

FULL LENGTH RESEARCH PAPER

Illegal trade of regulated and protected aquatic species in the Philippines detected by DNA barcoding

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Abstract

Illegal trade has greatly affected marine fish stocks, decreasing fish populations worldwide. Despite having a number of aquatic species being regulated, illegal trade still persists through the transport of dried or processed products and juvenile species trafficking. In this regard, accurate species identification of illegally traded marine fish stocks by DNA barcoding is deemed to be a more efficient method in regulating and monitoring trade than by morphological means which is very difficult due to the absence of key morphological characters in juveniles and processed products. Here, live juvenile eels (elvers) and dried products of sharks and rays confiscated for illegal trade were identified. Twenty out of 23 (87%) randomly selected "elvers" were identified as *Anguilla bicolor pacifica* and 3 (13%) samples as *Anguilla marmorata*. On the other hand, 4 out of 11 (36%) of the randomly selected dried samples of sharks and rays were *Manta birostris*. The rest of the samples were identified as *Alopias pelagicus*, *Toeniura meyeni*, *Carcharhinus falciformis*, *Himantura fai* and *Mobula japonica*. These results confirm that wild juvenile eels and species of manta rays are still being caught in the country regardless of its protected status under Philippine and international laws. It is evident that the illegal trade of protected aquatic species is happening in the guise of dried or processed products thus the need to put emphasis on strengthening conservation measures. This study aims to underscore the importance of accurate species identification in such cases of illegal trade and the effectivity of DNA barcoding as a tool to do this.

Keywords

CO1, illegal trade, juvenile eel, Manta ray, processed products

History

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Introduction

Illegal trade of marine fish stocks has been a major challenge to marine biodiversity conservation since the continuous and heavy exploitation of this resource leads to the declines in marine populations or even near-collapse of it (Mullon et al., 2005). Even with established regulation efforts, reports on illegal, unreported and unregulated fisheries (IUU) and illegal trade are still existent (Maes & Volckaert, 2007). At present, illegal substitution and trade of certain fish species has been a rising global concern (Rasmussen & Morrissey, 2008). Southeast Asia in particular has been recognized as a "wildlife trade hotspot" because of its unsustainable and ill-regulated wildlife trade (Nijman, 2010). This has been a rising concern since the epicenter of marine biodiversity that urgently needs improvement of conservation efforts is found in this part of the world, the Coral Triangle, encompassing to a large extent Indonesia, Malaysia, Philippines, Papua New Guinea, Solomon Islands, Timor L'Este, and Brunei, with the Philippines and eastern Indonesia having the highest concentration of species richness within the Coral Triangle (Sanciangco et al., 2013).

In the Philippines, a number of aquatic species such as eels of various life stages and sharks and rays are being utilized for various purposes resulting into the decline in their population (Crook, 2010; SEAFDEC, 2012).

The Philippine eel culture industry started in 1972 when profitable quantities of juvenile eels called "elvers" were discovered in the Cagayan river system (Gutierrez, 1976). The *Anguilla* were seen as commercially important and treated as fish species with aquaculture potential (Briones et al., 2007). However, a significant decline in population resulted to a prohibition of "elvers" exportation in the country during the 1970s (Gutierrez, 1976). This ban has been reinstated today under the Philippines' Fisheries Administrative Order (FAO) 242, which upholds FAO 107 and 107-1 series of 1986 that banned "elvers" exportation and revoked FAO 159 series of 1986, which allowed the exportation of the commodity. The reinstatement of the ban was recommended by the Philippine Bureau of Fisheries and Aquatic Resources (BFAR) Regional Office II in Cagayan after observing the excessive and non-stop exploitation of "elvers" due to its sharp price increase.

Shark and ray fisheries in the Philippines have also been expanding with an average annual production of 5882t for the past 20 years (Barut & Zartiga, 2002). According to the FAO fisheries Department (2012), the average annual reported shark catch for 2000–2010 was 5277t or 0.65% of the global reported catch. The commercial exploitation of shark and ray species began in 1960s and landings of these aquatic species has then declined (Barut & Zartiga, 2002; Bonfil, 2002). Manta ray fishing has also expanded and is now overexploited in by-catch and

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