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Cover: Timber rattlesnake, *Crotalus horridus*, Jackson County, Illinois. Photograph by Mary Boehler (see "About This Month's Cover," p. 79).

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Ring-billed Gull Predation on Eastern Tiger Salamanders

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Abstract

Tiger salamanders (*Ambystoma tigrinum*) likely provide an important source of protein for a wide variety of birds, but published reports of predation have been limited. Here, we document observations of Ring-billed Gulls (*Larus delawarensis*) preying on eastern tiger salamanders in Dane County, Wisconsin, in March 2021.

Understanding the ecological niche of an animal requires us to recognize its range of food items and its potential predators. Ring-billed Gulls (*Larus delawarensis*) forage opportunistically. Their seasonally variable, eclectic diet includes fishes, small birds and mammals, earthworms, a wide variety of insects, various grains and other plant matter, and anthropogenic refuse (Jarvis and Southern, 1976; Haymes and Blokpoel, 1978; Kirkham and Morris, 1978; Blokpoel and Tessier, 1986; Ludwig and Hull, 1989; Brousseau et al., 1996; York et al., 2000; Caron-Beaudoin et al., 2013; Washburn et al., 2013). Martin et al. (1951) list amphibians among the principal animal foods for this species, but we have found almost no published reports of Ring-billed Gulls feeding on amphibians. Welham (1987) reports leopard frogs (*Lithobates pipiens*) occurred in about 5% of Ring-billed Gull digestive tracts examined in Manitoba. Fassbender and Watermolen (2002) describe a Ring-billed Gull scavenging a partially decomposed mudpuppy (*Necturus maculosus*), and Smith and Green (2005) report observing a pair of Ring-billed Gulls feeding on juvenile Fowler's toads (*Anaxyrus fowleri*). Here, we add to these reports and describe observations of Ring-billed Gulls preying on eastern tiger salamanders (*Ambystoma tigrinum*).

On 21 March 2021, one of us (JS) was photographing birds at Shoveler's Sink Waterfowl Production Area in the Town of Cross Plains, Dane County, Wisconsin. The property, which the U.S Fish and Wildlife Service manages as part of its Ice Age National Scientific Reserve, is situated in the West Johnstown-Milton Moraines, a landscape characterized as a rolling hummocky moraine and outwash plain complex with scattered bedrock knolls (Mickelson, 2007; Wisconsin DNR, 2015). Shoveler's Sink includes 175 acres of oak savanna, grasslands and wetlands. A kettle pond/sinkhole, the remnant of a much larger glacial depression that formed in front of a terminal moraine, covers several acres of the property. Agriculture, deciduous forest, and grassland, with some urbanization, currently dominate the surrounding landscape. Shoveler's Sink is a popular destination for hunters, hikers, and local bird watchers, with more than 185 avian species reported from the site according to eBird (ebird.org, accessed 2 April 2021). The area is also important for breeding amphibians, with tiger salamanders, spring peepers (*Pseudacris crucifer*), boreal chorus frogs (*P. maculata*), leopard frogs, green frogs (*L. clamitans*), and American toads (*Anaxyrus americanus*) reported from the area.

At approximately 1500 h, while walking along the pond's shoreline, JS observed roughly a dozen Ring-billed Gulls foraging near the southwestern shore of the pond. Gulls dove into the water, completely submerging for several seconds, then emerged from the water with prey items in their mouths (Figure 1). Using a Canon RF 100-500 telephoto zoom lens, JS was able to photograph multiple individuals. We identified eastern tiger salamanders as the prey of several gulls, with both adult and neotenic individuals being taken. Several salamanders had damaged or missing tails. It is unclear, however, if the tail injuries occurred prior to or during the predation events. Unidentified frogs and fish were also taken as prey items.

Some of the adult birds were observed taking pieces of their catch and dropping them into very shallow areas near juveniles, allowing the younger birds to "fish," although these same juvenile gulls were also observed foraging and diving on their own. On several occasions, gulls that emerged with salamander prey were mobbed or pursued by three or four other gulls. This behavior seemed to subside over the following weeks but nonetheless suggests competition for a high value food resource. Competing gulls also showed interest when other birds emerged with frog prey (Figure 2) but did not appear to actively compete for fish.

Figure 1. Ring-billed Gull observed preying on an adult eastern tiger salamander at Shoveler's Sink, Dane County, Wisconsin in March 2021. Photograph by J. Seiders.

Figure 2. Ring-billed Gull observed preying on a ranid frog (*Lithobates* sp.) at Shoveler's Sink, Dane County, Wisconsin in March 2021. Photograph by J. Seiders.

Tiger salamanders are one of North America's most broadly distributed salamanders, occupying a range of landscapes, and it is likely these amphibians provide an important source of protein for a wide variety of birds of prey, waterfowl, water birds, and shore birds. Documentation of such predation, however, remains relatively limited. Observations of aquatic predation by birds include Great Blue Herons (*Ardea herodias*), Black-crowned Night Herons (*Nycticorax nycticorax*), Osprey (*Pandion hallaetus*), American White Pelicans (*Pelecanus erythrorhynchos*), and Double-crested Cormorants (*Phalacrocorax auritus*) feeding on adult and larval salamanders (Wolford and Boag, 1971; Roney, 1979; Lingle and Sloan, 1980; King, 1988; Findholt and Anderson, 1995; Derby and Lovvorn, 1997; Brodman and Pfingston, 2010; Ferguson et al., 2019). Belted Kingfishers (*Megaceryle alcyon*), Killdeer (*Charadrius vociferous*), Bitterns (*Ixobrychus exilis*), and Grackles (*Quiscalus quiscula*) have been observed feeding on larvae that failed to leave drying ponds (Sever and Dineen, 1977; Lannoo and Bachman, 1984). Burrowing Owls (*Athene cunicularia*), Great Horned Owls (*Bubo virginianus*), Barred Owls (*Strix varia*), Swainson's Hawks (*Buteo swainsoni*), and Loggerhead Shrikes *(Lanius ludovicianus*) prey on terrestrial life stages (Errington and MacDonald, 1937; Holman, 1976; Dunkle, 1977; Tyler, 1983; Cook, 1987; Jensen, 2003). Our report appears to be the first of Ring-billed Gull predation on tiger salamanders and adds to our growing understanding of the significant ecological value of this widespread salamander.

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Notes on Reproduction of Carpenter Frogs, *Lithobates virgatipes* (Anura: Ranidae)

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Abstract

I conducted a histological examination of gonads from 17 *Lithobates virgatipes* adults from the eastern USA consisting of 7 males and 10 females. No histology was done on one unsexed subadult bringing my sample to 18. Males contained sperm from all months examined: March to July. The smallest mature male (sperm in lumina of seminiferous tubules) measured 46 mm SVL and was from July. One female in spawning condition was from May. The smallest mature female (spawning condition) measured 52 mm SVL and was from May. Three of ten females (3/10, 30%) contained atretic follicles. Postovulatory follicles from a recent spawning were present in the ovary of one female from June.

Lithobates virgatipes (Cope, 1891) occurs on the coastal plain of the Atlantic coast from central New Jersey to northeastern Florida (Frost, 2022). Breeding migration does not occur since adults live in the breeding ponds; males call from open water (Mitchell, 2005). *Lithobates virgatipes* occurs in sphagnum bogs, acidic ponds, pocosins, and swamps (Elliott et al., 2009). Standaert (1967) reported breeding choruses of *L. virgatipes* frequently occurred during May, June and early July in New Jersey. Most males call every night during their breeding season (Dodd, 2013). Calling activity occurs between sunset and sunrise and peaks around midnight (Given, 1987). In the current paper I present data on the *L. virgatipes* reproductive cycle from a histological examination of gonadal material from the eastern USA. The biology of *L. virgatipes* is summarized in Gosner and Black (1968). Utilization of museum collections for obtaining reproductive data avoids removing additional animals from the wild.

A sample of 18 *L. virgatipes* adults collected 1940 to 1998 (Appendix) from Delaware (N = 1), New Jersey (N = 4), North Carolina (N = 2) Virginia (N = 11) consisting of seven adult males (mean SVL = 51.7 mm ± 5.4 SD, range = 46–62 mm), 10 adult females (mean SVL = 55.1 mm ± 3.8 SD, range = 48–62 mm) and one unsexed subadult (SVL = 37 mm) collected 1940 to 1998 was examined from the herpetology collection of the Carnegie Museum of Natural History (CM), Pittsburgh, Pennsylvania, USA (Appendix). An unpaired *t*–test was used to test for differences between adult male and female SVLs (Instat, vers. 3.0b, Graphpad Software, San Diego, CA).

A small incision was made in the lower part of the abdomen of the 17 adults and the left testis was removed from males and a piece of the left ovary from females. Gonads were embedded in paraffin, sections were cut at 5 μm and stained with Harris hematoxylin followed by eosin counterstain (Presnell and Schreibman, 1997). Histology slides were deposited at CM.

There was no significant difference between mean SVL of adult males versus adult females of *L. virgatipes* ($t = 1.510$, df = 15, $P = 0.152$). The testicular morphology of *L. virgatipes* is similar to that of other anurans as described in Ogielska and Bartmañska (2009a). Within the seminiferous tubules, spermatogenesis occurs in cysts which are closed until the late spermatid stage is reached; cysts then open and differentiating sperm reach the lumina of the seminiferous tubules (Ogielska and Bartmañska, 2009a). All seven *L. virgatipes* adult males were undergoing sperm formation (= spermiogenesis) in which clusters of sperm filled the seminiferous tubules. A ring of germinal cysts was located on the inner periphery of each seminiferous tubule. By month, numbers of *L. virgatipes* males exhibiting spermiogenesis (N = 7) were: March (N = 1), April (N = 1), May (N = 2), June (N = 2), July (N = 1). The smallest mature male (sperm in lumina of seminiferous tubules) measured 46 mm SVL and was from July (CM 20291). Wright and Wright (1933) reported adult *L. virgatipes* males ranged from 41 to 63 mm in body size.

One unsexed subadult (CM 141306) measured 37 mm SVL. I am unable to speculate when it might have reached breeding size.

The ovaries of *L. virgatipes* are typical of other anurans in consisting of paired organs located on the ventral sides of the kidneys; in adults they are filled with diplotene oocytes in various stages of development (Ogielska and Bartmañska, 2009b). Mature oocytes are filled with yolk droplets; the layer of surrounding follicular cells is thinly stretched. Two stages were present in the spawning cycle (Table 1): (1) "Ready to Spawn Condition" in which mature oocytes predominate; (2) "Post-spawning Condition," with postovulatory follicles present from recent spawning. I found histological evidence suggesting that *L. virgatipes* may produce a second clutch in the same reproductive season as indicated by the presence of some ripening follicles (upcoming spawning) and the concurrent presence of postovulatory follicles (recent spawning) (*sensu* Redshaw, 1972) in the same female (CM 155321) from June. Postovulatory follicles form when the ruptured follicle collapses after ovula-

Table 1. Two monthly stages in the spawning cycle of 10 adult female *Lithobates virgatipes* from eastern United States; * = postovulatory follicles present.

Month	N	Ready to Spawn Condition	Post-spawning Condition*
April	2	2	0
May	2	2	0
June	3	2	1
September	3	3	0

Table 2. Periods of reproduction for *L. virgatipes* from various localities.

Locality	Breeding period	Source
Carolinas and Virginia	Spring and summer	Beane et al., 2010
Florida	March to September	Krysko et al., 2019
Georgia	April to August	Wright, 1932
Georgia	March to August	Jensen et al., 2008
Louisiana	April to August	Boundy and Carr, 2017
Maryland	April through July	Cunningham and Nazdrowicz, 2018
New Jersey	April to early August	Given, 1987
North Carolina	Late winter, spring, and summer	Dorcas et al., 2007
Pennsylvania	Late April to early August	Hulse et al., 2001
Southeast	April to early fall	Dorcas and Gibbons, 2008
No specific locality	Late April to mid-August	Wright and Wright, 1933

tion; the follicle lumen disappears and proliferating granulosa cells are surrounded by a fibrous capsule (Redshaw, 1972). Postovulatory follicles are short-lived in most anuran species and are resorbed after a few weeks (Redshaw, 1972). The smallest mature *L. virgatipes* female (ready to spawn condition) measured 52 mm SVL (CM 142347) and was from May. Wright and Wright (1933) reported adult *L. virgatipes* females ranged from 41 to 66 mm in body size.

Atretic follicles were noted in the ovaries of 3/10 (30%) of the *L. virgatipes* females. In early atresia the granulosa layer is slightly enlarged and contains ingested yolk granules. In late atresia the oocytes of these females are replaced by brownish vacuolated granulosa cells which invaded the lumen of the oocyte or solid black pigment containing cells. Atresia is a widespread process occurring in the ovaries of all vertebrates (Uribe Aranzábal, 2009). It is common in the amphibian ovary (Saidapur, 1978) and is the spontaneous digestion of a diplotene oocyte by its own hypertrophied and phagocytic granulosa cells which invade the follicle and eventually degenerate after accumulating dark pigment (Ogielska and Bartmañska, 2009b). See Saidapur and Nadkarni (1973) and Ogielska et al. (2010) for detailed descriptions of follicular atresia in the frog ovary. Atresia plays an important role in fecundity by influencing numbers of ovulated oocytes (Uribe Aranzábal, 2011).

Times of breeding for *L. virgatipes* throughout its range are shown in Table 2. My data are in accordance with work of others that *L. virgatipes* reproduction occurs April to early fall, see Dorcas and Gibbons (2008).

My finding of one June female with postovulatory follicles (recent spawning) and concurrent vitellogenic follicles for a subsequent spawning suggests *L. virgatipes* may produce a second batch of eggs in the same year. Examination of additional *L. virgatipes* females to further explore the possibility of multiple spawnings is hereby warranted.

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Appendix

Eighteen *L. virgatipes* from the eastern U.S. examined by state and county from the herpetology collection of the Carnegie Museum, (CM), Pittsburgh, Pennsylvania, USA.

DELAWARE, Sussex County**:** CM 28001; **NEW JERSEY,** Burlington County: CM 23809, 26223, 116781, Ocean County: CM 20291; **NORTH CAROLINA,** Craven County**:** CM 19491A, Currituck County: CM 38474; **VIRGINIA,** Caroline County: CM 155321, 155325, 155447, 155449, 158345, 158346, Virginia Beach City County: 140290, 141306, 142297, 142309, 142347.

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Portrait of a Herpetologist as an Older Man — Chapter 5
Monitor Lizards and the Leader of Them All, the Komodo Dragon

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Portions of this article have appeared elsewhere [see Murphy and Walsh (2006); Murphy et al. (2019)]

The public sees the Komodo dragon, with its awesome morphology and unsettling feeding behaviors, as a combination of crocodilian, lizard, and dinosaur — a creature that mercilessly tracks and devours its prey. This amalgamation of fear, respect, and adoration has driven the research machine for many years.

– Kurt Auffenberg and Walter Auffenberg (2002)

Since I — about 30 years ago — got my first living Nile monitor and became acquainted with his life habits in the terrarium, the monitor lizards have fascinated me all the time, these "proudest, best-proportioned, mightiest, and most intelligent" lizards as [Franz] *Werner strikingly called them*.

– Robert Mertens (1942)

Modern comparative methods allow the examination of the probable course of evolution in a lineage of lizards (family Varanidae, genus Varanus*). Within this genus, body mass varies by nearly a full five orders of magnitude. The fossil record and present geographical distribution suggest that varanids arose over 65 million yr ago in Laurasia and subsequently dispersed to Africa and Australia. Two major lineages have undergone extensive adaptive radiation within Australia: one evolved dwarfism (subgenus* Odatria, *pygmy monitors), whereas the other Australian lineage (subgenus* Varanus*) remained large, and several of its members evolved gigantism.*

– Eric R. Pianka (1995)

Monitor lizards adopt characteristic defensive postures, flattening themselves from side to side and extending their gular pouches, presumably to make themselves appear as large as possible. Often they hiss loudly and flick their tongues. Big species lash their tails like whips with considerable accuracy. Some species stand erect on their hind legs during such displays.

Male monitor lizards engage in ritualized combat, fighting over females. Larger species wrestle in an upright posture, using their tails for support, grabbing each other with their forelegs and attempting to throw their opponents to the ground. Blood is sometimes drawn in such battles. Smaller species grapple with each other while lying horizontally, legs wrapped around each other as they roll over and over on the ground. The victor then courts the female, first flicking his tongue all over her and then, if she concurs, climbing on top of her and mating by curling the base of his tail beneath hers and inserting one of his two hemipenes into her cloaca. (Male varanids have a unique cartilaginous, sometimes bony, support structure in each hemipenis, called a hemibaculum.)

– Eric R. Pianka and Laurie J. Vitt (2003)

Introduction

In 1926, the first living Komodo dragons (*Varanus komodoensis*), known as "oras" in Indonesia, were placed on exhibit in New York's Bronx Zoo (Figure 1) and the Amsterdam Zoo (Figure 2), but the effort to display them in New York was less than satisfactory. W. Douglas Burden (1927) painted this gloomy picture, "After watching these great carnivores in the wilderness of romantic Komodo, it was painful to see the broken-spirited beasts that barely had strength to drag themselves from one end of their cage to the other. Surely, it is not all a matter of diet and a change of climate. Perhaps, as in the case of many mammals, *Varanus komodoensis*, in order to survive, demands the freedom of his rugged mountains." In 1934, a dragon on display at the Smithsonian's National Zoological Park (NZP) lived only two years after capture by the Griswold-Harkness expedition. Five dragons were exhibited at NZP over a 40-year span, the average longevity being five years and the maximum being 12 years (Figures 3 and 4). Because the largest specimens were generally wild-caught, dragons at other North American and European zoos fared poorly as well (see Flower, 1937; Jones, 1965; Rookmaaker, 1975), no doubt due to the fact that adult animals often have difficulty adjusting to captivity.

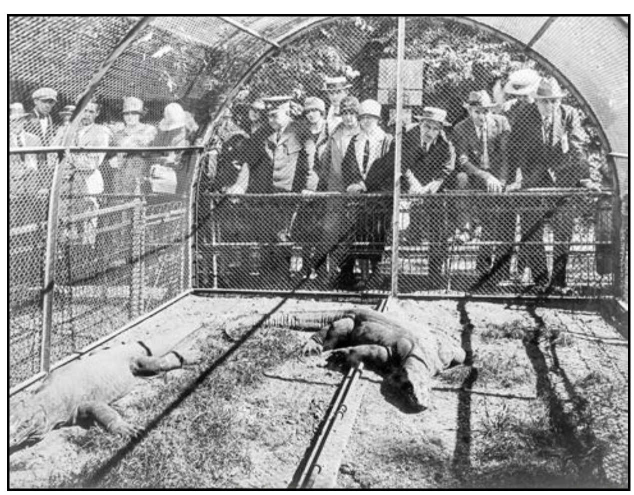

Figure 1. Komodo dragon exhibit at the Bronx Zoo (Wildlife Conservation Society). Undated photograph (possibly early 1930s.), courtesy of Wildlife Conservation Society.

Figure 2. Komodo dragon with keeper at Natura Artis Magistra in Amsterdam, photographed between 1926 and 1931. Komodo dragons were added to the collection in 1926. Five years later, 12 eggs were laid in a hole and protected by the female. Note tortoise in back right corner of exhibit. Photograph provided by Eugène Bruins, Natura Artis Magistra Archives.

Figure 3. Keeper Roy Jennier next to "Xomo," the first Komodo dragon at Smithsonian National Zoological Park. This lizard was collected by the Griswold-Harkness expedition in 1934, cost $780 at that time, and lived two years. Hot water pipes in rockwork provided heat. This image was duplicated in color on a postcard for sale. Photograph provided by Smithsonian National Zoological Park Photo Archives.

Rookmaaker (1975) reported that his grandfather had captured 12 dragons in 1927, using 200 men to surround a dragon which was "snared by means of a noose attached to a stick." One went to the Amsterdam Zoo, one to Rotterdam Zoo, one to Berlin Aquarium, two to Surabaya Zoo, and two to London Zoo. Five died before reaching their destination. The Amsterdam specimen is pictured with a rope muzzle around its head. Dragons rarely lived beyond five years in captivity, and most did not survive the first few months. Zoo visitors were excited about viewing these huge, carnivorous lizards so collecting expeditions to Komodo were mounted to secure specimens for display until World War II brought collecting to an end for many years.

I was able to see this varanid in the wild while teaching a course in Jakarta, Indonesia, for the Smithsonian's Zoo Biology Training Course, developed by Chris Wemmer and Charlie Pickett. On Komodo Island, Bill Zeigler from Brookfield Zoo and I watched males bipedally combat, and we saw courtship and copulation. The rangers demonstrated running speed by tying a goat haunch to a rope, and running nearly full speed with a lizard following nearly as fast. To demonstrate agility, the bait was hung from a tree about eight feet above a group of mostly female dragons, about six feet or less in length. The dragons repeatedly jumped to retrieve it, but the effort was unsuccessful.

At the time the Indonesian government put on feeding demonstrations, using freshly killed goats, several times a week. Tourists were stationed on a bluff above. Twenty lizards, ranging in size from subadults to large adults, were imprinted to the lower space, with the largest ones forming a close circle in front and the small ones darting in to grab scraps. We watched a ranger throw a very large goat into the middle of the circle and I timed the scenario from when the goat hit the ground until I could no longer see the tiniest bit of goat—**seven minutes**! This story has a very unhappy ending. The rangers decided to permanently discontinue these feedings, but the largest dragons stayed, waiting for goats from the sky, and starved to death, according to Quentin Bloxam (pers. comm.).

On Rinca Island, I heard a deer distress call, and after 15 minutes a large dragon slowly crossed the dirt path, presumably tracking the deer, and ignoring me completely. A subadult lizard about three feet long foraged for prey by directing its rapidly-flicking tongue under mostly flat rocks with spaces beneath Those places were thoroughly checked by the animal for over two hours but prey was not available.

At the London Zoo, there were several intriguing reports on dragon behavior that seemed to contradict the belief that dragons were always dangerous to man and were delicate captives. Hill (1946) mentioned a dragon at the zoo pushing a shovel over the stones in his cage,"and the more noise he can make with it, the more it seems to please him." Curator of reptiles Joan Beauchamp Procter (1928) wrote: "The dragon, whose name is Sumbawa, walked around a very long table, and without paying attention to the audience ate a large fowl, several eggs, and a pigeon from her hand, allowing itself to be scratched and patted even when swallowing the fowl with enormous gulps, treatment which even dogs will not always permit" and "She [at death proved to be a male] would tear a pig to pieces but can be trusted with children." Sumbawa was the host at children's tea parties starting only a few weeks after arrival at the Zoo and was per-

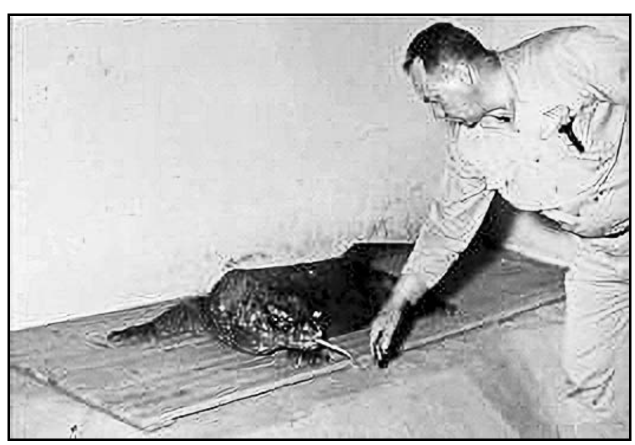

Figure 4. Supervisor of reptiles Jack DePrato and dragon named Kalana at Smithsonian National Zoological Park in late 1960s. Photograph provided by Smithsonian National Zoological Park Photo Archives.

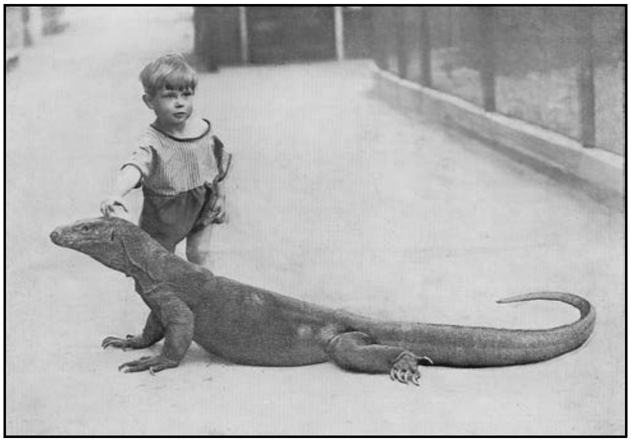

Figure 5. Sumbawa standing next to a two-year-old child. Photograph by F. W. Wood is from Joan Procter's article "Dragons That Are Alive To-day" (Procter, 1928–1929). Photograph provided by Kraig Adler.

fectly tame with all the guests. Procter (1928–1929) included a photograph of a two-year-old child standing next to Sumbawa (Figure 5) and examined dragon behavior, "The question of the ferocity of these lizards is, perhaps, the most misunderstood of all. All the lizards of the genus *Varanus* are savage, predatory, and highly strung, and they use their teeth, claws and slashing tails with great effect, as I have personal cause to know. At the Zoo we consider any large monitor more dangerous to deal with than a crocodile twice its size. But, allowing for this, *V. komodoensis* is the gentlest, most intelligent, and most tractable of them all. This is comparing them with specimens only half their weight ; species such as *niloticus*, *albigularis, bengalensis*, *salvator*, *nebulosus*, *varius*, and so on. It is quite true that they are very nervous, and also that they could no doubt kill one if they wished, or give a terrible bite when taking food from the hand greedily, but there is no vice in them."

Sumbawa accompanied Procter on strolls through the Zoo during her inspections, "investigating everything which might be of interest." The lizard responded to the voice of its keeper or curator, but disliked having its tympanum touched.

In 1942, curator Gustav Lederer described the habits of a

Figure 7. An adult Komodo dragon was allowed to walk among zoo visitors with keeper Albert Schick at Frankfurt Zoo. When the lizard arrived at the zoo in 1958, it measured 2½ meters. Photograph by R. Faust, provided by Christian Schmidt.

Figure 6. A Komodo dragon at Frankfurt Zoo in Germany during the early 1960s, with keeper Albert Schick. Photograph provided by Hans-Dieter Philippen and Gerard Visser.

tame dragon named Bübchen, which lived at the Frankfurt Zoo between 1927 and 1944 (Figure 6). It was taken on long walks through the zoo by the director. The dragon was in excellent health up to its death from an Allied bombing raid, in which the Aquarium was demolished, thus living 16 years, 8 months and 21 days. Some reptiles can recognize their keeper and are able to distinguish him from other persons. At Frankfurt, the dragon knew the veterinarian after the second treatment and could no longer be persuaded to leave its hiding place once the vet appeared. The lizard even recognized the operating table and fled from it (Lederer, 1931). Keeper Albert Schick allowed zoo visitors to interact with a dragon outdoors at the Frankfurt am Main Zoo (Figure 7). At Berlin Zoo, dragon Moritz was tame and followed its keeper like a dog (Figure 8).

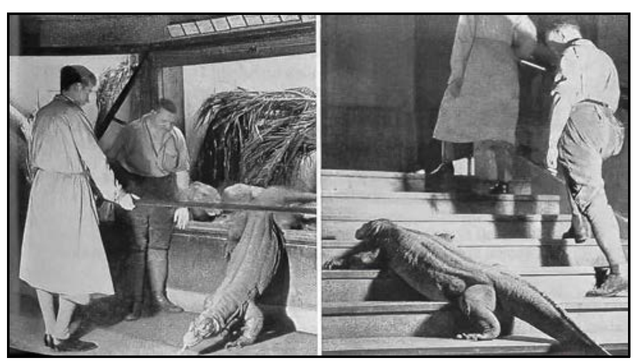

Figure 8. Moritz was an adult male Komodo dragon at Zoo-Aquarium Berlin. Two dragons from Rinca arrived at the zoo in 1927; Moritz lived until 1944. The other dragon named Max died shortly after arrival. Moritz is climbing out of its terrarium and following its keeper like a dog. Photograph provided by Archive Zoo-Aquarium Berlin.

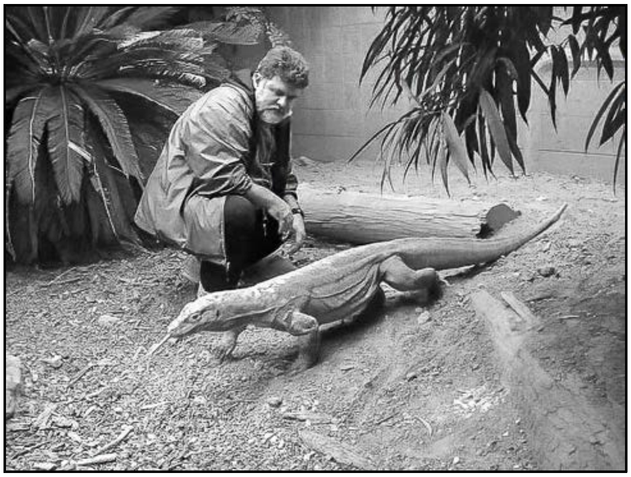

Figure 9. Kraken with keeper Trooper Walsh during one of the experimental trials to study play behavior at Smithsonian National Zoological Park in 1999.

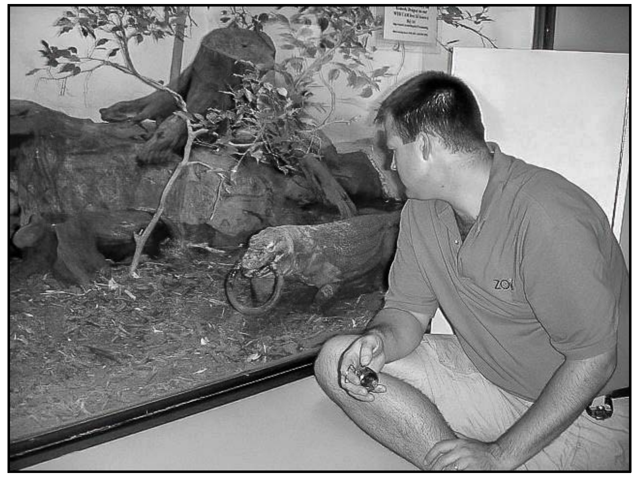

Figure 10. Keeper Rob Lewis records Kraken's behaviors during experimental trials at Smithsonian National Zoological Park in 1999. Photograph by Trooper Walsh.

Not all dragons are placid toward humans. Walter Auffenberg (1995, pers. comm.) told me about a large dragon tracking his children during his study on Komodo. The dragon's tail drag was superimposed over his children's footprints and Walter interpreted this as a potential predatory episode. Later, the dragon entered his tent, tore apart articles of clothing, and carried off a soiled handkerchief. Of the 55 hatchlings produced by the NZP female between 1992–1995, at least two were aggressive toward humans at hatching and remained so through adulthood.

Until recent decades, captive dragons had not been thoroughly investigated, due to lack of success in maintaining viable populations. At NZP several years ago, keeper Trooper Walsh asked me if I'd ever seen a dragon play. I was highly skeptical as this behavior is rarely mentioned in the literature. At the NZP in 1995, Kraken was a young female dragon, approximately 2½ meters in total length, that had hatched at the zoo three years earlier. Kraken often exhibited play-like behavior—removing a handkerchief or notebook from keeper Trooper Walsh's pocket, scraping his shoes with its forearm, playing tug of war with a plastic cup, interacting with him by using empty cardboard boxes, as well as pieces of cloth and scarves. Kraken stood on its hind legs, directed tongue flicks to Walsh's face, rested its head on his shoulder, and closed its eyes. Kraken carried Frisbees, shoes, plastic toy action figures for children, and other objects around in its mouth but made no attempt to swallow them (Figures 9–12). The lizard stuck its head into a plastic bucket, raised its anterior trunk so that the container covered its head and walked around the exhibit. The dragon placed its snout inside a shoe, lifted it off the substrate and moved throughout the cage. When Walsh whistled, Kraken turned its head toward the source of the sound. Kraken could discriminate between prey and non-prey; it would gently take a rat offered with tongs and never showed an inclination to bite Walsh. Kraken regularly turned its head to follow the flight patterns of birds flying overhead. See Burghardt et al. (2002) for an initial behavioral inventory and quantitative analysis of the trials with Kraken.

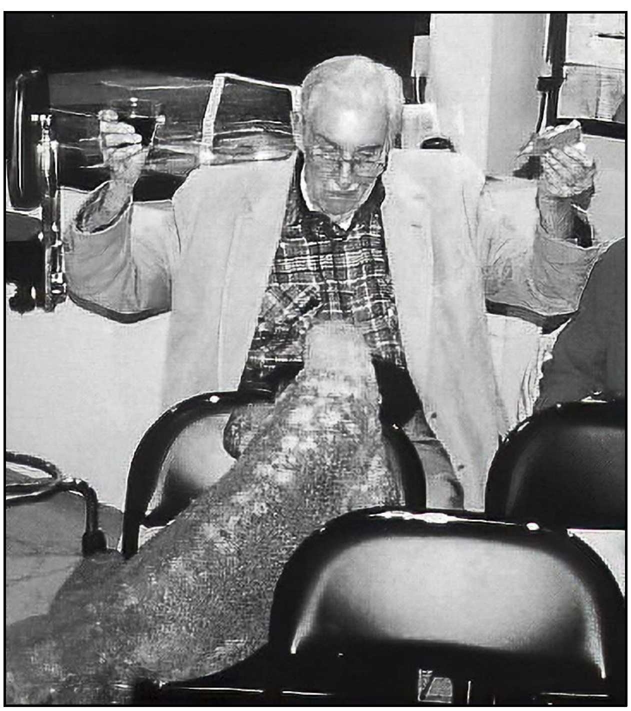

Figure 11. Kraken begs pizza from a familiar volunteer at Smithsonian National Zoological Park in 1998. Photograph by Trooper Walsh.

Several zoos have done research on their Komodo dragons.

Figure 12. Kraken investigates an unfamiliar visitor at Smithsonian National Zoological Park in 1998. Photograph by Trooper Walsh.

Figure 13. Ultrasonography of a dragon at London Zoo in 2005. Photograph provided by Richard Gibson, London Zoological Society.

At the Dallas Zoo, curator Ruston Hartdegen and associates discovered that a dragon could discriminate between its permanent keeper, another reptile keeper who had less contact with the dragon, and a keeper from another animal department. The dragon was calm with the familiar caretaker, nervous around the less-familiar reptile keeper, and displayed defensive behavior to the keeper from another animal department (R. Hartdegen, pers. comm.). Kraken at NZP exhibited the same responses toward familiar and unfamiliar persons.

At London Zoo in 2005, the staff utilized ultrasonography on dragons to determine sex and assess reproductive condition (Figure 13). In 2005, a large male named Raja was given target training (Figure 14). He was trained to associate a target on a stick with a food reward. The target was moved into and out of the restraint crate so that the dragon became comfortable entering this restricted space, which facilitates moving him. This was an interesting example of operant conditioning that used food as the initial cue; then the reward frequency was gradually reduced, using a clicker (sound producing device) as a bridge between the reward and the target (R. Gibson, pers. comm.).

A dragon named No-Name at Pittsburgh Zoo would come when called "NO" by the staff (Figure 15). Also at the Pittsburgh Zoo, a study was initiated to test a dragon's spatial memory by examining whether dragons use proximal (near-by) or distal (far away) visual cues to remember the location of a food reward hidden in the lizard's exhibit. Preliminary results support

Figure 14. A large male dragon named Raja in a restraint box for target training at London Zoo in 2005. Photograph provided by Richard Gibson, London Zoological Society.

the hypothesis that a dragon used proximal cues to remember the location of the food and additional experiments are underway to determine if a dragon can use distal cues in other circumstances (H. Ellerbrock, pers. comm.).

Another surprising finding was that dragons are parthenogenic (Watts et al., 2006). Two females—at Chester Zoo and London Zoo—produced offspring without male fertilization. Genetic fingerprinting identified parthenogenetic offspring produced by the lizards. "This reproductive plasticity indicates that female Komodo dragons may switch between asexual and sexual reproduction, depending on the availability of a mate — a finding that has implications for the breeding of this threatened species in captivity. Most zoos keep only females, with males being moved between zoos for mating, but perhaps they should be kept together to avoid triggering parthenogenesis and thereby decreasing genetic diversity."

Fry et al. (2009) published a paper from which I quote here: "Our multidisciplinary analyses paint a portrait of a complex and sophisticated tooth/venom combined-arsenal killing apparatus in *V. komodoensis* and its extinct close relative *V. priscus*.

Figure 15. Dolly Ellerbrock and a dragon named No-Name at Pittsburgh Zoo. This enormous male dragon was called "No" by the staff and would come to them when called. No-Name hatched at Smithsonian National Zoological Park in 1993 and died in 2012. At death he measured approximately 3 meters in total length and weighed ca. 100 kilograms. Photograph by Herb Ellerbrock, Pittsburgh Zoo.

Thus, despite a relatively weak skull and low bite force, we suggest that the combination of highly and very specifically optimized cranial and dental architecture, together with a capacity to deliver a range of powerful toxins, minimizes prey contact time and allows this versatile predator to access a wide range of prey including large taxa. These results indicate that *V. priscus* was the largest venomous animal to have ever lived." Some researchers urge caution until additional evidence is forthcoming that dragons are venomous (see Weinstein et al., 2012; Weinstein et al., 2013).

In summary, Komodo Dragons will prove to be interesting subjects for future behavioral studies. What I have presented here is mostly anecdotal but systematic studies to further examine the causes for these unexpected responses by dragons toward humans will be fruitful.

Also, we might ask why humans are motivated to interact with dragons and why are these lizards often personalized? It seems as though large reptiles in zoos, especially dragons, are often given pet names but this rarely occurs with smaller ones. Retired NZP curator Dale Marcellini offered an interesting observation — perhaps the size and shape of dragons (and other reptiles such as crocodilians) which are somewhat similar to humans may be the main reason that humans pay more attention to these large reptiles and, as a consequence, may well initiate interactions with them. In an attempt to dominate all animals, some humans may specifically focus attention on large, possibly dangerous reptiles even when there are potential risks. In other cases, humans motivated to understand why reptiles operate the way they do may concentrate on dragons and other gargantuan reptiles. Detailed comparative studies with small reptiles and humans would be enlightening.

In my experience working with living reptiles for nearly 60 years, no other species has interacted with humans like Komodo dragons—these lizards are something special. Noted varanid biologist Eric R. Pianka put it this way: "Varanid lizards differ from other lizards in several ways. They have more aerobic capacity and greater metabolic scope, most varanids range over larger areas, and they are much more intelligent than other lizards. If you doubt this, go to a zoo that has a Komodo dragon, make eye contact, and look into its eyes. You will be impressed with the way it looks back at you!" (Pianka, 2002).

Acknowledgments

I dedicate this contribution to Gerard Visser, Curator of Fishes and Reptiles at the Rotterdam Zoo in the Netherlands. He is Co-Chair of the European Amphibian and Reptile Taxon Advisory Group and EEP-coordinator for Komodo Dragons. Gerard has had a positive impact throughout his professional life on studying and conserving dragons. I also acknowledge Trooper Walsh for his sustained effort to follow the history of these lizards in the AZA studbook.

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Marvin L. Jones, retired registrar at the San Diego Zoo, died after suffering a massive heart attack on 4 April 2006. I consulted Marvin regularly about the history of dragons in zoos and aquariums during preparation of several manuscripts, our last conversation occurring two days before his death. His knowledge of zoo history was encyclopedic and he was always willing to share his knowledge with his colleagues. He is still missed.

Judith Block and Bill Lamar reviewed this manuscript and made helpful suggestions for improvement.

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About This Month's Cover

Mary Boehler's image of a timber rattlesnake, *Crotalus horridus*, shared first place in the contest for best photograph conducted at the January 26 virtual meeting of the Chicago Herpetological Society. Mary had this to say about her entry:

> The photo was taken on a hike in southern Illinois on May 25, 2021. This small timber rattlesnake was on a ledge about 4' off the ground. I happened to notice the snake as I was walking on the trail (a good reminder to look UP for snakes, not just DOWN). I was able to climb on the ledge and took some photos from above with my cell phone. I then admired the snake for a few minutes, and finished my hike still experiencing the joy of discovering my favorite species of snake.
>
> I like this photo because it shows the snake simply resting. A snake who is coiled rather than outstretched generally makes the best model for photographs, but when coiled most often rattlesnakes are in a defensive posture with their rattle up. While this makes for a dramatic photo, it also displays the unease the snake is feeling. This particular snake did not seem to react to my presence—never moved its head to watch me and never went into a defensive position. Also, with rattlesnakes so much interest is placed on the rattle—how many segments, is the rattle broken or intact? This snake has his or her rattle hidden, so we are left with some mystery. Another reason I like this photo.
>
> On the day I found this beautiful snake, I was hiking with my friend John Palis, who introduced me to some CHS members who I now consider friends. I joined the CHS shortly after meeting these "ambassadors," and am starting my third year as a CHS member. Nursing is my career, and field herpetology is my passion. I enjoy sharing photos and doing what I can to educate friends, family, and coworkers about reptiles and amphibians.

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The Life and Times of a Gila Monster Named Laura — Part 2

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The scientific name for the Gila Monster — *Heloderma suspectum* — is a perfect storm of a description for a unique and mysterious creature. The genus name of "*Heloderma*" is descriptive enough, as it combines the Greek words "*helos*," meaning the head of a stud or nail with "*derma*," meaning skin. Studded skin? Not bad, but it sounds better in Greek! "Studded bones" would be phrasing it a little more accurately. The "studs" on the skin, also called "osteoderms," are actually formed by the skin encapsulating the bony "studs."

Enough with the genus stuff. When I speak of the perfect name, it is the species name "*suspectum*" that I'm talking about. In 1869, it was Professor Edward Drinker Cope who hung that name on them because he "suspected" that they were venomous. That suspicion has proven itself to be true. But when we discuss *Heloderma suspectum* — often shortened to HESU in this piece — we are talking about a lizard that just plain doesn't make any sense to the discerning herpetologist. Is it a lizard, or a snake? Well, it has legs, so it's a lizard. But it damn sure does not act like any other lizard in the entire U. S. of A. The normal North American lizard flits about the landscape like a fart on a hot griddle, hopping on top of boulders, soaking up the sun, and snapping up unwary insects as part of its daily routine. A Gila Monster mostly lies low, avoids the sun as much as possible, and when it finally does lumber forth to snag a meal, it can easily consume a third or more of its body mass. Just like a snake, when it eats, it eats big – and may not eat again for a long time. The way the delicate tines of its black, forked tongue waver in the air, pick off minute scent particles, and slide them into the Jacobson's organ in the roof of its mouth is exactly reminiscent of a snake. Like so many species of snake, it carries venom, but the delivery apparatus and venom glands are in the lower jaw. Its bite contains venomous spittle or slobber, painfully delivered by a bulldog of a lizard who can chew that slobber into you for a very long time. And while venomous snakes almost universally can use their venom for both offense *and* defense, the venom of Gila Monsters is mostly (not always!) used as a defensive weapon. Most of us locals who love snakes also love Gila Monsters because they are more like a snake than a lizard.

On top of all these confusing features of HESU is the fact that they are so damn secretive. The most basic behaviors that are so apparent in other species are so hidden from the eyes of experts that we are often forced to speculate. In other words, like Cope who named them *suspectum* because he suspected they were venomous, even in modern times, we experts are *still* "suspectuming" many other things about them. We still know very little about them, 153 years after they were first described. And each "suspectulation" is more difficult to prove than the last – *especially* with free-ranging HESU in their wild state. That's what this author means by *suspectum* being the perfect storm of a name. There has been a lot of suspecting going on through the years with HESU, and very little proof. But it was not that long ago that it was even worse. While 1989 may seem like the Dark Ages to us now, that was only 33 years ago. I am going to quote you something from a book written by the world's foremost authorities on Gila Monsters — one hundred and twenty years *after* Cope first described them. Pursuant to the nesting of wild HESU, once oviposition transpires, one of these authorities wrote:

> The eggs *over-winter underground* and hatch in May, after a natural incubation period of approximately ten months (Lowe et al., 1986: p. 16).

A natural incubation period of ten months? Are they Gila Monsters or elephants? *How ridiculous*! While the confusion created by hatchling HESU gaily decorating our landscape in May might cause a really drunk herpetologist to *speculate* about such a thing, to brazenly put something like this in print is so *preposterous* that I lack the words to denigrate it. But I'll try. What a crock of Dark Ages bullshit! And these are the shoulders of the giants that those of us who came after are supposed to stand on? Fortuitously, in 1991, the more sensible "nobody knows" statement — flying in defiance of the lunacy suggested in 1986 — emerged about nesting in free ranging HESU:

> No biologist has yet discovered a Gila monster nest in the wild so the animal's natural egg-laying locations and procedures remain a mystery (Brown and Carmony, 1991, p. 44).

And finally, three years *after* team Schuett and Repp saw their own female *Heloderma suspectum* #2 AKA "Hs2" AKA "Laura" go from hefty to slim and drop an infertile egg, Dan Beck, the monster master himself, had *this* to say:

> In nature, *H. suspectum* lay eggs during July or August yet hatchlings do not emerge from the nest until nearly a year later . . . Some herpetologists believe that eggs of wild Gila Monsters hatch in fall . . . , but the hatchlings remain in the nest throughout winter. Others believe that the eggs overwinter and do not hatch . . . until the following spring . . . (Beck, 2005: p. 147).

To know Daniel D. Beck is to love him. In Schuett's words, spoken about Dan while his landmark book was in preparation: "He is kind and generous — to a fault!" This author knew Dan when he was a starving student. The mentality of most starving students in herpetology can usually be summed up on a "One Musketeer" basis. They are usually "None for all and all for one." When I initiated the public outreach program for the Tucson Herpetological Society, there was a need to raise $700 for a slide projector. Starving student Dan Beck told me he would get us the money. He used a T-shirt design of his, paid to have that T-shirt mass produced, and personally sold enough of his shirts to buy us that projector. At the time, he *really* could have used that money! I seriously hope that some of our CHS student members are reading this piece. Making a name for oneself involves more than how much grant money you can snag — maybe it's more about how much you are willing to give back?

From the mid-1970s right up to the turn of the century, *everything* about HESU was a big damn secret. While I don't want to be too hard on the somewhat infamous Dr. Lowe of the University of Arizona, the onus for the secrecy surrounding

HESU was on him. He had a star student, and that was Dan Beck. We'll be kind, and say that Lowe "encouraged" Beck to conduct his HESU studies in Utah and New Mexico. In other words, Lowe kicked Beck out of Arizona! Other than to say that Lowe set all knowledge of HESU back 30 years by not publishing any of his findings with the HESU populations in Arizona that were under his watch, we are done railing on him.

The turn of the century brought about a changing of the guard where HESU radio-telemetry studies are concerned. Dr. Dale DeNardo of Arizona State University started one in south-central Pinal County, Arizona. Dr. Brian Sullivan got one going in Maricopa County. It was through Brian's generosity—and permits—that Dr. Gordon Schuett and I started ours. The early days of the DeNardo study brought Emily Taylor into our core group, and Sullivan's study brought us Matt Kwiatkowski. Before Y2K—the Lowe years—I feared saying anything above a whisper about HESU. It was as if the walls had ears. Students of Lowe licked their lips and nervously glanced around the room whenever Gila Monsters entered any discussion. After Y2K, my email inbox overflowed with information about them. The early going of these frank and knowledgeable exchanges had *me* nervously licking *my* lips while waiting to hear footsteps. This was all great stuff – so great that surely it *must* be illegal to even talk about it? And it kept getting better, for in the thick of the discussions, Dan Beck boldly contributed to them. We all knew Beck was writing his book, and we all *clobbered* him with information about what we were seeing. That is why any readers of Beck's 2005 masterpiece will see the names just mentioned above scattered throughout. What an honor and privilege it was to be able to contribute to Beck's body of work. Where HESU studies were concerned, this was a new age of enlightenment. It was *long* overdue!

Are we ever going to talk about Laura? You know, Laura—the Gila Monster in the title, whose "life and times" we're supposed to be talking about? You bet! We're going to start talking about her right now! As both of you who read last month's column may remember, that piece was all about her getting fatter and fatter in the spring of 2002. Then she dove out of sight for nearly two months. When we finally saw her again on 15 July 2002, she was horribly thin. Five days later, she passed an infertile egg (Repp, 2022). All these tidbits passed before the eyes of the new guard of HESU Jedis as they developed, almost 20 years ago. There was no question among my most knowledgeable peers that Laura had oviposited. And the battle cry of "dig up the nest" was unanimously raised among the experts. And unlike the story of Chicken Little, when I asked "Who will help us to dig the nest?" there was an absolute onslaught of replies that went something like: "Pick me, Chicken Little. EYE will help you to dig up the nest."

And just like that, we had an army of people who, like me, wanted to be in on the discovery of that very first wild HESU nest. The landslide of volunteers was going to be needed, for there was the possibility that we would have *two* sites to dig. Laura had spent the entire month of June at her site #45, and the first two weeks of July at site #46. Written descriptions of both sites, as well as exact dates and other critical information regarding these two sites can be found in last month's column (Repp, 2022). But your kindhearted author has included an image of both "suspectumed" nest sites in this issue (Figure 1). These photographs will hopefully spare you from any dumpster-diving efforts required in order to retrieve your March 2022 *Bulletin*.

So, we knew where to dig. Now it became a matter of *when* to dig. Some favored an immediate approach. Dig now! Yeah, right, dead of July, the stinking hottest and most humid month of the year. Dig now, and maybe score a freshly oviposited clutch of eggs. We *knew* she had laid her eggs, and we *knew*

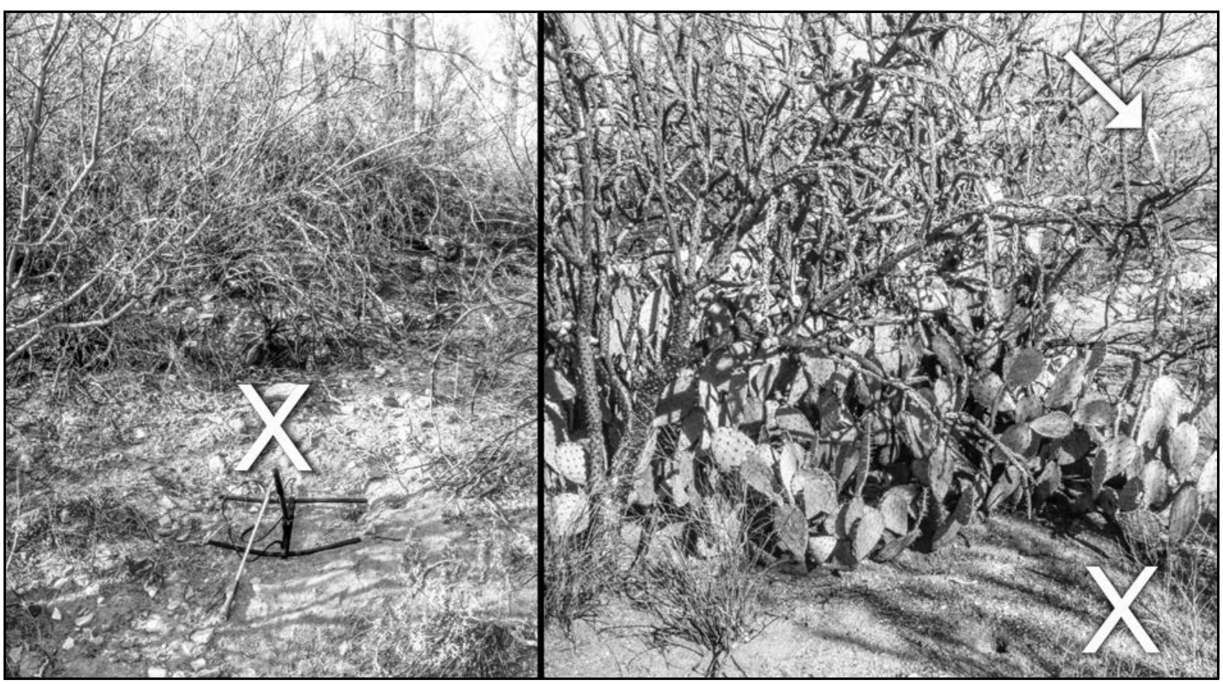

Figure 1. Laura oviposited somewhere in this mess! (Left) Laura's first potential nesting site. She spent nearly all of June 2002 here, and an X marks the spot where her signal was always the strongest during her stay. (Right) Laura's second potential nest site. She was here from late June to mid-July of 2002. Once again, X marks the most consistent location of her signal, and an arrow highlights the flagging hung directly above that location. See text for details. All images are by the author unless stated otherwise, south-central Pinal County, Arizona.

where she laid them. Make no mistake, it *still* would have been a major score. But we wanted *more*. We wanted to answer the bigger question: "When do the eggs hatch?" Was it in May, as Dr. Whatshisname declared in 1989, was it at some point earlier in the winter / spring, or did the hatching occur in the fall? Gordon and I were squarely in the camp of a fall hatch. But there was enough uncertainty that we split the difference right down the middle. We would dig in late December, and score at about the right time to give the world a new Christmas story to celebrate.

Dig Day

I have a new appreciation as to why a wild Gila Monster nest has never been discovered. I also am in awe of the complexity of life underground in the Sonoran Desert. –RAR field notes, 22 December 2002

Yes, 22 December 2002 was the day we selected to dig. A total of ten of us gathered, and we each brought our own private arsenal of digging implements. The only thing we lacked was a backhoe, but we were mentally stoked enough to create a short-cut to China without one. Gordon Schuett was there, and brought his brother Greg. Brian Sullivan came, and brought his two sons, Justin and Keith. Phil Fernandez of Grand Canyon State University attended. We also had our favorite giant, Rich Ihle, for the heavy work. Rounding out or crew was none other than Dan Beck (we wouldn't have had it any other way), and his father-in-law John Ernest. It goes without saying that your scribe was there as well. Without him, nobody would remember the date, or who was there, and would likely forget that they were there themselves. What would we do without me? Why, I guess we would just go around forgetting everything! That seems to be what everybody else does even when they *are* with me.

Prior to our gathering, I had a written a brief but thorough history of Laura's activities from 24 February 2002 through 18 July 2002 in my field notebook. The opening ceremonies on dig day involved everybody gathering around the scribe while he laid it all out. The thoughtful scribe even brought his 35mm slide images and a magnifying loupe. At the end of it all, through a unanimous showing of shrugged shoulders and dumb looks, it was decided that site #46 – Laura's early to mid-July location – would most likely be the location of her nest. We all grabbed our digging utensils and banged and clanged our way roughly 300 meters northward across the bajada and into the big wash. Prior to the groundbreaking ceremonies, I pointed out a strip of orange flagging that I had tied to the branch of an ironwood tree. The ¾-inch-wide by 6-inch-long swath of cloth ribbon dangled exactly above the patch of ground under which Laura consistently resided during her early July stay. I knew this *not* because we saw her there, but because her transmitter signal – which penetrates not only sandy loam but solid rock as well – told me where she was. That flagging was our "X marks the spot" in terms of a target to dig for.

My suggested approach – which in hindsight *might* have been a good one – was to dig straight down under that flagging until we either got a HESU nest or reached the gates of Hell. Others favored a more archaeological approach, whereby we would start at some distance away from the flagging, and trench our way toward it. Since that was far more work than was necessary, that is the approach we decided upon. At precisely 0940 hours, everything plant-wise that resided within a five-meter circle of that flagging was denuded. It was great fun to go on an all-out rampage with our hoes and rakes on the same prickly pear and cholla that had caused us so much misery through the years. There were many vulgar taunts and much jeering and cajoling as wave after wave of prickly pear was demolished and hefted aside. Good riddance! That chore being accomplished, we began to dig a semicircular-shaped trench. We started about five meters east and south of the flag, got about a meter deep, and began chopping the walls of our trench toward the flagging. At one point, Beck noted a perfect Gila Hole in the wall of the trench, and it was heading exactly toward that flagging. This was at 1015 hours, and our hopes were so high that I had Brian Sullivan snap a photo of Gordon and me. Thinking that we were moments away from the big score, we were all sorts of giddy and excited (Figure 2). That elation morphed into despair when the trench passed under my flagging, and continued into the depths of the former prickly pear. By 1150 hours, we hit the eastern edge of a massive packrat midden. At that point, a dizzying maze of chambers, tunnels, and Gila Holes was unearthed. The rathole was an absolute mayhem of labyrinth after labyrinth going up, down, left and right. Rat turds and cholla segments were everywhere apparent here.

Figure 2. Two different angles of the trenching approach for digging Laura's nest at her site #46. (Left) going from left to right around the perimeter of the trench: Justin Sullivan, Gordon Schuett, Greg Schuett, Keith Sullivan and Phil Fernandez. Trench center, front: John Ernest, standing in rear: Dan Beck. (Right) left to right encircling trench: Roger Repp, Gordon Schuett, Greg Schuett, and Keith Sullivan. Trench center, front: Justin Sullivan, rear: Dan Beck. This image is by Brian Sullivan, using the author's camera, 22 December 2002.

By 1150 hours, a heart-sinking wave of hopelessness swept my very soul. I hooked Rich Ihle and Brian and Justin Sullivan, and off the four of us trudged to site #45. Once again, I had hung flagging directly over the place where Laura had remained for most of June. This time, there would *not* be any of this trenching bullshit. We began to dig at 1206 hours, and we went straight down under the flagging. We almost immediately scored a young whiptail lizard. My three companions had been doing the bulk of the work at site #46, and gave out fairly quickly. As I had been doing nothing but writing and grinning for the camera with the previous effort, I was at full strength. I threw myself into digging that hole like a madman. My companions beseeched me to take it easy, that if I kept up the pace, I would *surely* give myself a heart attack. I no longer cared. And if in the course of my reckless digging, I hacked a hatchling HESU in two, that would have been tough shit! I gave pause at 1235 to note: "*Hole is ~1.5 meters in diameter by 600mm deep. Soil is caliche and rocky, some holes. Tarantula molt found.*" Shortly after, we found a young tarantula. At 1255, I paused again to write: "*Perfect chamber found beneath flagging, ~1m deep.*" It was indeed a perfect chamber – a helluva of a Gila Hole! While there is little doubt in my mind that this perfect chamber had been Laura's sweet spot in June of 2002, I kept digging anyway. I was trying to follow this Gila Hole to the left and right of the flagging, only to find that this particular Gila Hole dove deeper. When I went deeper, I found perfect Gila Holes running in every cardinal direction, and everything in between the cardinal directions. It was the perfect storm of Gila Holes. At 1426 hours, I turned toward my friends and hollered: "Eff this shit!" (Yes, that's right! I used the foo foo word, and took the name of sexual intercourse in vain.) I next created a new Olympic event, which shall be called "the shovel toss." I do believe that shovel sailed about the distance of center field to home plate, but no measurements were taken to verify that. My field notes for this day end with: "*Nothing is worth this!! Abort!*"

It was all a bust. The only egg found was ye olde figurative goose egg, and it was smeared all over my face. But in retrospect, many things were learned here. For one thing, we learned how to find whiptails and tarantulas in December. We also *all* got to see the complexity of a Gila Monster's private underworld. But mostly, we learned that there was a reason that nobody had ever found a free-ranging Gila Monster nest. It was not until 14 years later that we learned that a backhoe, timing, and pure shithouse luck were the ingredients required to score a HESU nest. But that is another story.

Laura's second surgery and release

When Laura was recaptured on 15 July 2002, a transmitter change was due. Had we performed the surgery on her while she was in her emaciated condition, we would have killed her for sure. We had no choice but to feed her first, and give her a chance to digest that meal before operating. That is why Gordon waited until 27 July before doing the surgery, and we released Laura the next day. We did not want to release her back into her suspected nest site, lest she be tempted to eat her own eggs. But neither did we want to throw her to the dogs by placing her elsewhere. Her site #46 was where she had been on her own accord prior to her 15 July recapture date. Less than ten meters from her site #46 dangled another one of our flags. That flag bore the following Sharpie-marker-inscribed data: "Hs5 / Site #8: 5/4/02." Your kind author will once again spare you any dumpster diving by reminding you all that male *Heloderma suspectum* #5, AKA "Hs5," AKA "Hercules" was captured in Laura's overwintering site #34 in March of 2002. That information is in last month's issue of the *Bulletin* (Repp, 2022). We of course hung flagging on every site that he (and every other Suizo Mountain subject) used exactly for this purpose. In this case, the flag told us that Hs5 had been very close to Laura's nest site, albeit two months before she got there. His site #8 involved a perfect Gila Hole running under the customary spine-infested, wash-island vegetation. We decided to place Laura in front of Hs5's Gila Hole, and hope that she would use it. The mission literally got off to a shaky start when Gordo tried to let gravity be our friend. He turned the cloth sack (is it a snake bag if a Gila Monster is inside?) upside down. The open top of the Gila Monster bag was inches above Hs5's Gila Hole. The idea was that Laura would effortlessly spew out onto the ground and enter that hole. But Laura was not in the mood to go effortlessly out of that sack. She dug in with all four sets of claws, and festooned herself therein. A form of organic Velcro held her in place. Hence, some felonious bag-flapping began, until such point as Laura's sack was flapping in the breeze like Old Glory on a Kansas flag pole. Laura *still* could not be coaxed to properly spew out of that sack. Gordon eventually rolled that sack up to the point where the outer-edges were nearly flush with her body. I reached in and snagged her behind the head, and tried to whisk her out. My hand clamping about her neck inspired her jowls to clamp on the inner lining of the sack. My attempt to whisk her out of that sack only accomplished inverting it. I wound up with Laura in hand, with the sack still dangling from her clenched teeth. We thought that if we placed her gently on the ground, she would let go. We tried that, waited five minutes, and began to lose our cool when she did not let go. Eventually, Gordon grabbed the open end of the everted sack, and tried to gently shake her loose. This effort only strengthened her resolve. The way she clung to that sack was reminiscent of a trapeze artist dangling by her teeth high above the center ring. Gordon began to grow vexed with the situation, and reinstituted the Old Glory on a Kansas flagpole routine again—this time with Laura on the outside of the bag. This was getting highly amusing, and your author took advantage of the photo opportunity (Figure 3). Eventually, the two gigantic brains of Laura's ape-buddies took charge of their four hands and disposable thumbs. The story of how Laura's ape-buddies were eventually able to impose their will on a lizard weighing less than one pound without both getting bit is one that will one day go down in the annals of herpetological flandickery. If she had been one percent more cunning or vindictive, we would *both* be missing digits today. This is all to say that Laura was eventually coaxed to release her grasp, and nobody died in the process. But once we freed her jowls, she turned them on us. That caused us to drop her like a hot potato. (That act probably spared the highly underrated sense of touch for both of us.) Just after the ground rose up to smite her body, the author took it upon himself to douse her with a canteen shower. This was done because she was all covered with bag lint and loose flecks of skin and crud. I wanted her clean and shiny for the photography that was ensuing. Hence, we had

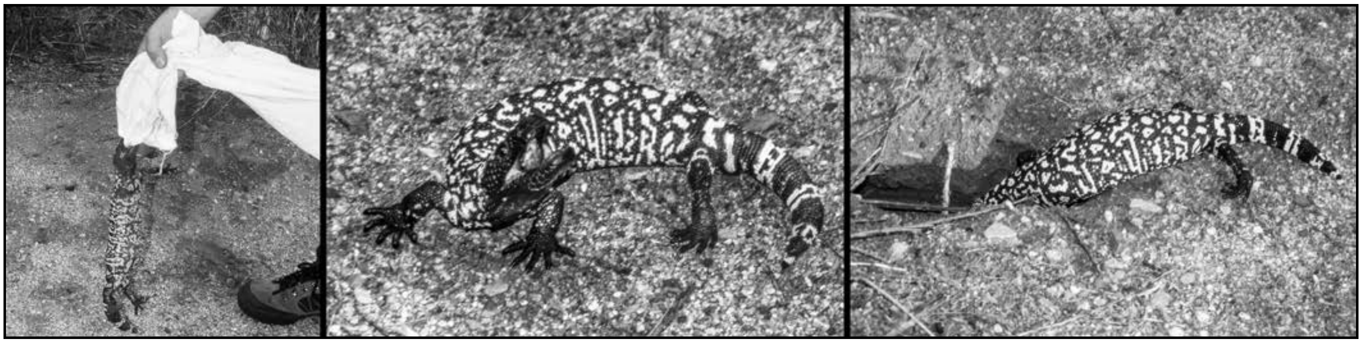

Figure 3. (Left) Laura is not cooperating with our attempts to release her. (Center) Once we finally separate Laura from the bag fabric, she becomes surly. (Right) A few tongue-flicks later, she crawls into a nearby Gila Hole. 28 July 2002.

a clean but severely agitated Gila Monster gracing my lens. Laura circled that Gila Hole, woofing audibly as she delivered a rather lengthy soliloquy about how much she hated us both (Figure 3, center). Was it something that we did? She finally quit her bitching for long enough to flick her tongue at the Gila Hole. There were three more quick tongue-flicks in the direction of the Gila Hole. And then—in she went! (Figure 3, right).

Laura the serendipitous monster

My dictionary defines the word "serendipity" as "a happy coincidence." It is somewhat comical that I entitled the column mentioned below "Kim, the Serendipitous Tiger Rattlesnake" because of all the happy coincidences that later surrounded her. But the following accounts about Laura serve to demonstrate just *who* our serendipitous herp really was.

Laura leads us to the same Tiger Rattlesnake—twice!

Back when we were all a little younger, this author wrote a column about the very first Tiger Rattlesnake (*Crotalus tigris*) to be documented from Iron Mine Hill. (Repp, 2020). We eventually named this snake "Kim." Even though the column about Kim was fairly thorough, this author made no mention of the fact that Laura actually led me to Kim. She did so on two different occasions—in just over a one-month time period! The short story on how this happened is as follows:

On 13 May 2001, I parked in our usual spot on the southwest side of Iron Mine Hill (IMH), fired up the receiver, and dialed up Laura. Her signal came in loud and clear. About 30 paces into tracking her, Kim—who was not yet named Kim—appeared directly in front of me. She was a beautiful adult female, and I captured her with high hopes of sticking a transmitter inside of her. Gordon was not at all interested, so we processed her, injected a PIT tag, took many photographs, and released her.

The second sighting of Kim—who would not become Kim for nearly eight years—occurred on 17 June 2001. At 1940 hours that evening, I tracked Laura to a packrat midden that was in turn buried under a prickly pear cactus. The pads of the prickly pear lay flat over the rat midden, and our Tiger Rattlesnake—Kim who wasn't Kim yet—was photographed as she was crawling under them (Figure 4). The photos of Kim's rattle count and distal tail banding taken on 13 May revealed it to be the same female Tiger as 17 June. She had moved 30 meters southwest of her capture spot during the month-and-four-day time lapse. I'm reasonably certain that this is the only time we observed one of our Gila Monsters sharing a site with a Tiger Rattlesnake. At least in the Suizo Mountains, Tiger / HESU commensals seem to be rare.

Laura leads me to a *feisty* case of mistaken identity

On 25 August 2002, Laura was tracked to her site #50. As the description of this site is adequately written on the datasheet itself, we go with those words: "*Hs2 not visible, signal coming from old stick Neotoma midden that is built upon exposed root system of a 6m tall ironwood. The midden stands 600mm tall by 1m wide by 1.5m long. Many entrance and exit holes. The ironwood bends and twists every which way, is infested with missile toe, and mulch and shade cover a six-meter radius around the trunk. Site 50 is on berm in channel of Suizo Wash.*"

Not bad! Note that the author called the packrat (*Neotoma*) midden a "stick midden." By this point in time, I had written up so many packrat middens that I had learned to distinguish the differences with one word. A "stick midden" was exactly that: a midden made solely of sticks and twigs interwoven together. They were the best kind of middens, as they were 100% free of cactus spines. Just above all that talk of a not visible HESU / a stick midden / an exposed root system / an Ironwood tree / and a 12-meter circle of shade and mulch, the first few lines of the datasheet opened with *this* tidbit: *"Hs2 site #50 plus Crotalus*

Figure 4. Kim, the serendipitous Tiger Rattlesnake, is viewed crawling into a packrat midden that harbors Laura, 17 June 2001. This is as close as the author can come to *Crotalus tigris* / *Heloderma suspectum* commensal.

Figure 5. A dangerous playmate comes calling. On 25 August 2003, this large adult male Black-tailed Rattlesnake (*Crotalus molossus*) was viewed coiled in front of a packrat midden that contained Laura.

molossus #6 site #1. Cm6 photo'd in situ, basking coiled in hollow created by roots of Ironwood described below (Figure 5). *Capture was difficult and frightening, snake bit itself and tongs many times, and kept coming out of the bag.*"

Yeah, it was on this day I learned a few things about *molossus*. The two most important lessons I learned this day was that 1. *Molossus* are not always the mild-mannered snake they are reputed to be, and 2. Big, hefty male *molossus* are *really* strong! Thrashing rattlesnakes were not new to me, but *nothing* before this moment equaled the ferocity of this big, bad, Black-tailed Rattlesnake. The snake biting himself was also nothing new, but like everything else he was doing, it went to extremes. He was not only biting himself; he was savagely chewing himself up the middle of his vertebrae. This was not a good handing of the situation on my part, but this *jerk* was definitely not making his own situation any better. Oh, and that "kept coming out of the bag" part? Yeah—he came out of that bag a *lot*! Those were the scariest moments.

We are going to leave Laura tucked in her stick midden for the remainder of this observation, and discuss instead this *mongrel* of a *molossus.* Once he was finally bagged, I was *not* able to get a PIT tag reading on him. Hence, it was deemed that he was new to the system, and he was dubbed *Crotalus molossus* #6, AKA, "Cm6" as a result. We never gave him a proper name, but a few come to mind now. It was just a few days ago that I looked at all of my 35mm slide images of Suizo Mountain *molossus.* These highly organized images reveal much, including great photos of their uniquely-patterned heads. By double-checking these images, I noted that the third *molossus* we had processed—Cm3—had the exact same head markings as did Cm6. That is because they were the same snake! The last time we had seen Cm3 had been mid-September of 2001. He was in coitus with Cm2 "Kelly" at that time. He had extensively courted Kelly for two months before that. We processed him long before he mated with Kelly, but my data clearly shows that we never stuck a PIT tag in him. The fact that Cm3 / Cm6 had been processed roughly a year before may have been reason enough for the fight in the dog on this day! In any case, even today—long after Laura the serendipitous monster has ceased to exist—she is *still* leading me to cool herps. For nearly 20 years, Cm3 was double booked!

While on the topic of a *Crotalus molossus* / *Heloderma suspectum* commensal, roughly a decade after this event, we had a simultaneous occupation of a HESU / *molossus* commensal site. The place was under a hellhole of catclaw, ironwood trees and dense hackberry. It was classic *molossus* turf. But until this day never a HESU. What makes that fact interesting is that the *molossus* eventually came back out. The HESU did not. Two in, one out? That's not good.

Back when we were *all* much younger, Dr. Richard Funk published a note about a *molossus* that had devoured a HESU (Funk, 1964). This note is a gem, and it is especially interesting that the *molossus* in Funk's observation was exactly the same SVL as Cm3 / Cm6 (1010 mm, or 39.76 inches). The Gila Monster in Funk's paper was one inch (2.54 cm) shorter in total length than Laura. If Laura was in any danger on the day described above, that threat was removed – at great peril to himself – by the author.

Laura pulls in my first Iron Mine Hill Gila Monster

On 21 February 1999, I found my first Iron Mine Hill Gila Monster. This was a moment of great excitement for me, for I had been looking for such a thing there since November of 1992. As was (and still is) my wont with finding a HESU at an overwintering site, I kept my distance upon finding him. I didn't want to do anything to scare him away. But I did take some images of him, and sketched a few identifying characters of his pattern in my field notebook. He remained as found until early March, and then he egressed. But he returned to his lair in November of 1999, and became my first Suizo Mountain "repeater" HESU. I named him "Suizo Mountain Gila Monster #1," which was shortened to "SMGM#1" for the sake of brevity in my notes. For the next two winter seasons, I was hot on him. (I was correctly guessing him to be a male.) Just after he egressed in March of 2000, a female Sonoran Desert Tortoise (*Gopherus morafkai*) occupied his site. She dug up his perfect Gila Hole, widening it to the point that she could squeeze under the overhanging boulder. As much as I *love* tortoises, I was *not* happy to see the one and only Gila Hole of my one and only repeating HESU spot get ruined by this tortoise. In December of 2000, I was delighted to see SMGM#1 back home again. But a week later, that same female tortoise settled back into her / his overwintering site again. The situation worsened when a large adult male tortoise dug his way in to settle beside the female. I now had not one, but *two* lard-ass herp cows blocking my view of my one and only Iron Mine Hill Gila Monster (Figure 6, left). I would normally be stoked to see a tortoise pairing in winter, but I could have drop-kicked the both of them off my hill—such was my angst at seeing them ruining my one and only Gila Hole. They had a whole damn planet to occupy, and they pick my one and only overwintering HESU honey hole to settle into? What are the odds? Fortuitously, the fall and winter of 2000 / 2001 was a wet one, which triggered a lot of tortoise movement. On 12 December of 2000, both tortoises were observed blocking the overwintering lair of SMGM#1. On 29 December, both tortoises had cleared out, giving me a good look at the monster (Figure 6,

Figure 6. During the fall / winter of 2000, the author contended with two Sonoran Desert Tortoises (*Gopherus morafkai*) blocking a visual of his one and only Iron Mine Hill Gila Monster. See text for details. (Left) 12 December 2000. (Right) On 29 December 2000, after the tortoises had departed, the lizard could be seen again. He eventually joined Laura in her overwintering site of fall / winter 2002–2003, and was captured for a transmitter surgery in February of 2003. He became *Heloderma suspectum* #7, or Hs7 (Frank), upon his entry to the study. See Figure 7 for more images of Frank.

right). The tortoises kept ping-ponging back to his HESU honey hole, but I got enough good looks, photos, and sketches of SMGM#1 to recognize him at a glance. But when he egressed from that particular shelter site in February of 2001, it seemed that he had found other places to roost.

Meanwhile, in late December 2002, Laura entered her site #37. This site is also known as "The Communal Hole." It is a slab of a shale-like gneiss boulder that is 200 mm thick by 1 m wide by 1.5 m long. A 270-degree west-facing elliptical hole that is 100 mm tall by 200 mm wide plunges beneath this boulder and forms many chambers underneath. On 20 January 2003, at 1336 hours, I looked into the depths of the den, and my datasheet had this to say: "*News! There are 2 monsters in the hole*." And three visits later, I got my first really good look at that second monster. Once again, we go to my datasheet: "*2/1/03, 1112 hrs: New male viewed basking broadside, left side facing out of hole, ~150mm deep. The good look that this afforded me caused immediate identification. Our new male is SMGM#1, who was photod many times in February of 1999, and fall / winter of 2001. Cool!*"

Yes, this was very cool indeed. My visits to Laura's site #37 intensified, in hopes that I could capture her boyfriend for a transmitter. My favorite sneak-attack route for visiting the couple was to quietly slip my way upslope, using vegetation and boulders to disguise my approach. I hoped to see SMGM#1 all the way out of the entrance. If and when that happened, my plan was to rush in and pounce. But there were other herps to track, and they were peppered all around Laura's site #37. On 23 February, I temporarily lost my bearings. Where the hell was I? I then realized that, quite by accident, I was standing on top of the large, flat boulder that covered Laura's site #37. I peered down over the west edge of this flat boulder, and saw the haunches of SMGM#1 directly below me. He was half in, half out of the hole, and did not seem to be in a hurry to move back in. Knowing that he was unaware of my presence, I took a top-down photo of the situation (Figure 7, left). I then jumped down, turned around, and grabbed a handful of monster. Nuthin' to it! On this day, Suizo Mountain Gila Monster #1 became *Heloderma suspectum #7*, or Hs7 for short. We named him Frank, after my father. Frank's surgery was performed by our local herp vet and all-around hero, Dr. Jim Jarchow. We released Frank on 2 March, and after a brief hesitation, he lumbered back into Laura's site #37. On 6 March, I had the photo opportunity of a lifetime when I saw Frank almost all the way out of the entrance hole of site #37, with Laura's chin and throat resting on his rear haunches. But by the time I could squeeze the photo off, Laura had slipped back out of sight (Figure 7, right). While I have many

Figure 7. (Left) Hs7, Frank, *in situ* moments before his capture and subsequent introduction to the Suizo Mountain Study on 23 February 2003. (Right) Just before this image was taken on 6 March 2003, Laura and Frank were both viewed out basking at their mutual overwintering site.

photos of two HESU inside of a shelter together, to this very day, I have *not* had a photo opportunity like that one. And I was *not* going to get another attempt with these two. Frank cleared out on this day. By doing so, he became the second male HESU to join Laura in the dead of winter, and leave her in early March.

Laura the nest raider

On the morning of 27 April 2003, I tracked Laura to a dense thicket of prickly pear cactus that stood ~80 cm tall by ~1 m wide by ~2 m long. The cactus patch bristled with thorny pads of ouch that angled every which way. It took some doing to even see Laura lurking in its spine-infested depths. I found that if I lay on my stomach, I could peer into a roughly 10-cm diameter hole among the pads in order to get a glimpse of her head and torso. Even though it was a bright and sunny morning, it was nearly pitch black among the dense inner-center cactus stalks where Laura was dwelling. She was viewed only as a dim shape, lying perfectly still on the soft, pebbly soil that nurtured the stalks of the pernicious plant. It was not until I brought my small but powerful mini-mag flashlight into play that I could actually see what she was doing. Her chin was poised above a shallow depression in the soil. That depression contained eight Gambel's quail (*Callipepla gambelii*) eggs. As soon as I saw that, I stuffed my camera into the aforementioned opening between the cactus pads, and adjusted the flashlight so that I could see Laura with one eye by looking above the camera body.

My approach obviously spooked her to the point that she appeared to be uneasy about continuing with whatever might come next. I remained as still and quiet as I could, and soon her predatory lust overcame her uneasiness about my presence. She lowered her snout into the soil depression, opened wide, and delicately lifted one of the eggs out of the nest. I then began the process of blindly photographing what came next, while watching developments over the top of the camera. In this fashion, I watched her ingest the first two eggs. As she lifted each egg out of the nest with her front teeth, she did so gingerly. She seemed to be taking great pains not to break them with her initial, forceps-like teething action. Once the egg was lifted out of the nest, she tilted her head upward, and let gravity assist her in getting the whole egg into the rear of her gullet. It was only when the entire egg was all the way inside of her jowls that she used a combination of her rear teeth and a side-to-side serpentine motion of the neck working in unison to crack the egg open. It was a highly audible process. And once cracked, the eggs were swallowed whole—yolk, shell and all. Not a drop of yolk was wasted. After the second egg was thusly consumed, the scribe hopped up and started the datasheet. There next ensued a flurry of multi-tasking that involved documenting this observation to the point where it was nailed nine ways to Sunday. And since 27 April 2003 was a Sunday, Laura's feast was nailed *ten* ways to Sunday by the time it was finished.

Figure 8. Laura the nest raider! See text for details.

The observation began at 0923 hours, and ended at 0947. All eight eggs were devoured during this 24-minute time period. The process of her cracking each egg was loud enough to be clearly heard throughout the process. The ambient temperature was 29.5°C, and her body temp was 30.5°C. The exact location was pinpointed by GPS. And while the photographs are not perfect, they could have been so much worse. I was fortunate that she was even in the framework of them! I had no idea what the camera was capturing until the 35mm slides were processed and in my hands a week or so later. I'm pleased to share the best of the bunch (Figure 8).

The life and times of a Gila Monster named Laura -- Part 3?

We continued to track Laura for over a year after this event. During her final year in our study, we were radio-tracking a total of nine Gila Monsters. Five of these were males, and four were females. While the most exciting year of Laura's life was still ahead of us at the point where we stop this narrative, that story will better serve monster *and* mankind alike if we discuss all nine of the Suizo HESU at once. They put on one helluva show for us! When I moved to Arizona, I arrived with dreams of being able to simply find Gila Monsters. Never in my wildest dreams would I have imagined that the day would come when I could report their comings and goings with such depth and authority.

This here is Roger Repp, signing off from Southern Arizona, where the turtles are strong, the snakes are handsome, and the lizards are all above average.

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Minutes of the CHS Board Meeting, March 18, 2022

A virtual meeting of the CHS board of directors via Zoom conference video/call was called to order at 7:35 P.M. Board members Rich Crowley, Stephanie Dochterman and Margaret Ann Paauw were absent. The meeting was also attended by Bob Bavirsha. Minutes of the February 11 board meeting were read and accepted with changes.

Officers' reports

Treasurer: Rich Crowley went over the February financial report.

Membership secretary: Mike Dloogatch read through the list of those whose memberships have expired.

Sergeant-at-arms: Tom Mikosz reported that 16 were in attendance at the February 23 virtual meeting.

Old business

John Archer asked board members to come up with ideas for questions for an online poll of the membership.

The Notebaert Museum has dropped some requirements, so we can expect to meet in person for the March general meeting. There are still issues to be resolved before we can resume the Cold-blooded Weekend shows.

The meeting adjourned at 8:25 P.M.

Respectfully submitted by recording secretary Gail Oomens

NEW CHS MEMBERS THIS MONTH

Keith McPeek
Jakob Rajamanickam
Danielle Sofia
Cara Wind

Advertisements

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 mdloogatch@chicagoherp.org.

UPCOMING MEETINGS

Please try to join us *in person* or online for the next meeting of the Chicago Herpetological Society, to be held at 7:30 P.M., Wednesday, April 27, at the Peggy Notebaert Nature Museum, Cannon Drive and Fullerton Parkway, in Chicago. **Jeff Coleman**, a Ph.D. student at the University of Texas at Austin, will be our speaker. Jeff was awarded a CHS grant in 2021 to study how poison dart frogs acquired their chemical defense, and the title of his program will be "The Evolution of the Toxin Uptake System in Poison Frogs."

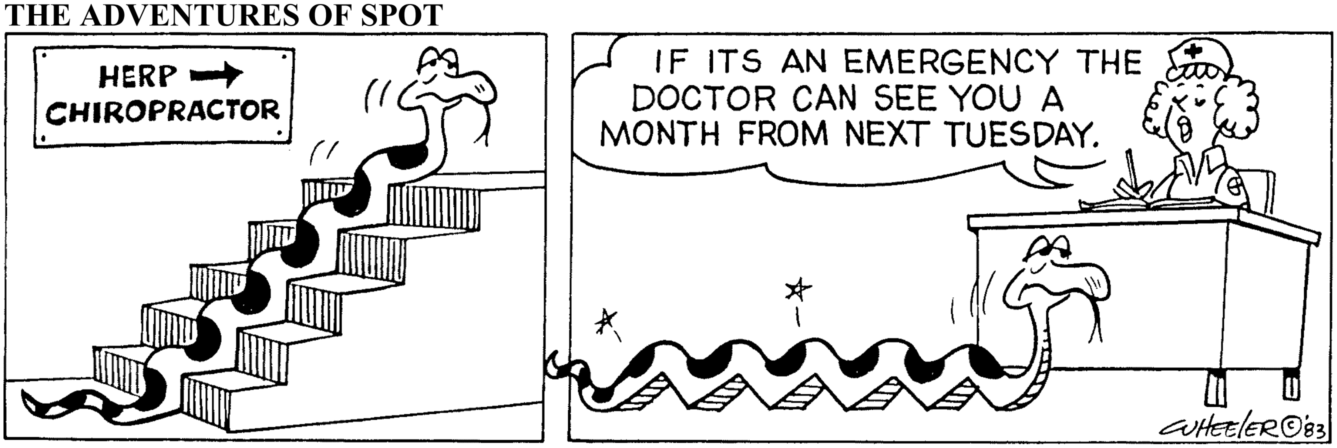
The speaker at the May 25 meeting will be **David Lazcano**, who recently retired from his position as professor of biology at the Autonomous University of Nuevo León in San Nicolás de los Garza, Mexico. David and his students and colleagues have contributed many articles to the CHS *Bulletin* over the past 30 years. David will speak about ongoing projects and activities in the hepetology lab at the university.

Please check the CHS website or Facebook page each month for information on the program. Information about attending a Zoom webinar can be found here:
<https://support.zoom.us/hc/en-us/articles/115004954946-Joining-and-participating-in-a-webinar-attendee->

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? The next board meeting will be held online. If you wish to take part, please email: mdloogatch@chicagoherp.org.

THE ADVENTURES OF SPOT



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