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Hydration (H_2O) Therapy for *Phrynosoma*

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ABSTRACT:

Water is assumed to be assimilated primarily from the insect prey upon which the xeric species feed, and secondarily, and irregularly from "rain harvesting" as discussed by Dr. Sherbrooke and observed by others. How much water is good? How much is too much and how little is not enough on a species by species basis?

Dozens of *Phrynosoma platyrhinos* during the course of preparation of this paper (1998-2000) have been "rescued" from busy thoroughfares and property about to be developed, or temporarily transported home for closer observation. In addition the writer has had experience with three other species (i.e., *P. cornutum, hernandesi,* and *mcallii*), but more species need to be examined.

An experiment was designed to test water needs of several captive species. Not surprising, *P. hernandesi* relocated to the St. George altitude seemed to require more water than did the other species. Next in its ability to drink as a percentage of body weight appeared to be the hatchling *cornutum* followed by the *platyrhinos* (all ages) and finally the *mcallii*. Evidently, the species obtained from the higher altitudes progressively were able to obtain more water from sources alternative to prey, and may have built up a dependence upon it. A table in the discussion portion reflects these amounts and percentages. It is interesting to note that the subject *hernandesi* were collected at 8000', the *cornutum* came from 4800', the *platyrhinos* (mostly around St. George) from between 2000' - 3000' and the *mcallii* from about 200'-300' above sea level. It will be interesting to correlate the tabular information with precipitation levels for each native area to formulate a hypothesis for wild individuals.

In the case of new captives dehydration and malnutrition seemed to go hand in hand, particularly for two *P. platyrhinos* captured during an expedition to Arizona (Yucca and Wickenburg areas, respectively). Appetites at the outset of captivity for these two were poor when compared to native caught *P. platyrhinos*. After rehydration both individuals resumed a healthier appetite and the large female gained about 25% of original body weight in 10 days time. Characteristically, it was likewise found that with *platyrhinos* hatchlings kept in indoor terraria, regular artificial rehydration stimulated appetite and was essential in order to foment growth and physical activity. In the case *of P. hernandesi* the writer attributes his recent success with their husbandry to the fact that each lizard is allowed to drink liberally from a hypodermic syringe every 2 - 3 days.

Lizards kept outdoors in a somewhat natural enclosure, although observed regularly lapping up water from the effects of sprinkler irrigation, readily accepted additional water from syringes, etc., when brought indoors for periodic weighing and measuring. Other factors need to be more closely monitored with wild individuals to be able to prove the aforestated tentative conclusions. Factors may include mean

temperature, reproductive activity and food availability. And, based on the work conducted thus far, one must keep in mind the differences in individual species and the biophysical surroundings in which they are temporarily placed, contrasted with natural habitats.

In conclusion, whether the scientist maintains his or her specimens in an outdoor or indoor setting,, it is very important to see that water is not only readily available, but that water intake is monitored conscientiously.

FOREWORD:

Far too many horned lizards succumb to the ill effects of improper maintenance by hobbyists and students alike. The writer theorized that a handbook on *Phrynosoma* husbandry would be useful to the amateur and scientist, as well as appreciated by throngs of horned lizards suffering from confinement. Water is essential for all living organisms in one measure or another. Designed as a draft of an important later chapter, and as a publication of some preliminary studies in the area of hydration, this paper's direction is to stress the importance of water to horned lizards, particularly in captivity.

STATEMENT OF HYPOTHESIS:

Hydration may be used as an effective therapy when applied in a conscientiously applied program of nutrition and regular monitorization.

EXPERIMENT DESIGN:

Some 35 horned lizards representing three species of *Phrynosoma* were already being monitored daily, and weighed and measured at least once a month pursuant to another experiment[1] conducted by the writer. Random representatives of each species taken from an outdoor enclosure (600+ square feet), were weighed more frequently and offered water from a syringe[2] every few days. An accompanying table sets forth relevant data. Additionally, some hatchling and juvenile *P. platyrhinos* and *hernandesi* with one hibernation or less were maintained in indoor terraria (20 gallon to 60 gallon glass tanks) with the usual heat and sun lamps to artificially illuminate, etc. Filtered tap water was utilized from which chlorine and other impurities were removed, and allowed to stand at room temperature until it was no longer noticeably colder than the surrounding air.

[1] "Nutritional Aspects & Prey Preference Interplay Observed in 4 species of Horned Lizards"

[2] One cubic centimeter ("cc") of water weighs one gram.

ADDITIONAL DISCUSSION:

It was assumed that the *hernandesi* coming from higher altitudes with greater precipitation, hence humidity, would require the most water. It was likewise imagined that as the altitude progressively declined (where each of the subject species was captured) the dependence upon artificial means of hydration would commensurately decline in view of the usual theories of genetic adaptation. However, what this experiment did not have the luxury to examine was a precise formula concerning how much water is needed to match the precipitation regimes in each ecosystem. Neither has a formula been developed subsequently to take into account body weight, age and other factors of the individuals examined. Rather the scope was merely to see if water in whatever quantities might serve as a stimulus to one or more other behaviors, particularly as an inducement to eat. An affirmative answer was unveiled after much close observation. Percentages of water intake to body weight before hydration were precisely measured and appear in tabular form in the appendices.

METHODS of HYDRATION:

This varied for each species and age group. *P. hernandesi* juveniles would perch patiently on the writer's thumb of his left hand and readily drink from a hypodermic syringe almost as soon as they sensed the water unless not enough time had elapse since the last such administration. Intervals of three to four days or more induced more responsiveness than did daily attempts. *P. platyrhinos* hatchlings often were more squirmy at first and had to be gently confined within the writer's fist with only the head protruding. When they would not drink as readily as the *hernandesi*, a tiny droplet of water would be placed over each nostril[3]. As soon as they opened their mouths to breath they apparently tasted (or at least sensed) the water, sometimes initially taking it in through the nostrils simultaneously, followed by voluntary gulps of dozens of additional droplets from the syringe itself. At times the same nostril covering procedure was necessary to prompt drinking by the *hernandesi*, but as often as not a mere droplet placed on the forehead or on the rostrum would trigger the desired reaction. Each young horned lizard was allowed to drink until it lost interest, sometimes taking up to 10 minutes of gently squeezing out water from the syringe until the lizard ceased to swallow. Its face would then be dried on a cotton T-shirt and the lizard was immediately reweighed and returned to its cage. Visual cues given by the lizards that they wanted no more water included suddenly backing away from the syringe, attempting to scamper off, and flicking the water from its face when unconfined, and wriggling determinedly when gently confined.

Adult *P. cornutum* and *platyrhinos* were watered automatically in their outdoor enclosure almost daily during the high point of the summer by turning on a rainbird sprinkler (See separate paper entitled "An Experimental Outdoor Enclosure for Horned Lizards" for further description) for 5-10 minutes in the middle of the afternoon when temperatures were in the high 90s or exceeded 100º Fahrenheit. At times various individuals were seen to lap water from stony surfaces, or "rain harvest[4]", lick leaves or even attempt to extract moisture from wet sand. Curiously, not once did any of them approach a larger pool (6" x 18") of water that was reconstituted each time the sprinklers were turned on and remained for only 10-15 minutes after they were shut off. However, one particular female *P. cornutum* when placed in the pool stood up to her knees and drank some water before scampering off. Periodically, both species were brought indoors temporarily and offered water from a syringe. The *cornutum* generally were more

[3] This trick was discovered by the writer on his own who was later delighted that the practice was already confirmed by Montanucci as a useful and apparently harmless method to induce drinking. ("Maintenance and propagation of Horned Lizards (Phrynosoma) in Captivity", 1989, Bulletin of the Chicago Herpetological Society 24(12): 229-238.

[4] Coined by Wade C. Sherbrooke, "Rain-harvesting in the Lizard, *Phrynosoma cornutum*: Behavior and Integumental Morphology," 1990, Journal of Herpetology 24(3):302-308

visible and observed to be more aggressively drinking during the outdoor sprinkler bouts whilst the *platyrhinos* adults usually seemed content to lie spread eagle on a stepping stone and merely soak up the moisture. Accordingly, I thought that the adult *cornutum* would routinely take to the water offered by the syringe in greater quantities than the platyrhinos adults, but in spite of their larger size and collection at higher altitudes this was only irregularly the case. Because of their shorter time in captivity than many of the *P. platyrhinos* this needs to be studied further. At times the adult *cornutum* were even stubborn to initiate drinking. It seemed that they could hold their breath forever (when water covered both nostrils). So, a careful prying open of the mouth and injection of water was what was needed to precipitate a swallowing action. After they got a healthy mouthful of water, they generally drank liberally. Changes in body weights indicate how much in each case.

CONCLUSIONS:

1) *P.* h*ernandesi* may not necessarily require more water than *platyrhinos* in their native environment, but when placed in a xeric environment they evidently had some catching up to do. The writer attributes the well-being of the *hernandesi* in captivity for this year's experiment largely due to the discovery of hydration therapy. Appetites--though difficult to quantify--remained healthy, whereas *hernandesi* in prior years when not administered extra water, generally languished in captivity and refused to eat, preferring to spend endless amounts of time upright, scratching on the terrarium's glass walls. While some glass scratching still persists the writer believes it has more to do with the dimensions of the cage than anything else. Once these dimensions were increased substantially (such as removing four juvenile *hernandesi* from a 20 gallon with a single light to a 60 gallon with two types of lighting at either extreme, three types of sand, and a bush in the middle and a rock and a branch on one end), they almost never engaged in this worrisome behavior again. No adult or sub-adult *P. hernandesi* were available at the time this hydration experiment was conducted, and therefore their needs and response in captivity also require further study.

2) Hatchling *platyrhinos* are obviously more fragile, and therefore, water-dependent than adults of the same species. Water intake as a percentage of body weight is substantially greater for hatchlings than in adults who may compensate by acquiring moisture from the larger insects which only they can ingest, and in the larger quantities that the sub-adults and adults are capable of consuming.

3) Hatchling *cornutum* data during the brief period for which the two hatchlings under study have been observed seems to mirror corresponding adult/hatchling moisture proportions in the *platyrhinos* examples. *P. cornutum* of both ages seemed to intake marginally more water than did the *platyrhinos*, but not enough samplings are yet available to state this conclusively.

4) It is probably not wise to continue prying open mouths, nor forcing them open with any sort of pressure long-term for the risks of inducing trauma and even mouth-rot are not yet understood. Likewise, the use of force adds a new variable to the equation and possibly affects the data in an overly biased way. Luckily, none of the specimens treated in this many have yet revealed any demonstrable ill side effects, but I may just have been lucky. What can be said in mitigation of the potential stress this caused is that all adults which were forced to drink water seemed to gain weight even after a rigorous mating and egg-laying season and appeared to be in robust condition before aestivating and withdrawing from activity altogether as the cooler nights have descended upon us. It has not seemed prudent to turn on the sprinklers in the outdoor enclosure for a few weeks now, although it did finally rain, and Mother Nature's prescription was probably the most appropriate in terms of maintaining a certain outdoor moisture level.

NOTE: The writer thought and still believes that there would have been no point in denying water to a particular control group of horned lizards since many years of personal observation of reptiles removed from their natural habitats already provided a basis for the tested hypothesis.