

# How One Genetics Lab Monitors the World's Wildlife Crimes using SoftGenetics' GeneMarker® Software

Jim LeMay is used to getting mysterious packages in the mail. As a forensic scientist at the U.S. Fish and Wildlife Forensic Laboratory in Ashland Oregon, his job is to help solve wildlife crimes using genetics.



In the early 1990s, he was sent a lot of caviar from Wildlife Inspectors checking what was being imported at the country's Ports of Entry. At the time, the Beluga sturgeon (*Huso huso*) in the Caspian Sea were considered critically endangered because of overfishing and banned from commercial trade in the United States. Despite this, the roe (or eggs) fetched thousands of dollars per pound as caviar on the black market. It was LeMay's job to determine if suspicious caviar originated from legal species, like salmon, or black market sturgeon.

"It was a big issue at the time so we were getting a lot of caviar sent to us to ensure it was legal," he said.

Thanks in part to his work, fishery managers in the international community have a more accurate understanding of the black market trade in sturgeon caviar. However, other species, such as paddlefish and white sturgeon, have become critically endangered today due to the continued high price of rare caviar and the market shift from Caspian Sea sturgeon to American species.

## **Wildlife trafficking is a global issue**

The United States and China are the two of the biggest markets for illegally trafficked endangered species. However, wildlife trafficking and trading is truly a global issue.

The U.S. Fish and Wildlife Forensic Laboratory, where LeMay works with five other geneticists, is the only full service forensic laboratory in the world devoted to wildlife law enforcement. Its mission is to examine, identify, and compare evidence using a wide range of scientific procedures and instruments, in the attempt to link suspect, victim and crime scene with physical evidence.

The lab operates under the U.S. Fish and Wildlife Service, which has roughly 250 special agents throughout the United States and in various countries investigating wildlife crimes like poaching and illegal trafficking. It also has over 250 Wildlife Inspectors at Ports of Entry throughout the United States. The Wildlife Inspectors monitor shipments coming into and out of the U.S.

## **Piecing the crime together**

Much like a human case, LeMay and his colleagues are sometimes asked to match a hair to an animal that was killed. One case LeMay remembers had to do with a moose that was killed in Denali National Park — where it is illegal to hunt. LeMay was sent blood and tissue samples found at the scene and was asked to determine if the evidence from the scene matched some meat found in a suspect's home freezer.

“They sent us the samples because they were highly suspicious of the guy's story and asked us to validate it,” LeMay said.

This scenario is very common for LeMay. Once he receives the sample, he goes through the process of extracting the DNA, purifying it, quantitating it, amplifying microsatellite DNA and using GeneMarker software by SoftGenetics<sup>1</sup> to create DNA profiles, and compare the profiles to those in the Lab's species reference database.

In this case, LeMay used genetic analysis to determine that the samples and the meat were indeed from the same moose, which forced the suspect to change his story from, *I didn't do it, to the park boundaries weren't well marked, so I didn't know I was inside the boundaries.*

### **What animal did this come from?**

The majority of work LeMay and his colleagues do at the lab is species identification. Most geneticists specialize in a particular group of species. So when a sample comes in, it typically is sent to the appropriate expert. LeMay's area of expertise is ivory, rhino horn, moose and bear while his colleagues handle deer, elk, whale, walrus, fish and so on.

So when an unidentified gallbladder was sent to the lab, the team worked together initially to determine the species.

In China, there are farms where bears are kept in cages so small they can't even stand — their gallbladders and bile are coveted for medicinal qualities and both are harvested from bears on these farms. Pharmacists have created synthetic forms of bear bile to treat some liver diseases, but that has not stopped the trade in farmed bear bile. While it is illegal to import bear bile into the U.S., people still import it and sell it on the black market or use it for personal purposes.

There is a push to shut down bear farms, but LeMay said there are still quite a few in existence today. Of the 2,500 gallbladders the lab has looked at over the last decade, 56 percent are from a bear — the rest come from a wide variety of species like pigs, cows, sheep and pythons and a variety of other domestic and foreign species.

### **Ivory is still a major problem**

Probably the most well-known cases LeMay works on are for ivory, which despite a widely publicized and successful campaign against elephant poaching, is still a lucrative business on the black market.

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<sup>1</sup> Mention of tradenames does not imply US Government endorsement of commercial products.

“It’s unfortunate but I still do a lot of work with ivory,” he said.

One time, LeMay received a sword from one of the Special Agents with an ivory-like handle. The first question he asked himself was whether it was old enough to be a mammoth or mastodon, which are extinct but are legal to trade. After investigating, it was apparent the sword was clearly from a more recent species. The next question became, is it walrus? A whale tooth?

LeMay works on dozens of cases like this. This sword ended up being African elephant ivory and was confiscated.

### **What’s next?**

LeMay knows he and the genetics team cannot stop all illegal wildlife trafficking so he is helping with efforts to set up labs in other counties like the one he works at in Oregon. He just got back from Indonesia in August where he worked with USFWS International Affairs Office and agencies from the Indonesian government to collaborate and create a lab like the Ashland lab.

“The U.S. just doesn’t have enough manpower to monitor illegal animal trafficking on a global scale,” LeMay said. “But that doesn’t mean we give up.”