Marine Policy 89 (2018) 1–10

Contents lists available at ScienceDirect

Marine Policy

journal homepage: www.elsevier.com/locate/marpol

An economic approach to marine megafauna conservation in the coral triangle: Marine turtles in Sabah, Malaysia

Louise S.L. Teh[a,*], Lydia C.L. Teh[b], Gavin Jolis[c]

[a] Fisheries Economics Research Unit, Institute for the Oceans and Fisheries, University of British Columbia, 2202 Main Mall, Vancouver, British Columbia, Canada V6T 1Z4

[b] Nereus Program, Institute for the Oceans and Fisheries, University of British Columbia. 2202 Main Mall, Vancouver, British Columbia, Canada V6T 1Z4

[c] WWF, Malaysia, 1 Jalan PJS 5/28 A Petaling Jaya Commercial Centre, 46150 Petaling Jaya, Selangor, Malaysia

ARTICLE INFO

Keywords:
Total economic value
Marine turtles
Marine megafauna conservation
Economic incentives
Sabah, Malaysia

ABSTRACT

This study quantifies the Total Economic Value (TEV) marine turtles contribute to the Semporna Priority Conservation Area in Sabah, Malaysia, based on field surveys conducted in May 2014 with marine stakeholders, including 60 fishing households, 9 resorts, and 7 government and academic institutions. The estimated TEV of marine turtles was USD 23 million per year, ranging from USD 21–25 million. The estimated non-consumptive value of marine turtles far exceeded the consumptive use value. Moreover, the protection of marine turtles could potentially generate 1146 tourism jobs, equivalent to USD 469,000 in employment income per year. Conservation could be partially funded from tourism, as tourists were willing to contribute USD 1.5 million for marine turtle protection and conservation annually. Scenario analysis showed that the discounted TEV of marine turtles could reach up to USD 716 million over 30 years if full protection of turtles was implemented now. This is more than double the discounted TEV of marine turtles under status quo conditions (USD 262 million). By showing the substantial economic value derived from marine turtles, this study not only provides an important incentive for protecting marine turtles in Semporna, but also for investing in conserving marine resources in the wider Coral Triangle and Asia Pacific region.

1. Introduction

It is increasingly recognized that integrating an economic approach to ecosystem management is essential for maintaining the flow of goods and services from marine ecosystems [15]. Quantifying the economic contribution ecosystems make to social and economic well-being enables informed trade-offs to be made in conservation planning, thereby facilitating stakeholder buy-in and potentially contributing to more effective marine management. Demonstrating the economic value of ecosystem goods and services can also provide an incentive for more effective stakeholder participation in natural resource management [4,7,16,59].

This is particularly relevant for the Coral Triangle, which is globally significant as the epicenter of marine biodiversity [22], but where marine species and ecosystems have been intensely exploited and face continuing anthropogenic and environmental threats [6]. One of the main challenges to effective conservation measures in the Coral Triangle is the high marine dependence and poverty of many coastal communities, which leave them no choice but to continue exploiting marine resources [10,18]. Overcoming the human-nature conflict is thus a critical and urgent issue in the Coral Triangle.

Marine megafauna are large, long lived marine species such as sharks, rays, marine turtles, dugongs, and other slow growing and late maturing marine mammals. Due to their vulnerable life histories, marine megafauna are often the first organisms to be affected by human pressures, making their protection a conservation priority [47]. In particular, marine megafauna are highly threatened by the Coral Triangle's rapid economic development, human population growth, and heavy dependence on coastal resources for livelihoods and food security.

Sharks, dugongs, and marine turtles continue to be targeted for lucrative trades, resulting in severe population declines throughout the region [27,30,31,46,58]. At the same time, these same species are an important attraction for the region's fast growing marine tourism industry, which serves as a potential avenue for funding marine conservation. However, tourism development can also have damaging effects on ecosystems and marine animals, and has led to negative human-species interactions [25,26,55]. Therefore, reducing human pressure on vulnerable marine megafauna in the Coral Triangle requires participation and buy-in from multiple stakeholders [17,45,51]. One

* Corresponding author.
E-mail addresses: l.teh@oceans.ubc.ca (L.S.L. Teh), lydia.teh@oceans.ubc.ca (L.C.L. Teh), gjolis@wwf.org.my (G. Jolis).

https://doi.org/10.1016/j.marpol.2017.12.004
Received 28 July 2017; Received in revised form 3 November 2017; Accepted 3 December 2017

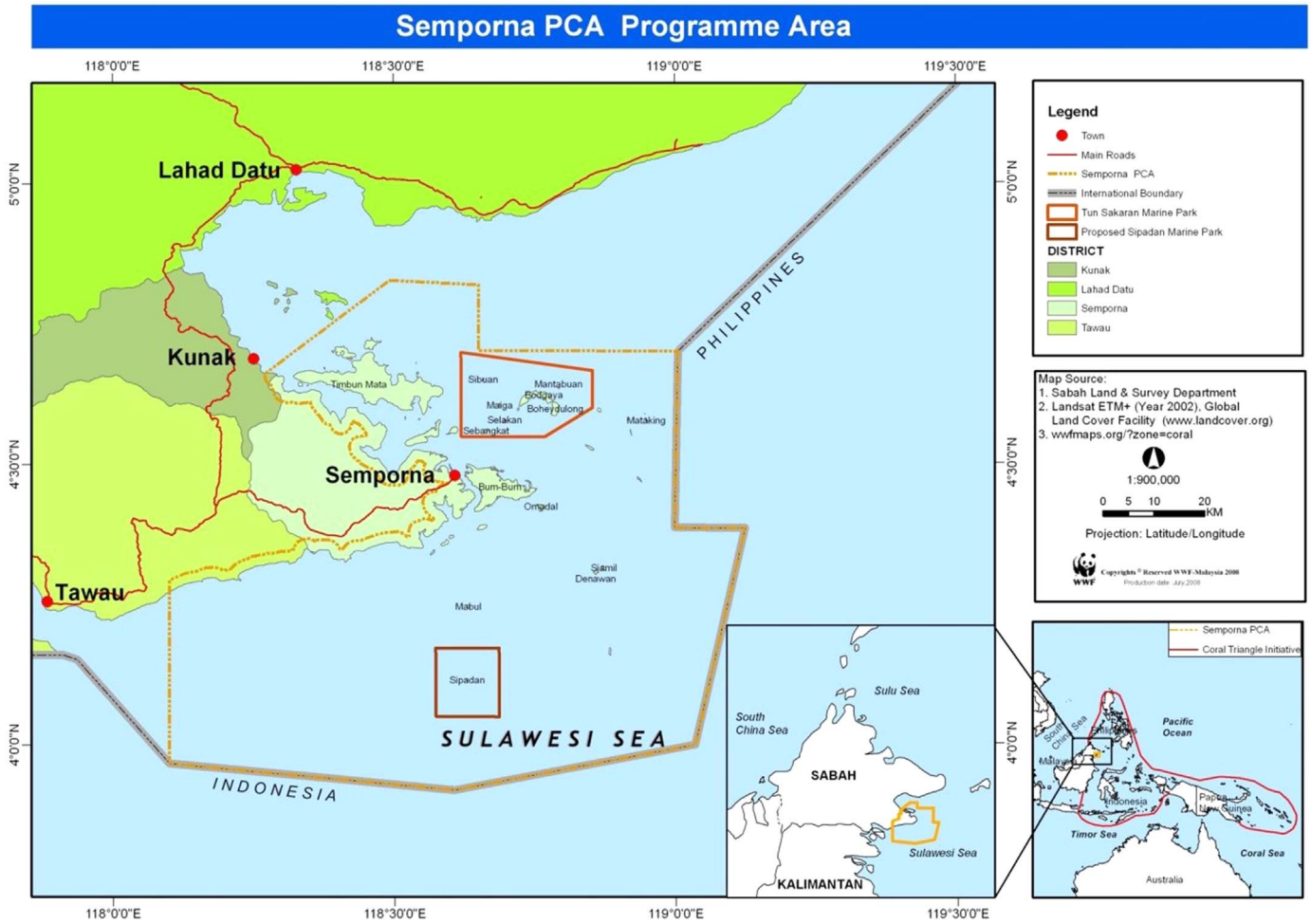

Fig. 1. Map of the Semporna Priority Conservation Area (boundary indicated by beige border). Tun Sakaran and Sipadan Parks within Semporna PCA are demarcated by dark brown borders. The inset maps show the location of Semporna PCA within Sabah and within the Coral Triangle. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)
Map source: Jolis and Kassem [29].

way of obtaining this is to demonstrate the economic benefits arising from conservation (e.g., [23]).

This paper applies an economic approach to the case of an iconic marine megafauna – marine turtles – in the Malaysian portion of the Coral Triangle. The objective is to estimate the total economic value marine turtles contribute to fishing communities and the marine tourism sector in Semporna, Sabah. In doing so, this study aims to demonstrate the economic importance of marine turtles, thereby providing an economic incentive for multiple stakeholders to participate in, and improve marine turtle protection and management within Sabah.

1.1. Marine turtles in Semporna

The Semporna Priority Conservation Area (PCA) is located within the district of Semporna on the south eastern coast of Sabah, a Malaysian state situated on the north eastern part of Borneo island (Fig. 1). This area forms part of a turtle migratory corridor and also serves as an important turtle nesting and foraging ground [29]. The marine environment is economically and socio-culturally significant for Semporna, where fishing remains a core livelihood [9,52]. There are two marine parks situated within the Semporna PCA. The Tun Sakaran Marine Park (TSMP) is a multi-use area where designated zones are off-limits to any extractive use. The Sipadan Island Park (SIP) is a protected nesting ground for green and hawksbill turtles. Both TSMP and SIP are managed by Sabah Parks, a state agency.

Four species of marine turtles are found in the Semporna PCA – Green (*Chelonia mydas*) and hawksbill (*Eretmochelys imbricata*) turtles are sighted frequently; Olive ridley turtles (*Lepidochelys olivacea*) are seen occasionally [29,36], while Leatherback turtles (*Dermochelys coriacea*) are rarely seen. Leatherback and hawksbill turtles are listed as Critically Endangered on the IUCN Red List, while Greens are listed as Endangered, and olive ridleys as Vulnerable. All four turtles are listed on CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) Appendix A, which only permits trade in these species under exceptional circumstances.

Marine turtles in Sabah are protected under state laws. The Wildlife Conservation Enactment 1997 provides full protection to green and hawksbill turtles, while the Sabah Parks Enactment 1984 protects marine turtles from illegal hunting and capture within marine park boundaries.

Despite the existence of these regulatory measures, marine turtles in Sabah still face substantial threats from human activities, including incidences of mass killings for unknown reasons, and smuggling [12,13]. Turtle egg collection has been a threat to the long-term sustainability of Sabah's turtle populations for decades [36], and the persistence of turtle egg sales in Semporna and other parts of Sabah continues to pose a threat to marine turtle populations [2,14]. Tourism development and fisheries activities further increase pressure on marine turtle habitats and the likelihood of negative interactions with humans.

After coming ashore to nest and lay eggs, a female marine turtle returns to sea to migrate back to its primary feeding and foraging