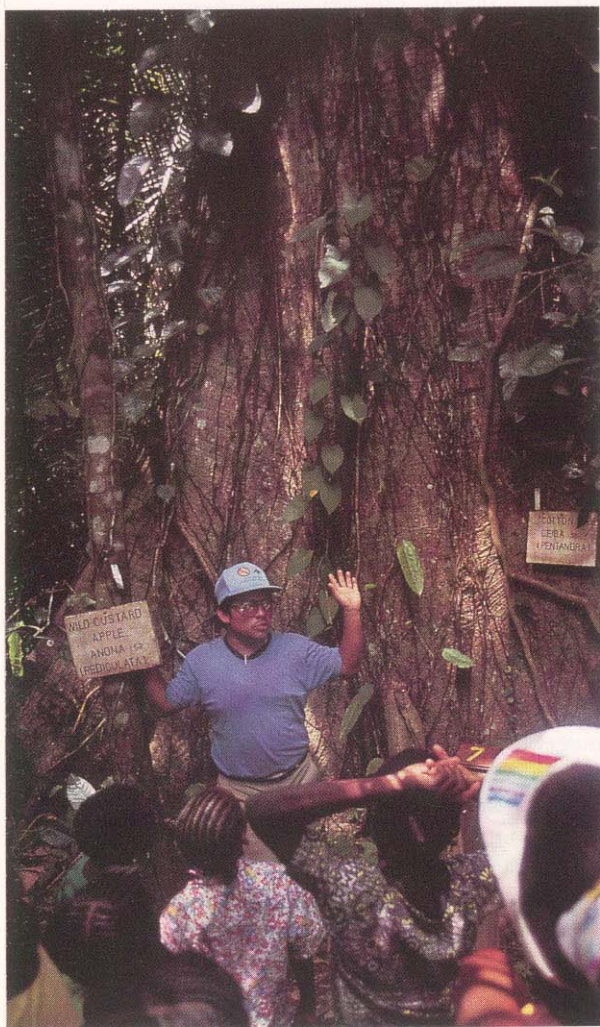


Land of Five Cats

The Cockscomb Basin of Belize

by ERIC HOFFMAN



Above: Mayan naturalist Ernesto Saqui leads children through the Cockscomb Basin Wildlife Sanctuary in Belize. This small nation on the Caribbean coast of Central America has a progressive record for preserving its natural places. The 102,000-acre Cockscomb, where five species of wild cats roam, is one of Belize's greatest environmental achievements.

Above Right: Largest cat in the Americas, the jaguar (*Panthera onca*) can weigh 200 pounds and is strong enough to bring down a tapir three times its size. In the Cockscomb Basin, jaguars live solitary lives in territories as large as 25 square miles.

ERNESTO SAQUI silences the Garinagu schoolchildren trailing along behind him: "Quiet! You might rob me from seeing a jaguar. We are making too much noise to appreciate the forest." Saqui, a Maya Indian and director of the Cockscomb Basin Wildlife Sanctuary in south-central Belize, could just as easily have been "robbed" of seeing an ocelot, puma, margay, or jaguarundi, such is the feline diversity in the immense primeval rainforest sanctuary that he and a group of local Mayan wardens oversee.

Upon hearing mention of a jaguar, the shy Garinagu stop talking and draw together nervously, peering this way and that past the massive buttressed trunks of trees and into the profusion of moist greenery that surrounds them on all sides. From far off in the forest comes the mournful call of a great tinamou, a forest-dwelling bird, and from a limb directly overhead comes the hoarse croak of a keel-billed toucan, whose multi-colored banana-sized bill is easy to spot. The children point at it eagerly.

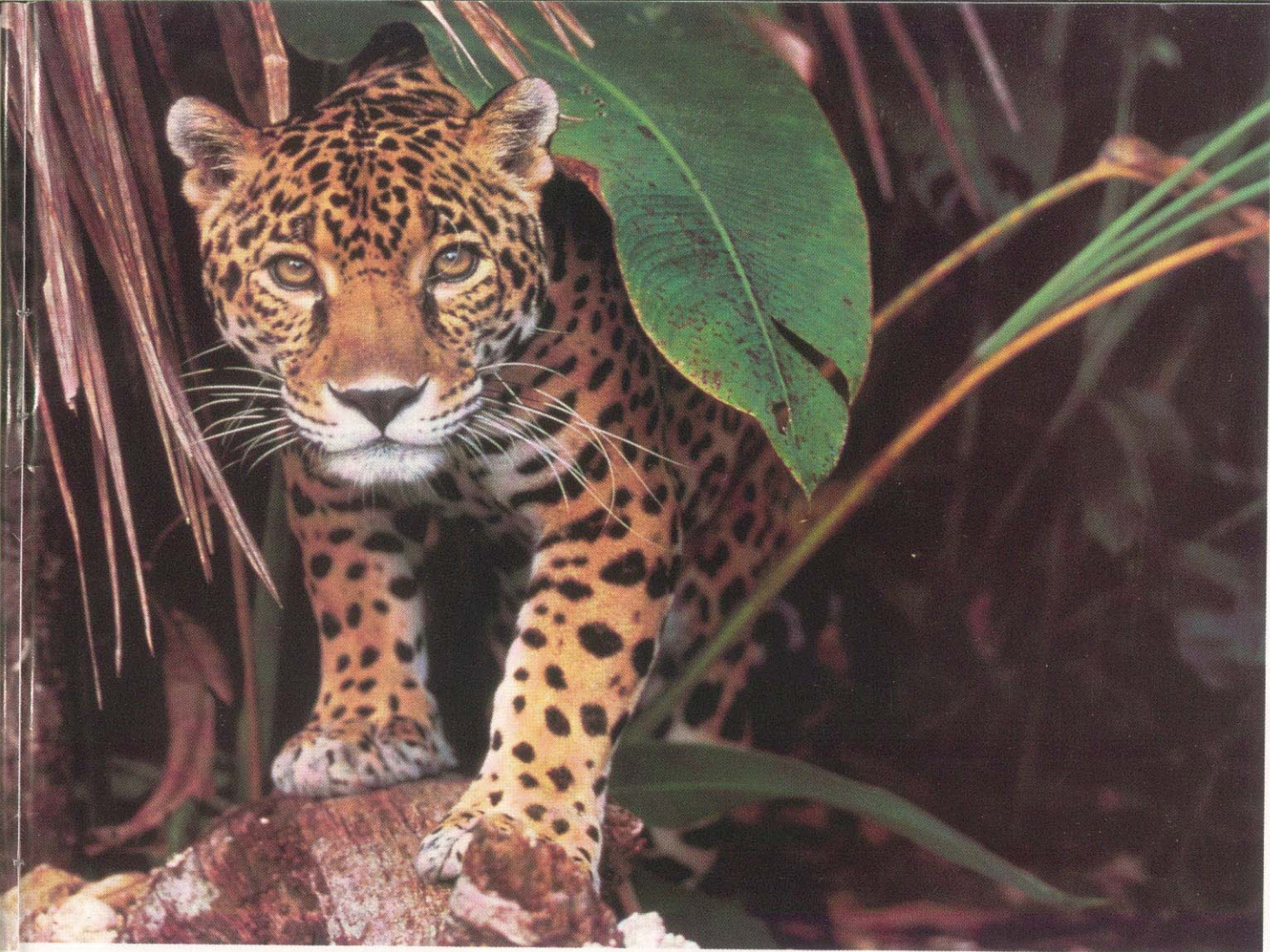
The Garinagu are coastal people whose culture can be traced to African slaves shipwrecked in the seventeenth century who intermarried with Arawak Indians. Despite Belize's small size, this is the first visit to the rainforest for these children, who now hang on Saqui's every word. Saqui smiles, knowing any jaguar in range of their voices is going to stay hidden. By merely evoking the big cat's name he gets his visitors' undivided attention. He can now begin his well-rehearsed description of the intricate web of life that surrounds them.

"My people, the Maya, won't cut down a ceiba," Saqui says, pointing to a huge tree whose buttressed trunk measures 20 feet across. The ceiba tree, adorned in flowering orchids and vines, towers above the forest canopy. "We believe there is a god of the skies above and



one of the underworld below. The transformation from one world to the next goes through the limbs and roots of the tree. If the ceiba tree could talk, it would tell tales of all the creatures of the forest: the parrots, wild pigs, coatis, climbing rats, otters, and five different kinds of wild cats who hunt here because there are so many kinds of animals to eat."

Belize is unique when it comes to policies protecting wildlife and integrating people from all parts of society into conservation programs. Formerly British Honduras, Belize became an independent country in 1981. Poor from the start, stymied by economic stagnation, frustrated by the combination of a 95-percent literacy rate and few skilled jobs, and with a population of only 200,000 citizens, the future didn't look bright. However, ecotourism was just catching on and having the lowest population density in Central America, the greatest marine reef in all of the Americas, and vast tracks of undisturbed rainforest packed with wildlife became a fantastic advantage. Ecotourism now brings \$45



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million into the country every year, an amount exceeded only by sugarcane production. Steadily, Belizean authorities have moved to protect the country's natural heritage. Between 1982 and 1993 the popularly elected government committed 31 percent of the country to park or sanctuary status. The Cockscomb Basin Wildlife Sanctuary is the jewel of this commitment.

The Cockscomb first gained worldwide notice in 1984, when North American wildlife biologist Alan Rabinowitz, working for the New York Zoological Society, and Ben Nottingham, a University of Tennessee graduate student, concluded a first-of-its-kind jaguar study there.

Rabinowitz estimated that about 50 of the big cats maintained contiguous territories in the Cockscomb. This was the highest documented density of jaguars north of the Panama Canal. Shortly after his initial study, a process began that resulted in the entire 102,000-acre basin becoming a reserve, where hunting of the jaguar's prey species was banned. The small Mayan village of eight families

within the reserve's boundaries was relocated to a village on the eastern boundary named Maya Center.

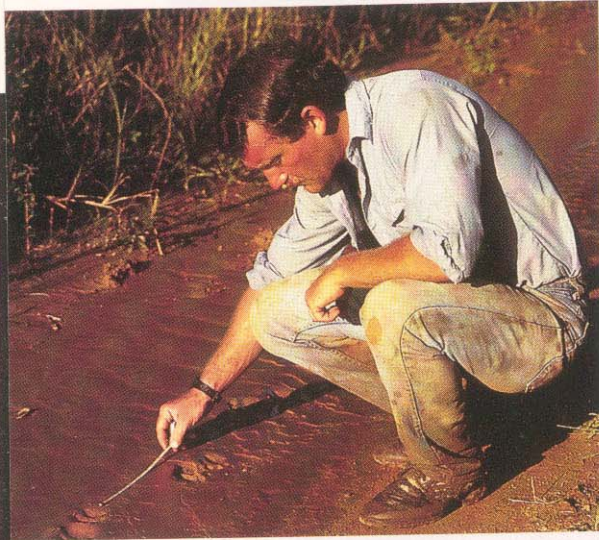
Rabinowitz emerged from his adventures in Belize with an Indiana Jones image. In 1983, he crashed a light airplane in the jungle canopy while trying to locate a jaguar he'd outfitted with a radio transmitter. He climbed down vines and branches to safety and to this day the plane remains stuck in the tree, serving as a tourist attraction with a trail kept open by local Maya. During the mid-1980s, Rabinowitz also worked to change the attitudes of citrus farmers who had been killing jaguars, and he successfully led a lobbying effort with then-Prime Minister George Price to set aside an area for jaguars. He later wrote a best-selling book, *Jaguar*, which chronicled his experiences, before shoving off for Asia to study rare species of leopards. Today, he is an intermittent visitor to Belize, called in by government officials to conduct studies on jaguar-related issues.

In truth, the Belize government had already placed a moratorium on hunting

the species in 1981—a ban still in effect today. By 1986, largely through Rabinowitz's prompting, 3,600 acres of the reserve had already gained sanctuary status, where all kinds of exploitation, including logging, were forbidden. But, Rabinowitz's research revealed, the sanctuary was too small to give sufficient protection to jaguars, which require from six to 25 square miles of territory each. Four years ago, the entire basin became a sanctuary.

The Cockscomb has survived as an intact ecosystem because it is a nearly impenetrable natural fortress, hemmed in on three sides by the rugged Maya Mountains. The entire basin has only one dirt road, which penetrates the eastern flank so people can visit the sanctuary. From the end of this six-mile road, walking on the trails is the only way to get around. The entire sanctuary is covered with an extremely diverse rainforest containing over 3,000 plant species. The Mayan caretakers maintain a dozen trails that slice through riverine, old-growth, and secondary growth forest.

Below: Biologist Alan Rabinowitz of the Wildlife Conservation Society conducted pioneering jaguar behavior studies in the Cockscomb that helped establish the basin as a sanctuary for the cats and other wildlife. Here, Rabinowitz measures the distance between jaguar tracks.



BEN NOTTINGHAM

In addition to the diversity of cats, the rainforests of Belize harbor a rich variety of other mammals that are often prey for the cats. Below: Prized by humans for rich meat, the paca (Agouti paca), or gibnut as it is called in Belize, falls prey to jaguars and other ground-dwelling cats.

Below right: The Central American woolly opossum (*Caluromys derbianus*) is a nocturnal, arboreal fruit eater, perhaps most likely to become prey for the tiny, acrobatic margay.

From Ben's Bluff Trail, at dusk, the entire basin to the west is an unforgettable visual and auditory experience, swathed in a verdant mosaic of endless treetops. Calls from howler monkeys, roaring as loud as lions, and birds punctuate the eerie stillness. The Cockscomb's floor is crisscrossed with large and small watercourses kept swirling by nine months of relentless rain. The downpours, insects, high temperatures, body-drenching humidity, and the jagged granite ridges intimidate all but the most daring. This inhospitableness to humans is largely to thank for the area's pristine nature.

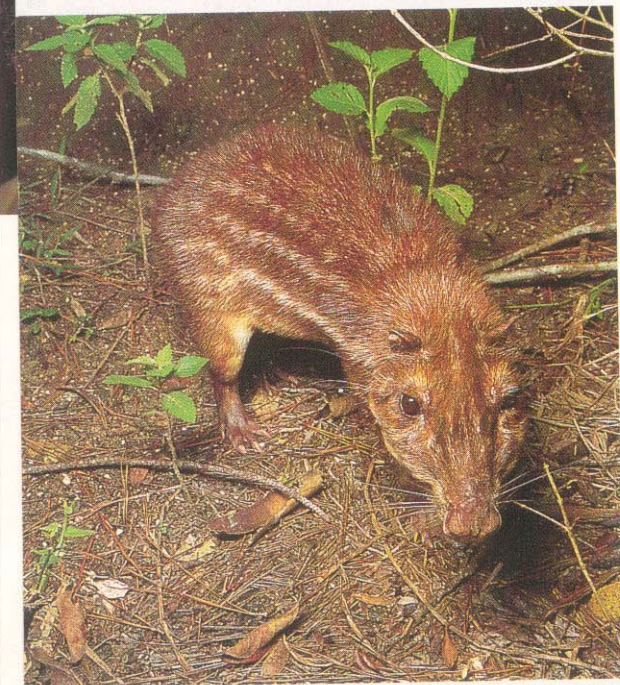
Logging camps that once existed in the basin have been reclaimed by the jungle. Their names, "Leave If You Can" and "Go to Hell," tell you what the loggers thought of the area. Even the Maya, who have lived in the rainforest for centuries, found other, more user-friendly jungle and never settled in the Cockscomb in appreciable numbers. Still, the few Maya using the basin in modern times hunted the black howler monkey out of existence. A couple of dozen of the bellicose primates have been captured elsewhere in Belize and then released in the Cockscomb. Today, the population is increasing.

Keeping permanent settlers out of the Cockscomb basin has served the ecosystem well. In addition to its botanical plethora, the Cockscomb

contains 56 mammal species, 300 different birds, dozens of reptiles, and countless varieties of insects. The endangered scarlet macaw lives in the old forest in the remote west end, and toucans and hummingbirds are common. Such rarities as Baird's tapir, a 600-pound donkey-sized creature with an elephant-like snout and a body shape of a rhinoceros, cool off in the streams. Among the other mammals are peccaries, brocket deer, kinkajous, tayras, pacas, armadillos, and an abundance of prolific arboreal and terrestrial mouse and rat-sized creatures.

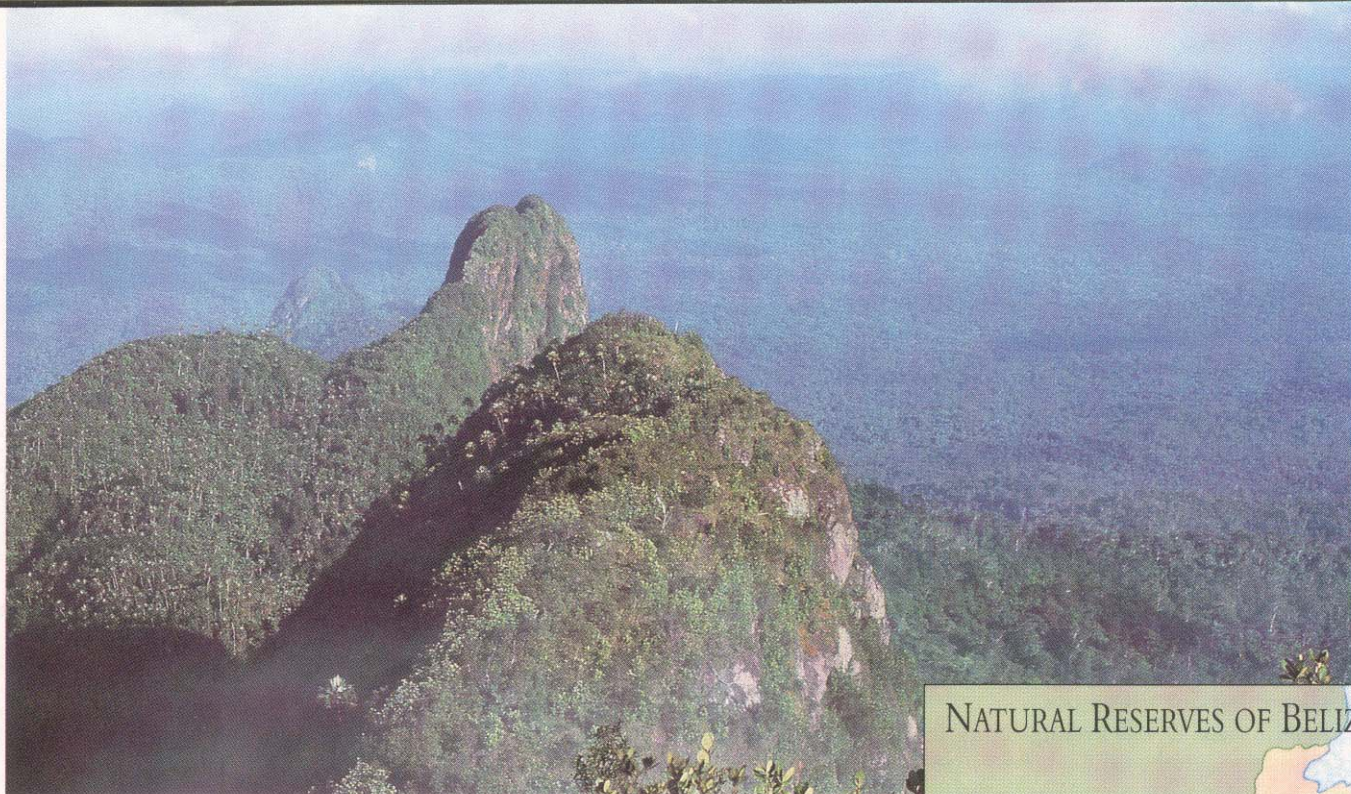
To the calculating eye of a predator, all this abundance assures a meal is never far from tooth or claw. At the top of this food web are five different felines, living side by side and acting out survival strategies that are just beginning to be understood. With the exception of the small oncilla of South America and the bobcat and lynx of North America, the Cockscomb is home to all the wild cats found in all the Americas.

The Cockscomb is unique in this regard. Most wild cats, especially the ones sporting colorful coats, have not fared well during the last two centuries. Habitat destruction, ignorance about territorial and dietary requirements, agricultural development, and the illegal pet and skin trade have taken their toll, eliminating wild cats from much of their historic ranges.



TONY BATH





TONY RATH

Viewed from the rarely climbed Victoria Peak, the Cockscomb Basin resembles a green sea surrounded by jagged towers of the Maya Mountains. Only one dirt road enters the basin, leaving it largely intact for three thousand plant species and multitudes of animals. The Maya never settled the basin in large numbers, but a small village was resettled when the basin became a reserve.

HAVING FIVE DIFFERENT species of rare cats in a single basin provides an extraordinary opportunity to learn about the niche each one occupies. Besides Rabinowitz and Nottingham, University of Florida graduate student Michael Konency, working on a National Geographic Society grant, launched a study of the Cockscomb's small felines: ocelots, margays, and jaguarundis.

Ironically, most Americans know cheetah, lions, tigers, and leopards from Africa and Asia—they are the subjects of television documentaries and are constantly covered in magazine articles—better than any of the American cats. Their absence from television and other media is attributable to the paucity of information about all of them, except perhaps the mountain lion. Rabinowitz is blunt about it: "It's appalling how few studies have been undertaken to understand the cats of the Americas."

One thing is certain of the cats still found in Belize, they have been eliminated from vast stretches of their historic ranges. Jaguars once occurred in the Southwest of the United States, but are now extinct. The last sighting was in Texas in 1950. Ocelots, which were also relatively common in the Southwest and as far east as Mississippi, have been re-

duced to a single remnant population of 35 cats in a genetically isolated reserve in southern Texas. There is some evidence that the United States may have been the northernmost range for the margay, which is now found only in the rapidly disappearing rainforests in Central and South America. The last jaguarundi documented in the United States was a road kill in 1986.

The disappearance from most of Mexico of the jaguar, ocelot, and margay together with habitat destruction and organized fur market operations in Amazonia led to their inclusion on Appendix I of the CITES endangered species list, a classification reserved for the world's most critically endangered creatures. These cats also enjoy protection under the U.S. Endangered Species Act, which forbids U.S. citizens from trading in cat parts or products anywhere in the world. Yet jaguar- and ocelot-skin coats can still be openly purchased in Europe. And throughout their historic ranges, agricultural development and habitat-slicing highways continue to carve up the cats' traditional haunts—isolating populations, stagnating gene pools, and eventually eliminating whole populations.

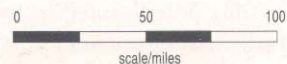
When Rabinowitz, Nottingham, and Konency took up the quest to learn



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more about these mysterious felines in the mid-1980s, their task was a formidable one, only made possible by new radio telemetry techniques and technology, which allowed researchers to plot cat movements day and night. Diet was assessed by sifting through scat to identify remains of the last meal. Talking with the Maya who had hunted in the region, and chance meetings with cats constituted the other data-gathering techniques.

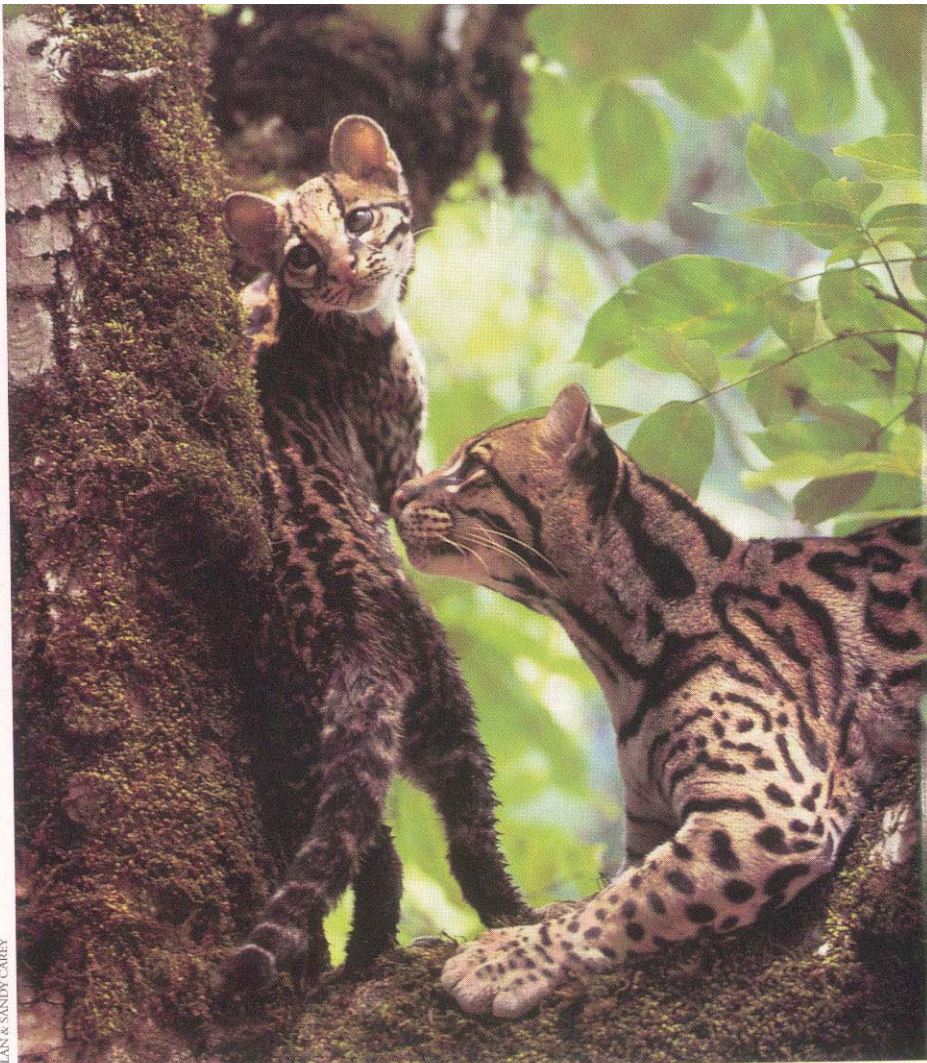
In the lexicon of field biologists "resource partitioning" was an area of keen interest. Rabinowitz recalls, "We asked ourselves which part of the habitat did each cat exploit, to what degree is there overlap, competition, avoidance, and communication?"

Rabinowitz, now a leading figure in wild cat research for the Wildlife Conservation Society, refers to what we know about America's wild cats as "a scratch on the surface." Still, the findings offer new insights for management of these species.

THE JAGUAR (*Panthera onca*) is the third largest feline in the world and the largest in the Americas. At first glance it looks much like a leopard, but is usually more massive through the front legs, neck, and head. The males have especially big heads with thickly built jaws, suitable for crushing bones. A large jaguar may weigh as much as 200 pounds and is powerful enough to dispatch anything in the forest, even an adult tapir weighing three times more.

Despite their physical prowess, the jaguars Rabinowitz studied ate mostly pacas (a hare-sized Central American rodent), the smallish brocket deer, and armadillos, which are an easy catch because of their noisy foraging habits. Armored armadillos probably aren't the tastiest jaguar cuisine in the forest, but they were the most available food source at the time. "Jaguars simply take what is available," explains Rabinowitz. "But because of their size they can capture large animals, which allows them a food resource not available to the smaller cats."

In territories as large as 25 square miles, the Cockscomb jaguars live solitary lives, avoiding one another as much as possible. They communicate through scent with potent-smelling urine and feces placed as signposts to other jaguars. "There was no evidence of territorial



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boundaries being established through fighting, but as soon as a jaguar died its territory was added to the territory of neighboring jaguars. The territories are contiguous, allowing a cat to operate next to other cats, but without direct competition," explains Rabinowitz. "The movements of male jaguars within their range is often highly concentrated. The males often stayed in a small area of about two square miles for up to a week. Here they hunted, mostly at night, in an area they came to know intimately."

More than the other wild cats, the jaguar has been persecuted as an alleged menace to people and livestock. Human deaths caused by jaguar attacks are rare and haven't been documented in Belize, Guatemala, or southern Mexico in recent years. Yet their reputation as dangerous animals persists. Most meetings between humans and jaguars amount to a fleeting glimpse. Jaguars have developed a strong

avoidance of people that may date to the ancient Maya, who both worshiped and killed them for their skins.

Rabinowitz set up a study in the Cockscomb in 1986 to test the big cat's reputation as a stock killer. By monitoring a group of jaguars whose ranges included livestock raising areas, Rabinowitz concluded there are "non-problem jaguars" and "problem jaguars." Most cats were non-problem jaguars who avoided villages and cattle in open pastures. One male would walk within 200 meters of grazing cattle and veer back into the forest without attacking them. Another cat, whose territory extended into privately owned citrus orchards and cattle ranches, regularly traveled down a narrow forest corridor without molesting the cattle, preferring cover to open areas.

However, when stock wandered into the forest of a non-problem jaguar, the cat didn't hesitate to take it. Domestic pigs

TONY RATH



WENDY SHATTL & ROB ROZINSKI



Top: The margay (*Felis wiedii*) hunts only between 1:00 and 5:00 A.M. Most arboreal of Belize's cats, the margay has loosely jointed rear feet and can catch itself with one outstretched paw when leaping between branches. By stalking rodents and birds only at night and only in trees, the margay avoids competing with other, larger cats.

Above: Sometimes called the otter cat, the jaguarundi (*Felis yagouaroundi*) can inhabit dense rainforests or dry brushlands. Jaguarundis stay mostly on the ground traveling enormous distances. Despite its small size, a male jaguarundi can cover a territory four times larger than a jaguar's.

staked out in the forest far from people were eaten. Two dogs left tied to a tree outside of a village by Mayan Indians were also killed by jaguars. Yet "tracks of jaguars came within 90 meters of a camp, but always circumvented the area," notes Rabinowitz.

Problem jaguars proved more apt to take domestic animals. In most cases a problem jaguar had previous injuries that compromised its ability to hunt. One female with a canine tooth missing was moved into Rabinowitz's study area from northern Belize where it was captured after killing cattle. Upon release this cat

wandered into pastures and killed calves until it was shot. Ten of the thirteen carcasses Rabinowitz examined showed prior injuries—missing canine teeth or gunshot wounds. Only one was a prime adult male. Examination of bodies of non-problem jaguars, that were killed for "preventative reasons" in areas where no stock had been taken, showed no signs of previous injuries. Rabinowitz also discovered that "reports of livestock deaths by jaguars could not always be substantiated. In Brazil it was found a small number of cattle are lost due to jaguars compared to diseases, drownings, and starvation."

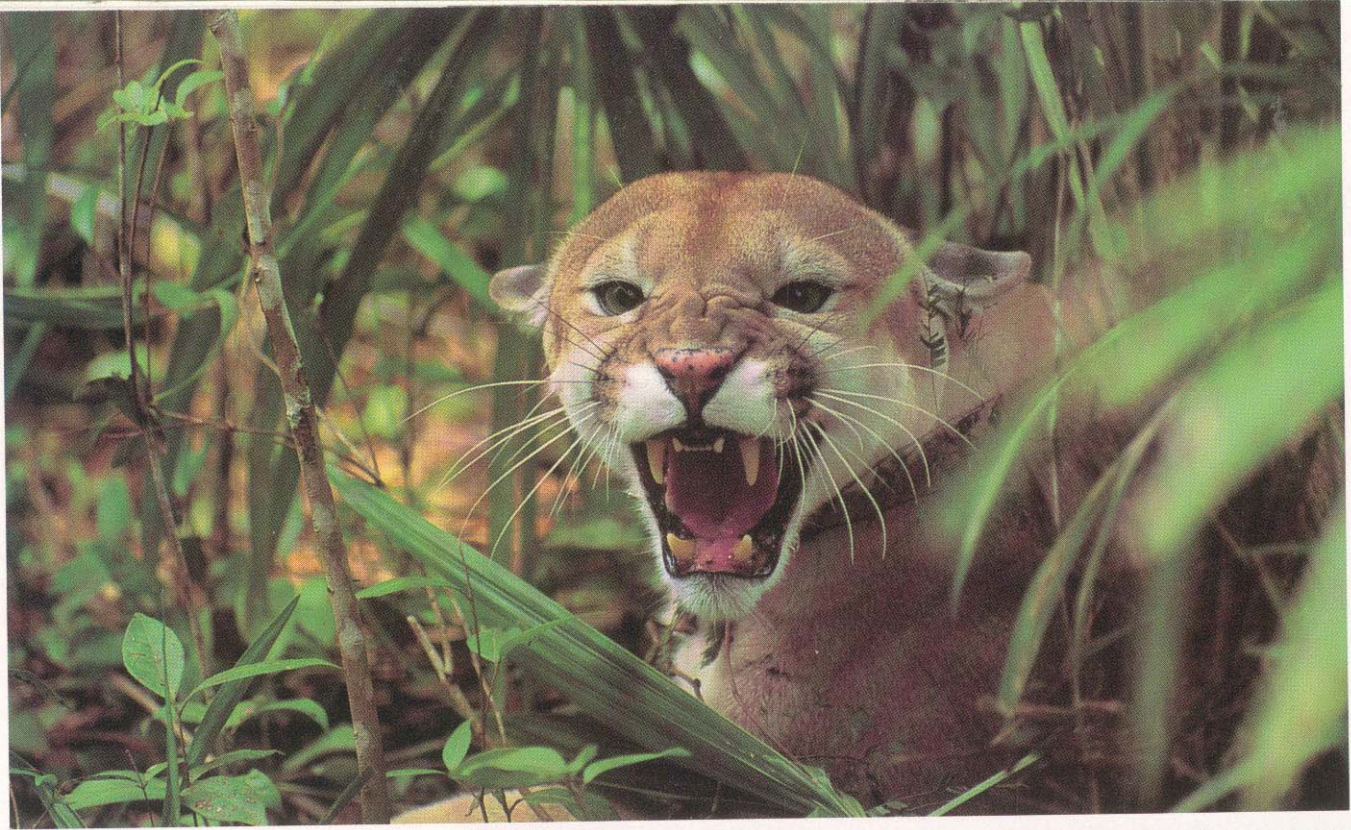
THE TINY MARGAY (*Felis wiedii*) is the least known cat in the Americas because it is so secretive, entirely nocturnal, and rarely reveals itself to people. Michael Konency lifted their veil of secrecy a bit with the help of radio collars.

Margays sleep aloft, where they also hunt. Between 1:00 A.M. and 5:00 A.M. they creep and leap from branch to branch, making meals out of a long list of arboreal rodents and a wide range of birds. Margays demonstrate textbook definitions of two kinds of resource partitioning. Their nocturnal regime is an example of "temporal partitioning"—active only during the night and early morning, they leave the rest of the day to other predators. Living above the other cats exemplifies "spatial partitioning," which affords margays their own "space" with their particular food species, and extra safety.

When it comes to good looks and high-wire athleticism few cats can compete with the margay. It has large round eyes, slightly oversized ears, and comes in a striking yellow-and-black polka-dotted coat that glistens as if it were paint. The margay's anatomical adaptations include loosely jointed rear feet that allow it to descend a tree headfirst rather than the backing-down method used by most cats. It also possesses proportionately longer claws than other species. These characteristics, plus its lightweight body and daredevil disposition, make it well suited for life in the trees. When leaping from one tree to the next it can catch itself with a single outstretched paw. One account by a researcher in Brazil described a margay "ricocheting through branches, neither losing balance nor speed."

Nobody knows how many margays there are. However, even assuming they are doing well within their rainforest domains, the overall picture is bleak. Deforestation will have destroyed about 90 percent of the margay's habitat in Central America by the year 2000, according to Archie Carr, who assesses conservation programs in Central America for the Wildlife Conservation Society.

THE JAGUARUNDI (*Felis yagouaroundi*), the other small cat of the Cockscomb, is only slightly larger than the margay, weighing between 10 and 20 pounds. It is a cat in perpetual identity crisis. Known as the "otter cat," it is often



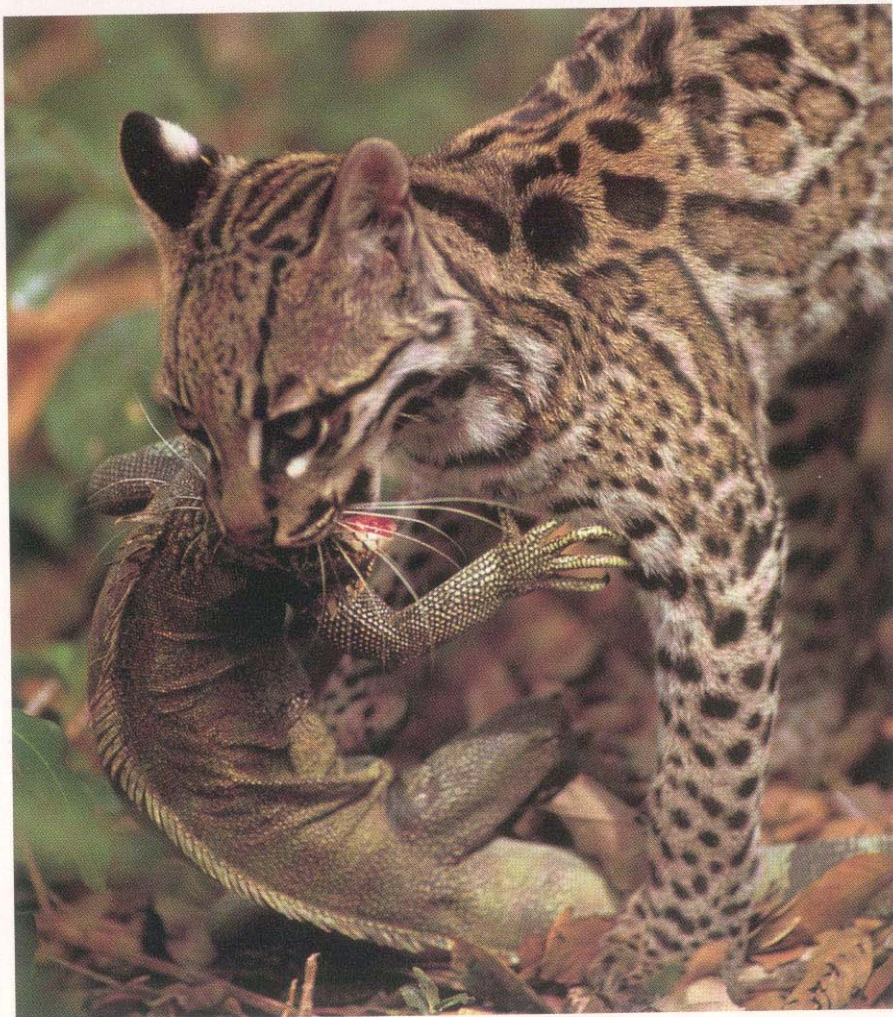
TONY BATH

confused for a member of the weasel family because of its long body, short legs, smallish head and ears, and solid coloration. Identifying jaguarundi tracks is easy because the cat's toes are significantly longer than those of other cats. Its coat ranges from black to reddish brown.

The jaguarundi is a generalist compared to the margay and it is found in a variety of habitats. Two subspecies once lived in the southwest United States and sightings are still reported there from time to time. However, according to Michael Tewes, who heads the Caesar Kleberg Wildlife Research Institute's feline program in Texas, "many of the sightings are of feral cats or raccoons." Tewes would one day like to re-establish jaguarundis in the United States.

A graduate student working with Tewes live-trapped jaguarundi 150 miles south of the U.S. border in Mexico, proving the jaguarundi is widely distributed and adaptable. It lives in the wettest rainforests of Belize and the dense dry chaparral brushlands of northern Mexico. In Mexico it has a reputation as a chicken thief, proving its adaptability may extend to living near people while avoiding them—a true litmus test for survival.

Konency radio-collared four jaguarundis in the Cockscomb and discovered territorial behavior that defies easy explanation. That jaguarundis are day hunters was already well known. The surprise was that the males Konency col-



ERWIN & PEGGY BAUER

Above: An ocelot makes a meal of a green iguana. These entirely carnivorous cats hunt rodents primarily, supplemented by birds, snakes, lizards, and other vertebrates. Ocelots themselves are still hunted for their coats, although the cats are protected by wildlife trade laws.

Opposite: In Belize, the cougar (Felis concolor) has a distinctive reddish coat and weighs half as much as its North American counterpart. Cockscomb cougars rarely reveal themselves, though tracks and scat are sometimes seen.

lared were incredible wanderers. One male roamed nearly 70 square miles of jungle. His travels included scaling a 3,000-foot escarpment, and then climbing back down. Jaguarundi rarely retraced their steps, even when they returned to the area where they were first captured. The females proved to be much more sedentary than males, staying within a small territory of about ten square miles for about a year at a time.

The male jaguarundi's behavior flies in the face of conventional wisdom about cats. Generally, the larger the cat, the greater the territory it needs. Not so with the jaguarundi. Jaguars in the same habitat, weighing ten times more than a jaguarundi, may occupy a territory less than one quarter the size.

In the Cockscomb, 90 percent of the jaguarundi's diet consisted of small terrestrial mammals, which were consistently smaller than the creatures eaten by larger cats. Jaguarundi also seem to appreciate fallen fruit more than other cats do.

Unlike the margay, whose arboreal lifestyle generally protects it, the small, mostly ground-dwelling jaguarundi must constantly worry about becoming a meal to the larger cats. By hunting during daylight hours, when jaguars, mountain lions, and ocelots are less active and easier to spot, and by rarely retracing its steps, the jaguarundi minimizes the chance of being caught by a larger predator laying in wait on a heavily scented trail.

WEIGHING UPWARDS of 35 pounds, the ocelot (*Felis pardalis*) is the mid-sized leopard-marked cat of the Americas. The ocelot is a striking creature with a supple, narrow body adorned in a yellow coat intersected by black horizontal bars and blotches that create effective camouflage when the cat walks through combinations of shadow and light.

The cats Konency radio-collared in Belize proved to be nocturnal hunters but were most active near daybreak. They made only occasional movements during the day. The ocelots usually settle for rat-

sized mammals, but their scat also revealed some success with mid-sized possums, armadillos, and an occasional diminutive brocket deer. The ocelots are active cats that make the most of their territories, crisscrossing and backtracking along familiar routes in partially-overlapping territories ranging from ten to 20 square miles. They seem to have no preference for a particular habitat, spending equal time in dense secondary forest and mature forests, and also flourishing outside of the rainforest wherever there is adequate cover. Rabinowitz thinks ocelots compete most directly with jaguars and mountain lions, which hunt many of the same animals. Jaguars have been known to aggressively pursue ocelots they encounter, but in general cats of the different species stay clear of one another by paying attention to scents, staying alert, and by operating in different parts of the forest, often at different times of the day.

The ocelot is the only one of the three yellow-and-black-marked cats that can still be found in the United States, and its status there is extremely tenuous. According to Tewes, who has spent nine years studying ocelots in southern Texas, the cats prefer almost impenetrable arid chaparral brush that only occurs on about 2,000 acres of the 45,000-acre Laguna Atacosa National Wildlife Refuge where they live. "Lack of suitable habitat is the challenge we must face before the cats expand," explains Tewes, whose Texas A&M-based Caesar Kleberg Wildlife Institute's Feline Research Program, at Kingsville, is the only program addressing the conservation of ocelots in the United States.

Despite the desperate plight of the last known U.S. population, Tewes is guardedly optimistic. "We're working with private landowners and governmental agencies to develop habitat restoration that may allow dispersal to take place."

THE MOUNTAIN LION (*Felis concolor*) in the Cockscomb is a reddish color and is called the "red tiger." It weighs only 70 pounds, which is half the size of its light-colored North American counterpart. In fact, the Belizean version may be a subspecies that is yet to be officially designated. So far, attempts to catch one in the Cockscomb have failed. This elusive cat is primarily known through its tracks, occasional sightings, and frag-

ments of prey species found in its scat. It eats mostly mid-sized and small creatures, a diet similar to ocelots and jaguars. The mountain lion is the most widespread cat in the Americas, living from central Canada to Patagonia in South America, where its adaptable diet includes everything from field mice to rabbits, deer, and guanacos.

According to Belizeans involved in the Cockscomb, adaptability of the local Maya living in the nearby forests is the key to the sanctuary's long-term success. Ernesto Saqui explains, "When I first became involved, a Peace Corps worker and an American scientist were the ones trying to run things," he recalls. "They didn't know what to say to the local people who had been removed from the basin and resettled at Maya Center. How are they to make a living? Could they adjust to a new lifestyle with their pride? The Maya were told that there would be no more hunting and farming where they had lived. I knew how they felt. I also know what's at stake from a conservation viewpoint."

The sanctuary now employs eight Mayan wardens and watchmen and they appreciate the importance of conservation, says Saqui. The village is establishing businesses and crafts to cater to tourists. Therese Bowman Rath, the president of Belize Audubon, the strongest conservation lobby in the country, and the overall manager of the Cockscomb, says, "Ernesto is the key because he is respected by the Mayans and can convince them to give the sanctuary a chance. Winning the hearts and minds of the locals is essential, and so is developing economic stability for everyone involved."

During my stay in the Cockscomb, night watchman Alphonso Ical, from Maya Center, casually described the jaguars that passed within 100 yards of headquarters when he made his nightly rounds. "Seeing a jaguar is good because it helps the night pass faster," he says. "Last week I saw a female and two cubs. The sanctuary was made for the jaguars, so it is good we are seeing them." □

ERIC HOFFMAN is a journalist specializing in nature related subjects. He is the author of *Adventuring in Australia*, published by Sierra Club Books, and has recently completed a guidebook to Belize.