



Determination of Age and Geographical Origin of African Elephant Ivory

*Research and Development Project of the German CITES Management Authority
(Federal Agency for Nature Conservation)*

Exact methods for determination of age and geographical origin are essential to meet the still persisting problem of ivory smuggling and can help to avoid the intermixing of legal with illegal ivory. Long-term preservation of the constantly declining elephant population of Western and Central Africa will only be possible with a control mechanism that helps identifying the age and geographical provenance of confiscated ivory. This, as a worldwide necessity, was also acknowledged by the 15th Conference of the Parties of the Convention on International Trade in Endangered Species in March 2010. The German Federal Agency for Nature Protection responded to this need and initiated above mentioned project, in co-operation with its executing partners, the WWF Germany and two German universities.

Age determination

The purpose of this part of the project is to validate a new method for the determination of age, based on isotope analysis. Additional to the existing methods using the radiocarbon ($^{14}\text{C}/\text{C}$) testing the new method will combine it with the analysis of a variety of nuclides ($^{90}\text{Sr}/\text{Ca}$, ^{228}Th , ^{232}Th and others). With the conventional method the results can be ambiguous, with the year of death not clearly defined (e. g. 1962 and 1980 for the same sample). Combining this method with the determination of strontium and thorium the result is more accurate. The reason is that due to nuclear testing a significantly increased value of $^{90}\text{Sr}/\text{Ca}$ is typical for a death between 1960 and 1970. Low values indicate a death before 1960 or after 1980. A value below the detection limit indicates a death before 1955. ^{228}Th and ^{232}Th are naturally occurring radionuclides of the thorium decay series. If the time of death is dated back before 1960 the ratio of the two nuclides is 1:1; if the death was approximately 1990 the ratio is higher than 1:1. Therefore by combining these analyses the time of death of the elephant can be determined with a high degree of certainty. This makes the method very precise and extremely reliable.

Determination of geographical origin

Furthermore a method for the determination of the exact geographical origin of African elephant ivory will be tested and applied. The focus of this part of the project is to build up a reference database for the African continent, by testing more than 500 ivory samples and combining the results with the spatial monitoring data of the IUCN. Therefore ivory with known origin from all over Africa must be tested with a combination of various geochemical analyses (strontium, but also carbon, nitrogen, oxygen and sulphur). The composition of these elements in a tusk is dependant on the food elephants are consuming, which differs according to their habitat (vegetation, soil and climate). I.e. young volcanic regions like the East African Rift are characterized by a low $^{87}\text{Sr}/^{86}\text{Sr}$ ratio, whereas geologically older parts have a high $^{87}\text{Sr}/^{86}\text{Sr}$ ratio. Carbon and nitrogen isotopes serve as indicators of the nutritional composition or of the climate zone. A very low $\delta^{13}\text{C}$ ratio indicates densely forested habitats, a high ratio is indicative of savannah landscapes. After its completion the database can be used to identify the geographical provenance of confiscated ivory as a device to check the legality, and will be opened for everybody.

More details about the project are available on the homepage of the German Federal Agency for Nature Protection (http://www.bfn.de/0305_cites+M5054de7a952.html -> current issues)