

Conservation of Hawksbill Turtle (*Eretmochelys imbricata*) in Indonesia

Lessons Learned and Future Challenges

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ABSTRACT

The Hawksbill turtle (*Eretmochelys imbricata*) is a highly migratory species of subtropical and tropical areas with an important role in the ecosystem. However, the hawksbill turtles are being hunted for their shell to make jewelry and decorative products. The harvest of its tortoiseshell with a combination of other threats (e. g. climate change, loss of habitat, by-catch) brought this species on the edge of extinction. Historically, Indonesia was one of the major tortoiseshell harvesters and exporters. Despite the export of tortoiseshell considerably decreased, open tortoiseshell markets still exist in Indonesia and harvesting is present on a substantial scale. Conservation of this species is crucial for the ecological balance of coral reefs and thus for coastal communities dependent both on marine sources and tourism where sea turtles represent noticeable attraction. This paper presents conservation methods and lessons learned from fieldwork and it discusses strategies and challenges for further conservation of this species in the near future. The paper also focuses on the potential of further research of Hawksbill turtle and on the halting of tortoiseshell trade in Indonesia. The aim of this paper is to contribute to the development of conservation strategies of Hawksbill turtle in Indonesia.

Keywords: *Conservation strategy, Hawksbill turtle, Indonesia*

1. INTRODUCTION

The Hawksbill turtle is among the smallest of sea turtles, it has a typical pointed bird-like beak that helps a turtle to remove sponges from the reefs and thus allow corals to grow. Compared to other marine turtle species, hawksbills have long generation length. Age to maturity in Indo-Pacific hawksbill turtles requires 30-35 years [1, 2]. The largest populations of hawksbill turtle occur in Southeast Asia [3].

High exploitation due to the trade of its unique scutes, eggs, and the loss of habitat in a combination of other threats caused up to 80% population decline [1, 4]. Hawksbill sea turtles are in the IUCN Red List classified as critically endangered since 1996, and

also, they are listed in Appendix I of CITES since 1977 [1, 5].

Conservation of this unique species is necessary not only for its ecosystem services that hawksbills provide, but also for their value in non-consumptive uses. Tourism, educational and scientific research are all activities that provide economic gains and employment to local people [6]. Unfortunately, Indo-Pacific populations of hawksbill turtles are the least studied marine turtles [7]. To save this species from extinction both research and conservation measures are necessary [8, 9].

2. TORTOISESHELL TRADE

Tortoiseshell consists of keratin that is why the scutes are easy to cut and mold into different shapes through the application of heat. The scutes are formed into many decorative products and jewelry [10]. The tortoiseshell trade in Southeast Asia is closely connected with European colonialism. The Portuguese, Dutch, French, and English played a major role in global trade. During the 20th century, Japan became the largest tortoiseshell importer and Indonesia was its main source of the shell [1, 11]. In 1992, the Japanese import of tortoiseshell ceased which led to the decline in the volume of Indonesian tortoiseshell trade [1]. However, the volume of this trade is still substantial. The collection of tortoiseshell still occurs in numerous places, with most of the trade appearing to be disorganized and underground [8, 12].

Within the last 150 years, there were harvested more than 9 million hawksbills for their tortoiseshell around the globe [13] and Indonesia is historically one of the main harvesters and exporters [12]. Recent (between January 2015 and August 2018) seizures from Indonesia, Malaysia and Vietnam recorded trade of 174 stuffed, and 936 crafted products with almost 1 tonne of raw scutes [14].

3. CONSERVATION OF HAWKSBILL TURTLE IN INDONESIA

In the following paragraphs there are presented the conservation measures and steps that are being implemented in Indonesia towards saving the Hawksbill turtle from extinction.

In Indonesia, all species of sea turtles have full law protection and its catch, keeping, trade, and consumption are forbidden with up to 5-year sentence in prison and a fine up to 1 billion IDR [15,16]. Indonesian ministry of environment and forestry issues national action plans (NAPs) for the conservation of sea turtles in 5-year periods. Many nesting beaches of sea turtles are already protected in Indonesia and national programs for further protection of these places are in progress [17]. Unfortunately, only minor attention is paid for the illegal tortoiseshell trade and there are no governmental strategies to eradicate this market in Indonesia. The prime role in halting the trade in turtles is NGOs [8].

Tortoiseshell trade is long-term monitored by TRAFFIC, but only historically known places are monitored [8]. Also, ProFauna Indonesia [18] observes known areas of tortoiseshell trade. Law enforcements are crucial for halting tortoiseshell trade in Indonesia [8, 18]. For example, ProFauna Indonesia successfully cooperated with the Nature Conservation Agency on seizures of tortoiseshell products in Bali and Yogyakarta (both in 2003) [18]. However, based

on our experience, these law enforcement actions are usually a result of intensive lobbying from NGOs.

Our team was part of two multi-stakeholder actions towards sea turtle conservation in Indonesia. First, on Bangkaru, Aceh Singkil Regency, Sumatra, in 2016 our team was asked by rangers of Bangkaru Island (the Pulau Banyak archipelago, Sumatra) to help with turtle eggs poaching. According to rangers' data, there were zero hatchlings for almost two months, therefore, together with local authorities, we initiated steps to help the sad situation. Eventually, three poachers were arrested. It was the first time in Sumatra that poachers were arrested and went to prison. Second, at the beginning of the year 2018, we were part of the investigation team that managed to acquire more than 1200 turtle eggs and bottles with explosives for blast fishing. Investigations continued in the following months. In December 2018, together with police and Marine Resources Agency, there was acquired tortoiseshell jewelry from around 300 hawksbill turtles in Berau Regency, Kalimantan. The acquisition was being prepared for several months. It is noteworthy that ProFauna Indonesia (2014) stated that 'tortoiseshell trade in Berau is rampant'. Hopefully, this action considerably contributed to the eradication of tortoiseshell trade in Berau.

We strengthen the importance of communities and their role in conservation. In both cases, we continued in implementing conservation steps. The arrested poachers from Bangkaru spent almost two years in prison, and then we invited them to join a unique educational project at local schools to offer them an alternative source of income. All of them agreed and joined the project. We gave them training and the ex-poachers became ambassadors of turtle and marine conservation during lectures at 27 schools in the region. At the end of the project, they were given boats to ensure for them a long-term and sustainable source of income.

In Berau, local vendors declared and signed a declaration prepared by the Regent of Berau Regency that they will not be selling tortoiseshell products again. As an alternative, local vendors and craftsmen were given tools to be able to work with coconut shells instead of tortoiseshell. With one vendor of tortoiseshell jewelry, a trial is in the process because 6 months after the seizure, the vendor started selling these products again.

It is necessary to motivate government stakeholders and community members to enforce the law and to take actions. To promote sustainable solutions and conservation actions with positive effect on biodiversity in Indonesia, Liberec Zoo, Czech Republic and the Czech Coalition for Biodiversity Conservation (CCBC), in cooperation with the Embassy of the Czech Republic in Jakarta, bestowed

awards to government officials from the Berau region, along with several members of the army, officials of the Ministry of Maritime Affairs and Fisheries, police and non-governmental organizations for their extraordinary contribution to biodiversity conservation. These awards serve as great motivation to people to take steps towards conservation.

4. FUTURE CHALLENGES

Hawksbill turtles are critically endangered, but also among the least studied marine turtles especially in Indo-Pacific. A lot of research is needed in order to define rookeries, foraging habitats, migratory tracks, and population genetic structures [4, 7]. As only limited data and research exist, it substantially restricts further analysis and preparation of conservation steps [4, 19, 20].

Improved understanding of genetic diversity and phylogeography in hawksbills turtles especially in Southeast Asia is stressed by many research and evidence suggest that there exist transoceanic migrations, including connections between the Atlantic Ocean and Indo-Pacific [21]. To define populations and determine the gene flow among different populations it is critical to understand population function and migratory patterns. Based on that, it is possible to prepare a proper conservation management [20, 21].

One of the possibilities that allow us to study populations is to extract mitochondrial DNA to define haplotypes of different populations from tortoiseshell items. DNA can be also taken from skin tissue or mucus - for example from nesting females [9, 10, 21]. There are only two previous studies that extracted DNA from tortoiseshell items [9, 10]. WWF Australia is now concentrating its efforts on development of genetic techniques to accurately define poaching hotspots [9].

WWF Australia [9] is also planning to establish GeneBank of hawksbill turtles in Indo-Pacific. We see a great potential for Indonesia to cooperate with WWF Australia in the development of the GeneBank. Indonesia could considerably contribute to the research and conservation of hawksbill turtles.

5. CONCLUSION

Hawksbill turtles were traded on a large scale in the previous decades. Even though the trade has decreased already, it still exists in many areas throughout Indonesia. Its conservation is vital not only for the balance of the sea ecosystem, but also for local communities that can profit from tourism and research connected with marine turtles and coral reefs. The future conservation measures must be based on proper scientific data and the whole process till community

outreach should be planned systematically in accordance with people's needs and sustainable development. For the following years it is vital to study more deeply the genetic structure of hawksbills in Indonesia. We advise to focus especially on market survey of tortoiseshell trade and the consequent analysis of mitochondrial DNA from tortoiseshell. Last but not least, in the most rampant areas of tortoiseshell trade, work with local communities should be initiated.

AUTHORS' CONTRIBUTIONS

AH, TO, and TZ have contributed equally to the work.

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