HISTORICAL PERSPECTIVES

Iguanas of the Galápagos Islands[1]

Franz Werner,
with extensive quotations from Charles Darwin

The Galápagos Islands are a world unto themselves. The majority of the plants and animals there are found nowhere else. Among the animals, the reptiles play a very important role, ecologically replacing the mammals that are absent from the islands, especially the herbivores. Only a few species are native, but each is (or was only a few decades ago) exceedingly abundant. Of particular interest are the iguanian squamates and, of those, two exceptionally unusual species stand out. These are easily distinguished from related iguanas by examining their dentition, the shape and scalation of their heads, the strength of the head skeleton, and the lack of a dewlap. Both species agree in general body form and they also demonstrate some behavioral similarities; neither of the two is particularly mobile and both are vegetarian, although they consume very different plants. In fact, one lives on land and the other is completely dependent upon water. Unique among squamates, the latter, which can accurately be called a marine animal, feeds exclusively on aquatic plants.

The Sea-lizard, as we are wont to call it, *Amblyrhynchus cristatus* Bell [translator's note: Thomas Bell was an Englishman who named many amphibians and reptiles in the 19th century], is the only representative of its genus. It is a very large iguana. Of the total length of 135 cm, 80 cm is tail. Weight can reach 12 kg. The short, broad head slopes steeply to each side, tapers toward the front, and the profile arches rapidly and sharply from the forehead to the blunt snout. To best characterize the beast, I have taken the following information from Steindachner [Franz Steindachner was an Austrian ichthyologist and herpetologist associated with the Vienna Museum of Natural History from 1860 until his death in 1919], who wrote a treatise on the squamates of the Galápagos Islands [published in 1876]: The entire top of the head is covered in mosaic fashion by

Sea-lizard, *Amblyrhynchus cristatus Bell.* 1/6 natural size.

[1] Excerpted and translated from Franz Werner (1913. Die Lurche und Kriechtiere von Alfred Brehm. Zweiter Band: Kriechtiere (Schuppenkriechtiere), pp. 86–92 + table "Lizards V," no. 3. *In* O. z. Strassen (ed.), *Brehms Tierleben. Allgemeine Kunde des Tierreichs.* 4th ed. Bibliographisches Institut, Leipzig and Wien. Translated by R. Powell. Quotes from Darwin were not translated from Werner's text, but instead were taken directly from C. Darwin (1845. *The Voyage of the Beagle.* 2nd ed.). Some excerpts omitted by Werner are included here.

Granular-head, *Conolophus subcristatus Gray.* 1/5 natural size.

many quadrangular (usually) or six-sided scales of varying sizes; the largest are conical or even pointed and lie primarily toward the front of the head, whereas the smallest form the supraocular shields. The lateral but relatively highly situated, egg-shaped nares are angled from low in front to high in back, and are surrounded by an elevated leathery rim, which in turn is surrounded by small scales. Nine to ten five-sided plates form the upper lip and 12–13 four-sided plates make up the lower lip. An arc-like band of keeled scales extends from the region under the eye to the temple, whereas the underside of the head is covered by small rounded scales. The egg-shaped tympanum is embedded in a raised border of tubercular scales. The skin of the throat and neck is more or less loosely attached and forms a distinct gular fold. The body is generally robust, and the dorsal crest is continuous from the neck to the tip of the tail, although indentations mark the transitions from neck to body and body to tail. The scales of the body are distinguished by size and location. Dorsal scales are all keeled, lateral scales are tuberculate, whereas the ventral scales are completely smooth. The long tail has a thick base but becomes distinctly compressed laterally toward the tip, in essence forming a paddle or fin. The tail is covered with keeled scales, like those on the back, arranged in distinct rings. The limbs are short and stocky. The third and fourth toes are of equal length and are longer than the others. All are connected by a small web and equipped with powerful, sharp, and slightly arched claws. The thick tongue is as wide as the mouth. The long, large teeth are serrated and attached to the outer fold of the deeply grooved jaws. Each upper jaw bears 22–25 teeth, each lower jaw 20–24, of which 6–8 are similar to the lateral teeth and are on the intermaxilla. The small and not particularly numerous teeth on the pterygoid and sphenoid are easily displaced.

Color and pattern vary by age. Young Sea-lizards have numerous light gray flecks on both sides of the head, the chin, and on the sides of the body. These may reduce the black ground color to net-like reticulum. On the back, alternating dirty gray and black bands of flecks produce a more or less regular pattern of crossbands. The upper and lateral sides of the limbs are either punctuated with small gray flecks or larger gray spots. The chin is a dark dirty gray, the throat is black, and the belly a dirty yellow-brown. The digits, the axilla and groin, and the distal half of the tail are black. The dorsal crest is variably yellow or gray with black bands. Occasional individuals are entirely black.

Sea-lizards are phenomenally abundant on the Galápagos Islands. Darwin found them on all of the islands he visited; Steindachner found them on Albemarle, Charles, James, and Jervis islands, with those on the latter in particularly large numbers and including some individuals of imposing size; W.E. Cookson [an English explorer] also found them on Abingdon Island. Corresponding to their habits, these lizards restrict themselves to the rocky shorelines and, according to Darwin's observations, are not to be found more than 10 paces from the water's edge.

Darwin noted: "They are occasionally seen some hundred yards from the shore, swimming about; and Captain Collnet, in his Voyage, says,

'They go to sea in herds a-fishing, and sun themselves on the rocks; and may be called alligators in miniature.' It must not, however, be supposed that they live on fish. When in the water this lizard swims with perfect ease and quickness, by a serpentine movement of its body and flattened tail — the legs being motionless and closely collapsed on its sides. A seaman on board sank one, with a heavy weight attached to it, thinking thus to kill it directly; but when, an hour afterwards, he drew up the line, it was quite active. Their limbs and strong claws are admirably adapted for crawling over the rugged and fissured masses of lava, which everywhere form the coast. In such situations, a group of six or seven of these hideous reptiles may oftentimes be seen on the black rocks, a few feet above the surf, basking in the sun with outstretched legs.

"I opened the stomachs of several, and found them largely distended with minced sea-weed (Ulæ), which grows in thin foliacious expansions of a bright green or a dull red colour. I do not recollect having observed this sea-weed in any quantity on the tidal rocks; and I have reason to believe it grows at the bottom of the sea, at some little distance from the coast. If such be the case, the object of these animals occasionally going out to sea is explained. The stomach contained nothing but the sea-weed. Mr. Bynoe, however, found a piece of a crab in one; but this might have got in accidentally, in the same manner as I have seen a caterpillar, in the midst of some lichen, in the paunch of a tortoise. The intestines were large, as in other herbivorous animals. The nature of this lizard's food, as well as the structure of its tail and feet, and the fact of its having been seen voluntarily swimming out to sea, absolutely prove its aquatic habits; yet there is in this respect one strange anomaly, namely, that when frightened it will not enter the water. Hence it is easy to drive these lizards down to any little point overhanging the sea, where they will sooner allow a person to catch hold of their tails than jump in the water. They do not seem to have any notion of biting; but when much frightened they squirt a drop of fluid from each nostril. I threw one several times as far as I could, into a deep pool left by the retiring tide; but it invariably returned in a direct line to the spot where I stood. It swam near the bottom, with a very graceful and rapid movement, and occasionally aided itself over the uneven ground with its feet. As soon as it arrived near the edge, but still being under water, it tried to conceal itself in the tufts of sea-weed, or it entered some crevice. As soon as it thought the danger was past, it crawled out on the dry rocks, and shuffled away as quickly as it could. I several times caught this same lizard, by driving it down to a point, and though possessed of such perfect powers of diving and swimming, nothing would induce it to enter the water; and as often as I threw it in, it returned in the manner above described. Perhaps this singular piece of apparent stupidity may be accounted for by the circumstance, that this reptile has no enemy whatsoever on shore, whereas at sea it must often fall prey to the numerous sharks. Hence, probably, urged by a fixed and hereditary instinct that the shore is its place of safety, whatever the emergency may be, it there takes refuge." Darwin was unable to address reproduction in these animals.

Steindachner visited the Galápagos Islands in 1872 and, like Dampier and Darwin before him, saw thousands of Sea-lizards. "When my fellow traveler, Pitkins, saw a large number of these hideous animals, he ran into the midst of the densely packed mass. When I visited the same site shortly thereafter and again after about an hour, it was completely void of lizards. They had all fled into the sea and probably had sought out another, more distant refuge. My experience, also on James and Jervis islands, indicated that the sea-lizards, although sluggish and awkward in their movements and easily captured without resistance, do these days seek the sea to escape

Granular-head, *Conolophus subcristatus Gray.* 1/8 natural size. *Photograph by W.P. Dando, F.Z.S. – London.*

potential threats when they notice enemies in the vicinity — instead of, as earlier, returning stubbornly to the same site on shore. On calm days, one frequently encounters these lizards long distances from shore swimming and diving with ease and surprising speed. Their movements in water resemble those of a snake. Only the head is emergent while swimming, and the limbs are adpressed. On Jervis Island, I found them only in the immediate vicinity of the sea, usually in herd-like masses of 100–150 packed into small spaces on the rough and rugged lava. On James Island, I encountered only a few individuals considerably above the shore along the edges of small, overgrown cavities in the rocks that might serve as nesting sites. The stomach and intestine, as Darwin already mentioned, are without exception stuffed with foliacious green or dull-red algae."

The second lizard of the Galápagos Islands, which we will call the Granular-head, differs distinctly from the Sea-lizard in overall stature and in the absence of pterygoid teeth in adults. Overall, these are even more plump and ponderous. Restricted to dry land, they lack webbing between the short toes that terminate the stout limbs. The tail also is shorter and only slightly compressed, oval in cross-section and almost without a crest. In contrast, the neck is considerably longer and bears longitudinal folds of skin on its underside. The head also is more elongate, consequently less distinctly arched in profile and sloping less steeply to the sides. For all of these reasons, Steindachner agreed with those researchers who considered the Granular-head, *Conolophus subcristatus* Gray [John Edward Gray was a 19th century English naturalist and is widely regarded as the founder of the herpetological collections at the British Museum], to be a representative of a unique genus (*Conolophus* Fitz. ["Fitz. refers to Leopold Fitzinger, a prolific Austrian zoologist who wrote *Neue Classification der Reptilien* in 1826 and *Systema Reptilium* in 1843]).

In terms of color, the Granular-head differs considerably from the Sea-lizard. The head is a more or less lively yellow, the back near the crest is brick- or rust-red, and, in rare cases, the body sports faint, alternating yellowish and reddish-brown crossbands. Down the sides, the reddish-brown color gives way to a dirty, dark brown. Here and there, one may notice dots or small black flecks with indistinct edges. The belly is dark yellow with a tinge of reddish-brown. The upper and outer surfaces of the forelimbs are reddish, the hindlimbs are brownish yellow, but the claws and toes are black. These lizards reach a length of 107 cm, of which 54 cm is tail.

Darwin observed Granular-heads in the central islands of the Galápagos Archipelago, Albemarle, James, Barrington, and Indefatigable, where they occupy both the higher, moister areas

Illustration by John Binns.

and the lower, infertile regions, where they actually are more common. Darwin noted: "I cannot give a more forcible proof of their numbers, than by stating that when we were left at James Island, we could not for some time find a spot free from their burrows on which to pitch our single tent. Like their brothers the sea-kind, they are ugly animals, of a yellowish orange beneath, and of a brownish red colour above: from their low facial angle they have a singularly stupid appearance. They are, perhaps, of a rather less size than the marine species; but several of them weighed between ten and fifteen pounds. In their movements they are lazy and half torpid. When not frightened, they slowly crawl along with their tails and bellies dragging on the ground. They often stop, and doze for a minute or two, with closed eyes and hind legs spread out on the parched soil.

They inhabit burrows, which they sometimes make between fragments of lava, but more generally on level patches of the soft sandstone-like tuff. The holes do not appear to be very deep, and they enter the ground at a small angle; so that when walking over these lizard-warrens, the soil is constantly giving way, much to the annoyance of the tired walker. This animal, when making its burrow, works alternately the opposite sides of its body. One front leg for a short time scratches up the soil, and throws it towards the hind foot, which is well placed so as to heave it beyond the mouth of the hole. That side of the body being tired, the other takes up the task, and so on alternately. I watched one for a long time, till half its body was buried; I then walked up and pulled it by the tail; at this it was greatly astonished, and soon shuffled up to see what was the matter; and then stared me in the face, as much as to say, 'What made you pull my tail?'

"They feed by day, and do not wander far from their burrows; if frightened, they rush to them with a most awkward gait. Except when running down hill, they cannot move very fast, apparently from the lateral position of their legs. They are not at all timorous: when attentively watching any one, they curl their tails, and, raising themselves on their front legs, nod their heads vertically, with a quick movement, and try to look very fierce: but in reality they are not at all so; if one just stamps on the ground, down go their tails, and off they shuffle as quickly as they can. I have frequently observed small fly-eating lizards, when watching anything, nod their heads in precisely the same manner; but I do not at all know for what purpose. If this Amblyrhynchus [in Darwin's day, both Galápagos iguanas were placed in the genus *Amblyrhynchus*] is held and plagued with a stick, it will bite it very severely; but I caught many by the tail, and they never tried to bite me. If two are placed on the ground and held together, they will fight, and bite each other till blood is drawn.

"The individuals, and they are the greater number, which inhabit the lower country, can scarcely taste a drop of water throughout the year; but they consume much of the succulent cactus, the branches of which are occasionally broken off by the wind. I several times threw a piece to two or three of them when together; and it was amusing enough to see them trying to seize and carry it away in their mouths, like so many hungry dogs with a bone. They eat very deliberately, but do not chew their food. The little birds are aware how harmless these creatures are: I have seen one of the thick-billed finches picking at one end of a piece of cactus (which is much relished by all the animals of the lower region), whilst a lizard was eating at the other end; and afterwards the little bird with the utmost indifference hopped on the back of the reptile.

I opened the stomach of several, and found them full of vegetable fibres and leaves of different trees, especially of an acacia. In the upper region they live chiefly on the acid and astringent berries of the guayavita, under which trees I have seen these lizards and huge tortoises feeding together. To obtain the acacia-leaves they crawl up the low stunted trees; and it is not uncommon to see a pair quietly browsing, whilst seated on a branch several feet above the ground. These lizards, when cooked, yield a white meat, which is liked by those whose stomachs soar above all prejudices. Humboldt [Alexander von Humboldt, a famous German naturalist whose explorations of South America thrilled Europe and inspired Darwin] has remarked that in intertropical South America, all lizards which inhabit dry regions are esteemed delicacies for the table. The inhabitants state that those which inhabit the upper damp parts drink water, but that the others do not, like the tortoises, travel up for it from the lower sterile country. At the time of our visit, the females had within their bodies numerous large, elongated eggs, which they lay in their burrows: the inhabitants seek them for food."