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Cover: Smooth green snake, *Opheodrys vernalis*, Waukesha County, Wisconsin. Photograph by Steve Barten.

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The Verdant Enigma: A History of the Smooth Green Snake (*Opheodrys vernalis*) in Texas and Adjacent States

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Introduction

Throughout much of its contemporary North American range the Smooth Green Snake (*Opheodrys vernalis*) can be abundant at certain times and under certain conditions. However, although considered by many to be the rarest snake in Texas, it was recently removed from the state's Threatened/Endangered List under the suspicion that, since no new specimens had been collected in the last half-century, it was likely extinct in the state. The species was probably never abundant in Texas—at least within the time that "modern" man has been there. During the most recent North American glaciations (none of which extended farther south than southern Illinois), when the climatic features of what was to become the state of Texas were certainly more boreal than they are today, it is possible that *O. vernalis* was a common element of the fauna, much as it remains in most of the northern United States and southern Canada. The generally accepted post-Ice Age scenario involves the more cold-adapted biological associations south of the last glaciation retreating northward as the climate subsequently warmed, leaving some populations behind, much like peripheral puddles that form when a pond dries up. Such remnant populations, when or if they are eventually discovered, are said to be "relictual." There is little doubt that the remaining populations of the Smooth Green Snake in Texas and the surrounding states are but relicts of a formerly much wider distribution.

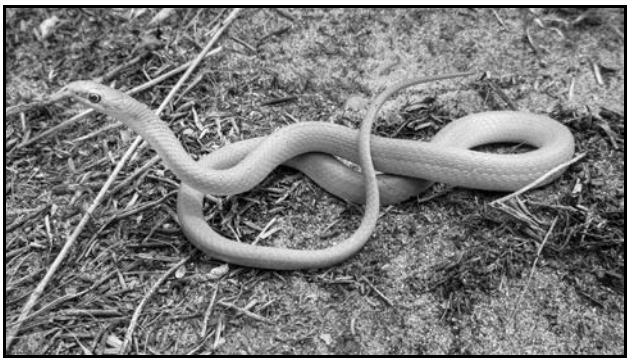


Figure 1. Smooth Green Snake (*Opheodrys vernalis*). Specimen from an Iowa sand prairie within its usual range. Photograph by Don Becker (PD).

Troubling, however, is the seeming reality that the Texas populations are apparently the only remaining "peripheral puddles" of *Opheodrys vernalis* to be found anywhere south of the latitude of the final Pleistocene glaciations (excepting, of course, the *montane* populations in the Southwest that persist in areas that are "elevationally" boreal). Portions of the intervening areas (especially eastern Oklahoma, Arkansas, and Missouri) would appear to constitute much more ideal habitat for the species than coastal Texas, but no unequivocal, documented specimens of *O. vernalis* exist from these regions.

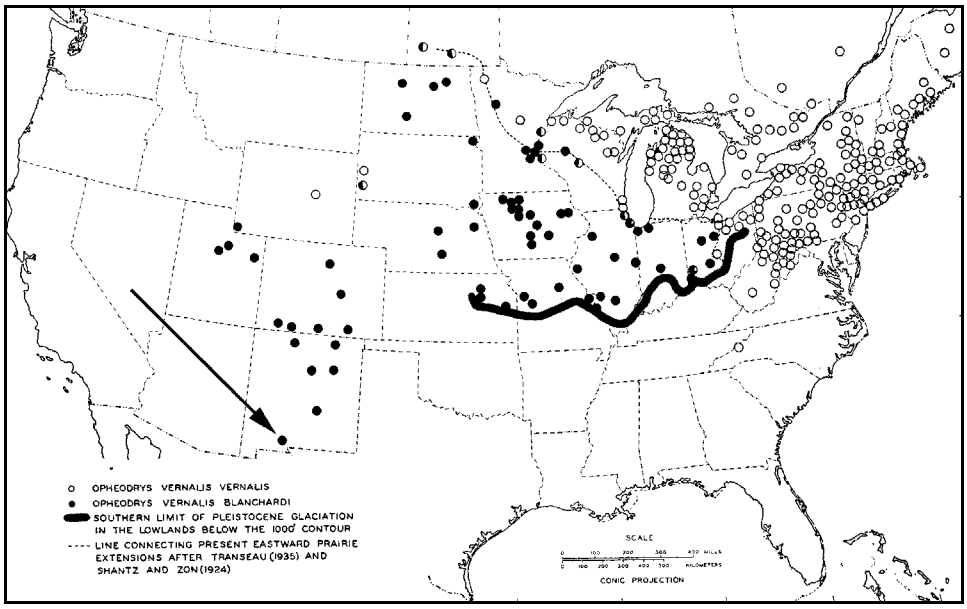
The known history of the Smooth Green Snake in Texas is rather controversial, however, filled with erroneous identifications, undocumented sightings, and once extant but now tragically lost specimens. Currently represented from the state by only six indisputable museum specimens (two of which may have vanished), a couple of tentative fossil records from central and far west Texas, and 4–6 unvouchered sight records likely corresponding to actual specimens that somehow either never made it into collections of record or were so placed but are now irretrievably lost.

Additionally, the acknowledged expert on this species, the late Arnold B. Grobman (1918–2012), maintained throughout his lifetime that all legitimate specimens of *Opheodrys vernalis* from Texas and the adjacent states (except New Mexico) "were established via human agency" (Grobman, 1941; Walley, 2003: p. 776.3), despite the fact that this species has never been popular with local herpetoculturists. This intransigence was also applied to purported records from several other southern states and, indeed, some of those reports have been shown to be incorrect. However, there is ample cause to believe that viable, indigenous, but largely relictual populations of this secretive, cryptically colored snake exist in Texas and some of its surrounding states.

Curiously, Grobman's pronouncement was adopted by Bryce C. Brown, who succeeded John K. Strecker as The Authority on Texas Herpetology, even though Brown's thesis advisor at Texas A&M College, William B. Davis (1949) had personally collected—and published on—an *O. vernalis* found near Sealy, Austin County, a year before Brown's magnum opus, *An Annotated Check List of the Reptiles and Amphibians of Texas* (Brown, 1950), was published.

All of the known, verified *Opheodrys vernalis* specimens collected in Texas have been found in coastal prairie, habitat hardly considered typical for the species. The most recent examples were road casualties discovered in the 1960s, which would make more than half a century since a specimen from the state has been brought to the attention of science. Admittedly, this is a small, cryptically colored, and secretive snake, but still, some of the known specimens have come from relatively populous areas of the state; the locality of one of the later specimens, near Hobby Airport in Houston, has now been swallowed up by the state's largest city.

In 1973 Richard B. Worthington thoroughly reviewed all of the available records of *O. vernalis* from Texas at that time, including a road-killed specimen he had collected nine years earlier in what is now urban Houston (Worthington, 1973). Only



Distribution of specimens of *Opheodrys vernalis* available to Grobman for his monograph. The arrow indicates the unlikely Las Cruces, New Mexico, record he accepted. Notice that no Texas records are plotted. The line representing the southern limit of Pleistocene glaciation is emphasized. (After Grobman, 1941)

one new specimen, hidden in a private collection, has appeared from the state during the 50 years since Worthington's paper, despite the dogged efforts of a number of enthusiasts at identified localities and other areas deemed ecologically plausible habitat. Nevertheless, the time appears appropriate for a new summary to consolidate our sparse understanding of possible remaining populations at the southern terminus of its once even more substantial range.

The early Texas "specimens"

"Owassee," Texas (1883)— A specimen purported to be from "Owassee," Texas, by Yarrow (1883) exists in the United States National Museum (USNM 1489). According to Worthington (1973) the ventral count on this female snake (125) place it in the nominate subspecies, rendering it highly unlikely to have originated from Texas. Additionally, since no settlement of that name appears to exist within the state, it would seem the locality datum on this particular specimen is in error and that it is not from a Texas locality.

Deming's Bridge, Matagorda County 1 (1890)— The official history of the Smooth Green Snake in Texas begins in 1890 when F. W. Wamsley collected two specimens near Deming's Bridge in Matagorda County. These specimens were described by Samuel A. Garman in 1892, and apparently at least one is still extant under the catalog number 19887 in Harvard University's Museum of Comparative Zoology. The Deming's Bridge locality cannot be found on modern maps as it has not existed since near the turn of the nineteenth century, but it is well known in the area and is represented by a state historical marker. Thus, at least one of the original specimens reported from Texas is genuine. This discovery was not particularly controversial at the time, given the rudimentary state of herpetological knowledge in Texas in the 1890s (Garman, 1892).

Armstrong County (1905)— The next purported *Opheodrys vernalis* specimen from Texas was reported by Vernon Bailey in his 1905 "Biological Survey of Texas." This specimen was allegedly from the Panhandle community of Washburn, Armstrong County. Bailey made no reference to the ultimate disposition of this specimen and Grobman (1941) was unable to locate it for his revision of the species 36 years later. Grobman rejected this record due to his observation that, "The accepted records that are represented by reliable museum specimens and that are south of the junction of the Ohio and Mississippi Rivers are from the mountains, which is not true for any of the Texas locality records" (Grobman, 1941: p. 16). With this statement, any future specimens from Texas became controversial.

Bosque County (1907)— Another *O. vernalis* supposedly collected at Clifton, Bosque County, Texas, by "Atkinson and Link" on 29 May 1907, was assigned the catalog number 442 in the collection of the Carnegie Museum. In correspondence with M. Graham Netting, of the Carnegie Museum, Arnold B. Grobman (1941: pp. 15-16) was able to determine the scalation of this specimen would place it in the eastern race of the species, unlikely to be found as far southwest as Texas. Additionally, Netting noted that the reliability of the collectors' records was highly questionable. Worthington (1973) further questioned the validity of this specimen, and the locality was regarded as erroneous (without comment) by Dixon (1987).

Ellis County (1931)— Grobman apparently also came across an additional record from Texas during his examination of museum specimens for his upcoming revision. Collected by a well-known herpetologist of the time, Charles Burt, specimen UMMZ 84096 in the University of Michigan's Museum of Zoology, bore the collecting datum "10 miles south of Waxahachee (*sic*) [Ellis County], Texas" and was collected in April 1931. Grobman rejected this more recent Texas specimen on the basis of its distance from the normal range of the species, pending the collection of additional specimens from the same area. Richard D. Worthington (1973), however, expressing doubt Grobman

actually examined UMMZ 84096, came up with an even better reason for rejecting this particular specimen: it was actually a misidentified Rough Green Snake (*Opheodrys aestivus*).

The Grobman monograph (1941)

In 1941, Arnold B. Grobman published his monograph on the Smooth Green Snake, and it remains the seminal document regarding this species. Grobman personally examined more than 800 examples of *O. vernalis* from the collections of many different museums and included additional data acquired for him by others. This massive accumulation of scale counts was entered onto the then state-of-the-art sorting medium of IBM punch-cards and was analyzed by "various interpreting machines." Grobman acknowledged receiving "information on biometrical methodology" from Lawrence M. Klauber, an engineer by training who was instrumental in establishing statistical techniques in herpetology in the early twentieth century. Clearly this monograph was technologically advanced for the time in any of the biological disciplines.

The main conclusion of this research, however, was that *O. vernalis* comprised two geographical races, diagnosable by ventral count, and that each race occupied a distinctive habitat. The new, western race was named *Opheodrys vernalis blanchardi* in honor of Dr. Frank N. Blanchard "in recognition of his remarkable achievements in herpetology" (Grobman, 1941: footnote 3). Despite all the biometry that went into its discovery, the key to identification of the new race was remarkably simple: "Males with 131 or more ventrals, females with 140 or more ventrals" (Grobman, 1941: p. 10). All unequivocal Texas specimens of *O. vernalis* are referable by the apparently clinal ventral count to the western portion of the species' distribution (corresponding to Grobman's purported race "*blanchardi*").

Grobman was somewhat rigid, however, concerning his paradigm of the acceptable range and habitat that could be occupied by *O. vernalis*. He was apparently impressed by the observation of Roger Conant (1938) in Ohio, where both races are found, that the Smooth Green Snake occurred only in localities that had been glaciated during the Pleistocene. Plotting of his locality records confirmed this was the southward limiting factor in populations located below 1000 feet in elevation (the heavy black line in the map in Figure 2).

Ironically, confusion with the superficially similar Rough Green Snake, *O. aestivus,* seems to be involved with a number of controversial records of putative Smooth Green Snakes from other southern and Midwestern states, even though Grobman stated in the introduction of his revision, "As a species it [*Opheodrys vernalis*] is remarkably distinct and cannot conceivably be confused with any other American species" (Grobman, 1941: p. 7).

The post-Grobman specimens

Austin County 1 (1949)—On April 23, 1949, William B. Davis and a group of his students from Texas A&M College stopped along a roadside about 2.5 miles west of Sealey, Austin County, Texas to examine a temporary rain pool in the open prairie. In the short grass of the highway right-of-way, they discovered and collected a single specimen of *O. vernalis*. Davis gave few details about the snake other than it had 137 ventrals and, therefore, was referable to Grobman's newly proposed western race "*blanchardi.*" Unthinkable by today's standards, neither the collection in which the specimen was deposited, nor its catalog number or sex were mentioned in the published note in the journal *Copeia*.

Instead, Davis (1949) chose to confront Grobman's apparent dogmatism in refusing to accept records of *O. vernalis* from Texas (as well as several other southern states) as genuine; Grobman had in fact dismissed these records with the almost flip comment that they "are obviously in error." Davis's irritation is apparent when he writes, "His main points of argument are that specimens were either outside *his* [emphasis Davis's] accepted range or that the collector's data are unreliable." Davis instead proffered an analogy between the isolated Texas records for the Crawfish Frog, *Rana areolata*, which his group also collected at the same location and the disjunct nature of *O. vernalis* populations in Texas. "Because of this recent capture of *vernalis*, I am inclined to accept the records from Bosque, Ellis and Matagorda counties, Texas, as authentic" (Davis, 1949). Unfortunately for Davis, Grobman was eventually shown to be correct (perhaps for the wrong reasons) about the first two of those three localities. This specimen is located in the Texas Cooperative Wildlife Collection at Texas A&M University under the catalog number TCWC 3273 (Worthington, 1973).

Austin County 2 (1953)—Four years after reporting an *O. vernalis* from near Sealy, Austin County, Texas (see Davis, 1949), W. B. Davis reported another specimen, a female, from 8 miles south of Sealy. Scale counts are given, which place this specimen in the subspecies "*blanchardi*," as would be expected. The snake was collected in a "meadow" and presented to the author. Davis then devoted the remaining three paragraphs of the short four-paragraph paper to again refuting Grobman's (1941; 1950) claims that the Texas specimens could not be naturally occurring. Unfortunately, Davis again refers to the Ellis County (Waxahachie) specimen, which was later shown to be a misidentification, and to the mysterious "southern Oklahoma" specimen (doubtless KU 2537, although not cited as such) (Davis, 1953). Again, the disposition of the specimen is not stated in the note reporting its existence, but according to Worthington (1973), it is in the TCWC as #10589.

Brazoria County (1961)—Under the "news and notes" section of the *Texas Herpetological Society News Letter*, which he edited, John E. Werler (1962: p. 4) describes finding large concentrations of snakes on high ground south of Angleton, Texas, the previous fall, as a result of flooding associated with Hurricane Carla. Among them were three *Opheodrys vernalis*. These specimens were taken to the reptile house at the Houston Zoo where, upon their failure to thrive, they were preserved and apparently kept at that facility. In fact, shortly thereafter I was personally shown a jar containing one of these snakes, which had assumed the characteristic post-mortem bluish coloration (it had apparently been green in life). Although the reptile house staff was aware of the significance of these specimens, the snakes apparently were never placed into a permanent collection.

In their magnum opus on the snakes of Texas, Werler and Dixon (2000) added very little information to that contained in

the newsletter 38 years earlier: "Most smooth green snakes found in Texas were discovered during late April and early June, usually following rain showers. An opportune time to find these elusive snakes is immediately after a hurricane or severe storm, when the rising waters have inundated the low-lying coastal prairies, forcing many of the local terrestrial snakes from their hiding places. It was after such a hurricane that two smooth green snakes were discovered near Angleton, crawling over clumps of grass on one of the few available spits of high ground." (Werler and Dixon, 2000: p. 176).

Unexplained is how the number of snakes taken changed from three in the original newsletter report into two in the subsequent account. Regardless, given the reputation of the late John Werler, plus the fact that I personally saw one of the preserved specimens, I accept this sketchy evidence as valid, especially so considering how few Texas records exist. Interestingly, even though Werler himself collected the Brazoria County specimens, he and Dixon (2000) declined to include this record via a dot in their distribution map for this species (the maps in this volume tend to be extremely conservative—although highly detailed—generally omitting records for which extant museum specimens could not be located).

Harris County (1964)—On 15 June 1964 Richard D. Worthington collected a fresh road casualty *O. vernalis* just south of Hobby Airport. The specimen was a small adult male 33.2 cm in total length (TTL) and was described as being light brown dorsally with a faint olive tint. Worthington speculated that the locality and brownish coloration of this specimen might indicate some affinity with the species that was then known as *Opheodrys mayae* of the Yucatan Peninsula in Mexico (now *Symphimus mayae*). He then reviewed the status of all specimens of *O. vernalis* known from Texas at that time that were represented by vouchers. He did not mention the unfortunately no longer extant Brazoria and Bexar County specimens. Worthington's specimen resided in his personal collection (RW 2185) at the time it was reported, some nine years subsequent to its collection. It is now located in the collection of the University of Texas at El Paso (UTEP H-3675) (Worthington, 1973)

Chambers County (1969)—A remarkably brief note in the journal *Southwestern Naturalist* described the first Chambers County, Texas, record of a species that had not been reported in the literature for Texas (excluding the 1961 Werler specimens) for more than 12 years at the time. W. L. McClure described the habitat as "coastal prairie with native short grasses the dominant vegetation. Rice fields are nearby. Elevation is 7 feet above sea level." The female specimen was said to be light green in coloration and was deposited in the collection of a school district in the Houston area (Spring Branch Science Center #ZV 364) (McClure, 1969).

Matagorda County 2 (1969)—As I was putting together a historical summary of known specimens of the Smooth Green Snake (*Opheodrys vernalis*) from Texas and adjacent states (Lott, 2015, 2016), I had heard rumors about an additional specimen having been collected on the Texas coastal plain, in Matagorda County, in 1969, the same year that the Chambers County specimen had been found. A search of the HerpNet database at the time (now incorporated into the VertNet database) failed to turn up any entries for such a specimen, and the rumor I had heard did not mention whether the snake had been deposited into a major collection. Consequently, being unable to locate any references for this specimen, I assumed that my informant had simply confused the locality of the 1969 Chambers County specimen for this alleged one since the odds of discovering two different specimens of this rare snake at two different locations during the same year appeared to be remote.

Subsequently, however, immediately after the publication of Lott (2016), I was contacted by Dr. Travis J. LaDuc, Curator of Herpetology at the University of Texas at Austin Biodiversity Center (which includes units of the former Texas Natural History Collections [TNHC]), who informed me that this second 1969 specimen did indeed exist and that it resided in that collection. This specimen is cataloged as "TNHC 66029" and was collected on 12 April 1969 by Norman Richard and R. Minton on Texas Hwy 35, 1.5 mi W of the Palacios cutoff at Palacios, Matagorda County, Texas. Dr. LaDuc offered that apparently the collectors did not recognize the significance of their find, as it resided unnoticed in the personal collection of Mr. Richard for the next 37 years until his collection was donated to the University of Texas in 2006. Apparently, the specimen had not yet been entered into the HerpNet database when I conducted my initial search of that site; it does appear in the current VertNet database, however.

Uncertain Texas locality records

Bexar County (Helotes) - Perhaps the most controversial and yet tantalizing Texas "record" for the species rests almost entirely upon the authority of one individual, Albert J. B. Kirn (1885–1950), an avocational naturalist who resided in the community of Somerset, in southwestern Bexar County, for the last 27 years of his life. A self-taught, "broad spectrum" biologist who concentrated in ornithology, Kirn authored or co-authored numerous papers in various fields of natural history during his lifetime (Messerly, 1998). Later in life, he occasionally published anecdotal herpetological notes in the journal *Herpetologica* and corresponded with Lawrence M. Klauber and Cornell herpetologists Albert and Anna Wright. Somewhat surprisingly, however, he never personally went to print with his discovery of preserved Smooth Green Snakes, allegedly from the village of Helotes, Bexar County, at the southern edge of the Edwards Plateau just northwest of San Antonio.

The presumed Helotes specimens were first mentioned in J. Walker Davenport's booklet, *Field Book of the Snakes of Bexar County, Texas and Vicinity*, which stated, "This snake is not considered a native of this part of the country but Mr. A. J. Kirn found three pickled specimens [of *O. vernalis*] in the collection of specimens by the late Gabriel Marnoch, labeled Helotes, Texas. Several collectors report having seen this snake in the Helotes region but none have been brought into the [reptile] garden." (Davenport, 1943: p. 47).

The Reptile Garden, which Mr. Davenport operated, was part of the Witte Memorial Museum in San Antonio. At one time one of the largest fund raisers for the museum, the Reptile Garden exhibited many local snakes in a large concrete pit from which daily shows were performed for the benefit of paying spectators,

including the opportunity to sample the culinary adventure of fried rattlesnake.

To fill their pit, the Reptile Garden paid local collectors to bring in snakes from the countryside. It is not surprising that commercial collectors would tend to concentrate on larger, heavier species given that their remuneration was based on the total weight of snakes they caught. Also, since such collectors probably were not especially concerned about the subtleties of identifying small, relatively "worthless" species, it is doubtful that many of them would have appreciated the differences between the very similar and locally abundant Rough Green Snake (*Opheodrys aestivus*) and the Smooth Green Snake.

Gabriel Wilson Marnoch (1838–1920) (the "Marnock" spelling seems to appear mainly in the herpetological literature), the hypothetical collector of the specimens in question, was the son of an immigrant Scottish physician who settled in the Helotes area during the 1850s. An ardent naturalist, Marnoch collected the type specimens for forms that Edward D. Cope, of the Philadelphia Academy of Science, would describe as "*Lithodytes latrans*" (Barking Frog), "*Syrrhophus marnockii*" (Cliff Chirping Frog), "*Eumeces brevilineatus*" (Short-lined Skink), and "*Eutaenia cyrtopsis ocellata*" (Eastern Black-necked Garter Snake), as well as the type specimen of the Texas Banded Gecko (*Coleonyx brevis*), later described by the Smithsonian's Leonard Stejneger. Marnoch seems to have done most of his collecting in the immediate vicinity of his home at Helotes but is known to have obtained some specimens from an area on the Guadalupe River, about 22 miles distant from Helotes (T. Vermersch, personal communication).

The only other published reference to these specimens is contained in a portion of a letter from Kirn to Albert and Anna Wright, which they subsequently included in their *Handbook of Snakes*: "Letter from Kirn, Somerset, Tex., May 6, 1946: 'Did I ever tell you that there are two smooth-scaled snakes, *Opheodrys v. blanchardi*(?) in the collection at St. Mary's Univ., San Antonio? They are from the Marnock collection, and the jar is labeled 'Green snakes, Helotes.' There is no label on the specimens." (Wright and Wright, 1957: p. 564) Curiously, the number of snakes involved changes from three to two. This is apparently the last published reference to even the possibility that these specimens might represent a genuinely relictual population of this species in the Texas Hill Country; herpetologists writing on the fauna of Texas since then have ignored these accounts of the seemingly lost specimens.

John K. Strecker (1922: p. 3) noted that "He [Marnoch] did some exchanging but at the time of his death [1920], less than fifteen per cent of his collection was foreign material and most of this representing generic groups not found in Texas." This of course opens the possibility that Marnoch's specimens could have been obtained by trade from another collector residing within the traditional range of *O. vernalis*, and possibly presents a logical explanation for how they ended up in the natural history collection of Saint Mary's University.

According to Strecker (1922: p. 3), "After her husband's death, Mrs. Marnock presented a portion of his collection to the Scientific Society of San Antonio and sold the balance to the

Figure 3. Gabriel Marnoch's homestead as seen from the bluff across Helotes Creek, near Helotes, Texas. Photograph by the author, April 1961.

Baylor University Museum," which Strecker curated. Upon its dissolution, the collections of the Scientific Society were presumably also donated to St. Mary's University, where Kirn discovered the Green Snakes in question. Since there were apparently no *O. vernalis* among the Marnoch specimens obtained by Strecker (although the superficially similar *O. aestivus* was represented [Strecker, 1922]), it remains conceivable that some of the specimens donated to the Scientific Society might have originated from outside the area, possibly considered exotic natural history curiosities by the Marnochs.

Unfortunately, Saint Mary's University no longer maintains a natural history collection. According to Emma H. Messerly, who wrote an account of Kirn's ornithological work in Oklahoma, his extensive ornithological collections, including his field notes, etc., were also donated to Saint Mary's University upon his death in 1950. By the early 1960s, however, the St. Mary's natural history collection (presumably including Marnoch's donated specimens as well) was in disarray and was itself subsequently donated to the "Natural Science for Youth Foundation," which "distributed the specimens among their affiliate museums" (Messerly, 1998: p. 11).

Consequently, it would appear that Marnoch's three (or two) Smooth Green Snake specimens purportedly from Helotes are now thoroughly lost to science—a shame, for if they were extant a count of their ventral scutes could possibly determine whether they belonged to the appropriate segment of the distribution (the "*blanchardi*" subspecies), as do all unequivocal Texas specimens of *O. vernalis* (if they instead had counts characterizing the nominate subspecies [*O. v. vernalis*], this would constitute evidence that Marnoch had indeed obtained them elsewhere).

The admittedly sparse fossil evidence from the Edwards Plateau would appear to indicate that two different species of *Opheodrys* (*O. aestivus* and "*Opheodrys* sp. indet.") inhabited the area during the late Pleistocene (Wisconsin) (Holman, 1969). Furthermore, with the exception of large tortoises, the herpetofauna of this period appears to have consisted of currently extant species that continue to occupy the Plateau or nearby areas (Holman, 1969). Even though distinguishing between fossil vertebrae of the two species of *Opheodrys* is difficult and likely prone to subjective error (Holman and Richards, 1981), the fact

that there are only two currently existing species of *Opheodrys* increases the likelihood that *O. vernalis* may have persisted in relict populations on the Edwards Plateau into recent times. Habitats on the Edwards Plateau superficially resemble those currently occupied by *O. vernalis* in the montane western portion of its current range and the more mesic areas of the Plateau are well-known for harboring relictual Pleistocene flora and fauna. At any rate, the existence of a population of *O. vernalis* on the Plateau is no more improbable than that of those that have been found in the coastal prairies.

The Helotes area of northwestern Bexar County has undergone extensive developmental pressure during the last 50 years and is now contiguous with the metropolis of San Antonio. Less than two miles from Marnoch's old homestead is a large high school with an enrollment of more than 3,000 students serving the residents of the area. If *O. vernalis* had ever occurred in this region, it is likely long gone, considering the attention this iconic locality has historically received from herpetologists. If so, it would join the ranks of a considerable number of other snake species known to have once been found there but which apparently are no longer: e.g., Prairie Kingsnake (*Lampropeltis calligaster*), Common Kingsnake (*Lampropeltis getula*), Milk Snake (*Lampropeltis triangulum*), Western Hog-nosed Snake (*Heterodon nasicus*), and the Eastern Garter Snake (*Thamnophis sirtalis*), among others.

Guadalupe Mountains (Culberson County, Texas / Eddy County, New Mexico)— In 1979 J. W. Mecham addressed the likelihood of this species occurring in the Guadalupe Mountains, which straddle the Texas-New Mexico border in the Trans-Pecos region: "The inclusion of *Opheodrys vernalis* [in the herpetofauna of the Guadalupe Mountains] is based primarily on a recent sight record of the species in the McKittrick Canyon area by Mr. Tony Burgess, although a rancher some years ago gave the writer a good description of what apparently was this species in the vicinity of the ruins of Queen, New Mexico (northern Guadalupe Mountains, 6000 ft). The form is known as a sub-Recent fossil (Logan and Black 1977), and occurs nearby in the Sacramento Mountains." (Mecham, 1979: p. 172)

A year later, in his *Annotated Checklist of the Amphibians and Reptiles of the Guadalupe Mountains National Park*, J. W. Grace (1980) says, under "possible species": "Smooth Green Snake, *Opheodrys vernalis*. Skeletal remains from upper west side, sighting from McKittrick Canyon; to be expected at intermediate elevations; secretive, color blends with vegetation."

In 1990, Dennis Parmley confidently identified late Pleistocene *Opheodrys* vertebrae from Fowlkes Cave, a limestone sinkhole in the barren southern end of the Apache Mountains, about 55 miles (89 km) south-southeast of the southern terminus of the Guadalupe Mountains, as *O. aestivus* rather than *O. vernalis*. This locality, however, is at least 2000 ft. (~610 m) lower in elevation than most currently appropriate *vernalis* habitat in the Guadalupes. These two vertebrae were also associated with other snake fossils characteristic of more xeric zones.

Adjacent states

Louisiana— Dundee and Rossman (1989) in their treatment of that state's herpetology include no reference to *O. vernalis*. It should be noted, however, the prairies and marshes of southwestern Louisiana, especially Cameron Parish, are ecologically similar to and geographically proximate to the Chambers County, Texas, record.

Arkansas— Trauth et al. (2004: p. 39), in a chapter entitled "Amphibian and Reptile Species Erroneously Reported from Arkansas," state: "The distributional limits of several species in neighboring states may actually extend into Arkansas, but Arkansas specimens have not been unequivocally verified. These species include . . . *Liopeltis vernalis* . . . (Dellinger and Black, 1938)." Apparently, however, Dellinger and Black, as well as Schwardt (1938), were following Hurter and Strecker (1909) who originally listed an *O. vernalis* from Arkadelphia, Arkansas, based upon a specimen in the Field Museum collection (FMNH 405). However, a letter from Clifford Pope of the Field Museum to Arnold Grobman in 1940 re-identified this specimen as an *Opheodrys aestivus* (Grobman, 1941: p. 14; Walley, 2003). Interestingly, Werler and Dixon (2000: plate 85) and Dixon and Werler (2005: p. 221) both include a color photograph of an *O. vernalis* labeled as "Adult from Arkansas."

Oklahoma— A single specimen of this species was first reported from Oklahoma by Hobart M. Smith and Arthur Leonard (1934), who provided remarkably little information about the specimen in question other than it was from "southern Oklahoma."

Webb (1970: pp. 59-60), under the heading "Unverified, Problematical, and Probable Species," states, "Aside from KU 2357 [a specimen from 'Southern Oklahoma,' described as a single 'soft, dark-colored male having 129 ventrals' in the collection of the University of Kansas], no other smooth green snakes have been discovered in Oklahoma."

Herpetologist Shane Lowe, then residing in Oklahoma, contacted the University of Kansas concerning KU 2357 and was informed that the specimen is indeed an *O. vernalis*, and not an *O. aestivus*. The only new information obtained about the purported sole Oklahoma specimen is that it was collected by an enigmatic "Dr. Miller" ca. 1916 (D. [Shane] Lowe, personal communication). It would appear that the Ouachita Mountains in the extreme southeastern portion of the state would be the most likely area for this species to exist.

New Mexico— Although well-known from the northern portion of the state (Degenhardt et al., 1996), this species is apparently absent from the Madrean ranges of southwestern New Mexico and southeastern Arizona (and, in fact, is completely unknown from the state of Arizona). Curiously, Grobman (1941) accepted and mapped a specimen (USNM 22377) with obviously incorrect locality data stating it was from Las Cruces in the Mesilla Valley of Doña Ana County. This locality is within the hot and dry Chihuahuan Desert and was rejected by Degenhardt et al. (1996) for that reason. This specimen, however, could have come from the well-known population in the Sacramento Mountains some 95 km (60 miles) distant, and much closer to Alamogordo, Otero County. Alternatively, it could have come from an unknown population in the nearby Organ Mountains.

Chihuahua— "*Opheodrys vernalis blanchardi* Grobman (Western green snake). Locality: 2.6 km N Pedernales or 38.4 km SE

Guerrero on Mexico 16, 2185 m (UAZ 34416). A single specimen of *O. vernalis* was collected in plains grassland on the continental divide. This is the first record for the state of Chihuahua, and for Mexico. The nearest *O. vernalis* population known is in the Sacramento Mountains of New Mexico, northeast of El Paso, Texas, some 480 km to the northeast (MALB 769-770: NW Ruidoso). The disjunct populations of *O. vernalis* in Chihuahua and New Mexico suggest that these may be relicts of the Wisconsin glacial period when conditions were cooler and/or moister, and mesic vegetation more continuous between the Rocky Mountains and the Sierra Madre Occidental. This record of dispersal is especially interesting because *O. vernalis* is a terrestrial, non-riparian species." (Van Devender and Lowe, 1977: p. 46). The Smooth Green Snake would appear to be an element of the Rocky Mountain faunal assemblage and consequently unlikely to be found further south in Mexico.

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Supplemental Material

I have visited and photographed habitat at or near all but one of the *known* collection sites for Texas specimens of *Opheodrys vernalis*. Selected photos and commentary may be viewed at the following link:
https://drive.google.com/file/d/0B-Wla23JXrgcbHJZTlN4bm5tNmc/view?usp=sharing

Notes on the Herpetofauna of Mexico 43: Predation by a White-nosed Coati (*Nasua narica*) on a Texas Alligator Lizard (*Gerrhonotus infernalis*) in the Parque Ecológico Chipinque, Municipalities of San Pedro Garza García and Monterrey, Nuevo Léon, Mexico

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Abstract

We report predation by a white-nosed coati (*Nasua narica*) on a Texas alligator lizard (*Gerrhonotus infernalis*) in Parque Ecológico Chipinque. In addition, we describe certain aspects of the biology of each species and provide a brief description of the study site.

Resumen

Reportamos la depredación por parte del coatí de nariz blanca (*Nasua narica*) sobre la lagartija caimán de Texas (*Gerrhonotus infernalis*) en el Parque Ecológico Chipinque. Además, describimos ciertos aspectos de la biología de cada especie y proporcionamos una breve descripción del sitio de estudio.

Introduction

With the aid of a camera trap and a cellphone, the predation on an adult Texas alligator lizard (*Gerrhonotus infernalis*) by a White-nosed coati (*Nasua narica*) was recorded by a forest ranger (JRCA) on 27 November 2022 at 1258 h, air temperature 22.2°C and humidity 34% (25°36'28.58"N, 100°21'17.99"W; datum WGS 84; elev. 1,296 m). The event took place in oak-pine forest at a nature spot known as Meseta within the Parque Ecológico Chipinque (PEC), a privately protected area located in the Monterrey Metropolitan Area, Nuevo León, Mexico. The PEC lies inside the Parque Nacional Cumbres de Monterrey, a federally protected area (Figure 1). The photographs in Figure 2 show that the coati captured and consumed the *G. infernalis*, and was holding the lizard upside down by the head with its paws while eating it.

As part of the PEC Conservation and Sustainable Management Plan, a permanent monitoring program has been implemented by its conservation team alongside forest rangers throughout the area. As a result of this program, it is possible to continually document animal behavior in the wild.

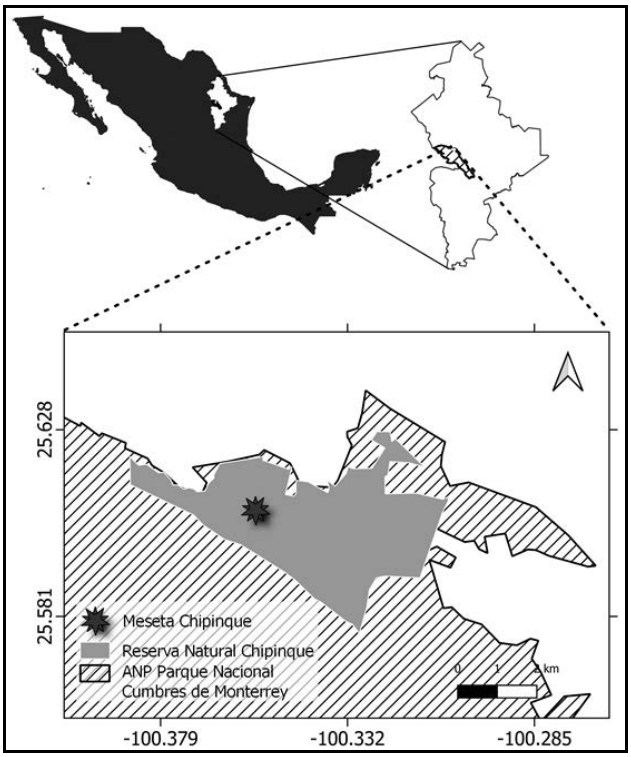

Figure 1. Location of Parque Ecológico Chipinque (PEC), inside the Parque Nacional Cumbres de Monterrey, Nuevo León, Mexico. Map created by Maria Fernanada Soto-Zúñiga.

Background on the predator, *Nasua narica*

The white-nosed coati, *Nasua narica* Linnaeus, 1766, is a medium-sized mammal belonging to the family Procyonidae. It is one of six procyonids that inhabit Mexico (Aranda Sánchez, 2012; Espinoza-García, 2014). Its distribution extends from the southern United States through Colombia, Ecuador and Peru,

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Figure 2. A white-nosed coati (*Nasua narica*) eating a Texas alligator lizard (*Gerrhonotus infernalis*), found in Parque Ecológico Chipinque (PEC), San Pedro Garza García, Nuevo Léon, Mexico. Photographs by Jairo Ricardo Castilla-Arciniega.

west of the Andes (Aranda Sánchez, 2012; Salcedo-Rivera et al., 2022). The habitats registered are temperate and humid forests from sea level to 3500 m. These animals are frequently seen in groups of females and offspring; adult males are often solitary. They are considered important seed dispersers and their reported predators are primarily large felids like cougars and jaguars (Gompper, 1995; Espinoza-García, 2014).

Coatis are omnivores; their diet is principally fruits and invertebrates such as beetles, ants, crickets, and spiders. Vertebrates are also consumed, including mammals such as the North American least shrew (*Cryptotis parvus*), the eastern cottontail rabbit (*Sylvilagus floridanus*), deer mice (*Peromyscus* spp.), and reptiles such as the spiny torquate lizard (*Sceloporus torquatus*). Some studies reported that 14.88% of its diet has been identified as vertebrates (mammals, reptiles and birds); only 6.51% of all its diet is represented by reptiles; vertebrates in general are consumed more frequently during dry season (Leopold, 1959; Ceballos and Galindo, 1984: pp. 231, 235-236; Ceballos and Navarro, 1991; Valenzuela, 1998; Altamirano Álvarez et al., 2013).

Several carnivorous and omnivorous mammals belonging to the order Carnivora (procyonids, canids, felids, mustelids), some Chiroptera (e.g., *Vampyrum spectrum*), and some marsupials in the family Dasyuridae are potential lizard predators (Lintulaakso et al., 2023; Reuter et al., 2023),.

Background on the prey *Gerrhonotus infernalis*

The Texas alligator lizard*, Gerrhonotus infernalis* Baird 1859 (1858), is an anguid lizard found from central Texas southward through Chihuahua, Coahuila, Nuevo León, and Tamaulipas and on into Durango, Zacatecas, San Luis Potosí, Querétaro, and Hidalgo (Lemos-Espinal and Dixon, 2013; Ramírez-Bautista et al., 2014; Nevárez-de los Reyes et al., 2016; Terán-Juárez et al., 2016; Lazcano et al., 2019; Cruz-Elizalde et al., 2022).

The elevational distribution of *G. infernalis* is from 1350 to 3400 m (Lemos-Espinal and Dixon, 2013). This lizard primarily inhabits rocky hills in juniper-oak woodlands, often in the vicinity of cliffs, which can provide refuges (Lemos-Espinal and Dixon, 2013). This lizard moves slowly and deliberately, seeking prey by stealth (Lemos-Espinal and Dixon, 2013). Its diet consists primarily of arthropod invertebrates, such as beetles, crickets, cockroaches, grasshoppers, spiders, and scorpions. It is an opportunistic feeder, so it also preys on lizards and snakes (Greene et al., 2009; Lemos-Espinal et al., 2018). *Gerrhonotus infernalis* is oviparous and, as reported by Lemos-Espinal and Dixon (2013), it appears to mate in the fall, with oviposition occurring in the spring and hatching taking place some 43–49 days thereafter. The IUCN Red List conservation status for *Gerrhonotus infernali*s is Least Concern (IUCN, 2023) and its EVS (*sensu* Wilson et al., 2013) is 13, placing it at the upper limit of the medium vulnerability category. This species is not listed by SEMARNAT (Nevárez-de los Reyes et al., 2016).

Background on the study site

The vegetation community at the study site is oak-pine forest. This temperate forest community is most abundant at 975 to 2200 masl. The main elements of the forest are trees and shrubs between 15 to 20 meters in height, with *Quercus* the most dominant genus. The following species are typical: loquatleaf oak (*Q. rhysophylla*); white oak (*Q. polymorpha*); Lacey oak (*Q. laceyi*), Virginia live oak (*Q. virginiana*), Chisos oak (*Q. canbyi*); and white oak (*Q. laeta*), which are associated with madroño (*Arbutus xalapensis*), black cherry (*Prunus serotina*) and Mexican walnut (*Juglans mollis*). Pine forest elements are also found at low density (Alanís-Flores et al., 1995).

Materials and methods

Monitoring flora and fauna is one of the main activities regularly carried out by the staff of PEC, registering the healthi-

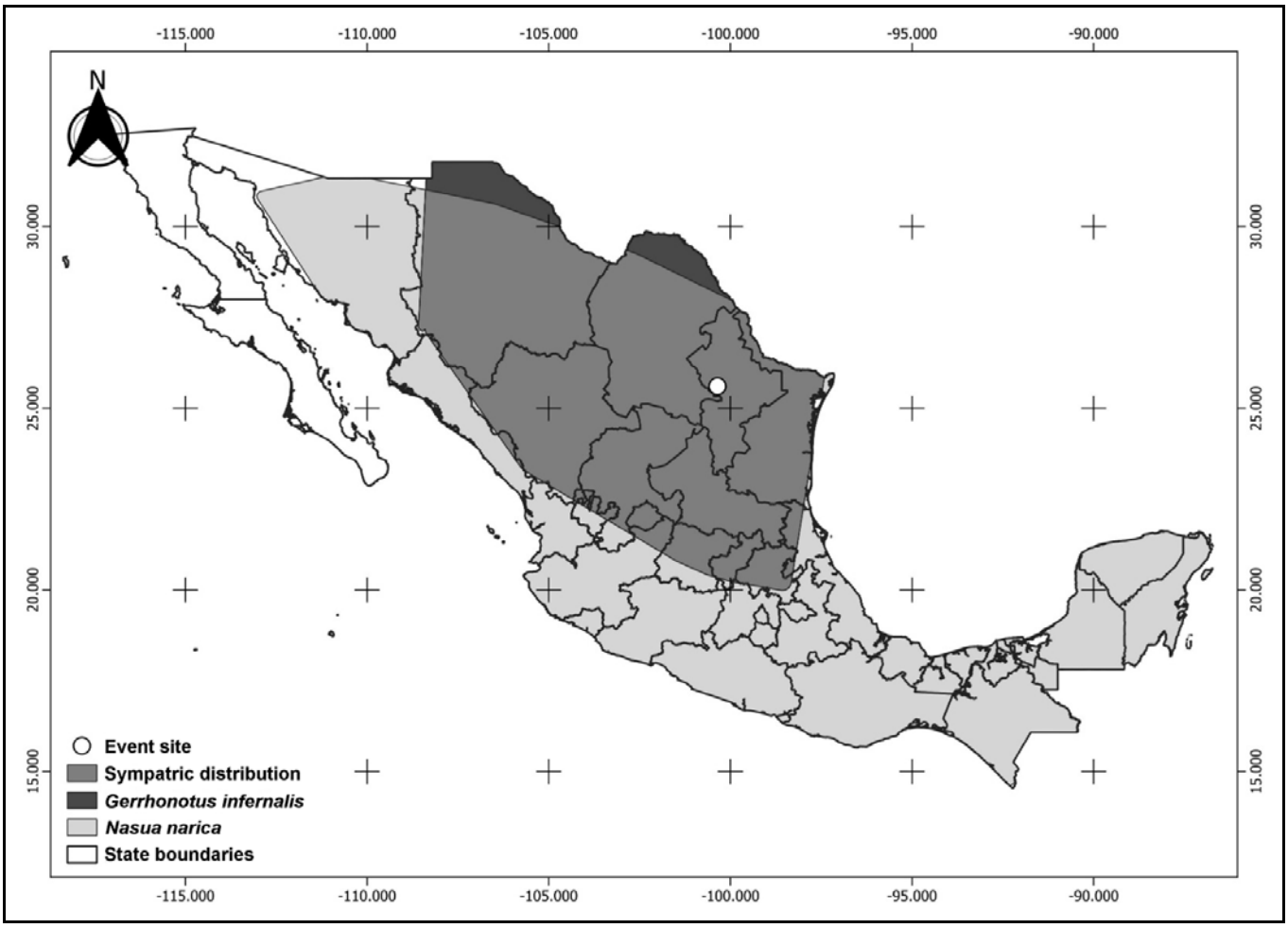

Figure 3. Sympatric distribution of *Nasua narica* and *Gerrhonotus infernalis* in Mexico. Map created by Edgar Emmanuel Hernández-Juárez.

ness of its different plant communities and fauna, also monitoring the behavior of visitors, since the main function is to allow leisure activities for inhabitants of the Monterrey Metropolitan Area. This area now includes almost 13 municipalities (Apodaca, Cadereyta-Jiménez, El Carmen, García, San Pedro Garza García, General Escobedo, Guadalupe, Juárez, Monterrey, Salinas Victoria, San Nicolás de los Garza, Santa Catarina and Santiago), and the present population is 5,046,743 inhabitants (https://es.wikipedia.org/wiki/Zona_metropolitana_de_Monterrey).

Discussion and conclusions

Both *G. infernalis* and *Nasua narica* are common in the park. We have documented in the past another species of mammal that was photographed eating a *Gerrhonotus infernalis*; this was a gray fox (*Urocyon cinereoargenteus*) (García-Bastida et al., 2018). Other mammal species present in the park are potential predators of *G. infernalis* adults and offspring. These include the collared peccary (*Pecari tajacu*), black bear (*Ursus americanus*), ringtail cat (*Bassariscus astutus*), coyote (*Canis latrans*), jaguarundi (*Herpailurus yagouaroundi*), common opossum (*Didelphis virginiana*) (Nájera-Sánchez, 1997; Carvajal et al., 2001; Juárez-Casillas, 2003; Rodríguez Ramírez, 2008; Díaz-Oliveros, 2017; Esqueda et al., 2022), and ocelot (*Leopardus pardalis*) (García-Bastida et al., 2016).

To our knowledge, this is the first report of a *G. infernalis* as a food item for a white-nosed coati (*Nasua narica*) in Mexico. This observation also contributes to our understanding of the trophic relationships between mammals and reptiles in oak-pine forest in northeastern Mexico. Previous surveys conducted in the area indicate that *G. infernalis* is the one of the most common lizard species found in the different sections of the park (Lazcano et al., 2006; Aguillón-Gutiérrez et al., 2007; García-Bastida, 2013; Lazcano et al., 2017; Lazcano et al., 2022). The area lacks population level studies of any vertebrate; therefore, we do not know how the predator-prey index stands. We suggest that future studies should focus on obtaining population data for these possible predators in the park.

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Notes on Reproduction of Ornate Chorus Frogs, *Pseudacris ornata* (Anura: Hylidae), from South Carolina

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Abstract

I conducted a histological examination of gonadal material from 27 adult *Pseudacris ornata* from South Carolina consisting of 19 males and 8 females. The *P. ornata* reproductive cycle commences in autumn and continues into the early part of spring. The smallest mature male (sperm in lumina of seminiferous tubules) measured 28 mm SVL. The smallest mature female (yolking follicles) measured 29 mm SVL. I found one gravid female from October indicating *P. ornata* may commence reproduction earlier than November as previously reported (Table 1). By reproducing in winter "cold weather breeding" (*sensu* Ethier et al., 2021), *P. ornata* likely avoids competition with other hylid frogs.

Pseudacris ornata (Holbrook, 1836) occurs on the Atlantic Coastal Plain from southeastern North Carolina to central Florida, central Mississippi and southeastern Louisiana (Frost, 2022). It is fossorial, spending most of its time buried in loose sandy soil (Dodd, 2013). *Pseudacris ornata* is a winter-breeding species with reproduction occurring December through early April (Pechmann and Semlitsch, 1986). It is extremely difficult to find *P. ornata* outside of the breeding season (Elliott et al., 2009), hence my samples reflect the months of breeding (December to April). The biology of *P. ornata* is summarized in Glorioso (2010). In this paper I present data from a histological examination of *P. ornata* gonads from South Carolina. Utilization of museum collections for obtaining reproductive data avoids removing additional animals from the wild.

A sample of 27 *P. ornata* from South Carolina (Appendix) collected 1939 to 1956 consisting of 19 adult males (mean snout–vent length, SVL = 32.7 mm ± 1.8 SD, range = 28–37 mm) and 8 adult females (mean SVL= 32.6 mm ± 4.2 SD, range = 27–38 mm) was examined from the herpetology collection of the North Carolina State Museum of Natural History (NCSM), Raleigh, North Carolina, USA.

A small incision was made in the lower part of the abdomen 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 NCSM. An unpaired *t*-test was used to test for differences between male and female SVLs.

There was no significant difference between mean SVL of adult males versus adult females of *P. ornata* ($t = 0.0518$, $df = 25$, $P = 0.9591$). Testes of *P. ornata* are surrounded by black pigment as has been previously reported for the congener *P. crucifer* by Rugh (1941). The testicular morphology of *P. ornata* is similar to that of other anurans as described in Ogielska and Bartmañska (2009a). Within the seminiferous tubules, spermiogenesis 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). A tangled mass of spermatozoa or open sperm cysts was observed in the lumen of each seminiferous tubule. A ring of germinal cysts is located on the inner periphery of each seminiferous tubule. There was no discernible testicular cycle in my monthly samples of *P. ornata* males as all 19 exhibited spermiogenesis (sperm formation): December (N = 5), January (N = 5), February (N = 5), March (N = 2), April (N = 2). The smallest sexually mature male of *P. ornata* measured 28 mm SVL (NCSM 106633) and was from December. Wright and Wright (1933) reported adult *P. ornata* males measured 25–35 mm. The majority of my samples are from early in the year during the reproductive period.

The ovaries of *P. ornata* are similar to those of other anurans in being paired organs lying on the ventral sides of the kidneys; in adults the ovaries 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. Three stages were present in the spawning cycle (Table 1): (1) "Not spawning" in which previtellogenic oocytes or atretic oocytes predominated; (2) "Yolking" follicles are in process of accumulating yolk: (3) "Ready to spawn" in which mature oocytes predominated. The smallest reproductively active female (accumulating yolk) measured 29 mm SVL (NCSM 106808) and was from December. One slightly smaller female (27 mm SVL) from November (NCSM 106969) exhibited a massive follicular atresia and would not have spawned. Because this female was close to the minimum size for *P. ornata* adult females (28 mm) in Wright and Wright (1933) I considered it to be an adult. One October *P. ornata* female (NCSM 106975) was in spawning condition indicating the next period of reproduction had started. October spawning has not previously been reported for *P. ornata*; previous reports

Table 1. Three monthly stages in the spawning cycle of 8 adult female *Pseudacris ornata* from South Carolina.

Month	N	Not spawning	Yolking	Ready to spawn
October	2	1	0	1
November	2	1	0	1
December	4	0	1	3

Table 2. Months of breeding by state for *Pseudacris ornata*.

State	Breeding period	Source
Alabama	December to March	Mount, 1975
Florida	November to March	Krysko et al., 2019
Georgia	November to March	Jensen et al., 2008
Louisiana	November to April	Boundy and Carr, 2017
North Carolina	Call December to March	Dorcas et al., 2007
South Carolina	November to April	Semlitsch et al., 1996
Southeast	December to March	Dorcas and Gibbons, 2008

indicate spawning commences in November (Table 2 and Ethier et al. [2021]).

Atretic follicles were noted in two of eight (25%) *P. ornata* females (NCSM 106975 October; NCSM 106969 November). 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 a detailed description of follicular atresia in the frog ovary. As previously mentioned (NCSM 106969) from November exhibited a massive follicular atresia and would not have spawned. Follicles in advanced atresia consisting of compact black bodies were interspersed with previtellogenic oocytes. Atresia plays an important role in fecundity by influencing numbers of ovulated oocytes (Uribe Aranzábal, 2011). Incidences of follicular atresia increase late in the reproductive period (Saidapur, 1978). Saved energy will be presumably utilized during a subsequent reproduction. No postovulatory follicles (evidence of recent spawning) were found (*sensu* Redshaw, 1972). This is likely because of my small sample size. They have been reported in other *Pseudacris* species (Goldberg, 2020).

In conclusion, the *P. ornata* reproductive cycle commences in October and continues through the early part of the year. My report of one gravid female from October indicates *P. ornata* may commence reproduction earlier than November as previously reported. By reproducing in winter "cold weather breeding" (*sensu* Ethier et al., 2021) *P. ornata* likely avoids competition with other hylid frogs.

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Appendix

Twenty-seven *P. ornata* from South Carolina examined (by county) from the herpetology collection of the North Carolina State Museum of Natural History (NCSM), Raleigh, North Carolina USA. **Barnwell**: NCSM 106596; **Beaufort**: NCSM 106620–106624; **Berkeley**: NCSM 106631–106635, 106808–106810, 106975, 106976; **Charleston**: NCSM 106572–106576, 106960, 106961, 106963; **Colleton**: NCSM 106968; **Dorchester**: NCSM 106803, 106969.

Mexican Geographical Distribution Notes 4: First State Record of the Invasive *Lepidodactylus lugubris* (Sauria: Gekkonidae) from the State of Colima, and Extension of the Known Range in Jalisco

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Introduction

Lepidodactylus lugubris is an invasive, all-female, tropical gecko species, native to southeast Asia and parts of Oceania (Kohler, 2008). It has been widely introduced in the tropical Americas, including Florida, Costa Rica, Panama, Colombia, Ecuador, Brazil and other places (Hoogmoed and Avila-Pires, 2015). While it has been informally suggested that this species occurs in Mexico, evidence of this has been lacking. As recently as 2015, Hoogmoed and Avila-Pires (op. cit.) argued that *L. lugubris* should not be considered as extant in Mexico due to inconsistencies in literature and lack of vouchered museum specimens. However, Ahumada-Carrillo and Weatherman (2018) reported an established population in Puerto Vallarta, Jalisco. Since then, photographic evidence has appeared online on iNaturalist.com of individuals from Sinaloa, Nayarit, Colima, Guerrero and Nuevo León (C. Grünwald, personal observation). Herein, we report on a population from two boat terminals, which are located at opposing ends of a commercial water taxi service, one in the state of Colima and one in the state of Jalisco.

Distribution Records

MEXICO: COLIMA: Municipio de Manzanillo: La Culebra, on the Isla de Navidad peninsula, approximately 1.3 airline km S of Barra de Navidad, Jalisco (19.190518°N, 104.681215°W; WGS 84; 24 m elev), 08 August 2022. Christoph I. Grünwald and Maria del Carmen G. Mendoza-Portilla. Verified by Jason M. Jones. A photo voucher of the individual was deposited in the University of Texas Arlington, Digital Collection (UTADC 9870a–b), and this observation was added to the iNaturalist platform as: https://www.inaturalist.org/observations/155093982. This lizard was found active at night on a palm trunk.

MEXICO: JALISCO: Municipio de Cihuatlán: Barra de Navidad, at a restaurant which borders the water taxi terminal that services trips to La Culebra, Colima. Jalisco (19.2002°N, 104.6838°W; WGS 84; 5 m elev), 09 August 2022. Christoph I. Grünwald and Maria del Carmen G. Mendoza-Portilla. Verified by Jason M. Jones. A photo voucher of the individual was deposited in the University of Texas Arlington, Digital Collection (UTADC 9819), and this observation was added to the iNaturalist platform as: https://www.inaturalist.org/observations/130817813. This lizard was found active at night on the *palapa* structure of the restaurant.

Discussion

Combined, these records represent a range extension of approximately 170–172 km S of the known range of this invasive species in Mexico (Ahumada-Carrillo and Weatherman, 2018), and the Colima record represents the first formal documentation of this species from the state of Colima. At the Barra de Navidad locality, numerous individuals were seen on the *palapa*, and it appears that this species is locally abundant. In Colima, only one specimen was found; however, two other photographs from the Municipio de Manzanillo are present on iNaturalist.com.

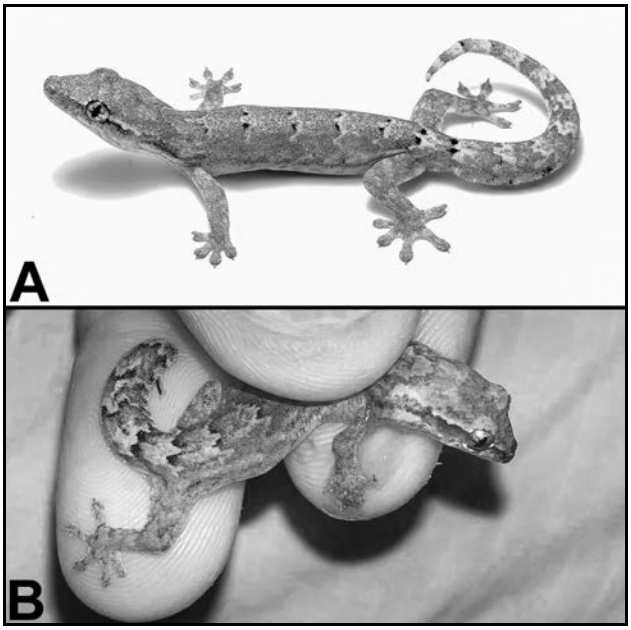

Figure 1. *Lepidodactylus lugubris* specimens reported herein. (**A**) Specimen from La Culebra, Municipio de Manzanillo, Colima (UTADC 9870a–b). Photograph by Jacobo Reyes-Velasco (**B**) Specimen from Barra de Navidad, Municipio de Cihuatlán, Jalisco (UTADC 9819). Photograph by Christoph I. Grünwald..

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2. Biodiversa A.C., Avenida de la Ribera #203, C.P. 45900, Chapala, Jalisco, Mexico.

3. Herp.mx A.C., C.P. 28989, Villa de Álvarez, Colima, Mexico.

Mexican Geographical Distribution Notes 5: First Records of *Thamnophis proximus* (Serpentes: Natricidae) from the State of Michoacán

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Mexico: Michoacán de Ocampo: Municipio de Lázaro Cárdenas: 1.6 km S of Lázaro Cardenas, on road to Playa Erendira (17.9463°N, 102.2237°W; WGS 84; 5 m elev.) 16 August 2022. Alejandro Mijangos-Betanzas. Photo vouchers of the individual were deposited in the University of Texas Arlington, Digital Collection (UTADC 9821A–E) and this observation was added to the iNaturalist platform as: https://www.inaturalist.org/observations/164354675. This snake was active crossing a road during the day in areas of mangrove swamps. § 2.0 km S of Lázaro Cardenas, on road to Playa Erendira (17.9452°N, 102.2273°W; WGS 84; 4 m elev.) 16 August 2022. Alejandro Mijangos-Betanzas. Photo vouchers of the individual were deposited in the University of Texas Arlington, Digital Collection (UTADC 9822A–B) and this observation was added to the iNaturalist platform as: https://www.inaturalist.org/observations/164356584. This snake was found DOR during the early evening in an area of mangrove swamps. Identity of both specimens was verified by Iván T. Ahumada-Carrillo.

Together, these individuals represent the first verified records of this species from Michoacán (Duellman, 1961; Huacuz-Elias, 1995; Rossman et al., 1996). Furthermore, they extend the known range of this species 186 km WNW from Técpan de Galeana, Guerrero (CAS 134485). This extension is significant, as this is the furthest north / west this wide-ranging species has been collected on the Pacific coast of Mexico.

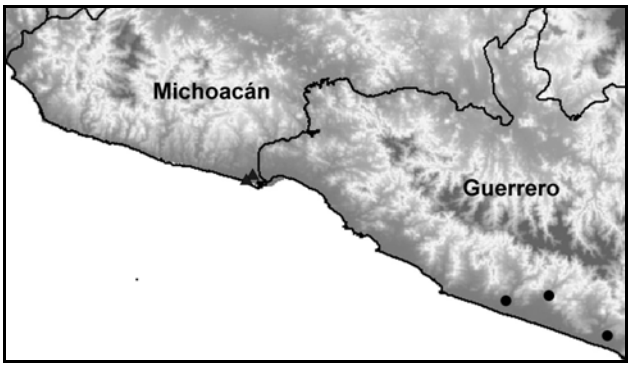

Figure 2. Map showing the known distribution of *Thamnophis proximus* in Guerrero and Michoacán. Historical records are taken from GBIF (2023) and depicted by circles, whereas new records reported herein are depicted by triangles.

Acknowledgments

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Figure 1. Photographs of *Thamnophis proximus* from Michoacán reported herein. **A**. *Thamnophis proximus* (UTADC 9821) as found, eating an unidentified anuran (*Leptodactylus*?) from 1.6 km S of Lázaro Cardenas, on road to Playa Erendira, Municipio de Lázaro Cardenas, Michoacán. **B**. *Thamnophis proximus* (UTADC 9821) after consuming anuran. **C**. *Thamnophis proximus* (UTADC 9822) from 2.0 km S of Lázaro Cardenas, on road to Playa Erendira, Municipio de Lázaro Cardenas, Michoacán. All photographs by Alejandro Mijangos-Betanzos.

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Herpetology 2023

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.

PREDICTING NEST SITE SELECTION

C. B. Eversole and S. E. Henke [2022, Herpetologica 78(2): 133-138] note that habitat characteristics can have large effects on nest site selection of oviparous vertebrates. It is thought that habitat preference in many species is driven by natural selection because of habitat-specific fitness consequences. However, long-term studies on nesting of oviparous reptiles, in particular, are less common in comparison with other nesting vertebrates. As a result, specific habitat associations that define nesting habitat for many species are largely unknown. The authors studied habitat characteristics and selection of American alligator (*Alligator mississippiensis*) nest sites in inland freshwater wetlands. They investigated the habitat characteristics associated with 112 nests studied during the 2013–2019 nesting seasons, and quantified habitat characteristics in relation to nest locations and random points. A nearest neighbor analysis indicated that American alligator nests are not randomly distributed across wetlands, but are more representative of a clumped spatial distribution, suggestive of habitat preference and site selection. The authors measured habitat variables such as wetland vegetation cover, average water depth, island density, bank slope, canopy cover, and wet bulb globe temperature, as well as alligator population demographics such as relative adult proportion, at each nest and random site. Subsequently, they found that the best variables for predicting American alligator nest site selection included island density, slope of bank, canopy cover, and wet bulb globe temperature. The best predictive model demonstrated that the odds of nest site selection increased with increasing canopy cover, wet bulb globe temperature, island density, and decreasing bank slope. These habitat choices presumably reduce the risk of nest predation and provide thermal cover for proper balance of nest site microclimate. Based on these results, practices focused on alligator nesting habitat should consider these specific habitat characteristics in outlining applied strategies and working toward management and conservation goals.

BEETLE CORRIDORS AS REFUGES FOR LIZARDS

B. Borczyk et al. [2022, Herpetozoa 35:59-63] note that ecosystem engineering is among the most important factors shaping ecosystems; however, it remains largely unstudied. They present observations on three lizard species, the common lizard *Zootoca vivipara*, the sand lizard *Lacerta agilis*, and the slow worm *Anguis fragilis*, which use habitats created by the great capricorn beetle, *Cerambyx cerdo*. These galleries are heavily used by the common lizards and young sand lizards. The authors discuss the possible advantages of such beetle-created habitats for reptiles: antipredator refuges, hibernation sites, thermoregulatory behavior, and preying activities. Since previous studies have reported numerous invertebrate species as well as vertebrates (including bats and snakes) in these refugia, the authors find the great capricorn beetle–inhabited oaks to be potentially important microhabitats for a variety of animals.

PERSONALITY IN BOX TURTLES

J. H. Roe et al. [2023, Herpetologica 79(1):9-21] note that boldness, defined as an individual's tendency to engage in risk-taking activities, is a phenotypically variable trait linked with numerous behavioral and fitness outcomes in free-ranging animals. They examined variation and repeatability of boldness and other behavioral characteristics in two wild eastern box turtle (*Terrapene c. carolina*) populations using radiotelemetry, and assessed fitness correlates of boldness over multiple years. They observed large amounts of among-individual variation and within-individual consistency (i.e., repeatability) of boldness as measured by their head emergence latency following a standardized confinement assay. Individuals were also consistent in several in-field behaviors including movement rate, home range size, and date of emergence from overwintering refuges. Individuals with shorter head emergence latencies (i.e., bolder turtles) had larger home ranges, emerged earlier from overwintering dormancy, and experienced moderately lower survival compared with shy individuals. Boldness did not affect time spent within the thermal preference range, somatic growth rates, or the frequency of mating or same-sex aggressive encounters. Boldness and its effects on in-field behaviors differed between sexes and populations, and the relationship between boldness and survival was temporally variable. Results suggest possible intrinsic behavioral types in *T. c. carolina* and highlight the importance of long-term and multi-population studies when examining ecological and evolutionary processes that shape personality phenotypes in turtles.

IMMATURE GOPHER TORTOISE HOME RANGES

L. Stemle et al. [2022, Journal of Herpetology 56(2):172-179] note that gopher tortoises, *Gopherus polyphemus*, which are important ecosystem engineers and a keystone species across the southeastern United States, are experiencing ongoing population declines and warrant additional habitat protection and management throughout their range. Conservation assessments for gopher tortoises are currently limited by scant knowledge of the ecology of younger age classes. The authors implemented a short-term study of immature gopher tortoise spatial ecology at Archbold Biological Station (ABS), Florida, to determine home-range size, movements, and activity levels of 3–7-yr-old tortoises. They used GPS technology to obtain high-resolution temporal tracking data (approximately 10-fold increase compared with prior studies). Despite the relatively short duration of the study (≤40 d), immature gopher tortoises (n = 6) at ABS had home-range sizes ranging from 0.38 to 1.46 ha, approximately 6.6-fold larger than previously reported annual home-range estimates. Tortoises also left their burrows more often (4.0 ± 3.2 SD times per day) and for longer duration (31.5 ± 10.6 SD min per emergence) than in studies conducted elsewhere (1.6 times and 18.8 min, respectively). These results illustrate the importance of employing new technologies to track previously difficult-to-observe life stages and improve conservation efforts for imperiled species.

MUDPUPPIES IN WESTERN NEW YORK

A. M. Haines and C. M. Pennuto [2022, Journal of Herpetology 56(3):324-335] note that although the range of the common mudpuppy, *Necturus maculosus*, is large, recent observations suggest its population is dwindling in the Great Lakes region. A lack of understanding about its distribution at a finer scale or whether diet and body condition exhibit seasonal patterns limits the ability to develop a conservation management plan. This study investigated seasonal changes in common mudpuppy diets and body condition across western New York over a 2-yr period by using rock turning (RT) and trapping (TR) collection methods. Common mudpuppies were found in all four major watersheds of the region in both lentic and lotic habitats. RT was more efficient than TR in streams, whereas TR was a better option in lakes. Male-to-female sex ratios and four of five measured morphological features did not differ between collection methods, although the largest and smallest common mudpuppies were captured by RT, suggesting some size selectivity in TR. Body girth was significantly smaller for common mudpuppies collected by RT, and this was attributed to seasonal differences in activity. Stomach contents were varied and differed by season, with 41 unique prey types recovered, including several forms of microplastics. In summer and fall, common mudpuppies fed on invertebrates exclusively, but during winter and spring, fish were incorporated into the diet. Body condition reflected the change in diet, with a higher body condition when fish were present in the diet. These findings suggest seasonal data are necessary to fully understand common mudpuppy conservation needs.

MAP TURTLE DIETS

J. Vuèenoviæand P. V. Lindeman [2021, Herpetologica 77(2): 121-127] note that *Graptemys pearlensis* and *G. gibbonsi* are sister map turtle species endemic to adjacent Gulf Coastal river drainages and both are candidates for federal listing. Little has been reported about the diet of either species. The authors examined fecal samples collected from turtles captured throughout their respective ranges in the Pearl and Pascagoula river drainages. Females of both species primarily consumed invasive Asian clams (*Corbicula* spp.), with adult females being nearly exclusively molluscivorous while juvenile females also consumed softer-bodied prey items. Adult males and unsexed juveniles primarily consumed insects; males in particular specialized on trichopteran larvae and also ate more mollusks than did unsexed juveniles. In comparisons to each species' sympatric congeneric sawback species, the two focal species' avoidance of sponges caused large interspecific differences. Due to their greater consumption of insect prey than mollusks, unsexed juvenile *G. pearlensis* and unsexed juvenile and adult male *G. gibbonsi* were slightly more similar in diet to their respective sympatric congeneric sawbacks than to conspecific large juvenile females and adult females. Scoring of similarity in diet was greatly influenced by strongly predominant prey items found within each class of each species. Future studies of interspecific dietary differences in sympatric species should include consideration of intraspecific variation in diet as it relates to body size and sexual dimorphism.

Minutes of the CHS Board Meeting, June 13, 2023

A meeting of the CHS board of directors was called to order via Zoom at 7:37 P.M. Board member Margaret Ann Paauw was absent. Caitlin Monesmith and Zorina Banas were also present. Jason Smith has assumed the duties of president and presided over the meeting. Minutes of the May 16 board meeting were read and accepted.

Officers' reports

Treasurer: Rich Crowley presented the May financial report.

Media secretary: Gabrielle Evans reported that Instagram remains our most active social media platform. Gaby will be checking into TikTok to see if it is relevant for us.

Membership secretary: Mike Dloogatch read through the list of recent nonrenewals. We are still not getting any new members signing up.

Sergeant-at-arms: Tom Mikosz reported 15 in-person attendees at the May 21 meeting.

Committee reports

Shows: Gail Oomens reported that the CHS will be showing animals at the Edgewater Greek Fest, July 8–9, at the St. Andrew Greek Orthodox Church.

Junior Herpers: Caitlin Monesmith reported that two families attended the meeting on May 21. She is prepared for the next meeting with arts & crafts, games and herp trivia questions.

The meeting adjourned at 8:23 P.M.

Respectfully submitted by recording secretary Gail Oomens

NEW CHS MEMBERS THIS MONTH

Zander E. Perelman
Luke Stevens

UPCOMING MEETINGS

Monthly meetings of the Chicago Herpetological Society begin at 2:00 P.M. on the third Sunday of each month. Please try to join us online or *in person* at the Notebaert Nature Museum, 2430 N. Cannon Drive, Chicago. The next meeting will take place on July 16. Because the June meeting was canceled at the last minute, this meeting will be the annual members' **Show & Tell**. All CHS members are encouraged to display one of their favorite animals either at the in-person meeting or via Zoom. Be prepared to give a short (under five minutes) presentation to the group. Don't be shy. Neither age (yours) nor commonness (the animal's) should be a limitation. If you wish to present via Zoom, you must notify John Archer (jarcher@chicagoherp.org) beforehand.

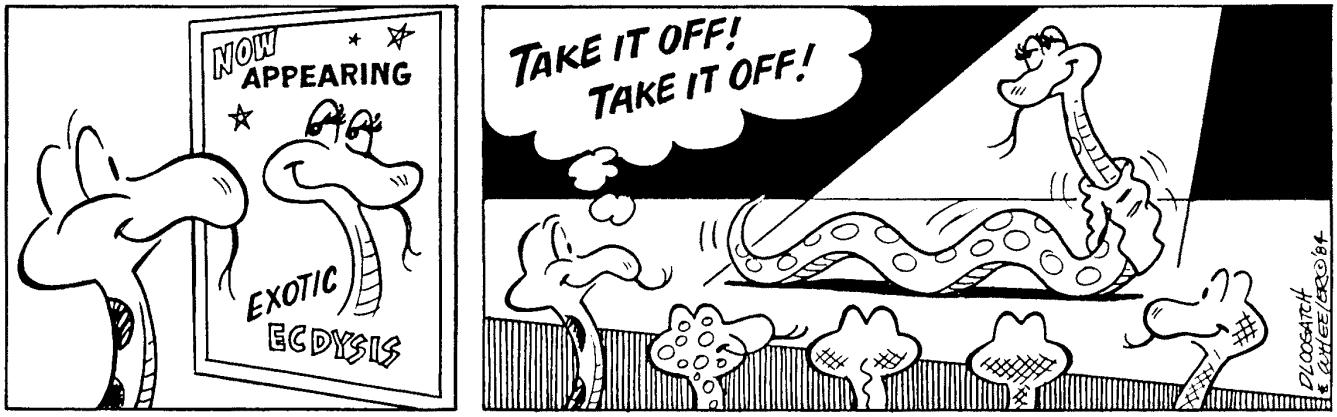
The program for the August 20 meeting has not yet been confirmed.

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: jarcher@chicagoherp.org.

THE ADVENTURES OF SPOT



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