D13 Ancient DNA Analysis of Dried Coral Samples: An Accurate DNA-Based Identification of Threatened Species for Support of Wildlife Trade Law Enforcement

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The goal of this presentation is to introduce attendees to a new ancient DNA-based approach to extract DNA from dried and/or processed coral samples. Attendees will also gain an understanding of how this technique will benefit wildlife trade law enforcement, through the accurate identification of threatened and endangered coral species.

This presentation will impact the forensic science community by providing a reliable, sensitive, DNA-based protocol for the rapid identification of protected coral species, and provide law enforcement with an effective method of detecting illegally traded specimens of protected coral species. This technique will contribute to the long-term protection of coral reefs, which has wide implications for marine ecosystems, environmental conservation, and sustainable trade.

Despite being listed as protected taxa under CITES**,** every year over one million corals are illegally harvested and shipped worldwide for the use in jewelery, art, and for the purpose of collection. For example, red coral (*Corallium rubrum*)-or precious coral- has been highly valuable as a gemstone for millennia. Illegal coral harvesting (in addition to the effects of global warming) has significant harmful impact on the marine ecosystem. Stony coral colonies are an essential part of highly diverse marine reefs, providing the basis for food and shelter of other marine wildlife. Research has shown that the slow growth rate of some species leads to colonies with ages of up to thousand years old.

To ensure the survival of these coral species and subsequently of the fragile marine ecosystem, law enforcement personnel must be able to discriminate between material manufactured from protected species, those made from unregulated species, and imitations made from legal materials to uphold international agreements such as CITES and national laws for wildlife conservation. However, these efforts are handicapped by the lack of reliable and accurate methods for species identification. The currently common visual identification of protected coral species is hampered by corals' diverse morphology, the modification of the coral into beads and other jewelery, and the excellent quality of some imitation material.

Although DNA-based species identifications have been applied to fresh coral specimens, the feasibility of extracting DNA from museum specimens or modified specimens found in jewelery and arts has not been tested. The goals of this pilot study were to test the feasibility of extracting DNA from modified or dried red coral samples and to obtain an accurate DNA-based species identification. Ancient DNA extraction protocols and strategies used here are highly sensitive techniques originally designed to maximize the amount of DNA recovered from severely degraded materials. The coral samples used in this study were obtained from the TRAFFIC repository in Vancouver, Canada. Coral samples were prepared and extracted using a modified ancient DNA extraction protocol (Yang et al. 1998). To ensure a reliable DNA-based species identification, the study targeted short, conserved regions (including COI and 16S gene fragments) of the coral mitochondrial genome. In this study, red coral DNA was successfully extracted and amplified from less than 0.5g of coral specimen, and the obtained sequences matched available red coral (*Corallium rubrum*) reference sequences. This result demonstrates the feasibility of recovering DNA from dry coral samples and the high sensitivity of this method for species identification with minimal destruction of the source material.

Once optimized, this technique will prove to be a fast, reliable and sensible DNA-based method for wildlife law enforcement agencies to identify endangered and protected coral species during investigations of illegal trade of protected coral species.

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