

APPENDIX 1

LIZARD TRAPPING RESULTS FOR AREA 50, NORTHWEST FIELD

PERIOD COVERED: April – May, 1997

SUMMARY

This report summarizes the results of the initial period of lizard trapping conducted at the Area 50 project site in Northwest Field, Guam. The Division of Aquatic and Wildlife Resources (DAWR) will soon attempt to remove brown tree snakes (*Boiga irregularis*) from the site, which will permit the eventual release of Guam rails (*Gallirallus owstoni*) and other native endangered species. Deer and feral pigs will also be eradicated from the area to allow recovery of plant communities.

The study described in this report is the first phase of a project to gather baseline data on changes in the occurrence and densities of lizards in Area 50 before, during, and after the removal of brown tree snakes. Plans call for lizard trapping to be repeated at intervals of 4-6 months to assess changes in abundance resulting from snake removal. Campbell (1996) documented increases in the abundance of the introduced skink *Carlia fusca* and the geckos *Hemidactylus frenatus* and *Lepidodactylus lugubris* after snake eradication was achieved on two 1-ha study plots at another site in Northwest Field, but failed to notice a significant change in numbers of the skink *Emoia caeruleocauda*. He also reported increases in snout-vent lengths of all lizard species following snake removal. Our study will attempt to determine if similar changes are observable in lizard populations at a larger 23-ha location using less intensive study techniques than those of Campbell (1996).

METHODS

Lizard abundance was assessed using sticky traps placed along four transects (Transects A-D) radiating from the center of Area 50 (Figure 1). These coincided with the trap lines used for small mammal surveys (G. Beauprez, DAWR, unpubl. data). Lizard traps (Victor Mouse Glue Traps, Woodstream Corp., Lititz, PA) measuring 12 by 16 cm in adhesive surface area were set at 12 stations separated by 10-m intervals along each transect. Three traps were placed at each station, with one laid on the ground, a second stapled to a nearby tree trunk at 1.2-1.8 m high, and a third attached to smaller branches (< 2.5 cm thick) or foliage at 1.2-1.8 m high. Traps were checked hourly during the day from 0830-1730 hr, once after nightfall at 1900 hr, and again the next morning at 0630 hr. Traps were kept in the same location throughout each trapping period, but were replaced with fresh units if they became fouled with debris or rain. Captured lizards were carefully removed from traps with cooking oil to avoid tail breakage and to reduce mortality. Animals were measured for snout-vent length and released outside of Area 50. *Emoia* and *Carlia* were considered adults if they had snout-vent lengths greater than 43 mm and 49 mm, respectively (McCoid 1989; M.J. McCoid cited in Campbell 1996). Tail color was also recorded for *Emoia*. Two workers took part in the study, with each assigned to one transect per day. Trapping was conducted along Transects A and C on 14 April 1997 and along Transects B and D on 13 May 1997. Standardized visual censuses were not made.

Habitat Types in Study Area

The trapping area encompassed three habitat types, as follows:

Tall limestone forest - This forest type featured a canopy greater than 5 m tall and some large tree trunks. Ground cover was moderate to fairly dense. Major plant species included *Guamia mariannae*, *Premna obtusifolia*, *Vitex parviflora*, *Aglaia mariannensis*, *Eleocharpus joga*, *Tristiropsis obtusangula*, *Ficus* sp., *Flagellaria indica*, *Mikania scandens*, and *Jasminum marianum*. Twenty-six trapping stations occurred in this habitat, 10 of which were located on the edge or within 5 m of a weedy opening.

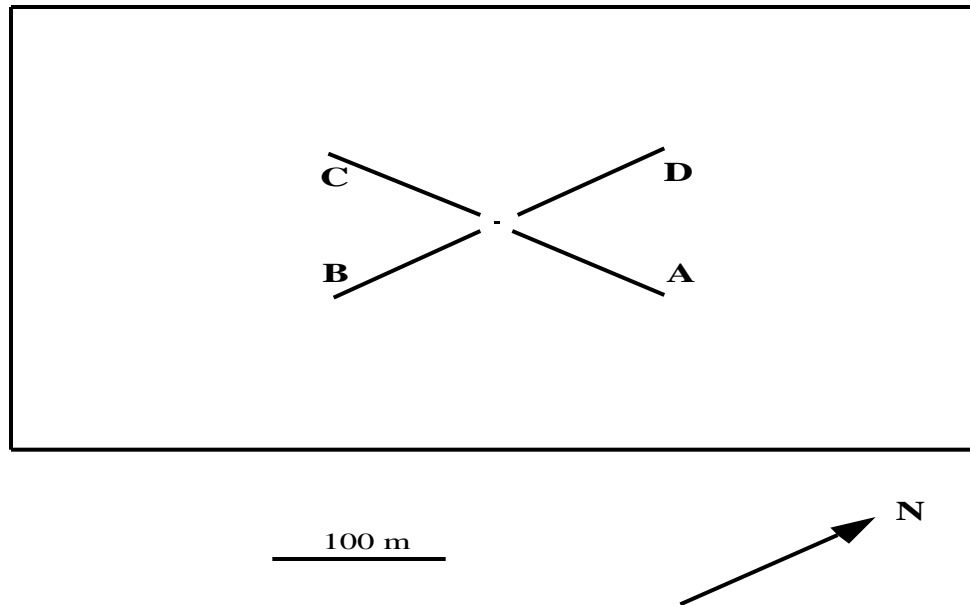


Figure 1. Locations of Transects A-D in Area 50, Northwest Field.

Short limestone forest - The forest type was 3-6 m tall with no large tree trunks present. Ground cover was moderate to fairly dense. The most common species were *Guamia mariannae*, *Premna obtusifolia*, *Vitex parviflora*, *Aglaia mariannensis*, *Leucaena leucocephala*, *Triphasia trifolia*, *Flagellaria indica*, and *Mikania scandens*. Twenty-one stations were set in this habitat, with 12 found on the edge or within 5 m of a weedy opening.

Weedy openings - These open sites featured dense ground cover that was usually 0.3-1 m tall. *Bidens alba* was the dominant weed species, with *Momordica charantia* and *Chromolaena odorata* also relatively common. Few or no trees were present. Only one station was located in this habitat, however, 22 forested stations occurred on the edge or within 5 m of a weedy opening.

Weather conditions - Transects A and C were completed on a mostly cloudy day with several rain showers, while Transects B and D were done under hot and mostly sunny conditions. Both study nights were dry and partly cloudy.

RESULTS AND DISCUSSION

A total of 213 lizards representing four species were caught during this initial trapping session (Table 1). *E. caeruleocauda* was by far the most common species recorded, comprising 85.4% of all individuals. Other species collected included *C. fusca* (11.7%), *Gehyra mutilata* (1.4%), and *H. frenatus* (1.4%). General visual observations corroborated that *Emoia* was much more common than *Carlia* along each transect.

Table 1. Total numbers of lizards captured on Transects A-D in Area 50, April-May 1997.

Transect	<i>Emoia caeruleocauda</i>	<i>Carlia fusca</i>	<i>Gehyra mutilata</i>	<i>Hemidactylus frenatus</i>	Total
A	40	8	2	0	50
B	43	8	0	1	52
C	47	5	0	1	53
D	52	4	1	1	58
Total	182	25	3	3	213

Similar numbers of lizards were caught on each of the four transects ($G = 0.118$, $df = 3$, $P = 0.990$), with *Emoia* comprising 80.0-89.7% of the animals captured on each trap line (Table 1). Differences in weather conditions between study days did not have a noticeable effect on the numbers of skinks captured ($X^2 = 0.508$, $df = 1$, $P = 0.476$).

Size classes of captured *Emoia* and *Carlia* are shown in Figures 2 and 3. Adults comprised a large portion (76.3%) of the *Emoia* population. All brown-tailed individuals were adults, in contrast to 22.8% of the animals with blue tails.

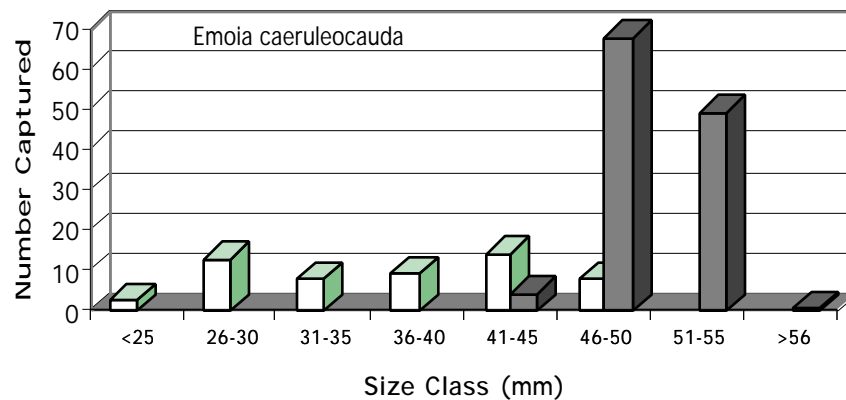


Figure 2. Size frequency distribution of *Emoia caeruleocauda* with blue tails (n=55; white bars) and brown tails (n=122; dark bars) captured on Transects A-D in Area 50, April-May 1997.

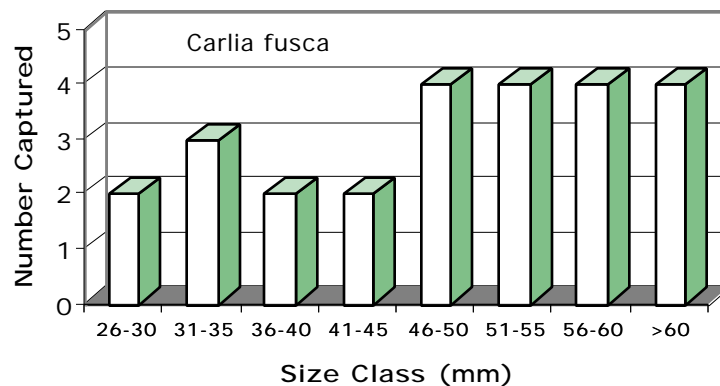


Figure 3. Size frequency distribution of *Carlia fusca* (n=25) captured on Transects A-D in Area 50, April-May 1997.

Additionally, 68.7% of all *Emoia* had brown tails and 31.3% had blue tails (Table 2, Figure 3). Because the population of blue-tailed *Emoia* deviated from normality (Wilk-Shapiro

test, $W = 0.918$, $P < 0.001$), a Wilcoxon 2-Sample test was used to compare size differences between the two color phases of this species. As expected, individuals with brown tails were significantly larger than those with blue tails ($Z = -10.221$, $P < 0.001$). These data support the belief that blue tails are typically found on juveniles and some older females (Wiles et al. 1990). The percent of animals with blue tails in Area 50 was lower than on the neighboring island of Rota, where this color phase comprised 57% of the *Emoia* caught in traps (Wiles et al. 1990). About half (48.0%) of the *Carlia* captured in Area 50 were adults.

Table 2. Measurements (mm) of lizards captured on Transects A-D in Area 50, April-May 1997. SVL = snout-vent length; SD = standard deviation; CV = coefficient of variation.

Species	Sample size	Mean SVL length	SD	Size range	CV
<i>E. caeruleocauda</i> (all individuals)	177	45.7	7.6	24 - 57	16.6
<i>E. caeruleocauda</i> (brown-tailed only)	122	49.7	2.4	44 - 57	4.9
<i>E. caeruleocauda</i> (blue-tailed only)	55	36.6	7.4	24 - 49	20.2
<i>C. fusca</i>	25	48.2	11.7	26 - 64	24.2
<i>G. mutilata</i>	3	50.0	3.6	47 - 54	7.2
<i>H. frenatus</i>	1	48.0	-	48	6.0

Mean capture rates (\pm SD) of skinks by trap type were: ground traps, 3.7 ± 2.0 animals per day (range = 1-11 animals); branch traps, 0.4 ± 0.7 animals per day (range = 0-3 animals); and trunk traps, 0.3 ± 0.5 animals per day (range = 0-2 animals). The majority of *Emoia* were caught on ground traps (83.0%), with far fewer individuals captured on branches (9.9%) and trunks (7.1%) (Table 3). Juveniles were taken in greater numbers ($G = 14.519$, $df = 2$, $P < 0.001$) on branches and trunks (39.0%) than adults (9.5%), indicating that younger animals are more arboreal than older ones. All *Carlia* were taken on ground traps, while all geckos were collected on tree trunks.

Analyses of capture data by habitat type showed that *Emoia* abundance did not differ between forest types (adults, $G = 0.023$, $df = 1$, $P = 0.880$; adults and juveniles combined, $G = 0.062$, $df = 1$, $P = 0.804$) or with distance (< 5 m vs. > 5 m) from weedy openings (adults, $G = 0.037$, $df = 1$, $P = 0.847$; adults and juveniles combined, $G = 0.036$, $df = 1$, $P = 0.850$). Similar results were obtained for *Carlia* (both age groups combined), which was equally common in short and tall limestone forest ($G = 0.004$, $df = 1$, $P = 0.952$) and at stations near weedy openings and those farther away ($G = 2.81$, $df = 1$, $0.05 < P < 0.10$). Data from the single trap station in a weedy opening were excluded from statistical analyses because of the small sample size.

Hourly capture rates of *Emoia* and *Carlia* were greatest from 0830 to 1330 hr (Table 3, Figures 4, 5, and 6), with 83.1% of all skinks (*Emoia*, 82.4%; *Carlia*, 88.0%) caught during this period (Table 3, Figure 6). The combined capture rate for both species in all trap types peaked at 0930 hr, then generally showed a steady decline during the rest of the day. *Carlia* displayed a second peak in captures at 1330 hr, but this was perhaps an artifact of the small total number of captures for this species. All geckos were caught at 1900 hr ($n = 2$) or 0630 hr ($n = 4$).

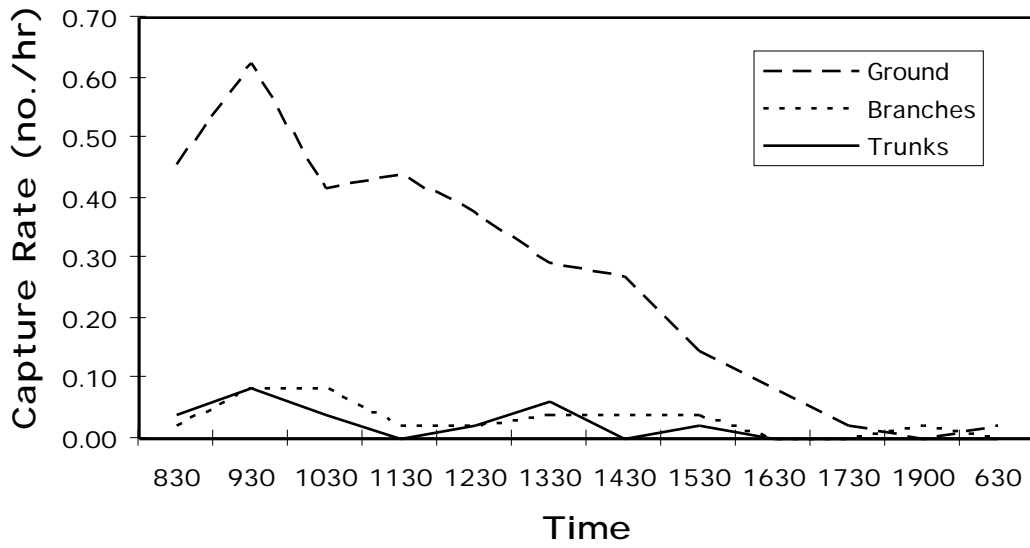


Figure 4. Capture rates (number of animals caught per hour per trap) of *Emoia caeruleocauda* in sticky traps placed on three substrates along Transects A-D in Area 50, April-May 1997.

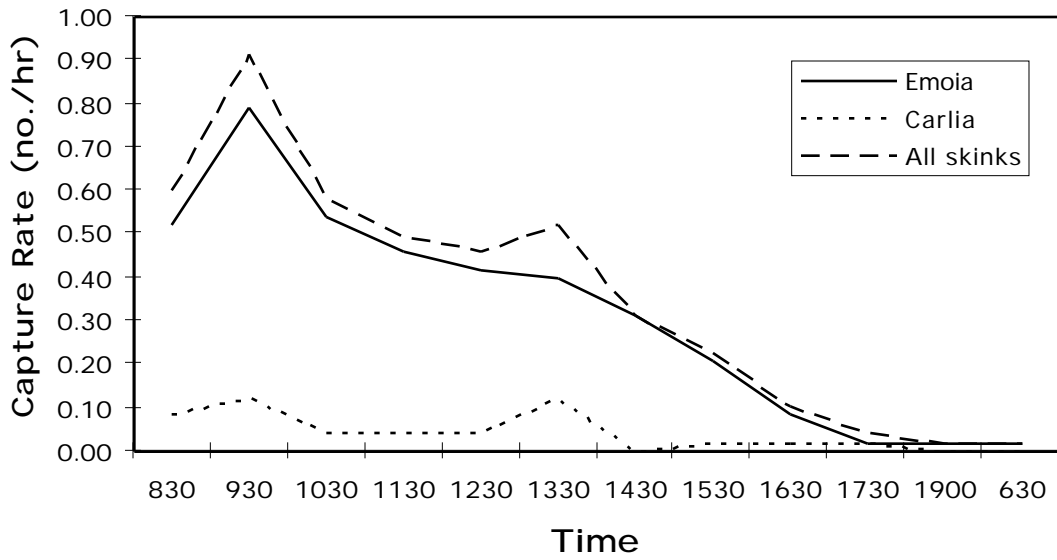


Figure 5. Capture rates (number of animals caught per hour per trap) of *Emoia caeruleocauda* and *Carlia fusca* in sticky traps placed on three substrates along Transects A-D in Area 50, April-May 1997.

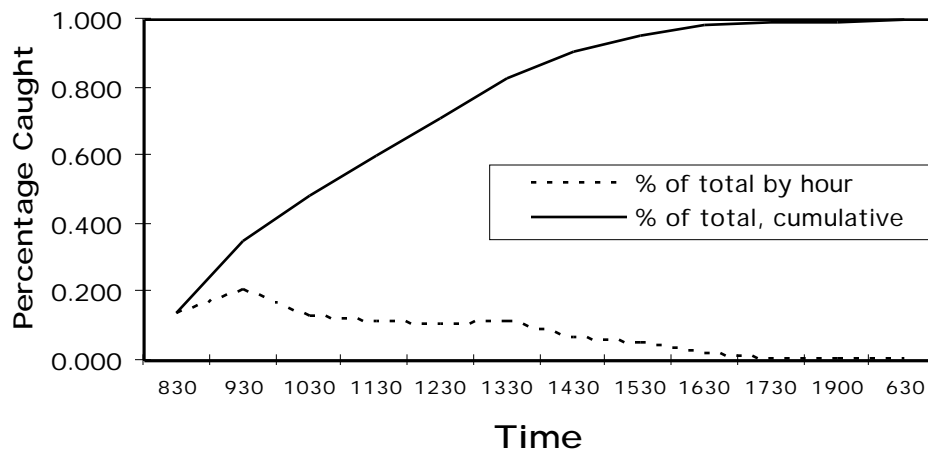


Figure 6. Hourly and cumulative captures of all skinks per hour (expressed as a percentage of all individuals caught during the day) in sticky traps on Transects A-D in Area 50, April-May 1997.

Table 3. Numbers of *Emoia caeruleocauda* () and *Carlia fusca* (†) captured per hour in sticky traps placed on tree substrates along Transects A-D in Area 50, April-May 1997.

SPP	T.L.	830	930	1030	1130	1230	1330	1430	1530	1630	1730	1900	630	Total
	G	22	30	20	21	18	14	13	7	4	1	0	1	151
	B	1	4	4	1	1	2	2	2	0	0	1	0	18
	T	2	4	2	0	1	3	0	1	0	0	0	0	13
	A	25	38	26	22	20	19	15	10	4	1	1	1	182
†	G	4	6	2	2	2	6	0	1	1	1	0	0	25
	A	29	44	28	24	22	25	15	11	5	1	1	1	207

^aKey to trap locations: G = ground; B = branches; T = trunk; A = all trap locations combined; T.L. = Trap Location; and = all skinks.

ACKNOWLEDGEMENTS

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LITERATURE CITED

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