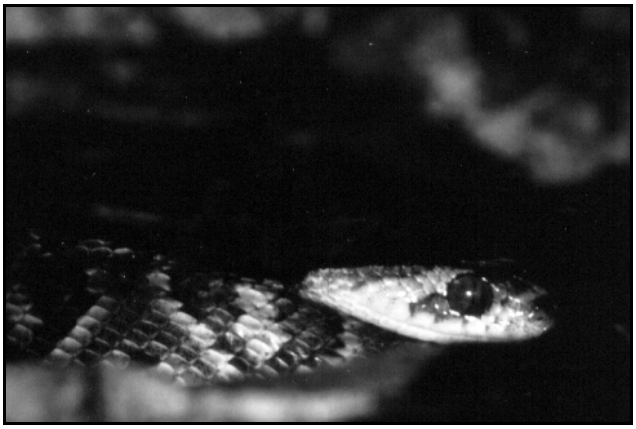
Up to this point, one detail has been omitted. The word "returned" has been used, and would imply that the object that "returned" would have had to "leave." The "arrival" of reptiles to their winter dens is called "ingress," and the "departure" is called "egress." Ingress generally occurs around mid-November, and egress happens very close to the first day of spring. The time periods just mentioned could at best be called general, because there is a tendency of some individuals of each species to shift about, or use a series of sheltersites throughout the winter. This behavior is little understood by science, but the fact is, it happens. Ingress in particular appears to vary from year to year, and species to species. Egress, on the other hand, is nearly universal amongst the animals under observation. By April 1, the vast majority of herps have cleared out. For the most part, I couldn't *buy* a herp in my very best winter locations.

One last detail remains before discussing the actual sheltersite selection of the reptiles under discussion. Those from the northern climes might read this and say "Shoot, Roger, what's the big deal? You are in the south, of course you are seeing reptiles during the winter!" This is both true, and not true. Approximately 80% of the reptiles in our area become scarce

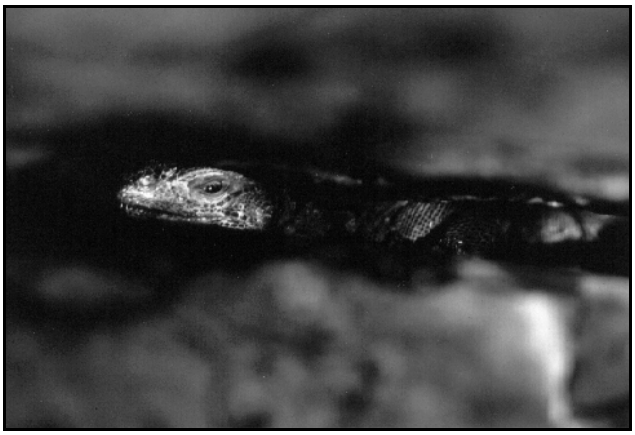
Female desert tortoise (*Gopherus agassizii*) in winter sheltersite. This particular tortoise has been returning to the same shelter since November 1991. Photograph by the author.

Winter basking behavior in *Gopherus agassizii*, January 13, 1993. Female tortoise in front of sheltersite. Photograph by Dan Bell.

Rock crevice used by a wintering lyresnake. Photograph by the author.



Sonoran lyresnake (*Trimorphodon biscutatus lambda*) as it appeared in the crevice shown at left on March 20, 1994. Photograph by Dan Bell.



Chuckwalla (*Sauromalus obesus tumidus*) wintering in a shallow rock crevice, March 12, 1994. Photograph by Dan Bell.

Winter sheltersite of a Gila monster. Photograph by the author.

or invisible from late October through mid-March, much like those that dwell in more northerly latitudes. Examples of rarely- to never-encountered winter herps would include the more common colubrids, such as longnose snakes, (*Rhinocheilus lecontei*), desert kingsnakes, (*Lampropeltis getula splendida*), or western patchnose snakes, (*Salvadora hexalepis*). Many years of careful winter searches have not yielded any sidewinders, (*Crotalus cerastes*). Such lizards as desert iguanas, (*Dipsosaurus dorsalis*), and leopard lizards, (*Gambelia wislizenii*), are completely absent during the winter months, as are the Couch's spadefoots (*Scaphiopus couchii*), and Sonoran Desert toads, (*Bufo alvarius*). These and other herps too numerous to mention here abound on our plots during the warmer months of spring, and/or summer.

It should also be added that the five species under discussion are not the sole winter-active herps in our area. Canyon treefrogs (*Hyla arenicolor*) are very winter-active, as are sideblotched lizards (*Uta stansburiana*), and tree lizards (*Urosaurus ornatus*). Multitudes of these three species can be observed on any warm winter's day, and all three species have been observed in copulation. Lowland leopard frogs (*Rana yavapaiensis*), also are not only winter-active, but lay their eggs during this time period. Sonoran mud turtles, (*Kinosternon sonoriense*) can be seen swimming and basking during winter time periods. Four tiger rattlesnakes (*Crotalus tigris*) have also been seen basking during winter, and a total of 14 black-tailed rattlesnakes (*Crotalus molossus*) were observed either basking or moving about, well away from any obvious sheltersites.

The few weeks previous to the first day of spring (March 20), also brings on some activity from other Arizona herps, most notably zebratail lizards, (*Callisaurus draconoides*), greater earless lizards, (*Cophosaurus texanus*), and whiptail lizards (*Cnemidophorus* ssp.). The occasional regal horned lizard (*Phrynosoma solare*), and collared lizard, (*Crotaphytus collaris*) show themselves, as well as Clark's spiny lizards, (*Sceloporus clarkii*). The Sonoran gopher snake (*Pituophis catenifer affinis*), and red coachwhip (*Masticophis flagellum piceus*) also turn up occasionally. But activity in these herps is generally confined to only the very warmest days (usually above 80°F).

Getting back to the five species under discussion, there is not much in the herp literature that deals with their wintertime behavior. Even with tortoises, which in our area have been well studied, not much can be found to back what we are seeing. Most of the local herpetologists seldom get out to monitor winter activities, but instead focus their studies on summer activities of herps. Because winter documentation in the herp literature is scanty, it is extremely difficult to cite the observations of others.

We know that on our "plots," tortoises routinely bask during the winter months (see Martin, 1995). They also move from shelter to shelter, sometimes in the dead of winter. Close to the Tucson area, all 87 tortoises found have some sort of rock structure as part of their sheltersite. These rock structures have some form of hole beneath them. Some of these holes are not very deep, one of my tortoises, a female, dens with two-thirds of her body in the breeze (see Bailey, 1992). In other cases, the actual burrow is quite deep. The deepest-denning tortoise that I can see appears to be about 4 meters down. There is another large male that dens out of sight, and I can see about 6 meters into its burrow. Of the five species of reptiles under discussion, only tortoises have been observed feeding during winter time periods (see Bailey, 1992).

The tortoises under our observation appear to be mostly solitary denners. Out of 87 tortoises found, only once were two seen to spend the entire winter together in one shelter. This was observed during the winter of 1994–95 and, in this case, one was a male and the other was a female. Some tortoises have also been observed sharing their hibernacula with *atrox*. Every winter since 1991–92, at least two cases of this happening appear in my notes. The two species appear to coexist peacefully when this happens. *Atrox* have been observed coiled around, or crawling over, their larger-bodied "burrow buddies." The benefits of this occurrence to either species remains in question. It may just be that the chosen shelter suits both parties in question.

Chuckwallas are rock crevice denners. Close to Tucson, they primarily winter alone, but on two occasions I have observed two together for the entire winter. Moving 100 miles westward, however, I found 17 that had infested a large rock face that was split into several crevices. The few chuckwallas that I routinely check have shown winter activity. I might see them in their crevice on a cold January day. A week of warm

Lyresnake and chuckwalla, as observed basking on February 21, 1994, about 30 cm apart in a vertical rock crevice. Photograph by the author.

weather will follow, and I will find their crevice empty. Then, a week later, the weather will turn cold, and the "chuck" will once again be visible in the home crevice. For reasons unknown, the chuckwallas are moving about in the dead of winter. Perhaps like tortoises, they also may be foraging for food. My camera will always be ready for anything that presents itself along these lines.

My data is scanty on Gila monsters. But I do have six that den quite close to one another, and have seen all six basking at the mouths of their crevices during the month of February. A favored basking position of theirs is to sit with only their heads showing out of their holes. Their shelters are generally a small hole under a rock. I went out with a fiber optics borescope to look at all 12 of my "monster" dens. (Remember, the first three discovered were removed, as was their habitat not long afterwards!) They are all very similar. They have a tight entranceway, with barely enough room for the monster to crawl inside. The first inner chamber beneath their boulder home is well scalloped out, which allows the monster to enter the hole head first, do a Gila U-turn, and face back out of the hole again. In every case, the inner chamber has holes that allow the monster to go even deeper beneath the surface. I have seen Gilas basking during every month of winter, but much more so during February and March (see Martin, 1997).

As for lyresnakes, they are also a winter basking species, and can be viewed at the mouths of their rock crevice shelters every month of the winter. They select rock crevices that are rather narrow, and most times these crevices run perpendicular to the ground. In all of my lyresnake crevices, there is a hole at the base of the crevice that allows the lyresnake to go underground. Lyresnake behavior consists of moving forward, back, up and down in the crevice. In this way, they are able to thermoregulate and seek optimum body temperatures. On very cold days, they will crawl into the holes at the base of their shelters, and be hidden from view. I have never witnessed more than one lyresnake per crevice at a given time, but do have a crevice that has yielded three different lyresnakes. There are hints from others that they den communally (Retes, pers. com.), but that has yet to be witnessed by this author. (Author's note, added 2-12-98: The lyresnakes are making a "lyre" out of me! In one of our plots, we have observed three lyresnakes sharing one crevice. Hats off to Retes!) I have also observed chuckwallas and lyresnakes using the same shelter-sites together, and they seem to co-exist peacefully.

Thus far, this author has written of basking, shifting, feeding and relocation of reptiles from one shelter to another during astronomical winter. This is all well and fine, but what follows is an account of the undisputed champion of winter behaviors, the western diamondback rattlesnake. Yes, they also bask, and shift, and move freely from shelter to shelter throughout the winter months. But they also do other things, which will be discussed shortly.

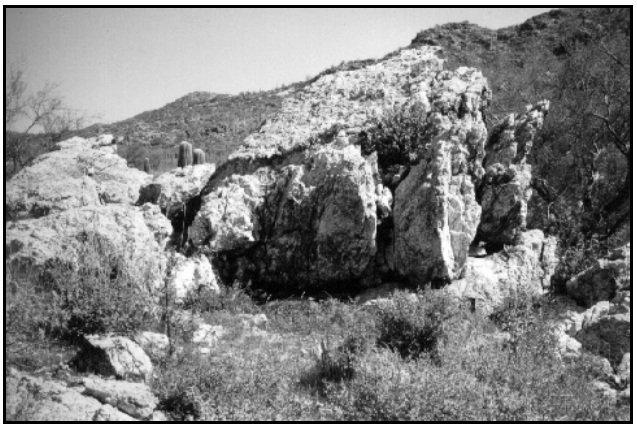
The winter sheltersites, or dens, of *atrox* can be broken down into three types. The "crevice dens" will be discussed first. The crevice dens can be compared to chuckwalla and lyresnake dens, although the crevice is generally wider. The crevices also tend to be more horizontal than those selected by chuckwallas and lyresnakes. Like the chuckwalla dens to the west of Tucson, I have seen as many as 17 *atrox* in one rock formation that is split into a series of crevices. Each crevice in this particular densite usually contains one to four individuals. The second type of den is the "soil burrow" type of den, which contains the insulating debris of a pack rat (*Neotoma albigula*). I have only been able to find three such dens in my searching. By far the most spectacular dens are the "gash" type dens. These consist of wide splits at the base of large rock formations. They generally are about 30 cm tall, by as much as two meters wide. These gashes taper inward, becoming narrower the deeper one goes, and in all six of my gash dens, the snakes can crawl deep enough to be out of sight. Another feature that all six gash dens share is a protective, overhanging rock shelf. Erika Nowak, a researcher for the Colorado Plateau Research Station, has suggested (pers. com.) that such a shelf might serve to thwart avian predators. Our gash dens always contain more than one snake, but in our area, I have never seen more than 21 snakes. Our local *atrox* do not seem to gather in the huge numbers that can be found elsewhere around the country.

Another phenomenon in the local *atrox* dens is the apparent absence of communal denning with other snakes. This runs contrary to the observations of many other herpetologists studying other species of denning rattlesnakes. Never have I looked into an *atrox* den of any type and seen any other type of snake within the den. Having said that, I did observe a *C. molossus* basking just outside an *atrox* den, very close to two of them. Five times I have observed coachwhips (*Masticophis flagellum piceus*) prowling about *outside* the entranceway to a den. Never have I observed predatory action on the part of these coachwhips (i.e., predation on an *atrox* by a *Masticophis*).

A necessary ingredient to all our *atrox* dens appears to be the debris of the pack rat. In all six of our gash dens, the entranceway is piled high with whatever happens to thrill the industrious little rodents the most. In our area, the many-spined teddy-bear cholla pods appear to be a popular pack rat "decoration." Nowak (pers. com.) indicates that in her *atrox* dens, (170 miles to the north), the "decorations of choice" by *Neotoma* are prickly-pear cactus-pads. It is interesting to note that in one of our dens, the pack rats have appeared to die off. During the winter of 1996–97, none of the usual debris appeared in the front of the den. The snake numbers fell dramatically in this particular den. Whether or not this was a direct result of the absence of *Neotoma* is purely a matter of speculation on the part of this author.

I have many observations of strange interactions between pack rats and *atrox* during the colder months. For example, on November 25, 1995, a group of six of us saw a pack rat resting with one of its paws against the flanks of a very large *atrox*. One week later, on a solo jaunt, I saw what appeared to be the same rat snuggled against the flanks of the same snake. The rat was sleeping when first viewed, and only lazily opened one eye when my light hit it in the face. It does not surprise me that the snakes do not appear to eat the rats during the colder months. What does surprise me is the fact that the rats seem to know they are safe.

However, as spring approaches, and the temperatures begin



Example of a "crevice den" for *Crotalus atrox*. As many as eight snakes have been visible in this particular den. Photograph by Don Swann.

Example of a "gash den" for *Crotalus atrox*. As many as 21 snakes have been observed at one time in this den. Photograph by the author.

Aggregation of *Crotalus atrox*, March 19, 1995, in front of the gash den pictured above. Note the position of the large snake on top of the pile. This male appeared to be protecting his harem from the disturbance. Photograph by the author.

Two *Crotalus atrox* fleeing from the photographer, January 31, 1993. Note the build-up of cholla pods and other debris, which may serve to increase humidity, as well as insulate the den. This is the handiwork of the pack rat, *Neotoma albigula*. The snakes are unaffected by the spines. Photograph by Dan Bell.

Two male *Crotalus atrox* captured in full ascent during combat, March 22, 1996. The snake in the background, which is standing taller, was the victor in this well-fought match. Photograph by the author.

A pair of *Crotalus atrox* mating, March 19, 1995. Photograph by the author.

to rise, the rodents become extremely wary. On March 17, 1997, we accidentally scared a large *atrox* into a narrow opening at one of our "soil" dens. A pack rat came scurrying out of the hole, saw us, and two other *atrox* out basking. It jumped back into the entrance of its burrow, and nervously watched both us and the snake behind it. As the snakes become more active in some of our other dens, the rats are often observed in constant motion, always managing to avoid the snakes.

Based on my own observations, I have come to the conclusion that at certain times, (namely the colder months of late fall and early winter), there appears to be a true symbiotic relationship between predator and prey. The predator benefits in many ways from this relationship. The first and foremost of these is the insulation to the den that the debris gathered by the rat provides. As soon as ingress is complete, the rats begin to rebuild their midden. At times, this debris gets piled in such a way as to completely wall in the snakes. Nowak (pers. com.) indicates the same patterns of "den-walling" in her *atrox* shelters. Temperatures can occasionally drop into the 20s (F) during the Arizona winters, and there can be no question about the benefits of this semi-sealed chamber. Going back to my observation of the rat sleeping against the flanks of a large *atrox*, there may be a form of mutual warmth-sharing involved. The body warmth of the rats may increase the ambient temperature within the den. It is even remotely possible that the bodies of the snakes may be used by the rats as a crude form of blanket to trap their own body heat. As improbable as this all may seem, pack rats and rattlesnakes have been seen denning together in other parts of the country as well. There is much work that should be done to investigate the unusual relationship between these two animals.

As for other ways the rats may benefit from the presence of the snakes, I have observed snakes ingressing with full sets of rattles, and egressing with rattles that appear to be chewed off. In March 1996, I also observed a pack rat nibbling on the remains of a hawk-killed snake. It might also make sense that a larger predator, such as bobcat or badger, might think twice about trying to dig a pack rat out of a midden infested with *atrox*!

Neotoma albigula caught between a rock and a hard place, March 17, 1997. At the time this photo transpired, a large *atrox* had entered the den and was behind the rat. Two more *atrox* were basking out front and two photographers were mucking up the works. Note how high the debris is piled at the entranceway of this densite. Photograph by the author.

Putting aside any suppositions on pack rats and *atrox*, we now explore two behaviors in *atrox* that seem absent in the other four species of reptiles under discussion. We speak of combat (i.e., agonistic behavior—see Schuett and Gillingham, 1989), and mating. Both have been observed numerous times during astronomical winter in the Tucson area.

Atrox combat is truly a spectacular event, not soon to be forgotten by anyone fortunate enough to witness it. The fight begins when one male snake rises in the air and issues its challenge. This rising is performed by the snake standing as high as balance will permit, generally one-half of the body length. Many things can happen after the first snake rises into the air. The "intruder" may not like what it sees and flee in all-out panic. Sometimes the aggressor will give chase, and pursue the intruder for distances of up to 50 meters. Sometimes, the intruder will rise to meet the challenge, only to decide that discretion is the better part of valor, and to drop and run is the best course of action. At times, both snakes will rise, and then both drop without combat occurring. When this happens, some sort of decision appears to be reached between the two participants.

But there are also times when two evenly matched snakes will rise, neither will be intimidated, and all hell breaks loose.

The beginning stages of combat are slow, graceful, and downright poetic to witness. Both snakes rise in the air, and seem to waver like stalks of grass in the breeze. They face each other, turn their heads sideways so that they are looking at each other through one eye, turn their heads 180 degrees to each other, and then face each other again. Their straight, periscope-like forms then begin to draw into "S" shaped curves, the two "S" shapes begin to merge as one as they wrap about each other, and then the full fury of the fighting is unleashed.

Once "wrapped" about each other, the idea appears to be for one snake to knock the other to the ground. Seldom is the knockdown clean, usually the snakes are so tangled up with each other that they wind up knocking themselves to the dirt along with their opponent. In spite of the furious action, the snakes do not hiss, rattle, or bite each other, but their "sparring" is otherwise quite audible. As they twist and tumble about, their scales grate against each other, much like rubbing two pieces of sandpaper, and the sound of them hitting the ground together is quite loud. These bouts can last for hours, but my longest viewed episode lasted 20 minutes. Eventually, the combat reaches a conclusion when the winning snake chases the loser away. But even this effort does not insure that the losing snake will not "sneak" back into the den. My observations match those of Beaupre (1995): the losing snake will, at times, swing a wide circle around the den, and sneak back in when the "victor" is not paying attention. In observations of captive pit vipers, researchers are discovering that the loser sacrifices its immediate mating rights (Gillingham et al., 1983; Schuett et al., 1996).

But there is a gentler side to *atrox* as well, and every late winter/early spring, I witness this with clocklike regularity. I am speaking of the spring mating, which only lately has come to light in the herp-literature (Beaupre, 1995). The mating is always a great joy to behold, and is both a happy and sad time for me. I am happy when I see it, for it means that future generations of *atrox* are forthcoming, yet I am sad because it signifies the end of another fantastic winter herping season. Soon after the mating, the snakes disperse, fanning out into the flats that surround their winter hibernacula.

There is so much more that could be discussed concerning wild aggregations of *atrox*. For just one example, consider the alpha-males, and their importance to the success of the dens. These alpha-males are generally the first to arrive in the fall, and the last to leave in the spring. They also tend to be the last to enter the den for prolonged "hibernation," and are often the only ones out basking during the colder winter months. Are they "standing guard" over the entire den? This author thinks so! Male-to-male sexual encounters have been observed, as has the successful mating of smaller, less-dominant males while alpha-males look on (see Schuett and Gillingham, 1989). I have also seen smaller male snakes "hide" female snakes by shielding them from sight with their bodies (Beaupre, 1995, describes this behavior as "stacking"). I have seen male snakes guard their harems from photographers by positioning themselves on top of clusters of females. As denning *atrox* appear to be social animals, there is much that could be learned from studying their social interactions!

There can be no solid conclusion to what is unfolding in the Tucson area during the winter months. There are too many areas that still need more research and documentation. We are seeing the reptiles under discussion use some sort of homing instinct to zero in on appealing sheltersites. We know that these reptiles arrive and leave, we know *when* they arrive and leave, but don't know specifically what triggers this. We see evidence of *atrox* being more advanced in behavioral modes than the other four species under discussion.

In closing, the date of this writing is November 8, 1997. At this time, we have lyresnakes appearing in home crevices, chuckwallas have not yet arrived, some tortoises are home, some are moving towards home. No Gilas have shown themselves yet. In some of the *atrox* dens, ingress appears complete, in others, it has barely begun. The cycle has started again, just as it has for perhaps several thousand years. We earnestly look forward to the next go-around in hope that the months ahead will yield new knowledge and insights into little-understood phenomena.

Literature Cited and References

Bailey, S. J. 1992. Hibernacula use and home range of the desert tortoise (*Gopherus agassizii*) in the San Pedro Valley, Arizona. Unpubl. M.S. Thesis, University of Arizona, Tucson, Arizona.

Beaupre, S. J. 1995. Sexual size dimorphism in the western diamondback rattlesnake (*Crotalus atrox*): Integrating natural history, behavior, and physiology. Sonoran Herpetologist 8(3): 112-118.

Gillingham, J. C., C. C. Carpenter and J. B. Murphy. 1983. Courtship, male combat and dominance in the western diamondback rattlesnake (*Crotalus atrox*). J. Herpetology 17(3):265-270.

Martin, B. E. 1995. Ecology of the desert tortoise (*Gopherus agassizii*) in a desert-grassland community in Southern Arizona. Unpubl. M.S. Thesis, University of Arizona, Tucson, Arizona.

————. 1997. How I spent the prime of my life living with Gila monsters. Sonoran Herpetologist 10(10):106-110.

Nowak, E. M. 1998. Implications of nuisance rattlesnake relocation at Montezuma Castle National Monument. Sonoran Herpetologist 11(1): 2-5.

Schuett, G. W. 1996. Fighting dynamics of male copperheads, *Agkistrodon contortrix* (Serpentes, Viperidae): Stress-induced inhibition of sexual behavior in losers. Zoo Biology 15:209-221.

Schuett, G. W., and J. C. Gillingham. 1989. Male–male agonistic behavior of the copperhead (*Agkistrodon contortrix*). Amphibia–Reptilia 10:243-266.

Schuett, G. W., H. J. Harlow, J. D. Rose, E. A. Van Kirk and W. J. Murdoch. 1996. Levels of plasma corticosterone and testosterone in male copperheads (*Agkistrodon contortrix*) following staged fights. Hormones and Behavior 30:60-68.

Bull. Chicago Herp. Soc. 33(3):57-59, 1998

Notes on Wrinkled Frog (*Rana rugosa*) Tadpoles from Hawaii

Heidi Gilbertson
Department of Wildlife Ecology
University of Wisconsin
Madison, WI 53706

Dreux J. Watermolen
Wisconsin Department of Natural Resources
P.O. Box 7921
Madison, WI 53707

Abstract

Tadpoles of *Rana rugosa* are described and illustrated based on 17 specimens collected in Hawaii. Photographs of the oral disc at two different developmental stages are provided.

Rana rugosa is native and widespread in northeastern China, Japan, Korea, and the Ussuri Region of Russia (Nakamura and Ueno, 1963; Okada, 1966; Szyndlar, 1984; Fei et al., 1990; Maeda and Matsui, 1990; Zhao and Adler, 1993), where it primarily inhabits paddy-fields, pools, ponds and running water (Hallowell, 1860; Stewart, 1953; Shannon, 1956; Hahn, 1960; Okada, 1966). *R. rugosa* was introduced into Hawaii from Japan in 1896, and is now found on all the main Hawaiian Islands (McKeown, 1996). In Hawaii, it occupies mountain streams that offer both abundant shade and year-round clear, cool running water.

Okada (1966) and Maeda and Matsui (1990) briefly describe the tadpoles of *R. rugosa*, and Altig and Johnston (1986) list several larval characteristics. Illustrations of *R. rugosa* tadpoles include a photograph in McKeown (1996) and a line drawing in Maeda and Matsui (1990). Okada (1966) and Fei et al. (1990) provide line drawings of mouthparts, without indicating a developmental stage or discussing variation in oral structures. The descriptions and keys for eggs, tadpoles, and adult frogs in Fei et al. (1990) are written in Chinese, and there is currently no English translation available.

We have not been able to locate a recent or complete published description of *R. rugosa* tadpoles; nor have we been able to find information regarding the growth and development of *R. rugosa* in Hawaii. Here, we supplement previous accounts and illustrate with photographs and line drawings significant oral features.

Methods and Materials

Nine *R. rugosa* tadpoles were collected with a 14 cm × 20 cm aquarium dip net from a pool at the base of a small waterfall in Pua Kaa Park northwest of Hana on the island of Maui. Tadpoles were collected 9 March 1988 from the first pool upstream of State Hwy. 36 and were fixed and preserved in 10 percent formalin. Eight additional specimens (two collected on Maui and six from the island of Oahu) maintained in the Bishop Museum at the University of Hawaii were examined (see Appendix 1 for collection information).

Specimens were examined in the laboratory with the aid of a dissecting microscope. Measurements and morphological characters reported follow Altig (1970) and Altig and Johnston (1986; 1989). Developmental staging follows Gosner (1960).

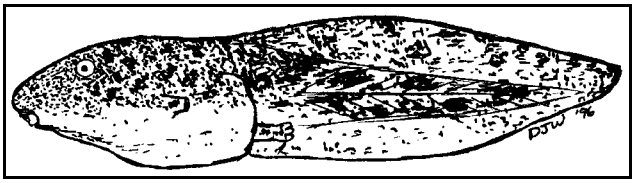


Figure 1. *Rana rugosa* tadpole at stage 40.

Description and Discussion

The body is depressed and globular in shape with the snout bluntly pointed (Figure 1). The eyes are dorsal and the oral disc is small and almost ventral. The nostril apertures are dorsal and are situated closer to the eye than to the end of the snout. The single spiracle is sinistral and fused to the body wall level with the body axis. The anus is dextral and near the anterior limit of the subcaudal crest.

McKeown (1996) describes the tadpoles as "greenish-grey." In formalin, the body is darkly pigmented on the dorsal surface and cream-colored ventrally. Minute, white spots are more numerous on the venter than the dorsal surface; these spots are silvery in living specimens (Maeda and Matsui, 1990; pers. obs.). The spiracle exhibits some dark spots. The tail fins are finely mottled, with the musculature having fewer, but larger spots than the fins.

The intestinal coil is visible through the ventral surface (in preserved specimens) until stage 40 when it begins to fade as the venter becomes white. The narrow, dorsal "wrinkles" characteristic of the adult frog appear by stage 42.

McKeown (1996) states that tadpoles "grow to about 1½–2 in (38–51 mm) before metamorphosing into tiny frogs." Although McKeown (1996) does not indicate if these measurements represent total length or snout–vent length, we believe 38 mm to be a minimum total length. Okada (1966) lists total lengths ranging from 50 to 76 mm, and Maeda and Matsui

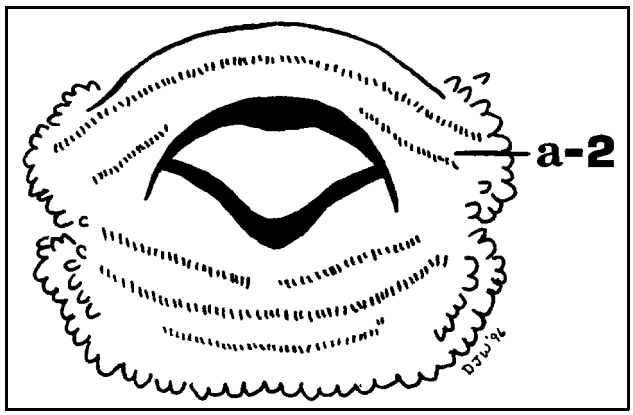


Figure 2. Mouthparts of *Rana rugosa* tadpole at stage 35, depicting the second anterior tooth row (a-2) present in some specimens.

Table 1. Developmental stage (after Gosner, 1960) and body measurements (in mm) of *Rana rugosa* tadpoles.

	Stage	Total length	Body length	Tail length
Maui specimens	26	34	13	21
	35	45	18	27
	35	61	21	40
	38	59	19	40
	39	57	21	36
	40	59	20	39
	40	63	24	39
	41	62	21	41
	41	77	26	51
	42	57	20	37
	42	66	22	44
Oahu specimens	31	24	11	13
	36	59	23	36
	37	48	19	29
	38	41	15	26
	39	55	22	33
	42	43	16	27

(1990) state that mature larvae reach 45–80 mm in total length and metamorphose at a snout–vent length of 25 mm. Seven tadpoles "with hind limbs" measured by Okada (1966) range in body length from 18 to 26 mm. Our observations are similar to these reported sizes (Table 1). Thirteen of the specimens that we examined with hind limbs fall within the range reported by Okada (1966).

The tail ranges from 54.2% to 67.8% of the tadpole's total length (Table 1). In height, the tail ranges from 7 to 17 mm. Its dorsal fin ranges in height from 2 to 5 mm, with the ventral fin slightly narrower, ranging from 1.6 to 3.5 mm.

Okada (1966) and Fei et al. (1990) illustrate the oral disc structure, without designating a particular developmental stage. Figures 2–4 depict the oral disc structure of *R. rugosa* at various stages. The oral disc is laterally emarginate, possessing numerous small blunt papillae with a wide dorsal gap. Few submarginal papillae are present laterally. The jaw sheaths are heavy and darkly pigmented. The upper jaw sheath is a wide, hipped arch; the lower sheath is wide and V-shaped (Figure 2). Labial teeth are dark in distinct rows.

Using the method of Altig (1970), the tooth-row formula has generally been given as 1/3(1) (Okada, 1966; Altig and Johnston, 1986). Intraspecific variation in tooth-row number has been reported in some anurans (e.g., *Scaphiopus bombifrons*, Bragg and Bragg, 1959; *Scinax acuminata*, Mercolli et al., 1994; *Rana sylvatica*, G. S. Casper, pers. com.). We observed this type of variation in *R. rugosa*, with some specimens possessing a second, split anterior tooth-row (a-2; Figure 2). All four of the specimens from Oahu and one from Maui possess this "extra" row. A second specimen from Maui contains an a-2 row on only one side. The number of teeth in these rows ranges from 16 to 34.

While the "mature" tooth-row formula of a species is usually established in the early larval stages, the relative proportions of the rows change during ontogeny (Gosner, 1960). In *R. rugosa*, the third posterior row is shorter than the first and second posterior tooth rows (Figures 2 and 3). At stage 26, the third posterior row is 53% as long as the second posterior row. At stage 40, it is as much as 59% of the second row. The number of teeth in a given row varies ontogenetically, with the number of teeth per row generally increasing as the tadpole develops. However, the larval mouth parts begin to break down following stage 40, when the adult mouth parts begin to form (Figure 4).

R. rugosa occurs in a variety of habitats. Hahn (1960) collected adults adjacent to swift, large, deep rocky streams in Korea, and McKeown (1996) reports *R. rugosa* from cool mountain streams in Hawaii, where it is often found in shallow pools. Nine of the tadpoles we examined were collected in a rocky stream pool with relatively clear water and little submergent vegetation. They were found (feeding ?) on small, underwater ledges less than 1 m deep. Collection information for the Bishop Museum specimens indicates they were also collected in small, shallow pools (Appendix 1).

In Japan (ca 30–45°N Lat.), *R. rugosa* overwinters as a

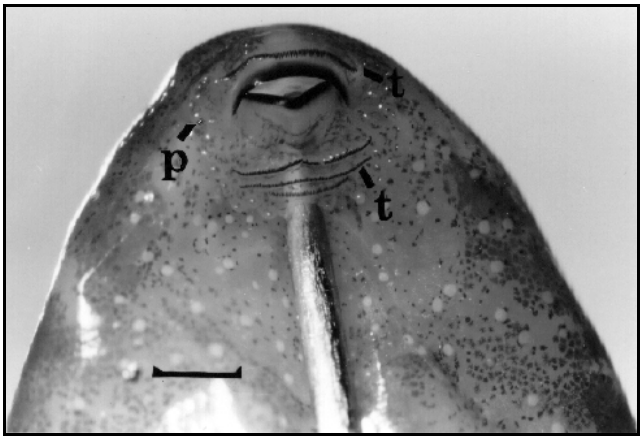


Figure 3. Oral disc of *Rana rugosa* tadpole at stage 26. Note that the first posterior tooth row lacks the gap typical of the species.
p = papillae; t = labial teeth; scale bar = 1 cm.

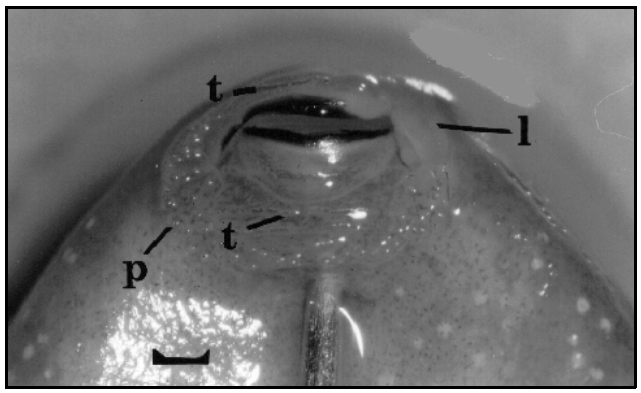


Figure 4. Oral disc of *Rana rugosa* tadpole at stage 40. Note that larval mouthparts are beginning to break down and adult lip (l) is beginning to form on the tadpole's left.
p = papillae; t = labial teeth; scale bar = 1 cm.

tadpole and metamorphoses in May to August of the second year (Maeda and Matsui, 1990). The one-year-old tadpole is "generally like the mature tadpole. Seldom, however, do they show the hind limb developing" (Okada, 1966). Webb et al. (1962) suggest a more extensive breeding season in Korea based on the considerable variation in adult sizes observed in a single year. In Hawaii's tropical climate (ca 19–22°N Lat.), *R. rugosa* appear to breed nearly year-round, with tadpoles being collected in March, July, October and November. Similar to bullfrog (*R. catesbeiana*) tadpoles (see McKeown, 1996), which are often found in the same pools, *R. rugosa* tadpoles transform into frogs in less than one year.

Acknowledgements

Tadpoles from Maui were collected by DJW during a St. Norbert College natural history field studies course. J. R. Hodgson assisted in the field. Tadpoles were examined as part of an undergraduate internship completed by HG. S. R. Craven's support for this project is appreciated. A. Lacy helped in obtaining much of the literature cited. J. Parrish, J. Susko-Parrish, and G. Ostermeier assisted with tadpole photography. M. H. Huang translated portions of the book by Fei et al. (1990), and C. Kishinami loaned the Bishop Museum specimens. We are grateful to all of them.

Literature Cited

Altig, R. 1970. A key to the tadpoles of the continental United States and Canada. Herpetologica 26:180-207.

Altig, R., and G. F. Johnston. 1986. Major characteristics of free-living anuran tadpoles. Smithsonian Herpetol. Info. Service (67): 1-75.

Altig, R., and G .F. Johnston. 1989. Guilds of anuran larvae: Relationships among developmental modes, morphologies, and habitats. Herpetol. Monogr. 3:81-109.

Bragg, A. N., and W. N. Bragg. 1959. Variations in the mouth parts in tadpoles of *Scaphiopus* (*Spea*) *bombifrons* Cope (Amphibia: Salientia). Southwestern Nat. 3:55-69.

Fei, L., C.-Y. Ye and Y.-Z. Huang. 1990. Key to Chinese Amphibia. Chongqing: Chongqing Branch, Sci. Technol. Literature Press. [in Chinese].

Gosner, K. L. 1960. A simplified table for staging anuran embryos and larvae with notes on identification. Herpetologica 16:183-190.

Hahn, D. E. 1960. Collecting notes on central Korean reptiles and amphibians. J. Ohio Herpetol. Soc. 2(4):16-24.

Hallowell, E. 1860. Report upon the Reptilia of the North Pacific Exploring Expedition, under the command of Capt. John Rogers, U.S.N. Proc. Acad. Nat. Sci. Philadelphia 12:480-510.

Maeda, N., and M. Matsui. 1990. Frogs and toads of Japan. Tokyo: Bun-Ichi Sogo Shuppan Co. [in Japanese with some English].

McKeown, S. 1996. A field guide to reptiles and amphibians in the Hawaiian Islands. Los Osos, CA: Diamond Head Publishing, Inc..

Mercolli, C., J. R. Dixon and A. A. Yanosky. 1994. Spawning and larval development of *Scinax acuminata* Cope, 1862 (Anura: Hylidae). Bull. Chicago Herp. Soc. 29(12):271-274.

Nakamura, K., and S.-I. Ueno. 1963. Japanese reptiles and amphibians in colour. Osaka: Hoikusha. [in Japanese].

Okada, Y. 1966. Fauna Japonica. Anura (Amphibia). Tokyo: Biogeographical Soc. Japan.

Shannon, F. A. 1956. The reptiles and amphibians of Korea. Herpetologica 12:23-49.

Stewart, G. D. 1953. Notes on a collection of amphibians from central Korea. Herpetologica 9(3):146-148.

Szyndlar, Z. 1984. A description of a small collection of amphibians and reptiles from the People's Democratic Republic of Korea with notes on the distribution of the herpetofauna in that country. Acta Zool. Cracov. 27(1):3-18.

Webb, R. G., J. K. Jones, Jr., and G. W. Beyers. 1962. Some reptiles and amphibians from Korea. Univ. Kansas Publ., Mus. Nat. Hist. 15(2):149-173.

Zhao, E.-M., and K. Adler. 1993. Herpetology of China. SSAR Contrib. Herpetol. (10):1-522.

Appendix 1. Collection information for Bishop Museum specimens

Museum Nos.: BPBM 8574, 8575, 8576 (1 tadpole each). Hawaii, Oahu. 2.3± km S and 1.9± km W Hau'ula, (Ma'akua Gulch), 213± m. In quiet pool at side of stream. Collected 8 July 1982. 8574 killed 13 July 1982; 8575 killed 30 July 1982; 8576 killed 15 August 1982

Museum No.: BPBM 12210 (3 tadpoles). Hawaii, Oahu. N. Halawa Valley, site 3 (lower rock hole), 21.409°N, 157.853°W, 900 ft. In small rock pool of stream. Collected 26 October 1994.

Museum Nos.: BPBM 11798 and 1179 (1 tadpole each). Hawaii, Maui. Hanawi NARS, Hanawi Stream, 2920 ft. (unnamed tributary)—20.80°N, 156.12°W. Collected 12 November 1992.

Bull. Chicago Herp. Soc. 33(3):60, 1998

Book Review: *Reptile and Amphibian Variants: Colors, Patterns, and Scales* by H. Bernard Bechtel 1995. xvii + 206 pp. Krieger Publishing Co., Melbourne FL. ISBN 0-89464-862-4. $64.50

[Zoo Book Sales offers a 20% discount on this book to CHS members]

David Blatchford
Bungalow No. 2, Kirkhill Cottages
St. Quivox, Ayr, Ayrshire KA6 5HJ
Scotland

Arguably two of the most significant events in recent herpetological husbandry were when Ernie Wagner told a rather surprised world that reptiles not only expect to be cold in the winter but if we ever hoped to breed them then we should pander to this whim, and secondly when Bernard and Bette Bechtel produced the first captive-born albino corn snakes in 1961. These precious hatchlings were the progeny of an F_1 cross between a male albino corn snake that had been collected in North Carolina in 1953 and three wild-type females. Twenty-five percent of the babies that emerged from these F_1 matings (three clutches) were albino, confirming the belief that albinism was the result of a single recessive gene that, if it followed classical Mendelian inheritance, would surface in the next generation. This not only started the Bechtels on a lifelong study, but also stimulated the reptile-keeping community to unlock the hidden genes that have produced such a range of gaudy forms normally shunned by nature for such profligate use of color. However, it has taught us many things, not the least that such flamboyant coloration is pleasing to many a human eye. And the monetary exchange that this has generated has been the powerhouse behind the revolution in captive breeding that has enveloped at least the world of snakes over the past few years.

This book attempts to explain a little of the biology behind the mechanism of inheritance and the machinery of color production. This is not an easy task and the job has not been made any simpler by including both reptiles and amphibians. I suspect a far more satisfactory, or at least less unwieldy, job would have resulted from concentrating the text on snakes where, it has to be said, most of the interest in color variants lies. Indeed the proliferation of different color morphs of corn snakes alone could well fill a book of this size. However, what the author has chosen to undertake is first to describe the history of each mutation and then to describe the mechanism by which it has arisen. The genetics content is at an elementary level; anyone who thinks otherwise should dip into a modern textbook and will soon appreciate that this is not a subject for a popular text.

The net result is entertaining but sometimes confusing; the information necessary to understand the elements of inheritance, the nature of allelic mutations and the relevant biochemistry of the processes involved is intermingled with natural history and folklore.

The text attempts to fulfill two roles: primarily it is written for the amateur herpetologist who wishes to understand why for example, when you cross two albino black rat snakes you may find all wild-type progeny. But it contains such basic information on the species described that it seems also to have been written with the biology student in mind who has little knowledge of reptiles or amphibians. Consequently much of the text may be superficial for the informed reader from either camp.

Nevertheless the information is not readily available elsewhere and certainly not written from the unique standpoint of a reptile enthusiast. Chapter One is a whistle-stop introduction to reptiles and amphibians and Chapter Two is entitled "Biology of the Skin." The mechanism of genetics is introduced in the third chapter, stopping well short of any molecular genetics, with an explanation of the Punnett square. The three chromatophores that are found in ectothermic vertebrates are described and their involvement in pattern, color change and function are covered by three short chapters before the first mutation—albinism—is discussed. Anerythism (lack of red, paradoxically caused by a lack of yellow, so more accurately called axanthism) is the other half to the albino pairing of no black (amelanism) and it is put firmly in context with a discussion of the corn snakes that have so changed the face of snake breeding. Again, as in all other sections the snakes have the lion's share and "other reptiles" and amphibians are relegated to a brief discussion at the end of the chapter.

Perhaps the most spectacular of all color aberrations is leucism, which produces a pure white animal with pigmented eyes. This is the subject of a fascinating chapter which also covers piebaldism and melanism. The book also includes a chapter on anomalous patterns and the more bizarre scalelessness, bicephaly and hybrids. Finally there is a chapter entitled "Investigative Breeding" which briefly covers some of the more recent mutations which have been line-bred specifically for the snake-keeper.

The book is completed with a portfolio of large color plates illustrating some 46 snakes, both normal and aberrant, plus six lizards, seven chelonians, one alligator and 16 amphibians.

This is an unusual cocktail of science, natural history and anecdote and while it may not qualify as a standard textbook, it does put each of the naturally occurring mutations into a historical context.

It is a unique work from the doyen of the occult reptilian genome.

Bull. Chicago Herp. Soc. 33(3):61-63, 1998

HerPET-POURRI

by Ellin Beltz

Olympic speed slithering?

New contributor Kelli Swayne sent a calendar page from Bayer Pharmaceuticals for January 2, 1998, which reads: "The black mamba, a snake from southern Africa, has been said to move 25 to 30 miles per hour while chasing a man on horseback." She wrote, "Most of my snake books tell me that the average snake moves at a top speed of five to six miles per hour on land. Is the black mamba an exception? Also why would a snake chase a man on horseback? I know those snakes are aggressive, but why would they chase non-prey animals that could kill them?" Well, I'm no expert on this topic, but I think what Bayer has reprinted here is what we call an "urban legend," except in this case it's more like a "countryside legend." How about it, readers? How fast can a black mamba slither, with or without the man on horseback?

New turtle excluder

Science News reports that researchers have developed turtle excluder devices for crab traps in an effort to reduce mortality of diamondback terrapins. The researchers found that, on average, one terrapin is killed every five crab trap days, although one trap killed 49 turtles in a single day. Diamondback terrapins used to be very common in brackish water along the Atlantic coast of North America, but were decimated by overcollecting for the restaurant trade around the turn of the century. Researchers in this study found that 15 to 78 percent of local turtle populations can be killed in a single year by shallow-water crabbing operations. [Volume 152, November 1, 1997, from Karen Furnweger]

Tick tick tick

Veterinarians are finding large African ticks on imported reptiles and warn that tick-borne diseases may spread to Florida livestock and wildlife. The African ticks grow up to about the size of a 5-cent piece and carry heartwater, a disease which can spread to deer and cattle—but not to humans. One imported tortoise taken to a vet was found to have 50 ticks tucked under its shell. If you have imported reptiles, please check them carefully for ticks or take them to your vet for a check up, advises the United States Department of Agriculture. [*Orlando Sentinel*, November 10, 1997, from Bill Burnett]

Do unto others . . .

A Bay Lake, Florida, man claims he wasn't poaching alligators last June 12, merely making the lake safe for his stepsons who wanted to go frog-gigging. The Circuit Court judge was unamused and the man was sentenced to a year of probation, fined $500 and ordered to pay $800 in court costs. In addition, he was banned from using firearms off his property; but his guns were returned to him. The man claims his legal fees cost him $4,500. The charges arose from the disovery of a dead 6-foot alligator in a 20-gallon garbage can in the man's pickup truck by an officer with the Florida Game and Fresh Water Fish Commission. [*Daily Commercial*, Leesburg, Florida, October 22, 1997, from Bill Burnett]

When the weather acts like a child

Humans are not the only species affected by El Niño, the odd weather system caused by warming of the southern Pacific Ocean by underwater volcanos. Turtles in the Mazunte, Mexico, center for sea turtle studies had the roof of their center blown off by hurricanes Pauline and Rick which whipped the coast of Mexico in November. Hurricane Pauline tore up the Escobilla nesting beach on October 8 and destroyed up to six million sea turtle eggs. Turtles returned to the beach immediately after the storm and laid more eggs. Volunteers estimate that another 100,000 turtles laid eggs after the beach was storm damaged. A local biologist said that they don't believe the storm damage will cause a long-term problem for the nesting beach or turtle popluations. [November 13, 1997: *Orlando Sentinel*, from Bill Burnett; University of New Mexico *Daily Lobo*, from J. N. Stuart]

Get involved if it involves you

- The "Proposed Rule for the Humane and Healthful Transport of Live Reptiles and Amphibians" can be requested by fax, (703) 358-2280, or by E-mail <r9oma_cites@fws.gov>. Contributor Joseph Jannsen writes: "Everybody agrees there is a need to regulate the transport of herps into this country. The U.S. Fish and Wildlife Service's job is to protect reptiles and amphibians being imported into the U.S., not draft regulations to make it easier to do so. However, with the input of parties on both sides of this issue, perhaps the Service can insure the herp you buy at your local pet shop reached there healthy and humanely, while allowing herp importers to continue to do business." January 28, 1998.

- The Indiana Department of Natural Resources goes to all the local reptile shows and conservation officers set up a public information booth to educate consumers and keep an eye on dealers. One officer has been part of the scene since the early 1980s when he says that there were only three professional dealers in the whole state. In 1995, there were more than 250—business is booming. An emergency rule enacted on December 3 prohibits the sale and transportation for sale of dangerous reptiles and amphibians, and other reptiles and amphibians native to Indiana. This rule expires November 30, 1998, and the state is taking comments at this time. [*The Times*, Porter County, Indiana December 28, 1997, from Jack Schoenfelder]

Life in reptile land

- "Scientists hope the bog turtle's designation [as a threatened species] will help stem a decline in the reptile's numbers, a reduction blamed primarily on an illegal pet trade. Only a few thousand of the species remain." [*Chicago Tribune*, November 5, 1997, from Ray Boldt]

- A video titled "The Reptile Dude" by Scott Davis includes his original reptile songs and is supposed to be available through Blockbuster or at Tachell Films, (888) 821-3456. [*Los Angeles Daily News*, August 7, 1997, from E. A. Zorn]

• *Houma Courier*, January 2, 1998: "Alligator wrestler vows return." A 27-year-old Florida man plans to return to his job after a 10-foot, 350-pound alligator "clamped down on [his] head and wouldn't let go for about two minutes." [from Ernie Liner]

• An applicant for a job "arrived with a snake around her neck. Said she took her pet everywhere." [*Managers Intelligence Report*, January 1998, from Jack Schoenfelder]

• A man in Kuala Lumpur, Malaysia, who raises tortoises on a farm awoke recently and saw a car and a van parked near his ponds. Four suspects escaped, although police did catch one apparent thief loitering near a van full of piles of tortoises and terrapins, according to Sheikh Mustafa Sheik Ahmad, the police chief for the district. [*The Courier*, Houma, Louisiana, December 27, 1997, from Ernie Liner]

One tale from two newspapers

"Incredibly lucky" was the comment of officials at the Long Island Reptile Museum about the recovery of their colleague after being bitten by a West African gaboon viper. He was rushed by helicopter to the regional center for snakebite treatment at the Bronx's Jacobi Medical Center; antivenin was provided by the Bronx Zoo. Within an hour, the man had been treated with antivenin and was also receving oxygen, antibiotics and tetanus shots. It is also believed that the snake did not inject a full load of venom. "Minor surgery" was performed to reduce swelling in the forearm, but the actual bite site on the hand was still intact. The manager of the museum was asked why the snake had struck its keeper and replied, "It's hard to figure what went through the mind of this reptile, which has a brain the size of a grain of rice. We'll never know, of course, but maybe it felt some sense of danger. It certainly wasn't hungry." The last person in the U.S. who nearly died from a gaboon viper bite was a 16-year-old boy who stole two gaboons from the National Zoo in 1983. [*Newsday*, December 30, 1997, from Joseph Jannsen] *The New York Times*, December 29, 1997, wrote: "The establishment refers to itself as a museum, but visitors and neighbors called it a commercial showplace that attracted tourists, people wanting to buy pets and parents wanting an exotic venue for children's parties." [from Mike Dloogatch]

While on the other side of the mountains . . .

"A 38-year-old man passed away in Jenkins Township, Pennsylvania, in November, a couple of hours after going to the home of a friend to see his snakes. According to the friend, the man had playfully reached into a cobra's tank, picked up the snake, and was bitten. Refusing a ride to the hospital, the man said 'I'm a man, I can handle it,' and instead went to a bar, where he had three drinks and bragged to patrons that he had just been bitten by a cobra. An hour later he was dead." Chuck Shepherd. [News of the Weird, *Reader*, January 9, 1998, from Ray Boldt]

A tale of two states

• "A boa constrictor and a python are believed loose around Makawao [Maui]" reports the *Honolulu Star Bulletin*. The daily searches began when shed skins were found at a ranch. It has been said time and again that an isolated island ecology like Hawaii's is very fragile and alien escapes usually lead to ecological damage if not outright catastrophe, so the hunts continue even though some have suggested the skins might have been only a prank. "Hawaii, as a virtual snake-free state, is vulnerable to these kinds of alien species. I want to remind all our residents to be vigilant," said the snake expert for the state Department of Land and Natural Resources who added that species at risk include the nene and other ground-dwelling native birds that have no defenses against snakes. Boa constrictors are native to South America and Burmese pythons belong in India, Sri Lanka, Indochina, southern China and Indonesia. "Officials said they will try to capture the snakes alive." [January 9, 1998, from Sean McKeown; and January 11, 1998 *The Maui News* and *the Haleakala Times* January 21-February 3, 1998, from Erik Frye] Erik's contribution arrived by way of his dad, who wrote: "These articles detail what may be a humongous hoax and are, with the insight of herpetological experience, rather humorous. After reading them, I immediately thought about you and your monthly column. Enjoy! By the way, not only are sea snakes native to the Hawaiian Islands; tiny 'blind' worm snakes, *Rhamphotyphlops bramina*, were brought to the island years ago in potted plants. They are now very commonly found almost everywhere the soil is sufficiently moist to support a population of tiny . . . invertebrates upon which it feeds. Many people seeing these four- to six-inch (parthenogenetic, all-female) creatures exposed during digging in their gardens, mistake them for earthworms. I can well imagine what people thought when they came across that 17-foot shed python skin! Fredric L. Frye"

• Brown Cuban anoles (*Anolis sagrei*????) are displacing native green Florida anoles (*Anolis carolinensis*). "Floridians have heard the invasion story before. Hydrilla weeds plug the rivers. Medflies destroy the oranges. Love bugs splatter windshields. Florida is the most invaded territory in the continental United States," writes Tyler Gray in the *Orlando Sentinel*, September 14, 1997. The researcher working on the native and alien anoles marks his study specimens with numbers in Sharpie marker. Gray says, "they look almost like tiny race cars—minus the corporate sponsors and STP decals." The marker wears off at the next shed. [contributed by Bill Burnett]

Good news for a change

• The Shedd Aquarium's new master plan for Galleries I and II includes flooded Amazonian forest, Philippine coral reefs and presettlement Illinois wetlands. A new outdoor building under the south terrace will house a series of large habitats and the coral reef in the center of the Rotunda will be remodeled. If you've ever dreaded cleaning a tank, consider this: "After Labor Day, the 90,000-gallon exhibit will be closed to repair the ravages of saltwater on its systems since the last overhaul 12 years ago." It will reopen to the public by Thanksgiving. New video monitors will permit everyone in the Rotunda to both see and hear the diver more clearly. [*WaterShedd*, January/February/March 1998]

• "On 30 October, approximately 1,800 Ramsey Canyon

leopard frogs/larvae, headstarted at the Phoenix Zoo, were reintroduced to historic localities. Zoo staff, volunteers, and agency biologists backpacked the frogs to suitable sites in . . . southeast Arizona. . . . Less than 25 adults [are now] inhabiting an artificial pond on Nature Conservancy property. . . . Survivorshop of these head-started frogs will be closely monitored by agency biologists for one year before additional releases are scheduled." [American Zoo and Aquarium Association, January 1998, both from Karen Furnweger]

Instant replay

Lake Okeechobee, Florida: "Researchers have found young alligators along Lake Okeechobee's northern shore have very low levels of hormones controlling reproduction, growth and resistance to disease. 'Our results raise a very large red flag,' said Louis F. Guillette, Jr., of the University of Florida. 'Something is clearly causing dramatic changes in the environment for these alligators,' he said." [*The Chesterton Tribune,* February 10, 1998, from Chuck Keating] Didn't somebody find out that it was pesticides mimicking hormones already?

Outer space all over again

A four-year-old newt is making its third journey aboard the spacecraft MIR, arriving on a cargo ship with eight other newts and 120 snails, according to the ITAR-Tass news agency. It made its first space journey in 1995. Scientists are studying if it retains skills from previous missions and whether it gets accustomed to space faster than its newbie companions. The Russian-American team will film the animals to study movement in weightlessness. [*Albuquerque Journal*, December 25, 1997, from J. N. Stuart]

Isn't Conservation Biology nice?

• *Anolis* lizards transported onto previously lizardless islands in the Bahamas in 1977 and 1981 have been found to have adapted to the vegetation of their new homes. "On those experimental islands with shorter vegetation, the lizards had shorter limbs. . . . The amount of morphological change we found, given that it had only been a decade, was remarkable," said a Washington University (St. Louis) biologist. [*Popular Science*, September, 1997, from Alan Rigerman]

• Studies on the Panamanian golden frog reveal that not only do the frogs hear with their lungs (as do other species from torrential streams) but use a form of sign language by waving their forearms. Researchers played calls to their study subjects in the frogs' natural habitat and recorded their response. They then observed the forearm waving. [*National Wildlife*, June/July 1997, from Mark T. Witwer]

• Tadpoles go deaf from two to four days before metamorphosis, other than that, they hear just fine, according to researchers at Brown University in Providence, Rhode Island. This was the first study that measured hearing in water; previous workers had only measured hearing in air.

• It's nice to know I wasn't dreaming all those years I kept my pig frog. Bought as a tadpole after a CHS show in 1987, Taddie became a frog I thought was a bullfrog until my husband pointed out the toe webs and proclaimed it a pig frog. This might explain why the poor animal was so shy that it spent all its fully grown time hiding by remaining motionless adjacent to cover in the aquarium. I used to sit with my back to the tank and do homework for school, or write this column. Every so often I'd hear a kind of a "groink" but it was not the same as the call, being very low-pitched and hard to hear. Sometimes it was a sharp call about one-third as long. But try as I could I never got to see Piggy making the noise until he was very old in 1995. What I thought I was seeing was the noise being made by his just clicking the tympanum, but I was never close enough to be sure. Now a researcher at the University of California has found that the loud "jug-o-rum" call of the mature bullfrog comes mostly through the ears. He demonstrates this by covering the ears with his fingers during the croak. The cry then becomes muffled and quieter. During the study he made little frog earmuffs out of bits of foam and a spring. Ever since other workers tried to prove that most of the sound of a frog cry comes through its vocal sac by placing the frog in helium (and it didn't work), scientists have been trying to find where the volume for the cry originates. [*Science News*, Volume 153, January 3, 1998, from Mark T. Witwer] Perhaps somebody will see the second call of the pig frog, vibrating ears at each other in the canebrake someday.

Thanks to everybody who contributed the articles above, and to Ray Boldt, E. A. Zorn, Mark T. Witwer, Garrett Kazmierski, Claus Sutor and J. N. Stuart for stuff they sent that I heartily enjoyed but which my poor, tired fingers and tweaky tendons are tired of typing. You can contribute, too. Send clippings with date slug/publication and your name firmly attached to each piece (address labels rule!) to: Ellin Beltz, 1647 N. Clybourn Avenue, Chicago, IL 60614-5507. Okay, so I'm a dinosaur, but letters only to my E-mail <ebeltz@ripco.com>.

Currently Happening Stuff

reported by Gary Kostka

Welcome NIHS . . .

President Steve Spitzer opened the January 28 general meeting of the CHS by welcoming a group of visitors from the newly established Northwest Indiana Herpetological Society. Steve offered his hopes that they would enjoy the meeting, and possibly learn some things that would help them in their quest to form their own society.

St. Louis Zoo or Bust . . .

Member-at-large Audrey Vanderlinden stepped up to the podium to give an update on the CHS field trip to the St. Louis Zoo, scheduled for Sunday, June 14. Audrey has seen to all the details of what promises to be a memorable event. Transportation to and from the St. Louis Zoo will be by luxury motor coach, and participants will have a unique opportunity for a behind the scenes tour of the zoo's state-of-the-art reptile and amphibian facility known as the Herpetarium. Along with the other herps in the zoo's considerable collection, you'll be able to see a colony of rare tuataras and a Komodo dragon. Audrey emphasized that there are only 47 seats available for this adventure, so anyone interested in taking part should contact her ASAP to make reservations. Full details of the St. Louis Zoo trip are listed in the February '98 Bulletin. Reservation requests and/or questions should be directed to Audrey Vanderlinden at (773) 836-2477.

All that and a picnic too? . . .

As if the St. Louis Zoo extravaganza weren't already enough, Audrey went on to announce that she is in the process of organizing a CHS Picnic. Although her attempts to secure a picnic permit and site have not yet borne fruit, she indicated that the event would most likely take place in late July or early August at a forest preserve on Chicago's northwest side. As usual, the success of this event will hinge directly on member participation—participation not just on the day of the picnic itself, but in the preparation and planning leading up to it. Audrey's done us a service by picking up the "Picnic Ball," now it's up to the rest of us to help her run with it. If you'd like to help in resurrecting the CHS Picnic, you may contact Audrey at the number listed above, or let her know when you see her at the next general meeting.

Ray has his say . . .

Ray Pawley, Reptile and Amphibian Curator Emeritus of the Brookfield Zoo, was among those attending the January general meeting. Following Steve Spitzer's brief introduction, Ray took a few moments to bring us up to date on some of the personal and herpetological happenings in his life. He received a warm round of applause as he announced his March '97 marriage to Hedda Saltz. Also on the personal front, Ray informed us of his retirement from Brookfield Zoo as of June '97. He intends to continue on with his career by pursuing consulting work both at the environmental level and at zoological parks, with the possibility of getting involved in animal nutrition at some point in the future. "I'm working harder now looking for work than I ever worked when I was working." admitted Ray, sounding a bit bemused.

Moving on to herpetological matters, Ray filled us in on some research concerning parthenogenesis in snakes that he has undertaken in collaboration with a geneticist doing research at Brookfield Zoo. Numerous cases have been documented of female snakes laying viable eggs or giving birth to living young years after being taken from the wild, without having had the opportunity to mate since the time of their capture. This phenomenon, referred to as latent reproduction, has always been considered to be the result of delayed fertilization brought about by retention of viable sperm within the female's reproductive tract. Ray was unaware of any actual documented proof that sperm retention was the factor responsible in these cases of latent reproduction, and this is what prompted consideration of parthenogenesis as a possible cause.

Although both Ray and his collaborators believe that viable sperm may be retained within a female snake for as long as a year, it is their supposition that parthenogenesis is probably responsible for reproduction occurring much beyond that point. To aid them in researching their theory, Ray requested that anyone owning a female snake that had not bred in several years but which had mated in the past, might, in the event of its death have the animal necropsied and her reproductive tract removed and preserved. He also indicated that the excised tissue should be preserved in alcohol, not formalin. These preserved reproductive tracts may then be turned over to Ray who will pass them on for DNA testing. These tests, commonly referred to as DNA fingerprinting, should enable the researchers to determine whether sperm is still present within the reproductive tract tissues. Ray would be interested in speaking to anyone who might be able to contribute the preserved reproductive tract of any type of female snake meeting the above-mentioned criteria. Any questions concerning the details of making such a contribution or about the research project itself should be directed to Ray Pawley at (708) 445-8311.

Ray's next herpetological nugget of interest concerned research involving the Aldabra tortoise, conducted by a group based in England known as the Nature Protection Trust of the Seychelles. The Seychelles, a group of islands located in the Indian Ocean off the western coast of Africa were at one time home to a number of species of giant tortoise including the

Aldabra. With the exception of the Aldabra, all of these species were considered to have gone extinct 300 to 400 years ago. However, it now appears as if this may not be the case, as members of the Seychelles Trust believe that at least one of these species may in fact still exist. This belief is based on distinct physiological differences observed in tortoises which had until this time all been considered to be Aldabras. Ray concurred with these observations, stating that he had also seen so-called Aldabra tortoises in zoos which were markedly different in appearance from other members of the species with which he was familiar. The Nature Protection Trust of the Seychelles is currently seeking photos of adult Indian Ocean giant tortoises collectively referred to as Aldabras to aid them in their comparative study. Anyone having such photos, and willing to contribute them to the Seychelles Trust's Aldabra tortoise research project is encouraged to contact Ray Pawley at the previously listed number for further information.

Points to Pond(er) . . .

The program portion of January's meeting was a bit out of the ordinary in that two speakers were featured. Chuck Roth led off with an informative presentation covering the installation and maintenance of backyard ponds. Owner of the Chesterton [Indiana] Feed and Garden Center, Chuck holds a degree in horticulture and is actively involved in environmental issues through his membership in Indiana's "Friends of the Dunes" organization. Following Chuck was our own Ron Humbert who put a herpetological spin on the evening's proceedings with a brief yet enlightening presentation detailing the establishment and maintenance of herps in backyard pond habitats.

Chuck's presentation was replete with information, containing everything one desiring to create a backyard pond might need to know. Chuck's narrative was augmented with a fantastic selection of slides illustrating the various stages of pond construction as well as some beautiful examples of completed water gardens.

The first step in pond construction is to determine where it will be located. Ideally the site should be level with well drained soil to help prevent runoff water from entering the pond during periods of rain. Select a site that receives plenty of sun, as most aquatic plants require high levels of light in order to thrive. Avoid overhanging tree limbs as they tend to introduce organic litter, which can tax the pond's filtration system. Convenience to electrical and water supplies should also be a considered. Power will be required for the pond's pump, filter and any other mechanical or lighting elements, and water is necessary not only for filling the pond initially, but also for periodic top-offs as needed.

Chuck then went on to discuss pond liners, of which there are two basic types: the rigid or preformed; and the flexible liner made from sheet plastic. Preformed liners come in a variety of shapes and are generally no more 18 inches deep with a typical capacity of 250 to 300 gallons. Their relative ease of set-up often makes them the liner of choice for first-time pond installations. Well suited for smaller sites or in free-standing applications on patios or decks, they can also be relocated should the need ever arise. Flexible liners allow for the construction of a custom-designed pond of much greater size and depth than is possible with a rigid liner. Depth becomes a factor if one intends to leave fish and plants in the pond through the winter, and Chuck noted that a minimum depth of 3 to 4 feet would be required to achieve this in the Midwest.

The preformed pond is installed by simply digging a hole that mimics the shape of the liner, then placing it within the hole. The liner top should be flush with the surrounding ground, and care must be taken to insure that the liner is level when the installation is complete. This may best be accomplished by removing small amounts of dirt at a time during the excavation process until a satisfactory result has been achieved. Backfilled dirt around the edge of the liner should be packed in and watered down repeatedly to promote settling. The pond may now be filled and water plants should be added at this time. Nonfloating plants should remain in their pots to allow them to moved about the pond or to be removed altogether for routine maintenance or winter storage. Landscaping around the pond's perimeter provides the finishing touch. Chuck recommended placing cap rocks around the pond's border, positioned so as to slightly overhang the edge. This is not only aesthetically pleasing, but also helps to provide a barrier against runoff water entering the pond.

Installation of the flexible liner is accomplished by first digging the deepest part of the pond, which will form the central area. Build up the grade surrounding this deep-water zone by making successively shallower excavations, leaving a series of outwardly ascending earthen shelves when complete. This arrangement of shelves will allow for the optimum placement of a variety of potted water plants within the pond according to the depth requirements of each. With the excavation complete, the flexible liner can now be placed inside. Efforts should be made to remove as many wrinkles as possible from the liner as it is laid in the hole, and bricks may be used to hold it in place as the job progresses. With the lining installed, the pond is now ready for filling. Remove the bricks as the pond fills, as the weight of the water will now serve to hold the liner securely in place. Add water plants, install the cap rock border, do your perimeter landscaping and voila! You've got yourself a pond right in your own backyard.

Chuck then went on to discuss pump and filtering requirements for ponds. A pond's size in cubic feet is calculated by multiplying its average length $\times$ width $\times$ depth. This figure is then multiplied by 7.48 to arrive at the pond's capacity in gallons. As a rule of thumb for selecting a pump, Chuck recommended that it be capable of circulating the pond's total gallon capacity every two hours. In other words, a pond containing 1,000 gallons of water would require a pump capable of circulating 500 gallons in an hour. Keep in mind that other elements in the pond such as waterfalls or fountains will deplete a pump's circulating power, so make sure to factor them in when choosing a pump. It is better to err on the side of too much power when purchasing a pump as the flow can always be decreased if necessary.

Filters are of two types, mechanical or biological, and can be placed either inside or outside of the pond. Mechanical filters serve only to remove debris from the water, trapping it on a foam pad that must be removed and cleaned periodically. A biological filter cleans the water and maintains its clarity through the action of beneficial bacteria, which live within the filter and feed on algae and organic wastes. Chuck explained that the two types of filters come in a wide variety of sizes and styles and can be used either singly or in tandem depending on the particular application. Filtration is also accomplished through the inclusion of floating plants in the pond. The root systems of these plants hang down in the water and consume the nutrients that undesirable algae might otherwise feed upon.

Chuck then spent some time describing some of the products currently available to help the aquaculturist in maintaining a state of biological equilibrium within the pond. It struck me that many of the potential problems and remedies he discussed were exactly like those encountered by home aquarists, but on a larger scale. From water-testing kits to bacterial additives to chemicals that decloud, dechlorinate and provide a slime coat for fish, the aquaculture market appears to be a lucrative one indeed.

We then moved along to the topic of plants in the water garden, of which there are four basic types. Bog or marginal plants are those which live in the very shallow water at the pond's edge and include cattails, hibiscus, cardinal flower and iris. Floating plants having roots that hang down in the water include water lettuce and water hyacinth. Submersible plants or oxygenators such as seaweed grow from the bottom of the pond, but do not rise above the water's surface. Deep water plants such as water lilies and water lotuses are also rooted at the bottom of the pond, but their stems extend upwards and they leaf and flower above the surface. Sixty percent of the water surface should be covered by plants to shade the pond, which will help to keep the water cool and inhibit the growth of algae. Included in this portion of the presentation were numerous breathtaking slides of water gardens incorporating plants of tremendous beauty and variety, which Chuck described for us.

If fish are to be added to the pond Chuck recommended that it be done so slowly, with the addition of two per week being a suitable rate. Before introducing the fish, make sure the pond and its plant life have achieved a state of biological balance. A good rule of thumb for determining how many fish should be kept in a pond is one inch of fish for every 24 square inches of surface area. Addition of fish and the subsequent overfeeding that often occurs can lead to a loss of balance in the pond, as the fish's waste products and breakdown of the uneaten food will add significant levels of nitrates to the water.

Chuck went on to describe the seasonal requirements involved in maintaining a Midwestern backyard pond. Spring maintenance includes removal of any accumulated debris before replacement of the pump and filter, which are typically removed from the pond for the winter. Beneficial bacteria should be added at this time, and feeding of fish can resume when the water temperature reaches 55°F. Plants should also be fertilized at this time, and those removed for indoor storage can be placed back in the pond.

Summer may require addition of water to the pond to compensate for evaporative loss. Ensure that all connections in waterlines running to pond elements are secure as heat expansion may cause them to loosen or fail, causing the pond to drain. Fish should be monitored for signs of heat-related stress. Maintain adequate shade by adding more plants if necessary.

As the weather cools in autumn, reduce fish feeding gradually, stopping altogether when the water temperature drops to 55°F. Greater efforts will have to be made during this time of year to keep the pond free from leaves and debris, and more frequent filter cleanings will be required. Prepare indoor facilities for storage of plants or fish which are to be removed from the pond for the winter.

Winter is the pond's dormant season. Pumps and filters should be removed from the pond before freezing conditions set in, and they should be thoroughly cleaned and serviced at this time. Fish or plants to be kept inside through the winter should also be brought in prior to the first freeze.

Chuck wrapped up his presentation by saying that a backyard pond is certain to attract visitors. Along with a variety of wildlife, a pond will most assuredly attract children. Children are fascinated by ponds, and they can serve a wonderful learning tool, but they can also be a danger as well. Chuck stressed the necessity for supervision and safety should children visit the pond, and I'd say that's sound advice.

Humbert's Herp Hints . . .

Ron Humbert's opening observation, "A pond without a painted turtle is like a day without sunshine," was received with warm laughter as he began his portion of the evening's program. Ron was quick to add however that the addition of herps to a pond creates a whole new set of problems, not the least of which is a significantly greater burden placed on the pond's filtration system. Ron noted that he uses a standard sump pump to periodically vacuum up the layer of malm that develops at the bottom of his own 380-gallon pond, which harbors turtles as well as frogs. Along with decreasing the load on his pond's filter, the removal of this organic waste lessens the need for Ron to make complete water changes, needing only to replace the water removed during the vacuuming process.

"At this point, all the snake and lizard folks can take a nap," quipped Ron, as he went on to discuss the types of herps best suited for life both in and around a backyard pond. As one might guess, amphibians and aquatic turtles are the best candidates.

Ron advised against using wild-caught frogs to populate backyard ponds, as they would be certain to make their escape at the first available opportunity. If frogs are to voluntarily remain in a backyard pond it is necessary for them to imprint on that particular pond at the time of their birth. This can be accomplished by allowing frog eggs collected from a

natural pond to complete their development and hatch out in one's own pond. Tadpoles removed from the wild are also unsuitable for stocking a backyard pond as they have already imprinted on the pond of their birth, and will most likely leave the backyard pond after metamorphosing.

Ron also noted that the frogs don't always dutifully sit around the pond, and are often inclined to venture out into the surrounding landscape. He cautioned that unless one wants to reenact the woodchipper scene from the movie *Fargo*, it's a good idea to check the yard for wayward frogs prior to mowing the lawn. Backyard frogs are also subject to predation from a variety of animals and may need to be replaced from year to year. If your introduced population of frogs does manage to survive, further problems may occur when spring arrives and your neighbors are subjected to the nocturnal chorus of their mating calls. Although Ron admitted to finding this amphibian serenade appealing, he warned that others might not feel the same.

Newts and salamanders can also fare quite well in the habitat provided by a backyard pond. Ron described a colony of red-backed salamanders that has become established in his yard after an inadvertent migration from Michigan. It seems that the salamnders had stowed away in a load of sphagnum moss that Ron had brought back to Lombard, Illinois, for use in his outdoor box turtle pen. The redbacks have found his pond to their liking, and can often be found under the cap rocks which surround it.

Aquatic turtles, though well suited to a backyard pond existence have a number of problems associated with their outdoor captive maintenance. The number one problem according to Ron, occurs when heavy rains cause a pond to overflow allowing turtles the chance to easily exit the pond and walk about the neighborhood. These excursions often have an unhappy ending for the turtle. If the forecast calls for rain and you're going away for the weekend, Ron suggested moving the turtles inside until you've returned. A cap rock border overhanging the pond's edge will also help to keep the turtles from wandering off.

Another problem pointed out by Ron was the fact that many aquatic turtles are herbivorous and therefore would quickly make a meal of most of the water plants described in Chuck Roth's portion of the program. Any attempts to keep red-eared sliders or painted turtles in a backyard pond would most likely mean having to forgo the inclusion of plants in the pond. Excluding plants from the pond means sacrificing a natural source of filtration making it that much more difficult to keep the pond clean and maintain its biological balance.

No matter where you live, if you keep turtles in an outdoor pond you're more than likely to suffer losses to raccoons. Ron made mention that on more than one occasion he has observed a mother raccoon teaching her young how to hunt turtles at his own pond. Rather than attempting to keep the raccoons out, Ron indicated that the only practical way to get rid of them was to trap them and release them at an appropriate site some distance away.

Weather conditions and pond temperature must also be taken into consideration when maintaining turtles in an outdoor setting. The Midwestern climate is too severe to allow most turtles to remain in the pond throughout the year, so they are typically moved indoors during the coldest months. Summertime can also pose a problem if you have a shallow pond. Water temperatures can rise to lethal levels if the pond is in direct sun, so make sure turtles have a cooler refuge available, or bring them inside if the weather gets too hot. Turtles may be moved out to the pond earlier in the spring if a heater is provided to elevate the pond's temperature.

Ron concluded with some excellent slides of his own backyard pond as well as a number of man-made ponds that he's seen in the course of his travels. Of particular interest was a half-acre pond created on a two-acre site in Michigan. Constructed by a friend of Ron's who used a Bobcat to dig the hole, the pond and surrounding land are utilized as a wood turtle breeding habitat. The area is surrounded by a wall of cinder blocks stacked two high, and Ron noted that although the wood turtles could easily scale this barrier they make no attempt to do so as they are perfectly content within their man-made habitat.

Thanks to both Chuck Roth and Ron Humbert for what amounted to a very informative and entertaining program.

Countdown, ReptileFest '98. All Engines Are Running . . .

On the evening of February 21 I had the extreme pleasure of attending the second ReptileFest committee meeting, and I'm excited to report that things are progressing nicely. In fact, this year's 'Fest appears to be headed for greater heights than ever. Response from members wishing to exhibit herps in the show has been encouraging, and 'Fest co-chairs Lori King-Nava and Gary Fogel are hoping to exceed last year's total of 50 exhibitors. Vendors wishing to take part in this year's show are also lining up to register. In short, ReptileFest '98 has the potential to be a milestone event for the CHS if we all pull together and help out.

I'd like to urge every member interested in exhibiting an animal at ReptileFest '98 to find the exhibitor's registration form included in this month's *Bulletin*, fill it out and return it as quickly as possible to Ron Humbert at the address indicated on the form. Expedience in this matter will enable 'Fest coordinators to better plan the show's layout. Registration forms may also be returned to Ron Humbert, Lori King-Nava or Gary Fogel at the general meeting. If you choose not to exhibit, maybe you'll consider helping out at the show in some other capacity. There will be plenty of things to do, and your efforts will truly be appreciated.

Perhaps the greatest contribution can be made by telling family, friends, co-workers and the people that you see in the course of your daily affairs about ReptileFest '98. We can put on the greatest show in the world, but it means very little unless we draw a crowd. So talk it up, spread the word far and wide, ReptileFest '98 . . . It's Creeping up on You! Any questions, comments or offers to help may be directed to Lori King-Nava at (773) 477-3645 or Gary Fogel at (773) 935-6938.

Thanks for your indulgence. See you next month.

Herpetology 1998

In this column the editorial staff presents short abstracts of herpetological articles we have found of interest. This is not an attempt to summarize all of the research papers being published; it is an attempt to increase the reader's awareness of what herpetologists have been doing and publishing. The editor assumes full responsibility for any errors or misleading statements.

BUSHMASTER SYSTEMATICS

K. R. Zamudio and H. W. Greene [1997, Biol. J. Linnean Soc. 62:421-442] used mitochondrial gene sequences to reconstruct phylogenetic relationships among subspecies of the bushmaster, *Lachesis muta*. These large vipers are widely distributed in lowland tropical forests in Central and South America, where three of four allopatric subspecies are separated by montane barriers. Their phylogeny indicates that the four subspecies belong to two clades, the Central American and South American lineages. They used published molecular studies of other taxa to estimate a "reptilian mtDNA rate" and thus temporal boundaries for major lineage divergences in *Lachesis*. The authors estimate that the Central and South American forms diverged 18–6 million years ago (Mya), perhaps due to the uplifting of the Andes, whereas the two Central American subspecies may have diverged 11–4 Mya with the uprising of the Cordillera de Talamanca that separates them today. South American bushmasters from the Amazon Basin and the Atlantic Forest are not strongly differentiated, perhaps due to episodic gene flow during the Pleistocene, when suitable habitat for this species was at times more continuous. These results agree with previous evidence that genetic divergence among some Neotropical vertebrates predated Pleistocene forest fragmentation cycles and the appearance of the Panamanian Isthmus. Based on morphological, behavioral, and molecular evidence, the authors recognize three species of *Lachesis*. In addition to *L. muta*, the widespread South American form, the Central American forms are treated as distinct species (*L. melanocephala* and *L. stenophrys*), each deserving of special conservation status due to restricted distribution and habitat destruction. This study confirms ideas put forth earlier by Dean Ripa [1994. Reproduction of the Central American bushmaster (*Lachesis muta stenophrys*) and the black-headed bushmaster (*Lachesis muta melanocephala*) for the first time in captivity. Bull. Chicago Herp. Soc. 29(8):165-183].

NEW TURTLE SPECIES HONORS PETER PRITCHARD

W. P. McCord [1997, Chelonian Cons. and Biol. 2(4): 555-562] describes a new batagurid turtle species, *Mauremys pritchardi*, from northern Myanmar and adjacent Yunnan, China. It is related to *Mauremys mutica*, and is the westernmost member of the *M. mutica* complex, which includes *M. annamensis* as well as several morphologically differentiated populations of *M. mutica*. The species is distinguished from *M. mutica* by smaller size, especially of adult males; relatively shorter plastron; relatively longer abdominal scutes; presence of two stripes on each side of the head (the lower one often interrupted), sexual size dimorphism favoring females (sexes of similar size in some populations of *M. mutica*, dimorphism favoring males in Ryukyu populations); absence of plastral concavity in adult males, and more clearly defined dorsal keels.

PARTHENOGENESIS IN THE ARAFURAN FILESNAKE

J. Dubach et al. [1997, Herpetological Natural History 15(1): 11-18] report on the Arafuran filesnake (*Acrochordus arafurae*), an obligate aquatic, live-bearing snake from Australia. Two females born in captivity at Melbourne Zoo were transferred to Brookfield Zoo where one gave birth to two living male offspring. Multilocus DNA fingerprint analysis was used to identify the mother, determine whether a father was involved through long-term sperm storage, and compare the level of genetic variation in this trio with wild-caught individuals. The three captive filesnakes were almost identical genetically (the band-sharing coefficient ranged from 0.96 to 1.00). Chromosome analysis of the mother yielded a diploid female karyotype with a ZW sex chromosome pair. The history of these captive filesnakes and the high genetic similarity suggest that the living young were the product of a parthenogenetic mode of reproduction. In general, between-population diversity was high and within-population variation was low indicating that gene flow is limited between drainages and that populations are partially isolated, particularly during dry seasons. Results from these comparisons also suggest that parthenogenetic reproduction might occur in wild populations.

INCUBATION EFFECTS ON HATCHLING CUBAN ROCK IGUANAS

A. C. Alberts et al. [1997, Copeia (4):766-776], to examine the effects of incubation temperature and moisture levels on embryonic development and posthatching growth and behavior, incubated a total of 123 eggs collected from 18 wild female Cuban rock iguanas at 28.0, 29.5 or 31.0°C on wet (-150 kPa), moist (-550 kPa), or dry (-1100 kPa) substrates. Although there was no effect of incubation temperature or water availability on egg survival, larger females exhibited higher infertility and greater mortality of initially viable eggs, suggesting that reproductive senescence may occur in this long-lived species. Incubation temperature, although it had little influence on size at hatching, significantly affected several measures of growth, including changes in body length, mass, and head dimensions. In general, hatchlings from higher incubation temperatures grew faster during their first year. However, by 16 months of age, growth rates no longer varied among hatchlings incubated at different temperatures. Incubation temperature had no detectable effect on thermal selection by hatchlings at 14 to 16 months of age, as there was no tendency for hatchlings incubated at higher temperatures to preferentially select higher basking temperatures. Moisture levels during incubation did not significantly affect size, growth, or thermoregulatory behavior of hatchlings. These results have important implications for understanding how environmental conditions experienced during embryonic development may affect future fitness and survivorship.

SPAWNING PONDS

J. Barandun and H.-U. Reyer [1997, Amphibia–Reptilia 18(2): 143-154] analyzed the use of spawning sites by *Bombina variegata* in a dynamic habitat containing a variety of different ponds. Cool or shadowy as well as permanent ponds were not used for spawning at all. Among the ephemeral ponds that were used, egg numbers increased with water temperature, both when compared among ponds and between different areas within ponds. Egg numbers were also higher in ponds of intermediate duration than in those persisting for shorter or longer periods. Ponds of intermediate duration with moderate predator densities and with larvae of competing anuran species (*Hyla arborea*, *Bufo calamita*) were used more often than short-lived ponds with no predators and competitors. This pattern of spawn deposition can be interpreted as an attempt to select sites allowing rapid larval development (warm water) and to avoid sites with high numbers of newts and invertebrate predators (permanent ponds). The selection criteria seem to be adaptive, because pond duration and desiccation are more important for larval survival than predators and competitors. Yet, optimal reproductive conditions remain highly unpredictable for *Bombina variegata*, as the characteristics and dynamics of spawning ponds are mainly determined by climatic conditions. Consequently, survival chances of tadpoles can change within a few days or weeks, depending on rainfall and evaporation.

TEMPERATURE EFFECTS ON LIZARD EMBRYOS

R. M. Andrews et al. [1997, Copeia (4):827-833] note that the most widely accepted explanation for the evolution of viviparity at high elevations and latitudes (cold climates) is that, by retaining eggs either for short periods (in the transition between oviparity and viviparity) or for the entire gestation, females can keep embryos warmer than in nests and, thus, enhance their development. However, longer egg retention is not the only mechanism that would allow squamate embryos to cope with the low ambient temperatures in nests at high elevations or latitudes. They tested the hypothesis that short-term exposure to cold temperatures has less effect on embryonic development of species or populations from cold than warm climates, indicating physiological adaptation of embryos to cold temperatures. The experimental subjects were four species (five populations) of *Sceloporus* lizards from a wide range of elevations: *Sceloporus scalaris* (Arizona, 1460 m) and *S. aeneus* (Mexico, 2800 m) from the *scalaris* species group; and *S. undulatus* (Virginia, 600 m) and *S. virgatus* (Arizona, low and high elevation populations at 1800 and 2400 m) from the *undulatus* species group. Eggs were incubated under simulated natural temperature regimes, but experimental eggs were exposed to cold (8, 11, 14 or 17°C) for five days to determine mortality and delay in hatching relative to control eggs that were incubated under the same simulated natural temperature regimes. Mortality of eggs that were exposed to cold temperatures during incubation did not differ from that of control eggs, and mortality did not vary with elevation. Experimental eggs hatched later than control eggs, but the delay in hatching was again not related to elevation. The hypothesis of physiological adaptation to cold by embryos was thus rejected.

TWO NEW TAXA OF VENEZUELAN WHIPTAILS

A. L. Markezich et al. [1997, American Museum Novitates 3207] studied two color morphs of whiptail lizards (*Cnemidophorus*), one brilliant blue and one bright green, which occur in distinctly different habitats on the Paraguana Peninsula, Venezuela. Multidisciplinary analyses (karyotypes, protein electrophoresis, color pattern, scalation, using univariate and multivariate statistical techniques) revealed that the blue and the green lizards represent two distinctively different diploid bisexual species. The green form, which also occurs in other areas of Falcon, Venezuela, and on the Guajira Peninsula, Colombia, in open dune or desert scrub communities, is described as a new species, *Cnemidophorus arenivagus*. Based on comparisons with known *C. lemniscatus* from the Guianan Region, the blue lizard, which occurs in less open habitats such as tropical thorn woodland, is described as *Cnemidophorus lemniscatus splendidus*, a new subspecies. Although its occurrence off the Paraguana Peninsula is suspected also, this remains to be documented. Color photographs and details of morphological and genetic variation for the new taxa are presented and correlated with data from *C. lemniscatus* of the Guianan Region. The new subspecies is compared with populations of *C. lemniscatus* from northern Venezuela and northeastern Colombia. The relationships of both new taxa to the geographically nearest congener, *Cnemidophorus arubensis* of Aruba Island, which is only 30 km north of the Paraguana Peninsula, are discussed, but they remain obscure. A small population of lizards considered by previous workers to be *Cnemidophorus lemniscatus* in sympatry with *C. arubensis* at one locality on Aruba Island probably is *C. arenivagus*. The two species of *Cnemidophorus* on the Paraguana Peninsula are mainly allopatric or narrowly parapatric in their microgeographic distribution but sympatric at a few localities with disturbed habitats. They do not appear to interbreed and are allotopic in areas of sympatry. These taxa differ from each other in habitat preferences and diet (the green taxon is primarily herbivorous), and they are similar in reproductive biology.

DESERT TORTOISE CHEMICAL CUES

S. J. Bulova [1997, Copeia (4):802-810] examined the influence of chemical cues on burrow choice by desert tortoises (*Gopherus agassizii*) using a series of four two-choice tests of treated and untreated artificial burrows. A total of 32 adult tortoises (16 males, 16 females) were tested during nesting and mating seasons. Treatments included feces from an adult male, feces from an adult female, feces from the subject tortoise, and chin-gland secretion collected from an adult male tortoise. When presented with chin-gland secretion, male tortoises spent more time inside the treated than the untreated burrow during observations, and significantly more males used the treated burrow during the mating season. In addition, males were less likely to use the treated burrow, when the treatment was another male's feces. During the nesting season, significantly more females used the untreated burrow when the treatment was another female's feces. Feces and chin-gland secretion deposited in the vicinity of burrows may influence burrow use patterns by free-ranging desert tortoises.

Unofficial Minutes of the CHS Board Meeting, February 13, 1998

The meeting was called to order at 7:40 P.M. Board members Karen Bielski, Ron Humbert and Jack Schoenfelder were absent.

Officers' Reports

The minutes of the January Board of Directors meeting were read and accepted.

The Treasurer's report was read and accepted.

Current membership is 1032. John Driscoll will turn the maintenance of the computerized membership list over to new Membership Secretary Gino Martinez.

Steve Spitzer reported on behalf of Vice-president Jack Schoenfelder that the speaker for the March general meeting will be Randall Gray, as had been previously scheduled.

Steve also reported that the CHS has received an information/application packet from the Illinois Department of Natural Resources detailing their 1998 grant program. Any interested parties should contact Steve.

ReptileFest 1998: ReptileFest information has been included in the Chicago Academy of Sciences Spring Calendar of Events, which is mailed to their membership. There are a few vendors who have committed to ReptileFest already; more are being sought after. The Director of Conservation at the John G. Shedd Aquarium is summarizing their iguana research into a poster presentation for use at ReptileFest.

CHS Picnic: Picnic chairperson Audrey Vanderlinden is still working on securing a permit for this year's picnic.

Old Business

Zoo Trip: There is still room on the bus for the CHS trip to the St. Louis Zoo. Anyone interested in participating should see Audrey Vanderlinden.

Monthly Raffle: Bob Warzecha volunteered to staff the raffle table at the general meetings. Steve Spitzer appointed him to the position.

The status of the CHS Salamander Safari was briefly discussed.

New Business

Jennie Picciola reported that a message was left on the CHS voice mail from a teacher looking for help in putting together a curriculum for gifted students on frogs. It was suggested that she might call the Chicago Academy of Sciences to inquire about their traveling display dioramas.

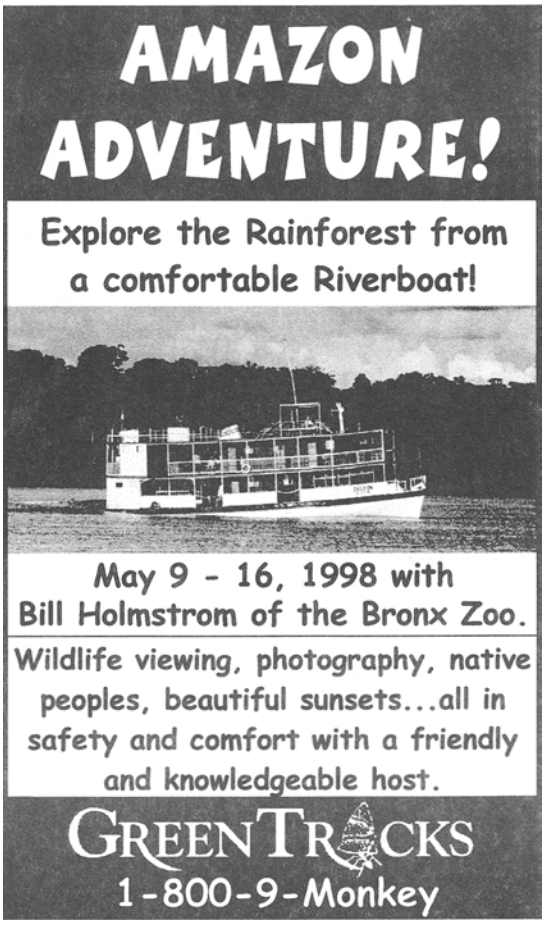
Round Table

Gino Martinez asked for the CHS logo on diskette so he could incorporate it into any flyers or other items he might be printing for the CHS.

Lori King-Nava will be making a display box for CHS literature for our booth at the Chicagoland Pet Show coming up at Arlington Park.

The meeting adjourned at 8:30 P.M.

Respectfully submitted by Recording Secretary Jennie Picciola



Advertisements

American Federation of Herpetoculturists: A nonprofit national membership organization of herpetoculturists, veterinarians, academicians and zoo personnel involved in the captive husbandry and propagation of amphibians and reptiles. Membership includes highly acclaimed magazine, *The Vivarium*, dedicated to dissemination of information on herpetocultural accomplishments, herp medicine, breeding and maintenance, field studies and adventures, enclosure design and much more. AFH membership is $26. Send information requests to: AFH-News, P.O. Box 300067, Escondido CA 92030-0067.

Artist wanted: My name is Jim Hatfield. I wrote the book, *Green Iguana—The Ultimate Owner's Manual* and I have an iguana column for *Vivarium* magazine. I am looking for some talented CHS member who could draw cartoons and/or iguana illustrations for my column and articles in other reptile magazines. Send me copies (*only*) of your work to: Jim Hatfield, P.O. Box 102, Lake Oswego OR 97034-0014. I will then get in contact with you.

For sale: *Bulletin* boxes, $10 each. Library quality with "Chicago Herpetological Society" imprinted. Each container holds about two years' worth of *Bulletin*s. Send check or money order to Chicago Herpetological Society, 2060 N. Clark Street, Chicago IL 60614. Allow four weeks for delivery.

For sale: rats and mice—pinkies, fuzzies and adults. Quantity discounts. Please send a SASE for pricelist or call Bill Brant, *THE GOURMET RODENT*, 6115 SW 137th Avenue, Archer FL 32618, (352) 495-9024, E-mail <GrmtRodent@aol.com>.

For sale: murine-pathogen-free rats and mice available in all sizes, live or frozen: pinkies, fuzzies, crawlers, small, medium and large. Frozen crawler mice in lots of 2000, $.17 each. Also available, full grown hairless mice. FOB shipping point. Master Card accepted. Call (518) 537-2000 between 8:00 A.M. and 5:00 P.M. or write SAS Corporation, 273 Hover Avenue, Germantown NY 12526 for prices and additional information.

For sale: high quality feeder mice. Shipped UPS Next Day Air. All mice are properly processed to insure a quality product. Fourth year of production and supply of frozen feeder mice. Prices: pinks, $25/100; fuzzies, $30/100; weanlings, $35/100. Also available are 4 oz.+ rats, $100/100. Quantity discounts available. The Mouse Factory, P.O. Box 85, Alpine TX 79831, (915) 837-7100, Ray Queen.

For sale: from Bayou Rodents, excellent quality feeder mice and rats. Every size available. Pinks starting at $20/100. Orders are shipped by overnight service Monday thru Thursday. We accept Visa, MasterCard and Discover. For more info, contact Rhonda or Peggy, (800) 722-6102.

For sale: **high quality frozen feeders**. Over a decade of production and supply. Seven sizes of mice availabe: small newborn pinks up to jumbo adults. Prices start at $25 per 100. Feeders are separate in the resealable bag, not frozen together. Low shipping rates. Free price list. Kelly Haller, 4236 SE 25th Street, Topeka KS 66605, (913) 234-3358 evenings and weekends.

For sale: In stock, Flex-watt and Ultra-therm heating products. **Frozen rodents** always available. Mice: pinks–crawlers, 3/$1; weanlings, 40¢; subadult, 50¢; adults, 65¢; large adults, 75¢. Rats: small, 85¢–$1; medium, $1.25–2.00; large, $2.25–2.75; jumbo, 3/$10. Call on quantity discounts [note: discount on orders picked up at CHS meetings]. Live rodents available at higher prices. **Available now**: newsletter/catalog—many unique/hard-to-find herp husbandry items. Send business-size SASE for catalog, or call. Scott J. Michaels, D.V.M, Serpent City, P.O. Box 657, Island Lake IL 60042, (815) 363-0290.

For sale: Herp bags—colors vary, translucent ripcord nylon, super lightweight, extremely durable construction with hot corners sewn in, double seamed. Custom sizes made upon request. Sizes: 46" × 14", $7 each; 24" × 12", $6 each; 24" × 6", $5 each. Shipping fees, $1 for first bag, $.30 each additional bag. Nicole Lechowicz, 290 Warren Road, #69, Carbondale IL 62901, (618) 457-2783.

For sale: *The Complete Index to the Proceedings of the Annual Reptile Symposium on Captive Propagation and Husbandry / International Herpetological Symposium, Volume 1, 1976, to Volume 16, 1992*. A categorized listing of all papers contained in the 16 volumes (over 300 entries). Thermal perfect bound, 26 pages. Extremely useful for symposium proceedings owners or anyone interested in learning about important, specific captive care and breeding articles. Also includes a looseleaf Volume 16 table of contents, which did not appear in this unedited volume. $7.00 each (postpaid). Dave Fogel, The Herp House, 1750 Haines Road, Orwell OH 44076, (440) 685-4615 phone, (440) 685-4572 fax.

For sale: Selling most of my collection. Great prices—some freebies! Some herps, but mostly arachnids. Andy Davies, (773) 279-1541.

For sale: one male and three female yellowfoot tortoises, 12–14", long-term captives, $1600; four leopard tortoises, 4–9", lots of yellow, $700. Will consider trading for other tortoises/turtles. Ray Austin, P.O. Box 3065, Peoria IL 61612-3065. (sorry, no phone)

For sale: **STAR** tortoises, c.b. 6" mainland female, c.b. 5½" Sri Lankan male (wider lines, lighter skin). Will sell for best acceptable offer. (847) 918-1118.

For sale: two Burmese brown tortoises, 6–7", captive born and raised, sex unknown, $300 each or $500 for both. Also, c.b. African spurred tortoises, $50 each. Will trade for other tortoises. Looking for Egyptian Greeks that were imported several years ago. I need males and also will buy hatchlings from this species. Please help. Bob, (520) 868-4659. [AZ]

For sale: two large adult female northern blue-tongued skinks, $100 each; female Mexican rosy boa, c.b. 1995, $85. Chicago area pick-up only. (708) 361-5835.

For sale: leopard geckos, adult proven breeders, $40 each or quantity discount for entire colony. Also, 1997 c.b. hatchlings, $20 each. Quantity discount will apply. Ron Winfrey, (616) 363-9276. [MI]

For sale: White oak rat snakes; trinket rats; blue beauty rats; coastal carpet pythons; pure jungle carpet pythons; Amazon tree boas; Cuban boas; frilled dragons 9/97. HISS & THINGS, INC., Jim Kavney, (305) 664-2881. URL <http://www.hiss-n-things.com> E-mail <hissn1@aol.com>. [FL]

For sale: Taking orders for exceptional Hondurans: Albino, hypo, anerythristic, possible het for albino, maybe a snow or two plus three kinds of double-hets—for snow, ghost, and ???? (hypo and albino). Available now: 1997 hatch albino and het *nelsoni*, and one male 1996 hatch Honduran, possible double-het for snow (definite het/albino, 50% chance het/anerythristic). Diverse bloodlines, only perfect animals shipped, price protection. Terry Dunham, ALBINO TRICOLORS, (813) 824-0705 (before 10 P.M. EST please) or E-mail <rtdunham@earthlink.net>. {FL]

For sale: **Premium captive-produced reptiles**. **Piebald black pines**; Brazilian rainbow boas (Lamar); blonde trans-Pecos rat snakes; Baja rat snakes; gray-banded kingsnakes (Langtry); Okeetee corns; melanistic garters (double hets); Peruvian matamatas; Mexican redleg tarantulas. Also, feeder mice and rats, husbandry items, bedding, etc. Mike Stefani, (630) 372-3936.

For sale: beautiful, tricolor kingsnakes. Send SASE for **free** list. Also, free phone consultation on snake husbandry problems as a service to the herp community. Robert Applegate, P.O. Box 338, Campo CA 91906, (619) 478-5123. Thank you for your attention.

For sale: **albino boas**. Ethical private breeder who is not trying to make a living off this *hobby* will be offering the following '98 babies from my "mite-free" genetically diversecollection that has *never* been exposed to the I.B.D. virus. Available this spring: Colombian boas . . . albinos, heterozygous, possible hets, and my signature bloodline —"Ultra-Golden" Colombian boas (which will also be heterozygous for albinism!) Great snakes at or below market value. Call to discuss pricing or just to "talk snakes." Steven E. Snow, (815) 624-8204, 7–9 P.M. Central Time.

For sale: 6' female boa constrictor, proven breeder, $100. Jack Phillips, (847) 724-4552.

Advertisements (cont'd)

For sale: female D'Albert's python, beautiful, large, long term adult, $175; 8 male and 18 female leopard geckos, hi-yellow, stripe, jungles, all adult breeders, and one male white-line and one female fat-tail gecko, and 1 female Nicaraguan banded gecko, and two female Mojave Desert banded geckos, entire mixed gecko group, $750; male Children's python, adult, Barker Stock $125; creamsicle corn, $45; albino corn, $25; Mexican black king $35; 50/50 Cal king, $35; Pueblan milk, $40. Steve Bostwick (515) 274-4580. [IA]

For sale: Brazilian rainbow boas—2-year-old, 3' female, tame, healthy and a great eater, $250—7-month-old female, $175; lavender phase Cal. king, $50. Mark, Strictly Serpents, (847) 854-3259.

For sale: Send SASE to CRC, P.O. Box 0731, Las Vegas NV 89125-0731 for brochures and list of species available. Limited bookings available for guided tours of herpetological collection sites in Nevada. Call/fax (702) 450-0065. URL <http://www.herp.com/crc/> E-mail <crcsafetie@aol.com>.

Tours: Adventure tours to Madagascar! Join **Bill Love** seeing and photographing fauna and flora, heavily herp-biased, across the world's least known mini-continent. Maximum fun & photo ops assured on every trip. Contact him at: BLUE CHAMELEON VENTURES, P.O. Box 643, Alva FL 33920. TEL: (941) 728-2390, FAX: (941) 728-3276, E-MAIL: <blove@cyberstreet.com>.

Tours: **Road-riding in Costa Rica!** Treat yourself to the trip of a lifetime! Learn about tropical herps, find them, photograph them, see where they live. **Greentracks, Inc.**, offers the best herpetological tours led by internationally acclaimed herpetologists and herpetoculturists. See the Amazon, visit cloud forests, experience the world's greatest rainforest, super sunsets and good company. Call (800) 9-MONKEY.

Wanted: Barbour's anacondas (*Eunectes barbouri*); dark-spotted anacondas (*E. deschauenseei*); female Arabian sand boas (*Eryx jayakari*). Larry Dower, 639 N. 13th Street, Reading PA 19604, (610) 372-4509.

Wanted: stud male yellow-footed tortoise. Chicago area. Will split litter. Bill Peterson, (708) 798-3133.

Wanted: adult female red-sided garter snakes. Scott, (919) 934-0110. [NC]

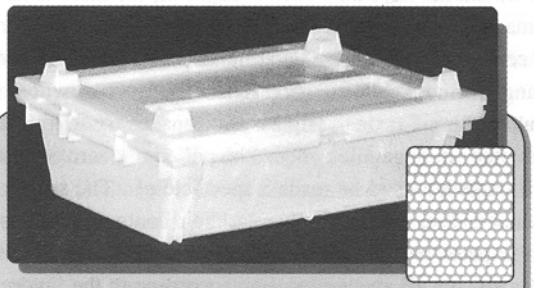
Wanted: big-headed turtles; mata mata turtles; Mexican giant mud turtles (*Staurotypus triporcatus*); exceptionally large common snappers (45 lbs. & up); large alligator snappers (over 90 lbs.); spectacled caiman from Trinidad, Tobago and Surinam; dwarf caiman; smooth-fronted caiman; albino turtles (except red-eared sliders). Walt Loose, (610) 926-6028, 9:00 A.M. – 1:00 P.M. or after 11:30 P.M. Eastern Time.

Wanted: Styrofoam boxes, any size or shape so long as they're not flimsy, preferably with cardboard liners, willing to pay from $2 to $5. Bring to CHS meetings. Scott J. Michaels, D.V.M, Serpent City, (815) 363-0290.

Line ads in this publication are run free for CHS members—$2 per line for nonmembers. Any ad may be refused at the discretion of the Editor. Submit ads to: Michael Dloogatch, 6048 N. Lawndale Avenue, Chicago IL 60659, (773) 588-0728 evening telephone, (312) 782-2868 fax, E-mail <MADadder0@aol.com>.

Health Food for your herps!

Highest quality rodents are available in all sizes from pink mice to jumbo rats. Fresh frozen crawler mice are only 17¢ each in lots of 2,000. All frozen animals are shipped in insulated boxes.



Nearly 9,000 holes and they still can't escape!

The new TTC is ideal for transporting, breeding and storing your mice, rats, snakes and lizards. The strong plastic TTC has over 2,200 holes on each side and over 4,500 holes on the lid to provide maximum air circulation even when stacked. Each TTC can be divided into 2, 3 or 4 compartments and its smooth plastic construction makes washing a snap.

SAS

273 Hover Avenue • Germantown, NY 12526-5320
518-537-2000 • Fax 518-537-7287

UPCOMING MEETINGS

The next meeting of the Chicago Herpetological Society will be held at 7:30 P.M., Wednesday, March 25, at the Field Museum of Natural History, Roosevelt Road at Lake Shore Drive, in Chicago. **Randall Gray**, a herpetoculturist from Weatherford, Texas, will speak on the husbandry and breeding of lizards of the genus *Uromastyx*. Randy probably knows as much or more about the care and keeping of these interesting and beautiful spiny-tailed agamids as anyone does. For those of you who are into herbivorous lizards, these creatures, which are becoming more widely available as captive-bred hatchlings, make better pets than iguanas in many ways.

At our April 29 meeting, **Robert Applegate**, a private herpetoculturist from Campo, California, will speak on the breeding of colubrid snakes. Bob was one of the true pioneers in the field of herpetoculture; we are fortunate to have him with us to share his expertise.

We are required to use the entrance on the west side of the museum. **We are allowed to use the free parking lot to the west of the museum as long as space is available. Your best bet is to try that lot first before settling for the lot to the east of the museum or for the Soldier Field lot. For the latest on the parking situation call our CHS message line, (773) 281-1800, before you come.** Public transportation is an option: the Roosevelt Road (12th Street) bus now goes directly to the museum, thus providing a connection with the el and subway. This bus service runs until 11 P.M.

Turtle Club

The Chicago Turtle Club will meet Sunday, March 22, 1:00–3:30 P.M., at the North Park Village Administration Building, 5801 N. Pulaski, in Chicago. Ron Humbert will speak on box turtles.

1998 INTERNATIONAL HERPETOLOGICAL SYMPOSIUM IN CINCINNATI

The 22nd annual meeting of the International Herpetological Symposium will take place June 25–27, 1998, at the Holiday Inn–Cincinnati Airport in Cincinnati, Ohio. The theme for the event will be: Are Captive Snakes Mere Caricatures of Their Wild Counterparts? In addition to a strong line-up of speakers, events will include a banquet and auction, a Cincinnati Zoo field trip and dinner, David Dennis/Eric Juterbock slide shows, workshops (photography; amphibian, turtle, lizard and snake husbandry), and a special celebration of the beginning days of the Ohio Herpetological Society. The banquet speaker will be Kraig Adler. Other speakers will include Elliott Jacobson, David Chiszar, Joe & Suzanne Collins, Jim Harrison, Johnny Arnett, Bernard Bechtel, Mike Goode, Harvey Lillywhite, Pete Strimple, Neil Ford, Aaron Bauer, Bill Love, Peter Tolson, Paul Weldon, Vince Scheidt, Eugene Bessette, Gordon Schuett, Sherman Minton, Robin Saunders and Gordon Burghardt. Registration will be $125 on or before May 15, $150 thereafter. For registration or other information contact: Stan Draper (IHS Secretary), P.O. Box 16444, Salt Lake City UT 84116-0444; E-mail <SDraper@npsp.com>.

MOVING??

Please let us know in plenty of time of any change in your mailing address. The *Bulletin of the Chicago Herpetological Society* is sent to our U.S. members by bulk-rate third class mail. This means that the U.S. Post Office will not forward your *Bulletin* with the rest of your mail. This is so even if you make a special request that your magazines be forwarded (such a request only applies to second class mail).

THE ADVENTURES OF SPOT

NONPROFIT ORG.
U.S. POSTAGE
PAID
PERMIT NO. 9869
CHICAGO, ILLINOIS

CHICAGO HERPETOLOGICAL SOCIETY

Affiliated with the Chicago Academy of Sciences

2060 North Clark Street • Chicago, Illinois 60614