IN DEPTH

An uncontacted Amazon tribe watches a plane in a 2010 photograph.

PHOTO: © GLEISON MIRANDA/FUNAI/SURVIVAL

INDIGENOUS PEOPLES

Uncontacted tribe in Brazil emerges from isolation

Anthropologists worry about the threat from novel infections and conflicts with other tribes

By **Heather Pringle**

In a terse, one-page announcement last week, Brazil's Indian affairs department (FUNAI) let it be known that an isolated tribe in the Amazon region had just taken a momentous and potentially tragic step. Emerging from dense rainforest along the Upper Envira River in the state of Acre, Brazil, the group willingly approached a team of Brazilian government scientists on 29 June and made peaceful contact with the outside world.

The event—Brazil's first official contact with an isolated tribe since 1996—was not entirely unexpected. Since early June, fearful villagers in the region had radioed Brazilian authorities at least twice about a group of some 35 tribal strangers who were raiding their crops and trying to make off with machetes and other tools. Recognizing the potential for trouble, FUNAI dispatched a team of specialists, including medical personnel and Brazilian anthropologist José Carlos Meirelles, an adviser on indigenous matters to the government of Acre.

FUNAI's swift response is commendable, says anthropologist Kim Hill of Arizona State University, Tempe, who has conducted extensive fieldwork among Amazon rainforest tribes. Since 1987, the agency has maintained a no-contact policy, except in cases where a tribe's survival was deemed to be in peril. That was probably the case here, Hill notes. "There was a serious threat of violence between two native populations, and the intervention should eliminate that," he says. But Hill and others remain deeply concerned about the future of the newly contacted tribe as it encounters novel diseases and resource-hungry outsiders. As much as 60% of a newly contacted Nahua population in the Peruvian Amazon died between 1983 and 1985 from influenza, whooping cough, and other diseases caught from loggers, noted Beatriz Huertas Castillo, a private Peruvian scholar, in a 2004 report.

The massive Amazon rainforest holds the world's largest concentration of isolated tribes—at least 70 in the Brazilian Amazon alone, according to FUNAI. Many, if not most, have had at least fleeting contact with the outside world, particularly during Brazil's rubber boom in the late 19th and early 20th centuries, when rubber tappers made a practice of rounding up and enslaving indigenous tribespeople. After that, many populations fled to remote Amazon headwaters and cut off all contact with outsiders.

It is not yet clear what prompted the tribe along the Upper Envira River to end its long seclusion. The FUNAI field team has yet to identify the tribe's language, much less ask for its story, and has now requested the assistance of linguists.

But officials think the tribe most likely migrated from a large area in Peru that includes Murunahua Territorial Reserve and Alto Purús National Park, some 300 kilometers away (see map, p. 126). Although the land is protected on paper, illegal loggers there have built roads and set up base camps to cut down valuable mahogany. The logging is selective, but the heavy machinery may be frightening off wild game, an important source of food for isolated people.

The cocaine trade is also encroaching on the protected area, according to an online report in *GeoJournal* in 2011 by geographer David Salisbury of the University of Richmond and Chris Fagan, executive director of the Upper Amazon Conservancy in Jackson, Wyoming. Processors have set up camps to make cocaine paste, and heavily armed traffickers now use the tribes' traditional migratory trails to reach river tributaries in order to transport the product into Brazil. "On the Purús River, the number of conflicts between uncontacted tribes and both coca workers and loggers has increased in recent years resulting in deaths on both sides," Salisbury and Fagan wrote.

The newly contacted tribespeople may have been fleeing such conflicts, but Hill says that they may also have scouted out desirable resources such as game in the Upper Envira River area in Brazil. Or, he adds, "they might have discovered that they can raid weaker neighbors and get goodies."

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>
> **Kim Hill,** Arizona State University, Tempe

Either way, the tribe's decision to move and make contact with the outside world

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A homeland under pressure

Brazilian officials think the uncontacted tribe fled from illegal loggers and drug traffickers in two parks in Peru

leaves them vulnerable. The top priority now, says anthropologist Robert Walker of the University of Missouri, Columbia, is to prevent disease transmission by quarantining the area, giving access only to individuals screened by medical personnel, and providing food and medical care to the elderly and young, who are at the highest risk of infection. "Vaccinations are a possibility at some point," Walker says. But he adds that immunizations may frighten tribespeople, causing them to flee and carry "pathogens to currently uncontacted people."

In the end, Hill says, the fate of the newly contacted people may depend on whether FUNAI is willing to provide long-term medical monitoring and assistance, as well as a parcel of land that they can call their own. "So often in the past, people have been abandoned," says Fiona Watson, research director of Survival International, a nongovernmental organization based in London. "And that first year of contact is extremely important, because that's when you see these astronomically high figures of people dying."

More details about the tribe are likely to emerge soon, but there is little doubt, Hill says, that these people "would like interaction with more humans on the planet." Interviews with small populations generally show that they "remain isolated out of fear, not from some deep desire to avoid all other human societies." ■

NUCLEAR WEAPONS

Medical isotopes confound nuclear test monitoring

Gases from medical isotope plants can mimic the signature of a bomb, but makers say they will cut emissions

By **Chelsea Wald**, *in Vienna*

If a rogue nation tries to hide a nuclear test, a faint whiff of radioactive xenon leaking from the test site can unmask it. But a peaceful nuclear technology—the manufacture of medical isotopes—can produce almost identical emissions, confounding detection. Now, medical isotope–makers are pledging to help tame the problem; this month, the list of cooperating companies reached six.

At stake is a worldwide network of hundreds of detectors—including 80 for radionuclides—that the Vienna-based Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO) is setting up to sense any violations of the treaty, which 183 countries have signed and 162 have ratified (*Science*, 24 July 2009, p. 382). If plants' emissions mask the signal of an actual bomb, it will be much harder to verify an apparent violation and hold a country to account.

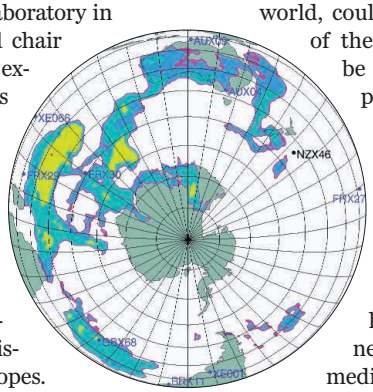
The problem came to light in the early 2000s, when scientists in Freiburg, Germany, were testing noble gas detectors for CTBTO. The detectors kept getting unexpected hits of radioxenon, says Ted Bowyer, a nuclear explosion monitoring expert at Pacific Northwest National Laboratory in Richland, Washington, and chair of the CTBT radionuclide expert group. It took 5 years of sleuthing using atmospheric modeling to trace the gas to plants making radioisotopes for imaging and therapy.

Medical isotope facilities fire neutrons from a nuclear reactor at a uranium plate, which is then dissolved to remove the isotopes. The process also creates short-lived radioactive xenon isotopes, which are vented as waste. The levels of radioactivity from the vented xenon are too low to cause health problems but high enough to trip CTBTO's alarms. When a sensor in northern Canada picked up xenon following North Korea's first nuclear test in 2006, the proximity of a large Canadian medical isotope plant reduced scientists' confidence in their conclusion.

CTBTO has little leverage over the isotope makers. What's more, producers are already under intense pressure to switch their reactor fuel from highly enriched to low-enriched uranium to reduce the risk of nuclear proliferation, says W. Randy Bell, director of CTBTO's International Data Centre in Vienna. Nonetheless, some have started to cooperate with CTBTO. So far, six have signed a pledge to keep emissions low, as well as to share their emissions data. Data sharing is helpful but "not a panacea," Bowyer says.

One solution is an extra-large activated-charcoal trap to hold the xenon until it decays away, says Johan Camps of the Belgian Nuclear Research Centre in Mol. "You will really have to build a new building," with shielding to protect people from the trapped radioxenon. Camps's team is also developing a new compact trap using a novel silver-exchanged zeolite material, which their tests have shown has 15 times the efficiency of activated charcoal.

A rash of new plant construction prompted by isotope shortages following production problems at older plants (*Science*, 21 January 2011, p. 277) may also offer an opportunity. Bell estimates that 20 new producers, many in the developing world, could come online by the end of the decade. Mitigation could be designed into the new plants from the start.



Test-ban monitors can trace xenon using atmospheric models.

With mitigation technologies yet to mature, however, scientists are nervous about a planned medical isotope plant in South Korea. It is among the plants that have agreed to limit emissions, but the stakes are high. After North Korea's last nuclear test on 12 February 2013, noble gas detectors in Japan were the first to identify a radioxenon signal. With tension high in the region, the last thing CTBTO's scientists want to contend with is a lot of false hits. ■

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