
Bette Armstrong Honored With State of Texas House Resolution

by Rep. Jim Keffer

Bette Armstrong, HLCS's Member Services Officer, was honored with a State of Texas House Resolution, No. 1175, authored by Rep. Jim Keffer.

WHEREAS, Bette Armstrong moved with her husband, Jim, to Eastland in 1993 in search of a nice, quiet town in which to enjoy their retirement together, little dreaming that she would soon embrace a local legend so fully that she would become one of the community's best-known boosters and most beloved residents; and

WHEREAS, From her initial involvement as the seamstress behind the design of Lil' Rippy, a lovable stuffed horned toad doll, for a contest she read about in the newspaper, Mrs. Armstrong has continued to draw on her talent and energy to promote the tale of the renowned reptile named Old Rip, a horned toad who was buried for 31 years in the cornerstone of the Eastland Country Courthouse and emerged from the experience alive; and

WHEREAS, By creating cookie cutters, refrigerator magnets, and other horned toad memorabilia and organizing contests and events cen-

tered on Old Rip's lengthy rest and reentry into Eastland society, Mrs. Armstrong has generated renewed interest in the community's most popular tourist attraction; and

WHEREAS, Thanks in part to the generous promotional efforts and infectious enthusiasm of Mrs. Armstrong, Old Rip the Horned Toad has secured a permanent place of honor in Texas lore alongside such other celebrated Lone Star phenomena as the jackelope and the Marfa Lights; and

WHEREAS, A member of the Eastland Chamber of Commerce and the Horned Lizard Conservation Society, Mrs. Armstrong is affectionately known around Eastland as the "Toad Lady", and she has also demonstrated her commitment to the critter by sewing and donning a horned toad costume, which she has worn for numerous appearances, including a trip to the State Capitol during the 77th Legislative Session when the chamber paid tribute to Old Rip as the Most Famous Horned Toad in Texas; and

WHEREAS, This lovely lady's tireless work has elevated Old Rip's fame to heights enjoyed in bygone days when he visited President

Coolidge and appeared with Texas Governor John Connally; Mrs. Armstrong is now as closely associated with the Eastland landscape locally as her famous subject, and though she is moving to a new home, she makes take pride in knowing that her efforts have brought a smile to the faces of countless Texans and earned her the lasting respect and friendship of a great many people; now, therefore, be it

RESOLVED, That the House of Representatives of the 78th Texas Legislature hereby commend Bette Armstrong for her many good works in behalf of the story of Old Rip and Eastland County and extend to her sincere best wishes for continued happiness; and, be it further

RESOLVED, That an official copy of this resolution be prepared for Mrs. Armstrong as an expression of high regard by the Texas House of Representatives.

[H.R. No. 1175 was adopted by the House on May 23, 2003, by a non-record vote]

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How the Horned Lizard Got Its Horns

Kevin V. Young,¹ Edmund D. Brodie Jr.,¹ Edmund D. Brodie III^{2*}

Many descriptions of evolutionary adaptations are criticized as "just-so stories" (1) that are based more on intuition than on direct tests of adaptive hypotheses. The elaborate crowns of horns possessed by many species of horned lizards (genus *Phrynosoma*) are classic examples of intuitively adaptive features that lack direct tests of function. The bony horns that give horned lizards their name are presumed to function as a defense against predators (Fig. 1B). Here we present data from the wild showing that natural selection by loggerhead shrikes favors longer horns (fig. S1) in the flat-tailed horned lizard (*Phrynosoma mcalli*).

Predation is difficult to document in the wild. Some predators, however, leave behind explicit records of individual predation events that can be exploited to assay natural selection. Loggerhead shrikes (*Lanius ludovicianus*) often impale their prey onto thorns, twigs, and even barbed wire as a means of subduing their quarry (2). When shrikes attack horned lizards, they

typically spear the lizard through the neck and pull off the soft tissue. What remains is a record of the successful shrike predation attempts marked by desiccated skulls of horned lizards hanging in trees and bushes (Fig. 1A).

We quantified selection (3, 4) on relative horn lengths of flat-tailed horned lizards by comparing the skulls ($n = 29$) of shrike-killed lizards with the heads of live lizards ($n = 155$). Our results showed predation by loggerhead shrikes generated selection that favored longer parietal and squamosal horns (Fig. 1, C and D). The average parietal horn length of live horned lizards was 10.0% longer ($\bar{x} \pm SE : 9.65 \pm 0.01$ mm) than that of shrike-killed lizards (8.77 ± 0.21 mm), and the average squamosal horn length was 10.4% greater in live lizards (24.28 ± 0.21 mm) than in those killed by shrikes (21.99 ± 0.49 mm). Visualization of the selection function indicates that both traits experience positive directional selection with threshold lengths above which predation is rare or absent. Standardized selection gradients

[measured in standard deviation units (3)] suggest that selection is stronger on the length of squamosal ($\beta' = 0.0945$; $P = 0.007$) than on the length of parietal horns ($\beta' = 0.0549$; $P = 0.055$). These magnitudes of selection are less than the median observed in most selection studies ($\beta' = 0.15$) (5) but nonetheless indicate that constant selection with moderate heritability (0.5) of horn length would change squamosal and parietal horn lengths a full standard deviation in 21 and 36 generations, respectively.

Modern methods for analyzing natural selection have increased our understanding of which traits experience selection (6). These methods, however, typically cannot identify agents of selection or reveal the functional relations that result in natural selection (3). Even most classic data sets demonstrating selection in the wild, including Bumpus's sparrows (7) and Lande and Arnold's pentatomid bugs (8), did not reveal the agents responsible for the observed patterns of survival. Our results present a rare opportunity to link the statistical form of selection to an identifiable agent, in this case predation by shrikes. Our study does not show that other agents and forms of selection do not play a role in the evolution of horn size, but clearly illustrates that defense against shrike predation is one factor driving the radical elongation of horns in some species of horned lizards.

References and Notes

1. R. Kipling, *Just So Stories* (Doubleday, New York, 1902).
2. R. Yosef, *Evol. Ecol.* **6**, 527 (1992).
3. E. D. Brodie III, A. J. Moore, F. J. Janzen, *Trends Ecol. Evol.* **10**, 313 (1995).
4. Materials and methods are available as supplemental material on Science Online.
5. J. M. Hoekstra et al., *Proc. Natl. Acad. Sci. U.S.A.* **98**, 9157 (2001).
6. J. G. Kingsolver et al., *Am. Nat.* **157**, 245 (2001).
7. H. C. Bumpus, *Biol. Lect. Woods Hole Mar. Biol. Sta.* **6**, 209 (1899).
8. R. Lande, S. J. Arnold, *Evolution* **37**, 1210 (1983).
9. Funded by the Department of Defense Legacy Resource Management Program through the U.S. Marine Corps, Marine Corps Air Station, Yuma, and administered by the Southwest Division Naval Facilities Engineering Command, Natural Resources Branch, and by the Bureau of Reclamation. Fieldwork was facilitated by P. Cutler, W. Fisher, B. Morrill, R. Palmer, R. Pearce, and A. Young.

Supporting Online Material

www.sciencemag.org/cgi/content/full/304/5667/65/DC1
Materials and Methods

SOM Text

Fig. S1

References

17 December 2003; accepted 11 February 2004

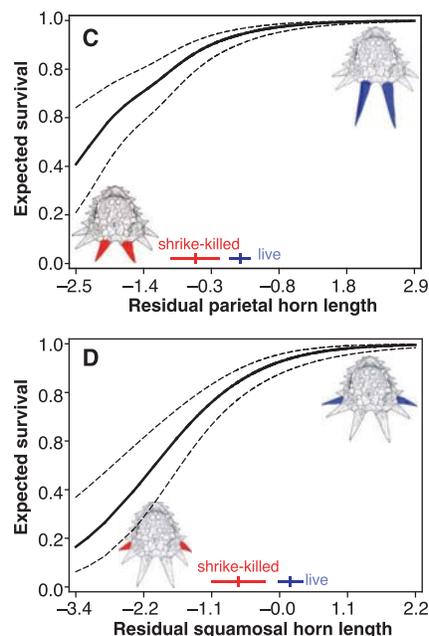


Fig. 1. (A) Flat-tailed horned lizard skull and dorsal skin impaled on a branch. [Photo, E. D. Brodie Jr.] (B) Live flat-tailed horned lizard in defensive posture. [Photo, K. V. Young] The live lizard in this photo had unhealed wounds anterior to the rear legs, consistent with an unsuccessful attack by a predator. Selection surfaces showing relations between survival probability and (C) relative parietal horn length and (D) relative squamosal horn length. Bars show means and 95% confidence intervals for shrike-killed and live lizards.

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Submitted Photos



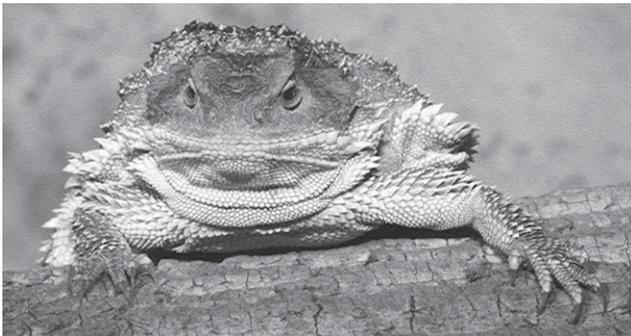
Desert Horned Lizard photo by Scott Messec

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Short Horned Lizard photo by James Edwards



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Recent Phrynosoma Publications

Fisher, R. N., A. V. Suarez, and T. J. Case (2002). "Spatial patterns in the abundance of the coastal horned lizard." Conservation Biology 16(1): 205-215.

Hernandez-Ibarra, X. and A. Ramirez-Bautista (2002). "Reproductive characteristics of the roundtail horned lizard, *Phrynosoma modestum* (Phrynosomatidae), from the Chihuahuan Desert of Mexico." Southwestern Naturalist 47(1): 138-141.

Powell, G. L., A. P. Russell, and M. J. Ryan (2002). "Ontogenetic scaling of the cranial horn array in *Phrynosoma orbiculare* (Squamata : Phrynosomatidae)." Journal of Herpetology 36(4): 578-589.

Henke, S. E. (2003). "Baseline survey of Texas horned lizards, *Phrynosoma cornutum*, in Texas." Southwestern Naturalist 48(2): 278-282.

Menke, S. B. (2003). "Lizard community structure across a grassland - creosote bush ecotone in the Chihuahuan Desert." Canadian Journal of Zoology-Revue Canadienne De Zoologie 81(11): 1829-1838.

McIntyre, N. E. (2003). "Effects of conservation reserve program seeding regime on harvester ants (*Pogonomyrmex*), with implications for the threatened Texas horned lizard (*Phrynosoma cornutum*)." Southwestern Naturalist 48(2): 274-277.

Montgomery, C. E. and S. P. Mackessy (2003). "Natural history of the Texas horned lizard, *Phrynosoma cornutum* (Phrynosomatidae), in southeastern Colorado." Southwestern Naturalist 48(1): 111-118.

Montgomery, C. E., S. P. MacKessy, and J. C. Moore (2003). "Body size variation in the Texas Horned Lizard, *Phrynosoma cornutum*, from Central Mexico to Colorado." Journal of Herpetology 37(3): 550-553.

Wone, B. and B. Beauchamp (2003). "Movement, Home Range, and Activity Patterns of the Horned Lizard, *Phrynosoma mcallii*." Journal of Herpetology 37(4): 679-686.

Montanucci, R. R. (2004). "Geographic variation in *Phrynosoma coronatum* (Lacertilia, Phrynosomatidae): Further evidence for a Peninsular Archipelago." Herpetologica 60(1): 117-139.

Young, K. V., E.D. Brodie Jr., and E. D. Brodie III (2004). "How the horned lizard got its horns." Science 304(5667): 65.

Wanted: *Phrynosomatics* Editor

This is my last newsletter as *Phrynosomatics* editor. The newsletter editor contacts people for material and puts together the newsletter electronically four times each year. Additional material comes through the mail and is converted to electronic form. The society provides software, but you will need to have your own hardware (like a computer, printer, scanner and internet connection). The newsletter is printed in Austin, Texas, and mailed out through a local mailing service.

If you have the skills and time to help us out, we really need you! If you are interested in the editor position, please contact the HLCS President, Wendy Hodges at wendyh@ucr.edu.

Upcoming Events & Chapter News

Texas Chapter

Texas Chapter is having an election and the nomination forms are in the mail. Nomination positions are for Texas Chapter President, Treasurer and Secretary. If you are a Texas Chapter member and have not received your nomination form, contact: Bill Brooks (512) 581-0377
E-mail: Bgbrooks@mail.utexas.edu

Horned Toad Festival
August 7, 2004 - near Amarillo, Texas
Wild Cat Bluff Nature Center
Contact Bill Brooks - (512) 581-0377
E-mail: Bgbrooks@mail.utexas.edu
<http://www.wildcatbluff.org>

First Annual Austin's Captive Breeder and Amphibian Sale and Expo
August 28 & 29, 2004- Round Rock, Texas
Wingate Inn and Conference Center
Contact Bill Brooks - (512) 581-0377
E-mail: Bgbrooks@mail.utexas.edu
www.carlscreepycrawlies.com/AustinExpo.html

The 3rd annual Horned Toad Fun Day
September 4, 2004 - Kenedy, Texas
Activities include horned lizard surveys.
Contact Wade Phelps or Bill Brooks
Wade's E-mail: dentalworks@awesomenet.net
Bill's E-mail: Bgbrooks@mail.utexas.edu

Texas HLCS Meeting & Horned Lizard Festival
September 11, 2004 - Austin, TX
Hornsby Bend Center for Environmental Research
2210 South FM 973, Austin, Texas 78725
Contact Bill Brooks - (512) 581-0377
E-mail: Bgbrooks@mail.utexas.edu

Texas Parks and Wildlife Expo 2004
October 2 & 3, 2004 - Austin, Texas
Booth sitters needed.
Contact Bill Brooks - (512) 581-0377
E-mail: Bgbrooks@mail.utexas.edu
<http://www.tpwd.state.tx.us/expo/>

New Mexico Chapter

The World Famous Lizard Races
July 4, 2004 - Lovington, New Mexico
Contact Lovington Chamber of Commerce
Phone: (505) 396-5311
<http://www.lovington.net/>

Old Timers Day Rodeo and Fiesta
July 9-11, 2004 - Magdalena, New Mexico
Horned lizard survey on Monday, July 12th.
Directions: Magdalena is on highway 60, just SW of central New Mexico. It is 30 miles west of Socorro and I-25.
Contact Tom McCain
Phone: (800) 667-5574
E-mail: htinc@juno.com

In September 2003, Brad Case, a Magdalena, New Mexico resident at the time, sent Tom McCain, president of the New Mexico Chapter of the HLCS, pictures of the Short-Horned Lizards (*Phrynosoma hernandesii*) he was seeing around his home, Tom was really surprised because the pictures showed what obviously appeared to be average short-horned lizards but they had TWO rows of fringe scales! One of the characteristics of this species is that it only has a single row of fringe scales, not two. Brad's pictures not only showed both male and female lizards with two rows of fringe scales, but in another picture, they seem to be mating belly to belly, an unusual posture for lizards. Tom discussed this with Dr. Wade Sherbrooke who advised him that this abnormality should be studied further and verified at a population level.

Attwater's Prairie Chicken Festival Trip Report

by Bill Brooks

On April the 4th, I left Bastrop and approached the Attwater Prairie Chicken National Wildlife Refuge from the West. Ruthann Panipinto approached the Refuge from the East. We met at the "Booming and Blooming" Festival, which is located one and a half hours west of Houston. This is the second year I have attended this festival and both years, this early April Fest was held amidst a colorful backdrop of Texas wildflowers. The drive to the refuge as well as the refuge itself was awash with Texas's finest spring display. Highway 71, as it approached I-10 was covered with bluebonnets. The fields of blue along the highways and in the protected prairie of the refuge were dotted with purple winecups, pink Drummond Phlox, verbena, paintbrush, and Indian Blanket. I was especially happy to see two of my old favorites, the white spider-lily in ditches along the roadside and the sky blue celestial wild iris growing in the park.

For a break in our booth sitting, Ruthann went out on a van tour to see the Prairie Chickens. She was the first one in the van to spot them. They saw four of the 50 or so birds loose on the refuge. The males were jumping up and down, stomping their feet, making their funny "booming" sound and inflating their bright red throat sacks, as males are apt to do for the females this time of the year. It was quite a sight.

Once again, the staff of the refuge was friendly, helpful and a joy to be around. Special thanks and congratulations go out to Sarah Schroeder, the intern in charge of this year's festival. We also had the good fortune to run into HLCS member and Texas Parks & Wildlife employee, Lee Ann Linam, who gave a talk on maintaining the prairie grasslands. (I learned while I was there that her dad was the first director of the Prairie Chicken Refuge.)

I'm sorry more of you couldn't attend. The audience at my talk was attentive, the visitors were friendly and interested in our horned lizards and the scenery was outstanding.



*Dig this:
We live here too!*

New Texas Chapter Bumper Sticker:

The new Texas Chapter bumper sticker is available for \$2. To purchase, contact Bill Brooks at the information listed on page 2. Designed by Ruthann Panipinto.

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