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THE THIRD ANOLIS NEWSLETTER

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A. ROSS KIESTER (University of Chicago) summarizes the work to date on Anolis onca on the Paraguana Peninsula of Venezuela, primarily by himself and Kenneth Miyata.

Harvard field parties visited the Paraguana Peninsula first in November, 1972 and then again in August, 1973. The resulting data on Anolis onca were reported by Williams (1974) in connection with a general evolutionary and phylogenetic discussion of the species. Some additional data were provided by K. Miyata in the Second Anolis Newsletter.

A more detailed study was begun by A. R. Kiester and K. Miyata in June, 1974. They selected a site on the Istmo de Medanos of the Paraguana Peninsula about 10 km north of the town of Coro. (Miyata had watched onca here in 1973.)

The site is a small "island" of high ground surrounded by mudflats which show signs of being occasionally under water although they have been dry during all of their visits. The island is about three acres in areas and was christened "Anole Atoll." The island is about 50 m from the center of the isthmus which constitutes continuous habitat for the lizard.

In June, 1974 the vegetation of the island was mapped and as many lizards as possible were marked. The marked lizards were followed through July first by Kiester and Miyata and then by R. Leuthueser. Kiester returned in September of 1974 and again in March of 1976 with J. Walters and D. Rabinowitz. Data from these three visits plus some data from the two earlier visits are now being worked up into a report on the ecology and natural history of this species. Here we summarize the findings and comment upon them.

Habitat and Habitat Use. Vegetation on the island consists primarily of widely scattered acacia bushes and opuntia with varying amounts of a small shrub and some grass. The acacias are small and range in size up to about 4 ft. high and perhaps 10 ft. across. Many are essentially bare of leaves. The opuntias are mostly small. The lizards generally live on the acacia bushes which have thick patches of grass growing at the base. In the course of over 100 hours of observation about 775 spot observations were made on the perches used by marked individuals. The anoles are usually perched on the thorny stems of the bushes, most often near the base. Sometimes they are found on the grass at the base of the bushes or on an opuntia. They were rarely seen in the windswept green tops of the bushes. This was in contrast to the nearby continuous stretches of habitat where, at least at some times, the lizards were frequently perched in the dense spiny tops of the low bushes.

The daily cycle of activity for this species shows a peak of activity in midmorning, lower activity during the hottest part of the day, but a marked decrease in the number of lizards seen from about 1500 until dark. Since most individuals seen during this later period are still perched on the shaded windward side of the bushes, and very few are perched on the sunny lee side, it must be more important for them to face the wind than to maintain an elevated body temperature at this time of day. Some individuals, usually adult

males, are found both in the sun and wind during this period, perched on small clumps of cactus which provide no wind barrier, or wandering about on the ground near their home bush. In June, July and September, smaller lizards and females were almost never seen on the ground. In March, several juveniles were seen out on the ground. At any one time only a fraction of the population was visible. Usually a majority of the lizards were (presumably) hiding inside the grass at the base of the bushes during any one census of the island.

Thermal Relations. Over 80 body temperatures were recorded for animals both on the island and on the nearby mainland. Analysis of 106 sample body temperatures regressed against air temperature yielded a value of $k = .875$. This k is the measure of the precision of thermoregulation of Huey and Slatkin (1976). A value of k very close to unity, as this one is, indicates that this species is not thermoregulating at all, at least while they are active. Thermoregulation is probably very difficult for this species because of the action of the wind which tends to bring the lizards into thermal equilibrium with the air very quickly (the opposite of the wind chill factor).

Home Range. Home ranges tend to be quite small; with some exceptions individuals did not leave the vicinity of a given bush. The number of lizards per bush or continuous clump of bushes varied according to the extent and complexity of the vegetation structure, with up to six individuals using the same patch. Some individuals were observed to move from one bush to another. Sometimes an individual would show up at several different bushes and then disappear, while others would move to an adjacent bush for a few days and then return to the bush where it was first seen.

Social Behavior. Adult males vigorously react to the presence of intruder males placed in the territory on a tether. Each bush or clump of bushes had only one full grown male (although it may have had a smaller male or two). Natural social interactions were observed between full grown adult males on a few occasions. These encounters in March, June, July and September took place in the late afternoon and were on the open ground between two bushes. They consisted of much vigorous headbobbing and dewlapping and some chasing and biting. It is therefore quite likely that the full grown adult males are territorial in a very classical fashion. Females also react to tethered intruders, but apparently less vigorously. Social interactions are much more common in November.

Feeding and Food. Few instances of food capture were noted, but those that were seen involved a lizard moving from a low perch onto the ground to pick up an item, or feeding by individuals who were already on the ground. The first behaved like classical trunk-ground sit-and-wait foragers (except that they were on small branches rather than trunks). However, two observations of prey capture by adult males out on the ground in the afternoon showed the existence of a striking prey-stalking behavior. The prey in these cases were robber flies and the lizards moved towards them very carefully using irregularities in the ground as cover when stopping. Finally they would dash at the fly from the last stopping point. This type of stalking behavior is not like that of,

say, Cnemidophorus or Ameiva but is rather more like that of a cat. This behavior pattern needs to be documented more fully, but appears to represent an example of a prey capture tactic not previously noted for the genus. The observations suggest that the repertoire of prey stalking tactics may be broader than previously supposed and that the expression of prey stalking tactics may depend on the ecological circumstances. Few other species of anoles ever forage on open flat ground.

Based on our present limited knowledge, Anolis onca appears to subsist primarily on invertebrates. Richard Salvato has analyzed a series of 38 stomachs from a variety of localities and the results are presented in Table 1. A single species of chrysomelid beetle made up a large portion of the stomach contents in the animals in which it was present. In addition to the arthropods, Salvato found a snail and shed skin. He also has an observation of an onca in the process of swallowing a female Cnemidophorus lemniscatus.

Kiester believes that it may be possible that the "island" population of onca may be acting essentially as aeolian planktivores because the sparse vegetation may produce little food and the strong winds may blow in significant amounts of insect prey. Clearly what is needed to substantiate this belief are stomach contents of island lizards and measurements of insect density on the island and of the amount of potential food blown in by the wind.

Size, Growth, and Reproduction.

Although our data is mixed from two different years and thus is not wholly reliable, a plot of the size distribution of the lizards for the three different times of the year that we have visited the island is interesting (Figs. 1 and 2). From these figures we can see that mean body size increases through the year. Further, the variance in body size decreases. That is, the population grows up until most all of the members are of adult size and there are no young in September. From this pattern and the fact that (according to local residents) rainfall occurs principally in December and January, we may infer that reproduction is very seasonal. A likely hypothesis is that eggs are formed and laid after the first rains so that the young come out in January and February (and possibly March). These young plus those lizards left from the previous year then grow throughout the rest of the year. By September most of the lizards in the population are adults and this situation continues until the next rainy season.

Another aspect of the annual variation in size patterns is the extreme sexual dimorphism in size. Females are never larger than 68 mm SV while males can grow up to 89 mm SV. In September females are restricted to a narrow size range of 59-69 mm while males range from 58-89 mm. There is a peak in the distribution of males at 64 mm which is the average size of females at that time. Males above the maximum female size of 68 mm are more evenly distributed as to size. The occurrence of a group of female-sized males at this time is suggestive. It seems to be the case that these smaller males may be tolerated

within the territory of an adult sized male while we know that large adult males never tolerate each other. This raises the intriguing question as to whether there is some control over the growth of males either though some social effect or through direct competition for food in which the larger male usually wins. It may be that smaller males who cannot get their own territory are in some way forced to remain at female size until they can strike out on their own. If such a "gating" phenomenon is occurring, it needs to be carefully documented and the elucidation of the mechanism will prove to have important implications for the nature or the relationships of growth, competition, and social systems in this species.

Survivorship. Of 55 animals marked in June and early July, 1974, a total of 26 were recaptured in September after an interval of at least 80 days (Table 1). Upon return to the island in March of 1976, over 18 months later, no lizards could be confidently identified as having been marked before, although two were possibilities. We have some indication that they may be able to regenerate toes. In any event, the data from 1974 alone show a lower rate of disappearance than is found for most mainland anoles. This may reflect lower mortality rates, although it may be due to lower emigration rates as well.

Predation. Predation seems very low for the lizards on the island. The only bird predator observed on the isthmus that could conceivably catch A. onca is the caracara, but these seem to have too much trouble maneuvering in the wind to be a threat. The mockingbird (Minus gilvus), which nested on the island, may take juveniles. On the main part of the isthmus several individuals of the large colubrid, Mastigodryas pleei were seen foraging. These probably take A. onca, but none were ever seen on the island itself.

Movement On and Off the Island. Our original impression was that there would be relatively little movement on or off the island because of the hostility of the intervening mudflat environment. However, in March when numbers of small individuals were seen, we saw a number of these smaller lizards out on the edge of the island and in one case found a small juvenile some 20 m out into the mudflats. Thus dispersal between the islands and to and from the mainland may be greater than we had previously expected.

Summary. Anolis onca clearly represents an extreme in Anolis habitat preference. Windborne food and low predation rates appear to go along with this habitat. Both of these factors are associated with the wind, and as Williams has remarked, the wind seems to be the key to the ability of this species to live along the coastal desert, and the lack of wind anywhere except right along the coast appears to explain the absence of the species further inland.

Our study area has now been followed for three calendar years and during our last visit the individual bushes mapped in the study were marked permanently using aluminum tree tags. Because of the location of the study area, we feel confident that it will not be disturbed by human activities. We hope that the site will remain useful for many years to come.

TABLE 1

	Number present In June	Number present in September	Percent remaining
females	25	14	56
males	30	12	40
Total	55	26	47.3

Disappearance rate of marked Anolis onca on Anole Atoll. A minimum of 81 days between June and September observations. Twenty-two of these animals were seen after intervals of 95 days.

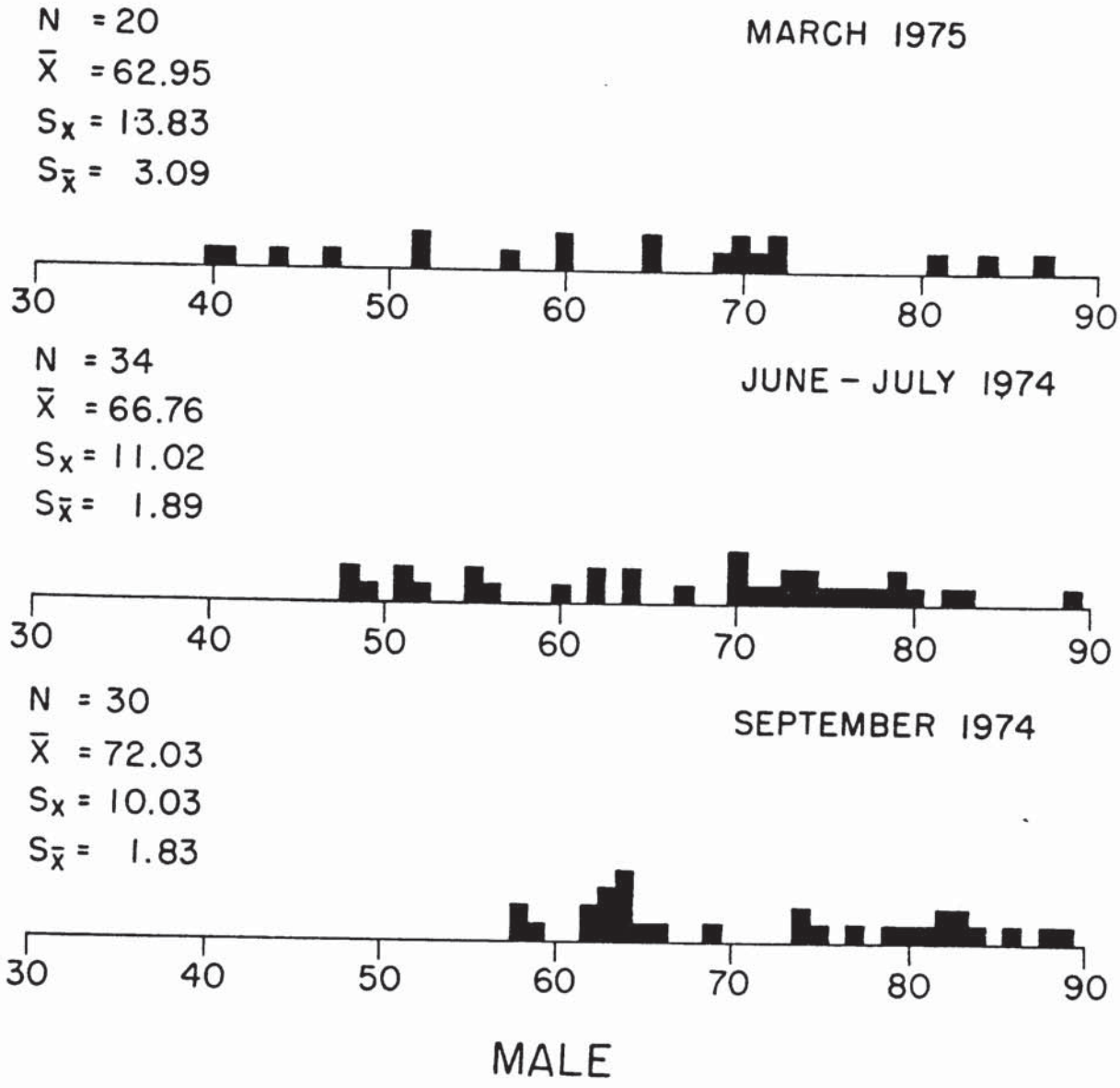
N = 20
$\bar{X}$ = 62.95
S_X = 13.83
$S_{\bar{X}}$ = 3.09
MARCH 1975
30 40 50 60 70 80 90
N = 34
$\bar{X}$ = 66.76
S_X = 11.02
$S_{\bar{X}}$ = 1.89
JUNE - JULY 1974
30 40 50 60 70 80 90
N = 30
$\bar{X}$ = 72.03
S_X = 10.03
$S_{\bar{X}}$ = 1.83
SEPTEMBER 1974
30 40 50 60 70 80 90
MALE

FIG. 1

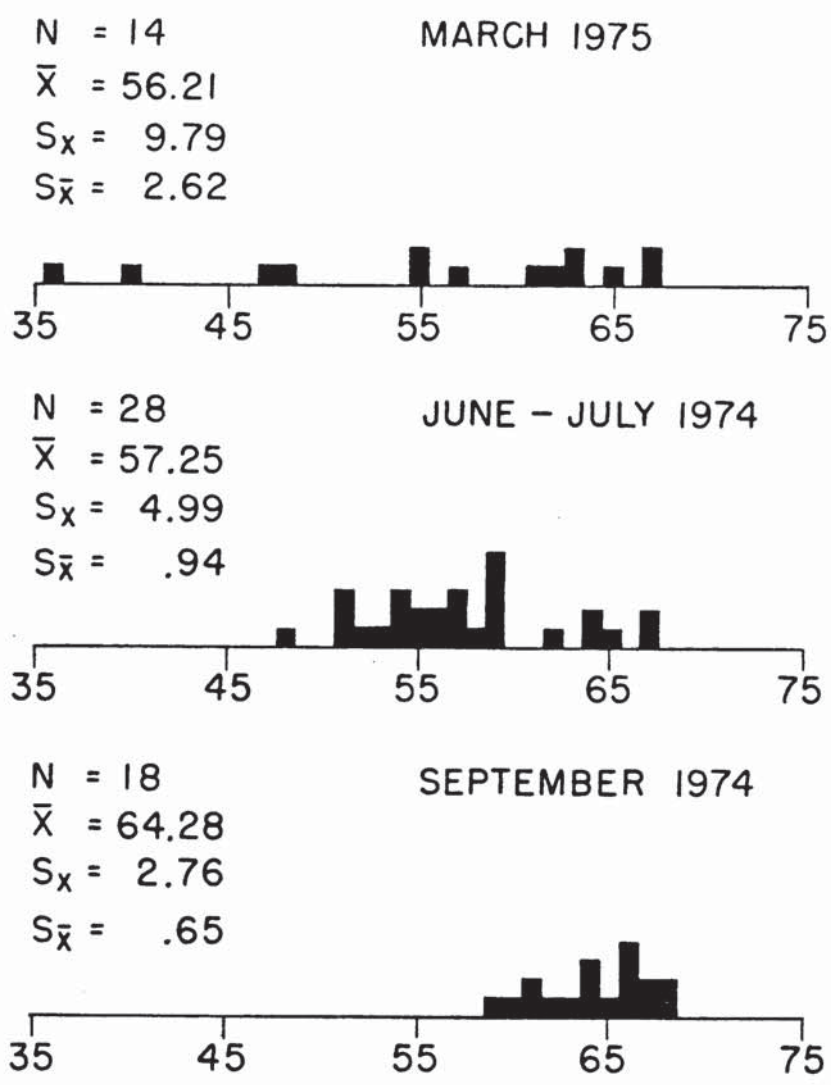
N = 14
MARCH 1975
$\bar{X}$ = 56.21
S_X = 9.79
$S_{\bar{X}}$ = 2.62
35
45
55
65
75
N = 28
JUNE – JULY 1974
$\bar{X}$ = 57.25
S_X = 4.99
$S_{\bar{X}}$ = .94
35
45
55
65
75
N = 18
SEPTEMBER 1974
$\bar{X}$ = 64.28
S_X = 2.76
$S_{\bar{X}}$ = .65
35
45
55
65
75
FEMALE

FIG. 2

Papers cited:

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