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MISCELLANEOUS NOTES ON THE ECOLOGY OF SOME BRASILIAN LIZARDS (SAURIA)

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INTRODUCTION

During the past twenty years I have collected lizards in many areas of tropical Brasil, building up collections and gathering information for studies of geographical differentiation. In the present paper I make available some ecological data that have accumulated in my notebooks and that I do not contemplate otherwise using in the immediate future, as well as some reliable information contributed by collectors.

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PLANT FORMATIONS OF BRASIL

A majority of these notes concerns the immediate environment of lizards, as relevant to the understanding of geographical differentiation. To provide a frame of reference and to avoid repetition, I'll comment briefly on the plant formations involved. A gazetteer is appended, to help locate the localities mentioned and to relate them to the patterns described.

The basic concept for understanding the broad features of the distribution of plants and animals in Brasil — and in cis-Andean South America in general — is that of *morphoclimatic domains*, due to Ab'Saber (1967, 1968). A morphoclimatic domain is characterized by a *core area* where are found superimposed some specific, typical features of relief, climate, hydrology, and vegetation; they are quite independent of geology. Ab'Saber recognizes in Brasil six domains, to which he assigns proper geomorphological names; I'll use instead, for easier reference, the names of the

characteristic plant formations. They are: (i) the Amazonian rain forest, or *hylaea*; (ii) the Atlantic forest; (iii) the Central Brazilian *cerrados*; (iv) the northeastern *caatingas*; (v) the *Araucaria* forest; (vi) the southernmost prairies. I shall confine the present notes to the four first domais, as the latter two are subtropical and foreign to my current research.

The core areas are polygonal, five of them roughly isodiametric, that of the Atlantic forest very elongate. The transitional (contact) areas, to be mentioned below, are extremely diversified. Otherwise, enclaves of contrasting formations are found inside all core areas.

All plant formations noted here are described and illustrated in Hueck (1966), which can be consulted with profit. On the contrary, much caution must be taken in using the information contained in Verdoorn (1945) and in Fittkau & al. (1969), as much of it is badly outdated. A very lucid account of the dynamic mechanisms that determine the climate of the core areas is given by Monteiro (*in* Cataldo, 1963).

The hylaea

Besides the references given above, the Amazonian forest is well treated by Richards (1952); Ducke & Black (1953) is also a valuable paper, and some recent work and reviews are contained in the "Atas" of a symposium held in Belém in 1966 (see Lent, 1967).

The core area of the hylaea is a large alluvial plain, with some low relief, surrounded by a raised rim of very heterogeneous geological constitution. The climate can be said to be in general equatorial super-humid, but warning should be given against the widespread fallacy that the climate is uniform both along the year and the valley. In reality, there is a very definite dry season, and some areas of the core are less pluviose than others (see map in Haffer, 1970). Even the apparent annual isothermy is misleading; averages do not vary much, but the maxima and minima show a much broader range (see, for instance, Vanzolini, 1952).

Three main facies, topographically determined, are recognized in the hylaea: (i) *mata de terra firme* on higher ground, never flooded; (ii) *mata de várzea*, on river bottoms and back-swamps, seasonally flooded; (iii) *igapó*, permanently flooded, while an extremely interesting type of environment, has little areal expression. In the literature (e.g., Crump, 1971) two types of forest are sometimes confused under the name "varzea": forest daily flooded by tidal rises of the rivers and varzea proper, as defined above.

Occupation of Brazilian Amazonia by Europeans and their descendants is older and more extensive than currently realized, and has left broad scars. It is not easy nowadays to find large areas of readily accessible virgin forest along the main course of the Amazonas or the lower course of its tributaries — even if we take "virgin" in the very moderate sense of forest never intensively exploited for timber or agriculture.

Inside the hylaea there are three types of open formations: (i) cerrado enclaves; (ii) natural grassland and parklike formations, and (iii) man-made clearings.

The cerrado enclaves are certainly relicts of drier episodes, when the present core of the hylaea was extensively covered by

open formations (see discussion and sketch map in Vanzolini & Williams, 1970).

Natural grassy areas (*campinas*, *campinaranas*) are found on the levees and back swamps of the alluvial plain and, at times, on higher ground. Sometimes they have sparse trees and even copses, which give them a park-like aspect. They are not easily distinguished from artificial pastures on the same type of terrain. These open areas, both seasonally flooded and not, may form together a sort of lacework along the lower course of the rivers, providing corridors for the spread of open formation animals. It is an intriguing possibility that some animal species may be adapted to this specific type of environment, belonging thus geographically but not ecologically to the hylaea.

The soil of the alluvial plain is poor, and degrades rapidly under cultivation. Second growth in abandoned areas differs much in character from the original forest, being low, dense and tangled. To which extent succession will reconstitute the forest in large clearings is not known; the process seems to be at best a slow and painful one. I fear this forest may be, at least in many areas, a post-climax.

The Atlantic forest

This is also a pluvial forest, which occupied, before the beginning of colonization (see Vanzolini, 1963) a long strip of easternmost Brasil, from about the 7th to the 28th degrees of latitude South. It is narrow (some tens of kilometers at most) on the north, but becomes much broader at the latitude of southern Bahia, further expanding towards the interior and ending in the Argentinian territory of Misiones.

This broad latitudinal expanse indicates that it is very tolerant of temperature. On the contrary it requires high humidity; the highest rates of pluviosity in Brasil (ca 4500 mm) are found in the state of S. Paulo, inside the domain. It sits on deeply decomposed regoliths, which give the landscape a very characteristic appearance, aptly named by Ab'Saber a sea of hills ("*mar de morros*"). The rounded "half orange" relief persists long after the complete erasement of the forest, permitting to infer its former presence — a very important geomorphological clue.

There are many enclaves of cerrado inside the Atlantic forest, especially in the states of S. Paulo and Paraná. On the other hand, the *Araucaria* forest, one of Ab'Saber's domains, is in fact a gigantic enclave on the southern end of the Atlantic forest.

Occupying the eastern façade and covering the best agricultural land of the country, it is obvious that the Atlantic forest had to be drastically reduced by man. Of its northern end only isolated remains are to be found now, veritable enclaves in the cultural steppe.

Cerrados

Three recent symposia summarize the literature and current research on the cerrados: one published by the University of S. Paulo (see citation under Vanzolini, 1963), one by the Brazilian Academy of Sciences (*Anais de Academia Brasileira de Ciências*, vol. 38, Supl.), and the latest edited by Ferri (1971).

The core area of the cerrados is the gently undulated highlands ("chapadões") of Central Brasil, covering large parts of the states of Mato Grosso, Goiás, and Minas Gerais. The main feature of the climate is a relatively dry winter.

Cerrados are open formations, with a ground stratum of grasses and diverge strata of shrubs and trees. The trees and many of the shrubs have an unmistakable xeromorphic appearance. They are stunted-looking, contorted, and the woody parts are covered with a remarkably thick squamose bark (rhitidome). However, they do not show any of the adaptations against loss of water that are at the heart of xerophytism proper. Cerrado plants go very deep (20 m and more) for their water, but are not economical of it; in fact, thorny and succulent plants are conspicuously absent, as are hairs and wax on the leaves.

Cerrados vary greatly with respect to the density of shrubs and trees, so much that, in fact, Brazilian authors tend to prefer the plural "cerrados" to the singular "cerrado". There are all gradations between almost pure grasslands with a few scattered shrubs, and "cerradões", which approach forests in density of trees and closure of canopy.

Cerrados abound as enclaves within all other formations. Conversely, they show enclaves, especially of forest. These are of two types, gallery forests and enclaves proper.

Gallery forests vary from thin rows of buriti palm (*Mauritia vinifera*), along the smaller creeks, to sizable belts of good forest hundreds or thousand of meters wide. Nothing is definitely known about the role they may eventually play in the distribution of closed formation animals.

Islands of forest in the cerrado are also known, but have neither been mapped nor systematically explored. The most important of them is the so-called "Mato Grosso de Goiás", in the southern part of the state (Waibel, 1948). This is also good agricultural land, and the forest is fast disappearing.

Caatingas

There is no recent specific account of the caatingas except a survey in a college Biology text (Frota-Pessoa & al., 1970); in the main, one has to be content with Hueck (1966). Lima (1960) can be consulted with profit.

The core area of the caatingas, the so-called "polygon of droughts" of Brasil, occupies a major part of the northeastern states, extending south as far as northern Minas Gerais.

Caatingas are actual xerophytic formations. Almost all plants are summer deciduous, there is a striking abundance of cacti and other succulent and thorny plants, and all plants are morphologically and physiologically adapted to semi-arid conditions.

The climatic determinant of the caatingas is not absolute lack of precipitation, but rather its irregularity. Rainy years afford good crops, but their sequence is never long, disastrous droughts being sure to intervene.

Caatingas are not known to occur as enclaves in the other core areas. Inside them, however, are found islands of cerrado and, most interesting, of forest (for a brief review see Vanzolini,

1970). The latter have been little studied, but their potential interest is enormous, both because they are floral and faunistic isolates and because the affinities of their fauna and flora are valuable paleoclimatic indications. For instance, Sneath (1926) recorded from some isolated northeastern forests birds of undoubted Amazonian relationships.

The contacts

Between the core polygons there are rather broad transitional belts. As mentioned, they vary in nature, and in reality have not been adequately studied and mapped; it is only possible to make some remarks, at the same time very general and very topical.

Broadly speaking, contacts may be sharp or transitional. Sharp contacts may be linear or interdigitating. Transitional contacts may be through complex mosaics or through truly transitional formations.

The contact between the hylaea and the cerrado may be broadly linear. The gallery forests get progressively wider towards the north until those of adjacent rivers meet on the interfluvium; along this line of continuous forest we consider the hylaea to begin.

In other places there is, between the hylaea and the cerrado, forest of a type that Ab'Saber and I have been calling informally "buffer forests" ("*florestas tampão*"). They differ in physiognomy and floristic composition from the hylaea, especially in being lower, drier and in part deciduous. A good example is the contact in the upper Xingu (Hueck, 1966).

The contact between the core of the hylaea and that of the caatingas is a complex one. There are strips of cerrado, several poorly known patches of buffer forests, and, principally, a vast belt of babassu palm (*Orbignya speciosa*) forest. The latter is a common tree in the hylaea, a conspicuous heliophil that quickly colonizes man-made clearings (it is making spectacular progresses now along the Belém-Brasília road). Large areas of the states of Piauí and Maranhão are densely covered with this palm, to the point that some authors prefer to treat the region as a separate entity, the "*zona dos cocais*".

The contact between cerrados and caatingas is mostly interdigitating; the distribution of the two formations is largely determined by topography, caatingas usually occupying the depressions and cerrados the intervening higher ground. Very frequently the interdigitating fingers get cut off, resulting into mosaic patterns of mutual enclaves inside the broad contact belt.

Between the cerrados and the Atlantic forest we have again broad belts of buffer forests (Hueck, 1966).

Finally, the contact between the caatingas and the Atlantic forest is also made through buffer formations, relatively better known than the others. In the northern areas these are open formation ("*agrestes*") that suffer less from drought and are actually mitigated caatingas, with some small enclaves of forest topographically determined (Lima, 1960). In the south there are buffer forests ("*mata de cipó*", vine forest), dense, tangled, low, made of thin trees and tough vines.

Family Gekkonidae

Bogertia lutzae Loveridge, 1941

Localities

Bahia: Pituba, Salvador; Itapoan, Salvador. *Pernambuco*: Igarassu.

I have collected this gecko at the type locality, Pituba, a suburb of the city of Salvador and at Itapoan, on the same strip of beach, a few kilometers to the north. The lizard is restricted to a belt of sand dunes covered with mixed clumps of *Hohenbergia salzmanii* (a ground bromeliad) and *Eugenia uniflora* (Myrtaceae). It is found, during the day, inside the bromeliads, which harbor an abundant and diversified fauna. Loveridge (1941), in the original description, cites the collector's (Dr. Bertha Lutz) data on the bromeliculous habits of the species.

Near Igarassu, Pernambuco, A.S. Rand and I collected one specimen in a non-identified bromeliad, growing among other vegetation on a sandy road cut. This is, to my knowledge, the only specimen caught away from Salvador.

Coleodactylus amazonicus (Andersson, 1918)

Localities

Pará: km 92 Belém-Brasília highway; Taperinha; Aveiro; Monte Cristo; Barreirinha; Maloquinha; As Pedras. *Acre*: Iquiri.

This is a diurnal lizard, that I have so far found only in terra firme forest in Amazonia. At least in Barreirinha it was common in the latter and absent in adjacent varzea forest.

It lives in the leaf litter, through which it moves agilely, with a swimming sort of motion.

In Aveiro it was common in a very small relictual copse, about 1-2 hectares in area.

Crump (1971) did not find the species in her detailed survey of forest habitats in Belém.

Coleodactylus meridionalis (Boulenger, 1888)

Localities

Pernambuco: Igarassu.

This species has a very interesting disjunct distribution (Vanzolini, 1968). A.S. Rand and I collected several specimens and saw many more in a small relict of the Atlantic forest, less than 1 km across and much disturbed, near Igarassu. It lives and behaves very much like the preceding species.

Gonatodes humeralis (Guichenot, 1855)

Localities

Pará: Alegre; Belém; Taperinha; Os Patos; Aveiro; Monte Cristo; Barreira; Maloquinha; Barreirinha; Óbidos; Oriximiná. *Amazonas*: Urucurituba; Itapiranga; Manaus.

This diurnal species seems to be primarily an animal of the forest, both terra firme, varzea, and igapó. It is also found in second growth (Os Patos), in edge situations (Oriximiná, Maloquinha), in planted groves (for instance, an old *Hevea* plantation in Itapiranga, a *Hevea* and cocoa grove in Urucurituba). In one locality (Barreirinha) I found a population in backyards, an environment completely different from the usual. Hagmann (1906), in a paper in which he describes the eggs, says that it frequents dead or half-dry tree trunks with partly detached bark, under which it hides. My personal experience, based on several hundred specimens, even in Belém, where Hagmann observed the species, and where it is very common in the city park, is very different.

G. humeralis will be seen on the lower one meter of tree trunks of any diameter between 5 centimeters and 1 meter, of any color or texture. The flight pattern is characteristic: the animal will usually run down spirally to the ground, and hide for a short time among roots or litter, close to the tree; after a while it will climb back. Much more rarely it will try to escape upward or hide in cracks. Specimens surprised on the ground (not a common observation) tend to run to the nearest tree and freeze among the roots or low on the trunk.

Very frequently several specimens of the same or both sexes can be seen on the same tree.

Tail autotomy is easy, and the white-tipped broken fragment stays wriggling in a characteristic way. The importance of this mechanism may be inferred from the fact that there is enormous variation in tail length in animals with apparently intact tails — a rare situation among lizards.

A.S. Rand collected in the Museum Goeldi park in Belém one specimen sleeping at night on the upper surface of an aroid leaf. He also obtained, in August 8, an egg that hatched on the 14th. Rand & Humphrey (1968) and Crump (1971) have ecological data for the Belém region.

***Gymnodactylus geckoides amarali* Barbour, 1925**

Localities

Goiás: Alvorada.

From its distribution (Vanzolini, 1968) it is clear that this is a cerrado form. However, the only definite record I know is my own, 23 km north of Alvorada, on the Belém-Brasília highway, one specimen, under a fallen log, in thin cerrado.

***Gymnodactylus geckoides darwinii* (Gray, 1845)**

Localities

Espírito Santo: Sooretama; Santa Teresa. *S. Paulo*: Caraguatuba.

This is a lizard of the southern half of the Atlantic forest. I know of no specimens caught in activity; all were collected under logs, within rotten logs, or in piles of rocks or firewood.

The following notes are due to Mrs. Helga Urban, who has observed the species in the island of S. Sebastião and kept many specimens in captivity.

One female, captured on July 2, 1950, and kept in captivity with one male, laid two eggs on December 26, between 7'30 and 7'45 AM, and another in February 3, 1951, at 3 PM. The first two eggs eclosed on July 18, 1951; the latter did not.

The day before laying the female dug an oval nest, long and deep enough to accomodate her, without the tail. After digging the nest she left it, returning next morning to lay. Each egg, after laid, was rolled around with the hind feet, becoming covered with adhered dirt. After the second egg was so treated the female filled the nest with dirt and smoothed the surface.

Phyllopezus p. pollicaris (Spix, 1825)

Localities

Bahia: Fazenda S. Francisco, Razo da Catarina.

I obtained one specimen under a rock in the very dry caatinga on the edge of the Razo da Catarina, in Bahia. A majority of the specimens available in collections comes, however, from regions where it is safe to say caatingas do not occur. The form would thus seem to occupy all types of open formations.

Thecadactylus rapicauda (Houttuyn, 1782)

Localities

Pará: Belém; Monte Cristo; Barreirinha; Lago Jacaré; Os Patos.

This is one lizard one always meets in Brazilian Amazonia, but never in large numbers (Hagmann, 1909), contrary to Beebe's (1944) experience in Guyana.

It is a nocturnal gecko, that I have only collected asleep during the day: one inside a large hollow tree (Belém); two under the peeling bark of dead trees in mandioca (*Manihot*) plantations (Lago Jacaré and Barreirinha); one on the trunk of a large tree in terra firme forest (Monte Cristo); and one on a mango tree in a village (Os Patos). The only young I collected (rostranal length 38 mm) was on a large tree, active during the day, in a igapó at Os Patos.

Parker (1935) has a note on the food of this lizard in Trinidad. Crump (1971) lists the species as being infrequent in terra firme forest at Belém. E.E. Williams (pers. comm.) collected one specimen in the crotch of a tree, during the day, on the campus at St. Augustine, Trinidad.

Family Iguanidae

Anolis auratus Daudin, 1802

Localities

Pará: Oriximiná; Alter do Chão; Os Patos.

The distribution of this lizard, is extremely important: it occurs on both sides of the Andes, from Amazonia to Panamá (E.E. Williams, pers. comm.).

This lizard is relatively common in Amazonia in perianthropic situations, and a few specimens are always brought in by children; I have collected it on the fence posts of the football field at Oriximiná. I have 2 personal records of natural situations. One is from Alter do Chão, on a grass clump. The other specimen was sitting on a single-log walk across a stretch of grass-covered swampy ground some 500 m wide at Os Patos. Ruthven (1925) found it common in Santa Marta "in open woods and clearings, generally found on grass and low bushes; abundant about the open marshes at Bolivar and Fundacion".

While it is certain that this is not a forest lizard, it has not been found south of the hylaea: it may be then a form adapted to open formations inside the hylaea or an immigrant entering the area along the lacework of riverine open formations.

Color in life (Oriximiná)

Male: dorsally smoky brown, smudged on the flanks. A golden yellow stripe from the upper lip through the sides of the body. A light line from the eye to the ear. Lower parts whitish, with a more or less deep yellow tinge. Throat fan: scales yellow, skin orange, sometimes very dark.

Female as male, but throat fan much smaller: even when it is stretched the skin cannot be seen among the scales.

Anolis fuscoauratus D'Orbigny, 1837

Localities

Pará: Belém; Santana dos Macacos; Taperinha; Oriximiná; As Pedras; Barreirinha; Maloquinha. *Amazonas*: Urucurituba; Reserva Ducke, Manaus. *Pernambuco*: Recife.

This is primarily a lizard of the forest, terra firme, varzea, and igapó, but very tolerant of edge situations (Oriximiná) and found even in city parks (Belém and Recife).

It prefers thin parches, trunks and vines 20 cm in diameter and less, usually vertical. The lizards are usually within 2 meters of the ground, looking either way. They try to escape by running up the trunk or by jumping to the ground and freezing.

I have collected two juveniles (Oriximiná and Santana) hopping on the ground and on low bushes. In Barreirinha I saw one adult changing its perch by a series of long (some 80 centimeters) jumps on the ground.

At Urucurituba I found in 1969 an extremely dense population, the only really dense population of any *Anolis* I have ever seen

in Brasil. The place is an old grove of interspersed cocoa (*Theobroma*) and rubber (*Hevea*) trees. The cocoa trees were planted in clumps of 3 to 8 plants, separated from 1.5 to 6 meters; the rubber trees were farther apart. The low canopy was close and there were no shrubs or grasses, but a very thick layer of leaf litter. There were at times 3-4 specimens per tree. In the same grove and trees *Gonatodes humralis* was also abundant and one specimen of *Iphisa elegans* (q.v.) was caught in the leaf litter. I was at the time more occupied with collecting a large series than with observing the lizards, but their general behavior agrees with the description above.

I obtained several specimens at Monte Cristo, where it seems *fuscoauratus* overlaps in niche with *trachyderma* (q.v.), but none was collected personally by myself. However, I saw 3 specimens, displaying at a height of 2 meters, on a narrow tree (10 centimeters in diameter), that I am reasonably sure were *fuscoauratus*.

Beebe (1944a) remarks that in Kartabo the species prefers trees with pale bark or covered with pale mosses; that he saw no specimens on the ground, and only once away from a good-sized tree, and finally that two specimens were caught on the top foliage of a 90 foot tall tree within 15 minutes of its felling. Except for the last point, that I cannot verify, all other items differ very much from my observations.

Rand & Humphrey (1968) and Crump (1971) have ecological notes for Belém, which completely agree with mine. They took temperature data showing that the animal is not a heliotherm.

Anolis ortonii Cope, 1868

Localities

Pará: Belém; Os Patos; Monte Cristo; Oriximiná; Igarapé Jaramacaru. *Amazonas*: Ilha Grande do Soriano.

This is a tree lizard, but seemingly of very wide tolerance. It is impossible at this stage to draw a picture of its preferences; it is better to describe the circumstances of each individual find.

At Monte Cristo one specimen was caught inside terra firme forest, on a tree trunk about 15 centimeters in diameter, about 1 meter above the ground. It tried to escape upwards. Another specimen was on a thin vine, at face height, also in the terra firme forest. At the same locality a further specimen was caught in the very middle of a mandioca (*Manihot*) plantation, about 2 meters above the ground, on a palm trunk 25 centimeters in diameter; it also tried to escape upwards.

In the Ariramba cerrado enclave (Igarapé Jaramacaru) 2 lizards were on a cashew tree (*Anacardium* sp.), in the cerrado some 100 meters from the edge of the forest.

At the Ilha Grande do Soriano dr. Fred Medem (travelling with the Expedição Permanente da Amazônia) shot two males that were displaying at a height of some 6 m on a tree trunk about 50 cm in diameter. The place was an open copse in a parklike situation.

All other observations were made in perianthropic situations. In Belém, E.E. Williams and I collected one specimen in a artificial rubber tree (*Hevea*) grove; it was initially at a height of 3 meters, and tried to escape upwards.

In Os Patos I caught 6 specimens inside the village, one on an avocado tree (*Persea*) near the ground, 3 on bacaba palms (*Oenocarpus*) and one on a rubber tree (*Hevea*).

In Oriximiná the species is very common in backyards, where it frequents fruit trees, especially papaya.

Many specimens, when handled, build up a "crest" of folded dorsal skin. They change color quite readily, from a very bleached to a very dark gray. The color pattern, all in grays and browns, does not change appreciably with preservation, except for some yellowish, at times almost golden, tones on the head, that vanish shortly after death.

The male dewlap (Oriximiná) is large. Contracted it shows a yellow median line and sides of mixed light gray and dark red. Extended, the scales are grey, the skin dark orange to dark red, except immediately around the scales, where it is yellow.

Crump (1971) found the species not common in terra firme forest (Belém).

***Anolis punctatus* Daudin, 1802**

Localities

Pará: Belém; Os Patos; Monte Cristo; As Pedras. *Acre*: Iquirí. *Pernambuco*: Recife. *S. Paulo*: Praia de Boraceia.

This is a species of the forest, both the Atlantic and the Amazonian. It is usually found at a height of 1 meter and more, on tree trunks of diameter between 20 centimeters and 1 meter. It tries to escape upwards, or by jumping on adjacent leafy vegetation, such as vines and saplings. The specimen collected in deep forest by Rolf Grantsau, at the beach of Boraceia, S. Paulo, is the southernmost record for the species. The Recife specimen was caught in the city park, on the edge of a relict forest. In Os Patos one specimen was collected in the igapó, on the trunk of an açai palm (*Euterpe oleracea*).

Beebe (1944a) cites two specimens caught on leaves on the ground, in the jungle, at Kartabo. E.E. Williams (pers. comm.) saw a very small juvenile one foot from the ground on a thin root in the Belém city park, where the species is common.

Rand & Humphrey (1968) have ecological notes for Belém, in agreement with mine. Their temperature data show the species to be a nonheliotherm. Crump (1971) found the species both in varzea and terra firme forest.

***Anolis trachyderma* Cope, 1876**

Localities

Pará: Monte Cristo.

This species has been more commonly called *A. leptoscelis* in the literature. I follow E.E. Williams (pers. comm.) in using the name *trachyderma*.

The immediate ecology of this species has been until now unknown (see Vanzolini & Williams, 1970). I have recently explored the type locality of a synonym (*Anolis garbei* Amaral, 1933,

Monte Cristo, synonymy also after E.E. Williams, pers. comm.) and had the luck of securing twenty odd specimens, of which 13 caught by myself, and can now offer the following data.

In the locality there is only terra firme forest; there are two successive ridges, 50-100 meters high, parallel to the Rio Tapajós, and farther inland a long ridge sloping down towards the interior. The species was found at all heights on the ridges and valleys, at all distances from the creeks that run in the area.

Five specimens were caught on the ground, one actively pursuing a cockroach. The others were at varying heights, up to 1.5 meters, but generally below 40 cm, on thin trees and saplings, up to 20 cm in diameter. The animals on tree trunks were indifferently looking up, down or sideways. Several undisturbed lizards were seen holding the body laterally curved, with the forequarters held high, exposing the lateral striped pattern, much more striking in life than might appear from the description. In fact, the first specimen I saw was in a situation that could have been occupied by *Anolis fuscoauratus*, but at the first glance there could be no mistaking the two species: *fuscoauratus* has a much quieter pattern than *trachyderma*. The raised position is also characteristic of the latter.

As far as the present observations permit to say, there is at least partial overlap between the structural niche of these two species. *A. fuscoauratus* occurs in the area, and I obtained several specimens from local collectors. However, the only examples I think I saw (I am reasonably sure of the identification) I could not collect: three specimens were displaying on a small tree at a height of about 2 meters, but a sudden rain squall made them disappear before I could shoot.

In other places *fuscoauratus* was commonly seen, but no *trachyderma* was obtained. This inversion of the abundance of the two species is in itself suggestive. It would seem that *trachyderma* uses the ground more and sits lower on trees than does *fuscoauratus*, but this would be only a difference in degree. That they may actually overlap, although no specimens were seen on the same tree, seems possible in view of the great difference in attitude and color pattern between the two species. *A. fuscoauratus* is dully colored even when alive, and sits flat on the substrate, raising its head only to bob and display. *A. trachyderma* was seen to sit with bent body and raised head and trunk, showing its bold color pattern.

William Duellman has kindly made available to me notes on 41 specimens collected in eastern Ecuador. Many specimens were collected asleep on bushes or low vegetation at night; those caught by day were mostly on the forest floor (one on a bush).

This is a tame lizard, easily caught by hand. No escape pattern was observed.

Color in life (male, Monte Cristo)

Dorsal aspect: Frontal depression and middle of snout greenish brown; sides of the snout with a mask of velvety dark brown, reaching the lip. The general effect is one of a light pearlshaped

raised snout, set-off by dark brown on the sides and by the light margin of the interocular stripe, which is dark, with light margins, and reaches the eyes. Along the back there is a middorsal stripe, light brownish gray, festooned, containing dark smudged points. Below this stripe, on each flank, a tan stripe, with correspondingly festooned upper margin and straight lower margin, beginning at the eye, where it meets the interocular band. Below this stripe a still lighter one, dark bordered, from the shoulder to the root of the thigh. Dorsal surface of fore limb smudged with several shades of grayish-brown, with two thin transverse white lines, one on the forearm and one on the arm, which are in continuity when the limb is folded. Dorsal surface of hind limb dark brown, with two thin transverse light lines on the thigh and an oblique similar line on the tibia; foot lighter.

Ventral aspect: Throat, when caught, light brown with indistinct transverse bars; when released from collecting bag, dark velvety brown with sulphur-yellow points and 3 transverse lighter bars. Throat fan (not expanded) with a dark red midline, next laterally a dark smudged area, next, on the sides and in front, a smoky dark red area. Extended fan with smudgy dark orange skin and black scales. Belly and ventral aspect of members variegated with several tones of brown.

Tail dorsally tan with a series of darker blotches; ventrally as belly.

Throat fan of the female smaller than that of the male, light orange, passing to yellow on the sides.

The male described above was the most conspicuously patterned specimen obtained. There is much variation in color, usually obsolescence of some element of the pattern.

***Enyalius catenatus* (Wied, 1821)**

Localities

Espírito Santo: Santa Teresa. *S. Paulo*: Boraceia; Caragatatuba; Ilha de São Sebastião.

This is a very important species. No other lizard ranges as widely in the Atlantic forest, and a study of its differentiation will certainly be very important to the understanding of at least two groups of problems, the distribution of forest refuges during pedimentation times (Bigarella & Ab'Saber, 1964; Vanzolini, 1970) and the effect of climate zonation on the differentiation of forest forms.

Enyalius is a forest dweller, at least from Bahia south. Individuals may be found high, 3 to 5 meters, on tree trunks, much as described for *Anolis punctatus* (I have good notes for Santa Teresa). On the other hand, Mrs. Helga Urban on the island of S. Sebastião and myself in Boraceia have found specimens on the ground. That the latter situation is not anomalous is shown by a consideration of stomach contents.

I have at hand notes on a series of stomachs of *Enyalius* from all over its Atlantic forest range, identified by dr. Floyd Werner for dr. Carl Gans and myself, who at the time intended to revise the genus. Among 42 stomachs with recognizable food items, 12

(92%) contained animals that can be confidently said to have been eaten on the ground: Blattaria, larvae of Coleoptera, Gryllidae, Diplopoda, Chilopoda, Phalangida and Oligochaeta. Of course this percentage represents a minimum, as other food items could have been caught on the ground as easily as on the vegetation. The 12 stomachs with ground-dwelling prey afforded 17 (9%) food items in a total of 192. Thus it may be said that *Enyalius catenatus* does a sizable part of its foraging on the ground. Two stomachs contained pieces of lizard skin.

Grantsau (1966) comments on the ecology of the form in coastal S. Paulo and figures a shedding specimens and eggs.

Egg laying

Mrs. Helga Urban watched egg-laying by a captive female. The specimen had been kept since April 1, 1961, in a large cage, containing a perch where it spent most of its time. On March 25, 1962, it dug a hole in the ground, next to a piece of wood, and laid two eggs, that were immediately covered with earth. The female remained on the ground for two days, after which she resumed her normal behavior. The eggs seemed to be not fertile and were destroyed by soil insects before they could be examined.

Enyalius bilineatus Duméril & Bibron, 1837

Localities

Espírito Santo: no further data. *Minas Gerais*: Mariana.

From the same series of stomach contents referred to above I have data on two specimens of this form. The *Espírito Santo* (specimen) contained one jassid (Homoptera). The other, from Mariana, had some lizard skin, one winged ant, one cockroach (Blattaria) and one tettigoniid orthopteran.

Iguana i. iguana (Linné, 1758)

Localities

Pará: Óbidos; Lago Jacaré. *Amazonas*: Vila Amazônia. *Maranhão*: Estreito. *Bahia*: Fazenda S. Francisco, Razo da Catarina.

The common iguana is exceedingly abundant in Brazilian Amazonia. I cite above the localities at which I took notes, but in fact my impressions are partly based on numerous incidental encounters with the species.

The iguana in Amazonia is always found near water, indifferently on tree limbs and on the ground. When disturbed on a high perch it dives and swims very well, either on the surface or under. It digs nests in the sand: I saw disturbed nests in mid-September in Óbidos.

Rand & Humphrey (1968) have notes for Belém, based however on few sightings.

There are many references to the natural history of the iguana in South American herpetological literature. Even Lacépède (1788), in his usual *pot-pourri* of information uncritically gathered from assorted travelers, reproduces some adequate observations made in Cayenne by de la Borde. Goeldi (1897), Hagmann (1909), Ruthven

(1925), Cott (1926), Beebe (1944a) and Test, Sexton & Heatwole (1966) give general ecological notes, along the same lines of mine, and data on reproduction. Lönnberg (1902) studied the relationship between the anatomy of the intestine and the diet, and H. Müller (1968) followed one population in Colombia for a full year, analyzing the growth of the individuals.

Since the early days of herpetology the iguana has been known to occur in the valley of the São Francisco, a long river that cuts across a vast expanse of caatingas. Valmont de Bomare in his *Dictionnaire* (1776) refers (based on unnamed travelers) to a certain "Ignarucu", explicitly from the São Francisco. Daudin (1802) referred it to *Dracaena*. Amaral (1950) correctly interpreted "ignarucu" to be a misspelling of "iguanucu", literally "the big iguana"; however, he followed Daudin in referring the name to *Dracaena*. This is improbable, as *Dracaena* does not occur south of Maranhão in eastern Brasil, while *Iguana* is quite frequent along the São Francisco, and Bomare's description fits it very well.

I had always imagined that these northeastern Brazilian populations of iguanas would live on the banks of the few permanent bodies of water of the region. However, in November, 1965, I collected a healthy, fat adult female on the edge of the Razo da Catarina, in northern Bahia. A "razo" is a stretch of caatinga so sandy that there is never any run off; the very scarce rainfall is immediately blotted by the sand and not a single gully is seen. Horses and cattle grown wild in the razos have to be taught to drink water. The iguana I collected was walking on the ground at least 80 km from the nearest permanent water. Local people commented that the animal is not rare and that indeed it lives in the caatinga. I compared this specimen very carefully with an Amazonian sample and found no differences in scale counts or body proportions.

Ruthven (1925) also reports *Iguana*, both young and old, running on the ground in desert scrub one mile from the nearest water.

Plica plica (Linné, 1758)

Localities

Pará: Santana dos Macacos; Os Patos; Monte Cristo; Barreirinha; Barreira. *Amazonas*: Reserva Ducke, Manaus.

Plica plica is a locally abundant lizard in Amazonia. I have always found it in terra firme forest, with the exception of the Os Patos specimen, caught on a mango tree in the village. It is usually found on large trees, high up in the trunk, and escapes by climbing very rapidly to great heights. I have seen only one specimen, a young one, on the ground (Barreirinha) on a fallen log; it immediately climbed a tree 90 centimeters in diameter.

It usually sits looking down with fore parts raised, as commented upon by Mole & Urich (1891) and depicted by Beebe (1944a). Parker (1935) has a note on the food, in Trinidad.

Color in life

This is a colorful lizard when alive. A young male (82 mm snout to vent) from Barreirinha is thus described in my notebook:

Dorsally, ground color grayish green, with jaguar type ocelli, with dark periphery and rufous center. Among them dark markings with reddish rusty orange suffusions. The granules on the head are varicolored, forming dark markings speckled with orange. The occipital shows marblings of the 3 colors, green, black and orange. The distal extremities of the limbs are a lighter gray than the remainder; the digits are yellowish.

Ventrally the whole animal is light grayish green. The gular appendix has a light middle keel; lateral to this it is very dark, smudged, surrounded by an orange area lighter than the color on the back. This orange spot extends into the neck. The main transverse gular fold is velvety black, with some orange on the middle of the front rim. The throat is punctuated, the anterior punctuations dark gray, the posterolateral ones (at the level of the fold) mixed orange and black.

The tail is dorsally barred, the bars brown with an admixture of green and grayish blue.

In older specimens (male from Monte Cristo, 155 mm snout to vent) there is much less orange. The labials and rostral are immaculate light green with dark sutures. The throat is reticulate and the appendix is very black, the color extending to the gular fold. The sides of the neck are strongly reticulate with several shades of orange, from rusty to very light.

The dorsal ocelli converge into 4 to 5 transverse bars, without any reddish color. The dorsal aspect of the limbs is indistinctly barred proximally, the hands and feet distinctly so. The dorsal aspect of the tail is olive green, with about 15 transverse bars, the first forming a chevron. Flanks and sides of the belly with dark orange reticulations over a ground color of mixed green and light orange. The ventral parts are uniform light green, with dilute yellow areas on the lower belly, anal flap, thighs and base of the tail, conspicuously not between the thighs.

Plica umbra (Linné, 1758)

Localities

Pará: Santana dos Macacos; As Pedras; Igarapé Jaramacaru.
Amazonas: S. Sebastião do Uatumã.

This is also primarily a lizard of the terra firme forest, but tolerant of edge and second growth situations. Its vertical range goes from very near the ground, on fallen logs or recumbent vines, to heights of 5-6 m on trunks 30-40 centimeters in diameter, of the type preferred by *Anolis punctatus*. It is very frequently seen high on vines.

I have seen the species in the city park at Belém, but took no notes there.

Beebe (1944a) has notes on the species in Kartabo. His data indicate a closer resemblance to *Plica plica* than do mine. I believe in the areas where I have worked *P. umbra* prefers much thinner branches, trunks and vines, and comes much closer to the ground. Rand & Humphrey (1968) have notes for Belém, especially temperature records showing the species to be a nonheliotherm. Crump (1971) found the species in all forest environments studied, but particularly common in terra firme forest.

Color in life (S. Sebastião do Uatumã)

General dorsal color somber green, with black spots tending to form cross bands. Head between green and gray, with reflections of both. Limbs as dorsum, with lighter green transverse bands, 3 on the forearm, 2 on the arm, 4 on the thigh, 3 on the tibia. Tail proximally with a chain of dark markings, distally barred.

Lips (inapparent with closed mouth) light blue. Sides of head and neck rosy gray, orange below the tympanum. Flanks greenish gray, spotted with black and white.

Ground color of mandible light gray, darker at the symphysis. Throat bluish, passing to warm yellow behind, with several indistinct dark bars. Gular fold orange.

Ventral parts in general rosy gray, spotted with white. Middle of thighs, anal flap and tail grayish blue.

***Tropidurus semitaeniatus* (Spix, 1825)**

Localities

Bahia: Fazenda S. Francisco, Razo da Catarina.

Given the complex topographical relationships between caatinga and cerrado, it is not easy to decide, on the sole basis of locality records, whether a form is specifically adapted on one of them or just generally to open formations. *T. semitaeniatus*, however, is clearly a caatinga species. It is common on rocky outcrops ("caatinga de lajeiro"), an environment where its flattened body and color pattern (gray with a median whitish streak) are especially procryptic.

Johnson (1952) has seen it in essentially this context in Pernambuco.

***Tropidurus spinulosus* (Cope, 1862)**

Localities

Mato Grosso: Baía das Pingas, near Aquidauna.

In this locality in the "pantanal" of Mato Grosso (a vast belt of lowlands seasonally flooded by the Paraguay river and its tributaries) I collected many specimens on a large "gameleira" (*Ficus* sp.).

Gallardo (1969) has notes on the ecology of the species in Santa Fé, where adults were seen frequenting on rocks or tree trunks, while the young were found in grassy areas.

T. spinulosus is one of the South American species used by Lönnberg (1902) in his studies of relationships between anatomy of the intestine and diet.

***Tropidurus torquatus* (Wied, 1820)**

Localities

Pará: Belém; Igarapé Jaramacaru. *Pernambuco*: Recife. *Goiás*: Gurupí de Goiás; Araguaína. *Mato Grosso*: Aquidauna.

Minas Gerais: Buritís; Arinos; Serra da Piedade. *Bahia*: Poções. *Rio de Janeiro*: Cabo Frio. *São Paulo*: Mato Dentro, São Roque.

I consider it better, at present, to group all noncrested Brazilian *Tropidurus* under the name *torquatus*. There is, no doubt, a considerable amount of variation, but I see no signs of the existence of sympatric species, and am more inclined to believe the group is a polytypic species or at most a species group. I prefer to emphasize its essential unity than to employ a division into species or subspecies not founded on any work of ensemble.

As here conceived, *Tropidurus torquatus* is a lizard of all open formations: cerrado, caatinga, sand beaches and perianthropic environments.

In the cerrado I have never seen *T. torquatus* on the ground, among grasses and bushes, but always on rocks, piles of logs or fences. This refers to all localities in Goiás, Mato Grosso, Maranhão and Minas Gerais. When a choice is possible it seems to prefer rocks to other substrates; this was quite evident in Buritís, in the Serra da Piedade and in the Igarapé Jaramacaru. In Mato Dentro it frequents boulder fields, hiding under large semi-detached flakes.

In Poções, *T. torquatus* was in the caatinga, on rocks, in a situation where one would expect to find *T. semitaeniatus*, which was not present.

In Cabo Frio there is one population of *Tropidurus* that has a very peculiar color pattern. Its ecology is also peculiar; it lives on a narrow strip of beach, partly on sand dunes, next to a belt, closer to the sea, occupied by *Liolaemus lutzae* (Vanzolini & Ab'Saber, 1968).

T. torquatus is very common at least in two cities, Belém and Recife. In the former locality it was well studied by Rand & Rand (1966); see also notes by Rand & Humphrey (1968). In Recife the picture is apparently very similar (Johnson, 1952).

Its is curious that this species, so abundant in Belém, has not been able to colonize other cities of the Amazon valley: I am sure it does not exist between Belém and Manaus. The Igarapé Jaramacaru population, occurring in the cerrado enclave of the Ariramba, must be a relict of times when open formations occupied much of the present hylaea (Vanzolini, 1970). Thus *Tropidurus* populations north and south of the Amazon must be genetically separated or very thinly connected along the coast, and the populations of the enclaves must be authentic isolates.

There are some notes in the literature on the general ecology and reproduction of *Tropidurus torquatus* as here considered: Goeldi (1897, 1902, Rio de Janeiro and Pará); Goeldi & Hagmann (1901, Pará); Bertoni (1913) and Schouten (1919, 1931), both Paraguay; Test, Sexton & Heatwole (1966, Venezuela); Gallardo (1969, Santa Fé, Argentina). It should be noted that the eggs described by Goeldi in 1897 as those of *Tropidurus* were later said by Goeldi & Hagmann (1901) to belong to the gekkonid *Hemidactylus mabouia*. Crump (1971) reports it from terra firme forest in Belém, but does not comment.

Wucherer (1863, Bahia) and Bertoni (1913, Paraguay) report predation by snakes, respectively *Pseudoboa coronata* and *Erythrolamprus aesculapii* (more probably *E. venustissimus*).

Uracentron azureum (Linné, 1758)

Localities

Pará: Barreira; Itaituba.

I have seen two live specimens, both brought in by boys, but was taken to the exact places where they were collected: in Itaituba, the wall of a house (ironically, a rare species inside a largish town) in Barreira a mandioca (*Manihot*) plantation, recently burnt — the specimen was at a height of about 1.5 meters on a burnt tree some 60 centimeters in diameter.

Cott (1926) observed in the island of Marajó one specimen sedately eating ants on a limb of a mangrove tree at a height of 25 feet. Beebe (1944a) found a specimen among some rocks near the shore at Kartabo.

Considering that the species is restricted to the hylaea (the Guiana forest included), I would guess that this species has an ecology somewhat similar to that of *Thecadactylus rapicauda* (although probably not nocturnal, I know of no iguanid that is) or that it is a form of the open formations inside the hylaea.

Color in life (Itaituba)

Dorsally one can see three shades of green: the head and the anterior half of the body chlorine green; from midbody to the basis of the tail, very bluish green; tail light green spotted with yellow. Fore limb as the back, but hand golden yellow. Hind limb as the back, but foot tan.

On the sides, extending on the back, several well marked dark bars: on the temporal region, at the height of the tympanum, in front of the arm. On the flanks several poorly marked bars. A sharp dark line on the posterior aspect of the thigh.

Ventrally: throat yellowish green; gular folds golden, this color extending on the breast and ventral side of the fore limb. This color gets progressively dirtier on the belly and lower surface of hind limbs, and also on the middle of the lower aspect of the tail, which is otherwise green.

Cott (1926) has also a description of the color pattern, but his specimen seems to have been duller than mine.

Uranoscodon superciliosum (Linné, 1758)

Localities

Pará: Apeú; Monte Cristo; Oriximiná. *Amazonas:* São Sebastião do Uatumã; Manaus.

This is a most famous lizard in Brazilian folklore; it is called Tamacuaré, has magic (mostly amorous, of course) powers, and the webs of embiopterans are thought to be his hammock, woven by himself.

I must begin by disagreeing with Beebe (1944a), who says that it lives chiefly in dense jungle, but is also found on rank growths along the shores of creeks and rivers. In Brazilian Amazonia this is the igapó lizard par excellence. If you find a clean enough igapó so that you can paddle through it, you are certain to see

this animal on a columnar (20 to 40 centimeters thick) trunk, vertically stretched, looking down. It frequents also the margins of rivers and creeks, many times on the ground but also on the crown of low trees, and is an extremely good diver and swimmer.

Boulenger (1885) in the Catalogue says: "in the young the digital fringe is almost as much developed as in *Basiliscus*. Tail strongly compressed, crested like the back; its length about twice that of head and body". Beebe (*loc. cit.*) reports bipedal running (like *Basiliscus*, which I can confirm) and has notes on food and reproduction in Kartabo.

Rand & Humphrey (1968) in their ecology of lizards at Belém refer to the riparian habit but have not worked in igapó. They say the species is not heliothermic. Crump (1971) also refers to the association of this lizard with water.

Family Teiidae

Ameiva ameiva (Linné, 1758)

Localities

Pará: Apeú; Monte Cristo; Barreira; Maloquinha; Boca do Cuminá-Miri; As Pedras. *Goiás*: Araguaína. *Mato Grosso*: Três Lagoas. *Bahia*: Poçoês. *Minas Gerais*: Ribeirão Confins. *São Paulo*: Castilhos.

In the absence of any significant study of geographical variation, I prefer to keep all Guiano-Brasilian *Ameiva* under a single specific name and to ignore for the present the proposed subspecies.

As in the case of all very common lizards, I am citing above only the localities from which I have written notes. However, I cannot avoid contaminating my ideas with numerous unrecorded encounters with the animal.

This is an ubiquitous lizard in Brasil, but primarily a form of the open formations, especially the cerrado. I'll describe first the situation and behavior at Ribeirão dos Confins, in the core area of the cerrados.

The home burrow is usually within a clump of vegetation, with small trees and tangled litter. There is around plenty of sun and shade and a mosaic of grass and almost bare soil. The animals forage during the hotter hours of the day, noisily scratching around. The flight pattern is characteristic, usually in three steps: (i) to the clump of vegetation; (ii) to the tangle around the burrow; (iii) into the burrow. If the fright is severe the first step may be omitted and the lizard run directly into the tangle.

Of this typical cerrado situation several variations occur: in cerrado with dense grass without bare patches (Três Lagoas), in dense grass without trees or any clumps of vegetation (Castilhos), in caatinga (Poçoês).

In Amazonia it is the commonest perianthropic lizard, occupying all backyards and scrub available. There, as in other parts of Brasil, second growth ("capoeira") at all stages is also occupied, regardless of the amount of sunshine that penetrates to the ground.

Finally, I have found the species several times (As Pedras, Monte Cristo, Maloquinha) inside the deep forest, at times far

from trails or clearings, and under closed canopy. This type of situation has been previously reported by Beebe (1945, Caripito and Kartabo), Hagmann (1909, Mexiana), Johnson (1952, Recife), and Crump (1971, Belém).

Other ecological information is given by Beebe (1945, general behavior and reproduction), Fitch (1968, Santa Cecilia, also escape pattern and temperature), Goeldi & Hagmann (1901, Pará), Johnson (1952, Salvador and Recife), Nicéforo-Maria (1930, Villavicencio), Schouten (1929, 1931, Paraguay), Vogl (1933, Venezuela), and Rand & Humphrey (1968, Belém).

Lönnberg (1902) used the species in his study of relationships between diet and intestinal morphology. Saville-Kent (1898) refers bipedalism as observed by a correspondent in Trinidad.

A natural death

One night, at approximately 20 hours, I heard in the park of the Museu Goeldi in Belém the spasmodic beating of a lizard tail. Thinking it would be a lizard being seized by a snake, I ran towards the noise. It was a large *Ameiva* turning and twisting on the ground. It repeatedly raised the body on the extended forelimbs, kicked with one leg, in a corkscrew movement, then righted itself difficultously.

After some 15 minutes the hindlimbs were almost completely paralysed, the forelimbs performed slow swimming motions, and the skin of the four limbs was flaccid and wrinkled. There was no marked rigidity, nor contracture.

In another 15 minutes I noticed weak swallowing movements; the tongue was protruded, weakly slipping in and out.

At this stage, pricking with a metal point produced: on the tail and foot, no reaction; on the leg, a slow spasmodic extension of the foot and adpression of the thigh; on the thigh, a slight flexion of the leg; on the shoulder, adpression of the arms; on the arm, swimming movements.

Immediately after (36 minutes from the beginning of the observation) the abdominal musculature was contracted, showing ridges along the longitudinal sutures between scales; the belly was rigid and concave. The swimming and swallowing movements continued. The tail became rigid, straight.

One hour after the beginning of the observation the animal was almost motionless, with the back longitudinally ridged. Reflexes were weaker and weaker.

At the next stage, 30 minutes later, there was complete dissynchrony of movements, generalized tremors and rigidity.

At 23:00 hours rigidity was complete and the animal was killed and preserved.

These symptoms strongly suggest a myelitic syndrome, possibly of viral origin.

Cercosaura o. ocellata Wagler, 1830

Localities

Pará: Maloquinha; Monte Cristo.

Seven specimens were caught alive, all inside terra firme forest. Five were in leaf litter, one was climbing a twig some

10 cm above ground, and one was on the trunk of a tree of about 30 cm diameter, 1.5 m above ground.

Ruibal (1952) suspected sexual dichromatism. I can now confirm this with the following notes taken from live specimens at Monte Cristo.

Adult female (2 specimens, 56 and 51 mm snout to vent): dorsum light tan, with occasional black spots, the scales with fine black punctuations; a light longitudinal stripe from the eye to the base of the tail, following the outermost dorsal row; dorsal surface of limbs as back; dorsal surface of tail with heavy black and white spots, associated or not; supralabials below and behind the eye with black and white spots; sides of body with round light spots surrounded by a moderate condensation of black punctuations, from the ear to the chest; ventral parts immaculate cream colored.

Adult male (3 specimens, 45, 51, and 51 mm): dorsum as in the female, but with practically no black spots; supralabial spots more contrasting than those of the female, the black blacker and the white whiter; flanks with a heavy orange suffusion, touching the dorsolateral stripe at shoulder level and on the posterior part of the trunk, reaching the sides of the belly, where the color is brightest; the patches of either side meeting ventrally at the base of the tail; a series of large ocelli, with a broad very black rim and a brilliant white center; the first ocellus is above the arm, the others irregularly spaced on the flank, sometimes confluent; dorsal aspect of tail with white but no black spots; two specimens with immaculate ventral parts, one with moderately dense black punctuation on the middle of the ventrals.

Juveniles: One male, 37 mm snout to vent, can be sexed by inspection of the femoral pores, that appear as very shallow impressions. Four specimens 33 mm and under cannot be sexed, as no pore impressions are visible. These specimens have the general female type of coloration, with one difference: the light dorso lateral light stripe is heavily bordered with black, and a more or less conspicuous mid-dorsal black line is present, giving the animals a striped appearance.

Thus the main sexual differences seem to be, on the bases of the few specimens available: (i) the presence of ocelli in males; (ii) the presence of an orange-colored suffusion on the flanks of the male; (iii) the heavy black spotting of the dorsal aspect of the female tail.

Cnemidophorus ocellifer (Spix, 1825)

Localities

Bahia: Itapoan, Salvador; Poções; Fazenda São Francisco, Razo da Catarina.

This is a common lizard in the caatinga, stony or sandy. It lives also on the beaches of northeastern Brasil. At Itapoan the adults were in the dunes where *Bogertia* (q.v.) was collected, and the young a certain distance away, in very sparse, low grass, very near the sea.

Johnson (1952) saw the species in the caatinga and also on the coast (Olinda); he presents color notes.

Colobodactylus taunayi (Amaral, 1933)

Localities

São Paulo: Ilha Vitória.

Specimens were caught among leaf litter in second growth forest; also in grass at the time of clearing garden plots for the planting of mandioca (*Manihot*).

Crocodylurus lacertinus (Daudin, 1802)

Localities

Pará: Belém; Aveiro; Lago Jacaré.

This is a semi-aquatic lizard. It lives on the muddy banks of rivers, creeks and lakes, usually climbing among tangled vegetation, but also on the ground. It hides in burrows on the banks.

Goeldi (1902) gives about this sort of ecological information.

Heterodactylus lundi (Reinhardt & Lütken, 1862)

Localities

Minas Gerais: Serra da Piedade.

I collected this lizard at the type locality, an isolated quartzite mountain in central Minas Gerais, surrounded by cerrado. I found the lizard only on the topmost 50 meters of the peak, which means the total area of the species is at most a few hectares, probably one of the smallest in the world. In 16 field hours I collected 3 specimens under small rocks. One further specimen was seen outside: it progressed by small jumps, a strange thing in an animal with such reduced limbs.

Iphisa elegans Gray, 1851

Localities

Amazonas: Urucurituba.

One specimen in the leaf litter of the cocoa and *Hevea* grove described under *Anolis fuscoauratus*. Beebe (1945) obtained one specimen in a jungle pit.

Kentropyx calcaratus Spix, 1825

Localities

Pará: Santana dos Macacos; Antonio Lemos; Monte Cristo; Barreirinha; Oriximiná; Igarapé da Sôrva, near Oriximiná; Boca do Cuminá-Mirí; As Pedras.

I am here calling *calcaratus* all Amazonian *Kentropyx* with small dorsals. It is clear that geographical differentiation exists, but it is equally clear that a single species is involved.

Numerous observations of this species permit to draw a satisfactory picture of its general ecological requirements: it is a forest

heliophil. It is found in all sorts of forest, from hillside terra firme to soggy varzea, and even in second growth, but seems to be more frequent near water. It forages on the ground very much like *Ameiva ameiva*, but also does a moderate amount of climbing, on the lower part of tree and palm trunks, and especially along fallen logs. On slanting logs I have seen it at a height of 3 to 4 meters. It is practically always, however, in places where the sunshine pierces the canopy, and is frequently found basking. On the places where it climbs it frequently overlaps *Mabuya mabouya*.

The records in the literature are in excellent agreement with these data. The habitat descriptions of Fitch (1968) and Rand & Humphrey (1968) are unambiguous, and both papers contain temperature data showing the conspicuous heliothermy of the lizard. Crump (1971) shows it is a "generalist", and stresses its association with *Mabuya mabouya*. I refrain from quoting Beebe (1945), because his identifications are not very sure.

***Kentropyx striatus* (Daudin, 1802)**

Localities

Pará: Igarapé Taperebá, Marajó; Boa Vista, Igarapé Apeú; Almeirim; Os Patos.

This is certainly a lizard restricted to the open formations along Amazonian rivers. It is found in the open, near water or on the actual edge of swamps.

Color in life (Almeirim, male)

Dorsally, head brown, changing to greenish on the nape and to light green over all the area of enlarged dorsal scales. On the sacral region some dark punctuations, becoming progressively denser along the tail. Dorsal aspect of forelimb brownish green, lighter on the fore arm; of hindlimbs a deeper green, with brown spots.

A light line from the eye through the upper margin of the ear, running along the outermost row of enlarged dorsal scales. Below this line a broader one, rufous brown, extending from the eye to a point behind the axilla. Flanks rufous brown, with small light blue spots. Sides of tail rufous brown with an admixture of green.

Post-symphysials ashy white, throat and chest light orange, belly dark orange, darker on the sides, merging into the brown of the flanks. Margins and keels of the individual ventral scales lighter than the ground color. Base of tail as venter, changing to burnt earth distally.

***Leposoma percarinatum* (Müller, 1923)**

Localities

Pará: Aveiro; Oriximiná; As Pedras.

All specimens were collected in leaf litter in terra firme forest, in agreement with what Lorenz Müller (1923) says in the original

description (he collected the type material himself): "im dichten Urwald im trockenen Laube kriechend".

Beebe (1945) has notes on the species both at Caripito and Kartabo; he comments on breeding and food, tells of 4 specimens caught together under bark, and has the surprising information that the species is usually nocturnal. I have never been very successful at night collecting in general, but have several times seen this animal pursuing a normal life during the hot hours of the day on the forest floor. Crumb's (1971) data agree with mine.

Neusticurus ecpleopus Cope, 1875

Localities

Pará: Monte Cristo.

Uzzell (1966) reviews the ecological literature and presents data gathered by D. Wake and R. Etheridge in Pasco, Peru. Since then Fitch (1968) published data obtained in the Napo valley (Santa Cecilia); the animals he observed lived in colonies along very small and brisk-flowing creeks and rivulets in the forest and had low body temperatures (non-heliotherms).

I collected 1 adult and 2 juveniles on different occasions, in the same spot, on the banks of a (at the time, early rainy season) sluggish small creek, one meter wide, 10 centimeters deep, in deep, shaded terra firme forest. One froze on the shore when it noticed I was trying to get him; the other two ran to holes in the banks.

Placosoma cordylinum champsonotum (Werner, 1910)

Localities

S. Paulo: Ilha de S. Sebastião.

Mrs. Helga Urban found eggs under bark and in leaf litter around roots of trees.

Prionodactylus oshaughnessyi Boulenger, 1885

Localities

Pará: Apeú.

Uzzell (in Peters & Donoso-Barros, 1970) reduces all *Prionodactylus* with a divided frontonasal to the synonymy of *P. argulus* (Peters). It seems to me that Amazonian specimens differ considerably from Peter's (1862) figure of the type, from Bogotá. Even inside the valley I notice much variation, but an evaluation of its meaning will depend on an extensive analysis, covering all the area, for which presently available materials are insufficient. Thus I prefer to apply the name *oshaughnessyi* (type-localities Canelos and Pallatanga, Ecuador) to eastern Pará specimens.

This Apeú example was collected by Herbert Schubart beating (for insects) the low branches of a tree.

Fitch (1968) found *P. oshaughnessyi* on the ground in the rain forest at Santa Cecilia, with a body temperature 2.1°C above air temperature. He found *P. manicatus* in the same area, on the

forest floor, at the edge of a cleared strip. Crump (1971) reports the same species as I (under the name *argulus*) from both varzea and terra firme forest in Belém.

Tretioscincus agilis (Ruthven, 1916)

Localities

Pará: Igarapé Jaramacaru.

Vanzolini & Rebouças-Spieker (1969) published on a perianthropic population. Since then I collected one specimen in a natural situation, at the edge of the Ariramba cerrado enclave, in leaf litter under an isolated cashew tree (*Anacardium* sp.).

Fitch (1968) collected one specimen at Santa Cecilia, on the forest floor.

Family Anguidae

Diploglossus lessonae Peracca, 1890

Localities

Rio Grande do Norte: Coitézeiras.

Prof. Cabral, of the Institute of Anthropology, University of Rio Grande do Norte, collected a sample of these lizards while excavating an archeological site, and had the courtesy of contributing the specimens and field notes. The locality is a river bottom, flooded periodically by the river Curimataú. The lizards were found at a depth of 1.5 to 2 meters. Prof. Cabral observed their progression through winding motions, with the limbs adpressed.

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GAZETTEER

Whenever feasible, localities are referred, directly or indirectly, to the Map of Hispanic America, 1 : 1 000 000, of the American Geographical Society.

Alegre, Pará. A fishing village a few kilometers from Marapanim (SA 23 1-48b).

Alter do Chão, Pará. SA 21 3-55b.

Alvorada, Goiás. On the Belém-Brasília highway. Approximate position 12°29'S 49°53'W.

Apeá, Igarapé, Pará. SA 23 1-48d.

Aquidauana, Mato Grosso. SF 21 20-56d.

Araguaina, Goiás. On the Belém-Brasília highway. Approximate position 7°12'S 48°12'W.

Arinos, Minas Gerais. On the Rio Urucuia, some 35 km SE of Buritís (SD 23 16-47b).

As Pedras, Pará. SA 21 1-56d.

Aveiro, Pará. SA 21 3-55c.

Barreira, Pará. SB 21 4-56d (as Barreiras).

Barreirinha, Pará. SB 21 4-56d (as Barreirinhas do Alarinho).

Belém, Pará. SA 22 1-48c.

Belém-Brasília highway. This highway begins in Santa Maria do Pará (not in Belém) and ends in Anápolis (not Brasília). Distances are measured from Santa Maria (SA 23 1-48d).

Boraceia, S. Paulo. A biological station belonging to this museum, 9 km east of Casa Grande (SF 23 24-46b).

Boraceia, Praia, S. Paulo. SF 23 24-46b (as Boraceia).

Buritís, Minas Gerais. SD 23 16-47b (as Burity).

Cabo Frio, Rio de Janeiro. SF 23 23-42a.

Caraguatatuba, S. Paulo. SF 23 24-45a.

Castilho, S. Paulo. Also Alfredo de Castilho. The collecting site is on the S. Paulo (left) bank of the Rio Paraná, across from Jupia (SF 23 21-52b).

Confins, Ribeirão, Minas Gerais. A small tributary of the Urucuia, 14 km from Buritís (q.v.).

Cuminá-Miri, Rio, Pará. SA 21 1-56d.

Ducke, Reserva, Amazonas. A forest reserve of the Instituto Nacional de Pesquisas da Amazônia, on the Manaus-Itacoatiara road (SA 20),

Estreito, Maranhão. Eastern head of the bridge of the Belém-Brasília highway over the Tocantins. SB 23 7-47a (as Estancia Nova; on the map but not in the index).

Gurupí de Goiás, Goiás. On the Belém-Brasília highway. Approximate position 11°42'S 49°04'W.

Igarassu, Pernambuco. SF 22 23-49b.

- Iquiri*, Acre. A camp where the Rio Branco-Porto Velho road crosses the Rio Iquiri (SC 19 9-66a).
- Itaituba*, Pará. SB 21 4-56d.
- Itapiranga*, Amazonas. On the Furo de Silves, some 10 km north of its opening in the Amazonas (SA 21 3-58b).
- Itapoan*, Bahia. A beach north of the city of Salvador (SD 24 13-39b).
- Jacaré, Lago*, Pará. SA 21 1-57d.
- Jaramacaru, Igarapé*, Pará. SA 21 1-56d (as Rio).
- Maloquinha*, Pará. On orphanage on the left bank of the Tapajós, some 10-15 km above Itaituba (SB 21 4-56d).
- Manaus*, Amazonas. SA 20 3-60d.
- Mariana*, Minas Gerais. SF 23 20-43c.
- Mato Dentro*, S. Paulo. A settlement some 20 km from S. Roque (SF 22 24-48a).
- Monte Cristo*, Pará. SB 21 4-56d (as Monte Christo).
- Óbidos*, Pará. SA 21 2-56b.
- Oriximiná*, Pará. SA 21 2-56b.
- Os Patos*, Pará. Small settlement 4 km downriver from Taperinha (SA 21 3-54c).
- Pedras*. See As Pedras.
- Piedade, Serra da*, Minas Gerais. SD 22 15-51a.
- Pingas, Baía das*, Mato Grosso. A swampy embayment of the Rio Aquidauna, some 80 km downriver from the city of Aquidauna (SF 21 20-56d).
- Pituba*, Bahia. A beach in the city of Salvador (SD 24 13-39b).
- Poções*, Bahia. SD 24 15-41a.
- Razo da Catarina*, Bahia. An uninhabited sand desert north of the road from Canudos to Geremoabo (SC 24 10-39a, 10-38b).
- Recife*, Pernambuco. SC 25 8-35d.
- Santana dos Macacos*, Pará. Small settlement some 40 km above the mouth of the Rio (or Furo) dos Macacos, Marajó (SA 22 2-51b).
- Santa Tereza*, Espírito Santo. SE 24 20-41b.
- S. Sebastião, Island*, S. Paulo. SF 23 24-45a.
- S. Sebastião do Uatumã*, Amazonas. Village near the mouth of the Rio Uatumã (SA 21 4-58d).
- Sooretama*, Espírito Santo. A federal reserve, 52 km north of Linhares (SE 24 19-40c).
- Soriano, Ilha Grande do*, Amazonas. SA 21 3-59d (as Ilha Autaz).
- Taperinha*, Pará. SA 21 3-54a (as Taderinha).
- Três Lagoas*, Mato Grosso. SF 22 21-52b.
- Urucurituba*, Amazonas. SA 21 3-58b, on the river.
- Villa Amazônia*, Amazonas. SA 21 3-57b (as Villa Baptista).
- Vitória, Ilha*, S. Paulo. SF 23 24-45a.

