HISTORICAL PERSPECTIVES

The Iguana[1]

Franz Werner

Characteristics of the genus *Iguana Laur.* [translator's note: "Laur." refers to Josephus Nicolaus Laurenti, who first formally described the Common or Green Iguana] include the elongate, laterally compressed body, a large, quadrangular head, a short neck, powerful limbs, exceedingly elongate toes, and an extremely long tail with keeled scales throughout, a distinct dewlap with an anterior border of spike-like scales, a middorsal row of enlarged spines that extend from the nape to the tip of the tail, multi-sided head scales of various sizes with alternately arched, tuberculate, or keeled surfaces, smooth or slightly keeled ventral scales, triple-keeled scales on the undersides of toes, distinct femoral pores, a large, round tympanum, wide nares, and dentition with the anterior-most teeth peg-like, sharp, and with a slight inward tilt, and others three-edged and, distinct from most related genera, serrated along the edge. In addition to the jaws, the sphenoid and pterygoid bones also bear a double row of small teeth, the numbers of which, like those on the jaws, vary by age.

The iguana, *Iguana tuberculata* Laur. [an alternative name for *Iguana iguana* that was widely used well into the 20th century], reaches 1.4–1.6 m in length, of which 1 m or more consists of tail. Ground color is an attractive leaf green. Very young individuals lack markings, but the rump and tail of larger animals bear distinct dark, often light-outlined crossbands. The underside is white or yellowish.

All iguanas are found in tropical South America, the nations surrounding the Gulf of Mexico, and several of the Lesser Antilles. All live in trees, particularly those along the banks of streams or lakes. There they move about with consid-

[1] Excerpted and translated from Franz Werner (1913. Die Lurche und Kriechtiere von Alfred Brehm. Zweiter Band: Kriechtiere (Schuppenkriechtiere), pp. 92–98 + table "Lizards IV," no. 3. In: O. z. Strassen (ed.), *Brehms Tierleben. Allgemeine Kunde des Tierreichs.* 4th ed. Bibliographisches Institut, Leipzig and Wien. Translated by R. Powell.

Iguana, *Iguana tuberculata* Laur. 1/7 natural size. Photograph from the Zoological Garden in Frankfurt a/Main by A. Fahr-Darmstadt.

erable dexterity, climbing or jumping from limb to limb. They also are quite adept at retreating into the foliage, rendering themselves invisible to the untrained eye. Toward evening, they frequently descend to the ground in order to forage — but, if threatened, they rapidly seek the highest branches whenever possible, or, as we already know, the depths of any nearby water. In the latter, they are as much at home as monitors [these are generally large lizards in the family Varanidae; all are found in the Eastern Hemisphere; some are quite aquatic in their habits]. The powerful tail is used as a combination oar and rudder and is capable of propelling them with surprising speed. They swim, as do all lizards, with all four limbs securely adpressed along their bodies, relying exclusively on their tails for propulsion and steering. In such a fashion, they are fully masters of the water. In addition, they are equally as adept at diving as at swimming, and are capable of spending considerable periods of time submerged in the depths. They do not tire while under water and, as a consequence of their skill, effectively evade any dangerous enemies unable to follow them into what is essentially a foreign element. They seem not the least concerned about crocodiles or caimans, many of which are found in the waters into which these lizards unhesitatingly venture.

Duméril [André-Marie-Constant Duméril, the foremost taxonomic herpetologist of his era] noted that he found only plant materials in all of the iguana stomachs he had examined, and others have agreed. Sumichrast [a naturalist] indicated that soft berries had been consumed in such quantities by the specimens that he had dissected that their intestines were extraordinarily distended. Tyler [another naturalist] indicated that, among the half-digested leaves he had found in the digestive tracts of iguanas, were innumerable quantities of small worms that, he assumed, had been on the leaves consumed by the lizards and inadvertently swallowed. The main dietary component surely consists of plant materials such as fruits and leaves, but we also know beyond any doubt that younger animals gladly take insects and, as testified by Tyler, earthworms and snails.

Typically, adults flee at the first sight of humans, mainly because they have learned to view them as their most dangerous enemy. In contrast, young animals sit quietly and are consequently easy to catch. However, if iguanas are forced into a corner, they defend themselves valiantly, initially inflating their bodies, extending their dewlaps, and hissing, then jumping at their opponent while attempting to bite. Once their jaws have a firm grip, they are quite unwilling to let go. Because the overlapping molars are very sharp, they leave a bite that bleeds freely, much like a wound caused by a knife. At the same time, the tail is used to inflict powerful, painful, and even dangerous blows.

During the breeding season, iguanas are said to be even more excitable and considerably more aggressive than usual, never leaving a chosen female while furiously attacking any animal that ventures too near. Even battles among males for possession of females are grim and frenzied. Well after the breeding season, females appear in the vicinity of sandbanks, in which they intend to lay their eggs. During this period, one can most readily see these animals, which typically spend the rest of their lives making every effort to remain invisible. On St. Lucia, egg deposition occurs during the months of February, March, and April. The eggs are about the size of those laid by pigeons, white or light straw-yellow in color, and have soft shells, the latter reminiscent of fine glove leather. Like those of most reptiles, the eggs are composed almost entirely of yolk. The females lay the eggs in holes dug in the sand, which they then carefully cover. Beyond that, they show no concern for the brood. However, Göldi [Emílio August Goeldi, a Swiss-born Brazilian naturalist for whom the famous Goeldi Museum in Pará at the mouth of the Amazon River was named] noted that a captive female attacked him vigorously as he attempted to examine her recently deposited eggs. Reports indicate that older females lay considerably more eggs than younger individuals. A female held in captivity by Göldi, for example, laid five eggs on one day and 32 more five days later. In a series of dissected specimens, 8, 14, and 17 eggs were found in increasingly larger females. Eggs were arranged in distinct rows on each side of the body cavity and were all about equal in size. Sumichrast noted that, in his experience, several females commonly laid eggs in a communal nest, so that one could on occasion find as many as ten dozen eggs in a single cavity. Many eggs are destroyed not only by ants but also by small mammals, especially the so-called muskrat found on St. Lucia [not the better known muskrat of North America]. Consequently, female iguanas may purposely seek out the seacoast, the sand of which is considerably less accessible to its enemies than the banks of rivers. Hatchlings appear to stay together for extended periods, as A[lexander]. v[on]. Humboldt [another famous German naturalist whose explorations of South America thrilled Europe and inspired Darwin] mentioned that his guide showed him a nest filled with 10 cm-long iguanas. "These animals were hardly distinguishable from a common lizard; the prominent dorsal crest scales, the large, erectile scales, and all of the dangling appendages that provide the iguana, when he is 1–1.5 m long, with such a fierce countenance, were barely present in these beginners."

In the West Indies, the idea that iguana meat is unhealthy is prevalent throughout the region. Nevertheless, no one pays much attention to that opinion, searching instead, almost with the same zeal as the members of Schomburg's party [reference unknown], for such tasty table fare. Catesby [Mark Catesby, an English naturalist] said that iguanas were common and profitable trade goods, caught by hand and passed along, until, in the end, they were bought as delicacies by rich mainlanders. The meat is considered to be easily digestible, nourishing, and tasty; it is fried or, more frequently, stewed. The eggs, which do not harden with cooking, are almost devoid of eggwhite; they are typically used in the preparation of broth. Talented collectors specialize in the search for this rather wonderful fare and use several different methods to capture animals. One of Schomburg's reports describes a rather unusual technique that some have disputed but several other writers have mentioned. Because the lizards are reputed to be quite curious, they extend their heads when approached, allow themselves to be stroked with a belt until it is tightened sufficiently to allow the animal to be effectively noosed. Once firmly in place, the tether is used to forcefully tear them from their arboreal perches. The iguanas obviously fight like crazy to free themselves, opening their powerful jaws, snarling and hissing — but, of course, are easily overwhelmed. The snout is secured with a loop of string and the body and limbs are tightly strapped. In this helpless position, the

iguanas are then taken to the market. I am loath to decide just how much if any of this tale is true. I do consider it possible that these curious creatures allow the collector to approach closely, at least in areas where they are seldom hunted. More commonly, trained dogs are used, particularly since, without their help, finding the lizards, artfully hidden amongst the foliage, is almost impossible. Liebmann [yet another naturalist] reported that, along the west coast of Central America, lizards are ambushed and cornered by dogs when they descend from their trees in the evening, Tyler expanded on this by noting that dogs were trained specifically for this task. Experienced dogs probably use their sense of smell to locate iguanas and then bark to draw the hunters to the tree in which the lizard is roosting or, if encountered on the ground, hold it until their masters arrive. Some dogs undoubtedly do not hesitate to grab the iguana by its back and shake it until it dies. For all that, a few dogs, those that have learned from experience and those that aren't particularly bright, fear the tail and teeth of a frenzied and frightened iguana. If the lizard does manage to flee, it almost invariably turns first to a tree; if, however, unable to find one quickly, it will just as readily seek shelter in a cave or crevice — in either case, it is probably lost. An iguana, seemingly secure in the foliage, is relatively easily shaken from a perch or the branch on which it rests can be cut. If in a cave, an iguana will often think itself secure if only its head is hidden. Once successfully in hand, in order to prevent being bitten, the hunter will run a tough stalk through the skin under the chin and out a nostril; tying the ends to render the mouth secure. Then, using the long tendons of the middle toes, the limbs are secured behind the back. Thus trussed, the tortured captive is taken to market the next morning. Because Mexicans are very familiar with the tenacity of iguanas, that often escape even after being shot in the body, such securely tied individuals may be held for months until eventually sold. This often occurs prior to festivals, during which iguanas are particularly prized when baked in corn tortillas and eaten as delicacies. They also may serve as special gifts.

Occasionally, one might find among the entrails what appears to be half an egg. In earlier times, these were considered to be powerful drugs with great healing properties, and may, from place to place, still be viewed as such today.

Initially, captive iguanas are wild and may be particularly vicious, biting their masters and threatening any animal that ventures too near. They may even kill weaker pets that enter their domains, including fellow captives. Over time, their frenzies calm and, in the course of several weeks, they become so tame that anyone can touch them.

Emílio Goeldi on Iguanas

Of recent observers, Goeldi in particular has contributed greatly to expanding the horizons of our knowledge about the lifestyles of iguanas. "The iguana, commonly called 'camelaão' by Brasilians, is encountered with increasing frequency as one progresses from Bahia to the north. Sightings in the vicinity of the Amazon River and along the coast of Guahana are daily occur-

Iguana, *Iguana tuberculata* Laur. 1/6 natural size.

rences, with an understanding that, within such larger regions, specific sites with proper topographical and vegetative features will be preferentially occupied. Conversely, iguanas avoid localities that fail to provide the resources necessary for survival. This is particularly evident, for example, here in Pará [the Brasilian state at the mouth of the Amazon]. Single iguanas are encountered only from time to time in the vicinity of the city and on adjacent islands. In contrast, during a short rowboat ride along Marajó Island, especially its southeastern part, one can see hundreds of individuals. I've also found them to be astonishingly common at Cape Maguarí and along the Atlantic Coast. Such numbers of iguanas inhabit several smaller islands, located from the immediate vicinity of Cape Maguarí to several hours away, that they are rightly considered to be their most abundant inhabitants and, further, over time they have proven themselves capable of dramatically altering the vegetation. I am quite familiar with two of these little islands, 'Ilha Camaleão' and 'Ilha Machados,' the latter of which I visited in early September 1896. Our gracious host, the owner of the island (and, coincidentally, the discoverer of *Lepidosiren paradoxa* on Marajó), blamed the untold numbers of iguanas living on the island for the extirpation of the native mangrove forest.

"The iguana is a vegetarian of the purest sort, a fact that, to my surprise, I fail to see reflected in the herpetological literature. Just in the immediate vicinity, iguanas make a major impression on the constitution of the plant communities; for example, on (1) mangrove trees (*Avicennia*), (2) thorny aturia bushes (*Drepanocarpus*), and (3) quick-growing anhinga stands (*Montrichardia*). These three plants obviously serve as the main foods for iguanas.

"During most of each year, the iguanas, as is characteristic of the species, live a happy and worry-free life in this hot, moist climate — as long as something to eat is available. A paucity of food is not likely in most cases, unless one is dealing with an isolated island, such as the examples cited earlier, combined with an overpopulation of lizards. In such cases, largely as a consequence of their own actions, iguanas may experience hard times during the dry seasons in these deserts of their own design. Animals may be severely emaciated and so feeble that they are hardly able to move. Such instances arouse our pity, particularly in contrast with their brethren who thrive along riverbanks where an abundance of fare prevails.

"If one glides slowly and quietly along in a rowboat, one can see iguanas left and right, so to speak, at every step. Some are perched on the highest branches of the airy mangroves, whereas others rest among the colorful garlands of the arribidaea bushes. The inexperienced novice first notices the older, larger individuals whose boldly patterned bodies are quite evident. In contrast, a more practiced eye is necessary to see juveniles or lizards that have recently shed. While basking motionless on their perches in the hot sun, their beautiful green dresses blend seamlessly with the juicy leaves of the vines that often garnish the tops of the anhinga bushes. As a rule, they hold their positions until one approaches all too near — but once the decision is made to flee, one is astounded by their unexpected adroitness. Iguanas are masterful swimmers and divers, and an individual that falls in the water must be considered lost unless bearing deadly wounds. Killing an iguana is not easy. They are unbelievably tough, and only a shot through the head or vertebral column will guarantee a catch.

"By the end of August, one begins to find gravid females about ready to lay their eggs. Yellow ovarian follicles collectively resemble a voluminous cluster of grapes that take up considerable space in the body cavity. My impression, for example, near Cape Maguarí, is that females are definitely in the minority. At least, we found on the average of up to four or five males for every female. This comment should be accepted with reservations, however, because I cannot be sure how much of a role chance has played in these encounters, or if humans have not affected the gender ratios. I had the opportunity to convince myself that the latter possibility could occur, mainly by local inhabitants focusing their efforts on catching females. If one slits the belly of a gravid female, the egg mass is immediately evident and often 'boils' out of the wound. A tightly patterned shotgun wound has a similar effect. The locals eagerly and greedily collect the egg masses, which are considered with some justification to be special delicacies. The French traveler, Thébaur, during his upcountry tour, made similar observations — and little has changed today in southern Guahana or on Marajó.

"From September on, the females begin to leave the banks of the large rivers, following the feeder creeks in order to penetrate farther into the lowlands. There they seek sandy places and old dunes where they will hide their eggs in self-constructed burrows, over which they are quite adept at smoothing the surface sands and rendering the nest nearly invisible. A good eye and considerable experience are necessary to find such places, and the locals have developed astounding skills along these lines. Once the females have completed their business, they return to the banks of the rivers.

"The brood consists of 1–1 1/2, at most two dozen eggs, figures that correspond with the numbers of follicles found in the ovaries of females collected in August. I shall use as representative examples, typical in size and shape, two well-developed eggs acquired from the Atlantic Coast of Marajó on 22 September 1886: 1. length 43 mm, breadth 26 1/2 mm, 2. length 43 mm, breadth 26 mm. In form they are broadly elliptical; the white shell is soft, and gives way to the slightest touch. Nevertheless, it is tough, and penetration with a single cut is possible only with a carefully sharpened knife.

"Iguana eggs are, as mentioned previously, delicacies. The extensive, granular yolk is tasty. It never hardens completely when boiled and can be spread like butter. Like those of the Amazon River turtle (*Podocnemis expansa*), they are somewhat hard to digest. Iguana meat also is quite tasty, and it reminds me of that of the local armadillos. It serves as a nice change of pace for river dwellers, and our museum personnel invariably voice their approval if iguana, boiled or grilled, is served. Here in Pará, one sees iguana meat offered for sale by the kilogram in the market or along the streets.

"I don't want to avoid reporting that finding food in our gardens for our wild-caught captive iguanas was, at first, a difficult task, primarily due to the fact that the above-mentioned plants have been displaced by civilizations throughout most of the city and its immediate environs. After considerable searching and experimentation, we were thrilled to find an excellent surrogate in a weed, locally known as 'malvarisco,' which thrives

in fallow fields and orchards. Iguanas readily accepted its leaves, which are similar in size to those of the coltsfoot. Since we have been feeding *Heckeria peltata*, we've not lost a single iguana; just the opposite, as a matter of fact, they are thriving and are, in many instances, downright fat. They also have begun to exhibit signs of becoming tame, moving toward the keeper when he brings them food. We have in a small way endeavored to cultivate this plant, specifically for our iguanas. This is in every way simple, and I am convinced that it would serve well as a crop raised in greenhouses by zoological gardens. It grows rapidly and is easily propagated from seeds. This weed requires no special care, requiring little investment of effort or money.

"*Iguana tuberculata* [= *Iguana iguana*], called 'cameleão' by natives, occurs in great numbers on Mexiana Island, but it is not easy to find because its green color blends well with the tangled bankside vines on which it prefers to perch. These iguanas are shy and, once they take flight, literally shoot across the crowns of trees and bushes with such alacrity that they disappear almost immediately from the view of the hunter and can be traced only by following the tell-tale crackling of small branches broken during their effort to escape. They will ascend the highest forest trees, and I recall one individual I shot down from an astounding height.

"The nest cavities are typically dug at an angle, with an approximately two-foot long passage leading to a slightly enlarged cavity that serves as the egg depository. Because the sand dunes are repeatedly watered during the rainy season, sufficient moisture is retained to keep the sandy burrow from collapsing. Consequently, these sites lend themselves to easy excavation through loose sand, but retain the moisture necessary to sustain the eggs. Although the nest cavities are carefully filled by the females, fresh nests are easy to find, as no effort is made to wipe out the telltale tracks. Because, however, the direction of the sloped passage is not always evident, natives probe the sand and identify the passage or even the egg chamber by the lack of resistance to their efforts."

BIOGRAPHICAL SKETCH

Emílio Augusto Goeldi (1859–1917)

Emílio Goeldi was a Swiss-born Brasilian naturalist. He studied at the University of Naples before earning his doctorate in 1883 at the University of Jena, where he studied under the famous evolutionary biologist, Ernst Haeckel. Goeldi emigrated to Brasil in 1884 to become assistant head of zoology at the Museu Nacional in Rio de Janeiro. He lost that position as a consequence of political changes, but, in 1894, accepted an invitation by the governor of Pará, the large northern state at the mouth of the Amazon River, to become Director of the Museu Paraense. Goeldi served in that capacity until 1904, when he resigned for reasons of health and returned to Switzerland. The museum was subsequently renamed the Museu Paraense Emílio Goeldi in his honor. In 1908, he became Professor of Zoology at the University of Bern, a position he held until his death.

Goeldi published in many areas. His most widely recognized work was *As Aves do Brasil* (*The Birds of Brasil*), published in 1894–1900, followed by an atlas in 1900–1906. Most of his herpetological work dealt with classification and distribution, but he also had a special interest in reproductive biology. Goeldi discovered *Hyla* (now *Flectonotus*) *goeldii* (named by George A. Boulenger in 1895), a frog in which the female carries the eggs attached to her back. Goeldi's major work in herpetology, *Repteis do Brasil*, was completed in 1892–1894, but was never published as a single volume. Much of the content consisted of compilations from the literature, but many of Goeldi's field notes (such as those quoted here by Werner) also were included.

Emílio Goeldi (*photograph courtesy of Kraig Adler*).

Source: Adler, K. 1989. Herpetologists of the past, pp. 5–141. *In* K. Adler (ed.), *Contributions to the History of Herpetology*. Society for the Study of Amphibians and Reptiles, Contributions to Herpetology, Number 5. Ithaca, New York.