

FOOD HABITS OF DITMARS' HORNED LIZARD WITH SPECULATIONS ON ITS TYPE LOCALITY

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This paper speculates on the habitat and type locality of Ditmars' horned lizard, *Phrynosoma ditmarsii* Stejneger. The habitat speculation has aided in the rediscovery of the lizard (Lowe, Robinson, and Roth, 1971). However, the type locality remains to be located. The brief information on hand remains, "State of Sonora, Mexico, not far from boundary of Arizona." It is the hope of the author that this paper will aid in the pinpointing of the type locality.

A study of the stomach contents of two of the three specimens in existence is reported. During the long search for *ditmarsii*, which had not been collected since 1897, it became obvious that any additional information would aid in its discovery. The difficulty with which *douglasi*, a related species, is taken in the nearby Chiricahua Mountains in southeastern Arizona indicated the magnitude of the problem of finding *ditmarsii* without more information. Some remaining clues were in the food and other items ingested by the lizards prior to capture. Fortunately, stomach contents were available from two specimens; a female from the American Museum of Natural History, and the female from the United States National Museum. The third known specimen, a male in the latter museum, had been kept alive by Ditmars for about a year and was of no value.

The stomach contents (including those of the large and small intestines) were removed, washed repeatedly in alcohol, screened, and then sorted under progressively higher magnifications. A few identifications were made by the author but where possible, specialists supplied determinations. Collections at the Southwestern Research Station and at the Herbarium and Department of Entomology of the University of Arizona were studied for host and habitat information on each species of insect and plant material found in the gut samples. Literature searches were made and the results included in the annotated list. Where distributions are not given the species are found throughout the Southwest or their distribution is inadequately known.

Non-food items present in the stomachs included pebbles, grass seeds, and spikelets, and an unidentifiable piece of plant stem. These items probably were ingested along with the harvester ant, *Pogonomyrmex apache* Wheeler.

Parasitic nematodes of the genus *Skrjabinoptera* were present in both stomachs. These were probably *S. phrynosoma* (Ortlepp), a common internal parasite of horned lizards, according to Mrs. May Belle

Chitwood of the United States Department of Agriculture at Washington, D. C.

The stomach contents of the AMNH lizard are mostly well preserved, whereas those of the USNM lizard are almost completely digested, consisting primarily of fragments. An itemized list of material taken from the two stomachs is given in Table 1.

Table 1. Stomach contents of two horned lizards, *Phrynosoma ditmarsii* Stejneger.

Item	AMNH ¹	USNM ¹
Andesite pebbles - - - - -	22	2
<i>Bouteloua</i> sp. spikelets - - - - -	9	27
<i>Muhlenbergia</i> sp., seeds - - - - -	2	
Genus and species ?, seed - - - - -	1	
Unidentified plant stem - - - - -		1
<i>Phidippus tyrrelli</i> P. & P., jumping spider -		1
<i>Phidippus</i> spp. - - - - -		2
<i>Leprus robustus</i> Hebard, grasshopper - -	1	
<i>Barytettix humphreysii</i> (Thomas), grasshopper - - - - -	2	
<i>Arphia</i> sp., grasshopper - - - - -	1	
Unidentified grasshopper parts, likely <i>Barytettix</i> - - - - -		3
Margarodidae, male scale insect - - - -	1	
<i>Scolopocerus</i> sp., coreid bug - - - - -		1
<i>Largus</i> sp., largid bug - - - - -		2
Pyrrhocoridae, undescribed genus and species; true bug - - - - -	1	
<i>Ophryastes bryanti</i> (V. D.), weevil - - -		2
<i>Pandeleteius</i> n. sp., weevil - - - - -	3	
Chrysomelidae larvae (<i>Cryptocephalus</i> or <i>Diachus</i> ?) beetle - - - - -		1
<i>Tiphia</i> sp., tiphid wasp - - - - -		1
ANTS		
<i>Odonotomachus desertorum</i> Wheeler? - -	5	
<i>Pheidole titanus</i> Wheeler? - - - - -	1	
<i>P. dentata</i> Pergande - - - - -		1
<i>Pogonomyrmex apache</i> Wheeler - - - -	12	33
<i>P. huachucae</i> Wheeler - - - - -	11	
<i>P. imberbicus</i> Wheeler - - - - -	22	
<i>Trachymyrmex arizonensis</i> Wheeler - - -	4	
<i>Xiphomyrmex spinosus</i> Pergande - - -	17	
<i>Gnamptogenys regularis</i> Mayr - - - -		2
<i>Liometopum</i> sp. - - - - -		1
<i>Camponotus</i> (<i>Myrmobrachys</i>) <i>trepidulus</i> Creighton - - - - -	1	4
Total species - - - - -	18	16

¹Numerals indicate total number of specimens or those represented by fragments.

The following annotated list includes those species for which additional useful information was available.

Inorganic Matter — The pebbles of andesite were described by W. H. Peirce of the Arizona Bureau of Mines as "a finely crystalline igneous rock characterized by plates or tablets of plagioclase feldspar and a dark to red brown ferromagnesian mineral of undetermined species. A small amount of magnetic and other unidentified material is present. Quartz was not observed." He also comments, "Based upon spotty evidence I would suggest that the material is dioritic in composition." These specimens were also identified as andesite, a close relative of diorite, by Mr. Sidney Williams of the Phelps Dodge Corporation at Douglas, Arizona. Andesitic outcroppings are widespread in Arizona but are poorly known in Sonora. Two areas of extensive andesite south of the border occur in the Sierra Manzanal, south of Cananca, and Sierra San Luis, near the Chihuahuan border, neither of which occur on Lumholtz's route studied by M. D. Robinson (see Lowe, Robinson, and Roth, 1971). This indicates that Robinette, the collector of the *ditmarsii* in the American Museum of Natural History, made side trips from the route or that there are other outcrops of andesite with which we are not familiar along Lumholtz's route.

Plant Material — *Bouteloua* sp., grama grass spikelets. Frank W. Gould of Texas A. & M. University states (correspondence), "Identification of *Bouteloua* species solely on the basis of spikelet material is at best exceedingly difficult. The material in the vial matches fairly well the annual *B. barbata* Leg." Gould (1951) reports this species from "open rocky or sandy slopes and washes—below 6,000 feet mostly at the lower elevations.

Muhlenbergia sp., probably *emersleyi* Vasey, Bullgrass. Gould (1951) records this grass from "rocky slopes and ledges and forest openings, mostly in dry soil 3,500 to 6,000 feet."

Insects — *Leprus robustus* Hebard, grasshopper. According to Ball et al. (1942) this species is found "on bare rocky soil sparsely covered with grass and rocky hillsides and ridges in the Lower and Upper Sonoran Zones."

Barytettix humpheysii (Thomas), grasshopper. According to Ball et al. (1942) this is "a rather common grasshopper in the Upper Sonoran Zone and the higher desert grassland of the Lower Sonoran." This species is replaced by *B. cochisei* Gurney at Agua Prieta, Sonora, and eastward.

Arphia sp., probably *aberrans* Bruner. This grasshopper is "Typical of limestone hills and rocky hillsides, most common in Upper Sonoran Zone but taken from 258 to 9,200 feet . . .", according to Ball et al. (1942).

Largus sp., largid bug. *Largus cinctus* Herrich-Schaffer and *L. consinus* Stal. are common in the live oak-Chihuahuan pine zone in the Chiricahua Mountains of southeastern Arizona at about 6,000 feet.

Pyrrhocoridae, undetermined genus and species. Only a distinctive thorax is known for this unique bug. A pair of dorsolateral horns is on the prothorax and the scutellum bears a single middorsal spine. According to R. C. Froeschner of the Smithsonian Institution, this species is "Very close to a South American genus (*Thaumastaneis*) known from Bolivia and Brazil." The bug should be easily identified in the field. It is black, about 6 mm. long, has distinct thoracic and scutellar horns and short wings. The latter indicates that this species is a ground-dwelling form similar to *Arhappe cicindeloides* Walker in shape, size, and probably habits (running over the ground and leaves under oak trees). The latter occurs commonly in the Chiricahua Mountains in the live oak zone.

Ophryastes bryanti (V. D.) is a rare, large (about 9 mm. long) wingless weevil, known only from females from the mountains of southern Arizona.

Pandeleiteius n. sp. is known only from one other female weevil taken at Yecora, Sonora, at 7,000 feet on juniper, according to Dr. Anne Howden of Ottawa, Canada.

Tiphia sp. Wasps of this genus are generally inhabitants of grasslands and similar mesophytic environments, according to H. W. Allen of the United States Department of Agriculture, Washington, D. C.

Pheidole subdentata Pergande. This ant is known from the mountains of southern Arizona to Nayarit, Mexico.

Pogonomyrmex apache Wheeler, harvester ant. This species consists of small colonies and usually constructs obscure nests in stony soils with no superstructure to mark a colony according to Cole (1968). One collection was made at the north end of Sierra Manzanal, Sonora, 4.8 miles south of Cananea about 5,200 feet among live oaks on a rocky hilltop. It is recorded along the southeastern Arizona border and south to Hermosillo in Sonora.

P. huachuacanus Wheeler. This ant has been recorded from 3,700 to 5,000 feet in the canyons of southern Arizona mountains (Creighton, 1952) but not previously in Mexico.

P. imberbiculus Wheeler. Cole (1968) records this species from 640 to 7,000 feet. Local collections have been made at the Southwestern Research Station at 5,400 feet in a riparian zone; on the north end of Sierra Manzanal, 4.8 miles south of Cananea, Sonora, about 5,200 feet among live oaks on a rocky hilltop; and at the head of Canyon de Evans in the Sierra de los Ajos, Sonora, among large live oaks in a riparian zone.

Trachymyrmex arizonensis Wheeler. This ant is known from 5,000 to 6,000 feet in the Huachuca Mountains, Arizona, according to Creighton (1950). It has been taken also in the same localities as *P. imberbiculus* Wheeler listed above.

Xiphomyrmex spinosus Pergrande is usually found in the foothills about 5,000-6,000 feet (Creighton, 1950). It has been found in the same habitats as *P. imberbiculus* Wheeler in Sonora and at Portal, Arizona (4,800 feet), on a dry limestone hillside.

Gnamptogenys regularis Mayr. is a distinctive ant with prominent longitudinal thoracic striae previously known from Tepic, Nayarit in Mexico.

Camponotus (Myrmobrachys) trepidulus Creighton. According to Wm. Creighton, presently of La Feria, Texas, the partially digested minor worker is probably this species which occurs on both the eastern and western slopes of the Baboquivari Mountains in Southern Arizona. This species nests only in the dead limbs of live oak.

The habitats of these ants have been summarized by Mr. Roy Snelling of the Los Angeles County Museum of Natural History as "a canyon habitat with a small stream, rocky slopes, grass, oak-juniper, possibly with sycamores on the canyon floor. Looks to me like the lizard was foraging above the stream, between the stream and the sides of the canyon."

Extensive collections of ants were made in the Chiricahua Mountain area in southeastern Arizona at elevations of 4,160 to almost 10,000 feet in order to determine the altitudinal distribution and habitat preference for the species found in the lizards. These species occurred sympatrically within 4,800 feet to 5,600 feet on dry hillsides, often adjacent to riparian situations.

The itemized list of material taken from the two stomachs is given in Table 1. Of a total of 31 items, only four or five were found in both lizards. These included the most abundant species, *Bouteloua* grass spikelets and *Pogonomyrmex apache* Wheeler, a harvester ant. Numerically, ants made up about 86% of the total invertebrates but in volume amounted to much less. The gut contents indicate that there is little difference in the feeding habits of *ditmarsii* and the related horned lizard, *douglasi* from the mountains of southeastern Arizona (unpublished data). Both species are general feeders.

The stomach contents of four specimens of *ditmarsii* recently collected are summarized in Table 2. The percentage of ants is about the same in the new lizards as in the original AMNH and USNM specimens. The recent specimens differed essentially in lacking pebbles, plant seeds, and many of the insects found in the earlier collection. Some ants were common in both collections, *Pogonomyrmex imberbiculus* Wheeler, *P. huachucanus* Wheeler, and *Xiphomyr-*

mex spinosus Pergrande but *P. apache* Wheeler, common in the older collections was represented only in one stomach and, surprisingly, with *P. barbatus* (F. Smith), not found in the older collections.

Table 2. Summary of stomach contents of six *Phrynosoma ditmarsii* Stejneger.

Specimen	Ants	Other Invertebrates
USNM - - - - -	42	9
AMNH - - - - -	65	8
UAZ 32358 - - - - -	9	4
UAZ 32356 - - - - -	33	6
UAZ 32353 - - - - -	44	5
UAZ 32355 - - - - -	60	10
Total - - - - -	253	42
	(85.8%)	(14.2%)

Several collecting trips were made into northern Sonora to collect samples of plant material, pebbles, and insects in different habitats and areas. These were compared with the stomach material (see Discussion).

The two lizards were apparently collected from the same habitat in the same area at the same time of year. Two distinctive species of ants, *Pogonomyrmex apache* Wheeler and *Camponotus trepidulus* Creighton, and *Bouteloua* grass spikelets were present in both stomachs. The four pebbles are similar in color and structure and appear closer to each other than anything picked up on field trips throughout northern Sonora. A study of the stomach contents of each lizard separately do not change any of the interpretations.

The general area of collection is confirmed, as most of the plant and insect species found in the stomachs are those known to occur in the mountains near the Arizona-Sonora borders, and the presence of the ant *Gnamptogenys regularis* Mayr, *Pandeleiteius* weevils, and the pyrrhocorid bug inject apparently southern elements, which would logically place the type locality south of the border and possibly further south than expected.

A literature review of the altitudinal distribution of the insects studied shows that the insects are usually collected in the Upper Sonoran Zone (4,500 to 6,500 feet according to Ball et al., 1942) or areas within 5,000 to 6,000 feet in the region of live oak, piñon pine, and juniper. Field experience and the Sierra Manzanal collections agree with this altitude range.

From the information presented and from field experience in southern Arizona and northern Sonora, it is reasonable to speculate on the area of the type locality of *ditmarsii*. The locality will be between Naco, Agua Prieta, and south, possibly north of Fronteras, Sonora. They will be found in an open

canyon between 5,000 to 6,000 feet altitude. The specific habitat will be at the side of a canyon floor adjacent to a rocky hillside clothed with live oak, grama, and Bullgrass, near soil having a high percentage of magnetic pebbles (all four pebbles react positively to a pencil magnet) consisting of brick red, black, and clear minerals. Conspicuous indicator insect species in the immediate area will be the wingless grasshopper; *Barytettix humphreysii* (Thom.); the harvester ant *Pogonomyrmex apache* Wheeler; the ant *Gnamptogenys regularis* Mayr; the large *Largus* bug (12-14 mm.); and the black-spined, short-winged pyrochorid bug. Both bugs should be present among dead leaves under live oaks.

The results of these studies still may not present an exact picture of the type locality of *ditmarsii*. The vegetation and climate of this area has changed in the 70-80 years since they were collected. There have been some prominent transformations in vegetation in the Southwest starting before the turn of the century. Good examples are given by Lowe (1964) and Hastings and Turner (1965) who show vegetal changes in the oak-woodland region over a span of 75 years in southeastern Arizona along the border. If similar changes took place south of the border, the insect life may have altered significantly and marginal species such as the pyrochorid bug, *Gnamptogenys* ant and the *Pandeleteius* weevil may have been pushed further south.

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