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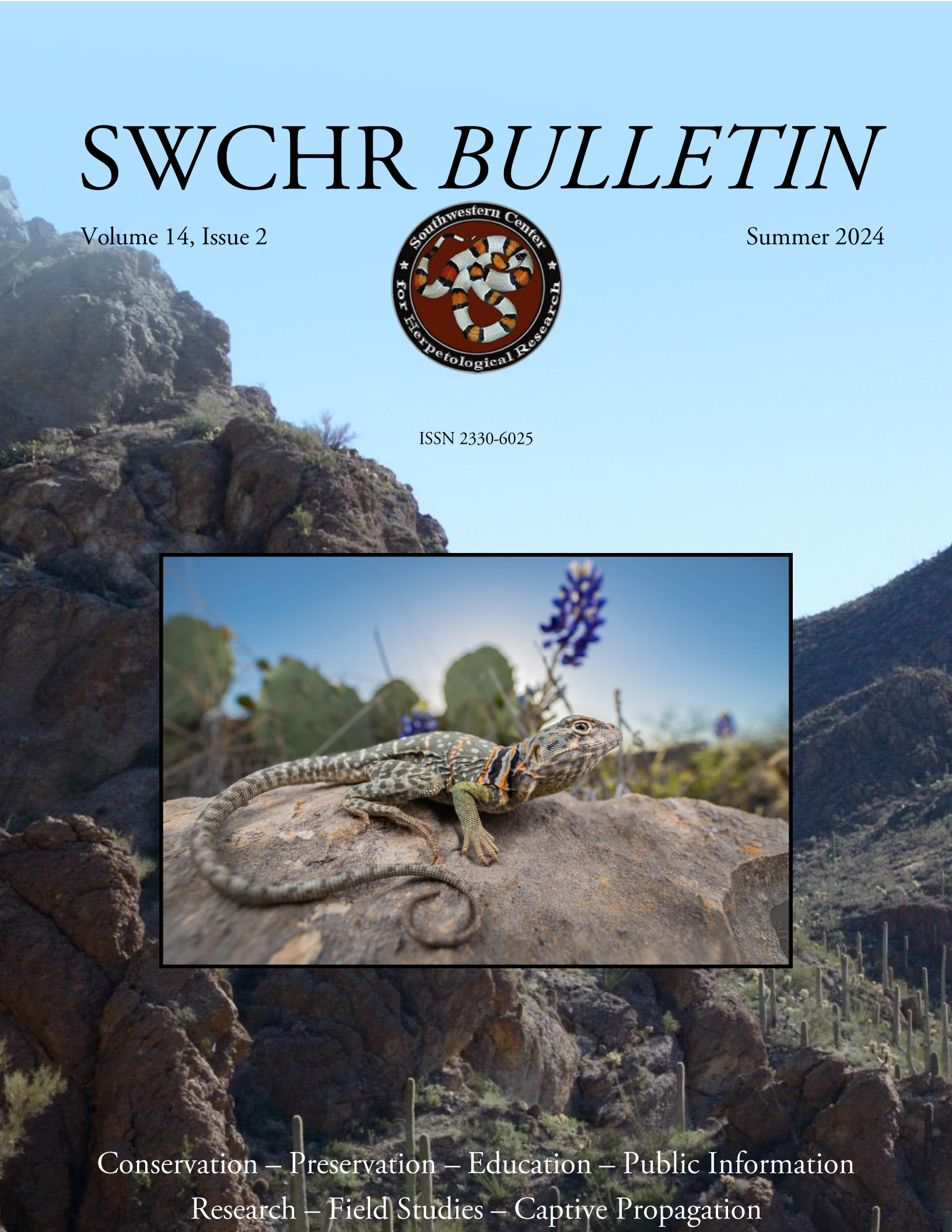

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Research – Field Studies – Captive Propagation

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OFFICERS 2023-2024

ON THE COVER: Eastern Collared Lizard (*Crotaphytus collaris*), Irion County, Texas (Francisco Portillo). With this photograph, Frank won the SWCHR 2023 *Hans F. Koenig Award for Excellence in Herpetological Photography.*

BACKGROUND IMAGE: Gates' Pass, Tucson Mountains, AZ (Bill White)

ABOUT SWCHR

Originally founded by Gerald Keown in 2007, SWCHR is a 501(c)(3) non-profit association, governed by a board of directors and dedicated to promoting education of the Association's members and the general public relating to the natural history, biology, taxonomy, conservation and preservation needs, field studies, and captive propagation of the herpetofauna indigenous to the American Southwest.

THE SWCHR LOGO

There are several versions of the SWCHR logo, all featuring the Gray-Banded Kingsnake (*Lampropeltis alterna*), a widely-recognized reptile native to the Trans-Pecos region of Texas as well as adjacent Mexico and New Mexico.

JOINING SWCHR

For information on becoming a member please visit the membership page of the SWCHR web site at
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A CALL FOR PAPERS

Are you a field herpetologist or a herpetoculturist (amateur or professional in either of those capacities) working with species native to the American Southwest? Do you have a paper or an article you have written for which you would like to find a permanent repository? Want to be assured you will always be able to share it with the world? Submit it to the SWCHR *Bulletin* for possible publication. Submitted manuscripts from SWCHR members, as well as non-members, will be considered. There are no page charges to have your articles appear in the SWCHR *Bulletin*, as some other publications now require. To the contrary, **published articles earn the author a free membership in SWCHR for the remainder of the calendar year** (or one-calendar-year extension if they're already a member).

To be accepted for publication, submissions must address herpetological species native to the American Southwest. Such topics as field notes, county checklists, range extensions, taxonomy, reproduction and breeding, diseases, snake bite and venom research, domestic breeding and maintenance, conservation issues, legal issues, etc. are all acceptable. For assistance with formatting manuscripts, contact us at the email address below.

Previously published articles or papers are acceptable, provided you still hold the copyright to the work and have the right to re-publish it. If we accept your paper or article for publication, you will still continue to be the copyright holder. If your submission has been previously published, please provide the name of the publication in which it appeared along with the date of publication. All submissions should be manually proofed in addition to being spell checked and should be submitted by email as either Microsoft Word or text documents.

Send submissions to info@southwesternherp.com.

A Message from the President

I hope everyone is well and finding themselves in the middle of an enjoyable field season. With much of the SWCHR region of interest experiencing record heat, it is important to bring enough water to drink during outdoor activities such as field herping, and plan activity/rest cycles to take advantage of cooler temperatures in the morning and evening (just like many of our target species do!).

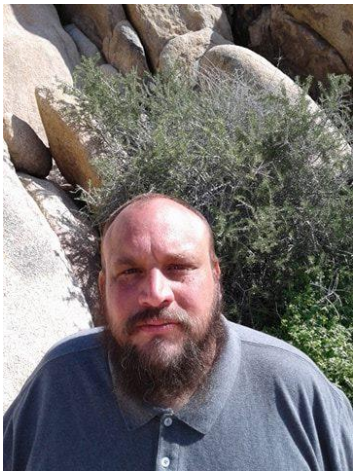
I do believe that this issue is a shining example of what SWCHR set out to accomplish with our *Bulletin* as a society that bridges amateur and professional herpetologists. In this issue you will find natural history notes that both fill in gaps to our knowledge, can be used to build further testable hypotheses, and change the way we view this world we inhabit. Along with the natural history notes in this issue, we see what avocational herpetologists can accomplish, and gain better understanding of one of the people to whom owe much gratitude. We also learn about online tools which can help us in the field.

Now on to my favorite part: being able to have the honor of introducing these amazing papers on behalf of SWCHR. We begin with an article by John Boyle and Mayra Oyervides, offering us a natural history note on a record-size Green Toad (*Anaxyrus debilis*) from the lower Rio Grande Valley. This is followed by SWCHR Vice President Gerry Salmon's commentary on a pioneer of Gray-banded Kingsnake (*Lampropeltis alterna*) husbandry. Up next we have product reviews for the OnX Hunt and Gaia mobile apps by Max Havelka and Brandon Bourassa; excellent tools to help keep you safe and legal in the field. Then we have my article describing tail bifurcation within Chuckwallas (*Sauromalus ater*) from the Western Mojave Desert. We end with another great book review by Tom Lott; this one on the second edition of *The Gray-banded Kingsnake* by Gerold and Walter Merker.

I believe that is enough of my rambling. I am excited to read further issues of the SWCHR *Bulletin* just thinking about what people may discover and build upon these natural history notes and informed articles, reflecting our passion for these "lower vertebrates." It's an exciting thought.

I will see you on the road cuts!

Robert Trumbley



A Record-Size Green Toad (*Anaxyrus debilis*) from the Rio Grande Valley, Texas (Anura: Bufonidae)

by

John Boyle and Mayra Oyervides

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mayraoyervides@hotmail.com

The Rio Grande Valley is a relatively arid environment and therefore is not immediately obvious as prime habitat for numerous amphibian species. Yet after a deluge of rain, the South Texas nights are a cacophony of unique frog calls. Many "herpers" (both recreational and professional) will travel to the valley after storms looking for certain species like *Rhinophrynus dorsalis*, the last surviving member of its family Rhinophrynidae; *Rhinella horribilis*, the giant mesoamerican cane toad; or even *Hypopachus variolosus*, the frog that sounds like a sheep. Still, despite all these charismatic anurans, sometimes an unexpected discovery can be more thrilling than what was originally sought.

Record-size Green Toad (*Anaxyrus debilis*) found in south Texas 19 June 2024. Photo by the author.

The Green Toad, *Anaxyrus debilis*, is a relatively small species of toad which is found throughout the southeastern United States and Northern Mexico. The reported maximum snout-vent length of *A. debilis* was 53 mm (Goldberg 2019). However, on 19 June 2024, at 1051 h, near Rio Grande City, Starr County, Texas, USA, a live adult female was found that measured 65 mm SVL. The length was calculated by comparing it with a reference object of known dimensions (researcher's hand). After sampling, the live specimen was released.

Record-size Green Toad (*Anaxyrus debilis*) found in south Texas 19 June 2024. Photo by the author.

Literature Cited

Goldberg, Stephen R. 2019. "Notes on Reproduction of Green Toads *Anaxyrus debilis* (Anura: Bufonidae) from New Mexico." *Sonoran Herpetologist* 32(1): 3-4.

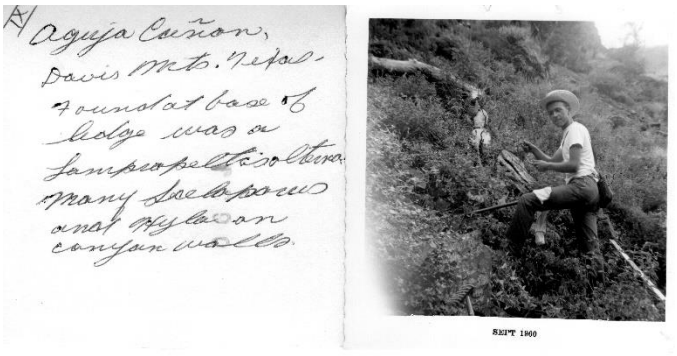
Record-size Green Toad (*Anaxyrus debilis*) found in south Texas 19 June 2024. Photo by the author.

Background on an Early Captive Gray-banded Kingsnake (*Lampropeltis alterna*) Specimen, with Modern Commentary (Serpentes: Colubridae)

by

Gerry Salmon

Recently David Barker gave me an old newsletter, "Herptile Herald," which contained an interesting article on a historic Gray-banded Kingsnake (*Lampropeltis alterna*) written by J. S. "Steve" Dobbs. Dave thought it would be of interest to me. He was right as it followed up a letter I had received from Dr. Harry Greene some twelve years prior. Steve Dobbs had written Harry and supplied some old black and white pictures from when this specimen was collected in 1960. "Herptile Herald" was a newsletter from the Southeastern Herpetological Society (formed 1969), and the group met at the Fernbank Science Center, 156 Heaton Park Drive, Atlanta, Georgia, in the 1970s. This issue was from 1975 and since it was not widely circulated, I found it worthy of a re-issue and wanted to publish it with the images that I received from Steve through Harry.



Scan of a black-and-white picture of Dave Edmonds holding a *Lampropeltis alterna* from Timber Mountain, near the Buffalo Trails Boy Scout Camp, Jeff Davis County, Texas. August 30, 1960. Left panel is notes from the back of the print. Photo by and courtesy of J. S. Dobbs.

The Dobbs article is copied below verbatim, with just a few typos corrected. Modern commentary follows.

"Notes and Observations on the Davis Mountain King Snake *Lampropeltis mexicana alterna* (Brown)"

Unfortunately, in the past, anyone concerned with the behavior of this rare reptilian form would have been sorely disappointed in this search for printed knowledge, for little is known. Perhaps no more than a few dozen specimens have been collected since the description in 1901 (Brown, Academy of Natural Sciences, Philadelphia).

Closeup of scan of black-and-white picture of Dave Edmonds holding a just collected *Lampropeltis alterna.* August 30, 1960. Photo by and courtesy of J. S. Dobbs.

This writing is to expand upon the habits of an animal of the above-mentioned species which had been in captivity for ten years. In appearance, the animal was similar in description to the type specimen, lacking only the red dorsal centers of the black crossbands.

This specimen, a male, was collected in Little Aguja Canyon, 25.4 km north of Fort Davis, Jeff Davis County, Texas. Its length was 38.1 cm. [*EDITOR'S NOTE: this measurement may be inaccurate; the snake appears larger in the accompanying photo. In addition, the subsequent measurement later in this article is smaller than this measurement. One or both of these measurements is in error.*] The

approximate elevation at which the animal was found reached 1600 meters above sea level and the date on which it had been collected was August 30, 1960, at 11:30 AM shortly before a heavy rain.

The ground temperature averaged 28.8 degrees C when the animal was found under a boulder on a talus slope at the base of the canyon walls. The plant association in the area was that of oak-cedar, with the ground concealed by a dense brush cover.

Other reptiles collected in the same locality were *Crotalus atrox*, *Salvadora grahamiae*, *Agkistrodon c. pictigaster*, *Coleonyx brevis*, *Sceloporus poinsetti*, *Sceloporus merriami merriami* and *Urosaurus ornatus schmidti*. *Bufo punctatus* and *Hyla arenicolor* were the only amphibians taken. Those amphibians mentioned were in abundance for this occurred during the rainy season in the mountains.

The captive housing arrangements for the specimen were a glass-fronted wooden cage (45.7 cm X 25.4 cm X 25.4 cm), the floor covered with some paper toweling, and containing a small cardboard box in which the snake could hide (providing the necessary security for the animal). A small water dish was added. When introduced to the cage, the kingsnake was quick to take advantage of the hiding box, where it spent most of its time while in that particular cage. The only time it would come from the mentioned box occurred at night when it would take advantage of the dark to prowl around the cage. If removed from the box and cage, it would quickly return to its hiding box when once again placed in the cage. The average temperature of the confined area was 29.4 degrees C. A dead white mouse was offered to the snake after the specimen had been acclimated for one week. This mouse was placed before the entrance of the hiding box, but the snake refused it. Ten days later, a freshly killed *Urosaurus o. schmidti* was offered in the same manner as the mouse. This food was accepted. After that meal, the specimen regularly accepted one small dead white mouse for a weekly feeding. The food was offered at dusk, and was ingested during the night. After a few months of this procedure, the *alterna* became accustomed to the routine, and would accept the mouse when it was offered on forceps. It always constricted the food before it began to ingest it.

Until the winter of 1964, the *alterna* always went off feed from the middle of December until the first week in March. Starting in 1964, the specimen fed throughout the winter, refusing an average of once in every three weeks. During its periods of ecdysis the specimen went off feed. Usually it would remain "blue" for three days, would then be clear for one day and would then shed cleanly and with no difficulty. The ecdysis if the specimen occurred every 70-80 days. While the animal remained in captivity, it grew to a length of 25.9 cm [*see previous Editor's Note*]. On June 20, 1971, the animal was placed on exhibit in the Herpetarium of the Fort Worth Zoological Park, in Fort Worth, Texas. It remained on exhibit there until I came to Atlanta, Georgia, early in 1965. At that time, it was placed in one of the reserve sections in the Reptile Building at the Atlanta Zoological Park.

The cage at the Herpetarium was one with a curved back and a screened top. Substrate consisted of pea gravel and oak leaves. A sandstone rock and a branch were used as cage dressings. In Atlanta, it was caged simply, in a square wooden cage with a glass front. The flooring was covered with newspaper, and a piece of curved cork bark provided security.

On exhibit in Fort Worth, the animal was much more active than it was at any other location. When it was inactive off exhibit, it spent most of its time loosely coiled between a water dish and a rock, which were adjacent. The average temperature was 31.1 degrees C and shedding was the same as before. At that time, the *alterna* took one large mouse or two small ones at each feeding. (However, during the last two years of its life, only one small mouse was presented at each feeding.) The average temperature in the section at Atlanta was 32.2 degrees C, and shedding remained the same as earlier.

Image of the *Lampropeltis alterna* specimen later in life. Photo courtesy of J. S. Dobbs.

In 1967, an unusual instance started its progression. Cataracts began to develop in both eyes of the specimen, and the animal was probably blind to all except light and dark by January of 1970.

This physical handicap, however, presented no noticeable problems to the animal, for it both fed and shed as before. Its movements became less, however, and it still utilized a piece of cork bark as a place to hide beneath.

Early in August of 1970, the *alterna*'s tail began to harden towards its tip. By the latter part of the month, about 10 cm of the tail had become dry and brittle (necrotic), and the animal had become inactive and unresponsive. He had gone off feed and was having difficulty with ecdysis. In addition, his neck had seemingly become quite stiff. On August 28, 1970, Howard Hunt, Curator of Reptiles at the Atlanta Zoological Park, euthanized the specimen.

The relationship of the *alterna* with *blairi*, and the entire Mexicana group is still vague and work remains to be done on this subject.

Ernest Tanzer has shown that *blairi* and *alterna* of the Mexicana group are of the same species. By hatching eggs from a single female specimen, both gradients were produced showing great diversion. The range of the two Texas varieties appears to be restricted to Texas Trans-Pecos counties and closely adjacent counties. There are also Mexican records for the species.

Image of the *Lampropeltis alterna* specimen later in life. Photo courtesy of J. S. Dobbs.

Much more field work will be necessary in addition to the observations in captivity, so that they may be correlated to give a complete picture of the aforementioned group.

Acknowledgments

David Edmonds—collector of specimen

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J. S. Dobbs, Director
Atlanta Zoological Park
Atlanta, Georgia

Commentary

The Davis Mountain Kingsnake was described by Arthur Erwin Brown in 1901 as *Ophibolus alternus*. The species went through several permutations of both the common name and scientific name to eventually become the Gray-banded Kingsnake (first use in Gehlbach and McCoy, 1965) and *Lampropeltis alterna* (since Garstka, 1982, dropping species *mexicana* from its scientific name). During the interim, narrow-banded to wide-banded ("*blairi*"), dark background colors to light, and collections in widely different habitats (limestone desert to igneous mountains) in western Texas and Mexico added to the confusion in identification. Davis Mountains-area adult specimens can be

varying shades of gray to brown. Since the holotype (ANSP 14977) the next individuals known to science that actually came from the Davis Mountains were this one, and a small road-kill from the Davis Mountains State Park (TNHC 28343) collected in 1958.

From a review of all museum or literature specimens, now considered *Lampropeltis alterna*, the Dobbs specimen was about the 12th known to science. Of these, only two remained alive for an extended amount of time following collection. The holotype was shipped from Pecos, Texas and received alive in Philadelphia in 1901, but was apparently preserved shortly thereafter. The Leo T. Murray specimen (SM 6444 from August 5, 1938) was collected alive, sent to Albert H. Wright at Cornell University, New York (received on August 23, 1938, photographed in life there) and shortly thereafter, returned to Baylor University in Waco. It may have been maintained alive until it was preserved but no available further information exists. The Hobart M. Smith 1939 specimen from Mexico (USNM 110819, HMS 11505) was euthanized and preserved at collection (Hobart Smith, pers. comm., 1998). The 1950 first living "*blairi*" specimen was collected alive and transferred to the San Antonio Zoo, where it later escaped from captivity and was not recovered (Ralph Axtell, pers. comm., 1998). There are notes in the Axtell paper on initial captive care (June 1950 to March 1951) with a growth table but its time in captivity was brief. The Dobbs account is then the first long-term account of captive care of the species.

The Dobbs specimen, from at or near the type locality (Rhoads and Salmon, 2012), is an important early captive and was kept in two US zoos for 10 years. It was one of the longest living specimens of its species during the time of its life. Given the measurement (38.1 cm = 15 inches) the specimen should be a large juvenile (second or third year?) when it was collected in late August of 1960. Although Steve states the exact measurement in his article, the specimen does appear larger (young adult?) in the picture of Dave Edmonds holding it. Steve may have used a snout to vent measurement. Considering the development of cataracts late in its seventh year in captivity, it seems a bit premature for geriatric conditions. Numerous wild collected or captive-produced *alterna* have been now maintained near to, or exceeding, 20 years of age (Salmon *et al.*, 1997) and, in my experience, cataracts are a condition seen at or about 15 years. Seasonal cooling of captive specimens may extend longevity.

Steve Dobbs also mentions the tail of this specimen becoming necrotic and falling off. No injury or a stuck shed skin is mentioned. This same condition was observed in an old captive female Black Pinesnake (*Pituophis melanoleucus lodingi*) in my care during her 27th year of life. Her tail tip became shriveled (and hardened) and this advanced over several weeks towards her vent. Her tail was surgically removed and that stopped the condition. No pathology was found (and no injury appeared to have caused it). The cause may have been from lack of blood flow to the extremity. This pinesnake also had cataracts for the last two years of her life.

Lyndon "Ardell" Mitchell, keeper at several Texas zoos, then keeper and supervisor at the Dallas Zoo Reptile House (1968-2000) said: "When Steve Dobbs' 'Davis Mountain Kingsnake' was placed on exhibit (at the Fort Worth Herpetarium), my view of native snakes shifted exponentially. This snake was discussed passionately in every Texas zoo herp building, and no others were seen for several years. I spent hours staring at it on exhibit. I remember that *alterna* very well."

This specimen was photographed on Kodachrome slide film about 1964 at the Fort Worth Zoo. In 1990, Jeffrey "Buzz" Ross allowed me to copy a slide he had of this specimen and a scan is published here. Buzz had been a keeper at the Fort Worth Zoo Herpetarium in the mid-1960s. Ironically, Buzz moved to Fort Davis from Fort Worth. I met him several times looking for snakes on the "Boy Scout Road" (near the place this *alterna* specimen was collected). The "Boy Scout Road" (RM 1832) accesses Little Aguja Canyon from State Highway 17.

Scan of Kodachrome slide of the male *Lampropeltis alterna* from near the Buffalo Trails Boy Scout Camp, Jeff Davis County, Texas. Slide photograph taken in 1964 at the Fort Worth Zoo. Photo courtesy of Jeff "Buzz" Ross.

In Gehlbach and McCoy (1965) this specimen is referenced as the FWZP (Fort Worth Zoo Park) specimen (from 16 miles north of Fort Davis, Jeff Davis County, Texas). John H. Mehrtens is acknowledged for supplying data on the live specimen at the time. It is interesting to note that John Mehrtens was Steve Dobbs' stepfather.

Unfortunately, this specimen was not preserved and placed in a museum collection after its death. Since it had good locality data and had been in an earlier published work on the species, some of the value of having it as a museum specimen has been lost. Scale counts, DNA and similar data are a benefit of preserved museum specimens.

In a subsequent letter from Steve to me in 2012, he stated that the location of collection was Timber Mountain (in the background of the picture with Dave Edmonds holding the *alterna*). Timber Mountain (elevation: 6447 ft, 1965 m) was located on the Little Aguja Mountain USGS map (sheet O30103g8) and is north of the Buffalo Trails Boy Scout Camp and Pig Pen Canyon. Steve said that Dave and he had permission to collect "pink rattlesnakes" (*Crotalus lepidus*) on the property, a species they did not find on this trip. Steve also recalled that he met Dave Edmonds from a science fair while they were both in high school in the Dallas area and that they both were interested in herps and beetles.

And what of the young man in the picture, Dave Edmonds? The young man in the picture is William David Edmonds, age 19 at the time, later a PhD in Entomology, who retired from Cal Poly, Pomona, then resided, and did field work, in Marfa, Texas from 2000 to 2016. He later moved to Portland, Oregon and last published in 2018 on Trans-Pecos dung beetles, and in 2022 on genus *Boreocanthon* (North American dung beetles). Dr. Edmonds responded to an email as this article was being completed. "I remember the pictured episode very well. Steve and I were collecting in an arroyo near the HQ of the boy scout camp and the *alterna* appeared among the rocks. We probably jumped around celebrating for a good while—it was not a snake we thought we'd ever see!"

In a follow-up communication, Dave Edmonds mentioned that he had "completed a sequel on the dung beetle genus *Melanocanthon* (2023) and is now in the midst of a third paper on a species group of Canthon closely related to these two genera. Interestingly, the distribution of one of the species in this group closely parallels that of *Lampropeltis alterna*—a fact I had not realized prior to our interaction." He added that he "collected this very species along the county road (now RM 1832) to the Boy Scout camp in August and September, 1960."

Connecting the dots in this convergence of an interesting species, pictures, letters, field work, scientific literature, zoo husbandry and friends was especially satisfying, while providing further reference material on the subject species. In my attempt to determine the identity of the "Dave Edmonds" in the picture, I sent the scan of the picture taken in 1960 in an email to a possible, and likely, subject. Not only was I pleased to have made the connection, but it turns out that Dave Edmonds had never seen the picture before. Nearly 64 years had passed between the collection of the *alterna* and receiving my email, with image attached. Steve Dobbs and Dave Edmonds had lost touch with each other about the time that Steve moved to Atlanta in 1965. Putting this information together also gave them a chance to reconnect.

Dr. Dave Edmonds on the Hip-O Ranch, near Marfa, Presidio County, Texas, early 2000s. Photo from the University of Nebraska—Lincoln website https://unsm-ento.unl.edu/workers/DEdmonds.htm and used with Dr. Edmonds' permission.

Reference material cited here can be viewed as PDFs at: https://sierraherps.com/bibliography/

Acknowledgments

I thank John S. "Steve" Dobbs, Sherri Bowers, David Edmonds, David Barker, Robert Hansen, Harry Greene, John Karges, Ardell Mitchell, Mary Finley Salmon, and Buzz Ross.

Acronyms

ANSP: Academy of Natural Sciences, Philadelphia
HMS: Hobart M. Smith
RM: Ranch to Market Road, Texas Department of Transportation designation
SM: Strecker Museum (Baylor University)
TNHC: Texas Natural History Collection (University of Texas at Austin)
USNM: United States National Museum (Smithsonian Institution)

A group of noted Texas zoo herpetologists/keepers from the 1960s-1990s. From left: Tim Jones, Ardell Mitchell, John Banks (seated), Tommy Logan, and Steve Dobbs. Image taken in 2014 and courtesy of Ardell Mitchell.

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Product Review: OnX Hunt and Gaia—Mobile GPS Apps to Help You Stay Compliant in the Field

by

Max Havelka and Brandon Bourassa

Imagine driving down a picturesque highway in New Mexico and coming across the perfect habitat for your target species. All that stands in your way is a barbed wire fence and the pervasive voice in your head reminding you that trespassing might not be the best idea. This is a common experience among all herpetologists and field herpers, but there are some convenient solutions to this dilemma. The OnX Hunt app provides up-to-date maps with layers detailing public and private land boundaries, land ownership information, topography, and more, plus an expanding suite of custom map tools to help you plan your trip and navigate in the field (Figure 1). Similarly, Gaia GPS also has available landscape jurisdictional information and supports both latitude/longitude and UTM coordinates, making this application more useful for field researchers.

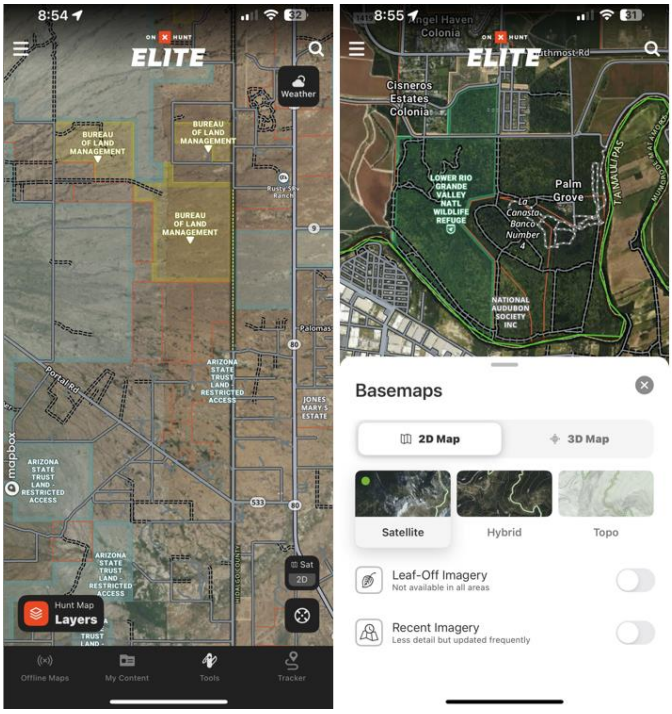

Figure 1: Screenshots of OnX Hunt illustrating boundaries of public and private land, as well as different options for basemaps and imagery. Photo by Brandon Bourassa.

While not as accurate as handheld measuring devices like the Kestrel, these apps also provide useful data like temperature, wind speed and direction, air pressure, and moon phase that might come in handy (Figure 2).

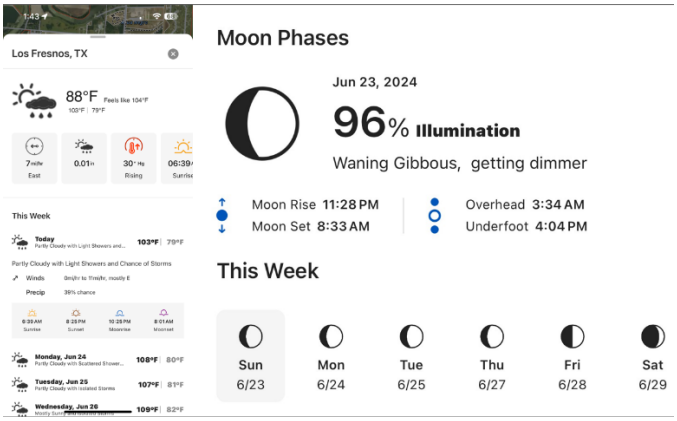

Figure 2: Screenshots of OnX Hunt showing weather conditions and moon phase information. Photo by Brandon Bourassa.

Although Gaia has labeled roads, it does not have community supported trail information like OnX. For many, this feature may not be very useful and tends to clutter the map. Gaia's maps are generally less cluttered with trail information. One button removes all menus to clear your view of the map and layers. You can easily choose from five stock map layers with the option to upload your own basemaps. Map options like the satellite topographical layer are clear and easy to read. This map layer makes navigation on and off trails easier to understand and is helpful when trying to understand what might be around the next bend or over the next rise. Downloading maps to be saved on the device to be used when out of service areas is reasonably simple and still contains necessary map information. Waypoint routing and guiding works well and can keep you on a straight path towards your destination. Gaia can also guide you along recorded tracks. Both apps provide downloadable maps for offline use, which, let's face it, is essential for most of us in the field. To help plan for whether an offline map will be necessary or not, Gaia also provides mobile coverage maps.

Gaia is most useful when it comes to recording tracks and making, sending, and uploading waypoints. You can start and stop recording tracks easily, so only necessary tracks are saved. This is especially helpful when building a new trail or route to then be sent for others to follow (Figure 3, next page). Tracks can be clearly labeled and easily searched for in the Saved Files menu. This feature is also useful for those conducting field work. You can easily record your survey tracks and save the records on other mapping applications. OnX is also useful for navigating with

waypoints, and the compass mode can be a lifesaver when trying to find your way back to camp after a long day in the field.

Figure 3: Screenshot of Gaia GPS illustrating recorded tracks from a desert tortoise survey. Photo by Max Havelka.

Like the recorded tracks, waypoints are easy to use, record, and send on Gaia. Waypoint files are easy to search for in the Saved Files menu, and waypoint customization options are available. The waypoints have room to add plenty of helpful information like notes or other relevant details. Waypoint icons can be one of the many stock icons available from Gaia or any of the many emojis from your keyboard (Figure 4). Making distinct waypoints with your custom icons makes looking over your map reasonably easy to glance at and can provide more information without having to click on individual waypoints to discover what they indicate. It is also possible to send and receive waypoints from other mapping applications, making recording and saving information reliable and useful on other GPS devices.

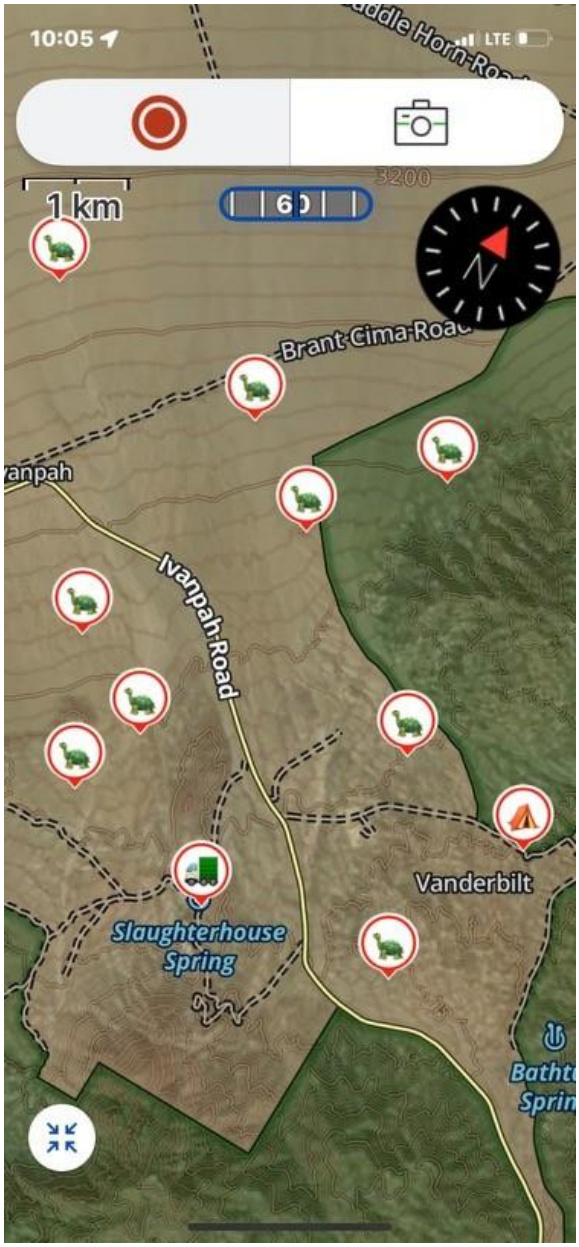

Figure 4: Gaia allows emojis to be used as waypoints, a feature that can be useful for field herpers and researchers conducting surveys. Photo by Max Havelka.

GPS applications such as OnX and Gaia are helpful tools for field research and outdoor adventure alike. It is important to remember that GPS applications on your smartphone will draw a fair amount of battery life from your device. Conventional GPS devices will last longer on a set of batteries and are easy to swap for a fresh set of batteries. For multi-day use, consider using your smartphone device in airplane mode, or bring along a portable power bank. Always be prepared and come with a backup plan just in case your preferred means of navigation lets you down, as any technology can do.

Tail Bifurcation in the Chuckwalla, *Sauromalus ater* (Lacertilia: Iguanidae)

by

Robert Twombley

Herein I document the second known example of tail bifurcation on a Chuckwalla, *Sauromalus ater* (Dumeril, 1856) from the Western Mojave Desert. Location coordinates can be obtained through iNaturalist (via the Southwestern Center For Herpetological Research and/or RASCAL projects).

Natural History

Sauromalus ater is a large lizard—the United States' second largest, surpassed only by the Gila Monster (*Heloderma suspectum*). Males can reach 230 mm snout-vent length, with typical adults ranging between 125 and 180 mm SVL. Hatchlings are 45-60 mm SVL (Jones *et al.* 2009). *S. ater* is a robust lizard, with a somewhat-flattened body and tail, and loose folds of skin on the neck and sides of body—except when it inflates its body, then it becomes round (Stebbins *et al.* 2012). Chuckwallas are habitat specialists restricted to rocky areas, hillsides, canyons, and isolated rock outcrops. For additional general information regarding *S. ater* see Beaman *et al.* (1997).

Tail bifurcation results from partial caudal autotomy, when a new tail does not grow directly in the alignment of the original tail (Arnold, in Gans and Huey [eds.] 1988). It arises from failure in the process of tail regeneration following autotomy, as opposed to conditions arising during development (Conzendy *et al.* 2013). The presence of two or even more tails generally occurs when the tail is damaged but is not completely autotomized; at this point an additional tail (or tails) begins to develop (Ananjeva and Danov 1991). The condition generally occurs at relatively low rates in wild populations (Barr *et al.* 2020; Henle and Grimm-Seyfarth 2020).

Documented caudal furcations, resulting in one or more additional tails, are generally limited to opportunistic single observations (Barr 2020). The most frequent condition in lizards is bifurcation, defined by Henle and Grimm-Seyfarth (2020) as the presence of two tails with the shorter tail splitting from a point distal to the midlength of the longer tail.Dawson,(2022). Tail bifurcation is considered common within the families Agamidae (Ananjeva and Danov 1991), Anguidae (Conzendey *et al.* 2013), Gekkonidae (Kumbar *et al.* 2011), Gymnophthalmidae (Pheasey *et al.* 2014), Teiidae (Cordes and Walker 2013; Pelegrin and Leão 2016), and Tropiduridae (Martins *et al.* 2013; Passos *et al.* 2014). However, only a few examples have been recorded in the family Iguanidae: Green Iguana, *Iguana iguana* (Lozano *et al.* 2020); Greater Earless Lizard, *Cophosaurus texanus* (Mata-Silva *et al.* 2010); the Rhinoceros Iguanas *Cyclura carinata*, *C. cychlura*, and *C. rileyi* (Hayes *et al.* 2012) and Tropical Tree Lizard, *Urosaurus bicarinatus* (Mata-Silva *et al.* 2013). This natural history observation is worth noting because of the rarity of tail bifurcation for this species. This is currently only the second case recorded; the first being Koleska *et al.* (2017).

Chuckwalla (*Sauromalus ater*) with tail tip bifurcation. Photo by the author.

Observation

My observation took place on 25 May 2024, through a visual encounter in a local population. I have been observing this population for over ten years now. This is the first time I have observed this individual, and any example of tail bifurcation from this population. After initially noticing the tail, I decided to catch the specimen and take a closer look. The tip of the original tail seems to have separated, after which the tip regenerated fully as a second tip, as pictured on the next page.

Closeup of the tail tip bifurcation. Photo by the author.

Conclusion

A Chuckwalla's tail is not easily lost, but can be detached by excessive pressure from predators attempting to pull the lizard out of its hiding spot (Stebbins 2012). Etheridge (1967) noted that juveniles of *Iguana iguana* have skeletal adaptations allowing tail autotomy, which disappear as they grow older and reach maturity. Therefore, it is presumed that for the two known examples of tail bifurcation in Chuckwallas, the specimens suffered a tail injury during an early stage of life and the tail bifurcation developed as a result. Tail breaks in Iguanidae are considered as outcomes of intraspecific aggression (Pérez-Buitrago *et al.* 2010), sexual aggression during mating (Iverson *et al.* 2004), or failed attempts of predation (Hayes *et al.* 2012). It should be noted that the area I have surveyed for the last ten years has come under more habitat destruction and collection pressure. The same small route up the granite hillside has come under more collection pressure over the last few years. This has been noted through personal observation of people collecting, talking with people, and observation of habitat destruction. I hypothesize that this specimen's injury happened at a young age, perhaps from a failed predation attempt or through a failed human collection attempt.

The behavioral and ecological effects of caudal furcations on individual lizards, and the subsequent impact on survivability, are not well understood (Dawson 2022). It has been suggested such malformations may impede locomotion (Barr *et al.* 2020; Bassett *et al.* 2021; Liang 2024); require more energy investment (Barr 2021); and restrict escape mechanisms, anti-predation tactics, and intra- and inter-specific signaling (Barr 2020). Behaviorally testing these hypotheses would be an important step in future research. Such research should include gross anatomy, as well as histology work to understand causal relationships, as Etheridge (1967) suggested concerning *Iguana iguana*. Knowledge from work with *I. iguana* can potentially be applied to S. ater and Desert iguana (*Dipsosaurus dorsalis*) tails. Furthermore, tail regeneration is of interest as a comparative model for regenerative medicine (Alibardi 2010; Delorme *et al.* 2012). Koleska (2017) believes these observations could be valuable in future research as well.

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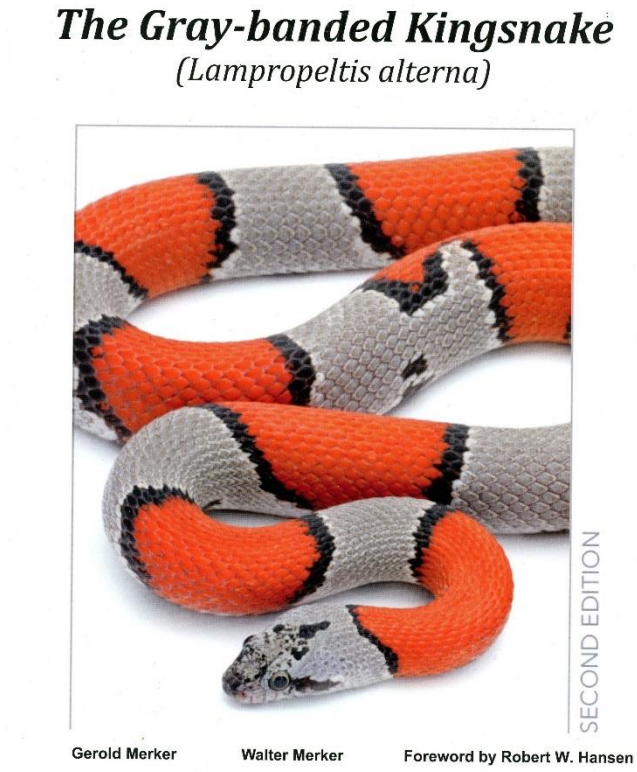

Book Review: The Gray-banded Kingsnake–Second Edition

By Gerold Merker and Walter Merker

2023, ECO Publishing: Rodeo, New Mexico
Paperback, 197 pages, numerous photos and illustrations.
Publisher's List: $29.95, Amazon: Not listed
8.5 x 11 x 0.5 inches
ISBN: 978-1-938850-43-1
E-book: Currently unavailable

Review by Tom Lott
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Whenever I review later editions of books, I attempt to point out the differences between the earlier edition(s) and the current one. In this case, however, the latest edition seems like a completely new book. Originally issued by a different publisher under a slightly different title, *Alterna: The Gray-Banded Kingsnake*, eighteen years earlier in 2005, the first edition was more-or-less a picture book full of eye-candy images but with very little explanatory text. It was in the same 8½ x 11-inch format in two dimensions, but it contained only 80 pages in a landscape orientation. The current edition contains almost 200 pages in portrait orientation, retaining the eye-candy quality but with considerably more informative text added.

The authors, a father and son team, have collectively spent decades studying the Gray-banded Kingsnake in the field and in captivity. Gerold, the father, is a retired educator and Walter, the son, is a veterinarian practicing in Tucson, Arizona. Both are California natives who made extended annual expeditions to the harsh Chihuahuan Desert habitat of *Lampropeltis alterna*. Gerold has been doing this foAr almost a half-century. Walter joined him in the 1990s.

This latest edition begins with a new foreword by Robert Hansen, the former editor of *Herpetological Review*, who probably knows more about the *mexicana-alterna* species complex than anyone. The authors' preface is slightly updated from the first edition. The acknowledgments section is much expanded and reads like a who's-who of the Grayband community, including those who lent photos or allowed photography of their specimens (I believe all of the photos in the first edition were taken by the senior author), and the many people who contributed information about various aspects of the natural history of the species.

The single-page "Characteristics" section of the original edition is expanded into a ten-page, profusely illustrated segment entitled "What is a Gray-banded Kingsnake?" which includes thumbnail shots of head pattern variation found in the various locales, followed by a two-page treatment of triad patterns associated with those locales, and concluded with a single-page of more common ventral pattern differences.

The first edition's single-page discussion of "Evolution" within the complex is updated to include Hansen and Salmon's 2017 review of the entire *mexicana-alterna* complex and the Myers *et al.* (2018) genetic examination of variation within *L. alterna*. The theories of possible mimicry influencing the patterns within *L. alterna* are discussed, but not as well illustrated as in the first edition.

The six-page "Other Species Within the *alterna* Community" section of the original edition is replaced with an 11-page, widely-spaced but detailed listing of additional herp species found within the range of the Gray-banded Kingsnake. This is followed by five pages of photos of the more common Grayband associates. A new "The Search for *alterna*" section details the actual techniques, equipment, and meteorological strategies used by Grayband hunters in their activities, including the distraction of "fake snakes" placed in likely locations by fellow hunters. Another new

chapter entitled "Predators and Prey" addresses those aspects of Grayband ecology with various new and previously published observations.

The expanded "Habitats" chapter introduces, with photos and descriptions, the extensive "locales" portion of the book. The bulk of the first edition (51/80 pages=64%) was devoted to twelve of the various "locales" associated by Grayband aficionados with particular morphs of this highly variable species. In contrast, the second edition has been expanded to include 28 locales, with the core portion of each indicated on a more detailed map of the region. Now comprising 100 out of 197 pages (51%), the locale section still makes up slightly more than half of the book. The size of the photos is reduced from the first edition to two per page, but is still quite adequate compared to the almost oversized ones in the first edition. Each section continues to feature a shot of the habitat in each locale. As with the first book, the locale accounts are arranged from west to east.

Many Grayband devotees claim they can identify the locale from which a particular specimen originated just by looking at it. I have not seen this "expertise" put to the test yet but I am skeptical. In general, however, at the Marathon Uplift, the geology changes from predominately limestone in the east to increasingly igneous in the west. Snakes from the west of the Uplift tend to be more speckled with black and with narrower orange bands. Those from the east of the uplift are less speckled and have wider orange bands. Snakes from less-collected locales are generally more highly prized than those from heavily collected areas. Snakes from unknown or mixed locales are usually deemed less valuable than those from better-known places, regardless of their attractiveness.

New chapters in the second edition include the detailed, well-illustrated, and self-explanatory topics of "Captive Care," "Naturalistic Cage Set-ups," "Captive Propagation," "Egg Care," "Neonate Care," Morphs, "Medical Concerns" (to include respiratory infections, stomatitis, mite infestations, internal parasites, ocular infections, dysecdysis [difficulty in shedding], and geriatric care). A short chapter on "Conservation" covers ecological threats to the species, most of which are deemed to be anthropogenic.

The textual portion of the new edition concludes with an expanded view of the "Alterna Culture," the almost cult-like passion of those infected. The Grayband community is truly an eclectic assemblage of varying personalities, ranging from day laborers to college professors whose defining behaviors the Merkers have faithfully described, being full-fledged members of the motley group themselves. As a disclaimer, this review is being written by a former Grayband addict with 30 years of recovery under his belt! A further disclaimer should be noted that this book was purchased and reviewed before I was aware that Gerold Merker was joining the SWCHR Board of Directors.

Finally, I will repeat that this second edition is more like a new book that contains virtually everything the average herper might wish to know about the Gray-banded Kingsnake, *Lampropeltis alterna.* Once again, I praise ECO Publishing for continuing its role as the premier publisher of not only herp books but also of history and general natural history works as well. Special appreciation goes to the editorial staff at ECO whose efforts have rendered this fine addition to the genre.

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SWCHR CODE OF ETHICS

As a member of the Southwestern Center for Herpetological Research, I subscribe to the Association's Code of Ethics.

Field activities should limit the impact on natural habitats, replacing all cover objects, not tearing apart rocks or logs and refraining from the use of gasoline or other toxic materials.

Catch and release coupled with photography and the limited take of non-protected species for personal study or breeding use is permitted. The commercial take and sale of wild-caught animals is not acceptable.

Collecting practices should respect landowner rights, including but not limited to securing permission for land entry and the packing out of all personal trash.

Captive-breeding efforts are recognized as a valid means of potentially reducing collection pressures on wild populations and are encouraged.

The release of captive animals including captive-bred animals into the wild is discouraged except under the supervision of trained professionals and in accordance with an accepted species preservation or restocking plan.

The disclosure of exact locality information on public internet forums is discouraged in most circumstances. Locality information posted on public internet forums usually should be restricted to providing the name of the county where the animal was found. When specific locality data is provided to one in confidence, it should be kept in confidence and should not be abused or shared with others without explicit permission.

Other members of the Association are always to be treated cordially and in a respectful manner.

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