

NOTES

DIET ANALYSIS OF A POPULATION OF *PHRYNOSOMA BLAINVILLII*
FROM THE SAN JOAQUIN DESERT, CALIFORNIA

SUSAN M. HULT

401 E. Thomas Avenue, Marshall, Minnesota 55056, USA, email: incrediblehult@msn.com

Abstract.—The Blainville's Horned Lizard, *Phrynosoma blainvillii*, is in decline throughout much of its range, and is listed in California as a Species of Special Concern. All species of the genus *Phrynosoma* have a dietary specialization for ants, but the degree to which horned lizards consume ants to the exclusion of other available prey varies among species. There have been few studies published on the general ecology of *P. blainvillii*, particularly within their range of the San Joaquin Desert, California, but previous literature indicates that *P. blainvillii* is one of only a few members of the genus that also consumes other insects in abundance. I examined 92 fecal pellets (scats) from a population of *P. blainvillii* in the southern San Joaquin Desert near Alpaugh, California, which showed that 62 scats contained both ant and beetle exoskeletons, 28 scats contained exclusively ants, 13 scats contained ants, beetles, and other arthropods, and two contained exclusively beetles. This is one of few field studies to document the lesser degree of myrmecophagy of *P. blainvillii*.

Key Words.—Blainville's Horned Lizard; Coleoptera; conservation; Formicidae; scat

The Blainville's Horned Lizard (*Phrynosoma blainvillii*) is endemic to California and Baja California and has declined throughout much of its range (Goldberg 1983; Jennings and Hayes 1994; Fisher et al. 2002; Stebbins 2003). *Phrynosoma blainvillii* is listed by the California Department of Fish and Wildlife as a Species of Special Concern (California Department of Fish and Wildlife. 2011. Available from <http://www.dfg.ca.gov/biogeodata/cnddb/pdfs/SPANimals.pdf> [Accessed 02 July 2015]). Dietary considerations are an important component in understanding the relationship of lizards to their habitat (Duffield and Bull 1998; Fisher et al. 2002), yet there have been few studies published on the diet of *P. blainvillii* (Smith 1946; Milne and Milne 1950; Jennings and Hayes 1994; Fisher et al. 2002).

Horned lizards are among the few species that consume primarily ants and the occurrence of horned lizards is closely tied to the presence of ants (Whitford and Bryant 1979; Rissing 1981; Donaldson et al. 1994; McIntyre 2003). Within the genus *Phrynosoma*, however, not all species exhibit an equivalent degree of myrmecophagy. For example, *P. solare* has a diet of approximately 80–90% ants, while *P. asio* has among the lowest degree of myrmecophagy at approximately 20–30% (Pianka and Parker 1975; Montanucci 1989; Sherbrooke 2003). The percentage of ants that comprises the diet of *P. blainvillii* ranges from 45% (Montanucci 1989) to 90% (Pianka and Parker 1975). Other prey items consumed by horned lizards include beetles, flies, grasshoppers, spiders, and other arthropods (Milne and Milne 1950; Pianka and Parker 1975; Montanucci 1989; Sherbrooke 2003). Here I report on the general composition of the diet of a population of *P. blainvillii* in the San Joaquin Desert of California.

While conducting a radio-telemetry study of *P. blainvillii* in the San Joaquin Desert, I opportunistically collected horned lizard scats. Horned lizard scat is easily differentiated from scats of other sympatric lizard species by their large, fat, cigar-shaped pellet (Fair and Henke 1997; Suarez et al. 2000; Sherbrooke 2003). Scats from California Whiptail (*Aspidoscelis tigris munda*) are more slender and less uniform in shape, and Western Side-blotched Lizard (*Uta stansburiana elegans*) scats are much smaller and also less uniform in shape than horned lizard scats (Newbold and MacMahon 2009). Blunt-nosed leopard lizards (*Gambelia sila*), which occurred at one of the sites at which I worked, have scat similar to California Whiptails. Through direct observation of a radio-tagged *P. blainvillii* defecating, I was able to confirm the identifying characteristics of horned lizard scats.

I collected 92 scats beginning 20 April and continued through 15 November 2009. I dried them overnight in a 79.4° C oven to remove water content and prevent fungal growth. Using a dissecting microscope and tweezers, I removed sand, detritus, and the uric acid plug from each scat leaving behind only arthropod exoskeletons. While looking under the microscope I sorted the prey items into either ants (Formicidae), beetles (Coleoptera), or unknown arthropods. I found that nearly all (98%) horned lizard scats contained ants, 67% contained beetles, and 14% contained unknown arthropods. I also found that more scats (67%) contained a combination of ants and beetles rather than exclusively ants (30%). A small percentage (2%) of scats contained only beetles.

These findings are consistent with literature that states *P. blainvillii* has one of the most varied diets of all horned lizards (Milne and Milne 1950; Pianka and Parker 1975; Sherbrooke 2003). Although ants are their

primary prey items, beetles may be consumed to a large extent and occasionally dominate their diet, while other arthropods also may be consumed, but to a smaller extent. Considering their dietary composition, *P. blainvillii* in the San Joaquin Desert do not seem to be as highly myrmecophagous as other horned lizards such as *P. solare*. Horned lizards are known to consume soft-bodied arthropods when available (Milne and Milne 1950; Pianka and Parker 1975). Because of the non-invasive nature of this dietary study, I could only identify prey items whose identifiable features survived the digestive tract of lizards, thus introducing a bias toward hard-bodied arthropods. Dietary specialization makes horned lizards particularly vulnerable to environmental changes affecting prey abundance (Suarez and Case 2002; Sherbrooke 2003). Management practices directed toward conservation of *P. blainvillii* should include maintaining the biodiversity of invertebrates on which this species depends.

Acknowledgments.—Thanks to Dana Gasper and Teresa O’Keefe who aided in the collection of scat. This study was funded by the Bureau of Land Management’s (BLM) Atwell Island Project.

LITERATURE CITED

- Donaldson, W., A.H. Price, and J. Morse. 1994. The current status and future prospects of the Texas Horned Lizard (*Phrynosoma cornutum*) in Texas. *Texas Journal of Science* 46:97–113.
- Duffield, G.A., and C.M. Bull. 1998. Seasonal and ontogenetic changes in the diet of the Australian Skink *Egernia stokesii*. *Herpetologica* 54:414–419.
- Fair, W.S., and S.E. Henke. 1997. Effects of habitat manipulations on Texas Horned Lizards and their prey. *Journal of Wildlife Management* 61:1366–1370.
- Fisher, R.N., A.W. Suarez, and T. J. Case. 2002. Spatial patterns in the abundance of the Coastal Horned Lizard. *Conservation Biology* 16:205–215.
- Goldberg, S.R. 1983. Reproduction of the Coast Horned Lizard, *Phrynosoma coronatum*, in southern California. *The Southwestern Naturalist* 28:478–479.
- Jennings, M.R., and M.P. Hayes. 1994. Amphibian and Reptile Species of Special Concern in California. Final Report. Contract Number 8023. California Department of Fish and Game Inland Fisheries Division, Rancho Cordova, California.
- 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*). *The Southwestern Naturalist* 48:274–313.
- Milne, L.J., and M.J. Milne. 1950. Notes on the behavior of horned toads. *American Midland Naturalist* 44:720–741.
- Montanucci, R.R. 1989. The relationship of morphology to diet in the horned lizard genus *Phrynosoma*. *Herpetologica* 45:208–216.
- Newbold, T.A.S., and J.A. MacMahon. 2009. Spatial and seasonal dietary patterns of the Desert Horned Lizard (*Phrynosoma platyrhinos*): harvester ant specialist or generalist ant feeder? *Canadian Journal of Zoology* 87:112–123.
- Pianka, E.R., and W.S. Parker. 1975. Ecology of horned lizards: a review with special reference to *Phrynosoma platyrhinos*. *Copeia* 1975:141–162.
- Rissing, S.W. 1981. Prey preferences in the Desert Horned Lizard: influence of prey foraging method and aggressive behavior. *Ecology* 62:1031–1040.
- Sherbrooke, W.C. 2003. Introduction to Horned Lizards of North America. California Natural History Guides No. 64. University of California Press, Berkeley, California.
- Smith, H.M. 1946. Handbook of Lizards: Lizards of the United States and of Canada. Cornell University Press, Ithaca, New York.
- Stebbins, R.C. 2003. Western Reptiles and Amphibians. 3rd Edition. Houghton Mifflin Co., Boston, Massachusetts.
- Suarez, A.V., and T.J. Case. 2002. Bottom-up effects on persistence of a specialist predator: ant invasions and horned lizards. *Ecological Applications* 12:291–298.
- Suarez, A.V., J.Q. Richmond, and T.J. Case. 2000. Prey selection in horned lizards following the invasion of Argentine Ants in southern California. *Ecological Applications* 10:711–725.
- Whitford, W.G., and M. Bryant. 1979. Behavior of a predator and its prey: the horned lizard (*Phrynosoma cornutum*) and harvester ants (*Pogonomyrmex* spp.). *Ecology* 60:686–694.