Researchers find a way to identify key nodes in illegal wildlife trade network

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Satellite imagery of Africa. Credit: Public Domain

(Phys.org)—A team of researchers with affiliations to several

institutions in the U.S. has found a new way to track import, export and connecting countries in the illegal wildlife trade network. As they describe in their paper published in *Proceedings of the National Academy of Sciences,* their work may help identify ways to reduce such trade in order to help protect the animals involved.

Most people are aware of the underground wildlife trade network, animals around the world are caught or killed and are sent whole or in parts to other places where they are highly valued. Such trafficking has resulted in reducing the numbers of many species, many to the point of extinction. Unfortunately, efforts by many people and organizations to stop the illegal trade have not been very successful. In this new effort, the researchers describe a new tool to help win the war.

To gain a better perspective on the geographic location of all the players involved, the researchers used the HealthMap Wildlife Trade database to gather data about illegal trade location details. The database was originally built to help track diseases spread by animals, but offered data on details such as animals found dead due to poaching or resale market raids by police. The team used the data to create a network that revealed the country locals of various players involved in the illegal trade. And that allowed them to identify those countries that play a crucial role in maintaining the network—the thinking is, if the activities in just those countries could be curtailed, the network might fall apart.

The team divided activities into two main sections—six countries that had the most illegal activity going on for three main animals—tigers, rhinos and elephants, and six countries that had the most connections. As an example, they found that disrupting such activity in the United Kingdom, Mozambique, China, Vietnam, South Africa and Thailand would cause a significant disruption of trade in rhino horns.

The team notes that adding data to the networks as it becomes available

should make the reports more accurate and thus more useful, both as a tool in slowing illegal wildlife trading and for studying the spread of diseases, particularly, those that jump to humans from animals.

More information: Quantitative methods of identifying the key nodes in the illegal wildlife trade network, Nikkita Gunvant Patel, *PNAS*, DOI: 10.1073/pnas.1500862112

Abstract

Innovative approaches are needed to combat the illegal trade in wildlife. Here, we used network analysis and a new database, HealthMap Wildlife Trade, to identify the key nodes (countries) that support the illegal wildlife trade. We identified key exporters and importers from the number of shipments a country sent and received and from the number of connections a country had to other countries over a given time period. We used flow betweenness centrality measurements to identify key intermediary countries. We found the set of nodes whose removal from the network would cause the maximum disruption to the network. Selecting six nodes would fragment 89.5% of the network for elephants, 92.3% for rhinoceros, and 98.1% for tigers. We then found sets of nodes that would best disseminate an educational message via direct connections through the network. We would need to select 18 nodes to reach 100% of the elephant trade network, 16 nodes for rhinoceros, and 10 for tigers. Although the choice of locations for interventions should be customized for the animal and the goal of the intervention, China was the most frequently selected country for network fragmentation and information dissemination. Identification of key countries will help strategize illegal wildlife trade interventions.

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