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**A Better way to Mark Lizards for Subsequent Re-identification**

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**BACKGROUND:**

Toe-clipping, as a means to mark reptiles for population studies has been practiced for decades by herpetologist. In today's information age, it has possibly become archaic. Brushing aside its possible compromising effects to individual animals, toe-clipping is neither fool proof nor very sophisticated. While it is unlikely that horned lizards, for example, of the same sex, relative size and coloration would be encountered in proximity of one another with an identical clipped toe configuration, one must not rule out the possibility of a previously unstudied lizard missing the corresponding toe due to natural causes showing up unexpectedly. Even less likely is the possibility of a purposefully marked individual--which is the subject of another scientist's investigation--wandering onto a study plot, or the possibility of the subject scientist encountering a recently released reptile coincidentally missing a particular digit. It has been documented that horned lizards, in particular roam quite a bit as compared to other small lizards which seem to be more territorial. (Fair & Henke<sup>1</sup>, Hodges, etc.). Often, looking at toes through field binoculars is difficult anyway, since sand usually covers one or more appendages on a given foot--requiring closer examination, in any event. Assuming the lizard can and will be captured anyway for weighing and measuring, and/or the extraction of blood, it would seem that a more reliable means of positive identification would be welcomed.

The insertion of fish line at the base of the tail to anchor colored beads has been suggested as an acceptable alternative<sup>2</sup>, but strikes the writer as being unnecessary, as well as, potentially even more compromising to the reptile than toe-clipping. There have been reports of horned lizards getting hung up in dense vegetation (Brown<sup>3</sup>) by their harnesses for transmitters, thus the suspicion is that beads and fish line could do likewise.

Invasive practices facilitating the insertion of foreign objects, such as, computer chips and transmitters, are yet another modality in the recited list of unnecessary methods for locating and identifying lizards. Just because *super glue* so far has been found to be adequate to close a wound (Milroy<sup>4</sup>) to allow proper healing, it is difficult to assess the trauma to the subject both during and after such a surgery. Resultant stress and discomfort have not been scientifically measured to date for any of the above-named practices; therefore sensitive researchers should be aware of alternatives which not only do not expose the defenseless little *Phrynosoma* to such potential dangers. To some, these aforementioned practices further would seem to border on the inhumane, particularly in light of more sophisticated options being available which are unaccompanied by any of the aforesaid risks.

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<sup>1</sup> Journal of Herpetology, 1999, Vol. 33, No. 4. pp.- 517-522. Inference from data in "Phrynosoma mcallii Occurrence in Arizona", AUG 1995, Univ. of Texas at Austin ( and related works by Wendy Hodges concerning the Flat-tailed Horned Lizard).

<sup>2</sup> "A Technique for Permanently Marking Lizards" M. Fisher and A. Mouth, Herpetological Review, 1989, 20 (2), pp. 45-46.

<sup>3</sup> Doctoral dissertation

<sup>4</sup> Personal telephone conversation 5 SEP 2000.

Three simple, practical, and harmless methods are proposed herein, namely:

**1) Digitalization.** Most horned lizards have some sort of spotted markings on the underbelly (flecking). These ventral patterns are unique. (Exhibits I-XII set forth ample evidence of this conclusion..) At the same time, such patterns have the advantage of being somewhat simpler in their array and configuration, than human fingerprints, for example. Thus, while they can be scanned, digitized and decoded electronically much as any retailer's optical reader unscrambles the milieu of bar codes affixed to purchased items, an inexpensive technology may be employed to interpret them. Recalling how John James Audubon drew his marvelous birds, a simple standardized grid may be overlaid on any photograph or scan to consistently give the viewer the proper proportions, and then the flecks or markings may be categorized by shape and color and their density recorded within each square. The result is to provide the scientist with a much broader numbering scheme for his specimens than any combination of clipped toes would afford.

"Cookie Cutter" outlines of horned lizards cut into Styrofoam can be utilized, or other artificial padding thick enough to protect the lizard from the weight of the lid of either the photocopy machine or computer scanner lid. Various sized cut-outs will accommodate different species, immobilizing them in the process. (See primitive examples brought for display.) Care should be taken to immediately remove the subject lizard from its confinement and to replace it in more comfortable surroundings. Also, one needs to carefully monitor the equipment (especially in the case of a normal photocopy machine which may become rather heated after much repetition). Different thickness of cardboard or synthetic packing material may be achieved by laminating the desired amount into stacks.

**2) Photography.** There is no substitute for knowing your horned lizards so that you can easily recognize them on sight. Diane Fossey was able to do this by hand drawing prominent features of Gorilla noses from pictures taken through a telephoto lens. The back patterns of horned lizards, coupled with scale array within them, horn structure, morphological imperfections, and other subtle distinctions with practice allow one to easily recognize and distinguish a couple dozen subjects without any problem. (Refer to "Designer Horny Toads", © R. Joseph Collet, August 2000). Most obviously, the color, sex and relative size of each individual will continue to be the first clues in identifying any specimen. In the photographs provided note the individual aberrations such as a double scale on Carmen's back within the upper right circular marking, the turned up (extensions of the parietal bone) horns on Okii's head, the "fused vertebrae" look of "Isabel's" spine, or the distinctive gray and white pattern to Weiss's dorsal markings. These and many other distinctive features will aid the researcher to recognize his horned lizards without having to resort to undesirable practices.

**3) Food-coloring as dye.** Diluted to about 50% strength, it will still withstand a fair amount of precipitation before needing to be re-administered, and possibly more than one shedding. Full strength seems to be equally harmless and obviously lasts longer. The tip of the tail (so that there is no risk to genitalia) is merely dipped into the solution which becomes even more evident on the contrasting, whitish, ventral side of the lizard. If necessary a foot or feet, additionally, may be colored, or alternatively, to the tail. Witness the live hatchlings brought to aid in this presentation for convincing proof of the effectiveness of this simple technique.

In conclusion, it is easy to appreciate that the aids discussed herein are much less obtrusive than sewn-on beads, and will not encumber the lizard (such as harnesses will) when negotiating shrubs and undergrowth. It is extremely doubtful whether a tiny amount of artificial coloration will either betray the reptiles ability to camouflage itself, or subject it to any chemical harm. It will be interesting to see, however, if certain coloration additives may actually help it to attract mates. More experimentation is required to prove the longer term viability of these alternatives, but the concrete examples afforded capably illustrate the advantages to both the lizard(s) and the researcher.

A separate discussion is presented on outdoor enclosures both as a healthy aid to husbandry, and as a positive way to facilitate sighting of subjects under study without the necessity of affixing transmitters.

### **EXPERIMENT DESIGN:**

To see if horned lizards could be committed to memory efficiently by focusing on, and recording of, certain prominent morphological features, or employing the use of artificial enhancements. Lizards were belly-scanned, photographed dorsally, and some member(s) of their bodies were dyed to obviate invasive alternatives, and to facilitate subsequent recognition.. Both dyed and undyed adults and sub-adults were released into an outdoor enclosure and monitored. Hatchlings were confined to indoor terraria and consequently were not exposed to rain or irrigation.. Most of the latter were partially dyed at the outset of the experiment.

### **EQUIPMENT UTILIZED:**

3 Pentium II computers running at 75, 90 and 135 MHz, respectively.

Epson GT-9000 color image scanner.

Epson Stylus color printer.

Software: Corel Draw (III), Microsoft Word (6.0) , Publisher (2.0) and Adobe Illustrator running under a Windows, Windows 95 and Windows 98 environment, respectively.

Paper: A-4 transparencies  
HP Professional Brochure & Flyer Paper  
Epson Photo Quality Glossy Paper  
Epson 720 dpi High Quality Ink Jet Paper

Minolta 35mm still camera, doubler lens and 1x and 2x lenses. A navy blue background was best for photographing lizards, dorsally. Natural light diffused (while underneath shady overhang ).

Sony *Video 8 Handycam* 64x zoom. Epson and Kodak 100 and 200 film for color prints.

Schilling Assorted Food Colors & Egg Dye , 4 vials of 0.25 Fl. Oz. (McCormick & Co., Inc.)

### **RESULTS:**

Food coloring persisted until shedding after which it was re-administered.

Positive identification was possible every time from dyeing operation, instantaneously.

After some initial getting accustomed (with few exceptions), all undyed adults were also quickly recognized merely by general size and coloration.

An excellent resolution was obtained when conducting belly scans in black and white as a photographic mode. A setting of 320 resulted in files of less than 144 Mb even in “.tif” format.

A good catalogue of visual reference material was assembled for each specimen.

The science of “fleckology” has been coined.

It was interesting to note how hatchling and juvenile fleck configurations seem to expand proportionately throughout growth development.

## **OBSERVATIONS:**

Still photography could be improved with the use of a tripod and possible artificial lighting

Cataloguing possibilities could be further enhanced by scanning in a color mode with even higher resolution.

Color scans made with similar resolution settings to the black and white scans did not come out nearly as sharp. While the different colors made it relatively easier to “clean-up”/touch-up the photos, much detail was lost even if printed in a monochrome mode. (Refer to “Greentail” *P.platyrhinos* exhibits.)

The Corel Photo Paint software allowed the writer to invert pictures, but the result was a m i r r o r image of the living animal. It is, therefore, better to scan with the horned lizard’s head facing toward the hinge of the scanner lid to avoid the mirror image look which occurs upon converting the picture to a 180° turn around. Nevertheless, the resultant pictures are useful to illustrate the possibilities of employing “fleckology” to the identification process.

Filtering of “.tif” files to “.jpeg” files could result in further economies for data storage while facilitating the subsequent transmission of photos via the INTERNET. For print publication it is suggested that “.jpeg” not be utilized as fewer pixels per square inch are subject to interpretation.

Early signs of sexuality may also be forthcoming as hatchling belly scans are closely scrutinized more easily with the aid of enlargements.

Sometimes the lizards wiggled during scanning. A more exact “footprint” of their respective shapes could be employed to minimize this occurrence. Also, faster scanning might be a possibility.

More samples are still required to refine the science of “fleckology”.