

Is There Intelligence in *Cnemidophorus*?

Memory and Trust Experiments

Background

The writer's residence is in St. George, Utah. His backyard is on a slope and abuts undeveloped land so designated in perpetuity by virtue of a zoning agreement with the aforesaid municipality, known locally as Webb Hill. At least six genera of lizards have been sighted within a 100 yards or less of the chain link fence which defines the boundaries of the corresponding public and private land, namely, *Cnemidophorus*, *Coleonyx*, *Crotophytus*, *Sauromalus*, *Sceloporus*, and *Uta*. From time to time all but *Crotophytus* and *Sauromalus* have been found within the confines of the writer's yard. In addition, four species of snakes (*Chionactis occipitalis*, *Lampropeltis getulus*, *Masticophis flagellum*, *Pituophis melanoleucus*, have also been discovered on adjacent property and/or in writer's outdoor enclosure set up for the study of reptiles.

During the Summer of 1999 it was observed that a number of Tiger Whiptail Lizards (*Cnemidophorus tigris*) fell into the outdoor enclosure originally set up for the observation of various species of Horned Lizards (*Phrynosoma*). Whether attracted to a particular food item sensed in said enclosure or whether they just fell in during routine exploration of the writer's yard, one cannot say. Nevertheless two or three seemed to remain, although if the larger adults got up enough speed, such as when being pursued by the writer, they could scale the cinder block wall and leap over the 5 inch width strip of tin affixed at about 2.5 feet.

Over the course of the Summer the writer noticed that he seemed to being surveyed by the Whiptails. Although wary, and given to sudden bursts of speed to escape counter surveillance, they would usually pause a short distance away, and peer from the edge of a bush or stone, to keep an eye on me. No doubt over time they noticed I was tossing mealworm larvae (*Tenebrio molitor*) to the horned lizards, for they began paying special attention to my movements and eventually tried to snatch the mealworms away from the horned lizards¹ before the latter could snap them up. During the Summer of 2000 the writer noticed the Whiptails were observing the writer's mealworm-tossing activities with a great deal of attention, as they would regularly track the airborne larvae and dash to them ahead of the horned lizards.

¹ The horned lizards in the enclosure for the most part have become quite accepting of my intrusions and seldom run away, even when approached directly. Of course, everyone should know that a defense strategy of horned lizards is to freeze when threatened, and to attempt to camouflage themselves by blending in with their background. Nevertheless, quite apart from this normal behavior in wild horned lizards, my captives are often out in the open and seem to know that I see them and have intentions of handling them, but don't seem to mind...

Problem(s)

I have not noticed any scientific articles dedicated specifically to the comparative intelligence of the different genera of Nearctic reptiles and have wondered if this were not a promising area for some serious research. After all, Deborah Gordon's perturbation studies² on the *Pogonomyrmex barbatus* (ant) and other researchers who have dealt with mammalian behaviors (e.g., Jane Goodall--Chimpanzees) suggest that somewhere in-between, the lizard might be capable of learning, as well. For example, how close to a dog's intelligence might that of an ordinary lizard be? We have theorized that because of the diminutive size of the reptilian brain, comparatively speaking, a lizard certainly could not be very intelligent. But just how smart is it and what is it capable of learning through trial and error, as opposed to behavior it has inherited through its evolution to date?

Hypothesis

I believed that Whiptail lizards could be "trained" to lose their innate fear of human beings using a food reward system initially, and this could be further demonstrated by their compliant behavior when not necessarily excessively hungry.

Experiment Design

I decided to see if I could coax *Cnemidophorus tigris* not only to eat out of my hand, but to climb up my arm of its own free will and/or allow me to touch it while it ate. The "training" exercises were broken down into five phases and tried on three individuals of different sizes.

Phase I: Surveillance of and eye contact with writer, and also retrieval response to my tossing a mealworm near the lizard rather than it being startled by sudden hand movements in the process.

Phase II: Cautious yet, steadily relaxing comfort zone of the Whiptails as they dared to come closer and closer each time a mealworm was tossed in their direction not quite as far as the last.

Phase III: Eating out of the plastic cup containing a quantity of mealworms in proximity to the writer, helping themselves, but not scurrying off to eat each larva before returning for another.

Phase IV: Taking a mealworm larva from between my fingers when offered or the lizard even voluntarily placing two or more of its feet into the palm of my hand in order to retrieve a larva.

² Ants at Work, ©1999 Gordon, Deborah M., THE FREE PRESS, A Division of Simon and Schuster Inc., 1230 Avenue of the Americas, New York, NY 10020

Phase V: Completely entering the palm of my hand and then proceeding to climb several inches up to my wrist to eat mealworms, and allowing me to pet the lizard while it munched away.

Discussion:

During the early part of the Summer of 2000 **Phases I** and **II** were initiated quite by accident which gave me the idea that the experimentation could be taken further. By mid-summer I became intrigued with the thought that more progress might be made and began engaging in, in earnest, exclusively with Tiger Whiptails (particularly one adult and one juvenile) further experimentation as set forth hereinafter. Of two adult *C. tigris*, one seemed less wary and was selected as a focal point. In less than one week, in the presence of witnesses, it progressed to **Phase V** and would repeat this behavior regularly. It then began to accept mealworms from two other humans in the same fashion. This entertaining behavior lasted a couple more weeks until the weather turned cooler and most of the reptilians began to hibernate. A juvenile remained visible a few more days, but only advanced to **Phase III** before hibernating. The other adult had long since escaped from the enclosure when frightened by the writer. When he entered the enclosure to check on the horned lizards it got up a head of steam and managed to scramble over the tin barrier which has been almost fool-proof in confining the less adroit, horned lizards.

During the Spring of 2001 the same, trained, adult Tiger Whiptail from the previous Summer emerged from hibernation and was recognized by the writer immediately. Within minutes it seemed to have done likewise and swiftly advanced through all five Phases. Thereafter it was regularly eating mealworms, its entire body in the palm of my hand and allowing me to touch it without much preliminary “warming up”. However, once I clamped down on one of its feet which made it struggle, and put it in an indoor terrarium

hoping to release it later the next day to see what its attitude would be after this experience. Three days elapsed before I found an opportunity to release it, and predictably it remained hidden for several days and was only just spotted (May 28, 2001) in the late morning.

Meanwhile, in mid-May of 2001, two Plateau Whiptails (*Cnemidophorus velox*, a parthenogenic species, bearing several longitudinal yellow stripes against a dark background and maintaining the characteristic, attractive blue tail) were introduced to the enclosure by neighborhood boys without my permission³, who new of my interest in reptiles. These lizards are usually found at higher elevations, but have descended to the desert floor in riparian areas by following the course of mountain and foothill creeks and streams to the banks of Virgin River where the subject specimens were apprehended). Interestingly enough, the *C. velox* exhibited the same signs of curiosity and then keen observance of my actions as previously documented concerning *C. tigris*. A subadult became quite visible in the early mornings and steadily began decreasing its distance between itself and the writer. During the next couple of weeks it had already been the

³ There has been a movement by Utah Department of Wildlife Resources (“UDWR”) to afford a certain modicum of protection to *C. velox* by including it as a classified species in the b-annual proclamation.

beneficiary of more than one *Tenebrio* larva catapulted as aforescribed. On the day when the writer commenced his experimentation with this--less wary individual of the two Plateau Whiptails--in less than 15 minutes the writer induced it all the way to **Phase IV** over the course of which it had already consumed so many mealworms that I disbanded the experiment. Notwithstanding, the Plateau Whiptail lingered about, highly visible for the next two hours as if in expectation that I would resume the experimentation that day.

Meanwhile, the *C. tigris* which heretofore had been so compliant, after its experience at being physically constrained and then confined to a small cage, also disappeared from the enclosure a few days after being reintroduced.

Training, therefore, resumed just with the *C. velox*, and by midsummer the photograph appearing on an earlier page was taken providing further documented evidence of the foregoing.

Questions

Does instinct give way to reason and intelligence or simply hunger in the experiments cited above?

Is it possible to equate intelligence with memory, as in the case of the Tiger Whiptail undergoing a hibernation between experimentation with the same result? Does the speed at which the *C. tigris* fell into the abandonment of its instinct and resumption of curious behavior rank it higher in the animal intelligence category than might have been previously suspected?

What other behaviors or tricks might the Whiptail Lizards be induced to perform?

To what extent will they allow humans to handle them without the food prompt--similar to horned lizards? Is the latter therefore more intelligent or less intelligent because it does not require the food cue to let down its defenses?

What other species might be more likely to adapt to human intervention at feeding time? (The writer in his youth while residing in Las Vegas, Nevada recalls similar experiences as hand-feeding with Desert Iguanas (*Dipsosaurus dorsalis*), the "Crested Lizard".

Conclusion

More research is needed to pursue these and other interesting ideas. Besides the *Cnemidophorus* genus, more documentation of similar and different experiments concerning other genera of reptiles would seem to be desirable. The writer has noted that particularly geckos, chuckwallas and horned lizards seem to recognize after a time that humans can be fortuitous providers of food, and that we are therefore not that intimidating, and can even be trusted to touch and pick them up without struggle.