

## Can They Stay Out of Harm's Way?

By J. MADELEINE NASH

The morning was just starting to heat up when a biologist, Ricardo Costa, set out to look for jaguars on Fazenda San Francisco, a 30,000-acre cattle ranch, rice farm and wildlife reserve in the region of south-west Brazil known as the Pantanal.

Soon, along a fringe of scrubby woodland, Mr. Costa spotted a young male jaguar lazing in sun-flecked shade. "It's Oreilha," he whispered, pointing out the tear in the animal's right oreilha, or ear.

As Mr. Costa watched from the driver's seat of a Toyota truck, the animal stretched and yawned, exposing teeth strong enough to crunch through the skull of almost anything. "Wonderful!" he said.

The jaguar, *Panthera onca* — the largest cat in the Americas and the third largest in the world — still prowls the rangelands of the Pantanal, a 74,000-square-mile mosaic of rivers, forests and seasonally flooded savannas that spill from Brazil into neighboring Bolivia and Paraguay.

From the jaguar's perspective, this vast, wildlife-rich area probably seems close to a slice of heaven — or, at least it would if the big cats were not routinely hunted down in retaliation for cattle losses.

Mr. Costa, for example, said that he worried about Oreilha and his more skittish brother, Grandão. Two years ago, he said, an older, larger male who patrolled the same territory was killed when it ven-

When jaguars kill cattle, ranchers retaliate. Now conservationists are trying for a truce that could save the Americas' biggest cat.

tured onto a neighboring ranch.

And now Fernando Azevedo, the senior scientist with whom Mr. Costa has been working, says he has lost 4 of the 14 jaguars he was starting to study at Fazenda São Bento, about 60 miles from San Francisco.

Once again, it appears, the animals were picked off when they wandered away from a ranch where they are protected, onto adjoining properties. Among the casualties, Dr. Azevedo suspects, were an adult female and her two nearly full-grown cubs. Convincing ranchers and ranch hands to end such killing has become a priority for conservationists in the region.

The importance of the Pantanal was underscored last October when Thomas Kaplan, executive chairman of the foundation Panthera, an emerging force in big cat conservation, finalized the purchase of two large ranches and signed an agreement to buy a third, creating a property that will soon total more than 400,000 acres.

The ranches, which will be run by Panthera, are

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**PREDATOR AND PREY** In the Pantanal region of Brazil, a jaguar on the Fazenda San Francisco ranch, top, and cattle being watched by a Pantaneiro cowboy, above.

FINDINGS | John Tierney

## In 2008, a 100 Percent Chance of Alarm

I'd like to wish you a happy New Year, but I'm afraid I have a different sort of prediction.

You're in for very bad weather. In 2008, your television will bring you image after frightening image of natural havoc linked to global warming. You will be told that such bizarre weather must be a sign of dangerous climate change — and that these images are a mere preview of what's in store unless we act quickly to cool the planet.

Unfortunately, I can't be more specific. I don't know if disaster will come by flood or drought, hurricane or blizzard, fire or ice. Nor do I have any idea how much the planet will warm this year or what that means for your local forecast. Long-term climate models cannot explain short-term weather.

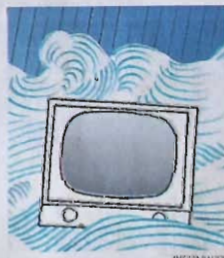
But there's bound to be some weird weather somewhere, and we will react like the sailors in the Book of Jonah. When a storm hit their ship, they didn't ascribe it to a seasonal weather pattern. They quickly identified the cause (Jonah's sinfulness) and agreed to an appropriate policy response (throw Jonah

overboard).

Today's interpreters of the weather are what social scientists call availability entrepreneurs: the activists, journalists and publicity-savvy scientists who selectively monitor the globe looking for noteworthy evidence of a new form of sinfulness, burning fossil fuels.

A year ago, British meteorologists made headlines predicting that the buildup of greenhouse gases would help make 2007 the hottest year on record. At year's end, even though the British scientists reported the global temperature average was not a new record — it was actually lower than any year since 2001 — the BBC confidently proclaimed, "2007 Data Confirms Warming Trend."

When the Arctic sea ice last year hit the lowest level ever recorded by satellites, it was big news and heralded as a sign that the whole planet was warming. When the Antarctic sea ice last year reached the highest level ever recorded by satellites, it was pretty much ignored. A large part of Antarctica has been cooling recently, but most coverage of that continent has focused on one



small part that has warmed.

When Hurricane Katrina flooded New Orleans in 2005, it was supposed to be a harbinger of the stormier world predicted by some climate modelers. When the next two hurricane seasons were fairly calm — by some measures,

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SERAILIONS GEORGES

MIND | Benedict Carey

## The New Year's Cocktail: Regret With a Dash of Bitters

# Can the Biggest Cats in the Americas Stay Out of Harm's Way?

From First Science Page

particularly important because they connect previously isolated wildlife preserves. Now, jaguars will be able to travel safely from one sanctuary to the other.

"With jaguars we have the opportunity to play offense," said Dr. Kaplan, an entrepreneur and financier who in 2006 founded Panthera. There are certain areas, like the Pantanal, where the wind is at your back."

Dr. Kaplan said that Panthera's plan was to continue running cattle on the ranches while testing a broad range of techniques for reducing livestock-jaguar interactions. The results, he hopes, will encourage others to adopt range management practices that encourage co-existence over conflict.

At stake in the Pantanal, conservationists say, is a significant fraction—perhaps 15 percent—of the world's remaining population of jaguars.

Cattle ranching and jaguar conservation do not need to be mutually exclusive, said Alan Rabinowitz, executive director of the science and exploration program at the Wildlife Conservation Society, based in the Bronx.

"Cattle open up the landscape," Dr. Rabinowitz said, and enhance habitat for the jaguar's wild prey. "If you were to take out the cattle and let large areas revert to scrubby vegetation, you'd have far fewer jaguars in the Pantanal than you do today."

Jaguars can also provide ranchers with an additional source of income. For example, several ranches in the Pantanal, San Francisco among them, run ecotourism operations that have turned a liability into a valuable asset.

Conservationists say that the next decade will be pivotal for jaguars in the Pantanal and throughout its range, which runs from northern Argentina to the borderlands shared by Mexico and the United States.

No one knows the precise rate at which the number of jaguars is declining or just how many jaguars there are. But the World Conservation Union pegs the total free-ranging population at fewer than 50,000 adults and classifies the animal as near threatened.

Jaguars may not yet be in such desperate shape as Asian tigers, whose nonreproductive population has plummeted below 2,500, or African lions, of which there are perhaps only 20,000 to 30,000 left in the wild. But if conflicts with people and their livestock are not soon resolved, conservationists warn, jaguars could quickly trace a similar trajectory.

At first pass, the conflict between jaguars and ranchers would seem to be intractable. "The cats are where the cows are, and the cows belong to people," said Almira Hoogesteijn, a research veterinarian at the Center for Research and Advanced Studies of the National Polytechnic Institute in Mexico.

Even though jaguars kill and eat cattle, they do so less often than one might imagine.

A quantitative picture of the dietary habits of jaguars emerged from a study conducted by Dr. Azevedo at San Francisco in 2003 and 2004.

Over the course of nearly two years, Dr. Azevedo and his field assistants collared 11 adult jaguars and tracked their movements. They also methodically collected their scats and examined the carcasses of their prey.

The contents of the scats revealed that the giant rodents known as capybaras were the jaguars' most common prey, followed by caimans and marsh deer. Of 113 carcasses confirmed as jaguar kills, capybaras made up 35; caimans, 23, and cattle, 32.

Dr. Azevedo, a predoctoral fellow at the University of São Paulo, then meas-



PHOTOGRAPHS BY THOMAS NARA

**TRACES** A jaguar kill at Fazenda São Bento, above. At another Pantanal ranch, below, a biologist, Ricardo Costa, examines scat from a jaguar.

ured the cattle that were killed against a larger background.

In all, 169 cattle deaths occurred at San Francisco during the study period, he and his former thesis adviser, Dennis Murray of Trent University in Canada, reported in the September issue of *The Journal of Wildlife Management*. Nineteen percent were lost to jaguars. Out of a 5,000-head cattle herd, the jaguar's take faded even more in significance: it amounted to less than 1 percent.

San Francisco keeps its jaguars in line with a variety of tactics, said the ranch's owner, Roberto Coelho. Among the strategies is using bulls and older cows with horns to "baby-sit" young, clueless animals and immediately moving cattle away from a paddock whenever depredation occurs.

In addition, Mr. Coelho said, San Francisco's extensive rice fields are an effective barrier between the cattle paddocks and the property's riparian forests. Among the important things to understand about jaguars, depredation experts say, is that they like to hang out in wooded areas close to water.

Consider the problems that Teresa Bracher has been having on the four ranches she owns in prime jaguar habitat along the Paraguri River, the Pantanal's main artery. For a time, depredation losses may have approached 8 percent, said Ms. Bracher, a committed conservationist as well as a rancher.

For assistance, Ms. Bracher turned to Peter Crawshaw Jr., a leading Brazilian jaguar expert based at the Pantanal National Park. Dr. Crawshaw suggested a

series of six ranches in Venezuela. On three, they note, jaguars managed to snatch a few calves when the buffaloes were first introduced. Then the herds learned to defend themselves, and the jaguar attacks ceased.

These intimidating herbivores, the Hoogesteijns found, appear to surround cattle in a broad, protective umbrella. On the Venezuelan ranches, jaguars preyed upon cattle significantly less often when they were placed in the same paddocks as buffaloes.

"With cattle, you will always have losses," said Rafael Hoogesteijn, who has agreed to become the supervisor of Panthera's ranching operations in the Pantanal. "But with buffalo, you can have true co-existence."

What frustrates conservationists here is that multiple techniques for minimizing the problems caused by jaguars exist, and the first, instead of being a last resort, the first reaction too frequently is to pick up a gun.

This occurs despite the fact that the jaguar is protected in Brazil, as, indeed, it is across most of its range. Enforce-

ment is not always strictly enforced. Thirty-eight percent of ranked jaguars as a larger source of economic loss than floods, droughts, rustling and disease.

Ranchers, depredation experts have found, tend to exaggerate their losses to jaguars. In part, that is because jaguars are eager scavengers and so can be observed feeding at carcasses they played no part in killing. But the tendency to exaggerate also stems from ranchers' often being unaware of the extent to which diseases like leptospirosis and brucellosis rob them of their profits. These diseases, Dr. Hoogesteijn said, attack the reproductive tract of cows, causing abortions and stillbirths. On one large Venezuelan ranch, he once calculated, the annual loss from problem pregnancies and births amounted to 400 of 3,000 "potential calves," or 13 times the number of real calves and many have been killed by jaguars and pumas.

Sometimes, problem jaguars do exist. And not a few bear old gunshot injuries that handicap them in stalking and killing wild prey. Some conservationists



THE NEW YORK TIMES SATELLITE PHOTOGRAPHS BY NANA

concede that hunting a problem animal may sometimes be a solution.

But more headway may be made by focusing on the human side of the problem, said Silvio Marchini, a wildlife biologist who worked in the Pantanal before moving to the Amazon. "There's an assumption that the reason people kill jaguars is because they cause economic damage. But social and cultural attitudes may also be very important."

As Marcos Moraes, the owner of São Bento, put it, "We need a new generation to come along and change the old ways of thinking."

In the Pantanal, jaguar hunting is part of a tradition as deeply ingrained as fox hunting once was in the English countryside—except that here, it is not the well-to-do landowners who most enthusiastically join the chase but their hired hands, the Pantaneiro cowboys.

For them, jaguar hunting is a form of bush entertainment, said Sandra Cavalcanti, a jaguar expert who will soon receive her Ph.D. from Utah State University.

There's also a macho component. "Killing a jaguar is considered a manly thing to do," Ms. Cavalcanti said.

Later this year, Ms. Cavalcanti, who has joined the staff that Panthera is assembling, hopes to begin addressing this problem by starting a cowboy outreach program, which could include things like medical services, instruction in range management and depredation control.

Jaguars in the Pantanal seem to be on a teeter-totter that could tilt strongly in one direction or the other. Given the stakes, Ms. Cavalcanti said, researchers no longer have the luxury to just study these elegantly patterned beasts. "To save them, she said, "we have to act."

## 'The cats are where the cows are, and the cows belong to people.'

spectrum of nonlethal jaguar deterrents, Ms. Bracher said, and she and her cousin, who runs the cattle operation, have implemented every one.

Among other things, they deployed guard dogs and surrounded their cattle with electrified fencing. They installed bright lights around the paddocks and instituted regular patrols. They even set off noisy fireworks at night, when jaguars are most active.

As a result, depredation has significantly declined. Like many other ranchers in the area, Ms. Bracher is wary of one antipredation measure: substituting water buffaloes for cattle. Water buffaloes easily turn feed, creating a problem as large as the one they are supposed to solve.

But, said Rafael Hoogesteijn, a Venezuelan veterinarian who is an internationally respected depredation expert, a properly managed water buffalo herd can be as close to predator proof as a group of ungulates gets. When a jaguar or puma appears, water buffaloes protectively encircle their young. They will even nudge the predator by advancing on it, with the big bulls in the lead.

In a soon-to-be-published study, Dr. Hoogesteijn and his sister, Almira, report on the experience with water buffa-



PHOTOGRAPHS BY THOMAS NARA

ment, however, it is all but nonexistent.

As Dr. Hoogesteijn and others see it, the current system of incentives is perverse. Ranchers are not penalized for shooting jaguars, but they also are not rewarded for resolving predation problems in an ecologically sensitive way.

Programs that compensate ranchers for their losses might help, some believe. Others note that such programs are costly and, if badly designed, can perpetuate poor range management practices.

A survey of 50 ranchers in the northern Pantanal published two years ago suggested that the people there were deeply conflicted where jaguars are concerned. Well over half of the respondents said that they could not tolerate jaguars on their own ranches, and yet nearly three-quarters thought jaguars should

## Observatory | Henry Fountain

### No Picky Eaters Among Successful Argentine Ants

The Argentine ant is a very successful invasive species, having conquered territories far from its native South America. Once introduced, it spreads across the landscape, displacing local ant species and making an agricultural pest of itself.

Researchers from the University



### Recognizing Stripes, Not Faces, Software Tracks Whale Sharks

Facial recognition software holds great promise, but the jury is still out on how effective it is now. The software, which compares patterns from one biometric image of a face to a database of images, usually proves particularly good at picking criminal out of a crowd, for instance.

In an Australian scientist is

having better luck with software that can identify individual whale sharks. It uses an analysis of their faces, but rather than facial patterns it spots and tracks stripes on the fish's skin.

Dr. Ian Norman of Monash University in Perth worked with computer programmer Jason Hobbins, and a NASA scientist, Zaven Arzumani, to adapt software originally designed for recognizing faces to recognize patterns of stars and stripes on whale shark skin.

Using thousands of photos submitted by researchers and others through a conservation organization, Ecocean, funded by Dr. Norman, the researchers were able to identify individual whale sharks around Nagabo Reef in Western Australia, a prime hunting area for these huge fish.

This paper to be published this month in the journal *Ecological*



PHOTOGRAPH BY DAVID J. PHILLIPS FOR THE NEW YORK TIMES

The skin of whale sharks has individual patterns.

Applications, the researchers report, suggest identifying many individual sharks from a year's survey, suggesting that the shark population, in that part of the ocean at least, is healthy.

### A Slippery Slope Is the Secret Weapon

walk around it without hurting it. But when it was wet, because of