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The Pantanal



Zilca Campos measuring skulls in a poachers camp. Photo by Bill Magnusson.

In 1987, I was invited by EMBRAPA researchers to visit the Nhumirim experimental ranch in the Brazilian Pantanal. EMBRAPA is a federal government agricultural research organization with centers throughout the country. Most of the regional centers study applied questions directly related to the production of crops or livestock. However, the Brazilian Pantanal is a huge flooded savanna where wildlife tourism and fisheries contribute significantly to the economy. There, the EMBRAPA center has active programs for wildlife management, fisheries and conservation-related activities.

The Brazilian Pantanal covers about 100,000 km², with few sealed roads. Access is mainly from Cuiabá in the north and Campo Grande in the east. Corumbá 350 km south-east of Campo Grande, is a small town near the Bolivian border on the north bank of the Paraguay River. It is on the last high ground before descending into the massive flood plains of the river, and conveniently placed for the EMBRAPA Pantanal wildlife division, but in 1987 it did not have a daily air service.

EMBRAPA personnel had arranged to take me on an excursion and I booked a flight to arrive in Corumbá the day before. However, there was bad weather over Corumbá and I was taken off the plane in Cuiabá. I explained to the airline staff that I had to get to Corumbá that day, but they said there was nothing to be done and sent me to a hotel. I was brooding in the hotel room and wondering what I could do to make my time in Cuiabá productive when the phone rang and I was summoned to the reception. The desk clerk said that I should return to the airport in transport that the airline company had sent. There were two young women in the van. One was quiet and reserved, but the other was bubbly and talkative and she chattered away on the way to the airport. They were from the small town of Sinop and were also on their way to Corumbá.

The airline attendant said that there was a plane going to São Paulo and that it would make an unscheduled stop in Corumbá to let me off. I had never imagined a jet airliner making an unscheduled stop just for me, and felt pretty important. Apparently, my remonstrating about the importance of my scientific presence in Corumbá had touched the airline staff's conscience. My imagined self importance was shattered when I boarded the plane. The two girls from the van boarded with me and sat beside me in the near empty plane. They explained that they were call girls and one had a special relationship with a state governor. It was for them that the plane was diverted to Corumbá.

There was a note at the hotel to call EMBRAPA, and I arranged to meet the center's wildlife researchers for lunch. Guilherme Mourão was a little taller than me, with unkempt curly hair, a slight lisp, and a habit of cocking his head slightly to the side and looking quizzically when someone was talking to him. Zilca Campos came up to my shoulder, was slightly built and had an eager sincere expression that made me careful about what I said because I was sure that she was storing it away for future use. They were very different from wildlife managers I had met in the USA and Australia and I wondered how long they would maintain their enthusiasm for the Pantanal. Once again, my preconceptions were totally wrong. I would eventually supervise the post-graduate studies of both of them, and they would teach me and the world much about the Pantanal and its wildlife over the next two and a half decades.

The trip to Nhumirim Ranch took most of the morning. At first it was along the low areas around the Paraguay River with extensive areas of flooded rushes and water lilies similar to the lagoons in Rio Grande do Sul. The road was raised above the surrounding marshes and lined by shallow borrow pits dug to provide earth for the levee banks along which the road ran. After a few hours, we turned north onto slightly higher grasslands with scattered islands of trees. It

reminded me of the Venezuelan Llanos, but the vegetation was lusher. Almost all the land in the Pantanal is covered by privately owned ranches, and we stopped regularly to open gates between paddocks. The cattle were mainly white hump-backed Zebu.



Photo 15.1 *Guilherme Mourão and Zilca Campos in the Pantanal in 1987.
Photo by Bill Magnusson.*

It was the dry season, and water was confined to the borrow pits and small crystal-clear streams that flowed under small wooden bridges. Capybaras, Jabiru storks and other wildlife abounded wherever there was water. Flocks of giant blue macaws foraged on the ground for palm seeds that were hard to crack with a hammer, but which they could snip in half with their massive bills. In the pools under the bridges, piranhas, pacus, oscars and other aquarium fish circled in a kaleidoscope of colors.

The Nhecolandia region of the Pantanal, and the Nhumirim Ranch in particular, is famous for small isolated lakes, and there are over a hundred on

Nhumirim alone. Some are saline and have little vegetation. Others have floating grass mats and a variety of floating and emergent water plants. All tend to be circular, with a border of grassland flanked by low forest. Local rainfall and overflow from the Paraguay River fill the lakes during the wet season, but many dry out or are reduced to shallow pools in the dry season. In extreme years, all the lakes dry and the caimans suffer.

Standing in the tray of the Toyota pickup and bumping across the sandy tracks, it felt much like parts of northern Australia. There was easy access to the lakes in the dry season, but in the wet season, when the waters of the Paraguay River spread out to cover thousands of square kilometers, the lakes are joined together and are only accessible on a tractor that can push through water over a meter deep. The area seemed ideal for an airboat, especially a powerful one like the ones Ted Joanen had, which would be able to travel across even dry ground. However, the cost of acquiring and maintenance for an airboat was beyond EMBRAPA's budget.

We had lunch of beef and manioc meal, washed down with tea that was so sweet it ran out of the cup like treacle. The meal was not accompanied by salad or other greenery, which the Pantanal cowboys did not seem to consider edible. As we would stay out till late at night we took a meal of salt meat mixed with manioc meal. I would never get used to Zilca's work schedule. I once got so tired that I told her I couldn't go on and we returned to the ranch to sleep at 4 a.m. It seemed that I had hardly closed my eyes when she banged on the door to wake me for breakfast two hours later. The only time I saw her break the work schedule was on a subsequent trip when we were bumping across a dirt track on a cold night in the dry season. It was nominally 15 °C, but the wind on the moving truck made it seem much colder. Guilherme told the driver to stop and everybody got out of the truck. Zilca passed out hot coffee as we stood

around the truck in the middle of nowhere. When I asked why we had stopped, Guilherme said in Portuguese “It’s just after midnight, it’s your birthday - we’re celebrating.” After my 10 minute birthday party, we got back to work.

The Pantanal caiman *Caiman crocodilus yacare* differs from the spectacled caimans in most of the Amazon in having a slightly stouter head and dark blotches on the sides of the lower jaw. In other respects, it is very similar to its northern cousins. International pressure and changes in the major drug trafficking routes, had led to a reduction in hunting of Amazonian caimans, and concentration of poaching on Pantanal caimans in the 1970s and early 1980s, resulting in the Pantanal caimans being responsible for most skins on the illegal market. The poachers were mainly poor cowboys who lived essentially as indentured serfs on the major cattle ranches. They would herd cattle during the day and hunt caimans at night to supplement their meager wages. The skins would be sold to intermediaries who flew them to Paraguay or Colombia, often bringing back drugs on the return trip.

I taught Zilca and Guilherme how to operate on hatchling caimans to determine their sex by direct observation of the gonads and how to mark babies by carefully cutting out raised tail scutes. You need patience and a steady hand to mark tiny crocodilians. You do not want to cut too far into the tail and hurt the animal, but you have to take out every vestige of the scute. If you leave even a tiny piece, it will partially regenerate and may not be distinguishable from the scars left by predators when the animal grows. It is hard to maintain patience because you know that the chance of any of the babies reaching adulthood is remote, and the chance of you being able to recapture them less likely still. Zilca’s dedication and patience would pay off twenty five years later when she and Guilherme published one of the most detailed long-term studies of growth in any crocodilian.

Zilca and Guilherme noosed caimans from a boat at night as did most crocodilian biologists. However, the small shallow lakes allowed other capture techniques in the dry season. The caimans would become concentrated in the muddy pools with fish and other aquatic fauna. A strong seine net pulled through the lake would often catch a dozen caimans at a time, some of which were very big. Pulling the net required several strong men on each end, and it was quite an adventure to rope the caimans as they were pulled from the water. My mother, who was then in her early sixties and the same size as Zilca, went with me to Nhumirim on one of those caiman netting expeditions. We had two large caimans roped and several more in the net to pull out. The two caimans with the nooses around their necks were heading in opposite directions, so I gave the ends of the ropes to my mother and told her to hold on. I was busy trying to subdue a caiman thrashing in the net when I heard “Bill, Bill, they won’t stop” and turned around to see my mother with both feet planted on the ground being dragged away from the lake by the two caimans, which had decided to go in the same direction. Each of them was bigger than she was, and they were both up in a high-walk position with their bellies well off the ground. After that, we gave her smaller caimans to hold.

I was surprised that the caimans did not always head for water. They learned quickly, and if they had been in a lake that had been seined, or that had been hunted intensively by poachers, they did not wait to be caught in the net or shot at in a confined space. When the truck pulled up at one end of the lake, the caimans would leave the other end and walk single file in the direction of the nearest forest. Usually it was one of the biggest caimans that led. Once in the forest they would scatter and hide under leaf litter or the abundant bromelias with hooked spines that were the major understory plants in most of the forest patches.

At first we thought that they only walked single file in groups as a result of disturbance, but Zilca and Guilherme found many groups travelling overland in single file, without any indication that they had been driven out of a lake or river. We knew that caimans would often abandon a lake or a pool in mass because it was common to see many caimans in a pool in which there had been none the day before. Presumably they leave when the food runs out in a pool, there is a build up of toxic waste from dead fish, or something else that makes the pool unsuitable. However, we have no idea how they communicate with each other, and how they decide who will be leader. I was reminded of the tracks of dinosaurs walking in a line that archeologists used to infer that they moved in herds. If the caimans passed a muddy patch they would leave the same sort of tracks. I wonder if we should stop thinking of crocodilians as solitary hunters and begin to consider them as pack animals.

Besides cutting some of the tail scutes, Zilca and Guilherme put colored cattle tags in tail scutes or numbered aluminum tags in the membranes between their toes. The plastic tags allow individuals to be identified from a distance, and the toe tags are useful to confirm the reliability of identification by scute cutting. However, they turned out to be useful for another reason. Poachers would camp in the forest near a lake with a concentration of caimans, shoot as many of them as they could during the night, and drag the carcasses up to a convenient spot in the forest to skin them. They took only the skin on the flanks because the back, belly and tail skin is full of bony osteoderms that make it virtually worthless for tanning. Along with most of the body, the poachers left the tags that were in the tail and foot webbing. By searching abandoned poachers camps, Zilca and Guilherme got valuable data on caiman movement, and an idea of the magnitude of mortality due to hunting.

We walked from the scorching heat of the grassland into the cool shade of the forest. Scattered over a dozen square meters were pieces of skull, bleached osteoderms from the dorsal skin, and dried feet, contorted into strange shapes. It was an old camp, and the hundreds of kilos of caiman meat and entrails had long since rotted into the ground. Nevertheless, the stale odor of death still permeated everything. Sorting through the piles of bones was a sad job for Zilca, who had a strong emotional attachment to the caimans she worked on. It could also be dangerous. People regularly died in shootouts between poachers and the forest police, and there was always the chance that the uneducated poachers might not distinguish between government in the form of police bent on capturing or killing them, and government in the form of researchers trying to do their best for both caimans and humans. Zilca and Guilherme would eventually visit hundreds of poacher camps before changes in fashion and international regulations made poaching in the Pantanal uneconomic.

The caimans nested at the beginning of the wet season, either in the forest or on grass mats floating over the lakes. Zilca searched for forest nests on foot or horseback, and found most that were put down each year on Nhumirim and the neighbouring property of Campo Dora. The dense understory of spiny ground bromeliads made nest searching in the forest difficult, but it was even harder in the floating grass mats, which were too fragile to walk over, but too thick to push a boat through. Zilca would climb a nearby tree and try to spot the nests, or use an ultralight aircraft to map them. Guilherme took me for a flight over Nhumirim in the ultralight, and I was impressed by the view it gave of the lakes and forests that were laid out like paisley tapestry. Nevertheless it confirmed my dislike of flying in light aircraft, especially because Zilca and Guilherme had crashed the ultralight several times.



Photo 15.2 Bill with a Pantanal caiman. Photo by Zilca Campos.

Zilca was studying sex determination in nests laid down in the forest and on the floating grass nests, and wanted to measure temperatures in as many of each as possible. The temperature of the nest depended on where it was made, so the floating-grass nests on average had higher temperatures. As the sex of

crocodilians is determined by the temperature at which they are incubated, the sex ratios of the hatchlings differed between the forest and floating-grass nests.

Zilca took me to a nest near a tree in the middle of a grass mat. We couldn't get a boat in, so we used boards for support and dragged ourselves along the trail made through the grass by the female. Zilca was in front and I could just see her head bobbing above water. A big female might weigh nearly as much as Zilca, so I was nervous that there might be one in attendance. However, Zilca pulled herself up on the tree and started digging through the nest. She held up an egg and gave a cheery grin of victory, but these eggs would not produce young. The grass mat had subsided and the eggs had drowned. In contrast to the forest nests, few grass-mat nests were raided by predators, such as coatimundis and tegu lizards, but they had to contend with this other source of mortality.

We could get the boat up to the next nest, and I leaned forward as we approached it, hoping to get a glimpse of an attending female. A round leather ball rose to the surface beside the nest, and rolled revealing dark rings on a yellow background. I could almost touch it, and soon realized that it was not a ball, but a loop of the body of a yellow anaconda. I had seen some big yellow anacondas sunning beside lakes in the dry season, and they must have been over 4 m long. This one was at least five times their diameter though, and I imagined a snake at least twice that length, so I wasn't game to grab it. This did not make sense. Yellow anacondas are big snakes, but nowhere near as big as the Amazonian anaconda, so I lent over to look closer and I saw that the snake's skin was stretched almost to bursting. By the time I realized my mistake, the ball was dragged down to be followed quickly by a body that was only a handspan wide. I made a quick grab, but the snake was long gone.

The snake had recently captured large prey, perhaps just as we were paddling toward the nest, and that was why part of it was so bloated. It may have been a

capybara, but there was a good chance that the snake had eaten the caiman that had been guarding the nest, and I had lost the chance of making the first record of a snake eating a caiman in attendance at a nest. Caimans attending nests in the forest are susceptible to jaguars, but we had not imagined that there were any predators that could take an adult caiman on a floating-grass mat. Whether it was a female caiman in the snake's belly I'll never know, but my admiration of Zilca's courage in swimming into nests was heightened. She not only risked the wrath of the caiman, she risked becoming prey to a yellow anaconda.



Photo 15.3 *Zilca Campos marks the position of a flooded nest while an assistant watches for the mother caiman. Photo by Bill Magnusson.*

The Pantanal caiman was listed by the US government as an endangered species, which removed one of the largest and most lucrative markets for hides of that species. US alligator farmers were worried about competition from cheap caiman hides, but I believed that concern was misplaced. Alligators have hides that receive the industry rating of “classic,” and they compete mainly with hides

from other classic species, such as the saltwater and Nile crocodiles. Caiman hides are more difficult to tan, and do not have the same glossy sheen of classic hides, so they have much lower price and fill a different consumer niche.

There were no good estimates of the number of caimans in the Pantanal, and the number in trade was still based on Karlheinz Fuchs' guess of a million a year. Therefore, Guilherme got funding for aerial surveys of caimans throughout the Pantanal. It turned out that many other wildlife species were more appropriate for Guilherme's aerial surveys than caimans. However, the data were sufficient to show that the Pantanal caiman was one of the most abundant crocodilians in the world, and not in need of any special embargos by the USA.

Many different groups were interested in harvesting caimans from closed-cycle farming, ranching or controlled hunting, so we applied to an international conservation organization for funds to hold a meeting in Brazil to discuss possibilities for conservation and sustained use of the Pantanal caiman. We put together an extensive justification for the meeting and worked out a budget. We intended to have a scientific meeting to discuss what was known about caiman in the Pantanal, followed by an open meeting with Brazilian government officials to decide on the best strategy for management of the resource.

We had no particular agenda, but I had previously pointed out the economic limitations on caiman farming and ranching because of the low value of nonclassic hides. Therefore, preservationists branded us as anticonservationists, and potential caiman ranchers branded us as anti-use preservationists. Our proposal to the conservation organization was rejected, mainly because of a report by a reviewer from a US zoo. I was accustomed to having applications turned down and was not particularly concerned until I received an invitation to a meeting on Pantanal caiman conservation funded by the same agency. I obtained a copy of the application and I was astounded. The reviewer who did

not like our application had made one of his own. However, he did not change much. In fact, he had only photocopied our application, torn off the first two pages, and substituted them with two of his own. It was exactly our application except for the proposer and the program.

There was still the scientific program, but the meeting afterwards would be restricted to the proposer and representatives of the conservation organization funding the proposal. They would decide what should be done and convey their decision to the Brazilians on the last day. Once I had calmed down, I realized that the US conservationist was sincere and doing what he felt was the right thing for the species. I called the representative of the conservation organization and explained to him how paternalistic the program would seem to Brazilians, and that there were severe ethical considerations associated with the pirating of a proposal by a reviewer. The funding agency changed its mind and funded our proposal, which could not have been as dangerous as the reviewer considered because the Brazilian government officials were extremely conservative and not about to authorize any liberalization of the wildlife laws.

Direct hunting of caimans in the Pantanal was not permitted. Attempts at farming were economic failures. Many ranching schemes also did not work, and it was sad to visit some of the early enterprises and see dead and dying young caimans in the rustic enclosures. A few ranching enterprises are still functioning, and they use high-tech methods adapted from the Argentinian broad-snouted caiman ranching operations. They have difficulty raising caimans to sizes optimal for tanning, but get much of their profits from selling meat to tourist restaurants around the Pantanal. They probably also allow some less legal activities to flourish. I have eaten big caiman steaks in a restaurant that proudly displayed IBAMA permits, but I know that the caiman from which that meat was taken was much bigger than anything raised economically in ranching

facilities. These industries don't seem to have affected the caiman densities in the Pantanal very much. The multiyear cycles of drought affect the Pantanal caimans much more than legal or illegal exploitation. In the drought year that I write this, Zilca tells me that all the lakes of Nhumirim ranch have dried up and many of the caimans have left. Those that haven't are dead or dying. Dams around the Pantanal, and river diversion for irrigation, probably have much greater effects on the number of caimans than any of the humans that think they are actively managing them.



*Photo 15.4 Dead hatchlings in a raising facility in the Pantanal.
Photo by Bill Magnusson.*

