Final Report

Development of Baseline Data and Procedures for Monitoring Populations of the Flat-tailed Horned Lizard, *Phrynosoma mcallii*

Contract FG9268 AM. 2

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DECEMBER, 1992

TABLE 7. Line-intercept Transect Estimates of Perennial Plant Composition. The relative frequency of each species is given as a percentage of: 1) the total number of plants; 2) the total number of living plants; 3) the total coverage of plants; and 4) the coverage of living plants. Total number includes both living and dead/dormant plants. In "% Total" columns, the percentage of the total number of plants on the transects that was comprised of living plants of a given species is followed by the percentage comprised of dead/dormant plants of a given species.

Species	% TOTAL NO.	% NO. ALIVE	% TOTAL COVER	% COVER ALIVE
Ambrosia dumosa	3 (17)	8	3 (16)	7
Asclepias subulata*	0 (0)	0	0 (0)	0
Croton californicus	0 (0)	1	0 (0)	1
Ephedra trifurcata	1 (1)	3	4 (1)	8
Eriogonum deserticola	0 (0)	0	0 (0)	0
Haplopappus acradenius	0 (2)	1	0 (5)	0
Hilaria rigida	5 (0)	11	10 (0)	20
Larrea tridentata	6 (1)	14	18 (2)	36
Palafoxia linearis	5 (1)	11	3 (0)	5
Psorothamnus emoryi	3 (4)	7	3 (3)	6
Psorothamnus schottii*	0 (0)	0	0 (0)	0
Tequilia palmeri	18 (32)	43	8 (23)	16
Tequilia plicata	1 (0)	2	0 (0)	1
Total surface coverage:			6	3

*Species occur on site, but at densities too low to be measured by line-intercept method.

of living plants; 4) the total coverage of plants, both alive and dead or dormant; 5) the total number of dead or dormant plants; and 6) the total coverage of dead or dormant plants. Chi-square contingency tables were used to test the null hypothesis that the frequency of sightings was not associated with perennial plant species. The expected frequencies were based on the results of the line-intercept transects. The null hypothesis was rejected for all six of the above cases. Sightings are not distributed independent of plant species. The resultant X^2 values were 62.05, 84.96, 59.17, 103.04, 44.22, and 36.81, respectively; the critical value at 11 DF is 19.68 (Rohlf and Sokal 1969).

For the total number of living plants, category 1 above, Ambrosia dumosa and Psorothamnus emoryi have a much higher frequency of association with FTHL sightings than expected, and Tequilia palmeri has a much lower frequency of association than expected. Excluding these three species from the analysis of the total number of living plants results in a X^2 value of 15.09; the critical value at 8 DF is 15.51 (Rohlf and Sokal 1969). Thus, for the remaining plant species, the null hypothesis is accepted and the frequency of sightings is distributed independent of species. Likewise, for category 3 above, based on percent coverage by live plants, the frequency of association with A. dumosa and P. emoryi are again much higher than expected, and the observed frequency of association with Larrea tridentata is much lower than expected. Excluding these three species resulted in a X^2 of 2.60 with 8 DF. Excluding A. dumosa, P. emoryi, and T.

palmeri from category 2, and A. dumosa, P. emoryi, and L. tridentata from category 4 failed to significantly alter the results. Thus, the null hypothesis was rejected for each of these cases (X^2 = 22.47, 16.40, respectively, at 11 DF).

Summarizing the above: FTHL preferred Ambrosia dumosa and Psorothamnus emoryi, and avoided Tequilia plicata which was the most abundant plant on the site. The plant with the greatest total coverage, Larrea tridentata, was also avoided. For all other plants on the site, the frequency of sightings associated with each plant species did not differ from the frequencies of occurrence of the plant species on the site.

Soil Temperature. The average monthly high soil temperature in sun and shade is plotted in Fig. 9. The voluntary minimum (29.3 °C, 85 °F) and maximum (41.0 °C, 106 °F) body temperatures (Brattstrom 1965) are superimposed on the graph. The voluntary activity range of body temperatures is bracketed by these body temperatures. The daily high soil temperature at 5 cm in the sun first reached the voluntary minimum body temperature during the week of February 4-6 in 1991 and February 26-28 in 1992. The daily high soil temperature at 5 cm is correlated with the minimum voluntary body temperature and the end of winter dormancy in mid-February.

Scat Analysis

All FTHL scat contained primarily ants during May through July. Although the other species' scat also contained some ants, only Uma notata and Callisaurus draconoides produced some scat (4/50 and 6/13 respectively) that contained primarily ants.

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APPENDIX A

TRANSMITTERS AND BACKPACKS

Relatively little is known of the population biology of the flat-tailed horned lizard (FTHL), Phrynosoma mcallii. This is not an unusual situation for a small lizard, and the usual approach to the problem is to initiate a program of capture-recapture studies to determine basic information such as home range size, activity patterns, growth rates etc. However, capture-recapture methods obviously depend on the ability of researchers to relocate individual animals which is not always possible with low density populations of highly cryptic animals such as the FTHL. To circumvent this problem, we developed a radio transmitter backpack and harness that enabled us to relocate individuals and use capture-recapture methods in our field studies of this cryptic species.

The transmitter is a modified configuration of an SM1 transmitter (AVM Instrument Company). The battery (Li 803) and electronics were potted in dental acrylic, and a 4 cm whip antenna extended posteriorly from the middle of the transmitter. The mass of the transmitter was less than 4.0 g and was essentially balanced on either side of the midline of the backpack. A backpack and harness was used to secure the transmitter to the lizard using materials that are readily available in fabric stores: polypropylene pleating tape; and clear polypropylene elastic.

The backpack is made from pleating tape that consists of a 5 cm wide polypropylene mesh that is trisected by two parallel strips of tightly woven polypropylene running lengthwise through the tape. The backpack is shaped like an

inverted "T" which is cut from the pleating tape (Fig. 1A). The vertical leg of the "T" (≈ 2 cm) is fashioned from a woven strip of the pleating tape, and the horizontal bar (2 cm long by 1 cm wide) is fashioned from the surrounding mesh material (Fig. 1B). Both ends of the woven strip and the perimeter of the mesh material should be melted with a soldering iron to fit the shape of the transmitter package and to prevent unravelling.

The harness straps (0.5 cm wide) are made from a 10 cm strip of clear polypropylene elastic. This material is thin and light weight, and in exposure tests it maintained its elasticity much longer than woven elastic materials. The straps are positioned at about 45° and are fastened to the vertical leg of the "T" with superglue and a stitch of thread (Fig. 1B and sample enclosed). The backpack and transmitter are then joined together with dental acrylic.

The backpack is attached to the back of the lizard by positioning the package with the straps on the lizard's neck and the antenna pointing posteriorly (Fig. 1C). A strap is pulled over the shoulder of one leg, across the chest, through the axilla of the other leg, and is fastened to the top of the transmitter with a drop of cyanoacrylic glue (superglue). The second strap is fastened in the same way, and a drop of superglue is applied between the straps where they cross on the ventral side (Fig. 1D) to keep the package from shifting. Thus the package sits firmly on the back of the lizard and does not restrict movement of the head or legs.

Captive lizards have been observed feeding immediately after attachment of a transmitter. The harness does not noticeably alter the normal activity of released lizards which have been observed to eat, breed, and construct burrows with no apparent interference caused by the transmitter.

The total mass of the telemetry package (< 4 g) was about 25% of the body mass of a lizard (mean 15.8 g, range 11.0 - 25.0 g) that was fitted with a backpack. As a matter of perspective, the mass of the backpack was about that of a clutch of eggs, 27% of the total body mass of the female (Pianka and Parker 1975).

The signal from the transmitter was received on an AVM LA12-DS Receiver using a three element AVM HHC Yagi antenna. The reception range varied with the position of the lizard above or below ground, but was usually about 100 m.

The backpack method of attaching transmitters has been used on 42 FTHL since April, 1990. A few lizards shed the harness, but most carried the package for at least the duration of the battery life (3 - 6 months).

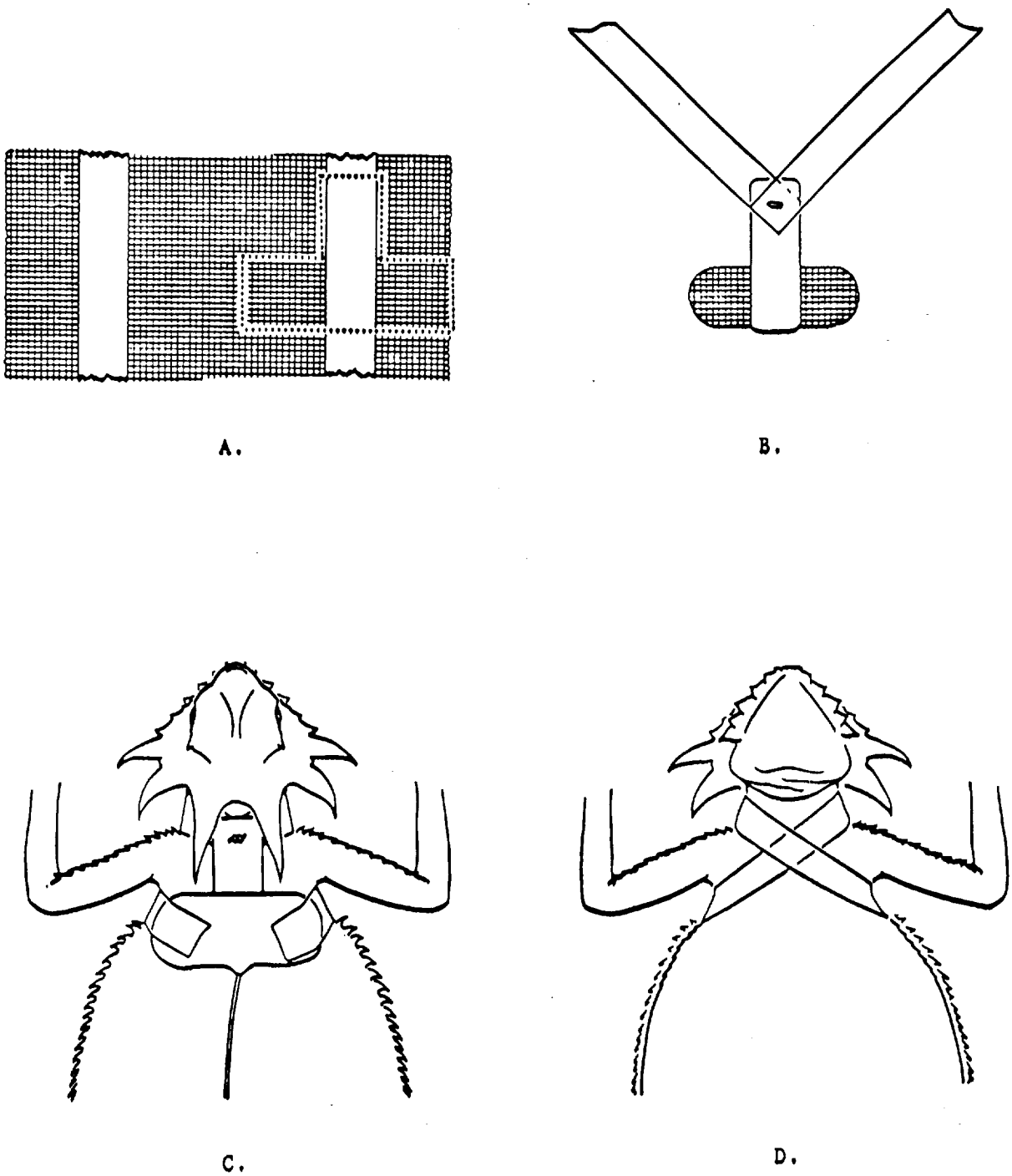

Fig. A1. Backpack construction and attachment to the lizard.