**From Pipette to Gavel: Using Gene Sequencing to Combat Ivory Cartels**

*{Insert African\_Elephant\_Uganda.jpg here}*

As a result of habitat degradation and illegal poaching, African elephants could go extinct in as few as 15 years.[[1]](#footnote-0) Despite recent protection efforts in sub-Saharan Africa, poachers kill 100 wild elephants every day![[2]](#footnote-1) Cartels are smuggling out thousands of the animals’ tusks every year to feed a booming international market for ivory. Demand is concentrated primarily in East Asia and the U.S. among people who buy the ‘white gold’ for good luck, fashion, or as a status symbol.[[3]](#footnote-2) While educating consumers might have an impact, innovative approaches are also needed to combat elephant poaching. One novel technique offers a new hope for these charismatic, elegant creatures. It rests on two unlikely allies: gene sequencing and elephant dung.

Scientists from the University of Washington are using forensic DNA analysis to track tusks from seized shipments and pin larger charges on cartel kingpins. To understand how DNA and international crime are linked, we need to start with elephant dung.

An elephant’s genetic information can be recorded in many ways: drawing blood, sampling dead skin, filing a tusk, or, as it turns out, gathering its feces. For years, Professor Samuel Wasser and his team have collected over 1000 dung samples from 71 elephant populations all over Africa. By isolating cells from the waste and performing DNA sequencing in a lab, Wasser has created elephant ‘genomic geography’ where different DNA sequences from dung samples correspond to different regions. This means that the team can pinpoint where an elephant lived based on its DNA.

In a new study, Wasser has shown how sequencing the DNA in elephant tusks and cross-referencing results with the dung map can connect ivory shipments and reveal cartel networks. The team was given access to 38 large ivory shipments seized both in Africa and overseas. Their first step was to organize the tusks in one shipment by size, color and distance to gumline (a mark made by the elephant’s lip on its tusk). This helped avoid wastefully extracting DNA from two tusks from the same animal. The majority of the tusks did not come in pairs, so Wasser’s next step was to sequence over 3000 ivory samples. The miraculous result was reliable data on where each and every tusk was taken from. Using this information, the researchers linked previously unassociated ivory seizures together to a common source: ivory shipments confiscated in Dubai and Kenya were connected back to the same Tanzanian elephant population. Furthermore, since seizures occurred at multiple points in the supply chain, the team developed a clearer picture of a tusk’s route from kill to customer. Most seizures were shipped through Togo, Kenya, or Uganda. “Not only can we identify the geographic origins of the poached elephants and the number of populations represented in a seizure, but we can use the same genetic tools to link different seizures to the same underlying criminal network,” commented Wasser.

*{Insert Carved\_ivory\_tusks.jpg here}*

Being able to link ivory shipments is a key asset for international law enforcement.[[4]](#footnote-3) The illegal ivory trade works somewhat like a pyramid: local poachers will sell tusks to a series of middlemen who buy and consolidate the tusks into larger and larger quantities before selling the tusks to export cartels. These export cartels then ship the ivory out of Africa, often in dozens of shipments to a variety of overseas destinations. Finally, profits from the shipments are used to sell ammunition to the poachers at the very bottom level. From a systemic perspective, focusing law enforcement on the poachers is inefficient: someone is always eager to replace an arrested poacher, and they typically don’t carry enough ivory for a large fine.[[5]](#footnote-4)

*{Insert Ivory Trafficking Structure article 01.png here}*

In contrast, apprehending leaders of key export cartels has the potential to significantly disrupt the supply chain, so this is where law enforcement is focusing their efforts. Currently, most cartel traffickers are prosecuted using evidence from a single-shipment seizure. Edouodji Emile N'Bouke was convicted of ivory trafficking in 2014 using forensic evidence from only one seizure in Togo.[[6]](#footnote-5) He is now a free man. Wasser notes that had the court been aware of a Malaysian seizure now linked to N'Bouke’s network, he might have gotten a heavier sentence. Being able to link multiple shipments to a single person means that larger fines and harsher sentences can be doled out to the traffickers in charge of Africa’s ivory cartels. As a result, the four billion-dollar illegal industry can be more vigorously attacked from the top down, hopefully saving more elephants.[[7]](#footnote-6)

Unfortunately, forensic DNA analysis relies on government willingness and expedience to submit seized tusks for sequencing. Right now, very few governments are participating.[[8]](#footnote-7) Wasser hopes this will change as more countries realize that a simple genetic technique can aid their judicial and law enforcement institutions in fighting organized crime. More broadly, these results should raise pressure on the Togo, Kenya and Uganda to escalate their anti-trafficking efforts. The sooner this happens, the better — elephants have no time to lose.

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