



volume 175

NOV 1937

HARPER'S MAGAZINE

TURTLE SANCTUARY

BY WILLIAM BEEBE

SOMEWHERE in the vicinity of two hundred millions of years ago small lizardlike creatures began to put difficulties in the way of their enemies by storing up plates of lime or bone in the skin of their backs. Right down to modern times armadillos have had the same idea with marked success, while snails have built marble houses round themselves since early in the dawn of life. Our nth grandfathers, indeed, withstood right sturdy blows when encased in metal armor, a protection as wholly external as the shell of the snails.

Going back to the hard-skinned lizards, the advantage of their defense led gradually to the inclusion of the actual bones of the body—the vertebrae of the backbone coalescing and the ribs broadening until their edges touched and fused. If the lizards had stopped there they would have had to roll up into a ball, like pillbugs and armadillos and hedgehogs, to insure protection when an enemy turned them upside down. So a bony framework came into existence over the lower surface, and this in turn bridged the gap along the sides, uniting with the dorsal armor. Thus was developed a most efficient cuirass, with openings for feet, head, and tail.

The law of compensation came into effect, and the stronger and more extensive the armor the slower and heavier became the owners, and in the course of time we find their descendants stumping about the earth as tortoises. We know little about the actual details of ancestry of these engaging reptiles, but in the mid-

Permian—say two hundred and twenty-five millions of years ago—a small lizard lived in South Africa of which we have collected odd bones and have matched them into position, and finally have clothed these significant relics with the name of *Eunotosaurus*. Although it had teeth yet it possessed rather wide ribs and other undoubted hints of chelonian forebears.

The success of armored defense, of this mobile-tank evolution, is proved by the fact that tortoises form one of the five reptilian groups which, out of eighteen, have survived into modern times. Long after tortoises had become well established, some bright side line—bright or lazy or venturesome—fell into the water geologically speaking, and discovered that it was easier to float along than to drag one's bony armature overland. Massive five-fingered posts of limbs gradually shaved down into thin flippers, and sea-turtles came into being.

Paleontology cannot as yet show us the gradations of this change, but we know that it must have occurred far back in time. One hundred millions of years ago the great inland sea, extending over all of the central United States, from Mexico and the Gulf to the Arctic, was full not only of mosasaurs and plesiosaurs but of the giant paddle-limbed sea-turtles *Archelon*, which measured as much as eleven feet over all.

Ever since, with penguinlike flight, sea-turtles have traversed all the warmer waters of the planet's oceans, and this very evening one of them reluctantly

provided the green-turtle soup which introduced my dinner.

I have compared their mode of progression with that of penguins, and the simile could be extended with entire accuracy to include the flight of the petrels and gulls which pass so swiftly overhead. Turtles are the only aquatic reptiles to use the forelimbs in this way, for the pelagic sea-snakes, as well as the surf-loving crocodiles and Galapagos lizards, all swim by undulations of the tail. Yet while turtles have gone far beyond the webbed-toe condition of snappers and other fresh-water tortoises, they have never attained the viviparity of ichthyosaurs and oceanic serpents, and are thus still dependent upon the land for the continuation of their race.

II

I have seen these turtles in both hemispheres and along the shores of four continents, but not until I spent a week on Clarion Island, a speck of land seven hundred miles off the west coast of Mexico, did green turtles leave the realm of exclamatory recognition and become exciting individuals, objects of intense interest and wonder.

One of the most important characteristics of animals is mobility, the power to move here and there over the earth's surface. In plants this is very restricted, and in the organic world voluntary movement is non-existent. Although green turtles have the power to fly swiftly through the water, yet they spend a great deal of time dozing at the surface. Only a practiced eye can distinguish between a floating turtle and a clump of kelp or a drifting log, and this frequent and prolonged immobility actually induces effects that ordinarily concern only vegetation or the rocks of a reef.

Now and then off Clarion we would discover a turtle floating quietly, with eyes asleep but ears very wide awake. Or it might have a tern or a small gull perched on the sloping back, the bird also asleep or preening its plumage. At

any moment, like Sindbad's camping place, the turtle-shell isle might sink from view. If the drifting chelonian happened to be a female, she and any avian passenger might be roughly capsized by the advent of one or more amorous males who made up in inturtlelike activity what they lacked in delicacy of courtship.

Well to the north we were able to capture one of these floating turtles, which measured only two feet in length but weighed seventy-five pounds. Like any rock on an offshore reef, the creature had a plentiful growth of short, red seaweed on the lower back, and clusters of barnacles sprouted here and there.

Two crabs were living and thriving near the tail of the reptile, just as they might on a drifting bit of seaweed, and often beneath turtles at sea we saw schools of small fish seeking sanctuary as they would under a log. In common with organisms such as sharks and large rays, shark-suckers frequently attach themselves to the under shell, and parasitic crustaceans skitter about on the rough skin of the neck and tail.

In a hasty search of a score of volumes I find that eighteen credit the green turtle with an exclusively vegetarian diet. Yet this single specimen which we examined had the stomach crammed with more than four hundred delicate, transparent, gelatinous firolas, or shell-less flying snails, as innutritious a food to our minds as could be imagined. In addition there were twenty-eight Munidas or scarlet lobsterettes as we might call them.

Sometimes the launch would pass a happily mated floating pair of turtles when a third jealous element would shoot full speed at the objects of his divided emotions. If his trajectory was poor and he aimed too high, he would scrape clear across and over them and roll back into the depths, like a missed tackle in football. Or the edge of his shell would strike straight and fair with an audible smack, and all three would heel far over and go down slowly by the stern.

A further stage in this procreative program was revealed when I went ashore on Clarion on the sixteenth of May. On a wide extent of sand to the east of our landing place were about forty turtle tracks made during the previous night. Above high tide it was difficult to distinguish the more recent marks from the palimpsest of the preceding nights, but between tides the sand had been swept clear of all old records.

At first glance the beach seemed to have been traversed by a brigade of baby caterpillar tanks, but close examination revealed an unexpected intricacy and beauty of design. The maximum width of the larger tracks was nearly three feet, and detailed comparison of ten or twelve showed very little variation. Shorter or greater length of successive units of the pushes probably indicated varying degrees of haste.

The outermost pattern was made by the fore flippers which alone provided the means of propulsion on land. Each effort resulted in a delicately incised loop, all of these being so perfectly connected that they formed an unbroken scroll or series of lunules. These were exactly like the conventional waves in old Egyptian and Chinese paintings. Each wave consisted of twenty or thirty fine, concentric lines, indications of the scales in which the flippers were incised.

Next inside the tracery of the swimming or pushing paddles were the deep parallel furrows caused by the boundary of the elevated central portion of the plastron, punctuated by successive indentations of the edges of the dragging hind flippers. From ridge to ridge in the center of the trail was a smooth zone about eight inches wide, caused by the continuous pressure of the flat mid-plastron region. The only mark on this smooth narrow path was an occasional nick, like the slight flick of a finger in soft sand, a tiny snowshoe track or tear-shaped impression, showing where the tip of the tail rested between pushes. It must have been lifted clear at each shove, for the intervening spaces were immaculate.

After dinner, in company with the two Samoans, I left the *Zaca* and went on shore, and for two hours nothing but turtles filled my consciousness. It was almost dark before the launch cast us loose and the two men began to row landward. I looked ahead and saw the north star just topping a distant, thousand-foot mountain, while straight behind was the *Zaca* with her two mast lights. Delicately balanced on the tip of the taller was the base of the Southern Cross.

The roar of the surf to right and left was deafening, and soon we began to rise and fall on successive swells. The rowers hung quietly for a time, then choosing a propitious, but to me quite invisible wave, they pulled with all their strength, we rose high in the air and slithered swiftly in. A second momentary balance and the giant Frank Taiga lifted and carried me over and through the beach smother as if I were some light bundle. On the next great wave the dory was launched again and in the dim light we watched it and the solitary rower rise and fall, again and again, so steeply that capsizing seemed inevitable.

By the light of two acetylene lanterns we started eastward along the beach. After a few steps the lights had to be extinguished, for none of us could stand the sandflies. They came by billions, entering ears, nostrils, eyes and filling our clothes. They did not bite but just suffocated us. The lanterns were actually hazy in the dense mist of the creatures. They covered my bare arm like a prickly sweater. The flashlight did not attract them so much, but wherever I turned it weird shadows swept over the white coral—magnified images of the individual minute midges which were actually on the glass. These insects should by rights be called corallflies, for the moment we stepped on to the sand part of the beach they vanished. Lights or no lights, as long as we were on the broken coral they made life unbearable.

We walked on, flashing the light all round. Not far from the water on the

black lava I saw a small dark-brown snake. It seemed unlike the one I had found in daylight, having lines of black spots on the body, so I picked it up and cached it inside my shirt. We had to watch our way over the huge scarlet grapsus crabs which never moved from our path. When I reached down and patted them it disturbed them not at all.

After climbing over the second out-jutting dyke of lava we came to the real sand beach, where at once we discovered fresh tracks and a few yards from the rocks we found the first turtle. In a few minutes we had counted thirteen. Two were still in the surf, the tide having begun to go down. Others were half-way up. I watched them carefully. They would make about three lunges with both fore flippers simultaneously, the hind ones remaining practically helpless, and each effort gained about eight inches. The fresh tracks at night looked exactly as I have described them, with double, deep central furrows and a regular succession of lateral patterns on each side, the mark of the hind flippers being absorbed in the larger impressions of the fore.

Nine turtles were at the summit of the beach and either resting from their herculean labors of pushing up through the soft sand or actually at work. I found this of the greatest interest. The first process was to sink themselves in a fairly deep hollow below the surface. This was done by lowering the head and jamming it into the sand, and then making swimming motions, very deliberately and simultaneously, with both front flippers, and then doing the same with the hind ones, although these limbs worked alternately. When this had been kept up for a while the turtle was almost suspended upon an isthmus of sand connecting two side cross bridges, with the sand swept away fore and aft, making an hour-glass figure of sorts. After a rest the right or the left front paddle would work at the same time as the opposite one at the posterior end of the turtle, this resulting in a revolving motion, first to one side

then to the other, until the hourglass had been changed into a circular pit with the great reptile balanced on a central projection. After, at the most, a half dozen efforts, the turtle always rested for a considerable time, evidently exhausted.

The whole thing was astonishing when considered in the abstract: this enormous creature, weighing several hundred pounds and spending its whole life in a medium which supported a considerable percentage of its weight, suddenly to swim ashore and to gouge a way through soft, clogging sand, and dig itself in at the top of the steep beach. Its flippers, head and back, and even its eyes were covered and clogged with sand. The exchange of the all-supporting water for the thin air and the obstructing sand would seem to offer almost insurmountable obstacles to the accomplishment of the most important and vital act of its life.

By studying six or eight individuals which happened to be at different stages of the operation, I was able to visualize the whole sequence. After establishing itself more or less horizontally in a well-excavated depression, the next phase began, the scooping out of the hole into which the eggs would be poured. Three turtles were in the midst of this particular activity, and unless I had seen that it was almost identical in each case, I should have been tempted to endow the first with incredible skill and intelligence. It must be remembered that no turtle of this species can by any possible chance ever see its own tail or hind flippers. In the turtle at work, furthermore, the head was always lowered, and with the eyes fast shut albeit well clogged with sand, was jammed tightly against the side of the hollow, helping to give leverage and stability. The egg hole of the turtle under consideration was already about twelve inches deep with perpendicular walls less than eight inches across. The operation is extremely difficult to describe owing to its intricacy. The hind flippers alone function; the fore limbs, head, and body are perfectly immova-

ble, and might just as well belong to some wholly alien sleeping organism.

One flipper is tightly pressed against one side of the hole just at the surface of the sand. The other is delicately raised and the tip curled inward as our four fingers can be brought round to the palm. The whole flipper is then lifted and, with as exquisite accuracy as if gauged by keen eyesight and as perfect efficiency as if guided by a superbly working machine, the folded webbed fingers are lowered into the center of the hole to the bottom. When the sandy surface is encountered, the flipper unfolds and the tip pushes gently down and down, not with an awkward shove or marked muscular effort, but with several gentle insinuating motions until the tip is buried several inches. Then the handlike organ again bends round and starts upward with a good fistful of sand. This is not only lifted but it is completely enclosed, hardly a grain being lost, and as it rises, the whole limb executes a twist and turn which one would never think possible when the ordinary oarlike function is considered. The twist is so complete that when a final flick throws away the load of sand it is sent directly backward parallel with the side of the turtle and far away from the excavation. This insures that none shall fall back.

But meanwhile there is the opposite side of the hole to consider. Throughout this maneuver of, let us say, the left foot, the right has been pressed flat against the opposite upper edge of the hole, holding back any possible sand slide. But in spite of this a certain amount of sand has drifted down on top of this flattened foot. To cope with this, the moment after the left flipper has cast away its load this right one snaps up and forward, scattering its adventitious covering of sand far forward toward the head. This motion is instantly succeeded by the rolling up of the fingers and the descent into the hole, repeating in detail the maneuver of its fellow. The left flipper, in its turn, is now pressing back its edge of the hole, and the sequence is complete.

But this is far from the whole tale, and occasional phenomena intrude themselves, adding, if such a thing were possible, to the wonder and mystery of it all. The sand is more or less dry and crumbly, and even the instinctive skill of a mother chelonian might not be able to keep the hole symmetrical to a sufficient depth were it not that when needed a fine shower or mist, not of urine, but of clear water, is sprayed over walls and bottom. This miracle keeps the sand in a condition of slight moistness, insuring sufficient cohesion and diminishing the possibility of collapse of the walls. Next morning, even with the greatest care, we were unable to excavate a hole of corresponding size without continual sand slides, and this with the use of eyes and hands and all our exalted intelligence.

As long as we directed our light at the posterior part of the turtle it kept up the work, but a continued flash into its half-closed eyes made it stop and lift its head. This, with an elaborate swallow of air, was all that the reptile could summon as an expression of surprise—perhaps the turtlean equivalent of "What an amazingly short night!"

When we encountered an animal crawling up the beach, a short stop and examination would work no change in the machinery of its journey, but if we annoyed it or tapped the shell it turned about at once and with increased lunges made straight for the water. No efforts on our part could alter this going into mental reverse. As far as we could see, the night's operations were at an end. Every turtle I sighted seemed like a great rounded piece of lava which had worked its way up through the sand. I have never seen less organic beings. Pemasa rolled one over, when it waved its flippers once or twice in midair and then resigned itself to this new fate. No stone-turning creatures or leverage phenomena had ever before entered its life or those of the tens of thousands of its maternal ancestors, and it knew no solution. It was well above the highest of tides; the next day's sun would bake it and soon

death would come, within a few yards of its watery home. After I examined it we canted it back and it lay as inert and passive as if nothing had happened. Perhaps the dragging thoughts in the dull brain were still on hole digging, and had not yet caught up with the fact of revolution. Resentment of that might come later.

One turtle half way up the beach showed signs of recent combat, either with creatures such as sharks or with a rival of its own kind. The shell was badly dented at one place and the neck bitten. On the top of the head was a single huge white barnacle, slightly tilted to one side, absurdly like the tiny fool caps which clowns sometimes wear, all the funnier on this eternally emotionless creature. On the carapace a cluster of the same crustaceans were thriving. Two of these we pried off, the slight scraping being sufficient to send the turtle scampering down the beach—using the word as defined in chelonian parlance.

These turtles were three feet or more in length, deep in proportion, and had endured life for perhaps many scores of years; but even they were vulnerable to what we are pleased to call natural causes, and at the farthest end of our nocturnal walk there loomed a huge form in the surf lying side on to the beach. I went close to it as the waves receded and saw that it was long dead, but even now it held a position that no other four-footed vertebrate would hold in death—the head down on the sand and the two fore flippers folded forward alongside it, as a dog will sometimes lie facing the fire in sleep. The shell showed no signs of violence. Perhaps this individual had succumbed to some internal parasites.

These turtles have at least one terrible enemy in addition to man—the tiger shark. The day before my visit to their egg-laying sanctuary we caught a thirteen-foot tiger, towed it ashore, examined and weighed it. In the stomach, besides several large fish and petrels, was a good-sized green turtle which must have weighed about fifty pounds in life.

One of the turtles busily digging at the top of the beach had lost a large piece out of the right hind paddle and although its brain knew nothing about it, this flipper was excavating much less effectively than the left. At first, the hole was slightly unsymmetrical, but as I watched, I could see the perfect flipper taking on more and more work, exceeding its share of half the labor, and the final sweep of my flashlight revealed an excavation round, deep and perfectly molded. Instinct and adaptation are more mysterious than all our modern explanations would have us believe.

III

Before I left for good I went off by myself and watched the largest and oldest turtle. Here, hundreds of miles from the Mexican coast, it was laying its eggs. At the same time others were similarly occupied on distant beaches of Australia, while during the coming months of summer individual green turtles would drift up New York Bay and direct their dim vision to the towers of the city itself. Sand-clogged eyes, almost closed nostrils, motionless fore limbs, these showed no signs even of passive vitality in the great beast before me. Yet its heart-shaped, low-arched shell was streamlined for swift motion, its flippers as cunningly molded as the fins of shark or swordfish. So all-important are these organs that in a newly hatched turtle, like the legs of new-born colts, the flippers are of extraordinary length, as long as the entire body.

On each forward paddle of this turtle there remained only a single claw to recall lizard ancestry, but beneath the thin scaly skin were gloved five fully-boned digits to separate forever this reptile from even the most highly developed fish.

The last flash of my light showed the turtle digging, digging, without cessation, mechanically as if controlled and motivated by some auxiliary caudal brain of super-reptilian intelligence, missing hardly a grain, molding a smooth, round womb in the sand, which would receive the ova and ensure the moisture, warmth,

and safety necessary for the development and hatching of a new generation.

Here and there on the beach ghostly boobies appeared within the circle of our lights. Some at the edge of the bushes were sound asleep, balanced on a weather-worn coral rock, standing on both legs with beak buried deep between the wings. Even with the light six inches away they were not aroused, but at the startled grunting squawk of a distant bird, they instantly became fully awake. The glare did not frighten them even then and they could see nothing of us, so they remained quiet and stared. Whenever we patted one gently on the head it would skitter along the sand for a few yards and then, boomerang-like, return to our feet. One devoted pair which refused to be roused were sitting close together upon two extremely unpleasant-looking, newly hatched chicks.

Giant red-brown crickets crawled but never jumped about the sand, and once I heard a Clarion wren singing sleepily from a clump of great lava rocks among the cactus. The night life of this isolated island was not greatly varied, but exceedingly strange—the juxtaposition of a thousand thousand midges, eleven laboring turtles, and the peppering of rocks and sand with great scarlet crabs.

Pemasa, the Samoan, told me many interesting things about the turtles. It seems they often dig several false holes, night after night, and leave them gaping, finally to go to some inconspicuous place beneath a small bush to deposit the eggs. After the laying is completed the turtles go away and do not return until the day of hatching when they come back and lie off shore waiting for the scrambling host of turtlings to reach the water, not, as I asked, to guard them in any way, but most horribly to devour them. I am glad to say that I believe this to be quite devoid of scientific truth. It recalled Pliny's unforgettable paragraph on sea-turtles written more than eighteen centuries ago. Philemon Holland quaintly renders this: "In the sea they live of muscles, cockles, and such small

shell fishes, for their mouthes are so hard that they be able to crush and breake stones therewith. Their manner is to go aland, where among the grasse they lay egges as bigge as birds ege, to the number commonly of an hundred. When they have so done, they hide them within the earth in some little hole or gutter, fare enough from any place where the water cometh, they cover them with mould, beat it hard downe with their breast, and so pat it smooth, and in the night time sit upon them: they couvie a whole yeare before they hatch. Some say, that the looking wistly upon their egges with their eeyes serveth instead of sitting." Pliny continues, "The female refuseth any intercourse with the male untill he has placed a wisp of straw upon her back."

A pleasant account is that of Topsell, penned a mere three centuries ago: "Some againe say, that after they have hidde their Egges in the earth for forty dayes, the Female cometh the just fortieth day, not fayling of her reckoning, and uncovereth her Egges wherein shee finde her young ones formed, which she taketh out as joyfully as any man would do Gold out of the earth, and carryeth away with her to the Water."

Pliny's last words are too good to omit, exceeding almost his credulity: "And although it bee incredible and not to be spoken, yet some there be who have written, That any ship maketh way more slowly at sea, that carrieth within it the right foot of a tortoise."

Let us return for a moment to the fate of the newly hatched turtles. The horror and disbelief aroused in my mind by the suggestion of wholesale infanticidal cannibalism on the part of the mother turtles is, as a matter of fact, a reaction of alien anthropomorphic emotion on my part, and only of hypothetical interest to the young reptiles themselves. If fifteen hundred emerge and scramble down the beach representing the offspring of my eleven egg-laying females, it is certain that fewer than twenty-five will ever live to become adult. Whether they will slip

down the eager maw of fish or shark, gannet or cormorant, sea-lion or porpoise, or actually satisfy the momentary appetite of their own parent is hardly of more than theoretical concern to the subjects of the bill of fare.

We had apparently reached Clarion at the very height of the breeding season of the green turtles, for the off-shore water was fairly dotted with them at times, the majority mating, three pairs sometimes seen in close proximity. During several hours of trolling one day we sighted more than fifty turtles of which about forty were engaged in courtship activities.

When we returned to the landing beach and flashed signals to the *Zaca* the breakers were crashing in quick succession. We watched the small black dot of the dory coming closer and closer. In a brief respite of relative calm when there seemed to be a wave missing from the eternal sequence, the boat shot in, we tumbled aboard and dived immedi-

ately into six huge rollers, our bow rising so high that it pointed full at the head of the Scorpion. But we reached the yacht without shipping a drop.

An hour later when I was in the cabin writing out these experiences, I was called on deck. The gibbous moon was well up, but still stained with the orange of its rising, while the water had suddenly calmed and completely lost its heaving swell. *Zaca*, and the pacific-with-a-little-p ocean, and the dim isle of Clarion were all equally soundless and quiet. I looked ashore and imagined that unimaginable scene in the heart of the distant sand, nine great turtles lying prone, with head, brain, and front limbs apparently wholly ignorant of the mysterious activities and finished craftsmanship of their busy hind flippers.

At my next formal dinner, when the guests are absorbed in the delicacy of their green-turtle soup, I shall be glad to rejoice in the memory of the brooding turtles of Clarion Island.

