B60 Using DNA Barcoding to Detect Fish Substitutions in Brazil

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After attending this presentation, attendees will understand DNA barcoding and the use of this technique in Brazil by a forensic laboratory to detect fish substitutions.

This presentation will impact the forensic science community by reinforcing the utility of DNA barcoding in forensic casework, including food fraud investigations.

Fish substitutions are usually a fraudulent way of making a product more profitable by swapping high-value species for lower-value ones. Besides being a form of economic deception, this illegal practice may cause health problems or damage the environment. The inadvertent consumption of some species that have the potential to cause allergic reactions, contain toxins and contaminants, or other species that are currently overexploited or protected, are some of the consequences of this illegal practice. Since processed fish products usually lack the external morphological characteristics used for species recognition, fraudulent substitutions are very common.

When morphological identification is compromised, genetic identification can be used to associate unknown samples to a reference sample by comparing sequences of mitochondrial genes. DNA barcoding is a universal system for cataloging and identifying species based on approximately 650 base pair sequences of the Cytochrome c Oxidase (COI) mitochondrial gene. Created as part of this system, there is an international publicly available reference database Barcode Of Life Data Systems (BOLD), with authenticated sequences and a search engine used for species identification. DNA barcoding has been used successfully to identify fish substitutions in many countries in the past few years.

In this study, the Brazilian Federal Police DNA Laboratory used DNA barcoding to identify 93 fish fillet samples collected from ten seafood processing plants in 2013 and 2014. The large majority (81%) of the samples were mislabeled. Among the substitutions, the laboratory found the exotic cheaper species of flatfish *Atheresthes stomias* and *Limanda aspera* sold as the Brazilian coast genus *Paralichthys*, the Alaska pollock *Gadus chalcogrammus* being passed off for the Argentine hake *Merluccius hubbsi*, and the protected Wreckfish *Polyprion americanus* labeled as a grouper species. Several other cases of substitutions involving species commonly traded in Brazilian markets are also discussed. Because of these identifications, some processing industries in the southern region of Brazil were put under special supervision by the Brazilian food safety authorities. This study represents a pioneer use of DNA barcoding in food fraud investigations by a police laboratory in Brazil and the results obtained reinforce the utility of this technique in forensic casework.

DNA Barcoding, Fish Substitutions, Food Fraud