D14 Wildlife Forensic Examinations in the Largest Dam Collapse in the History of World Mining

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After attending this presentation, attendees will better understand the important aspects of wildlife forensics as applied to environmental disasters.

This presentation will impact the forensic science community by informing attendees about modern techniques and integrated approaches in wildlife and environmental forensic examinations.

The goal of this presentation is to describe the assessment and extension of the environmental damage caused by a huge mining dam break that occurred on November 5, 2015, in Minas Gerais, the state with the highest concentration of industrial mines in Brazil.

The dam, owned by two of the biggest mining enterprises in the world, has been considered the biggest disaster of its kind in mining history, given the volume of waste released (50-60 million cubic meters of tailings extending along an affected area of 600km and costing an estimated $ 5.2 billion (United States dollars) in environmental damage.

Since Brazilian law considers water pollution an environmental crime, the Brazilian Federal Police established an investigation into the causes and consequences of this disaster. From November 2015 to March 2016, a multidisciplinary team of environmental forensic experts made technical inspections along 600km of the Doce River to determine the damage on local wildlife caused by the waste discharge. Furthermore, the experts examined more than 70 technical reports written by government agencies and consultancy companies in charge of monitoring the effects of the catastrophe. Moreover, the Federal Police forensic service established technical partnerships for the exchange of information with the Brazilian federal environmental agency (Instituto Brasileiro do Meio Ambiente E Dos Recursos Naturais Renováveis (IBAMA)), research centers such as the Continental Fish Center of the Brazilian Institute for Biodiversity Conservation (ICMBio), and universities.

The forensic investigation determined the environmental impact on crustaceans, amphibians, reptiles, mammals, birds, invertebrates, and domestic animals. At least 29,300 fish carcasses (more than 13.9 tons) were found and collected at more than 60 sampling points along the river. The disaster occurred just before spawning, killing a large number of fish that went up the river to reproduce. Thus, the forensic analysis also estimated the effects of the pollution on the depletion of fish stocks for the following years.

In addition, more than 1,500 water and sediment samples were submitted for ecotoxicological tests during the first four months following the disaster. This set of data was analyzed to monitor acute and chronic damage caused by the tailings plume to the aquatic fauna.

Some of the species that suffered acute and chronic effects are officially classified as endangered or critically endangered, such as the endemic marine catfishes *Genidens genidens* and *Potamarius grandoculis*, the blue land crab (*Cardisoma guanhumi*), and the sea turtles *Dermochelys coriacea* (leatherback sea turtle) and *Caretta caretta* (loggerhead sea turtle). Forensic veterinarians and biologists analyzed approximately 130 records of animal health care and performed dozens of necropsies and histopathological analyses.

The current forensic examinations were crucial for proving the environmental crime caused by the dam break, showing the deleterious effects of pollution on the Doce River wildlife. In addition to registering and interpreting the evidence to press criminal charges, the forensic reports warned about the importance of continuous monitoring of chronic effects in aquatic, terrestrial, and migratory animals.

Dam Break, Wildlife, Environmental Forensic