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A Hunter-Naturalist in the Brazilian Wilderness

The Headwaters of the Paraguay

AT Corumbá our entire party, and all their belongings, came aboard our good little river boat, the Nyoac. Christmas Day saw us making our way steadily up-stream against the strong current, and between the green and beautiful banks of the upper Paraguay. The shallow little steamer was jammed with men, dogs, rifles, partially cured skins, boxes of provisions, ammunition, tools, and photographic supplies, bags containing tents, cots, bedding, and clothes, saddles, hammocks, and the other necessities for a trip through the "great wilderness," the "matto grosso" of western Brazil.

It was a brilliantly clear day, and, although of course in that latitude and at that season the heat was intense later on, it was cool and pleasant in the early morning. We sat on the forward deck, admiring the trees on the brink of the sheer river banks, the lush, rank grass of the marshes, and the many water-birds. The two pilots, one black and one white, stood at the wheel. Colonel Rondon read Thomas à Kempis. Kermit, Cherrie, and Miller squatted outside the railing on the deck over one paddle-wheel and put the final touches on the jaguarskins. Fiala satisfied himself that the boxes and bags were in place. It was probable that hardship lay in the future; but the day was our own, and the day was pleasant. In the evening the after-deck, open all around, where we dined, was decorated with green boughs and rushes, and we drank the health of the President of the United States and of the President of Brazil.

Now and then we passed little ranches on the river's edge. This is a fertile land, pleasant to live in, and any settler who is willing to work can earn his living. There are mines; there is water-power; there is abundance of rich soil. The country will soon be opened by rail. It offers a fine field for immigration and for agricultural, mining, and business development; and it has a great future.

Cherrie and Miller had secured a little owl a month before in the Chaco, and it was travelling with them in a basket. It was a dear little bird, very tame and affectionate. It liked to be handled and petted; and when Miller, its especial protector, came into the cabin, it would make queer little noises as a signal that it wished to be taken up and perched on his hand. Cherrie and Miller had trapped many mammals. Among them was a tayra weasel, whitish above and black below, as big and blood-thirsty as a fisher-martin; and a tiny opossum no bigger than a mouse. They had taken four species of opossum, but they had not found the curious water-opossum which they had obtained on the rivers flowing into the Caribbean Sea. This opossum, which is black and white, swims in the streams like a muskrat or otter, catching fish and living in burrows which open under water. Miller and Cherrie were puzzled to know why the young thrived, leading such an existence of constant immersion; one of them once found a female swimming and diving freely with four quite well-grown young in her pouch.

We saw on the banks screamers—big, crested waders of archaic type, with spurred wings, rather short bills, and no especial affinities with other modern birds. In one meadow by a pond we saw three marsh-deer, a buck and two does. They stared at us, with their thickly haired tails raised on end. These tails are black underneath, instead of white as in our whitetail deer. One of the vagaries of the ultraconcealing-colorationists has been to uphold the (incidentally quite preposterous) theory that the tail of our deer is colored white beneath so as to harmonize with the sky and thereby mislead the cougar or wolf at the critical moment when it makes its spring; but this marsh-deer shows a black instead of a white flag, and yet has just as much need of protection from its enemies, the jaguar and the cougar. In South America concealing coloration plays no more part in the lives of the adult deer, the tamanduá, the tapir, the peccary, the jaguar, and the puma than it plays in Africa in the lives of such animals as the zebra, the sable antelope, the wildebeeste, the lion, and the hunting hyena.

Next day we spent ascending the São Lourenço. It was narrower than the Paraguay, naturally, and the swirling brown current was, if anything, more rapid. The strange tropical trees, standing densely on the banks, were matted together by long bush ropes—lianas, or vines, some very slender and very long. Sometimes we saw brilliant red or blue flowers, or masses of scarlet berries on a queer palmlike tree, or an array of great white blossoms on a much larger tree. In a lagoon bordered by the taquará bamboo a school of big otters were playing; when they came to the surface, they opened their mouths like seals, and made a loud hissing noise. The crested screamers, dark gray and as large as turkeys, perched on the very topmost branches of the tallest trees. Hyacinth macaws screamed harshly as they flew across the river. Among the trees was the guan, another peculiar bird as big as a big grouse, and with certain habits of the wood-grouse, but not akin to any northern game-bird. The windpipe of the male is very long, extending down to the end of the breast-bone, and the bird utters queer guttural screams. A dead cayman floated down-stream, with a black vulture devouring it. Capybaras stood or squatted on the banks; sometimes they stared stupidly at us; sometimes they plunged into the river at our approach. At long intervals we passed little clearings. In each stood a house of palm-logs, with steeply pitched roof of palm thatch; and near by were patches of corn and mandioc. The dusky owner, and perhaps his family, came out on the bank to watch us as we passed. It was a hot day—the thermometer on the deck in the shade stood at nearly 100 degrees Fahrenheit. Biting flies came aboard even when we were in midstream.

Next day we were ascending the Cuyabá River. It had begun raining in the night, and the heavy downpour continued throughout the forenoon. In the morning we halted at a big cattle-ranch to get fresh milk and beef. There were various houses, sheds, and corrals near the river's edge, and fifty or sixty milch cows were gathered in one corral. Spurred plover, or lapwings, strolled familiarly among the hens. Parakeets and red-headed tanagers lit in the trees over our heads. A kind of primitive houseboat was moored at the bank. A woman was cooking breakfast over a little stove at one end. The crew were ashore. The boat was one of those which are really stores, and which travel up and down these rivers, laden with what the natives most need, and stopping wherever there is a ranch. They are the only stores which many of the country-dwellers see from year's end to year's end. They float down-stream, and up-stream are poled by their crew, or now and then get a tow from a steamer. This one had a house with a tin roof; others bear houses with thatched roofs, or with roofs made of hides. The river wound through vast marshes broken by belts of woodland.

Always the two naturalists had something of interest to tell of their past experience, suggested by some bird or beast we came across. Black and golden orioles, slightly crested, of

two different species were found along the river; they nest in colonies, and often we passed such colonies, the long pendulous nests hanging from the boughs of trees directly over the water. Cherrie told us of finding such a colony built round a big wasp-nest, several feet in diameter. These wasps are venomous and irritable, and few foes would dare venture near bird's-nests that were under such formidable shelter; but the birds themselves were entirely unafraid, and obviously were not in any danger of disagreement with their dangerous protectors. We saw a dark ibis flying across the bow of the boat, uttering his deep, two-syllabled note. Miller told how on the Orinoco these ibises plunder the nests of the big river-turtles. They are very skilful in finding where the female turtle has laid her eggs, scratch them out of the sand, break the shells, and suck the contents.

It was astonishing to find so few mosquitoes on these marshes. They did not in any way compare as pests with the mosquitoes on the lower Mississippi, the New Jersey coast, the Red River of the North, or the Kootenay. Back in the forest near Corumbá the naturalists had found them very bad indeed. Cherrie had spent two or three days on a mountain-top which was bare of forest; he had thought there would be few mosquitoes, but the long grass harbored them (they often swarm in long grass and bush, even where there is no water), and at night they were such a torment that as soon as the sun set he had to go to bed under his mosquito netting. Yet on the vast marshes they were not seriously troublesome in most places. I was informed that they were not in any way a bother on the grassy uplands, the high country north of Cuyabá, which from thence stretches eastward to the coastal region. It is at any rate certain that this inland region of Brazil, including the state of Matto Grosso, which we were traversing, is a healthy region, excellently adapted to settlement; railroads will speedily penetrate it, and then it will witness an astonishing development.

On the morning of the 28th we reached the home buildings of the great São João fazenda, the ranch of Senhor João da Costa Marques. Our host himself, and his son, Dom João the younger, who was state secretary of agriculture, and the latter's charming wife, and the president of Matto Grosso, and several other ladies and gentlemen, had come down the river to greet us, from the city of Cuyabá, several hundred miles farther up-stream. As usual, we were treated with whole-hearted and generous hospitality. Some miles below the ranch-house the party met us, on a stern-wheel steamboat and a launch, both decked with many flags. The handsome white ranch-house stood only a few rods back from the river's brink, in a grassy opening dotted with those noble trees, the royal palms. Other trees, buildings of all kinds, flower-gardens, vegetable-gardens, fields, corrals, and enclosures with high white walls stood near the house. A detachment of soldiers or state police, with a band, were in front of the house, and two flagpoles, one with the Brazilian flag already hoisted. The American flag was run up on the other as I stepped ashore, while the band played the national anthems of the two countries. The house held much comfort; and the comfort was all the more appreciated because even indoors the thermometer stood at 97° F. In the late afternoon heavy rain fell, and cooled the air. We were riding at the time. Around the house the birds were tame: the parrots and parakeets crowded and chattered in the tree tops; jacanas played in the wet ground just back of the garden; ibises and screamers called loudly in the swamps a little distance off.

Until we came actually in sight of this great ranch-house we had been passing through a hot, fertile, pleasant wilderness, where the few small palm-roofed houses, each in its little patch of sugar-cane, corn, and mandioc, stood very many miles apart. One of these little houses stood on an old Indian mound, exactly like the mounds which form the only hillocks along the lower Mississippi, and which are also of Indian origin. These occasional Indian mounds, made ages

ago, are the highest bits of ground in the immense swamps of the upper Paraguay region. There are still Indian tribes in this neighborhood. We passed an Indian fishing village on the edge of the river, with huts, scaffoldings for drying the fish, hammocks, and rude tables. They cultivated patches of bananas and sugar-cane. Out in a shallow place in the river was a scaffolding on which the Indians stood to spear fish. The Indians were friendly, peaceable souls, for the most part dressed like the poorer classes among the Brazilians.

Next morning there was to have been a great rodeó or round-up, and we determined to have a hunt first, as there were still several kinds of beasts of the chase, notably tapirs and peccaries, of which the naturalists desired specimens. Dom João, our host, and his son accompanied us. Theirs is a noteworthy family. Born in Matto Grosso, in the tropics, our host had the look of a northerner and, although a grandfather, he possessed an abounding vigor and energy such as very few men of any climate or surroundings do possess. All of his sons are doing well. The son who was with us was a stalwart, powerful man, a pleasant companion, an able public servant, a finished horseman, and a skilled hunter. He carried a sharp spear, not a rifle, for in Matto Grosso it is the custom in hunting the jaguar for riflemen and spearmen to go in at him together when he turns at bay, the spearman holding him off if the first shot fails to stop him, so that another shot can be put in. Altogether, our host and his son reminded one of the best type of American ranchmen and planters, of those planters and ranchmen who are adepts in bold and manly field sports, who are capital men of business, and who also often supply to the state skilled and faithful public servants. The hospitality the father and son extended to us was patriarchal: neither, for instance, would sit at table with their guests at the beginning of the formal meals; instead they exercised a close personal supervision over the feast. Our charming hostess, however, sat at the head of the table.

At six in the morning we started, all of us on fine horses. The day was lowering and overcast. A dozen dogs were with us, but only one or two were worth anything. Three or four ordinary countrymen, the ranch hands, or vaqueiros, accompanied us; they were mainly of Indian blood, and would have been called peons, or caboclos, in other parts of Brazil, but here were always spoken to and of as "camaradas." They were, of course, chosen from among the men who were hunters, and each carried his long, rather heavy and clumsy jaguar-spear. In front rode our vigorous host and his strapping son, the latter also carrying a jaguar-spear. The bridles and saddles of the big ranchmen and of the gentlefolk generally were handsome and were elaborately ornamented with silver. The stirrups, for instance, were not only of silver, but contained so much extra metal in ornamented bars and rings that they would have been awkward for less-practised riders. Indeed, as it was, they were adapted only for the tips of boots with long, pointed toes, and were impossible for our feet; our hosts' stirrups were long, narrow silver slippers. The camaradas, on the other hand, had jim-crow saddles and bridles, and rusty little iron stirrups into which they thrust their naked toes. But all, gentry and commonalty alike, rode equally well and with the same skill and fearlessness. To see our hosts gallop at headlong speed over any kind of country toward the sound of the dogs with their quarry at bay, or to see them handle their horses in a morass, was a pleasure. It was equally a pleasure to see a camarada carrying his heavy spear, leading a hound in a leash, and using his machete to cut his way through the tangled vine-ropes of a jungle, all at the same time and all without the slightest reference to the plunges, and the odd and exceedingly jerky behavior, of his wild, half-broken horse—for on such a ranch most of the horses are apt to come in the categories of half-broken or else of broken-down. One dusky tatterdemalion wore a pair of boots from which he had removed the soles, his bare, spur-clad feet projecting from beneath the uppers. He was on a little devil of a stallion, which he rode blindfold

for a couple of miles, and there was a regular circus when he removed the bandage; but evidently it never occurred to him that the animal was hardly a comfortable riding-horse for a man going out hunting and encumbered with a spear, a machete, and other belongings.

The eight hours that we were out we spent chiefly in splashing across the marshes, with excursions now and then into vine-tangled belts and clumps of timber. Some of the bayous we had to cross were uncomfortably boggy. We had to lead the horses through one, wading ahead of them; and even so two of them mired down, and their saddles had to be taken off before they could be gotten out. Among the marsh plants were fields and strips of the great caeté rush. These caeté flags towered above the other and lesser marsh plants. They were higher than the heads of the horsemen. Their two or three huge banana-like leaves stood straight up on end. The large brilliant flowers—orange, red, and yellow—were joined into a singularly shaped and solid string or cluster. Humming-birds buzzed round these flowers; one species, the sickle-billed hummer, has its bill especially adapted for use in these queerly shaped blossoms and gets its food only from them, never appearing around any other plant.

The birds were tame, even those striking and beautiful birds which under man's persecution are so apt to become scarce and shy. The huge jabiru storks, stalking through the water with stately dignity, sometimes refused to fly until we were only a hundred yards off; one of them flew over our heads at a distance of thirty or forty yards. The screamers, crying curu-curu, and the ibises, wailing dolefully, came even closer. The wonderful hyacinth macaws, in twos and threes, accompanied us at times for several hundred yards, hovering over our heads and uttering their rasping screams. In one wood we came on the black howler monkey. The place smelt almost like a menagerie. Not watching with sufficient care I brushed against a sapling on which the venomous fire-ants swarmed. They burnt the skin like red-hot cinders, and left little sores. More than once in the drier parts of the marsh we met small caymans making their way from one pool to another. My horse stepped over one before I saw it. The dead carcasses of others showed that on their wanderings they had encountered jaguars or human foes.

We had been out about three hours when one of the dogs gave tongue in a large belt of woodland and jungle to the left of our line of march through the marsh. The other dogs ran to the sound, and after a while the long barking told that the thing, whatever it was, was at bay or else in some refuge. We made our way toward the place on foot. The dogs were baying excitedly at the mouth of a huge hollow log, and very short examination showed us that there were two peccaries within, doubtless a boar and sow. However, just at this moment the peccaries bolted from an unsuspected opening at the other end of the log, dove into the tangle, and instantly disappeared with the hounds in full cry after them. It was twenty minutes later before we again heard the pack baying. With much difficulty, and by the incessant swinging of the machetes, we opened a trail through the network of vines and branches. This time there was only one peccary, the boar. He was at bay in a half-hollow stump. The dogs were about his head, raving with excitement, and it was not possible to use the rifle; so I borrowed the spear of Dom João the younger, and killed the fierce little boar therewith.

This was an animal akin to our collared peccary, smaller and less fierce than its white-jawed kinsfolk. It is a valiant and truculent little beast, nevertheless, and if given the chance will bite a piece the size of a teacup out of either man or dog. It is found singly or in small parties, feeds on roots, fruits, grass, and delights to make its home in hollow logs. If taken young it makes an affectionate and entertaining pet. When the two were in the hollow log we heard them utter a kind of moaning, or menacing, grunt, long drawn.

An hour or two afterward we unexpectedly struck the fresh tracks of two jaguars and at once loosed the dogs, who tore off yelling, on the line of the scent. Unfortunately, just at this moment the clouds burst and a deluge of rain drove in our faces. So heavy was the downpour that the dogs lost the trail and we lost the dogs. We found them again only owing to one of our caboclos; an Indian with a queer Mongolian face, and no brain at all that I could discover, apart from his special dealings with wild creatures, cattle, and horses. He rode in a huddle of rags; but nothing escaped his eyes, and he rode anything anywhere. The downpour continued so heavily that we knew the rodeó had been abandoned, and we turned our faces for the long, dripping, splashing ride homeward. Through the gusts of driving rain we could hardly see the way. Once the rain lightened, and half a mile away the sunshine gleamed through a rift in the leaden cloud-mass. Suddenly in this rift of shimmering brightness there appeared a flock of beautiful white egrets. With strong, graceful wing-beats the birds urged their flight, their plumage flashing in the sun. They then crossed the rift and were swallowed in the gray gloom of the day.

On the marsh the dogs several times roused capybaras. Where there were no ponds of sufficient size the capybaras sought refuge in flight through the tangled marsh. They ran well. Kermit and Fiala went after one on foot, full-speed, for a mile and a half, with two hounds which then bayed it—literally bayed it, for the capybara fought with the courage of a gigantic woodchuck. If the pack overtook a capybara, they of course speedily finished it; but a single dog of our not very valorous outfit was not able to overmatch its shrill-squeaking opponent.

Near the ranch-house, about forty feet up in a big tree, was a jabiru's nest containing young jabirus. The young birds exercised themselves by walking solemnly round the edge of the nest and opening and shutting their wings. Their heads and necks were down-covered, instead of being naked like those of their parents. Fiala wished to take a moving-picture of them while thus engaged, and so, after arranging his machine, he asked Harper to rouse the young birds by throwing a stick up to the nest. He did so, whereupon one young jabiru hastily opened its wings in the desired fashion, at the same time seizing the stick in its bill! It dropped it at once, with an air of comic disappointment, when it found that the stick was not edible.

There were many strange birds round about. Toucans were not uncommon. I have never seen any other bird take such grotesque and comic attitudes as the toucan. This day I saw one standing in the top of a tree with the big bill pointing straight into the air and the tail also cocked perpendicularly. The toucan is a born comedian. On the river and in the ponds we saw the finfoot, a bird with feet like a grebe and bill and tail like those of a darter, but, like so many South American birds, with no close affiliations among other species. The exceedingly rich bird fauna of South America contains many species which seem to be survivals from a very remote geologic past, whose kinsfolk have perished under the changed conditions of recent ages; and in the case of many, like the hoatzin and screamer, their like is not known elsewhere. Herons of many species swarmed in this neighborhood. The handsomest was the richly colored tiger bittern. Two other species were so unlike ordinary herons that I did not recognize them as herons at all until Cherrie told me what they were. One had a dark body, a white-speckled or ocellated neck, and a bill almost like that of an ibis. The other looked white, but was really mauve-colored, with black on the head. When perched on a tree it stood like an ibis; and instead of the measured wing-beats characteristic of a heron's flight, it flew with a quick, vigorous flapping of the wings. There were queer mammals, too, as well as birds. In the fields Miller trapped mice of a kind entirely new.

Next morning the sky was leaden, and a drenching rain fell as we began our descent of the river. The rainy season had fairly begun. For our good fortune we were still where we had the

cabins aboard the boat, and the ranch-house, in which to dry our clothes and soggy shoes; but in the intensely humid atmosphere, hot and steaming, they stayed wet a long time, and were still moist when we put them on again. Before we left the house where we had been treated with such courteous hospitality—the finest ranch-house in Matto Grosso, on a huge ranch where there are some sixty thousand head of horned cattle—the son of our host, Dom João the younger, the jaguar-hunter, presented me with two magnificent volumes on the palms of Brazil, the work of Doctor Barbosa Rodriguez, one-time director of the Botanical Gardens at Rio Janeiro. The two folios were in a box of native cedar. No gift more appropriate, none that I would in the future value more as a reminder of my stay in Matto Grosso, could have been given me.

All that afternoon the rain continued. It was still pouring in torrents when we left the Cuyabá for the São Lourenço and steamed up the latter a few miles before anchoring; Dom João the younger had accompanied us in his launch. The little river steamer was of very open build, as is necessary in such a hot climate; and to keep things dry necessitated also keeping the atmosphere stifling. The German taxidermist who was with Colonel Rondon's party, Reinisch, a very good fellow from Vienna, sat on a stool, alternately drenched with rain and sweltering with heat, and muttered to himself: "Ach, Schweinerei!"

Two small caymans, of the common species, with prominent eyes, were at the bank where we moored, and betrayed an astonishing and stupid tameness. Neither the size of the boat nor the commotion caused by the paddles in any way affected them. They lay inshore, not twenty feet from us, half out of water; they paid not the slightest heed to our presence, and only reluctantly left when repeatedly poked at, and after having been repeatedly hit with clods of mud and sticks; and even then one first crawled up on shore, to find out if thereby he could not rid himself of the annoyance we caused him.

Next morning it was still raining, but we set off on a hunt, anyway, going afoot. A couple of brown camaradas led the way, and Colonel Rondon, Dom João, Kermit, and I followed. The incessant downpour speedily wet us to the skin. We made our way slowly through the forest, the machetes playing right and left, up and down, at every step, for the trees were tangled in a network of vines and creepers. Some of the vines were as thick as a man's leg. Mosquitoes hummed about us, the venomous fire-ants stung us, the sharp spines of a small palm tore our hands—afterward some of the wounds festered. Hour after hour we thus walked on through the Brazilian forest. We saw monkeys, the common yellowish kind, a species of cebus; a couple were shot for the museum and the others raced off among the upper branches of the trees. Then we came on a party of coatis, which look like reddish, long-snouted, long-tailed, lanky raccoons. They were in the top of a big tree. One, when shot at and missed, bounced down to the ground, and ran off through the bushes; Kermit ran after it and secured it. He came back, to find us peering hopelessly up into the tree top, trying to place where the other coatis were. Kermit solved the difficulty by going up along some huge twisted lianas for forty or fifty feet and exploring the upper branches; whereupon down came three other coatis through the branches, one being caught by the dogs and the other two escaping. Coatis fight savagely with both teeth and claws. Miller told us that he once saw one of them kill a dog. They feed on all small mammals, birds, and reptiles, and even on some large ones; they kill iguanas; Cherrie saw a rattling chase through the trees, a coati following an iguana at full speed. We heard the rush of a couple of tapirs, as they broke away in the jungle in front of the dogs and headed, according to their custom, for the river; but we never saw them. One of the party shot a bush deer—a very pretty, graceful creature, smaller than our whitetail deer, but kin to it and doubtless the southernmost representative of the whitetail group.

The whitetail deer—using the word to designate a group of deer which can neither be called a subgenus with many species, nor a widely spread species diverging into many varieties—is the only North American species which has spread down into and has outlying representatives in South America. It has been contended that the species has spread from South America northward. I do not think so; and the specimen thus obtained furnished a probable refutation of the theory. It was a buck, and had just shed its small antlers. The antlers are, therefore, shed at the same time as in the north, and it appears that they are grown at the same time as in the north. Yet this variety now dwells in the tropics south of the equator, where the spring, and the breeding season for most birds, comes at the time of the northern fall in September, October, and November. That the deer is an intrusive immigrant, and that it has not yet been in South America long enough to change its mating season in accordance with the climate, as the birds—geologically doubtless very old residents—have changed their breeding season, is rendered probable by the fact that it conforms so exactly in the time of its antler growth to the universal rule which obtains in the great arctogeal realm, where deer of many species abound and where the fossil forms show that they have long existed. The marsh-deer, which has diverged much further from the northern type than this bush deer (its horns show a likeness to those of a blacktail), often keeps its antlers until June or July, although it begins to grow them again in August; however, too much stress must not be laid on this fact, inasmuch as the wapiti and the cow caribou both keep their antlers until spring. The specialization of the marsh-deer, by the way, is further shown in its hoofs, which, thanks to its semiaquatic mode of life, have grown long, like those of such African swamp antelopes as the lechwe and situtunga.

Miller, when we presented the monkeys to him, told us that the females both of these monkeys and of the howlers themselves took care of the young, the males not assisting them, and moreover that when the young one was a male he had always found the mother keeping by herself, away from the old males. On the other hand, among the marmosets he found the fathers taking as much care of the young as the mothers; if the mother had twins, the father would usually carry one, and sometimes both, around with him.

After we had been out four hours our camaradas got lost; three several times they travelled round in a complete circle; and we had to set them right with the compass. About noon the rain, which had been falling almost without interruption for forty-eight hours, let up, and in an hour or two the sun came out. We went back to the river, and found our rowboat. In it the hounds—a motley and rather worthless lot—and the rest of the party were ferried across to the opposite bank, while Colonel Rondon and I stayed in the boat, on the chance that a tapir might be roused and take to the river. However, no tapir was found; Kermit killed a collared peccary, and I shot a capybara representing a color-phase the naturalists wished.

Next morning, January 1, 1914, we were up at five and had a good New Year's Day breakfast of hardtack, ham, sardines, and coffee before setting out on an all day's hunt on foot. I much feared that the pack was almost or quite worthless for jaguars, but there were two or three of the great spotted cats in the neighborhood and it seemed worth while to make a try for them any-how. After an hour or two we found the fresh tracks of two, and after them we went. Our party consisted of Colonel Rondon, Lieutenant Rogaciano—an excellent man, himself a native of Matto Grosso, of old Matto Grosso stock—two others of the party from the São João ranch, Kermit, and myself, together with four dark-skinned camaradas, cowhands from the same ranch. We soon found that the dogs would not by themselves follow the jaguar trail; nor would the camaradas, although they carried spears. Kermit was the one of our party who possessed the requisite speed, endurance, and eyesight, and accordingly he led. Two of the dogs would follow

the track half a dozen yards ahead of him, but no farther; and two of the camaradas could just about keep up with him. For an hour we went through thick jungle, where the machetes were constantly at work. Then the trail struck off straight across the marshes, for jaguars swim and wade as freely as marsh-deer. It was a hard walk. The sun was out. We were drenched with sweat. We were torn by the spines of the innumerable clusters of small palms with thorns like needles. We were bitten by the hosts of fire-ants, and by the mosquitoes, which we scarcely noticed where the fire-ants were found, exactly as all dread of the latter vanished when we were menaced by the big red wasps, of which a dozen stings will disable a man, and if he is weak or in bad health will seriously menace his life. In the marsh we were continually wading, now up to our knees, now up to our hips. Twice we came to long bayous so deep that we had to swim them, holding our rifles above water in our right hands. The floating masses of marsh grass, and the slimy stems of the water-plants, doubled our work as we swam, cumbered by our clothing and boots and holding our rifles aloft. One result of the swim, by the way, was that my watch, a veteran of Cuba and Africa, came to an indignant halt. Then on we went, hampered by the weight of our drenched clothes while our soggy boots squelched as we walked. There was no breeze. In the undimmed sky the sun stood almost overhead. The heat beat on us in waves. By noon I could only go forward at a slow walk, and two of the party were worse off than I was. Kermit, with the dogs and two camaradas close behind him, disappeared across the marshes at a trot. At last, when he was out of sight, and it was obviously useless to follow him, the rest of us turned back toward the boat. The two exhausted members of the party gave out, and we left them under a tree. Colonel Rondon and Lieutenant Rogaciano were not much tired; I was somewhat tired, but was perfectly able to go for several hours more if I did not try to go too fast; and we three walked on to the river, reaching it about half past four, after eleven hours' stiff walking with nothing to eat. We were soon on the boat. A relief party went back for the two men under the tree, and soon after it reached them Kermit also turned up with his hounds and his camaradas trailing wearily behind him. He had followed the jaguar trail until the dogs were so tired that even after he had bathed them, and then held their noses in the fresh footprints, they would pay no heed to the scent. A hunter of scientific tastes, a hunter-naturalist, or even an outdoors naturalist, or faunal naturalist interested in big mammals, with a pack of hounds such as those with which Paul Rainey hunted lion and leopard in Africa, or such a pack as the packs of Johnny Goff and Jake Borah with which I hunted cougar, lynx, and bear in the Rockies, or such packs as those of the Mississippi and Louisiana planters with whom I have hunted bear, wild-cat, and deer in the cane-brakes of the lower Mississippi, would not only enjoy fine hunting in these vast marshes of the upper Paraguay, but would also do work of real scientific value as regards all the big cats.

Only a limited number of the naturalists who have worked in the tropics have had any experience with the big beasts whose life-histories possess such peculiar interest. Of all the biologists who have seriously studied the South American fauna on the ground, Bates probably rendered most service; but he hardly seems even to have seen the animals with which the hunter is fairly familiar. His interests, and those of the other biologists of his kind, lay in other directions. In consequence, in treating of the life-histories of the very interesting big game, we have been largely forced to rely either on native report, in which acutely accurate observation is invariably mixed with wild fable, or else on the chance remarks of travellers or mere sportsmen, who had not the training to make them understand even what it was desirable to observe. Nowadays there is a growing proportion of big-game hunters, of sportsmen, who are of the Schilling, Selous, and Shiras type. These men do work of capital value for science. The mere

big-game butcher is tending to disappear as a type. On the other hand, the big-game hunter who is a good observer, a good field naturalist, occupies at present a more important position than ever before, and it is now recognized that he can do work which the closest naturalist cannot do. The big-game hunter of this type and the outdoors, faunal naturalist, the student of the life-histories of big mammals, have open to them in South America a wonderful field in which to work.

The fire-ants, of which I have above spoken, are generally found on a species of small tree or sapling, with a greenish trunk. They bend the whole body as they bite, the tail and head being thrust downward. A few seconds after the bite the poison causes considerable pain; later it may make a tiny festering sore. There is certainly the most extraordinary diversity in the traits by which nature achieves the perpetuation of species. Among the warrior and predaceous insects the prowess is in some cases of such type as to render the possessor practically immune from danger. In other cases the condition of its exercise may normally be the sacrifice of the life of the possessor. There are wasps that prey on formidable fighting spiders, which yet instinctively so handle themselves that the prey practically never succeeds in either defending itself or retaliating, being captured and paralyzed with unerring efficiency and with entire security to the wasp. The wasp's safety is absolute. On the other hand, these fighting ants, including the soldiers even among the termites, are frantically eager for a success which generally means their annihilation; the condition of their efficiency is absolute indifference to their own security. Probably the majority of the ants that actually lay hold on a foe suffer death in consequence; certainly they not merely run the risk of but eagerly invite death.

The following day we descended the São Lourenço to its junction with the Paraguay, and once more began the ascent of the latter. At one cattle-ranch where we stopped, the troupials, or big black and yellow orioles, had built a large colony of their nests on a dead tree near the primitive little ranch-house. The birds were breeding; the old ones were feeding the young. In this neighborhood the naturalists found many birds that were new to them, including a tiny woodpecker no bigger than a ruby-crowned kinglet. They had collected two night monkeys—nocturnal monkeys, not as agile as the ordinary monkey; these two were found at dawn, having stayed out too late.

The early morning was always lovely on these rivers, and at that hour many birds and beasts were to be seen. One morning we saw a fine marsh buck, holding his head aloft as he stared at us, his red coat vivid against the green marsh. Another of these marsh-deer swam the river ahead of us; I shot at it as it landed, and ought to have got it, but did not. As always with these marshdeer—and as with so many other deer—I was struck by the revealing or advertising quality of its red coloration; there was nothing in its normal surroundings with which this coloration harmonized; so far as it had any effect whatever it was always a revealing and not a concealing effect. When the animal fled the black of the erect tail was an additional revealing mark, although not of such startlingly advertising quality as the flag of the whitetail. The whitetail, in one of its forms, and with the ordinary whitetail custom of displaying the white flag as it runs, is found in the immediate neighborhood of the swamp-deer. It has the same foes. Evidently it is of no survival consequence whether the running deer displays a white or a black flag. Any competent observer of big game must be struck by the fact that in the great majority of the species the coloration is not concealing, and that in many it has a highly revealing quality. Moreover, if the spotted or striped young represent the ancestral coloration, and if, as seems probable, the spots and stripes have, on the whole, some slight concealing value, it is evident that in the life history of most of these large mammals, both among those that prey and those that are

preyed on, concealing coloration has not been a survival factor; throughout the ages during which they have survived they have gradually lost whatever of concealing coloration they may once have had—if any—and have developed a coloration which under present conditions has no concealing and perhaps even has a revealing quality, and which in all probability never would have had a concealing value in any “environmental complex” in which the species as a whole lived during its ancestral development. Indeed, it seems astonishing, when one observes these big beasts—and big waders and other water-birds—in their native surroundings, to find how utterly non-harmful their often strikingly revealing coloration is. Evidently the various other survival factors, such as habit, and in many cases cover, etc., are of such overmastering importance that the coloration is generally of no consequence whatever, one way or the other, and is only very rarely a factor of any serious weight.

The junction of the São Lourenço and the Paraguay is a day’s journey above Corumbá. From Corumbá there is a regular service by shallow steamers to Cuyabá, at the head of one fork, and to São Luis de Cáceres, at the head of the other. The steamers are not powerful and the voyage to each little city takes a week. There are other forks that are navigable. Above Cuyabá and Cáceres launches go up-stream for several days’ journey, except during the driest parts of the season. North of this marshy plain lies the highland, the Plan Alto, where the nights are cool and the climate healthy. But I wish emphatically to record my view that these marshy plains, although hot, are also healthy; and, moreover, the mosquitoes, in most places, are not in sufficient numbers to be a serious pest, although of course there must be nets for protection against them at night. The country is excellently suited for settlement, and offers a remarkable field for cattle-growing. Moreover, it is a paradise for water-birds and for many other kinds of birds, and for many mammals. It is literally an ideal place in which a field naturalist could spend six months or a year. It is readily accessible, it offers an almost virgin field for work, and the life would be healthy as well as delightfully attractive. The man should have a steam-launch. In it he could with comfort cover all parts of the country from south of Coimbra to north of Cuyabá and Cáceres. There would have to be a good deal of collecting (although nothing in the nature of butchery should be tolerated), for the region has only been superficially worked, especially as regards mammals. But if the man were only a collector he would leave undone the part of the work best worth doing. The region offers extraordinary opportunities for the study of the life-histories of birds which, because of their size, their beauty, or their habits, are of exceptional interest. All kinds of problems would be worked out. For example, on the morning of the 3d, as we were ascending the Paraguay, we again and again saw in the trees on the bank big nests of sticks, into and out of which parakeets were flying by the dozen. Some of them had straws or twigs in their bills. In some of the big globular nests we could make out several holes of exit or entrance. Apparently these parakeets were building or remodelling communal nests; but whether they had themselves built these nests, or had taken old nests and added to or modified them, we could not tell. There was so much of interest all along the banks that we were continually longing to stop and spend days where we were. Mixed flocks of scores of cormorants and darters covered certain trees, both at sunset and after sunrise. Although there was no deep forest, merely belts or fringes of trees along the river, or in patches back of it, we frequently saw monkeys in this riverine tree-fringe—active common monkeys and black howlers of more leisurely gait. We saw caymans and capybaras sitting socially near one another on the sandbanks. At night we heard the calling of large flights of tree-ducks. These were now the most common of all the ducks, although there were many muscovy ducks also. The evenings were pleasant and not hot, as we sat on the forward deck; there was a waxing moon. The screamers were among the most

noticeable birds. They were noisy; they perched on the very tops of the trees, not down among the branches; and they were not shy. They should be carefully protected by law, for they readily become tame, and then come familiarly round the houses. From the steamer we now and then saw beautiful orchids in the trees on the river bank.

One afternoon we stopped at the home buildings or headquarters of one of the great outlying ranches of the Brazil Land and Cattle Company, the Farquahar syndicate, under the management of Murdo Mackenzie—than whom we have in the United States no better citizen or more competent cattleman. On this ranch there are some seventy thousand head of stock. We were warmly greeted by McLean, the head of the ranch, and his assistant Ramsey, an old Texan friend. Among the other assistants, all equally cordial, were several Belgians and Frenchmen. The hands were Paraguayans and Brazilians, and a few Indians—a hard-bit set, each of whom always goes armed and knows how to use his arms, for there are constant collisions with cattle thieves from across the Bolivian border, and the ranch has to protect itself. These cowhands, vaqueiros, were of the type with which we were now familiar: dark-skinned, lean, hardfaced men, in slouch-hats, worn shirts and trousers, and fringed leather aprons, with heavy spurs on their bare feet. They are wonderful riders and ropers, and fear neither man nor beast. I noticed one Indian vaqueiro standing in exactly the attitude of a Shilluk of the White Nile, with the sole of one foot against the other leg, above the knee. This is a region with extraordinary possibilities of cattle-raising.

At this ranch there was a tannery; a slaughter-house; a cannery; a church; buildings of various kinds and all degrees of comfort for the thirty or forty families who made the place their headquarters; and the handsome, white, two-story big house, standing among lemon-trees and flamboyants on the river-brink. There were all kinds of pets around the house. The most fascinating was a wee, spotted fawn which loved being petted. Half a dozen curassows of different species strolled through the rooms; there were also parrots of several different species, and immediately outside the house four or five herons, with unclipped wings, which would let us come within a few feet and then fly gracefully off, shortly afterward returning to the same spot. They included big and little white egrets and also the mauve and pearl-colored heron, with a partially black head and many-colored bill, which flies with quick, repeated wing-flappings, instead of the usual slow heron wing-beats.

In the warehouse were scores of skins of jaguar, puma, ocelot, and jaguarundi, and one skin of the big, small-toothed red wolf. These were all brought in by the cowhands and by friendly Indians, a price being put on each, as they destroyed the stock. The jaguars occasionally killed horses and full-grown cows, but not bulls. The pumas killed the calves. The others killed an occasional very young calf, but ordinarily only sheep, little pigs, and chickens. There was one black jaguar-skin; melanism is much more common among jaguars than pumas, although once Miller saw a black puma that had been killed by Indians. The patterns of the jaguar-skins, and even more of the ocelot-skins, showed wide variation, no two being alike. The pumas were for the most part bright red, but some were reddish gray, there being much the same dichromatism that I found among their Colorado kinsfolk. The jaguarundis were dark brownish gray. All these animals, the spotted jaguars and ocelots, the monochrome black jaguars, red pumas, and dark-gray jaguarundis, were killed in the same locality, with the same environment. A glance at the skins and a moment's serious thought would have been enough to show any sincere thinker that in these cats the coloration pattern, whether concealing or revealing, is of no consequence one way or the other as a survival factor. The spotted patterns conferred no benefit as compared with the nearly or quite monochrome blacks, reds, and dark grays. The bodily condition of the various

beasts was equally good, showing that their success in life, that is, their ability to catch their prey, was unaffected by their several color schemes. Except white, there is no color so conspicuously advertising as black; yet the black jaguar had been a fine, well-fed, powerful beast. The spotted patterns in the forests, and perhaps even in the marshes which the jaguars so frequently traversed, are probably a shade less conspicuous than the monochrome red and gray, but the puma and jaguarundi are just as hard to see, and evidently find it just as easy to catch prey, as the jaguar and ocelot. The little fawn which we saw was spotted; the grown deer had lost the spots; if the spots do really help to conceal the wearer, it is evident that the deer has found the original concealing coloration of so little value that it has actually been lost in the course of the development of the species. When these big cats and the deer are considered, together with the dogs, tapirs, peccaries, capybaras, and big ant-eaters which live in the same environment, and when we also consider the difference between the young and the adult deer and tapirs (both of which when adult have substituted a complete or partial monochrome for the ancestral spots and streaks), it is evident that in the present life and in the ancestral development of the big mammals of South America coloration is not and has not been a survival factor; any pattern and any color may accompany the persistence and development of the qualities and attributes which are survival factors. Indeed, it seems hard to believe that in their ordinary environments such color schemes as the bright red of the marsh-deer, the black of the black jaguar, and the black with white stripes of the great tamanduá, are not positive detriments to the wearers. Yet such is evidently not the case. Evidently the other factors in species-survival are of such overwhelming importance that the coloration becomes negligible from this standpoint, whether it be concealing or revealing. The cats mould themselves to the ground as they crouch or crawl. They take advantage of the tiniest scrap of cover. They move with extraordinary stealth and patience. The other animals which try to sneak off in such manner as to escape observation approach more or less closely to the ideal which the cats most nearly realize. Wariness, sharp senses, the habit of being rigidly motionless when there is the least suspicion of danger, and ability to take advantage of cover, all count. On the bare, open, treeless plain, whether marsh, meadow, or upland, anything above the level of the grass is seen at once. A marsh-deer out in the open makes no effort to avoid observation; its concern is purely to see its foes in time to leave a dangerous neighborhood. The deer of the neighboring forest skulk and hide and lie still in dense cover to avoid being seen. The white-lipped peccaries make no effort to escape observation by being either noiseless or motionless; they trust for defence to their gregariousness and truculence. The collared peccary also trusts to its truculence, but seeks refuge in a hole where it can face any opponent with its formidable biting apparatus. As for the giant tamanduá, in spite of its fighting prowess I am wholly unable to understand how such a slow and clumsy beast has been able through the ages to exist and thrive surrounded by jaguars and pumas. Speaking generally, the animals that seek to escape observation trust primarily to smell to discover their foes or their prey, and see whatever moves and do not see whatever is motionless.

By the morning of January 5 we had left the marsh region. There were low hills here and there, and the land was covered with dense forest. From time to time we passed little clearings with palm-thatched houses. We were approaching Cáceres, where the easiest part of our trip would end. We had lived in much comfort on the little steamer. The food was plentiful and the cooking good. At night we slept on deck in cots or hammocks. The mosquitoes were rarely troublesome, although in the daytime we were sometimes bothered by numbers of biting horse-flies. The bird life was wonderful. One of the characteristic sights we were always seeing was that of a number of heads and necks of cormorants and snake-birds, without any bodies,

projecting above water, and disappearing as the steamer approached. Skimmers and thick-billed tern were plentiful here right in the heart of the continent. In addition to the spurred lapwing, characteristic and most interesting resident of most of South America, we found tiny red-legged plover which also breed and are at home in the tropics. The contrasts in habits between closely allied species are wonderful. Among the plovers and bay snipe there are species that live all the year round in almost the same places, in tropical and subtropical lands; and other related forms which wander over the whole earth, and spend nearly all their time, now in the arctic and cold temperate regions of the far north, now in the cold temperate regions of the south. These latter wide-wandering birds of the seashore and the river bank pass most of their lives in regions of almost perpetual sunlight. They spend the breeding season, the northern summer, in the land of the midnight sun, during the long arctic day. They then fly for endless distances down across the north temperate zone, across the equator, through the lands where the days and nights are always of equal length, into another hemisphere, and spend another summer of long days and long twilights in the far south, where the antarctic winds cool them, while their nesting home, at the other end of the world, is shrouded beneath the iron desolation of the polar night.

In the late afternoon of the 5th we reached the quaint old-fashioned little town of São Luis de Cáceres, on the outermost fringe of the settled region of the state of Matto Grosso, the last town we should see before reaching the villages of the Amazon. As we approached we passed half-clad black washerwomen on the river's edge. The men, with the local band, were gathered at the steeply sloping foot of the main street, where the steamer came to her moorings. Groups of women and girls, white and brown, watched us from the low bluff; their skirts and bodices were red, blue, green, of all colors. Sigg had gone ahead with much of the baggage; he met us in an improvised motor-boat, consisting of a dugout to the side of which he had clamped our Evinrude motor; he was giving several of the local citizens of prominence a ride, to their huge enjoyment. The streets of the little town were unpaved, with narrow brick sidewalks. The one-story houses were white or blue, with roofs of red tiles and window-shutters of latticed woodwork, come down from colonial days and tracing back through Christian and Moorish Portugal to a remote Arab ancestry. Pretty faces, some dark, some light, looked out from these windows; their mothers' mothers, for generations past, must thus have looked out of similar windows in the vanished colonial days. But now even here in Cáceres the spirit of the new Brazil is moving; a fine new government school has been started, and we met its principal, an earnest man doing excellent work, one of the many teachers who, during the last few years, have been brought to Matto Grosso from São Paulo, a centre of the new educational movement which will do so much for Brazil.

Father Zahm went to spend the night with some French Franciscan friars, capital fellows. I spent the night at the comfortable house of Lieutenant Lyra; a hot-weather house with thick walls, big doors, and an open patio bordered by a gallery. Lieutenant Lyra was to accompany us; he was an old companion of Colonel Rondon's explorations. We visited one or two of the stores to make some final purchases, and in the evening strolled through the dusky streets and under the trees of the plaza; the women and girls sat in groups in the doorways or at the windows, and here and there a stringed instrument tinkled in the darkness.

From Cáceres onward we were entering the scene of Colonel Rondon's explorations. For some eighteen years he was occupied in exploring and in opening telegraph lines through the eastern or north middle part of the great forest state, the wilderness state of the "matto grosso" — the "great wilderness," or, as Australians would call it, "the bush." Then, in 1907, he began to penetrate the unknown region lying to the north and west. He was the head of the exploring

expeditions sent out by the Brazilian Government to traverse for the first time this unknown land; to map for the first time the courses of the rivers which from the same divide run into the upper portions of the Tapajos and the Madeira, two of the mighty affluents of the Amazon, and to build telegraph-lines across to the Madeira, where a line of Brazilian settlements, connected by steamboat lines and a railroad, again occurs. Three times he penetrated into this absolutely unknown, Indian-haunted wilderness, being absent for a year or two at a time and suffering every imaginable hardship, before he made his way through to the Madeira and completed the telegraph-line across. The officers and men of the Brazilian Army and the civilian scientists who followed him shared the toil and the credit of the task. Some of his men died of beriberi; some were killed or wounded by the Indians; he himself almost died of fever; again and again his whole party was reduced almost to the last extremity by starvation, disease, hardship, and the over-exhaustion due to wearing fatigues. In dealing with the wild, naked savages he showed a combination of fearlessness, wariness, good judgment, and resolute patience and kindness. The result was that they ultimately became his firm friends, guarded the telegraph-lines, and helped the few soldiers left at the isolated, widely separated little posts. He and his assistants explored, and mapped for the first time, the Juruena and the Gy-Paraná, two important affluents of the Tapajos and the Madeira respectively. The Tapajos and the Madeira, like the Orinoco and Rio Negro, have been highways of travel for a couple of centuries. The Madeira (as later the Tapajos) was the chief means of ingress, a century and a half ago, to the little Portuguese settlements of this far interior region of Brazil; one of these little towns, named Matto Grosso, being the original capital of the province. It has long been abandoned by the government, and practically so by its inhabitants, the ruins of palace, fortress, and church now rising amid the rank tropical luxuriance of the wild forest. The mouths of the main affluents of these highway rivers were as a rule well known. But in many cases nothing but the mouth was known. The river itself was not known, and it was placed on the map by guesswork. Colonel Rondon found, for example, that the course of the Gy-Paraná was put down on the map two degrees out of its proper place. He, with his party, was the first to find out its sources, the first to traverse its upper course, the first to map its length. He and his assistants performed a similar service for the Juruena, discovering the sources, discovering and descending some of the branches, and for the first time making a trustworthy map of the main river itself, until its junction with the Tapajos. Near the watershed between the Juruena and the Gy-Paraná he established his farthest station to the westward, named José Bonofacio, after one of the chief republican patriots of Brazil. A couple of days' march northwestward from this station, he in 1909 came across a part of the stream of a river running northward between the Gy-Paraná and the Juruena; he could only guess where it debouched, believing it to be into the Madeira, although it was possible that it entered the Gy-Paraná or Tapajos. The region through which it flows was unknown, no civilized man having ever penetrated it; and as all conjecture as to what the river was, as to its length, and as to its place of entering into some highway river, was mere guess-work, he had entered it on his sketch maps as the Rio da Dúvida, the River of Doubt. Among the officers of the Brazilian Army and the scientific civilians who have accompanied him there have been not only expert cartographers, photographers, and telegraphists, but astronomers, geologists, botanists, and zoologists. Their reports, published in excellent shape by the Brazilian Government, make an invaluable series of volumes, reflecting the highest credit on the explorers, and on the government itself. Colonel Rondon's own accounts of his explorations, of the Indian tribes he has visited, and of the beautiful and wonderful things he has seen, possess a peculiar interest.