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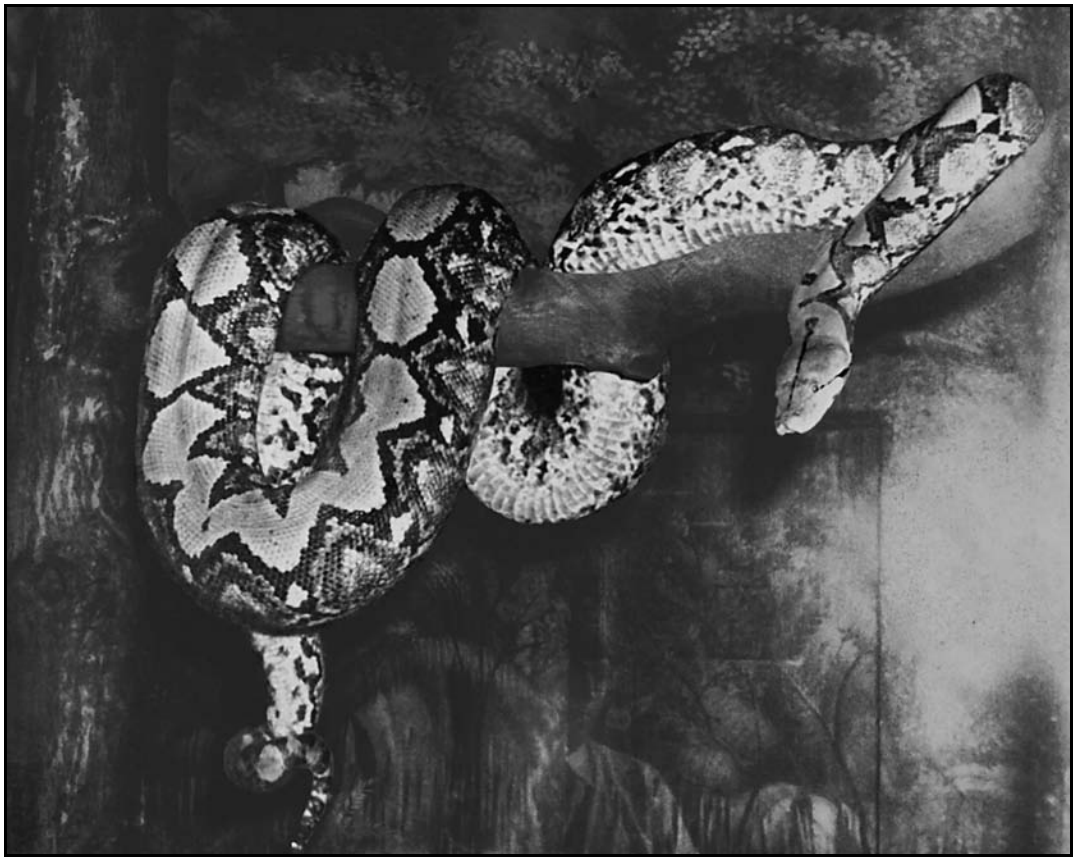

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Cover: Reticulated python, *Broghammerus reticulatus*. Photograph of "Colossus" at the Pittsburgh Zoo by Bill Allen.

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The Corrected Lengths of Two Well-known Giant Pythons and the Establishment of a New Maximum Length Record for Burmese Pythons, *Python bivittatus*

David G. Barker [1], Stephen L. Barten, DVM [2], Jonas P. Ehrsam [3] and Louis Daddono

There is strong popular interest in the sizes of giant pythons that dates far back into history and continues to the present day. This was particularly well illustrated by the media hysteria that followed the USGS news release on 20 February 2008 that was titled "USGS Maps Show Potential Non-Native Python Habitat Along Three U.S. Coasts." The report that followed described the Burmese python as "huge" with a maximum size of 7–8 m (23 ft–26 ft 3 in) (Rodda et al., 2008/2009; Reed and Rodda, 2009). The countless newspaper articles, news reports and documentaries that followed typically stressed the "massive" size of Burmese pythons and of pythons in general.

We have seen a lot of Burmese pythons in captivity over the past 40 years, and none approached those lengths. We believe that a realistic size limit for this species has taken on greater importance since Burmese pythons are no longer considered to be a subspecies of the Indian python, *Python molurus*, and are now recognized as a species, *Python bivittatus* (Jacobs et al., 2009; Schleip and O'Shea, 2010). Prior to this taxonomic change, many of the historical records of the largest specimens of Indian pythons and Burmese pythons have been confused.

In the course of our research, we found numerous examples of the difficulties in making correct measurements of living pythons. There are significant discrepancies that have arisen when the measurements of living pythons are later compared to the measurements of those same pythons at death. The length of a living large python, estimated or measured, is significantly greater than the measurement made at death in every case we found. Indeed, in our experiences, we all have witnessed examples of this phenomenon.

We are not aware of any mention in herpetological literature that at any point in life does the length of a snake decrease. Snakes grow relatively rapidly at a young age, and then the rates of growth slow, but at no time do they reverse. We here state that we do not believe that there is a significant difference in the live length of a snake soon before death and the length then measured after death. However, so far as we are able to learn, this has never been investigated; we acknowledge that there is some small possibility that snakes actually shrink after death, but this is not our experience or observation and we cannot offer any explanation for what that process might be.

We here publish previously unreleased data regarding the accepted record maximum size of the Burmese python, *Python bivittatus*, held by a female Burmese python known as "Baby." This snake was on public display during the period 1994–2003 at Serpent Safari, a permanent herpetological exhibition located in Gurnee, Illinois. One of the authors [LD] was the owner of this snake and another [SLB] is the veterinarian who cared for Baby.

In the course of our investigations, we have even come to question the actual length of what is widely accepted as the largest snake ever maintained in captivity, that being "Colossus," a reticulated python, *Broghammerus reticulatus*, that resided in the Pittsburgh Zoo from 1949 until 1963. The history of Colossus is perhaps the best example of the discrepancy between purported size and actual measured size.

Colossus

The reticulated python known as Colossus arrived at the Highland Park Zoo [now known as the Pittsburgh Zoo & PPG Aquarium] in August 1949 and remained there on exhibit until death in April 1963. By most accounts, Colossus was received from an animal dealer in Singapore, although Pope (1961) reported the origin of Colossus as "Siam" [now Thailand]. Colossus arrived at the zoo identified as a wild-caught adult female that was 6.71 m (22 feet) in length. In fact, Colossus was a male, and was several feet shy of that length.

We received this memory of Colossus from Arthur Bianculli. Bianculli was first a volunteer and then curatorial assistant at the Carnegie Museum from 1955 to 1979. He wrote, "I did see Colossus many times when he was alive. When I was a boy during the 1950s, I would walk over 4 miles to the Highland Park Zoo a few times every year. Colossus was usually lying near the front of his enclosure, often right up against the glass."

Bianculli continued, "Colossus wasn't obese, but he wasn't skinny either. He was healthy looking, well-muscled, with beautiful colors, an intricate pattern, and a radiant iridescence. In another nearby enclosure there was kept an anaconda which was shorter than Colossus, but was noticeably thicker. So, I would say that Colossus was about the proper weight for a python, possibly only slightly heavier than a wild specimen. Unfortunately, I don't know if Colossus was friendly or not because I never saw him interact with the keepers, nor did I ever see him feeding. I don't remember ever hearing any anecdotes about his being aggressive. To be perfectly honest, I can't remember ever seeing Colossus move. I don't know if he was lethargic by nature, or if he was always busy digesting, but every time I saw him he stayed perfectly still. My friends and I would stop and stare at him for perhaps 15 minutes, hoping to see him move, and sometimes wondering if he was alive. I think the only movement we ever saw might have been a flick of the forked tongue. I don't think Colossus was famous or even well-known at that time. I think that came later, thanks to the Guinness Book of Records. I mean everyone realized that he was big, but no one imagined that he might be the biggest."

We don't completely agree with Bianculli's assessment of the possible obesity of Colossus. There are two pictures of

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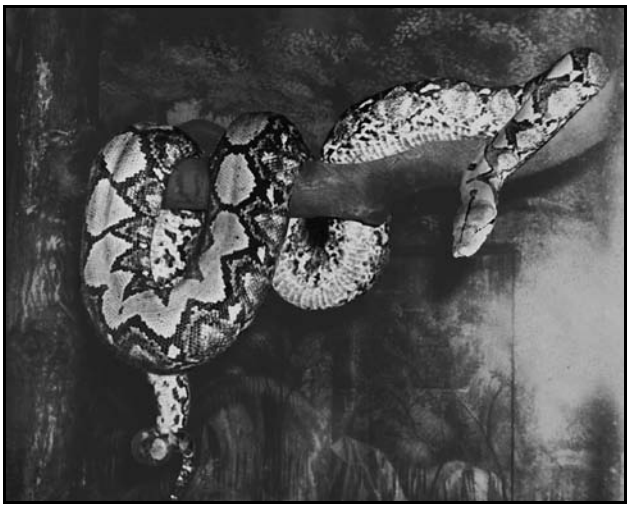
Colossus published opposite page 45 in Pope (1961). The lower image, reprinted below, shows a large, apparently fit, reticulated python, heavy, but not ridiculously so. However, the upper image of a coiled Colossus is the picture of an immensely obese reticulated python. Not a scale touches another on the posterior body. It's highly likely that this picture shows Colossus digesting one of his many 30-pound meals of pig, but the distension of the scales on the posterior body is typical of a very fat python with a massive amount visceral fat; such distension is not seen on a more slender python regardless of a meal. According to Barton and Allen (1961), Colossus consumed 68 pigs totaling 1991 pounds of food in his first 11 years of captivity. No doubt, Colossus did grow to gigantic size on this diet.

Herb Ellerbrock is a keeper in the Reptile Department of the Pittsburgh Zoo—and a living longevity record in the Reptile Department. He began his employment there shortly after the death of Colossus and 48 years later is still there. Ellerbrock (pers. com.) also grew up in the area of the zoo, visited the Reptile House whenever possible, saw Colossus many times, and knew many of the keepers who cared for this giant snake. Ellerbrock reports to us that Colossus was not tame, not trustworthy, and was never directly handled by keepers.

In a report on the feeding and growth of captive boas and pythons, Barton and Allen (1961) identify Colossus as "the male reticulated python received at the Pittsburgh Zoo" and as "the most spectacular snake now on display in the United States." Allen was then the supervisor in the Reptile Department of the Pittsburgh Zoo, and directly involved in the care and maintenance of Colossus. Barton and Allen (1961) state that the most accurate measurement of the weight of Colossus was made in 1954 when he was found to weigh 133.7 kg (295 pounds). The means by which this measurement was made is not described.

An account featuring Colossus and titled "The Largest Snake Ever Held in a Zoo" was published by Guinness World Records Limited (Wood, 1972). It states that on 12 June 1957 Colossus weighed 145.1 kg (320 pounds), and cites Barton and Allen (1961) as the source of this information; we note that this datum is nowhere mentioned in that account. However, Pope (1961) also mentions that Colossus weighed 320 pounds in 1957.



Colossus in his exhibit at the Pittsburgh Zoo. Photograph ca. 1960 by Bill Allen, Curator of Herpetology, courtesy of Herb Ellerbrock, Reptile Department, Pittsburgh Zoo and PPG Aquarium.

In the Barton and Allen paper, Allen states that Colossus was measured at 7.1 m (23 ft 3 in) on 4 June 1951; at 8.3 m (27 ft 2 in) on 24 February 1954; and at 8.7 m (28 ft 6 in) on 15 November 1956. Allen describes the means used to obtain the measurements as holding a measuring tape over the giant snake's body through a small gap between the transfer cage and the exhibit, and measuring section by section as the snake entered its cage. Barton and Allen (1961) state "We cannot offer these length data as exact measurements, because of the way in which they had to be collected, but we are certain they are accurate to within a few inches." The last several years of Colossus's life, there was general certainty that he was at least 30 feet in length.

Colossus died at the zoo on 14 April 1963. The next day several small Midwest newspapers each ran a similar small article, likely a press release issued from the Pittsburgh Zoo. The following article, published in the *Indiana Evening Gazette* from Indiana, Pennsylvania, is an example:

Advanced Age, Pneumonia Kill Pgh. Zoo Python

PITTSBURGH (AP)—Advanced age and pneumonia have taken the life of a snake believed to be one of the longest in captivity.

Colossus, 28½ feet long and weighing 300 pounds, died Sunday at the Highland Park Zoo. A Reticulated Python, he was thought to be about 30 years old.

Colossus was placed on display at the zoo in 1949 when he was 22 feet long. He was brought here from Malaya via Singapore.

However, the story was not correct. In the Guinness account about Colossus, Wood (1972) published several quotes from a letter he received from Bill Allen, dated 23 April 1966, regarding the death of Colossus. Allen writes that Colossus was not weighed that day but stated "[the body of Colossus] weighed over 200 pounds, as it took several men all they could do to move it, by dragging and pulling." More significantly, Allen reported that Colossus measured 24 feet. Allen explained this rather significant decrease in length writing "[the body of Colossus] was stiffened up and vertebrae had pulled together shrinking the snake." Wood (1972) stated that an autopsy of Colossus revealed that some vertebrae and "several rib sections" were nearly eaten through by reptilian tuberculosis.

According to Bianculli, the body of Colossus was delivered intact to the Carnegie Museum. There, on the morning of 15 April 1963, the carcass was skinned by Neil D. Richmond, then the Curator of Herpetology at the Carnegie Museum. The snake confirmed to be male and measurements were taken of the skin and the body. Today the skull and an assortment of vertebrae and ribs from Colossus are deposited in the collection of the Carnegie.

One of the authors [JPE] placed a request to Stephen P. Rogers, current Collections Manager of the Carnegie Museum, to receive the catalog information on Colossus held by the Museum. Rogers very graciously responded and sent this information: "We do not have the entire skeleton of Colossus, only a skull and selected vertebrae and ribs. Any disease that was present was probably not preserved in the bones saved. The data from the Catalogue is as this: CM 38716 PYTHON RETICULATUS MALAYSIA: SPECIFIC LOCALITY UNKNOWN, MALE, COLLECTOR UNKNOWN, PARTIAL SKELETON - SKULL, SOME VERTEBRAE & RIBS. "NAMED COLOSSUS. PITTSBURGH ZOO, DIED 14 APR, 1963. LOCALITY GIVEN AS MALAYA. FRESH HIDE 23' 11", SKELETON 20' 10", HEAD WIDTH 3.75", HEAD LENGTH 6.75", TAIL 27.5". SEE: BARTON, A J AND W.B. ALLEN 1961 ZOOLOGICA 46:2 P 83-87. I am not sure where the 28 feet length came from as the skeleton proper was only 20 feet 10 inches according to the original data."

An excellent illustration of the difficulty of accurately estimating the length of a living large python comes from Merel J. Cox (1991). Cox is a herpetologist who has traveled and lived in Southeast Asia, and has seen many reticulated pythons in his life. Cox wrote in *The Snakes of Thailand and Their Husbandry* that he personally had seen a reticulated python " . . . at a length of a few centimeters less than ten meters." In the preparation of *Tales of Giant Snakes* (Murphy and Henderson, 1997), author John Murphy contacted Cox, asking where he had seen this tremendous specimen. Cox answered, ". . . it was at the Pittsburgh Zoo, and the snake was named Colossus."

Colossus truly was an immense, big-bodied, giant snake, but he was 6.35 m (20 ft 10 in) in total length, exceptionally long for a male python, but nowhere near as long as was generally reported. It seems likely that Colossus did visibly grow larger in front of his keepers during his 14-year span in the Pittsburgh Zoo, but he was growing heavier, not longer. Colossus was neither the longest nor the heaviest snake ever maintained in captivity.

Baby

In a recent book on Burmese pythons, Dorcas and Willson (2011) state on page 28 that the length of Burmese pythons ". . . may approach 25 feet (7.62 m) in extremely rare circumstances" and then on page 129 they list the record maximum size for a Burmese python as 8.23 m (27 feet). The source of these data is not cited, but it is likely *Guinness World Records*—one of the editions published from 2003 to 2006, which refer to an individual snake named Baby.

So far as we have found, most, possibly all, reports published in the past 18 years that mention Burmese pythons with lengths of 6.1 m (20 ft) or longer refer directly or indirectly to Baby. Baby was a gigantic female Burmese python owned by one of the authors [LD].

Baby died of complications from a metastatic renal tumor. She was just shy of 27 years of age. She was old for a Burmese python; the published longevity for Burmese pythons, set by a python at the San Diego Zoo, had a known age of 28 years, 3 months, 9 days (Slavens and Slavens, 2000).

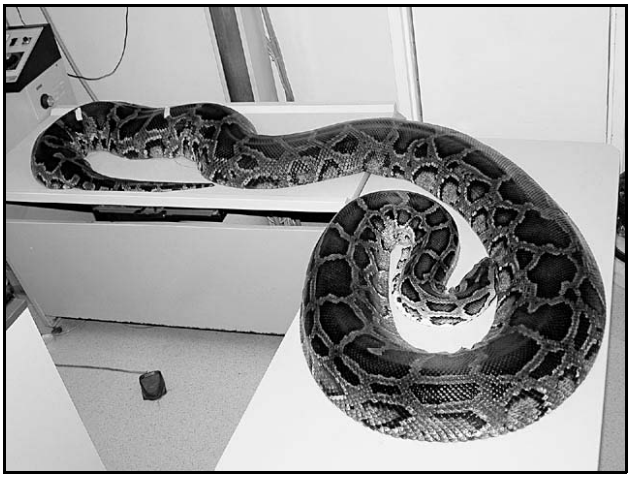
Baby first came to public attention in 1994 in an article published in the third issue of the new color, glossy herp magazine, *Reptiles* (Didier, 1994). The article featured a picture of Lou Daddono with Baby, and the snake looked to be a genuinely large specimen. In the interview, Daddono states that Baby was "approximately 20 feet long." Baby was again featured in *Reptiles* six years later, then described as 7.62 m (25 ft) in length (Cooper, 2000).

According to information sent in 2009 to one of the authors [JPE] from Joan Singer, General Manager of Serpent Safari in Gurnee, Illinois, Baby was "certified" by the Guinness Book of World Records as the largest snake in captivity in 1998. A team from Guinness World Records Limited and Fox TV visited Serpent Safari and "officially" measured Baby. Her weight was measured to be 182.8 kg (403 pounds), the heaviest snake ever weighed at the time.

As is typical of Burmese pythons, Baby was a gentle snake that tolerated handling and she was measured while moving in her cage using a cloth measuring tape that was run down the center of her back; her length was thereby recorded to be 27 feet long. Baby was first listed in *The Guinness Book of World Records* in 1999, and continued to be listed as the heaviest snake ever reliably measured until the 2006 issue.

Due to her spreading cancer and failing health, Baby was euthanized in the veterinary office of one of the authors [SLB]. Shortly after death, she was stretched full length down a hall and measured with a steel tape. Her actual length was determined to be 5.74 m (18 ft 10 in).

Like Colossus, Baby was genuinely a gigantic snake. By all accounts, and evident in all photos, as she grew older she became obese. Those keepers who cared for her and the public who admired her all assumed that she was growing longer as she grew heavier, but that was not the case. The eye can deceive and, as we have pointed out, it is very difficult to determine the length of a living large snake. We are willing to accept that, at least on the day she was officially weighed, she tipped the scales at 403 pounds. But Baby was significantly shorter than the 27 feet with which she was credited.



Baby in the examining room of the veterinarian toward the end of her life. Her medical problems have caused her to lose more than 100 pounds of weight. Photograph by Stephen L. Barten, DVM.

Baby was unchallenged as the record longest Burmese python ever measured. With this realization of the dramatic reduction in her actual length, there comes the question of what, then, *is* the record maximum length of Burmese pythons?

First, however, we want to point out that we are not aware of any attempt by the various involved parties to purposely deceive in their overestimations of the lengths of either Colossus or Baby. Honest mistakes were made in the very difficult endeavor to measure a live giant snake. Colossus was a huge dangerous snake, very difficult to measure, while Baby was publicly measured by an objective third party. It may be that neither the Pittsburgh Zoo nor Serpent Safari corrected the overestimations when and if they became aware of them, but they can scarcely be faulted for not wanting to lessen the publicity and impact of their best known and most popular attractions.

The lesson to be learned from these two examples is that length records for large specimens of pythons, boas and anacondas must be based on measurements made of the intact body soon after death, using a steel tape and in the presence of witnesses. Alternatively, a giant snake that is heavily sedated or anesthetized enough to allow it to maintain a relaxed, straightened position also can be measured accurately. Those measurements must then be published.

The record maximum length for Burmese pythons, *P. bivittatus*

It is important to recognize a record maximum length for a species. That length is to be equal to the length of the longest known specimen that has been accurately and correctly measured. We point out that it is also important that the measurements of other large specimens be entered into the literature, so that a general picture of the maximum size of a given taxon is formed.

We stress that even in species with indeterminate growth patterns, as the growth of reptiles has been described, long life does not necessarily mean exceptionally large size. Only a very small percentage of Burmese pythons, given the necessary longevity and conditions, will achieve anywhere near the maximum record size for the species. Most large older adults will be significantly smaller than the maximum length.

The problem of a single giant individual such as Baby is that her widely accepted length was so much greater than that of any conspecific that no one bothered to record the lengths of other very large Burmese pythons. During the past 30 years, there have been more than 100,000 Burmese pythons in captivity in the United States and there have been many older large females that should have been measured and their lengths recorded, but were not because they were thought to be so much smaller than the purported length of Baby.

The story of the record maximum size of boa constrictors makes a strong parallel to this situation in Burmese pythons, and illustrates the importance of identifying other large specimens. Oliver (1958) reported that in during WWII, a crew working on malaria control in the jungle of Trinidad killed a huge boa constrictor, *Boa constrictor*; this boa was reported to be 18 feet 6 inches in length. This snake was so much larger than any other boa constrictor that the measurements of only very few other large specimens have since been entered into the literature. This Trinidad record was accepted and published in many other manuscripts, including the widely read books of Pope (1961), Minton and Minton (1973), and Mehrtens (1987). However, Boos (1992) decided to investigate the record; he was able to locate and contact two members of the crew some 50 years after their work in Trinidad, and learned that this giant snake was actually an anaconda, *Eunectes murinus*, and not a boa constrictor. Because of this mistaken identity, today there still is no well accepted record maximum length for boa constrictors even though boas are common in many areas of their natural distribution and they are one of the most common snakes in captivity.

Designating a record maximum length for Burmese pythons takes on additional importance for two reasons. One is that this taxon is recently reclassified as a species and morphological data specific to Burmese pythons is important. A second is that exaggerated claims of the potential giant size of Burmese pythons are being made by the invasive python camp in south Florida, feeding incorrect information to the media.

We looked through historical accounts and entries for Burmese pythons for published records of the largest specimens. While nearly every account lists a maximum size for the species, most are anecdotal, stating lengths that are not actually based on specimens. For example, Deuve (1970) states that the maximum size of Burmese pythons is 7.62 m (25 ft) but does not explain on what this length is based or from where it came. He then states that the largest specimen known from Laos measured 4.50 m (14 ft 8 in) and was captured in 1957 in the town of Savannakhet—this is the kind of record that we looked for. Schleich and Kästle (2002) state that the maximum length is 7.62 m specimen based on a specimen from Laos and cite Deuve (1970) as the source, but that is not what Deuve stated. Both Whitaker and Captain (2004) and Saint Girons (1972) list 6.0 m as the maximum size without any explanation. Shah and Tiwari (2004) list the maximum size as 6.5 m (21 ft 4 in) without identifying any source for this measure; they do state that a 6.25 m shed skin was found in Royal Bardiya Park, but shed skins stretch significantly and in our opinion, the shed skin could have come from a python only 4 m in length. Boulenger (1912) states "Grows to 30 feet" without explaining on what this is based and apparently ignorant of the fact that neither Indian pythons nor Burmese pythons are found on the Malayan Peninsula. Rooij (1917) goes a degree higher and states that the species "reaches 10 meters," but likewise, she does not refer to any specific specimen and apparently is only repeating hearsay.

Wall (1921) lists measurements of several large pythons. Wall did not recognize Burmese pythons as a valid taxon, so data from Indian pythons and Burmese pythons are confused. He lists a specimen mentioned in a periodical, *Land and Water*, (August 10, 1866 or 1867) with a length of 18 ft 9 inches from Musoorie in Uttarakhand Province, India. That would be west of the western end of Nepal, and a python from that locality would probably be identified today as a *Python bivittatus*; however, if found a short distance south of Musoorie, there would be a strong chance that this would be a *Python molurus*.

The largest Burmese python record we can find is a snake that was shot by the Maharajah of Cooch Behar, taken in the district of Cooch Behar in Assam in the late 19th century, cited

by Anonymous (1901), Wall (1921), Daniels (1983), and Murphy and Henderson (1997). This snake was taken as a trophy and is purported to have measured 5.84 m (19 ft 2 in). As reported by Anonymous (1901), this snake was originally identified as a reticulated python; it was killed, skinned, the skin sent to a London taxidermist, mounted as a full mount, and then returned to India where the Maharajah donated the mount to the Bombay Museum. Later, according to Wall (1921) the specimen was identified as *Python molurus* (*sensu lato*). Unfortunately, it is not clear if the reported length is based on the freshly killed snake, the skinned hide or the length of the mounted specimen. The specimen was taken more than 110 years ago and it is unlikely that the uncertainty about its measure can be resolved.

Thus, it is our opinion that the record maximum length for Burmese pythons, *Python bivittatus*, is 5.74 m (18 ft 10 in) and that record is based on the specimen identified as Baby. Even though she lost 29% of her purported 27 feet length, so far as we are able to find, she remains the longest Burmese python.

As we mentioned earlier, we suspect that many possible record-length snakes may not have been reported over the past 18 years because of the published exaggerated size of Baby. We expect that this new record maximum length may well be exceeded in the future. However, the candidate for the record will have to be correctly and accurately measured and the measurement published before it can be accepted as a record.

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The Significance of an "Insignificant" Wetland in Brown County, Wisconsin

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Efforts to weaken wetlands protection in the state of Wisconsin have placed a spotlight on a small patch of land near Lambeau Field, home of the Green Bay Packers. It is located at the crossing of U.S. Highway 41 and Lombardi Avenue in Ashwaubenon, an "island" surrounded by commercial and residential development. A bill passed by the state Senate and Assembly early in 2011, and backed by Governor Scott Walker, has exempted this wetland from the normal permit process that would be required for the wetland to be filled (Jones, 2011). It was part of a plan by a car dealer from Neenah, acting on behalf of the Green Bay Packers, to develop the site. It was originally hoped that a Bass Pro Shop would be built there, but that company declared that it would not build on a wetland and separated itself from the project (Johnson, 2011; Jones, 2011). More recent information can be found in Lueders (2011) and at the website of the Wisconsin Wetlands Association.

I knew the wetland in question and the adjacent patch of forest when I lived and taught in the Green Bay area from 1984 to 2001. At first I lived a few blocks away and would bring my kids there to walk in the woods. Later I brought my college students. I could show them trilliums and wild ginger and lilies-of-the-valley blooming in the spring and witch hazels in the fall. There were native trees like beech and blue beech and butternut (a species of special concern in Wisconsin), and one day I noticed at least six species of ferns. I used the area to show my students how to locate calling frogs by triangulating on them with flashlights.

The wetland and forest provided habitat for a surprising number of amphibian species. Indeed, during visits to this site, my students and I were able to document for the first time in Brown County the occurrence of blue-spotted salamanders (*Ambystoma laterale*), spring peepers (*Pseudacris crucifer*), wood frogs (*Lithobates sylvaticus*) and American toads (*Anaxyrus americanus*) (Cochran et al., 1987; Cochran and Knutsen, 1987). Gray treefrogs (*Hyla versicolor*), chorus frogs (*P. triseriata*), and leopard frogs (*L. pipiens*) were also present. The only reptile I observed at this location was a snapping turtle (*Chelydra serpentina*) killed by a car on the adjacent road, although I found a garter snake (*Thamnophis sirtalis*) on the western side of U.S. Highway 41 before that area was developed for housing.

The diversity of amphibians present at this wetland reflected the close proximity of a mature forest. Even though the area as a whole was surrounded by roads, it was possible for the woodland species (e.g., blue-spotted salamanders, wood frogs, and spring peepers) to move directly between forest and breeding wetland without crossing pavement. Creation of artificial wetlands may be touted as a way to mitigate loss of natural wetlands through development, but how many artificial wetlands are created with an adjacent forest?

It is not the purpose of this report to evaluate the ecological significance of this wetland, although I do not believe that its role as habitat for a diversity of amphibians has been discussed previously. I would like to suggest, however, that the area had recreational significance, at least to the children of the neighborhood who were obviously using it in the 1980s and 1990s, and it certainly was of significance as an educational resource.

I haven't been back to this spot since I moved away from the Green Bay area in 2001. I understand that it has been degraded to some extent by being partially filled, perhaps illegally (Lueders, 2011). Even in 1990, "For Sale" signs indicated that its future was uncertain. And that, in microcosm, was one reason I left a good job in the Green Bay area. It was just getting too difficult to do that job the way I think it should be done. It was getting too difficult to take students to decent natural or even semi-natural habitats within the time available during a laboratory period. I sometimes use population data for Brown County as the basis for a classroom exercise in use of population models. Using data for the period 1960–1990, when the population increased by 56% (Brown County Planning Commission, 1994), and for the period 1990–1998, when the population increased from 194,594 to 218,149 (Hildebrand, 1998), and assuming a simple exponential model, results in similar estimates of the population doubling time (47 and 49 years, respectively). That these are somewhat lower than an estimate of the U.S. population doubling time (51 years) that included a healthy estimate of the contribution of illegal immigration (Brewer and McCann, 1982) reflects not the contribution of illegal immigration to Brown County population growth, but rather the substantial effect of legal immigration (i.e., the result of development). How much is enough of a good thing?

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Notes on Reproduction in Atlas Day Geckos, *Quedenfeldtia trachyblepharus* (Squamata: Gekkonidae) from Morocco

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Abstract

A histological examination was performed on gonadal material from a sample of 69 *Quedenfeldtia trachyblepharus* from Morocco. I recorded a mean clutch size of 1.13 eggs ± 0.34 SD, range = 1–2. Two is a new maximum clutch size for *Q. trachyblepharus*. Histological evidence in the form of oviductal eggs and concurrent early yolk deposition for a subsequent clutch, in the same female indicates multiple clutches are produced. The smallest mature females were 31 mm SVL; smallest mature males were 34 mm SVL.

Quedenfeldtia is a genus of diurnal geckos endemic to Morocco (Sindaco and Jeremèenko, 2008) and consisting of two species, *Q. moerens* and *Q. trachyblepharus* (Arnold, 1990). *Quedenfeldtia trachyblepharus* is known from the Atlas Mountains of Morocco where it inhabits rock faces and boulders from sea level to 4000 m (Schleich et al., 1996). Information on its reproduction is in Schleich et al. (1996) including mixed type of spermatogenesis, clutches of one egg deposited March–June in the Anti-Atlas range and 2–3 clutches deposited April–July in the Haut Atlas range and utilization of communal egg-laying sites. Loveridge (1947) reported one female from May contained one large ovum. The purpose of this note is to add information on the reproductive biology of *Q. trachyblepharus* based on histological analysis of gonadal material from museum specimens.

Methods

Sixty-nine *Q. trachyblepharus* (33 males, mean snout–vent length [SVL] = 40.1 mm ± 3.0 SD, range 34–46 mm) and (36 females, mean SVL = 37.3 mm ± 3.4 SD, range 31–43 mm) collected 24 May 1974 at Igrherm [alternate spellings: Igherm or Irherm], Taroudant Province, in the Souss-Massa-Drâa region of Morocco (30.06250°N, 8.40833°W, datum WGS 84, elev. 1600–1700 m) and deposited in the herpetology collection of the Field Museum of Natural History (FMNH), Chicago, Illinois, USA, were examined. The left testis was removed from males and the left ovary was removed from females for histological examination (Presnell and Schreibman, 1997).

Enlarged ovarian follicles (> 4 mm) and/or oviductal eggs were counted. Tissues were embedded in paraffin, sectioned at 5 µm and stained with hematoxylin followed by eosin counterstain (Presnell and Schreibman, 1997). Histology slides were deposited in the FMNH herpetology collection. Ovary slides were examined for yolk deposition or corpora lutea. Testis slides were examined to ascertain the stage of the testicular cycle. Mean SVL of male and female *Q. trachyblepharus* were compared using an unpaired t-test (Instat vers. 3.0b, Graphpad Software, San Diego, CA).

Results

The mean SVL of males was significantly larger than that of females ($t = 3.5$, $df = 67$, $P = 0.001$). The only stage observed in the testicular cycle was spermiogenesis (sperm formation) in which the lumina of the seminiferous tubules are lined by clusters of sperm or metamorphosing spermatids. The smallest reproductively active male (FMNH 197773) measured 34 mm

Table 1. Stages in the ovarian cycle of *Q. trachyblepharus* from May 1974..

Month	n	Quiescent	Early yolk deposition*	Enlarged follicles > 5 mm	Oviductal eggs**
May	36	7	6	2	21

* No oviductal eggs.
** Six of 21 females with oviductal eggs were undergoing concurrent yolk deposition for a subsequent clutch.

SVL. Since no males < 34 mm SVL were examined, this SVL should be considered an approximation of the minimum size for maturity in males.

Four stages were noted in the ovarian cycle (Table 1); (1) quiescence, no yolk deposition; (2) early yolk deposition (basophilic vitellogenic granules in the ooplasm); (3) enlarged ovarian follicles > 3 mm; (4) oviductal eggs. Mean clutch size for 23 females was 1.13 ± 0.34 SD, range = 1–2. The smallest reproductively active female (FMNH 197774) measured 31 mm SVL and was undergoing early yolk deposition. Six of 21 females from May with oviductal eggs (29%) were undergoing concurrent yolk deposition for a subsequent clutch. Since no females < 31 mm SVL were examined, this SVL should be considered an approximation of the minimum size for maturity in females.

Discussion

According to Schleich et al. (1995), *Q. trachyblepharus* males have a mixed type of spermatogenesis. Saint Girons (1982) categorizes this form of spermatogenesis as sperm production (spermiogenesis) from March to May. Although the full testis cycle has not been ascertained, *Q. trachyblepharus* appears to exhibit a mixed type of spermatogenesis as all males from May were producing sperm.

My finding of clutches of two eggs is a new maximum clutch value for *Q. trachyblepharus*, although a clutch of one egg appears more common for this species. One egg is typical for geckos of the family Sphaerodactylidae (Fitch, 1970) in which *Quedenfeldtia* is classified. My data support *Q. trachyblepharus* producing at least two clutches in the same reproductive season although the claim of Schleich et al. (1995) that three clutches may be produced will require further investigation.

In conclusion, my data have provided the following new information on the *Q. trachyblepharus* reproductive cycle: (1) females may produce clutches of two eggs; (2) histological verification is presented that multiple clutches are produced as evidenced by concurrent yolk deposition in females with oviductal eggs ; (3) females of 31 mm SVL and males of 34 mm SVL are mature. Additional monthly samples warrant examination before the timing of events in the *Q. trachyblepharus* reproductive cycle can be ascertained.

Acknowledgment

I thank Alan Resetar (FMNH) for permission to examine *Q. trachyblepharus* and for facilitating the loan.

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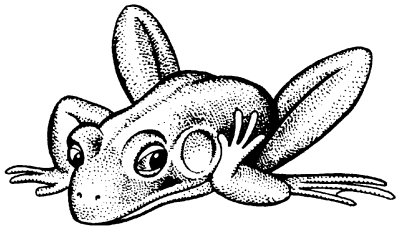
Appendix

Quedenfeldtia trachyblepharus from Morroco examined from the herpetology collection of the Field Museum of Natural History (FMNH), Chicago, Illinois: FMNH 197641, 197642, 197644, 197647, 197649-197654, 197656, 197658, 197659, 197661, 197665, 197666, 197668, 197678, 197679, 197683, 197684, 197687, 197689, 197693, 197694, 197697, 197698, 197701, 197702, 197704, 197707, 197710-197713, 197716-197718, 197722, 197724, 197726, 197729, 197735-197737, 197742, 199743, 197745, 197749, 197750, 197753, 197755, 197758, 197759, 197762, 197764, 1997767, 197768, 197770, 197771, 197773-197775, 197777, 197779, 197780, 197782, 197783, 199932.

The Tympanum

Invading to the South: Comments on Research on Salinity Tolerance of Burmese Pythons



Apparently researchers in the Giant Constrictor Risk Assessment Partnership [GCRAP] in South Florida are coming to the realization that their hypothetical thesis that Burmese pythons would and could invade north into the continental United States is now in a shambles, shredded largely by the past two cold winters. The experiment of Dorcas and Willson (2010), leaving 10 pythons outside in Aiken, South Carolina, to freeze to death in snow and ice in a huge enclosure full of a variety of types of shelters certainly didn't help matters. So what do they do now?

They start research projects to determine when and how those pesky pythons will invade to the south. That's right! Now they have set about determining just how the Florida Keys and the entire Caribbean beyond could be in dire danger of a flotilla of salt-tolerant pythons migrating southward, bringing with them all the scenarios of ecological collapse and eating poor pets and livestock that has never seemed to actually happen there in the Everglades. Well, there was one publicized goose incident. . . .

The brilliance of this idea is not lost upon us. We are certain that there were lots of high-fives and backslapping when someone had this brilliant idea. Really, would they rather be sitting in snowstorm in a swamp in northern Georgia setting up those ridiculously ineffective traps, preparing for the unlikely arrival of those giant slithering aliens, or sitting in Key West or Barbados, sipping piña coladas and waiting for the fleet to come in?

Of course it would be critical for them to get down there in advance and study the weaknesses of those insular ecosystems. GCRAP loves islands full of snakes—they've been monitoring brown tree snakes in Guam for 30 years now with funds well exceeding 100 million dollars of taxpayer money. Heck, they have never advertised the funding of that project and they have made it very difficult to discover—it might be 300 or 400 million dollars, courtesy of Congress, the military and the American taxpayer. Guam is where invasive snake biology was born.

So to start the ball rolling south, three researchers have published this very preliminary report titled: "Experimentally Derived Salinity Tolerance of Hatchling Burmese Pythons (*Python molurus bivittatus*) from the Everglades, Florida (USA)." The report is written by Kristen M. Hart, Pamela J. Schofield, and Denise R. Gregoire, all USGS employees, and published in the *Journal of Experimental Marine Biology and Ecology*. This is a report on a very simple experiment.

They took three groups of eight young Burmese pythons, shut them in cages, one to a box. They then gave one group only sea water to drink (salinity of 35), another group got brackish water (salinity of 10), and the third group, the lucky control group, got fresh water (salinity of .2). They then ran the experiment for 200 days. The snakes were checked five days a week, as invasive python biologists apparently don't work weekends.

Fourteen of the 16 babies in the two experimental groups died before the end of the experiment. We quote from the report: "Salinity strongly impacted survival of the hatchlings in the laboratory." They go on to state "[the result of . . .] each treatment was statistically different from the others." What that means is that the group receiving saltwater all died in 17 to 50 days (avg = 32 days). Six of the eight in the brackish-water group died (the first in 33 days, and the sixth in 197) and two in that group survived the experiment, bloated and not looking good. None of the control group died.

This is what is called a terminal experiment. Hart is a sea turtle researcher, or she was before she joined GCRAP—she knows all about salt glands and sodium balance in the blood. Schofield and Gregoire both have done very similar experiments to see how long freshwater tilapia will live in sea water and brackish water. They experimented on the animals until the animals died. The researchers knew that drinking sea water would kill the baby pythons—very few terrestrial vertebrates can survive drinking only sea water—the object was to see just how long baby pythons could live drinking only sea water and brackish water.

We suggest that this experimental design has a serious flaw. There should have been a fourth group of baby Burmese pythons that were given no access at all to water. Perhaps this was deemed too cruel, but this seems to us to be relatively important to the conclusions of this study. We don't know if anyone has tested this, but a baby Burmese python will live 20 or 30 days without drinking in normal captive conditions; in certain environmental conditions of high humidity and cool temperatures, baby pythons deprived of water probably can survive considerably longer than that. It appears to us that it is possible that this experiment shows how long a baby python can go without drinking before it is forced by thirst to drink sea water that then quickly kills it. It does not show any "experimentally derived tolerance" of baby pythons to poisonous levels of salt.

We note that in the manuscript the authors write that: " . . . individuals in the experimental treatment survived for about a month ***in*** full-strength sea-water (salinity of 35), and about five months ***in*** brackish-water (salinity of 10)." They go on to state that "Survival ***in*** salt water conditions during the first year of life for this species was unknown before now, and current global warming scenarios that incorporate sea-level rise are predicted to significantly reduce the area of suitable habitat for Burmese pythons, . . ." They then speculate that ". . . hatchling Burmese pythons could survive on average 32 days ***under full salt-water conditions***…" [bold italics ours].

These statements take considerable liberty with the actual experiment. The baby pythons were never ***in*** salt-water and the researchers have no idea if baby pythons can live immersed and/or swimming ***in*** salt-water.

Taking every advantage of the media, the USGS is quick to advertise research that might increase their funding. Director

Marcia McNutt stated in a press release that came out the day of the publication "This study demonstrates the distinct possibility that pythons could spread to new suitable habitats one estuary at a time." Apparently when Director McNutt read that the baby pythons were ***in*** salt-water conditions, she thought the snakes were actually in salt-water conditions, swimming their little hearts out for 32 days, not sickly, severely dehydrated, weak and bloated, dying of thirst.

The press release also credits Hart as saying "This recent study, based on lab experiments conducted by researchers from the U.S. Geological Survey, provides initial evidence that pythons may be able to survive in marine and estuarine environments such as bays, inlets and open seas."

Our own conclusion on the results of this little study is that it clearly shows that drinking salt-water kills pythons. A lot of salt kills them fast and less salt kills them slower. It can kill them in as little as 17 days, about as fast as some of the poisons that have been tried on pythons in the USGS and USDA studies to "manage" the python problem.

Our second suggestion to the researchers for further experiments to investigate the resilience of pythons to swimming in salt water is this: Since there apparently are no objections to terminal experiments with baby pythons, it's now time to actually investigate the swimming ability and endurance of pythons in fresh and salt-water conditions. We recommend that Hart and her colleagues buy 24 300-gallon Nalgene containers with smooth sides—round tubs 7 ft in diameter and 3 ft deep (expensive, but the government is paying). Then divide them into the three experimental groups and fill eight with salt-water, eight with brackish-water, and eight with fresh-water. Drop a baby python into each one and see how long they last until they drown. That seems to be the real way to determine the actual probability that baby pythons might swim over to the Keys and on out into the Caribbean.

USGS ought to be willing to maintain a live video feed on the USGS website showing those little pythons trying to keep their noses out of the water. It would probably have a huge audience and it would show us all the lengths that GCRAP researchers are willing to go to save the Everglades. **David G. Barker and Tracy M. Barker, vpi@beecreek.net**

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A Challenge to Every Reptile Keeper

Recently a Fox News poll about keeping exotic pets began circulating around Facebook.

"Stop the animal rights extremists, and vote!" was the cry from the reptile community.

While organized opposition from animal rights extremists to the keeping of reptiles as pets is a definite political problem, the most powerful way we can fight back is on a very personal level.

Unless the average person knows someone who keeps reptiles, they have no understanding of why we keep these animals. They don't understand the joy we get out of our pets, and the happiness that having these animals gives to us.

And because they have no understanding of why we keep these animals, they are fertile ground for negative messages about reptile keeping.

If we want to protect our right to share our lives with these amazing animals, we have to take that advantage away from our enemies. We need to reach out to the people who don't understand us and our pets. We need to share our love of our animals in ways they'll understand and relate to.

For me, I enjoy keeping pretty things, like my carpet pythons with their vibrant colors. I enjoy watching the animals blossom and grow under my care. I enjoy the daily interactions I have with my iguana Osama Binguana, who is notorious for seeking out my attention. I enjoy working on target training with my iguanas as well. I can't train them to sit and roll over, but I can train them to go where I want with food rewards.

All these things are concepts every pet owner can relate to, even if they have no interest in pets who aren't furry and cute. That's why I spend at least 30 hours a month doing outreach.

I am at schools and libraries, pet stores and Scout meetings, as well as at general pet events. You know, the kind where dog and cat people go? So do I. And I explain what goes into caring for the ball python. Why certain animals do not make great pets, and what it takes to keep them if you are interested.

I explain the legalities of keeping reptiles, and what people need to do to be responsible keepers. I am not above correcting bad knowledge, and challenging existing keepers to improve their habits, or telling them what they need to know to be a better keeper and a better representative of the reptile community. One bad apple can ruin a bunch—and change public perception in a heartbeat. I'm there to try to keep that from happening.

For those who know me or have met me, I am a brash, tattooed metalhead. None of that is present in my public persona representing the community. My tattoos are covered, my make-up is demure, and my language is family-friendly. My clothes are neat and pressed, and I have a spare shirt or two packed for changes in case I get pooped on. My animals are freshly washed the morning of the event, and only my most trustworthy are displayed.

When dealing with the "I saw on Animal Planet . . . " tales, I say, "There are always some people who are into things for the wrong reasons. People do bad things in every walk of life, and it

is no different in the pet community. Look at Michael Vick." That's something dog and cat owners understand.

It's great but not enough to work paid jobs at zoos, or doing paid educational events with your animals at birthday parties. It isn't enough to present at a herp society or reptile group, or to get together at your local show and talk about reptiles.

We need to reach a broader audience. We need to reach the people who will look at your snake and crinkle their faces with an "euwwww" response, and get past that to the common ground we share. We also need to help them see how responsibly keeping these animals benefits and protects wild populations.

This is why I challenge every single keeper to donate at least four hours of free reptile education to the general public in 2012.

- Contact your local library and ask if you can come in on a Saturday with a presentation.
- Contact your local pet shop and ask if you can set up a reptile display.
- Reach out to local Scout groups.

Don't just huddle with people who share your views at reptile shows; try to make a positive change on the perception of our beloved pets with people who don't share them yet.

I personally average 30 hours a month, doing free education in environments where people may not really expect to see reptiles. I challenge you to only four hours in a whole year.

This will not make the animal rights extremists back off, but it will make their audience more informed and less receptive to their distortions. Rather than falling on the ears of people who have no experience with a reptile keeper, it will fall on those of someone who has heard from us, who has seen the love and care we have for our animals, who may not want to keep reptiles themselves, but at least gets that we're not criminals and freaks, but pet lovers like them.

Will you rise to the challenge, or will you let the enemies of us and of our animals have the first, last, and only word? **Cindy Steinle** [This opinion piece first appeared in Cindy's blog for December 27, 2011, on Kingsnake.com. For more of Cindy's blogs see http://www.kingsnake.com/blog/authors/7-Cindy-Steinle]

Advertisements

Herpetology 2012

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.

BROWNSNAKE MICROHABITAT SELECTION

S. J. Hecnar and D. R Hecnar [2011, J. Herpetology 45(4): 478-483] note that understanding habitat selection is a fundamental goal of ecology and is vitally important for effective species conservation. Dekay's brownsnake (*Storeria dekayi*; hereafter "Brownsnake") is one of the most widespread snake species in eastern North America, and its association with cover objects is generally well known, but details regarding choice of refuges are largely unknown. The authors investigated Dekay's brownsnake microhabitat use during annual surveys at Point Pelee National Park, Ontario, Canada, from 1990 to 2010. They systematically checked all woody debris in stabilized dune habitat for snakes and noted the size and state of decay of woody debris that was used. Nearly all observations were of gravid females under woody debris. Greater use of large, moderately decayed woody debris relative to the range of available debris provided strong evidence of selection. Although most snakes observed were solitary, a significant number of aggregations were found. Female brownsnakes appear to migrate to stabilized dune from other habitats in the park to select suitable woody debris for gestation and parturition. Although these refuge sites would reduce predation risk, they also provide a moister and cooler microclimate than ambient conditions. Numerous observations of shed skins also suggested that this woody debris provides important microhabitat for ecdysis. Analysis of relative abundance over time showed considerable variation in numbers (1–31/yr) and an increasing trend. These results provide strong evidence of microhabitat selection by this species and highlight the importance of not making generalizations about microhabitat requirements, even for common snake species.

INDIGO SNAKE HOME RANGES

D. R. Breininger et al. [2011, J. Herpetology 45(4):484-490] note that wide-ranging snake species are particularly sensitive to landscape fragmentation, and understanding area requirements is important for their conservation. They used radiotelemetry to quantify how eastern indigo snake (*Drymarchon couperi*) home-range sizes were influenced by sex, land cover, and the length of time (weeks) individuals were radio tracked. Eastern indigos were found to have the largest home ranges among the snake species studied. Female home ranges averaged 44 and 76 ha, respectively, for kernel and minimum convex polygon estimators. Male home ranges averaged 156 and 202 ha, respectively, for kernel and minimum convex polygon estimators. Many animal species respond to habitat fragmentation by using larger areas than in unfragmented landscapes, but this study found that indigo snakes in fragmented landscapes used much smaller areas. The length of time that snakes were tracked had almost no influence on home-range size compared to sex and land cover type. Results suggest that maintaining populations of this large wide-ranging predator will require large conservation areas with minimum fragmentation.

TESTING SPECIES DISTRIBUTION MODELS

D. R. Trumbo et al. [2011, Canadian Journal of Zoology, 89(11):1074-1083] report that species distribution models (SDMs) have become an important tool for ecologists by providing the ability to predict the distributions of organisms based on species niche parameters and available habitat across broad geographic areas. However, investigation of the appropriate extent of environmental data needed to make accurate predictions has received limited attention. The authors investigated whether SDMs developed with regional climate and species locality data (i.e., within Missouri, USA) produce more accurate predictions of species occurrences than models developed with data from across an entire species range. To test the accuracy of the model predictions, field surveys were performed in 2007 and 2008 at 103 study ponds for eight amphibian study species. Models developed using data from across the entire species range did not accurately predict the occurrences of any study species. However, models developed using data only from Missouri produced accurate predictions for four study species, all of which are near the edge of their geographic ranges within the study area. These results suggest that species distribution modeling with regionally focused data may be preferable for local ecological and conservation purposes, and that climate factors may be more important for determining species distributions at the edge of their geographic ranges.

NORTHERN PACIFIC RATTLESNAKE HIBERNACULA

C. M. Gienger and D. D. Beck [2011, Canadian Journal of Zoology 89(11):1084-1090] note that hibernacula play an important role in the ecology of high-latitude snakes, and communally denning species may occupy their hibernacula for half the year or more. Because of the long duration spent at hibernacula, such sites can provide multiple benefits to snakes including shelter from lethal overwinter conditions, social opportunities, and basking sites important in thermoregulation. Adequate hibernacula seem to be limited on the landscape and individuals travel several kilometers to use and reuse specific sites. The authors investigated orientation, physical structure, and thermal properties of sites used as hibernacula by northern Pacific rattlesnakes (*Crotalus oreganus*), and compared them with random sites that appeared similar but were not used for hibernation. Hibernacula occurred primarily on south-facing talus slopes, were oriented on less-steep slopes, and were composed of rocks that were intermediate in size to randomly occurring sites. Results suggest that the orientation and physical composition of hibernacula allow them to be stable over time, allowing snakes to repeatedly locate the sites, as well as providing predictable overwinter refuge. Hibernacula were also warmer on the surface than north-facing random sites and provided increased basking opportunities for snakes thermoregulating in early spring after emergence from hibernation.

KEELED BOX TURTLES ON HAINAN ISLAND, CHINA

Wang J.-C. et al. [2011, Chelonian Conservation and Biology 10(2):159-164] studied reproduction and nesting of the keeled box turtle (*Cuora mouhotii*) during 2003 and 2009 on Hainan Island, China. The first gravid turtle was found on 28 April and nesting was from May until July, with a peak in mid-June. The first fresh nest was observed on 1 June and last fresh nest on 27 July. Some females laid eggs from 1 clutch in 2 batches. Clutch size ranged from 1 to 5. Mean egg measurements were as follows: length, 4.5 cm; width, 2.7 cm; and mass, 19.8 g. There was no significant relationship between turtle body size (mass, length, height and width) and clutch size or egg size (mass, length and width). Clutch size was significantly correlated with the egg mass and egg width. Possible low fertility, low hatching rate, and the long period to reach maturity imply that *Cuora mouhotii* has a low intrinsic rate of population increase. This, combined with overcollecting and habitat destruction, requires development of more effective conservation strategies for this endangered species.

BIGGER NOT ALWAYS BETTER

M. C. Jones et al. [2011, J. Herpetology 45(4):455-456] note that sexually dimorphic traits are used for mate selection either by female choice (intersexual selection) or male–male competition (intrasexual selection). In anurans, both types of selection mechanisms, especially intersexual selection, generally will favor large males. In bufonids, however, male size does not seem to be a factor in mate selection. Very little is known about the mating preferences of the endangered Houston toad (*Bufo houstonensis*). Studies examining the breeding dynamics of *B. houstonensis* were conducted during the early 1980s, with conflicting results. To further examine mate selection, 329 Houston toads were collected from Bastrop State Park, Texas, and the snout–urostyle length (SUL) was measured. There was no significant difference in size for males found in amplexus, suggesting females may not select larger males.

COMPETITION FOR BREEDING POOLS

M. J. Ryan and D. S. Barry [2011, J. Herpetology 45(4):438-443] note that competition and predation are two of the most important factors structuring communities, and these interactions may be exaggerated when two closely related species share similar resource requirements. They studied size-based habitat selection of artificial phytotelmata for deposition of tadpoles in two species of poison-dart frogs, *Dendrobates auratus* and *Oophaga granulifera*, in Costa Rica. *Dendrobates auratus* exhibits male parental care, and its tadpoles are predaceous, whereas *O. granulifera* exhibits biparental care, and its tadpoles are obligatory trophic egg eaters. These behavioral traits are integral factors in habitat selection for these two species. The authors found that the predaceous *D. auratus* selected large- and medium-sized pools, whereas *O. granulifera* selected all pool sizes but had a preference for small pools. *Oophaga granulifera* paid a high cost for exploiting large pools, experiencing 100% mortality when sharing a pool with *D. auratus*. The use of small versus large pools in these species is rooted in each species' divergent parental care strategies and tadpole feeding behaviors.

OVERWINTERING BY BABY EASTERN BOX TURTLES

R. L. Burke and W. Capitano [2011, Chelonian Conservation and Biology 10(2):256-259] studied 11 nests, and the resulting neonates of eastern box turtles (*Terrapene carolina*) in New York in 2001 and 2002, and documented neonate emergence and movements. None overwintered in the nest; instead, they emerged in the fall and overwintered buried shallowly close to the nest, where they were exposed to temperatures as low as -7°C. Further research is needed regarding neonate *T. carolina* behavior and the relative advantages of overwintering in the nest and overwintering terrestrially outside the nest.

TADPOLES AND REED CANARY GRASS

T. A. G. Rittenhouse [2011, J. Herpetology 45(4):491-496] notes that ephemeral, fishless wetlands with open canopies are known to be quality breeding habitats for pond-breeding amphibians. Yet many wetlands including these are commonly invaded by exotic plants, resulting in vegetation shifts from diverse native vegetation to monotypic stands of novel material. This study tested the hypothesis that an invasive grass, reed canary grass (*Phalaris arundinacea*), would reduce survival, growth, and development rates of four tadpole species relative to a mixture of native grasses. Grass type and amount were manipulated in fully replicated mesocosm experiments that contained American toads (*Anaxyrus americanus*), Cope's gray treefrogs (*Hyla chrysoscelis*), pickerel frogs (*Lithobates palustris*), or wood frogs (*Lithobates sylvaticus*). Counter to expectations, there was little evidence that diverse vegetation enhanced wetland quality for amphibians, because the quantity of decomposing plant matter influenced tadpole performance more than type of plant matter. Growth and development of tadpoles was generally not affected, indicating that this invasive grass produced minimal direct (e.g., toxic alkaloids) or indirect (i.e., through the food web) effects on tadpoles. However, differences in survival were found. It is possible that large amounts of grass supplied excess organic matter that decomposed rapidly underwater, causing a pulse of nutrients early in the larval period and anoxia. Wetlands invaded by reed canary grass may successfully produce metamorphs given that hydroperiods are adequate and eutrophic conditions do not occur in the wetland.

GEOFFROY'S TOAD-HEADED TURTLES IN BRAZIL

L. Schneider et al. [2011, Chelonian Conservation and Biology 10(2):206-212] studied reproduction and noted predation of *Phrynops geoffroanus* nests along the Guaporé River of the Brazilian and Bolivian Amazon during the beginning of the falling water level season in July 1989 and 2008. They searched for nests on the banks of the Guaporé River every morning along the Guaporé River between Divisa sector, state of Rondônia in Brazil and Versalles village, Department El Beni, in Bolivia. Ten nests were found in 1989 and 46 nests in 2008. Clutch size ranged from 7 to 16 eggs and was larger in 2008. There was no relationship between egg size and nest size or the size of eggs between year 1989 and year 2008. The predation rate in 2008 was 89.1%, all depredated by the lizard *Tupinambis teguxin*. Habitat loss for the lizard may be creating habitat utilization shifting and increased turtle nest depredation rates.

REEVES' POND TURTLES IN JAPAN

D. Suzuki et al. [2011, Chelonian Conservation and Biology 10(2):237-249] note that Reeves' pond turtle, *Mauremys reevesii*, is an aquatic geoemydid species that is broadly distributed in East Asia. Like many other Asian turtles, this species is facing an extinction crisis in most countries where it occurs. In Japan, however, this turtle commonly occurs in various freshwater habitats. Although the Japanese populations have generally been considered to be native, a few recent studies have yielded circumstantial evidence that suggested that they had originated from relatively recent artificial introductions from abroad. To evaluate the validity of such a view, the authors analyzed sequence variations of the mitochondrial cytochrome b gene and the control region in *M. reevesii* samples from various localities in Japan and adjacent countries. The results revealed the presence of 3 distinct genetic groups (groups A, B, and C) in the Japanese samples, of which groups A and B included haplotypes that were almost identical with some haplotypes from the Korean sample and the Chinese and Taiwanese samples, respectively. Sequences from *M. reevesii* shell products commercially traded in Taiwan included one that was almost identical to the group C sequence. The current Japanese populations of *M. reevesii* seem to have been derived from multiple artificial introductions from adjacent countries. This finding implies a need to be concerned about the effect of *M. reevesii* on the Japanese native wildlife, particularly on the Japanese endemic pond turtle, *Mauremys japonica*, with which *M. reevesii* is phylogenetically closely related and reportedly frequently hybridizes in the wild. However, the Japanese population may be useful as a genetically variable stock for conservation of this species, which is highly endangered in most of its range outside Japan.

EFFECTS OF LOW-ENERGY DIETS

S. Reguera et al. [2011, Canadian Journal of Zoology 89(12): 1178-1187] note that optimal diet theory predicts that predators optimize energy intake by balancing costs and benefits of foraging. One extreme strategy of snake foraging ecology is shown by specialist species that forage on low-energy prey, such as the mesa central blotched gartersnake, *Thamnophis scaliger,* which feeds almost exclusively on earthworms. Compared with other prey types such as small mammals, lizards, or arthropods, earthworms are low-energy prey because of their small size and high water content. Given the importance of energy acquisition for fueling snake reproduction, it is to be expected that a low-energy dietary specialist such as *T. scaliger* needs to forage frequently to store enough fat to reproduce. The high frequency of snakes containing prey, the presence of multiple earthworms in snakes, and the fact that females continue to feed when gravid suggest that *T. scaliger* is a voracious consumer of earthworms. Despite these foraging behaviors, females did not reproduce in sequential years, suggesting constraints in energy input to reproduce more frequently. A meta-analysis of the diet, body size, and reproductive frequency of some species of the genus *Thamnophis* confirms that consumption of invertebrate prey is associated with small snake size, but not with biennial reproductive frequency within the genus.

NESTING OF GREEN TURTLES AT ALDABRA

J. A. Mortimer et al. [2011, Chelonian Conservation and Biology 10(2):165-176] report that when Aldabra Atoll became a nature reserve in 1968, its endangered nesting green turtle (*Chelonia mydas*) population was the first to be protected in the Indian Ocean. In 1983, Aldabra became a UNESCO World Heritage Site managed by the Seychelles Islands Foundation. But prior to 1968, its green turtles suffered intense exploitation documented by trade statistics, historical literature, and a scientific study in 1927. Three population surveys conducted just before, during, and shortly after 1968 provide baseline data by which to assess the long-term population recovery monitored since 1980 using a standardized track count protocol. The 52 nesting beaches distributed along the 83-km outer rim of Aldabra were classified into 6 beach groups (WGT, SETT, DDM, DJL, CC, and North), with total beach length of 5.2 km. During Phase 1 (1980–1994) of the study, 17 index beaches (WGT #1–17) were monitored 4 times per month and other beaches opportunistically. During Phase 2 (1994–2008), index beaches (WGT #1–22 and SETT) were monitored at least 4 times per month and remote beaches monthly. Track counts were converted to estimated egg clutch production using nesting success data. Reproductive output for the atoll rose from a mean annual estimated 2000–3000 clutches in the late 1960s to 15,669 (SD = 2776) during 2004–2008, equivalent to a mean estimated 3100–5225 females nesting annually (assuming an average of 3–5 egg clutches per female). This represents a 500%–800% increase during 40 years of complete protection. During Phase 2, the rate of increase was highest at the Settlement Beach (SETT), which had historically suffered the most intense exploitation.

WOOD FROG TADPOLES IN NORTHERN PRAIRIES

D. B. Donald et al. [2011, Canadian Journal of Zoology 89(11):1063-1073] note that in the northern plains of North America, the wetland breeding habitat of amphibians and their populations could be reduced by a change in climate that included decreased precipitation. To test this hypothesis, relative abundance of late-stage tadpoles of the wood frog (*Lithobates sylvaticus*) was monitored from 1997 to 2010 during a wet–dry–wet cycle in 29 wetlands distributed throughout central Saskatchewan, Canada. The wetlands were dry for up to 7 consecutive years, and for a mean of 3.8 consecutive years. Consequently, tadpole occupancy of the wetlands was reduced to less than 40% for 5 consecutive years and none of the wetlands had tadpoles during the severe drought of 2001 and 2002. However, the drought had no observable long-term effect on either tadpole occupancy of wetlands or tadpole abundance. In 2007, 93% of the wetlands supported tadpoles, and in 2008 the highest mean relative abundance of tadpoles was recorded. Tadpole occupancy of wetlands was related to winter and spring precipitation ($R^2 = 0.84$) with 67% of long-term variation in occupancy related to snowfall from November to February and 17% related to rainfall from March to June. Less than 45 mm of winter precipitation for 6 consecutive years would probably cause regional extinction of populations of the wood frog.

Unofficial Minutes of the CHS Board Meeting, December 16, 2011

The meeting was called to order at 8:06 P.M. at the home of Deb Krohn. Board members John Archer and Greg Brim were absent.

Officers' Reports

Recording Secretary: Cindy Rampacek read the minutes of the November 18 board meeting, which were accepted as read.

Treasurer: Andy Malawy went over the financial report from November, and it was accepted.

Membership Secretary: Mike Dloogatch read a list of memberships expiring this month.

Sergeant-at-arms: Greg Brim counted 56 people at the November meeting.

Committee Reports

Shows:
- Notebaert, first full weekend of each month
- Great Lakes Pet Expo, February 4, 2012
- Reptile Rampage, Lake Forest, March 11
- Family Pet Expo, Arlington Racetrack, March 16–18
- NARBC Tinley Park, March 17 & 18

New Business

Jason Hood asked the new board to encourage members to submit articles to the *Bulletin*.

When Cindy spoke recently for the Minnesota Herp. Society, she got a mug. She thought this was a good idea, and suggested we give speakers CHS shirts or other items. The board agreed that this would be a good idea.

Mike Dloogatch mentioned that the Grants Committee will meet prior to January 29 because two of its members will be unavailable the following two weeks.

Round Table

Cindy shared the importance of carbon monoxide monitors.

Mike mentioned we got a few more packages from Marcia Rybak. A ton of beanie babies and a lot of other stuff.

Deb said she was glad we all came to her house.

Lawrence has two clutches of gecko eggs.

The meeting was adjourned at 9:02 P.M.

Respectfully submitted by recording secretary Cindy Rampacek

Chicago Herpetological Society
Income Statement: January 1 – December 31, 2011

Income		Expense	
Adoptions	$ 746.25	Adoptions	$ 2,383.89
Grants	197.00	Grants	5,000.00
Membership dues	12,627.20	Bulletin printing / mailing	17,241.38
ReptileFest	50,523.00	ReptileFest	27,446.96
Merchandise sales	435.00	Cost of merchandise	859.34
Amazon.com	106.64	Bank / PayPal fees	86.31
Interest	28.09	Other CHS shows	45.00
Donations (unrestricted)	14,972.00	Awards	219.86
Donations (conservation)	20.00	Liability Insurance	5,404.00
Raffle	737.00	Library	51.33
Miscellaneous	956.31	Licenses and Permits	131.00
		Postage	2,168.14
		Rent (storage)	480.00
		Speaker Reimbursement	3,908.07
		Telephone	421.43
		Miscellaneous	1197.00
Total Income	$81,348.49	Total Expense	$67,043.71

Net Income $14,304.78

Chicago Herpetological Society
Balance Sheet: December 31, 2011

Assets	
Checking	$ 3,983.45
Money market	44,453.55
PayPal	882.59
Postage on deposit	379.94
Total Assets	$49,699.53
Equity	
Restricted – Adoptions	$ 4,818.85
Restricted – Grants	197.00
Retained Earnings	30,378.90
Net Income	14,304.78
Total Equity	$49,699.53

UPCOMING MEETINGS

The next meeting of the Chicago Herpetological Society will be held at 7:30 P.M., Wednesday, January 25, at the Peggy Notebaert Nature Museum, Cannon Drive and Fullerton Parkway, in Chicago. The speaker will be **Ari Flagle**, a keeper in the Department of Ectotherms at the Fort Worth Zoo. Ari's topic will be "Unlocking the Secrets to Breeding Boelen's Pythons."

Speaking at the February 29 meeting will be **Mike Pingleton** of Champaign, Illinois. Mike, a field herper extraordinaire, will speak on "Herping in Mexico."

The regular monthly meetings of the Chicago Herpetological Society take place at Chicago's newest museum—the **Peggy Notebaert Nature Museum**. This beautiful building is at Fullerton Parkway and Cannon Drive, directly across Fullerton from the Lincoln Park Zoo. Meetings are held the last Wednesday of each month, from 7:30 P.M. through 9:30 P.M. Parking is free on Cannon Drive. A plethora of CTA buses stop nearby.

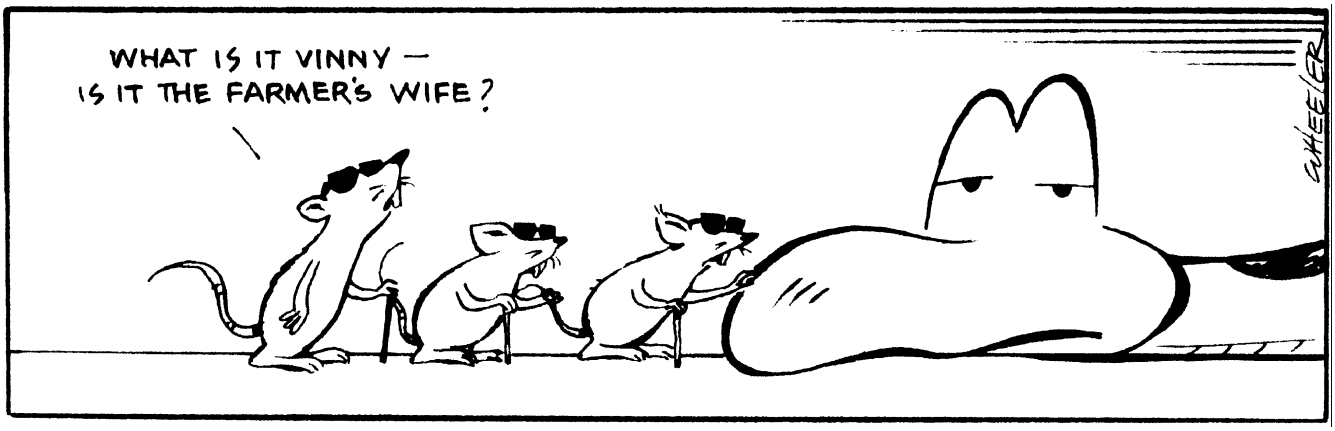
Board of Directors Meeting

Are you interested in how the decisions are made that determine how the Chicago Herpetological Society runs? And would you like to have input into those decisions? If so, mark your calendar for the next board meeting, to be held at 7:30 P.M., February 17, in the adult meeting room on the second floor of the Schaumburg Township District Library, 130 S. Roselle Road, Schaumburg..

The Chicago Turtle Club

The monthly meetings of the Chicago Turtle Club are informal; questions, children and animals are welcome. Meetings normally take place at the North Park Village Nature Center, 5801 N. Pulaski, in Chicago. Parking is free. For more info visit the group's Facebook page.

THE ADVENTURES OF SPOT



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