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Will mining company drive mass extinction of Madagascar's wildlife?

Madagascar's unique wildlife may be in serious trouble.

An invasive poisonous toad, called the Asian toad (*Duttaphrynus melanostictus*), is rapidly spreading across the island country, threatening the survival of its rare and endemic species, scientists say. Currently, scientists estimate that there are about 4 million toads on the island.

According to a recent report, the Ambotavy nickel refinery and mine, located close to the city of Tamatave, is most likely responsible for introducing the toads into Madagascar.

"We are extremely concerned with the current situation," James Lewis, Director of Operations at Amphibian Survival Alliance (ASA), told Mongabay. "Internal emails from Ambatovy staff seem to indicate they were aware of the increasing toad numbers over the three years preceding 2014 and acknowledge that they may very well have played a part in the introduction of this species."

The result of a single night's searching for the Asian toad around a small village near Farafaty, Toamasina, in Madagascar, illustrating

the plague proportions of this pest incursion. January 2016. Photo by James Reardon.

Mining company to blame?

Based on local observations and the current extent of invasion, experts estimate that the toads first arrived in Madagascar sometime between 2005 and 2010.

Since then, these toads have spread to an area of more than 100 square kilometers to the south and west of the city of Tamatave (Toamasina), a major shipping port on Madagascar's eastern coast. In fact, according to experts, the toads are only about two kilometers away from reaching a major canal system — the Pangalanes canal system — which will likely help them spread much more quickly to other parts of Madagascar, decimating wildlife populations.

A number of factors point towards Ambatovy mine as the probable culprit of the toads' introduction, experts allege in the report. First, is the pattern of the toads' invasion and distribution on the island.

The core area of the incursion is a region south of the city of Tamatave which has little economic activity, Christopher Raxworthy of the American Museum of Natural History, and a co-author of the report, told Mongabay. The only exception is the Ambatovy mine processing plant, he added, suggesting that this region is most likely the site of initial introduction of the toads.

In fact, Ambatovy processing plant began major construction at the site in 2007, supported by a Thailand-based construction company called Sriracha Construction Public Company Limited. Experts believe that Shiracha shipped considerable quantities of materials, supplies and equipment to Madagascar during the plant's construction, which could have accidentally brought in the toads.

Scientists have also found that as of November 2014, the area of invasion did not include the shipping port of Tamatave.

"Thus, the port itself was not the source of the invasion," Raxworthy said, "although future invasion of the port area by the toads could lead to their rapid expansion elsewhere in Madagascar."

Shipping records seem to confirm Ambatovy's role in the spread of the toads.

An independent source, who spoke on the condition of anonymity, said that "having examined the shipping records from southeast Asia, it has now been verified that the only ships coming from southeast Asia during that period, when the toads arrived, was that of the mining company."

Scientists suspect that activities associated with the Ambotavy mine processing plant may have accidentally introduced the Asian toads to Madagascar. Photo by James Reardon.

Scientists have also found a clue to the toads' source location in their DNA.

Genetic analysis indicates that the Asian toads on Madagascar originated from the same source population in southeast Asia, most likely from Thailand, Cambodia and Vietnam. This strongly suggests an introduction originating from this geographical region, the authors write in the report.

"Taken together, these data suggest that toads were probably accidentally shipped from Southeast Asia to an area south of Tamatave town, between 2005-10," Raxworthy said.

"This coincides in space and time to the major phase of construction of the Ambatovy Mine processing plant, which represents the dominant economic activity in this area. The plant has a direct rail link and road connections to the Tamatave shipping port, and substantial materials have been imported (primarily in shipping containers) during the construction and operation phases of the plant from 2007 onwards."

Local communities, too, believe that the toads arrived with the establishment of nickel-mining and processing facilities in the region. In fact, they even refer to the toads as the "Dynatec" toad, after Ambatovy's predecessor, according to the report.

Mongabay contacted Sherritt International, co-owners of Ambotavy mine, seeking responses to the conservationists' claims. Sherritt hasn't responded yet.

Sherritt, however, told BBC Earth that they are working "to support efforts to contain and or eradicate the toads", but have not acknowledged that the toads arrived on their containers.

Eradicating the toads

Conservationists are convinced though, that Sherritt's Ambotavy plant is most likely responsible for the accidental introduction of the Asian toads to Madagascar. And they are extremely worried.

"If eradication efforts are not implemented very soon, then we have to accept that the Asian Toad will spread across most of Madagascar, including within most reserves," Raxworthy said. "It will represent a sizable biomass and a novel toxic species within all of these biological communities."

The toads breed rapidly, producing around 40,000 eggs per year. They are opportunistic predators, scientists say, and eat almost anything they can swallow.

The toads are also a major health risk. They are known to be poisonous to other animals, including humans. For example, these toads have been implicated as the cause of multiple cases of human poisoning in their native range, and have also been associated with cardiac arrest and death in children who have consumed toad tissue.

Moreover, they can swiftly wipe out native predator snakes that are naïve to the poisonous nature of the toads. A reduction of large snakes on the island can then lead to a surge in black rat population, which can not only increase rat-borne diseases, but also have serious economic consequences.

Unsurprisingly, experts believe that steps to eradicate the toads need to begin immediately. Scientists have even started testing a number of eradication strategies, some of which have been quite successful, they claim.

"We have an excellent start with out trials demonstrating surprising efficacy of citric acid spray at achieving very high mortality — 100 percent for juveniles, those with a length of less than 35mm in our initial trials — and thus having the potential to massively reduce recruitment in the toads," co-author James Reardon, an eradication expert with New Zealand's Department of Conservation, told Mongabay.

Citric acid induces rapid dehydration of frogs due to osmotic imbalance, ultimately killing them. In fact, citric acid spray has been successfully used to eliminate Coqui frogs (*Eleutherodactylus coqui*) in Hawaii for many years, the authors write.

Asian toad, Duttaphrynus melanostictus, being measured to help understand how eradication methods target different age groups, near Farafaty, Toamasina Madagascar. Photo by James Reardon.

But eradication of a species like the Asian toad, over a large area, would be a logistical and technical challenge, Reardon said, one that would probably involve several years of the application of a number of different eradication methods used in synergy.

Large-scale eradication efforts are going to be especially difficult since the conservation community is quickly running out of funding to support this effort, experts say.

“To date, the feasibility study and current trials have been funded almost exclusively by the conservation community and our options for securing further funding to support eradication are almost at an end,” Lewis told Mongabay.

So conservationists are calling upon Ambotavy plant’s management committee to help with the toads’ eradication.

“If the arrival of the toad was a direct result of the development of the Ambatovy processing plant then we sincerely hope that the Ambatovy management, and all the investors in the project take immediate action to address this situation,” Lewis said.

“To date we have unfortunately seen no real attempt to address the situation in any significant way therefore

allowing the incursion area to expand and the potential threat to biodiversity in Madagascar to increase," he added.

Experts also say that the way the Asian toad invasion has been handled so far raises serious concerns about both the conservation community as well as the environmental claims of corporate responsibility and environmental sustainability made by big international businesses.

"Considering the global importance given to Madagascar's biodiversity, and the amount of money that has been spent on conservation, it is surprising how little effort is being made to eradicate these toads," Raxworthy said. "If someone proposed introducing these toads into Madagascar's reserves, conservationists would be rightly outraged. Yet by currently taking no action with this invasion, we are effectively facilitating this very outcome."

Citation:

- McClelland P., J .T. Reardon, F. Kraus, C.J. Raxworthy and C. Randrianantoandro. Asian Toad Eradication Feasibility Report for Madagascar. 2015. Te Anau, New Zealand. 75 p.