


WELCOME TO THE LIZARD SHOW

For marine iguanas of the Galápagos, life's daily rhythms begin with the tides

Story and photographs by Tui De Roy



With scales molting from his head, a male marine iguana in the Galápagos Islands plods toward higher ground. Gnarled dark skin, a spiny crest and sharp, hooked claws all add to a fearsome look, but marine iguanas are actually gentle grazers. When the tide goes out each day, the larger lizards, mostly males, swim to reefs to dine on seaweed.

EVERYWHERE AROUND ME, the black volcanic shoreline of Fernandina Island in Ecuador's Galápagos chain springs to life with equally black lizards. Their spiky, crested shapes blend so well with the jagged lava that at times I can hardly tell rock from reptile. But I can hear the rasp of lizard scales on the hard shore as the animals trudge close to me on their way into the ebbing tide.

These ebony shadows are marine iguanas, the only seagoing lizards in the world. Each day at low tide, masses of them march slowly down the craggy shore for a feeding foray in the sea. Tied to the rhythm of the oceans, iguanas eat only during daylight hours when the surf recedes and exposes seaweed-covered lava reefs. So strange is their daily expedition that even after 35 years of living and photographing in the Galápagos, I have never tired of watching them.

The spectacle begins as the tide turns—at midmorning on this particular day. As the water level drops, it slowly reveals large rock slabs covered with glistening fuzz, a quiltlike pattern of minute seaweeds in subtle greens, reds and browns. Heated by the sun, the salty plants give out a delicate sea smell.

Behind me, hundreds of marine iguanas now plod toward the water, slowly but purposefully on short, rotund legs and clawed feet. All around, I can hear the abrupt sniffs of lizards blowing a mist of concentrated brine from special salt-eliminating glands in their nostrils.

When the iguanas reach the water's edge, they hurl themselves resolutely into the wave wash. Almost all the largest begin to swim out to sea. These

are mostly males, which in some colonies reach 1.4 meters (4.5 ft.) in length and weigh more than 12 kilograms (26 lbs.). Heads held just above water, the big lizards undulate from side to side like snakes. Long, flattened tails propel the iguanas at a cruising speed rarely exceeding 1.6 kilometers per hour (about 1 mph).

Doggedly they swim against the on-rushing breakers, eventually reaching the offshore areas where lush mats of seaweed grow on submerged reefs some 5 to 12 meters (16-40 ft.) deep. The iguanas disappear from the water's surface, diving to graze on the seafloor like so many cows in an undersea pasture they share with large schools of reef fish.

With the biggest iguanas out of sight, I turn my attention back to the exposed lava where I sit. I am surrounded by small- and medium-size iguanas, mainly those smaller than 60 centimeters (2 ft.) in length, from this year's hatchlings to mature females. They scamper here and there, clinging to the rocks with long, curved claws, seemingly oblivious to the cold waves breaking over them.

Soon each animal begins to feed, tipping its blunt snout to one side, then to the other, with quick jerking motions as the lizards' tiny, three-cusped teeth scrape the stubble of seaweeds from the lava. As I look closely, I see that what seems like random munching is, in fact, selective nibbling—lizards spit out an entire mouthful if they inadvertently take the wrong seaweed. Methodically they select only the tender red and green forms, shunning the coarser brown seaweeds and ignoring the many large, stringy clumps streaming through the foam.

With so many iguanas feeding to-



On top of the world, a young iguana (above) perches on an adult. Gregarious by nature, iguanas often sunbathe in close proximity. These two are probably not even relatives.

Soaking in the heat, an entire colony basks on a sunny lava shore (right). Unable to control internal temperatures, the lizards heat up or cool off depending on their surroundings.

gether, I am amazed that this sparse covering can support so many animals—up to 3,000 per kilometer of coast in some places. The secret lies in the growth rate of marine algae here. Nurtured by cool, upwelling currents, seaweeds can increase in weight sixfold in only two weeks.

This same cool water is also the reason the iguanas in front of me seem

hurried, almost frantic, in their feeding. Like all reptiles, iguanas heat up or cool off depending on their surroundings; the lizards cannot control their internal temperature. Yet the range of body temperatures in which iguanas function efficiently is as narrow as ours, spreading only two or three degrees. In the cool sea, iguanas lose heat quickly and must get back to shore while they are

still warm enough to be alert and active. Temperature rules the day's activities as the lizards strike a balance between the sea, as chilly as 17 degrees C (62°F), and the lava shores, which bake to well over 40 degrees C (104°F). When the lizards return from the water, they clamber to high ground and spread-eagle, with the sun on their backs and their stomachs pressed

against the superheated ground. In an hour or two, they will have warmed up fully.

At that point, the iguanas could overheat if they continue sunbathing, splayed against the hot rock. If they reach 45 degrees C (113°F), they will die. Instead of escaping to shade, which is very difficult to find, they turn to face the sun, presenting only their

Braving the full brunt of a frothy surf, a juvenile not yet strong enough to swim into deeper water grazes on an exposed reef. The routine of marine iguanas is linked to the daily tidal cycle.



snouts to the most direct light. They also cool down by raising their bodies slightly in order to allow air flow beneath them.

Come nighttime, lizards face the risk of cooling down too much. To conserve heat, they heap into untidy piles and pool their warmth.

The marine side of the lives of these complex creatures fascinated observers as early as 1835, when the young

naturalist Charles Darwin recorded some of the first scientific observations of the species. Darwin noted with amazement that when one of his shipmates decided to kill an iguana by weighting it with a rock and dunking it over the side, the animal seemed none the worse for wear when retrieved after more than an hour underwater.

Modern scientists have used more sophisticated experimental methods, such as attaching depth recorders and thermometers to diving marine iguanas. One of the foremost authorities on marine iguana physiology, George Bartholomew of the University of California, found that diving iguanas lowered their heart rate by more than half. This drop conserves oxygen, as well as minimizing heat loss, by reducing blood flow.

Comparing his results with those of colleagues studying other reptiles, Bartholomew found that the marine iguana's abilities are standard reptilian responses, not just marine specialties. Yet none of the other species has succeeded in straddling the extremes of desert shore and chilling sea.

Aside from the dangers of temperature, marine feeding challenges the lizards' ability to get rid of excess salt. Like seabirds and many other reptiles, marine iguanas have on their foreheads,

in essence, a second set of kidneys. Marine iguanas' salt glands work far better than do those of most species, as William Dunson of Pennsylvania State University discovered. The iguanas can eliminate liquid almost twice as salty as sea water.

Scientists do not, however, understand one of the basic questions about these feeding forays: why the unfailing response to feed at low tide, even in the

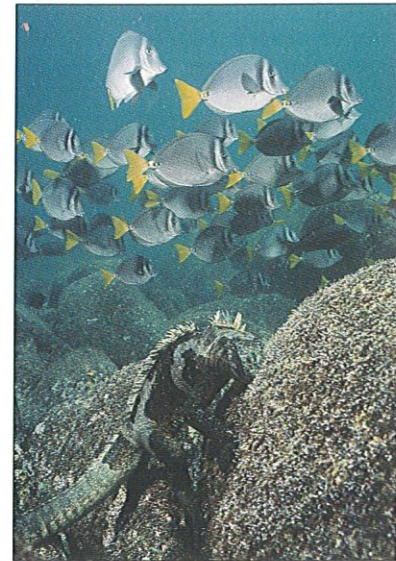
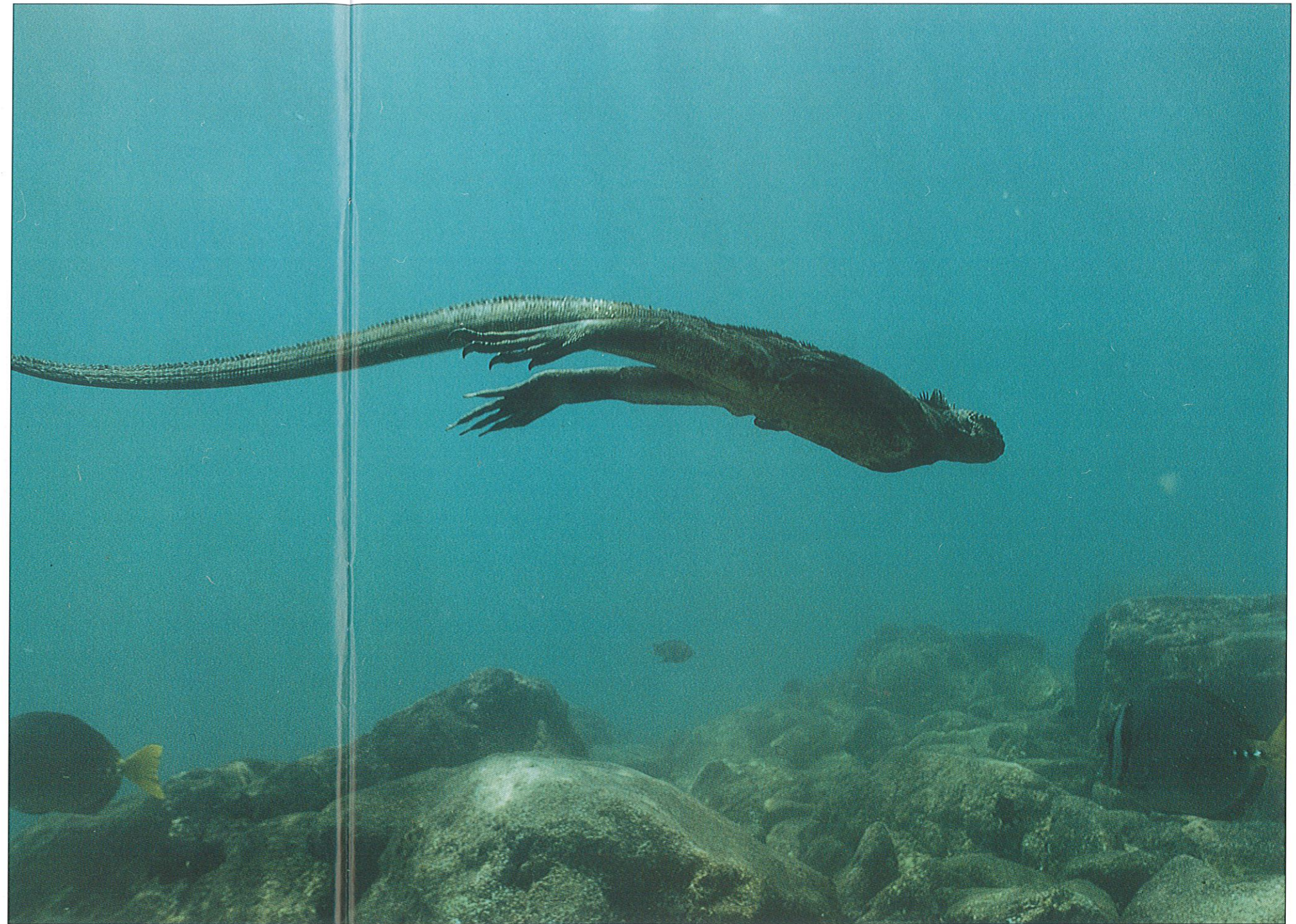
many cases when the resting colony cannot see the sea? Do the lizards smell the exposed algae, hear the changing sound of the surf or respond to some inner clock?

Whatever the mechanism, virtually all marine iguanas throughout the entire group of islands respond to the ebbing tide by heading out to feed, almost one hour later each day. Only a few large males ignore this schedule, swimming out to eat at noon when the day is at its warmest. The only factor that skews the pattern is a dangerously rough sea. Then the reptiles miss their meal altogether and fast until the weather improves.

Although marine iguanas feed at the same time up and down the islands, scientists recognized

long ago that not all of these seagoing lizards are created equal. Different islands have their own particular subspecies. On Tower Island, the iguanas are small and slender and never weigh more than 1.6 kilograms (3.5 lbs.). On Isabela, males over 10 times that bulk are the norm. On Hood Island, male iguanas in breeding season blossom into gaudy patches of bright red and copper-oxide green.

The species as a whole seems to be prospering. Biologists estimate the total population for the entire archipelago at 200,000 to 300,000. Yet in several



Accompanied by a parade of yellow-tail surgeon fish, a large male iguana (above) grazes on a layer of well-cropped red algae growing on boulders about 9 meters (30 ft.) underwater.

Undulating his flattened tail for propulsion, a male (right) glides through the sea. The heart rate drops from about 100 to 30 beats a minute to conserve oxygen during swimming.

areas, like Isabela Island's group of whoppers, the picture is far from rosy. Predators introduced by humans, particularly feral house cats, have proven adept at surviving along the desert shores.

Recently Linda Cayot, head herpetologist at the Charles Darwin Research Station in Santa Cruz, sounded the alarm. On an island with no intro-

duced predators, Cayot says, citing a recent study, 53 percent of all iguana hatchlings survived their first six months. However, in a nearby colony plagued by cats, fewer than 1 percent of hatchlings survived. Adults are too big for cats to attack, but Cayot warns, "When the adult iguanas, which may live many years, die of old age, there will be no young to replace them."

At least no cats are in sight on the shoreline I've been watching. Now the tide has turned, and the cold, insistent waves cause me to shiver. The iguanas are returning in droves, almost an hour after they first entered the sea. They are somewhat sluggish, particularly those that fed in deep water. As soon as they reach the dry rocks, they stop to sprawl on the black slabs. Masters of the ex-

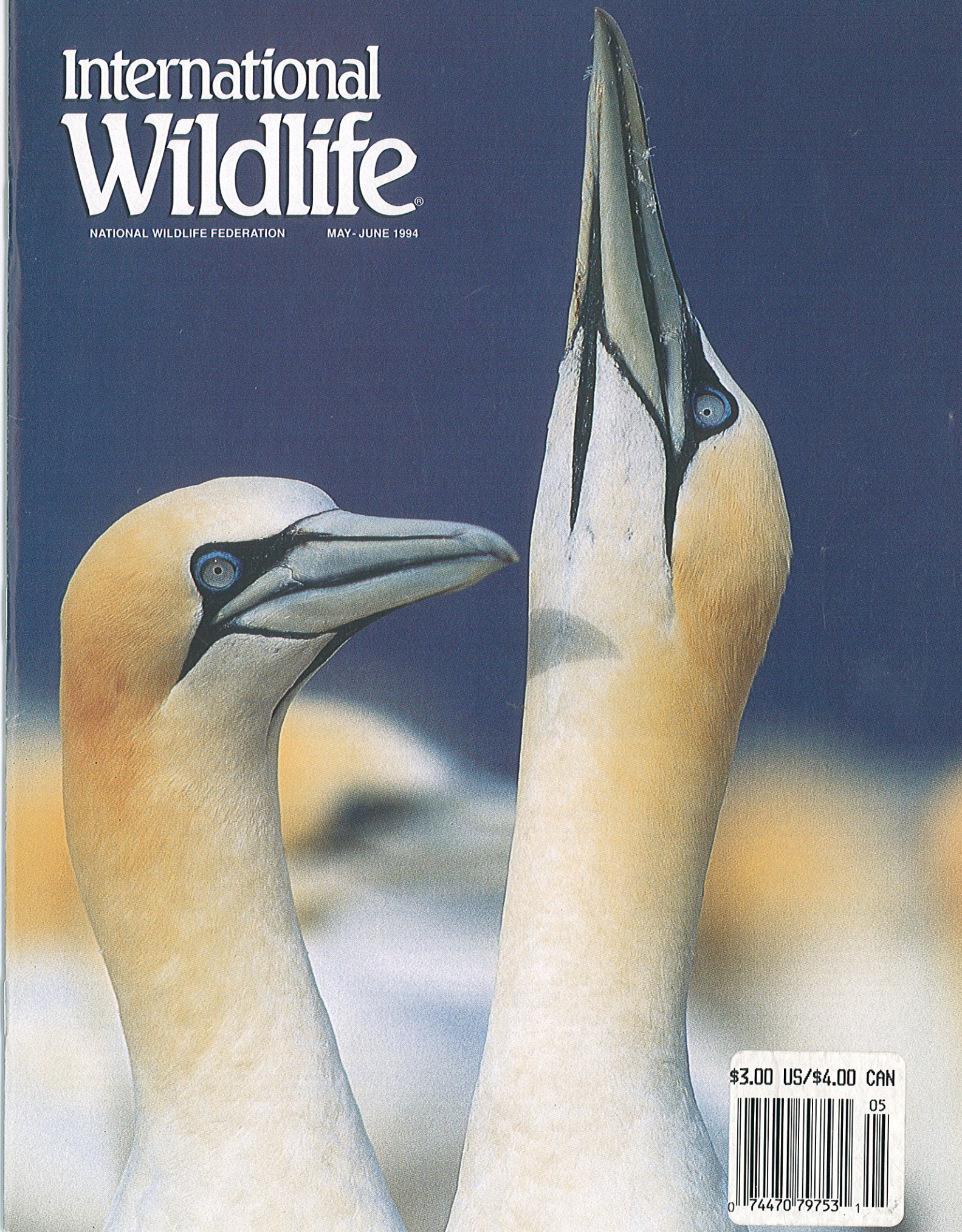
tremes, they are soaking in all the heat they can. □

Roving Editor Tui De Roy, who now lives in New Zealand, grew up in the Galápagos Islands and has spent much of her life there. After trips to both the Arctic and Antarctic to photograph wildlife, she still finds marine iguanas one of the most fascinating animals to watch.

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