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AMPHIBIANS, REPTILES, AND MAMMALS
OF EL MORRO NATIONAL MONUMENT,
VALENCIA COUNTY, NEW MEXICO

D. ARCHIBALD McCALLUM
Resident Naturalist
Cottonwood Gulch Foundation
Thoreau, New Mexico

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CONTENTS

Acknowledgments	i
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Section I, Reptiles and Amphibians

Introduction	1
Species Accounts	2
Literature Cited	21

Section II, Mammals

Introduction	24
Species Accounts	27
Literature Cited	85

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SECTION ONE
REPTILES AND AMPHIBIANS

INTRODUCTION

This is a report of an inventory of reptiles and amphibians which occur currently at El Morro National Monument, or are known to have occurred there in historic times. Elsewhere (11) I have discussed in some detail the history of ornithological fieldwork at El Morro. The nineteenth-century collectors mentioned in that account collected other vertebrates as well as birds; however, none, to my knowledge, took any reptiles or amphibians at El Morro, and their contributions to herpetology in the Zuni Mountain region were minimal. It remained for Frederick R. Gehlbach, working in the 1950's, to provide some order to our understanding of the Zunian herpetofauna. He visited the Monument many times with the Prairie Trek Expedition and collected fairly extensively there. His monograph (6) is the standard reference on the herpetofauna of the region, and I have used it frequently in my research and in preparing this report.

I began the current study in July, 1978. Most of my diurnal observations were made incidental to fieldwork on the birds of the Monument. The improved roads of the Monument were driven most mornings and nights to look for living and automobile-killed amphibians, reptiles, and mammals. In addition, on all my July and August visits I had the help of one or more assistants from the Cottonwood Gulch Foundation. These persons spent many hours in the field searching specifically for reptiles and amphibians. Scott Oviatt, an experienced and skillful herpetologist, was especially helpful on his visits in July, 1979. My days in the field were July 8-10 and 24-26, August 7-8, October 29-31, 1978; and March 18-19, April 22-26, May 5-9 and 18-22, June 5-8 and 13-17, July 6-8 and 19-21, August 5-9, September 8-10, November 13-15, 1979. I was able find all the species found

by Gehlbach, as well as a few others.

The species accounts which follow include all those species that have been reliably reported within the current boundaries of the Monument. Accounts of species suspected, but not yet confirmed, to occur there are enclosed in brackets. Each account gives a brief statement of the status and habitat preferences of the species at El Morro. There is also a more-or-less lengthy account of the biology of the species, synopsised from the literature. Known specimens are listed at the end of the account. They are from Gehlbach (6). Abbreviations for museums holding the specimens are as follows: CWGF = Cottonwood Gulch Foundation, Thoreau, M.M.; CU = Cornell University, Ithaca, N.Y; KUM = Museum of Natural History, University of Kansas, Lawrence, Kansas; UMMZ = Museum of Zoology, University of Michigan, Ann Arbor, Mich. Literature citations are by numbers, which refer to a complete listing of citations following the species accounts.

SPECIES ACCOUNTS

Amphibians

Class AMPHIBIA

Frogs and Toads

Order SALIENTIA (=ANURA)

Spadefoot Toads

Family PELOBATIDAE

Western Spadefoot

Spea hammondi Baird

Plains Spadeffot

Spea bombifrons Cope

Amphibians are usually thought of as creatures of wet areas, and, indeed, species diversity is much higher in swamps and other perennially wet places. But, a few kinds have adapted to xeric (dry) conditions. The group, among North American amphibians, with the most profound adaptations to aridity is the spadefoot toads. Transformed spadefoots may spend ten months, or even more, in burrows which they

themselves dig deep into the ground. They are able to absorb moisture from the surrounding soil. When soil moisture tension increases they can restore equilibrium by increasing the osmotic concentration of body fluids through retaining urea rather than excreting it. This adaptation requires a high tolerance for urea, which is toxic. At least one member of the family is known to have dark, keratinized layers of skin while in hibernation. This skin may reduce water loss also. (17)

They burrow by rocking the hind feet back and forth. The excavated soil passes forward under the body, and the animal slowly disappears backward into the ground. A horny, black "spade" on the bottom of each hind foot helps with the digging (8).

Spadefoots are renowned for their appearances en masse after the first rainstorm of summer. Ruibal et al. (17) showed that many S. hammondi are just below the surface before the rains come. Perhaps these toads have some endogenous circennial periodicity that wakes them up in June, at which time they burrow up to places close to the surface, where they await the rains. At any rate the place and time to see spadefoots is on a highway at night, and after a rain. According to Leviton (8), the first male to find a pond begins a call that is audible for hundreds of yards. Other males and then females flock to the pond. Because the ephemeral ponds resulting from cloudbursts are few it is adaptive for many animals to use those that are found, even though some competition for mates may take place as a result of crowding. These ponds may attract not only two or three species of spadefoots, but several other kinds of anurans as well. The resulting symphony can be nothing short of cacophonous.

I witnessed such a spectacle at Los Gigantes in July, 1977, after a hard afternoon rain. The muddy water was bubbling with floating toads, the throats of the males ballooning as they gave their strident calls. Probably that aggregation contained both western and plains spadefoots. Both species

are common in the sandy country around El Morro, and both have been recorded on the Monument by Gehlbach and by me.

When a female approaches a singing male he grasps her with his forelimbs in front of her hind limbs. This is called amplexus and is the standard mating posture of anurans. The pair swim together and as the female deposits her eggs the male releases sperm, which reach the eggs by chemical attraction and penetrate their gelatinous coating to fertilize them. As with many other kinds of animals from several orders, males will try to mate with any female, even those of different species. They may even grasp a passing male. Such indiscriminate behavior may result in hybridization. Interspecific hybrids are usually less viable than pure-bred individuals because the genes of the parental species do not always "fit" with each other. It is consequently a "waste" of parental genes to engage in mixed matings. Natural selection has favored certain "isolating mechanisms" which reduce the likelihood of individual animals choosing a mate of another species. Females have a greater investment in each gamete (egg cell or sperm cell), because theirs, being bigger, require more energy to produce than those of males. In many cases (e.g. lions, ducks, spadefoots), it is up to the female to choose the proper mate. Since any male will clasp her the female spadefoot must be able to choose at a safe distance. This she does by responding only to the calls of her own species. In the cases of plains and western spadefoots the calls are quite different and function as an effective isolating mechanism (5).

Once the eggs are laid they may hatch within 48 hours. The tadpoles must then metamorphose rapidly or face dessication as the pond dries up. This they do, accomplishing the feat within as few as 12 days. If food supplies are low they may eat dead tadpoles. If famine is severe some individuals turn to cannibalism (19). Spadefoot tadpoles acquire lungs before metamorphosis. If dissolved oxygen is at low concentrations in the water they swim frequently to the

surface and gulp air (20). Apparently there is strong synchrony in the time of emergence from the water by juvenile toads. This may be an adaptation to reduce predation through satiation, or to prevent, through crowding, dessication.(1).

Peterson gave the following account of an anuran chorus in El Morro's pool:

This is the first season that I have seen frogs in the water cove, and judging from the noise they are making at present there must be a thousand of them in there (Southwestern Monuments Monthly Reports (SMMR), July, 1934).

Budlong added, in commenting on the stagnancy of the water, "even the frogs are dying in it" (SMMR, September, 1937). There is no way to know which genus these "frogs" were. Spadefoots are El Morro's most common anurans, and might be implicated in Peterson's report. On the other hand, if Budlong was being factual some other species is more likely. The only anuran I have seen around the pool is the Woodhouse's toad, Bufo woodhousei.

Gehlbach (6) reported a specimen of Spea intermontana from two miles west of El Morro. This was the only specimen of the species from New Mexico. It has since been reidentified as S. bombifrons (John Applegarth, personal communication).

Specimens: S. hammondi, 17: KUM 14538-46, 17271-8.
S. bombifrons, 2: KUM 17222-3.

True Toads

Family BUFONIDAE

Woodhouse's Toad

Bufo woodhousei Girard

This is a true toad, the kind that reputedly gives you warts, which of course they don't actually do. They do have warts themselves. The warts, and the large paratoid glands, are really swollen poison glands. The poison they secrete is strong enough to dissuade most predators from picking up a toad a second time, and that of a related species, the marine toad (B. marinus), has been known to kill a

human (19). On the other hand, some predators, notably garter snakes (genus Thamnophis), are apparently immune to the toxins and prey extensively on toads. Arnold and Wassersug (1) found that garter snakes selectively feed on metamorphic toads, rather than tadpoles and juveniles. They reasoned that the metamorphic individuals are especially vulnerable because they cannot swim as well as a tadpole (because of their limbs) nor hop as well as a fully transformed toad (because of the tail). Thus metamorphosis is a time of great predation pressure. An apparent response is for all the tadpoles to transform at once. Thus the snakes are satiated and some toadlets survive (1).

Woodhouse's toads are found many places with spadefoots. Their annual cycle is similar, but development is not so condensed. They consequently require longer-lasting pools for breeding. Wassersug and Seibert showed that tadpoles of this species do not gulp air in response to low dissolved oxygen concentrations. When dissolved oxygen is very low, "they come to the surface to take in oxygen through their skins from the oxygen-rich surface waters" (20). Dissections have shown that, unlike the tiger salamanders and spadefoots, they do not develop lungs until metamorphosis (20).

Bufo woodhousei is probably evenly distributed around El Morro. I found it in and near the pool in the summer of 1979. It is also probably a regular visitor to the watered lawns of the residences. Peterson's and Budlong's statements about salamanders and frogs in the pool (see pp. 5 and 7), suggest that both kinds used these waters contemporaneously, even though salamanders at all stages are predaceous. I have not heard any anuran choruses at El Morro. An explanation for this nondetection will require further study.

Tree Frogs

Family HYLIDAE

Canyon Treefrog

Hyla arenicolor Cope

This species is common in the Zuni Mountain region

wherever there is abundant rock and an intermittent stream. it has also been known to occur in potholes on mesatops. Because potholes are abundant on El Morro's mesa treefrogs should be looked for there after summer rains.]

[True Frogs

Family RANIDAE

Northern Leopard Frog

Rana pipiens Schreber

Many similar-looking kinds of leopard frogs were once lumped under R. pipiens. It is now apparent to taxonomists that some of these populations represent good species. There are five species in New Mexico; the one in our area retains the old name (John Applegarth, personal communication).

Leopard frogs require permanent water, with some vegetation to hide in. Where these requisites are available they are often common. Their absence at El Morro may be attributed to absence of cover, distance from a source population, or some other ecologic or geographic factor.]

Salamanders

Order CAUDATA (=URODELA)

Mole Salamanders

Family AMBYSTOMATIDAE

Tiger Salamander

Ambystoma tigrinum Green

The status of the tiger salamander at El Morro apparently has changed during this century. E. Z. Vogt, Jr., said of a visiting kingfisher in October, 1936, "I'll bet he had his eye on the big juicy salamanders in the pool" (SMMR). Budlong, in an interview, said,

Now, when I was there, we had this low dam across the waterhole. It was full of axolotls...water dogs, I think you call them; the salamander phase of the salamander. Big things, about ten inches long (3).

"Axolotl" and "water dog" are both names applied to the gill-bearing larval forms of the tiger salamander.

Apparently the pool was regularly used as a breeding

area by salamanders. There is no evidence it is so used today. Though we have not seined the pool, and thus cannot be sure it did not contain a population of larvae in 1979, my assistants and I made careful observations there and saw none. In our area larvae are usually visible from the surface. The absence of larvae of salamanders and anurans may be attributable to the presence of fish in the pool. In Colorado salamanders do not lay eggs in ponds containing fish (8). The pool's dam has been enlarged since the 1930's. Perhaps when the water level was stabilized the fish were introduced, and they now prey on any anuran larvae which are produced (see also p. 6).

Gehlbach (6) reports two specimens, presumably transformed individuals, from El Morro. On the chilly morning of September 10, 1979 I heard a rustling in the weeds by the fence of the sewage lagoon. Momentarily out stepped a large adult tiger salamander, presumably headed for the putrid waters of the lagoon. Both the lagoon and the pool should be seined in the future.

The life history of the tiger salamander is nothing short of fascinating. Like almost all amphibians they must lay their eggs in water, because the eggs lack a protective amnion (a reptilian invention) that prevents dessication. Most adults in our arid climate spend much of the year in deserted rodent burrows far down in the earth where soil moisture is high and temperatures are moderate. This is the way they avoid dessication and freezing. They come out with the spring thaw and congregate in breeding areas--usually ponds and pools in creeks. The male noses the female along her belly and sides until she follows him to pick up a spermatophore (a packet of sperm) with the lips of her cloaca. Eggs are attached to debris beneath the water and hatch in about one month (8). Larvae look rather like adults except that they have external, feathery gills, have fins on their tails, and lack bold patterns of yellow and black spots.

In some cases larvae transform into adults in the same summer they hatch. Others may not transform until the second summer. Some larvae, called neotenes, never transform, but attain reproductive maturity while remaining obligately aquatic all their lives. What conditions produce these responses? Leviton (8) implicates the absence of iodine in some Colorado lakes. Iodine is necessary for the thyroid gland to produce growth hormone, which stimulates metamorphosis. But in some ponds in the Llano Estacado of Texas Rose and associates (7, 15, 16) have found both neotenes and transformed individuals. Clearly a body of water must be permanent for neoteny to be adaptive in it. In the few ponds which do not dry up it may be more adaptive to remain a larva than to face dessication as a transformed air-breather. But most eggs are laid in ephemeral pools. The resulting larvae must transform rapidly or die. Gehlbach (6) showed experimentally that larvae exposed to conditions similar to those in drying pools rapidly transform while those provided with artificially oxygenated water do not. Dede Armentrout, one of Rose's co-workers, told me that they were able to induce transformation within ten days of hatching.

The "axolotls" Budlong reported may have been reproductively mature, or they may simply have been large second-year larvae. At any rate I think it would be desirable for salamanders once again to occupy that pool. It provides appropriate conditions for neoteny to occur, a phenomenon which could be interpreted to visitors with considerable educational profit. Accordingly, I recommend that the fish, which are not there naturally anyway, be removed. The salamanders will take care of the rest.

Specimens. 2: KUM 15556-7.