STUDIES ON THE FAUNA OF CURAÇAO AND OTHER CARIBBEAN ISLANDS: No. 116.

NOTES ON THE HERPETOLOGY OF THE U.S. NAVAL BASE AT GUANTANAMO BAY, CUBA

by

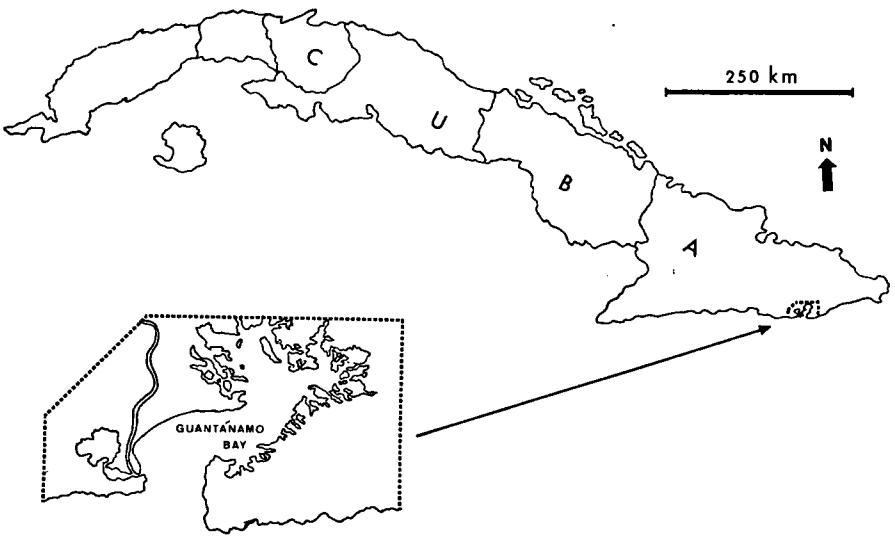
R. V. LANDO & ERNEST E. WILLIAMS

(Museum of Comparative Zoology, Harvard University)

The present relative inaccessibility of Cuba to citizens of the United States has been particularly disappointing since very much still remains for the herpetologist to do in that country. In particular, the province of Oriente is very inadequately known; we know just enough to be aware how much remains uncertain or uninvestigated. The collections at present available point to a truly extraordinary complexity without providing the materials to delineate or understand it.

The fauna of the very small area directly available to Americans – the Guantánamo Naval Base – in itself demonstrates some of the surprises and problems but offers a mere taste of the richness in both regards of the province as a whole. The Base has deserved closer attention than it has received. Many species have been described from it (or the vaguer locality "Guantanamo").

The locality "Guantanamo" as so often used – with no precision – is a source of considerable confusion, as THOMAS & SCHWARTZ (1966) and THOMAS (1968) have commented. It has become evident that the coastal area at the Base and the hills outside it are not a unit faunal area. This sharp change of faunas within a few miles is a frequent phenomenon in the Antilles and it makes nonsense of locality records which do not specify exact location, or better, elevation *and* ecology. The observations to be reported here were made solely on the Base itself; to this extent political conditions have compelled a concentration of effort which permits a clearer impression of this interesting area.



CUBA showing the position of the *Guantánamo* Naval Base. – Boundaries of the provinces are indicated. The inset shows the major contours of the base.

We summarize the herpetology of the U.S. Naval Base primarily on the basis of collections made from November 1959 to September 1962 by the senior author, R. V. LANDO. The notes on habitat, habits, and ecology are by R. V. LANDO, the systematic discussions by ERNEST E. WILLIAMS. A collection made by RICHARD THOMAS in early 1965 has also been made available to us. We have taken the opportunity to comment on relationships and on recently described forms whenever material permits. We have made special efforts to report on the ecological partitioning of the very limited living space of the Base by the various closely or distantly related species. A Key to the local forms is provided below. The latest reference to every form discussed is given, or mention is made that the form is under study.

NOTE TO ZOOGEOGRAPHERS

To place the fauna of the Guantánamo Naval Base in proper context it has been necessary to survey our current knowledge of

the Cuban fauna. It is a fact that should be more widely known that BARBOUR's 1937 Checklist is very badly out of date. The work of ALBERT SCHWARTZ and co-workers has in particular tremendously increased the number of species and subspecies recognized and has resulted in many other changes. Other workers have also studied segments of the Cuban herpetofauna; the total literature is massive and widely scattered. The recent list by BUIDE (1967) of Cuban amphibians and reptiles is almost complete but even it misses certain recently published forms. We have endeavored to help future workers by listing in the bibliography of this paper all the taxonomically important papers from BARBOUR & RAMSDEN's "Herpetology of Cuba" (1919) to those published by the end of 1968, and we summarize also in Table 1 the difference in numbers of taxa (species and subspecies) and full species recognized in 1937 and those currently acknowledged.

In each group (frogs, lizards and snakes) there has been a doubling or almost a doubling of the number of taxa considered valid (frogs 54 instead of 27, lizards 104 instead of 51, snakes 30 rather than 17). This, of course, reflects a very great increase in the numbers of the rather subjective and controversial category, subspecies. More important is the rise in the number of full species recognized: more than a 70% increase since the 1937 "Checklist" for frogs, almost 25% for lizards, more than 35% for snakes.

The increase is the more impressive when it is realized that the work of describing the Cuban herpetofauna (including the Isla de Pinos) at the alpha level is not yet finished. Here the important fact is that the currently recognized Cuban species are most probably not too many but too few. Some species may very possibly be reduced to synonymy or to subspecies status but there are already known subspecies that very probably require to be raised to species status and species still to be described. (We in this paper add one species of *Typhlops* to the Cuban fauna [1] and raise one subspecies of *Arrhyton* to species level.)

Beyond this what is true or Cuba is true of the other Greater Antilles, above all of Hispaniola, but also of Jamaica and Puerto

[1]) Since this was written R. THOMAS (1968) has published the records of *Typhlops biminiensis* for Cuba.

TABLE 1

DIFFERENCE IN NUMBERS OF TAXA (SPECIES AND SUBSPECIES) AND FULL SPECIES RECOGNIZED IN 1937 AND THOSE CURRENTLY ACKNOWLEDGED

	1937		1968	
	Taxa	Species	Taxa	Species
SALIENTIA				
Hyla	1	1	1	1
Bufo	5	3	9	6
Eleutherodactylus	19	17	42	31
Sminthillus	2	1	2	1
Total AMPHIBIA	*27*	*22*	*54*	*39*
SAURIA				
GEKKONIDAE				
Gonatodes	1	1	1	1
Hemidactylus	2	2	2	2
Sphaerodactylus	6	6	17	11
Tarentola	1	1	1	1
IGUANIDAE				
Chamaeleonides	1	1	2	2
Deiroptyx = *Anolis* q.v.	2	2	–	–
Anolis	25	16	38	23
Norops = *Anolis* q.v.	1	1	–	–
Cyclura	1	1	1	1
Leicephalus	4	4	34	5
ANGUIDAE				
Diploglossus	2	1	2	1
XANTUSIIDAE				
Cricosaura	1	1	1	1
TEIIDAE				
Ameiva	1	1	1	1
AMPHISBAENIDAE				
Cadea	2	2	2	2
Amphisbaena	1	1	2	1
Total Sauria	*51*	*41*	*104*	*52*
SERPENTES				
Typhlops	1	1	2	2
Epicrates	1	1	1	1
Tropidophis	7	6	12	10
Natrix	1	1	1	1
Tretanorhinus	1	2	2	5
Alsophis	1	1	4	1
Dromicus	2	1	4	1
Arrhyton	3	3	4	3
Total Serpentes	*17*	*16*	*30*	*24*
TESTUDINES				
Chrysemys	1	1	1	1
CROCODILIA				
Crocodylus	2	2	2	2
Total REPTILIA	*71*	*60*	*137*	79

Rico. ZOOGEOGRAPHERS: *please note that in the West Indies the period of discovery – even of significant discovery – is not quite ended.*

KEY TO THE LIZARDS OF GUANTÁNAMO NAVAL BASE

1. Belly with smooth squarish plates, abruptly distinct from granules of flanks and back. Plates in about 10 rows counted across belly. End of tail blue in life . . . . . *Ameiva auberi*
   Belly with more than 10 rows of enlarged scales which may be squarish or rounded, keeled or smooth, but are never abruptly distinct from flank and dorsal scales. End of tail never blue in life. Ground or arboreal, large or small 2
2. Toes with very distinct dilations 3
   Toes not at all or very slightly dilated 10
3. A round *terminal* dilation on each toe. Limbs short. Dorsal scales uniform in size. With or without a bold pattern of crossbanding. Small ground lizards (size to 33 mm), usually found under stones or wood . . . . . *Sphaerodactylus* sp. (see separate Key p. 174)
   Toe dilations *not* terminal, not round. Limbs longer. Never a bold crossbanded pattern. Nocturnal or diurnal. Adult size larger (to 156 mm) 4
4. Dorsal scales with granules and larger keeled tubercles intermingled. Nocturnal 5
   Dorsal scales uniform or only the median middorsal row or rows enlarged. Diurnal 6
5. Scales under dilated portion of toe divided, claw readily visible. Adults smaller (to 65 mm) . . . . . *Hemidactylus mabouia*
   Scales under dilated portion of toe *not* divided, claw present but hard to see. Adults larger (to 105 mm) . . . . . *Tarentola americana*
6. A middorsal crest of triangular enlarged scales. A giant lizard with a bold spotted pattern, often high in large trees. Adults to 156 mm . . . . . *Anolis equestris*

No middorsal crest 7

7. Ventral scales keeled. 8
Ventral scales smooth 9

8. Snout long, pointed and conspicuously ridged. Color green in light phase with almost always a narrow straw colored middorsal stripe. A lizard of the trees, frequently ascending to the crown . . . . . *Anolis porcatus*
Snout short, blunt, not ridged. Color brown with or without conspicuous pattern. A lizard of the lower trunks or fence posts, often in open sun, frequently descending to the ground . . . . . *Anolis sagrei*

9. Three or four transversely enlarged supraocular scales in a single row. A small lizard of the sea grape on the beach . . . . . *Anolis argillaceus*
Supraocular scales always more than three or four and not in a single row. A lizard of moderate size characteristic of tree trunks in half-shaded woods . . . . . *Anolis homolechis*

10. Supraoculars six or seven, enlarged transversely in a single row 11
Supraoculars not enlarged transversely, not in a single row 13

11. Scales between ear and shoulder mostly granular. Prefrontal scale pairs of approximately equal size. A black patch above shoulder. A lizard of semi-shaded woods. *Leiocephalus macropus*
Scales between ear and shoulder not granular, posterior pair of prefrontals much larger than anterior. *No* black patch above shoulder 12

12. A conspicuous light line on side. A lizard of open and cultivated areas . . . . . *Leiocephalus raviceps*
No light line on side. A lizard of rock beaches. . . . . *Leiocephalus carinatus*

13. A middorsal crest of a single line of narrow keeled scales. Ventral scales smooth. More or less clearly crossbanded. Large. . . . . *Cyclura macleayi*
Several rows of scales enlarged, keeled, Ventral scales keeled.

Five longitudinal lines on a brown ground. Small . . . . . *Anolis ophiolepis*

KEY TO THE SNAKES AND AMPHISBAENIANS OF GUANTÁNAMO NAVAL BASE

1. Belly scales transversely enlarged. Head wider than neck, body not wormlike, tail tapering. Eye distinct 3
   Belly scales not enlarged. Head not wider than neck, body wormlike tail blunt. Eye indistinct 2
2. Scales polished, shiny, with semicircular free edges. Tail with a small spine. Mouth small, never attempts to bite . . . . . *Typhlops biminiensis*
   Scales dull, squarish. Tail without any terminal spine. Mouth larger, will attempt to bite . . . . *Amphisbaena cubana cubana*
3. Dorsal scale rows 50–60. Dorsal pattern of bold blotches, a dorsal series which coalesce irregularly and two lateral series which remain distinct . . . . . *Epicrates angulifer*
   Dorsal rows fewer. Dorsal blotches absent or indistinct. Longitudinal lines present or absent 4
4. A brown snake, sometimes with conspicuous black edges to the scales. Never with longitudinal lines . . . . . *Alsophis cantherigerus adspersus*
   Scales never with conspicuous dark edges to the sides, always with some indication of a lined pattern 5
5. Lined pattern usually obscured by blotching. Ca. 27 dorsal scale rows at midbody. Sometimes reddish in color . . . . . *Tropidophis melanurus*
   Lined pattern distinct, not obscured by blotching. 17 scale rows at midbody . . . . . *Arrhyton landoi*

Geography of the Naval Base

The U.S. Naval Base is situated approximately 10 kilometers south of the city of Guantánamo in the province of Oriente and on the south southeastern end of the island (see map).

The Naval Base is approximately 40 square miles in area, bounded on the west, north and east by a six foot cyclone fence that is broken only at the northeast land gate and the north water gate which is the entrance to the inner bay and the Cuban port of Caimanera. Guantánamo Bay passes through the center of the Base in a general north to south direction and is actually contained within the reservation boundaries. The southern end of the Base is on the open Caribbean Sea.

The Naval Base is unique in that it affords the zoologist a variety of distinctly different habitats within a small area. The leeward point side, across the bay, to the west, offers the Guantánamo River, a fresh water lake, brackish water mud flats, and a dense mangrove swamp.

The back bay area to the north has many mangrove covered cays.

The eastern half or main side of the Base consists of rocky hills covered with high grass and scattered clumps of heavy brush and cactus (tree cactus and prickly pear cactus). The maximum elevation is at Paul Jones Mountain which reaches 494 feet. The valleys consist of shady groves with little undergrowth bordering knee deep grassy fields.

The southern boundary of both the leeward point and main side consists of a coral escarpment that reaches an approximate height of forty feet. Vegetation on the cliffs is mostly sea grape trees with scattered cactus and a vine similar to honeysuckle. At the base of the cliffs there are numerous caves and several natural beaches. The beaches are rocky and protected by natural coral reefs. Several feet from the high tide mark the rocks give way to sand and sea grape trees. Several feet further the sand gives way to natural soil at the base of the hills or fields where the beach opens into a valley. The escarpment usually drops off when the beach opens into a valley.

Since the crisis of November 1962, many of the wooded areas

and beaches have been physically changed and no longer afford ideal collecting areas.

SALIENTIA

Four species of frogs occur on the Base. This is a very small fraction of the Cuban frog fauna – now approximately 38 species.

Undoubtedly the dry coastal situation of the Base explains this restricted fauna, since the genus *Eleutherodactylus* which accounts for most of the abundance of frogs in Cuba is characteristic of wet and especially montane situations. Only two of the 30 described Cuban species of this genus occur on the Base. A second genus, *Bufo*, is represented by a single species, one of the larger of the six known Cuban toads. The single species of *Hyla* is the only one known in Cuba. The remaining Cuban genus *Sminthillus* with one species is not known from the Base.

Two of the genera (*Hyla* and *Bufo*) breed in open water; of these the first is arboreal, the second a ground dweller. Both of these are very much larger than the two species of *Eleutherodactylus*, both of which are able to climb but occur also often on the ground. It is not at all clear what ecological differences exist between these two species; one (*atkinsi*) is, however, considerably larger than the other (*etheridgei*).

Hyla septentrionalis Duméril & Bibron

Common throughout the Base. It can be found wherever fresh water collects, e.g. rain barrels, culverts, under stones in culverts, cisterns, banana tree axils, hollow trees etc.

Dorsal color in life varied from gray through green to brown, with one individual bronzy.

Hyla septentrionalis is, like its close relatives *Hyla dominicensis* of Hispaniola and *Hyla brunnea* of Jamaica, at once very common over wide areas and quite undifferentiated throughout its Cuban range. MYERS (1950) has discussed the nomenclature and species characters.

Bufo peltocephalus peltocephalus Tschudi

Common throughout the Base, but seldom seen because of its nocturnal habits. It is especially abundant after light rainfalls in the early evening to early morning hours. It burrows under rocks, logs, culverts, drain pipes and the exposed roots of the larger trees.

Bufo was found in large numbers around the golf course clubhouse because the outside lights, left on for security reasons, attracted many insects for the toads to feed on.

In life the coloration was light brown to tan with darker blotches, the venter dirty white or yellow.

Bufo peltocephalus Tschudi has recently (SCHWARTZ, 1960) been divided into two subspecies, an eastern nominate form with the restricted type locality of Santiago de Cuba in Oriente Province, and western *B. peltocephalus fustiger* Schwartz with type locality San Vicente, Pinar del Río Province, Cuba.

The Museum of Comparative Zoology material, never examined by SCHWARTZ, fully confirms the validity of his action. As would be expected, the specimens from the Naval Base are in complete agreement with the nominate eastern race. Both subspecies have a vermiculate dorsal pattern, but the Guantánamo and other members of the eastern race have the vermiculations sharply defined against the ground color in contrast to the diffuse and relatively obscure pattern of the western race.

Eleutherodactylus etheridgei Schwartz

Common along cliffs and culverts at the southern end of the Base. There they took refuge under loose stones and in the holes in the coral as well as in crevices in the stone wall at the golf course.

All specimens were collected at night. After a light rain in the early evening they could be found on the road as well as in the culverts at the side of the road, and also on the stone wall of the golf course and on the walls of the clubhouse itself along with *Hyla septentrionalis* and *Hemidactylus mabouia*.

Eleutherodactylus is apparently exceedingly common on the Base. It was used as food for captive snakes until its distinctness from *atkinsi* was recognized.

Coloration in life was light grey-brown with a dark bar between the eyes.

Eleutherodactylus etheridgei was described (SCHWARTZ, 1958a) from five specimens from the Naval Base. A sixth specimen was found in the MCZ collection after publication of the description. This specimen (MCZ 28331) is the only non-topotypic specimen. Collected by Major WIRT ROBINSON in Santiago de Cuba in 1903, it was only in 1955 separated from a series of *E. atkinsi* and then regarded as a color phase of *E. ricordii planirostris*. Its distinctness was realized only upon accession of a paratype of *E. etheridgei*.

The new series of 22 specimens reveals that this species is both well defined and quite uniform in its characters. All have the mottled dorsum, a dark interbrachial and interocular bars described by SCHWARTZ as characteristic. SCHWARTZ has examined and measured the new series. Table 2 (p. 173) provides a summary of the metric data for all known specimens.

Eleutherodactylus atkinsi atkinsi Dunn

Eleutherodactylus atkinsi was collected with *E. etheridgei* and the notes under that form apply to both.

Eleutherodactylus atkinsi and *E. etheridgei* are both members of the *ricordii* group. The record of *E. etheridgei* in association with *E. atkinsi* at Santiago and their close association at the Naval Base may point to considerable ecological similarity. However, RICHARD THOMAS got only *E. atkinsi* in mesic situations at the golf course and nursery.

As SCHWARTZ (1960) has commented, in life the presence of red in the groin and on the anterior surface of the thighs at once distinguishes *atkinsi* from *etheridgei*; adult *atkinsi* is also considerably larger.

This is regarded as the nominate race. An extreme eastern Oriente race (Cape Maisi, Baracoa etc.) was described by BARBOUR & SHREVE (1937). As they then remarked, specimens from western Oriente including Guantánamo are somewhat intermediate, possessing the black femoral spot or spots characteristic of true *atkinsi* and dorsolateral bands as in the eastern race *orientalis*.

SAURIA

The lizards of the Base are 16 species in 6 genera of 3 families, again a limited selection of a large fauna. The best represented genus is *Anolis* with, however, only 6 of the 20-odd species known on the island. *Sphaerodactylus* has four species at the Base; eleven are known from the island as a whole, but two of the four species at the Base are known only there. *Leiocephalus* is known from three of the five Cuban species. The remaining three genera are represented by only one species each, but each of these is either (*Hemidactylus*) the only widespread species of the genus on the island or (*Tarentola, Ameiva*) the only Cuban species of the genus.

A herpetological profile of these lizard species divides them at once into ground and arboreal forms, and these into subtler ecological subdivisions. ("arboreal" as here used includes wall, cave and cliff dwellers.)

Terrestrial: The three small terrestrial geckos – all species of *Sphaerodactylus* – remain the ecological mystery of this area. Habit and habitat preferences doubtless exist, but they have not yet been clearly demonstrated. – The three iguanids of the genus *Leiocephalus* are, on the contrary, no problem. Of two smaller species, *L. macropus* is characteristic of semi-shaded woods and *L. raviceps* of open and *cultivated* situations. The larger species *L. carinatus* is confined to very rocky areas. – The single teiid, *Ameiva*, is a creature of sandy beaches with sea grape.

Arboreal: The two arboreal geckos – which differ markedly in size – are nocturnal and thus have a very different period of activity from the diurnal iguanids of the genus *Anolis*. The anoles sort out among themselves partly by size, partly by type of customary perch and partly by sun or shade preferences. – The two smallest species have very different habitats. *A. argillaceus* frequents sea grape on the open beaches. *A. ophiolepis* is a striped lizard in the long grass. – *A. sagrei* and *A. homolechis*, similar in size and closely related, differ in sun-shade preferences; *sagrei* occurring on fence posts in the open sun; *homolechis* in half-shaded woods. Both of these perch well down on trees and forage on the ground. – The

two remaining anoles usually perch much higher in the trees but *A. porcatus* is very much smaller than *A. equestris*.

Hemidactylus mabouia Moreau de Jonnes

Rather common in damp shady areas, under rotting logs, paper etc. as well as under garbage cans and under the louvers of jalousies in inhabited areas.

The first specimens collected were reddish brown to chestnut when discovered under a large rotting cardboard carton in a damp shady area. They were placed in an empty cigarette box and carried home. On opening the box it was at first believed they had escaped, since they had turned frosted-glass white and were not immediately observed.

On October 7, 1961 five eggs approximately $\frac{5}{16}$ to $\frac{3}{8}$ inches oval were found in the rotting base of a small tree. The eggs were not adherent as in *Tarentola* and were thought to belong to *Anolis*, but on actual comparison were found to be more spherical than in *Anolis*. One hatched on October 22nd, the hatchling about $1\frac{1}{4}$ inches in total length. After drying out for several hours, the juvenile shed and then devoured the shed skin.

Color in life was pale gray to whitish to frosted-glass white in the light phase, brown chestnut in the dark phase.

Though the type locality of this species is in the New World, it is usually thought to have been imported into the Americas with the slave trade. Both the African and American populations referred to this species are under study by ARNOLD KLUGE.

H. mabouia is readily distinguished from other New World *Hemidactylus* by the failure of the adhesive lamellae of the fourth toe to extend proximally; an area of fine granules surrounds the base of the toe.

Tarentola americana Gray

Very common in the inhabited areas as well as in fields. It may be found near lighted windows, in or out of doors, under boards, logs, loose rocks, in crevices, hollow trees etc.

Color in life is earth color, greyish with six darker blotches between nape of neck and base of tail, an inverted "U" on the head, venter whitish gray.

Many specimens were captured during the daylight hours on the trunks of sea grape trees at Cuzco Beach and under boards covering water barrels set out in the hills for fire fighting.

On September 5, 1961 six eggs $^{9}/_{16}$–$^{5}/_{8}$ inch in diameter were found in a natural split in a tree trunk approximately six feet above the ground. The eggs were cemented to the tree and in pairs. The bark of the tree directly behind the eggs had to be removed in order not to damage the eggs. They were spherical except for the flat surface cemented to the tree and for the attachment to their twin.

Two eggs hatched on September 18, two on October 20, two on October 22nd. The hatchlings were approximately $1^{1}/_{2}$ to 2 inches long. After drying they, like *H. mabouia*, shed and devoured the shed skin immediately.

Tarentola americana (known also from the Bahamas) is characteristic of coastal areas in Cuba and does not extend far inland. As a member of a Mediterranean and North African genus, it is an anomalous member of the West Indian fauna, but, as discussed by LOVERIDGE (1944), it is a quite distinct species which it is not possible to confuse with any of the Old World members of the genus.

Sphaerodactylus

Abundant. These diminutive geckos were collected in a variety of areas throughout the Naval Base. They were equally abundant in the hills and at sea level. Typical habitats were under large loose-seated boulders, rock piles, small stones in sandy soil, at the base of large clumps of grass in semi-open areas, in seashore debris above the normal high tide mark, under wood piles and just about any place that offered seclusion at ground level.

Two and three specimens were usually found together. In one case, seven were found under a single piece of demolished brick masonry (approximately two feet square) near the Coast Guard pier. Three of these were captured and found to be *Sphaerodactylus, S. decoratus strategus* and *S. ruibali*. The same piece of masonry concealed three intact eggs, plus, at a conservative estimate, three dozen egg shells, all apparently hatched. A site several yards away yielded several more sphaerodactyls and a *Typhlops bimiensis* (MCZ 68944). (Unfortunately only the *Typhlops* and one sphaerodactyl were captured.) Only about 10% of the specimens encountered were subsequently captured, due to their diminutive size, their speed and unwillingness to injure them with a heavy hand.

Sphaerodactylus inhabit the same ecological situation as the Cuban scorpion and were frequently found under the same cover, making capture more difficult in that both used the same escape route and occasionally, when a scorpion assumed a defensive attitude, the sphaero would freeze near by.

TABLE 2

ELEUTHERODACTYLUS ETHERIDGEI

Measurements in millimeters for all known specimens (maximum + (mean))

	snout vent	head length	head width	tympanum	eye	nares to eye	femur	tibia	4th toe
♂ (N=13)	20.4(18.6)	7.7(6.9)	7.2(6.6)	1.8(1.6)	2.8(2.6)	2.4(2.0)	9.1(8.2)	9.4(8.7)	8.6(8.0)
♀ (N=15)	23.7(20.6)	8.5(7.7)	7.8(7.2)	2.0(1.8)	3.3(2.9)	2.8(2.3)	10.0(9.0)	10.7(9.4)	9.7(8.6)

TABLE 3

ADDITIONAL CHARACTERS OF GUANTÁNAMO SPHAERODACTYLUS

Guantánamo form of *Sphaerodactylus*	escutcheon in ♂	pattern in ♂	crossbands between axilla and groin in ♀	maximum size (snout to vent in mm)
decoratus strategus (vicinity of Base)	without thigh extensions	unspotted	3	40
ruibali (east side of Base to 10 miles E of bay)	with thigh extensions	finely speckled or vermiculate	0 (mottled with some neck and head banding)	32
notatus atactus	with thigh extensions	fine dark spotting	0 (three longitudinal stripes on head and neck)	30

The first two specimens were caught on LANDO's leg, where they took refuge while he was kicking a clump of grass in a semi-open area, trying to dislogde an *Anolis* that had taken cover there.

These remarks apply to all of the forms collected as all were obtained in the same type habitat and often under the same stone, log etc.

Three species of *Sphaerodactylus* occur on the Guantánamo Naval Base. Two are closely related.

The third species is quite distinct. It is *S. notatus*, a species with relatively large imbricate dorsals. The type locality of the species is Key West, Florida, and the only problem concerning the Cuban populations has been their possible racial difference from topotypes. This question has been resolved by SCHWARTZ (1966) in favor of recognition of a Cuban race – *S. n. atactus* – in addition to two Bahaman ones, the nominate race from the Florida Keys and southern Florida and one from Swan Island in the Caribbean south of Cuba.

The differences between *notatus* races are in scale counts (overlapping but statistically significant), color pattern (modal rather than absolute) and adult size. The probable inter-relationships of the races have been fully discussed by SCHWARTZ (1966).

The specimens of *notatus* here reported were not seen by SCHWARTZ. The counts fall within those reported by him.

KEY TO THE SPHAERODACTYLUS OF THE GUANTÁNAMO NAVAL BASE

1. Scales large, keeled, overlapping . . . . . .
   S. notatus atactus, female with longitudinal stripes on head, male with fine dense spotting
   Scales small, smooth, granular, not or very slightly overlapping 2

2. Three crossbands between insertions of fore and hand limbs . . . . . Female *S. decoratus strategus*
   Not crossbanded 3

3. Escutcheon present (a light glandular area on the otherwise pigmented posterior belly, sometimes extending onto the thighs). Pattern indistinct or spotting only 4

Escutcheon absent. U-shaped stripe on head, body mottled . . . . . Female *S. ruibali*

4. Escutcheon very distinct, clearly outlined against remaining belly scales, not extending onto thighs; unspotted, nearly unicolor . . . . . Male *S. decoratus strategus*
   Excutcheon scales less distinct, slightly pigmented, extending onto thighs; speckled or vermiculate . . . . . Male *S. ruibali*

TABLE 4

SCALE COUNTS FOR GUANTÁNAMO SPHAERODACTYLUS

Data mostly from THOMAS & SCHWARTZ (1966) and SCHWARTZ (1966); counts in parentheses are those for total range of species, if different.

Guantánamo form of *Sphaerodactylus*	dorsals	ventrals	midbody	fourth toe
decoratus strategus	50–67 (46–69)	32–42 (29–46)	73–84 (61–89)	6–13
ruibali	42–60	30–41	69–82	6–11
notatus atactus	26–29 (18–35)	– (24–33)	38–44 (36–49)	10–12 (7–12)

TABLE 5

COMPARISON OF THREE SPECIES OF TYPHLOPS

	Typhlops caymanensis	*Typhlops biminiensis*		*Typhlops lumbricalis*
		Cuba	Bimini	
dorsal rows	20 Type; 20–20–20 (2)	22–22–22 (2) 22–22–20 (2)	24–24–22 (2) 24–22–22 (2) 22–22–22 (3)	20
rostral to tail spine	380 Type; 400–408	441–479	464–511	less than 300
preocular in contact with supralabials 2 and 3	+	+	+	—
rostral shape	almost circular above	almost circular above	almost circular above	strap-shaped
postoculars	1 transversely elongate postocular	1 elongate postocular	1 elongate scale	2 unmodified scales

The two closely related forms are quite distinct. Both have small, smooth scales in contrast to the large keeled scales of *Sphaerodactylus notatus*, but *S. ruibali* has large scales as compared with others of its group, a more extensive escutcheon in the male and a distinctive color pattern in both sexes – speckled in ♂, mottled, not banded in ♀. THOMAS & SCHWARTZ suggest a possible relationship with *S. intermedius* of western Cuba and southwestern Oriente and point to other cases of disjunct or relict populations in Oriente. A problem exists regarding the nature of the ecological separation of *ruibali* from the other species of the area, but there is no possible doubt of its status as a full species.

Sphaerodactylus decoratus strategus females are strongly banded, males unpotted and with the escutcheon without thigh extensions.

Again it is critical that we know very little of the ecology of these forms. Since field identification will sometimes be difficult, especially for males, it will be essential for the solution of the ecological and taxonomic problem posed by the *ruibali-decoratus* complex that every specimen collected in the future have the exact locality and the exact ecology recorded. The ecological differences between the species may be subtle and statistical in nature; the most extreme meticulousness will not be misapplied.

For further interpretation of the complicated relationships of this *decoratus* group within and outside Cuba consult THOMAS & SCHWARTZ (1966).

One element of confusion regarding the taxonomy of *Sphaerodactylus* on the Naval Base has been relieved by the revelation that *S. alayoi*, alleged to come from the Base, was probably given an incorrect type locality by GRANT. As THOMAS (1968) reports, some at least of the paratypes of *S. alayoi* came, according to their collector, from an area well inland from the Base and the strong suspicion exists that the type did also. None of the LANDO collection nor any of the material recently collected by THOMAS could be assigned to unequivocal (female) *alayoi*. THOMAS & SCHWARTZ placed two male specimens collected by LANDO (MCZ 69438, 69440) with *alayoi* with a question. It now appears that these two specimens are more reasonably regarded as slightly aberrant males of *S. decoratus strategus* and that *alayoi* itself is most probably a subspecies of *decoratus*.

Anolis homolechis Cope

Abundant in forested areas on the Base. While this species is more or less confined to shaded glades, there are many such areas scattered throughout the 40 square miles of the Base and *Anolis homolechis* is abundant in all these areas.

The larger and darker males are usually found on the trunks of shade trees, three to eight feet above the ground, head characteristically pointing to the ground. The smaller females were usually found around the base of the tree trunks which were ordinarily shaded by tall grass.

The escape maneuvers of the males consisted of dodging around the trunk of the tree and climbing progressively higher out of reach. The females, while using the "run around the tree trunk method" also, either dropped off into the grass or jumped to the ground and ran to an adjoining tree.

The eggs of this species were found in hollow recesses and under the loose bark at the base of trees in groups of 2–3 eggs. The eggs were incubated with 100% success in a pint jar containing damp earth. They were left on the surface and hatched at intervals of from seven to fourteen days from the date of collection.

In captivity, roaches, moths and caterpillars were accepted without hesitation. The lizards would also accept flies, millers, crickers, meal worms and the soft-backed green grasshopper common on the Base. The caterpillar was a brown and green hairless variety found on flamboyant trees.

Color in life: In the male the color varies from a dull lustrous solid black through various shades of brown to an ash-grey ground color, with a discernible chevron-like pattern in dark brown or black.

The females always showed a clear pattern, lighter or darker shades, but the pattern always clear.

In the field the majority of the specimens encountered were in the black or brown phase and turned grey upon capture. When captured in the grey phase, they invariably changed to brown or black.

Anolis homolechis is island-wide in suitable ecological situations. Over most of its range, it shows little variation and is a basically gray brown animal with a white or grey dewlap. A population in extreme western Cuba, Cabo San Antonio and vicinity, with a yellow dewlap with three reddish stripes *and* light-edged dark

ocelli above the shoulders was regarded by BARBOUR (1937) and RUIBAL & WILLIAMS (1961) as a subspecies of *homolechis*. It has now been found to occur syntopically with typical *homolechis* and should be regarded as a distinct species, *A. quadriocellifer* Barbour & Ramsden (SCHWARTZ 1968b). In addition, there are *homolechis*-like populations with yellow dewlaps in the Sierra de Cubitas, Camaguey and on the adjacent north coast and in Oriente at Banes on the north coast and on the south coast both to the west and to the east of Guantánamo. There seems to be an association of yellow dewlap with dry coastal forest but not a rigorous correlation, since, as in the Guantánamo area, the populations with white dewlaps come to the coast in many areas and in the Sierra de Cubitas area and Camaguey, yellow dewlap forms are well inland.

SCHWARTZ (1968b) discusses the problem of the yellow-dewlap populations at length and describes the better documented of them as subspecies, despite the presence of zones of overlap or of contact without chromatic intergradation in certain cases. They do this on the ground that "habits, habitat, physiology ... grass aspect, size" etc. are either identical or very similar and hence to describe these populations as full species would be a rash solution of an enigmatic situation. Clearly further investigation utilizing new characters is desiderate.

On the Naval Base, RICHARD THOMAS (SCHWARTZ 1968b) has carefully examined the dewlap color of *homolechis*. He found that the dewlap may be white with yellow suffusions or blotches and hence possibly intergradient with populations with pale yellow dewlaps to the east. Here the documentation is much less adequate than in other cases and much further collecting will be needed to permit assessment of the situation. The *Anolis homolechis* at the Naval Base are not at this time assignable to subspecies.

Anolis porcatus Gray

Very abundant anywhere on the Base where there is suitable vegetation that will support insect life and both shade and direct sunlight available at all times during the day.

During mid-morning or mid-afternoon they may be found on the trunks of the "fan palms" (more abundant in uncultivated areas) or on the trunks of most trees in the cultivated areas (adjacent to industrial or housing areas). They are almost always encountered with their heads pointed toward the ground.

During midday, 11:00 AM to 1:00 PM, they take refuge in cool shaded places, e.g. under the dead palm leaves at the top of the trunk, in the axil of banana trees, or the underside of window louvers etc.

In its natural habitat this species is not shy and will challenge an intruder with characteristic pushups and intermittent extension of the dewlap.

In captivity, these lizards thrive well, feeding on moths, millers, flies, grasshoppers, mosquitos, roaches, crickets, and meal worms, in that order of preference.

Color in life: Bright green with a lighter dorsal stripe from nape of neck to anterior third of tail. Color varies through dark olive and brown and *lustrous black* in one individual. The dorsal stripe is not always visible in the dark phase (or in preserved animals). Belly is cream white, sometimes peppered with brown. Dewlap pink with white throat scales.

The taxonomy of the green anoles of Cuba is somewhat confused (RUIBAL & WILLIAMS, 1961a). The populations of eastern and middle Oriente, such as these at the Naval Base, are distinguished unequivocally by the presence of a light middorsal stripe *in both sexes*. (A light middorsal stripe may be present in the females of other populations.) The situation in western Oriente is, however, very imperfectly known. The name given above implies acceptance of the view that these lined populations intergrade to the west with the grey populations of Camaguey and Las Villas and these with the race of *porcatus* which occurs in Matanzas, Havana and Pinar del Río. This, however, is only one of several hypotheses (see RUIBAL & WILLIAMS) and the only evidence pertinent to the present race is a hybrid zone in the vicinity of Cabo Cruz in which these lined populations mix with the morphologically quite distinct *Anolis allisoni* of Central Cuba.

Anolis equestris palardis Schwartz

Rare. Only four specimens were seen in two and one-half years at the Base.

These lizards seen could be found on their individual trees at any given time. They descended from their perches at the tops of the tall tress about noon when the sun is directly overhead. Two were once observed from about 15 yards on opposite tree trunks, approximately twelve feet above the ground, in typical position, head down. They were apparently challenging each other, as, after several "pushups" and elaborate dewlap extensions, they ran down their trees to the ground and charged each other, locking in combat. While they were thus occupied, I tried to catch them; however, as soon as I moved, they released each other and ran to their respective trees, well out of reach. When I climbed one tree the animal watched me attentively, motionless, with the exception of his head, until I was within arms' length and then jumped to an adjacent tree. This happened repeatedly.

The captive animal was by no means timid or docile, attacking whenever its cage was opened.

It fed readily on various flowers, mostly hibiscus, lettuce, apple slices, small pieces of bloody beef, raw chicken liver, *Anolis* and a house mouse.

The anole was very deliberate in all its actions – feeding sessions lasting as long as thirty minutes. Each morsel offered was scrutinized first with one eye and then with the other. It would then grab the offering and shake it vigorously, shift it back and forth in its mouth with its tongue, crushing it thorouglhy before swallowing.

It would bite anything it accepted as food but refused local fruits (mango, papaya, guava) and prickly pear. A dove egg was left in the cage but was refused also.

Forcepts were used in feeding and the animal readily recognized the difference between the forceps, food help in the forceps, and a finger. It would not open its mouth even if prodded with an empty forceps but, if a finger were offered, it would readily open its mouth and assume a menacing crouch.

Its jaws are very powerful; when it seized the mouse, the sound was that of walking through dry twigs.

Color in life: Overall bright green with mottled black on dark brown background dorsally, the cream to white spotted scales remaining white through all color phases. Eyelids and temporal region bright orange. Venter white to cream. On one occasion the lower portions of the sides, legs and tail of the specimen captured turned *bright blue.* This lasted approximately one hour and was never witnessed again.

This very striking race of *Anolis equestris*, recently described by SCHWARTZ (1964), is represented in museums by very few speci-

mens, one, MCZ 68921, from the present collection. The complexity of geographic variation of Oriente *equestris* as compared with that in the remainder of Cuba is vividly portrayed in SCHWARTZ's account; it is the more impressive because, as SCHWARTZ has indicated, our present knowledge is very incomplete.

Anolis argillaceus Cope

Rare. MCZ 67382 was caught at 10 AM while it was foraging about the lower branches of a sea grape tree.

The immediate area of collection was on coral cliffs adjacent to the sea on the south side of the Base, elevation approximately 30 feet. The sea grape tree, normally a large shade tree on sandy beach areas, grows low and scrub-like on the cliffs around the perimeter of the Base.

This species was not as timid as other anoles and was slower in movement. It only moved short distances after several unsuccessful attempts to capture it.

Color in life: Light tan with darker brown longitudinal stripes dorsally. Lower surfaces dirty white.

This species is usually rare (RUIBAL, 1964). Only ALAYO (1957) reports it as a common fence post lizard in Santiago de Cuba. Its close relative, *A. loysiana*, though island-wide in distribution (RUIBAL, 1964), is unrecorded on the Base. In Camaguey the two species may be found on neighboring trees.

Leiocephalus raviceps uzzelli Schwartz

Common in the housing developments in cultivated areas (e.g. rock gardens, flower beds) and along the shoulder of roads bordering open fields. They live in burrows under large rocks, old boards, fallen timber etc.

Leiocephalus raviceps was seldom seen before the sun was fully risen or at high noon or in late afternoon. At these times these animals could be found under various types of shelter.

In the mid-morning and early afternoon they were observed to explore the area around their burrow, foraging in the grass and under small objects for insects. The longest of the three specimens collected was observed from time to time over a period of several weeks in the wild. At times it would travel some 30 yards from its burrow in search of food. This specimen was living under the concrete base of a clothesline pole in the author's backyard. After several unsuccessful attempts to capture it by the hand method, which had sufficed with the other

two, it was taken by placing an unbaited live trap in the vicinity of the burrow. These are curious lizards and will investigate anything within their area. It was thus only a matter of minutes after the trap was placed that the lizard emerged from its burrow, ran up to the trap, looked it over and crawled inside.

Food in captivity was roaches, caterpillars, ants, moths and millers.

Color in life: Dorsally light brown, sides darker with black dots and cream colored specks. A conspicuous cream-white line, longitudinally, separates the dorsal pigmentation from the greyish white venter.

SCHWARTZ (1960) divided *Leicephalus raviceps* into three races, two in Oriente, the nominate race and *uzzelli* (distinguished primarilt by the greater boldness of color pattern in *uzzelli*) and a disjunct population in Matanzas Province, quite distinct in both color and scale counts – *klinikowskii*. (SCHWARTZ & GARRIDO (1968) have since described another race from western Cuba.) The specimens from the Naval Base fit the subspecies *uzzelli* and fall within its expected range.

Leiocephalus macropus macropus Cope

Abundant among the dry leaves on the floor of coastal forests and groves of sea grape trees immediately adjacent to beaches or on the top of coral cliffs.

When approached, these lizards assume an alert position with the tail curled in a spiral over the back and the head cocked to one side, facing the intruder. If the intruder persists, they scurry off, keeping the tail still curled over the back.

At night or on exceptionally cool mornings they can be found under large pieces of loose coral, logs etc. (but only in areas that normally would be shaded during the day). In the daytime they forage about in the leaves in search of insects. Their diet consists largely of a small species of flying roach and millers and moths which seek refuge in the dry leaves during the day.

Though a nervous captive, never taming, they do feed well and readily eat roaches, grasshoppers, moths, millers, caterpillars, meal worms and ants. Although quite interested in the movement of earthworms, they could not be induced to feed on them, even when deprived of food for several days. (In fact, they appeared to be afraid of them.) They adapt also to drinking from a shallow pan of water.

Color in life: Shiny light olive brown above, transverse dark brown to black interscapular and sacral spots. A maroon band

edged and frequently spotted with cream on each flank. Entire lower surface greenish white.

Leiocephalus macropus is now known to be island-wide, though until 1959 reported only from the province of Oriente. Eight races are now recognized, primarily on the basis of color pattern, especially shoulder and throat pattern (SCHWARTZ & GARRIDO, 1967). No absolute scale differences have been discovered. The western populations – *L. m. koopmani* from Pinar del Río, *L. m. hyacinthurus* from Las Villas and *L. m. hoplitis* from Camaguey, all described by ZUG (1959) – appear to be widely disjunct and this may be a real situation in this primarily coastal species. Of the four populations in Oriente, the nominate race with a strongly marked shoulder patch is adjacent on the west to *L. m. immaculatus* Hardy 1958 which has the shoulder patch very reduced or absent and on the east to the still more brightly colored race, *L. m. asbolomus*. The specimens from the Naval Base belong clearly to the nominate race.

Leiocephalus carinatus aquarius Schwartz & Ogren

No specimens of *Leiocephalus carinatus* were taken in 1959 to 1962, apparently because of lack of collecting in the appropriate habitat. However, one specimen was taken by RICHARD THOMAS in 1965 and the species has long been known from the area.

The populations of *Leiocephalus carinatus* are again primarily coastal and the distributions widely disjunct. Six subspecies have been described. The lizards of the south coast of Oriente including the Guantánamo area have been described as *L. carinatus aquarius*, a grey subspecies which lacks the head spotting characteristic of the other Cuban races (SCHWARTZ & OGREN, 1956).

Cyclura macleayi macleayi Gray

In April 1960 a 38" male specimen was captured at Kittery Beach. The tail was not complete and had just begun to regenerate, the diameter at the break was approximately $\frac{5}{16}$ to $\frac{3}{8}$". The total

length of this specimen with a perfect tail would be increased by 6 to 8, possibly 10 inches.

Not having a cage suitable for a specimen this size, I secured him to a stake in the ground with a 10 foot length of $\frac{1}{8}$ inch line, loosely secured around its pelvic area, giving the iguana a circle 20 ft. in diameter to move about. Natural shade, sun and water was available within the perimeter of the circle. The specimen always assumed a menacing pose with jaws open when approached, but could be handled by the author without attempting to run or bite.

At first food was offered at the end of a stick as the specimen could inflict a severe wound. Within 24 hours it accepted food offered by hand and was exceptionally docile.

The diet consisted of hibiscus flowers, lettuce, raw shrimp, sliced apple, a wild yellow flower that grows close to the ground and is common throughout the Base. It also devoured raw chicken eggs if cracked above its head and dropped into its open mouth. (The chicken eggs were too large to be accommodated in the iguana's mouth.) The natural diet also may include sea turtle eggs as the species is numerous around the beaches and cliffs adjacent to the sea.

Cyclura frequents caves and also fissures in the coral escarpment that it has enlarged by digging. It was not observed to enter the sea; however, two young individuals (about 12″) were observed playing on top of a piece of the cliff that had dropped to the beach. When approached by LANDO, one individual tried to escape by diving into a pool of rain water which had accumulated in a low spot on the beach, completely submerging itself in the grass and weeds about a foot under water. This specimen was captured by feeling around in the soft mud until found. This specimen was destined for the MCZ but it was placed in a nylon net bag which in turn was placed in a large reptile compound where it was devoured, bag and all, by a 63 inch *Epicrates angulifer*. The snake died about a week later.

A female captured in 1962 was approximately 24 inches in total length. The major differences from the male were size of dorsal spines and of the gular pouch, which is greatly reduced in the female. This individual was very aggressive and did not become docile even after three months' captivity under the same conditions as the male.

Color in life: Dorsally brownish grey with lighter spots, tail banded dark grey to black evenly spaced, some individuals almost solid greyish brown. Large scales on cheeks and head yellowish to khaki, dorsal spines also yellowish to khaki, front feet black to first joint. Ventrally light grey to cream depending on age and environment of individual. Captive specimens seem to develop clearer patterns.

Cyclura macleayi, the largest of Cuban lizards, has not been divided into any Cuban races. It was at least at one time widely distributed over Cuba and the Isle of Pines, though apparently

preferring rocky areas. Two subspecies are currently recognized on the Caymans – *C. m. caymanensis* Barbour & Noble on Little Cayman and Cayman Brac and *C. m. lewisi* Grant on Grand Cayman. *C. m. caymanensis* is very weakly distinguished on modal characters from the Cuban form and was only reluctantly recognized by GRANT (1940). The Grand Cayman form, on the other hand, differs strikingly in its blue to blue green color in life and in having relatively longer caudal spines.

Ameiva auberi Cocteau

Very common around the sand dunes and under the sea grape trees in back of and on the beaches of the southeast edge of the Base. The specimen taken was captured when it took shelter under a rock in the sand approximately 15 feet from the high tide mark. The species also was seen to frequent piles of driftwood along the beaches.

These lizards are extremely alert and swift and are most often heard before they are seen as they run among the dry leaves under the sea grape trees. They can be found prowling about during the hottest part of the day, their movements somewhat jerky as they appear to be picking small insects out of the sand.

Food in captivity was roaches, caterpillars, small green grasshoppers. The captive specimen refused to eat ants of any kind.

Color in life: Olive brown dorsally, sides darker; three light lines extending to base of tail; first third of tail greenish grey, distal two-thirds bright blue; venter, except distal part of tail, bluish white.

No races of *A. auberi* have yet been published. The species is under study by ALBERT SCHWARTZ.

Amphisbaena cubana cubana Gundlach & Peters

No specimen of this burrowing species was taken in 1959 to 1962. One specimen was taken by RICHARD THOMAS in 1965.

The amphisbaenids of the Antilles were revised by GANS & ALEXANDER (1962). Two genera and three species are known from Cuba. *Cadea* with two species is known only from western Cuba and

the Isle of Pines. *Amphisbaena cubana* appears to be absent from extreme western Cuba and has a distinct race in Habana, Matanzas and Las Villas provinces. The nominate race was to be expected at the Base, since records do exist for San Carlos Estate, Guantánamo, but this appears to be the first definite record on the naval installation itself.

SERPENTES

Only five species of snakes are known from the Base – once again a very limited sample of the Cuban fauna and again a limitation partly ecological, partly regional. Every species is in a distinct genus and the genera are not particularly close.

Ecologically as well as morphologically, *Typhlops*, an extreme burrower, differs very much from all the others; it is also the smallest. *Arrhyton*, a cryptic semi-burrowing form, is next smallest. *Tropidophis*, *Alsophis* and especially *Epicrates* can be quite large. *Epicrates* is at least somewhat arboreal. *Alsophis* is a widespread terrestrial snake and *Tropidophis* seems to require a special habitat. In reality, however, the habits of these snakes are not well recorded and much of their biology is still to be reported.

Typhlops biminiensis biminiensis Richmond

Rare.

The first specimen (MCZ 68726) was captured September 22, 1961 (early morning – 4:45 AM) as it was crawling on the paved surface of a road. The surrounding area had typical semi-arid vegetation – mixed cactus and small shade trees. There are small grassy areas on the shoulder of the road, but most of the area is free of grass due to shade from trees or fallen leaves. The soil is loamy with outcroppings. It had rained the previous night but the soil was not saturated.

November 6, 1961 a second specimen (MCZ 68944) was taken at night (10 PM) on the road in the same locality.

In August 1962, two further specimens (MCZ 69443–44) were obtained while collecting *Sphaerodactylus* near the high tide mark on the bay side of the Base. The specimens were coiled in sand directly beneath two large sections of a fallen wall. They began to burrow in the sand as soon as exposed.

MCZ 68726 drank water readily from a receptacle provided and also devoured with great relish ants and ant pupae of a small species found nesting in an air plant common in the area. (A casual observer would not believe that this animal had poor vision when he observed the speed and accuracy with which it fed on the small ants.)

MCZ 68944 laid two eggs, $^{5}/_{8}$ inches long and $^{5}/_{16}$ inches in diameter. Both eggs failed to develop.

Color in life: Reddish brown dorsally and pinkish below, the line of separation of the two colors irregular over the whole length of the animals.

RICHARD THOMAS (1968) has already reported the discovery of *Typhlops biminiensis* in Cuba. This was the only surprise in the new collections of Guantánamo fauna. The only *Typhlops* heretofore recorded from Cuba had been *T. lumbricalis*. THOMAS was able to record *T. biminiensis* in Cuba not only from the LANDO collections but from specimens in the Senckenberg Museum from Rancho Luna near Cienfuegos, Los Villas Province.

T. biminiensis belongs to quite a different species group than *T. lumbricalis* and has its relatives in mainland *T. tenuis* and Cayman Island *T. caymanensis*. In all these the preocular touches labials 2 and 3 rather than 3 only as in *T. lumbricalis* and relatives. Table 5 compares *T. caymanensis*, Guantánamo *T. biminiensis* and *T. lumbricalis*.

The two populations of *T. biminiensis* and *T. caymanensis* all differ from their mainland relatives in the presence of a single postocular much narrower and longer than the scales posterior to it.

Ecologically the occurrence of *T. biminiensis* in such a coastal area as Guantánamo Bay is entirely logical. RICHMOND (1955) commented in the original description of *biminiensis* on the restriction of *T. lumbricalis* and *T. biminiensis* to different types of habitat, *lumbricalis* to "rocks on moist clay soils in areas of dense vegetation" and *biminiensis* to "dry sandy areas where there are no rocks on the surface." The soil at the Naval Base was in this case not sandy but the aridity was presumably the significant element in the ecology. It is noteworthy also that RICHMOND reports that "after rains *biminiensis* has been found crawling on the lawn of the Lerner Laboratory" at Bimini in exact parallel to the behavior of this species at the Base.

THOMAS describes the Rancho Luna locality for *biminiensis* as semi-xeric, contrasting in this regard with nearby Soledad, a more humid area from which *T. lumbricalis* is abundantly known.

THOMAS describes *T. biminiensis* as a polytypic species with three subspecies, the nominate form occurring on the Grand Bahama Bank (Bimini and Andros), on Elbow Cay on one Cay Sal Bank west of the Grand Bahama Bank and on Cuba, *T. b. paradoxus* on Inagua in the southern Bahamas, and *T. b. epactia* on Cayman Brac. These subspecies are distinguished by rostral shape, pigmentation and body proportions. *T. b. biminiensis*, broadly speaking, occurs within the range of *T. lumbricalis*, the two newly named subspecies and *T. caymanensis* are alone on their respective islands. Ecologically the newly described subspecies and *T. caymanensis* agree with *T. b. biminiensis*, occurring on arid and ecologically impoverished islands.

Epicrates angulifer angulifer

Found throughout the Base.

One 66 inch *Epicrates* was found at two o'clock in the morning in a low tree in the midst of tangled brush and cactus on a hillside facing Cable Beach, about 75 feet from the high tide mark. This specimen tried to remain coiled on the branch but did not attempt to escape or bite. A strong spotlight was used to locate and capture the snake but did not disturb it.

A 70 inch specimen was captured in the afternoon while it was crawling out of a cave in the cliffs at Cable Beach.

October 7, 1961, a 72 inch specimen was captured, again in the afternoon, while crossing Sherman Avenue at the northeast extension of the Base. This was a hill about a half mile from mud flats and from the bay with high grass and scattered cactus on each side of the road.

A juvenile 26 inches in length was found crossing a road in an inhabited area. It had apparently just shed for the first time since the navel scar was not healed and the scales were beadlike. The area was thoroughly searched for other juveniles and the female with no result. This individual was extremely aggressive, striking repeatedly, and retained this aggressive attitude even after several weeks of captivity and repeated handling.

Food in captivity was rats, mice, doves, iguanas and bats. The latter were caught while flying in the cage. Tree frogs, toads and birds' eggs were refused.

Color in life: Iridescent, light brown-straw ground color with dark brown-black rhombs in a single row longitudinally arranged. Dark circular markings on the sides between the rhombs with lighter centers. Venter yellowish (cream in a new-born specimen).

Only one species of *Epicrates* occurs on Cuba in contrast to the situation in Hispaniola where three species occur which form

graded series in regard to size and number of midbody scale rows. *E. angulifer* corresponds to the largest of the Haitian species.

Tropidophis melanurus melanurus

Found only at Quarry Road.

All specimens were caught in the same general area and between the hours of 8 and 11 PM. All were caught while crossing a paved road and did not attempt to escape upon approach.

This species is mild mannered and cannot be induced to bite even if handled roughly.

Food: Tree frogs, lizards except geckos, and mice.

Color in life: Two specimens were dark reddish brown when caught and the pattern was not visible. A half hour later the ground color became light grey and the pattern was very clear. All were iridescent and the last third of the tail was light green. One specimen was erythristic: iridescent bright orange dorsally, venter pinkish, the last third of tail light green.

In contrast to the situation in the boine genus *Epicrates*, Cuba has a complex radiation of *Tropidophis* (SCHWARTZ, 1958; SCHWARTZ & MARSH, 1960) with nine currently recognized species, while Hispaniola has a single species of *Tropidophis*. *T. melanurus* is the commonest of the Cuban species and the only one known from the Naval Base.

SCHWARTZ & THOMAS (1960) have described two Cuban races of *T. melanurus*, one from the Isle of Pines and one from Pinar del Río Province and the nominate race. These are all color races, though with some partially overlapping differences in scale counts. The Navassa *Tropidophis* described by COPE as a full species is regarded by THOMAS (1966) as a race of *melanurus*; it is distinct in its somewhat lower ventral and subcaudal count. On the other hand, THOMAS (1963) has elevated the Cayman *Tropidophis* populations, formerly regarded as conspecific with *melanurus*, to species rank as *T. caymanensis* and has described *T. c. schwartzi* as a third subspecies in addition to *T. c. caymanensis* and *T. c. parkeri*. The Guantánamo specimens belong to the nominate race.

Erythristic specimens of the genus have elsewhere been reported

only from Jamaica (SCHWARTZ & MARSH, 1960) where, in a portion of St. Elizabeth Parish, they are said to be relatively common (report by the collector to GARTH UNDERWOOD).

Alsophis cantherigerus adspersus Gundlach & Peters

Common throughout the Base, frequently found in fields, hillsides, wooded groves and beach area.

All specimens were found prowling during daylight – once crossing a road at high noon – or in late morning or early afternoon in grass and cactus, or once in a pile of driftwood. Despite collecting done at all hours, many rocks and logs overturned and caves explored, this species was never found under cover.
Food in captivity: Geckos, *Anolis, Hyla, Bufo, Eleutherodactylus.*

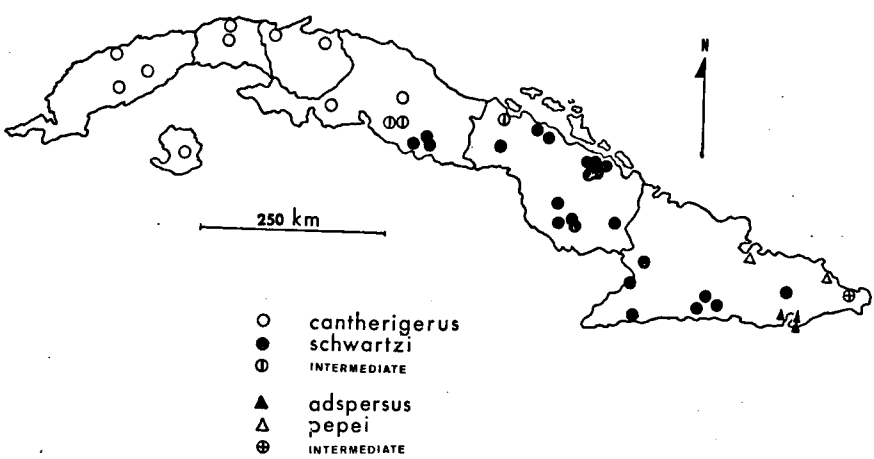
Color in life: Light brown peppered with black, suggesting diagonal lines on the sides. A dark brown to black stripe from nasal through eye to last lower labial. Two light dots mark the scale pits on the tip of each dorsal scale; there are three to four on the tail scales. In one specimen four stripes, one-scale wide, start under the chin. One on each side disappears at the 15th ventral; the two center stripes disappear at the 12th ventral. In another specimen there are only two such stripes, two scales wide, which disappear at the 7th ventral.

The possible propriety of use of the name *adspersus* for the Guantánamo population was suggested by SCHWARTZ & THOMAS (1960). The type of "*Dromicus* (*Alsophis*) *angulifer* Bibr. var. *adspersus* Gundlach & Peters" in the Berlin Museum cannot now be found (GÜNTHER PETERS, pers. comm.). However, allocation of the name to the Guantánamo population seems unequivocally necessary when the formal description of *adspersus* in PETERS (1865) is supplemented by GUNDLACH's fuller discussion of the form in his "Contribución a la erpetología cubana." This book, which has the sub-title "Notas para la erpetología cubana, según observaciones propias durante cuarenta y un años," is an indispensable supplement for all of the species discovered by GUNDLACH and described by WILHELM PETERS from GUNDLACH's specimens. GUNDLACH knew his animals in the field; the "Erpetología cubana"

draws upon his personal acquaintance with the living animals and carefully describes colors in life and frequently includes ecological notes and specific locality references.

The formal description of the variety *adspersus* in PETERS 1865 mentions a specific locality for the type specimen – Caimanera, a village on the west side of Guantánamo Bay. As SCHWARTZ & THOMAS have already suggested, this locality, even in the absence of precisely topotypic material, suggests that *adspersus* must be the name of the Guantanamo population and not, as current usage would have it, the populations of Camaguey and western Oriente, if these populations are distinguishable. GUNDLACH (1880) has, however, even more clearly delimited the range of "*Dromicus adspersus*." He says: "Solamente en la jurisdicción de Guantánamo he observado esta especies ..."

GUNDLACH further follows this observation with a detailed color description which is concluded by a repetition in Spanish of precisely the differential characters of *adspersus* which were recited in German in the formal description in PETERS (1865). Most important is the mention of lighter and brown-ashy color ("color general pardusco-ceniciento") and absence of crossbands ("no tener



Distribution of *Alsophis cantherigerus* in Cuba. – Symbols indicate specimens examined. Not shown is a population on the peninsula of Guanahacabibes (being the western tip of the island) which will be discussed by SCHWARTZ & GARRIDO.

las papas transversas angulosas"), a description which can apply only to the Guantánamo population.

Unfortunately the discovery that the Guantánamo population must bear the name *adspersus* requires a change of present names. GRANT (1956) following the erroneous suggestions of STEJNEGER (1917) and BARBOUR & RAMSEY (1919) regarded the northwestern Oriente populations of *Alsophis* as *adspersus*. Hence, when he encountered the distinctive animals of the Guantánamo region, he believed them to be an undescribed form for which he provided the subspecific name *spielmanni* with type locality Guantánamo. This name falls as an absolute synonym of *adspersus* Gundlach & Peters.

The northwestern Oriente and adjacent Camaguey populations, the distinctive characters of which have been reported by SCHWARTZ & THOMAS and regarded by them and by GRANT and others as *adspersus*, are then left without a name. In honor of Dr. ALBERT SCHWARTZ, who specially called our attention to this problem, they may be called: *Alsophis cantherigerus schwartzi*.

Alsophis cantherigerus schwartzi new subspecies

Type: AMNH 83638, 22.4 mi. west of Santiago de Cuba, ORIENTE, Cuba, R. F. Klinikowski coll., July 17, 1959.

Paratypes: ORIENTE. – Santiago de Cuba, AMNH 72458, M. C. Kurtz and F. Minarovich, June 29, 1947; USNM 56512, Julius Hunter, May 1903; MCZ 6928, coll. Capt. Wirt Robinson, 1904. – 2.5 mi. south of Felicidad, AMNH 83644, A. Schwartz, August 24, 1959. – El Cobre, USNM 29790, William Palmer, February 22, 1902. – Ocujal, USNM 139385, Jerry Hardy, August 29, 1956. – Guamo? USNM 29755, B. D. Bowdish, November 29, 1901; USNM 29781–83, R. S. Bowdish, January 1–2, 1902. – Manzanillo, MCZ 8460–61, T. Barbour, 1912.

CAMAGUEY. – Marti, AMNH 46717, A. Greenhall, 1930; AMNH 64445–46, A. Greenhall, August 1932. – Sierra de Cubitas near Banao, AMNH 83206, G. Silva, April 28, 1957; MCZ 56430, Molina and Ruibal coll. August, 1957. – Banao, AMNH 83222, native for A. Schwartz, August 19, 1947. – 2 km west of Banao, AMNH 72456, R. Ruibal, January 2, 1952. – 3.5 mi NW Banao, AMNH 83637, R. F. Klinikowski, June 27, 1959. – 6.5 mi NW Banao, AMNH 83223–24, R. Thomas, August 19, 1957; AMNH 83636, R. F. Klinikowski, June 26, 1959; AMNH 83645–46, R. F. Klinikowski, August 28, 1959. – Finca San Pablo, ca 15 km SW Camaguey, MCZ 56428, R. Molina and R. Ruibal, August 13, 1957; MCZ 56429, R. Molina and R. Ruibal, July 1957. – 20 km W Camaguey, AMNH 81249, G. R. Zug, June 26, 1958; ANMH 83633, E. Pujals, 1958; AMNH 83634–35, R. F. Klinikowski, June 23, 1959. – 21 km W Camaguey, AMNH 83225, R. Thomas,

August 25, 1957. – Río San Pedro, AMNH 72457, R. Ruibal, January 2, 1952. – Ciego de Avila, MCZ 8964, coll. La Salle College, Havana. – 14 mi E Moron, Loma de Cunagua, AMNH 83221, R. Thomas, August 13, 1957. – 12 mi E Moron, Loma de Cunagua, AMNH 83220, J. R. Feick, August 6, 1957.
LAS VILLAS. – Trinidad, AMNH 83218, native for A. Schwartz, July 31, 1957; USNM 137086–88, Jerry Hardy, December 20–25, 1954; USNM 138516–17, 139386, Jerry Hardy, September 11, 1955; USNM 139387, Jerry Hardy, September 11, 1956. – Finca Morales, 8 mi NW Trinidad, AMNH 83217, W. G. Gehrman, July 10, 1957. – 10 mi W Trinidad, USNM 138515, USNM 138518–19, Jerry Hardy, September 10–11, 1956.

Diagnosis: A subspecies of *Alsophis cantherigerus* distinguished by the following *adult* [1] pattern: (1) a dark head figure covering all or most of the parietal scales; (2) a dorsum anteriorly with light scales boldly edged with darker, posteriorly with darker scales, some of which may be uniformly black forming interrupted bands; (3) a distinctly bicolor belly, the anterior ventrals light with a dark free edge, the posterior ventrals and tail dark with greater or less red or yellow blotching, the amount very variable within a population, rarely wholly red.

Distribution: southeastern Las Villas (as far as the vicinity of Trinidad), Camaguey and western and south central Oriente provinces.

Alsophis cantherigerus schwartzi is closest to *A. c. pepei* Schwartz & Thomas of the north coast of eastern Oriente with which it shares the dark head figure invading the parietals and a bicolor belly. *A. c. pepei* differs in that the posterior belly is always uniformly dark without red or yellow blotching and in being always darker than *schwartzi* in all its coloration.

A. c. cantherigerus (from western and northeastern Las Villas westward) differs in that the black crown cap is reduced, the belly never distinctly bicolor and neither belly nor tail ever have the bold red and yellow blotching characteristic of *schwartzi*.

A. c. adspersus (inc. *spielmanni*) [2] is still more distinct, showing

[1]) Juvenile patterns in *A. cantherigerus* are not or barely distinguishable. There is also considerable individual difference in the size at which the adult pattern is achieved.

[2]) The total distribution of this form is not well documented by specimens. SCHWARTZ & THOMAS describe an intermediate between this race (as *spielmanni*) and *pepei* from the mouth of Río Yomuri not far from Maisi. Presumbaly *adspersus* extends along the south coast of eastern Oriente east of Guantánamo Bay.

the extreme in lightness of pigmentation, hence a very reduced or absent dark crown cap, no dorsal banding and a uniformly light belly without smudging or blotching. Table 6 compares the significant characters in the four Cuban subspecies.

The extralimital subspecies of *A. cantherigerus* (*caymanus* on Grand Cayman, *ruttyi* on Little Cayman, *fuscicauda* on Cayman Brac and *brooksi* on Swan Island) are all curiously similar to intergrades between *schwartzi* and *cantherigerus*. Like the latter they show a reduced head figure like that of *cantherigerus* but with a bicolor belly with some trace of lighter blotching like *schwartzi*. All four extralimital subspecies agree in differing from all Cuban subspecies in higher ventral counts, but differ also from each other in details of color.

Intermediates between *schwartzi* and *cantherigerus* have been examined from Soledad (MCZ 7946, 18124, 21833, 22699–704, 22725, 32661–64, 34253–56) and Baños de Ciego Montero (AMNH 7391), Las Villas Province, and from Embarcadero de Morón (AMNH 83219), northwestern Camaguey. From GRANT's 1956 description of his series of *cantherigerus* from Nipe Bay, these are intermediates between *schwartzi* and *pepei*, some specimens showing a completely dark posterior belly and tail as in *pepei* and others the mottling in this region characteristic of *schwartzi*. No intergrades between *adspersus* and *schwartzi* are known.[1]

Arrhyton landoi

Found at Cuzco Beach.

LANDO chanced upon MCZ 68724, coiled under a stone, approximately six inches below the surface, while looking for a *Sphaerodactylus* which took refuge in an agregate of small stones and loose sandy soil which offered a maze of small tunnels. On being exposed, the *Arrhyton* immediately began to burrow into the loose soil and rocks, doing so with great ease and speed. LANDO had to remove many stones and a large amount of earth to keep up with the disappearing specimen. If it had not been for the fact that the snake ran into an area of hard packed earth, it would have escaped.

On capture, the specimen did not attempt to bite but tried to escape by burro-

[1]) Still other races may be discovered. SCHWARTZ & GARRIDO are studying a dark population from the peninsula de Guanahacabibes.

TABLE 6

ADULT PATTERN DIFFERENCES IN CUBAN RACES OF ALSOPHIS CANTHERIGERUS

	cantherigerus	*schwartzi*	*adspersus*	*pepei*
head	Black crown cap reduced, covering only supralabials, frontal and perhaps the suture between parietals	Black crown cap covers parietals as well as supraoculars and frontal	Black crown cap reduced, on supraculars and frontal only, or absent	Black crown cap covers parietals as well as supraoculars and frontal
dorsum	Posterior dorsum boldly banded, black on grey, in adult	Posterior dorsum banded at least in half grown specimens	Banding absent in adults	Posterior dorsum black or obscurely banded
belly	Uniformly light or posteriorly weakly smudged, rarely uniformly dark	*Distinctly bicolor*, anteriorly scales light with dark free edges, *posteriorly sometimes entirely red, usually dark with greater or less bold red or yellow blotching*	Uniformly light	*Distinctly bicolor, anteriorly* scales light with dark free edges, *posteriorly uniformly dark*
tail	Uniformly light or dark below or weakly smudged with dark	*Usually dark below, but always with some bold red or yellow at least toward tail tip, sometimes entirely red*	Uniformly light	Uniformly dark

wing through my fingers and using the terminal scale of its tail in the same fashion as *Diadophis punctatus*. It exhibited a great deal of strength for its size.

Two weeks later at the same site, while collecting sphaerodactyls (which are exceptionally plentiful in this nine-square-yard area), I found another specimen under a large piece of coral, approximately five feet from the previous site. The soil under the coral contained no stones or other debris and consequently the specimen was easily captured with a handful of soil. It exhibited the same escape tactics as the first specimen.

In captivity this proved to be a shy and nervous species, remaining under the loose soil provided most of the time and dashing about when caught prowling on the surface and always finally retreating beneath the soil.

Earthworms, *Eleutherodactylus etheridgei* and *Sphaerodactylus* were offered as food and refused. Both specimens were seen to drink water from the receptacle provided.

A shed skin was found at a later date several miles from the original collecting site. The skin was found under a piece of coral which had to be pried from the surrounding coral.

Color in life: Reddish brown dorsally, bright and lustrous, with a black middorsal stripe less than one scale row wide, beginning on the nape of the neck and terminating on the tail. On each side a black stripe continued to the tail. Dorsum also liberally peppered with fine black specks. Lower surface cream; chin white.

Some dispute has existed regarding the status of this form. That *Arrhyton landoi* is distinct is not at all an issue; the controversy deals with its degree of distinctness and with its relationships. SCHWARTZ (1965) has well stated the case for subspecific relation to *A. vittatum*. Briefly, *landoi* is allopatric to *vittatum* so far as known, overlapping with the latter in subcaudal count and tail/total length ratio and rather similar in size and pattern.

Apparent sympatry of *landoi* with *taeniatum* and *dolichurum* – quite apart from significant morphological differences – disposes of the possibility of subspecific relationship with either of these.

The decision here to recognize *A. landoi* as a full species is not based on any new distributional evidence or scale counts of new specimens. We have seen material not examined by SCHWARTZ (a further specimen of *landoi* from Guantánamo, material from the Berlin and Paris Museums, including type specimens); however, these do not significantly alter the summary of scale data provided by SCHWARTZ. The only new information we have is based on the preparation of skulls of *taeniatum, vittatum* and *landoi* from speci-

mens in the Museum of Comparative Zoology, and one specimen of *A. dolichurum* generously loaned for this purpose by the American Museum of Natural History.

TABLE 7

TOOTH COUNTS IN ARRHYTON

	vittatum (7)	*landoi* (3)	*taeniatum* (2)	*dolichurum* (1)
dentary	15–17	14–15	12	12
maxilla	12–15 + 2	10–11 + 2	5–6 + 2	10 + 2
pterygoid	9–10	9	7–8	6
palatine	10–15	9	5–6	7

Arrhyton taeniatum turns out, as expected, to be very distinct morphologically, an extremely specialized snake. *A. vittatum*, on the contrary, is much more primitive, while both *landoi* and *dolichurum* are intermediate in most regards. Table 7 lists one of the most striking differences between the taxa: tooth counts.

It is evident that *landoi* is in all tooth counts lower than *vittatum* and distinct also from *dolichurum* and *taeniatum*, though closer in all except pterygoid tooth count to *dolichurum*. It is upon the evidence of this character that we rest our decision to raise *landoi* to species rank.

REFERENCES

ALAYO D., PASTOR, 1951. Espécies herpetológicas halladas en Santiago de Cuba. *Bol. hist. nat. 2*: 106–110.

ANDERSON, L. G., 1900. Catalogue of Linnean type-specimens of Linnaeus's Reptilia in the Royal Museum in Stockholm. *B.h. K. Svensk. Vet-akad. Handl. 26*: 39–67.

BARBOUR, T., 1914. A contribution to the zoögeography of the West Indies, with especial reference to amphibians and reptiles. *Mem. Mus. Comp. Zool. 44*: 209–359.

BARBOUR, T., 1921. Sphaerodactylus. *Mem. Mus. Comp. Zool. 47*: 217–278.

BARBOUR, T. & RAMSDEN, C. T., 1919. The herpetology of Cuba. *Mem. Mus. Comp. Zool. 47*: 69–213.

BARBOUR, T. & SHREVE, B., 1937. Novitates cubanae. *Bull. Mus. Comp. Zool. 80*: 377–387.

BOULENGER, G. A., 1885. *Catalogue of the lizards in the British Museum (Natural History), 2.* Edition 2. London, xii + 436 pp.

BUIDE, M. S., 1967. Lista de los anfíbios y reptiles de Cuba. *Torreia (n.s.) 1*: 1–59.

COCHRAN, DORIS M., 1934. Herpetological collections from the West Indies made by Dr. Paul Bartsch under the Walter Rathbone Bacon Scholarship, 1928–1930. *Smithsonian Misc. Col. 92* (7): 1–48.

GANS, C. & ALEXANDER, A. A., 1962. Studies on amphisbaenids (Amphisbaenia, Reptilia). 2. On the amphisbaenids of the Antilles. *Bull. Mus. Comp. Zool. 128*: 65–158.

GARRIDO, O. H., 1967. Sobre el Anolis rubribarbus (Sauria, Iguanidae) en Cuba. *Trabajos de Divulgación, Museo "Felipe Poey" 55*: 1–7.

GARRIDO, O. H. & SCHWARTZ, A., 1968a. Anfíbios, reptiles y aves de la península de Guanahacabibes, Cuba. *Poeyana (A) 53*: 1–68.

GARRIDO, O. H. & SCHWARTZ, A., 1968b. Cuban lizards of the genus Chamaeleolis. *Quart. J. Florida Acad. Sci. 30*: 197–220.

GRANT, C., 1956. Secondary sexual characters and ontogeny of color pattern in a Cuban snake (Alsophis). *Herpetologica 12*: 321–322.

GRANT, C., 1958. A new gekkonid lizard (Sphaerodactylus) from Cuba. *Herpetologica 14*: 225–227.

GRANT, C., 1959a. A new Sphaerodactylus from Guantánamo, Cuba. *Herpetologica 15*: 49–53.

GRANT, C., 1959b. Another new Sphaerodactylus from Guantánamo, Cuba. *Herpetologica 15*: 53.

GRANT, C., 1959c. New subspecies of Alsophis from Oriente, Cuba. *Herpetologica 15*: 58–60.

GRANT, C. & SMITH, H. M. & ALAYO DALMAN, PASTOR, 1959. The status of snakes of the genus Arrhyton in Cuba. *Herpetologica 15*: 129–133.

GUNDLACH, J., 1880. *Contribución a la erpetología cubana.* Havana, 99 pp.

HARDY Jr. J. D., 1958. A new lizard of the genus Leiocephalus from Cuba (Squamata, Iguanidae). *Jour. Washington Acad. Sci. 48*: 294–300.

HARDY Jr. J. D., 1966. (1968) Geographic variation in the West Indian lizard, Anolis angusticeps paternus, subsp. nov., from the Isle of Pines, Cuba (Reptilia, Iguanidae). *Carib. J. Sci. 6*: 23–31.

LEGLER, JOHN M., 1959. A new blind snake (genus Typhlops) from Cuba. *Herpetologica 15*: 105–112.

LEGLER, JOHN M., 1960. Remarks concerning Bahaman Blind Snakes (genus Typhlops). *Herpetologica 16*: 71–72.

LOVERIDGE, A., 1944. Certain American geckos of the genus Tarentola. *Copeia 1944*: 18–20.

MYERS, G. S., 1950. The systematic status of Hyla septentrionalis, the large tree frog of the Florida Keys, the Bahamas and Cuba. *Copeia 1950*: 203–214.

PETERS, W., 1865. Über einige neue Saugethiere (Mormops, Macrotus, Vesperus, Molossus, Capromys), Amphibien (Platydactylus, Otocryptis, Euprepes, Ungolia, Dromicus, Tropidonotus, Xenodon, Hylodes, und Fische (Sillago, Sibastes, Channa, Myctophum, Carascus, Barbus, Copoëta, Poecilia, Saurenchelys, Leptocephalus). *Monatsber. Kon. Akad. Wiss. Berlin*, 20 June *1864*: 381–399.

RICHMOND, N. D., 1955. The Blind Snakes (Typhlops) of Bimini, Bahama Islands, British West Indies, with description of a new species. *Amer. Mus. Novitates 1734*: 1–7.

RUIBAL, R., 1959. A new species of Sphaerodactylus from Oriente, Cuba. *Herpetologica 15*: 89–93.

RUIBAL, R., 1964. An annotated checklist and key to the anoline lizards of Cuba. *Bull. Mus. Comp. Zool. 130*: 473–520.

RUIBAL, R. & WILLIAMS, E. E., 1961a. Two sympatric Cuban anoles of the carolinensis group. *Bull. Mus. Comp. Zool. 125*: 183–208.

RUIBAL, R. & WILLIAMS, E. E., 1961b. The taxonomy of the Anolis homolechis complex of Cuba. *Bull. Mus. Comp. Zool. 125*: 211–246.

SACKETT, J. T., 1940. Preliminary report on results of the West Indies Guatemala Expedition of 1940 for the Academy of Natural Sciences of Philadelphia, Part I. A new Blind Snake of the genus Typhlops. *Notulae Naturae 48*: 1–2.

SCHWARTZ, A., 1957a. A new species of boa (genus Tropidophis) from western Cuba. *Amer. Mus. Novitates 1839*: 1–8.

SCHWARTZ, A., 1957b. A new species of Eleutherodactulys (Amphibia: Leptodactylidae) from Cuba. *Proc. Biol. Soc. Washington, 70*: 209–212.

SCHWARTZ, A., 1958a. Four new frogs of the genus Eleutherodactylus (Leptodactylus) from Cuba. *Amer. Mus. Novitates 1873*: 1–20.

SCHWARTZ, A., 1958b. A new gecko of the Sphaerodactylus decoratus group from Cuba. *Proc. Biol. Soc. Washington 71*: 27–36.

SCHWARTZ, A., 1958c. Another new large Eleutherodactylus (Amphibia: Leptodactylidae) from western Cuba. *Proc. Biol. Soc. Washington 71*: 37–42.

SCHWARTZ, A., 1958d. Another new species of Eleutherodactylus (Amphibia: Leptodactylidae) from western Cuba. *Journ. Washington Acad. Sci. 48* (4): 127–131.

SCHWARTZ, A., 1958e. A new subspecies of Anolis equestris from eastern Cuba. *Herpetologica 14*: 1–7.

SCHWARTZ, A., 1958f. A new frog of the auriculatus group of the genus Eleutherodactylus from western Cuba. *Herpetologica 14*: 69–77.

SCHWARTZ, A., 1959a. The Cuban lizards of the species Leiocephalus carinatus (Gray). *Reading Public Museum and Art Gallery Sci. Publ. 10*: 1–47.

SCHWARTZ, A., 1959b. A new species of frog of the Eleutherodactylus ricordi group from central Cuba. *Amer. Mus. Novitates 1926*: 1–16.

SCHWARTZ, A., 1959c. Variation in lizards of the Leiocephlus cubensis complex in Cuba and the Isla de Pinos. *Bull. Florida State Mus. 4* (4): 97–143.

SCHWARTZ, A., 1959d. The status of Eleutherodactylus pinarensis and a new species of the genus from western Cuba. *Herpetologica 15*: 61–69.

SCHWARTZ, A., 1959e. A new species of toad, Bufo cataulaciceps, from the Isla de Pinos and western Cuba. *Proc. Biol. Soc. Washington 72*: 109–120.

SCHWARTZ, A., 1960a. The large toads of Cuba. *Proc. Biol. Soc. Washington 73*: 45–56.

SCHWARTZ, A., 1960b. Variation in the Cuban lizard Leiocephalus raviceps Cope. *Proc. Biol. Soc. Washington 73*: 67–82.

SCHWARTZ, A., 1960c. Nine new Cuban frogs of the genus Eleutherodactylus, *Reading Public. Mus. and Art Gallery Sci. Publ. 11*: 1–50.

SCHWARTZ, A., 1960d. A new subspecies of Leiocephalus stictigaster Schwartz from central Cuba. *Proc. Biol. Soc. Washington 73*: 103–106.

SCHWARTZ, A., 1961. A review of the geckos of the Sphaerodactylus scaber group of Cuba. *Herpetologica 17*: 19–26.

SCHWARTZ, A., 1964a. Anolis equestris in Oriente Province, Cuba. *Bull. Mus. Comp. Zool. 131*: 403–428.

SCHWARTZ, A., 1964b. New subspecies of Leiocephalus from Cuba. *Quart. Jour. Florida Acad. Sci. 27*: 211–222.

SCHWARTZ, A., 1965a. A new Cuban Eleutherodactylus of the auriculatus group. *Herpetologica 12*: 27–31.

SCHWARTZ, A., 1965b. A review of the colubrid snake genus Arrhyton with a description of a new subspecies from southern Oriente Province, Cuba. *Proc. Biol. Soc. Washington 78*: 99–114.

SCHWARTZ, A., 1965c. Geographic variation in two species of Hispaniolan Eleutherodactylus, with notes on Cuban members of the ricordi group. *Studies Fauna Curaçao and Caribbean Islands 22*: 98–123.

SCHWARTZ, A., 1966. Geographic variation in Sphaerodactylus notatus Baird. *Rev. Biol. Trop. 13*: 161–185.

SCHWARTZ, A., 1968a. Geographic variation in the New World gekkonid lizard Tarentola americana Gray. *Proc. Biol. Soc. Washington 81*: 123–141.

SCHWARTZ, A., 1968b. The Cuban lizards of the Anolis homolechis complex. *Tulane Stud. Zool. 14*: 140–184.

SCHWARTZ, A. & GARRIDO, O. H., 1967. A review of the Cuban iguanid lizard Leiocephalus macropus Cope. *Reading Public Mus. and Art Gallery Sci. Publ. 14*: 1–4.

SCHWARTZ, A. & GARRIDO, O. H., 1968a. Four new subspecies of Leiocephalus stictigaster from Cuba. *Nat. Mus. Canada Nat. Hist. Papers. 37*: 1–23

SCHWARTZ, A., 1968b. An undescribed subspecies of Leiocephalus raviceps Cope from western Cuba. *Proc. Biol. Soc. Washington 81*: 23–30.

SCHWARTZ, A. & MARSH, R. J., 1960. A review of the pardalis-maculatus complex of the boid genus Tropidophis of the West Indies. *Bull. Mus. Comp. Zool. 123*: 49–84.

SCHWARTZ, A. & OGREN, L. H., 1956. A collection of reptiles and amphibians from Cuba with description of two new forms. *Herpetologica 12*: 91–110.

SCHWARTZ, A. & THOMAS, RICHARD, 1960. Four new snakes (Tropidophis, Dromicus, Alsophis) from the Isla de Pinos and Cuba. *Herpetologica 16*: 73–90.

SCHWARTZ, A. & ZUG, GEORGE R., 1958. Variation in the species of Cadea (Amphisbaenidae), and a record of C. blanoides from the Isla de Pinos. *Herpetologica 14*: 176–179.

SMITH, H. M. & GRANT, C., 1958. The proper names for some Cuban snakes: an analysis of dates of publication of Ramon de la Sagra's Historia natural de Cuba and of Fitzinger's Systema Reptilium. *Herpetologica 14*: 215–222.

STEJNEGER, LEONHARD, 1917. Cuban amphibians and reptiles collected for the United States National Museum from 1899 to 1902. *Proc. U.S. Nat. Mus. 53*: 259–291.

THOMAS, RICHARD, 1963. Cayman Islands Tropidophis (Reptilia, Serpentes). *Breviora 195*: 1–8.

THOMAS, RICHARD, 1966. A re-assessment of the herpetofauna of Navassa Island. *J. Ohio Herp. Soc. 5*: 73–89.

THOMAS, RICHARD, 1968a. Notes on Antillean geckos (Sphaerodactylus). *Herpetologica 24*: 46–60.

THOMAS, RICHARD, 1968b. The Typhlops biminiensis group of Antillean Blind Snakes. *Copeia 1968*: 713–722.

THOMAS, RICHARD & GARRIDO ORLANDO, H., 1967. A new subspecies of Dromicus andreae (Serpentes, Colubridae). *Ann. Carnegie Mus. 39* (16): 219–226.

THOMAS, RICHARD & SCHWARTZ, ALBERT, 1966. The Sphaerodactylus decoratus complex in the West Indies. *Brigham Young University Sci. Bull. (Biol.) 7*: 1–26.

WILLIAMS, E. E., 1961. Notes on Hispaniolan herpetology. 3. The evolution and relationships of the Anolis semilineatus group. *Breviora 136*: 1–8.

ZUG, G. R., 1959. Three new subspecies of the lizard Leiocephalus macropus Cope from Cuba. *Proc. Biol. Soc. Washington 72*: 139–150.