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EXPLORING LOCAL KNOWLEDGE INFORMATION OF HORSESHOE CRABS IN BANTEN

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ABSTRACT

Travel and Data Collection play crucial information such as the need to travel to various locations where horseshoe crabs are found to gather data. This study aims to explore local knowledge regarding horseshoe crabs in several coastal areas of Banten, Indonesia. A qualitative-descriptive method was applied, where the data were collected through interviews with 25 respondents across seven coastal locations, and combined with field observations of actual catch. The results show that Tachypleus gigas is the most frequently encountered species, mainly caught as bycatch using bottom gillnets. Locations such as Kronjo and Mauk recorded the highest number of horseshoe crab, with up to 16 individuals caught. Respondents consistently perceived a decline in horseshoe crab populations, with bycatch identified as the main factor (84%), followed by habitat degradation (4%) and pollution (12%). While 56% of respondents recognized horseshoe crab as protected species, 44% still assumed they were unprotected. Most respondents (96%) stated they had never consumed horseshoe crab. These findings indicate that although local communities possess a basic awareness of species and fishing impacts, conservation efforts and legal protections remain minimal. This highlights the urgent need for targeted conservation education and stricter regulation of fishing practices to prevent further decline.

INTRODUCTION

Horseshoe crabs are considered ancient species that have existed for hundreds of millions of years and are still extant today, earning them the designation of "living fossil animals." Horseshoe crabs hold significant ecological value due to their important role in aquatic ecosystems, particularly as indicators of coastal environmental quality, and they also contribute to the biomedical field (Tan *et al*., 2012; Shuster *et al*., 2009). The unique compounds found in their blood are

recognized as a valuable source of bioactive substances for the pharmaceutical industry (Tanacredi *et al*., 2009).

The population of horseshoe crabs in various regions of the world has experienced a decline due to several factors, including habitat degradation, pollution, and overfishing (Berkeley *et al*., 2004; John *et al*., 2018; Meilana *et al*., 2020). In certain areas, horseshoe crabs are frequently caught unintentionally in fishermen's nets. These incidental catches, known as bycatch, can sometimes exceed the quantity of the target species (Supadminingsih *et al*., 2018). In Indonesia, horseshoe crabs are protected under the Regulation of the Minister of Marine Affairs and Fisheries No. 44/PERMEN-KP/2023, which prohibits their capture and trade. Furthermore, based on the global conservation status provided by the International Union for Conservation of Nature (IUCN), Indonesian horseshoe crabs are listed in the Red List under the category of Data Deficient (DD). This status indicates that there is currently insufficient data available to assess the risk of extinction for horseshoe crabspecies in Indonesia. In Banten Province, according to research by Meilana *et al*. (2020), respondents reported sightings of horseshoe crabs in areas such as Ujung Kulon and Serang. However, no actual quantitative data exist regarding the species or the number of individuals captured by fishing gear in these locations.

The coastal region of Banten is inhabited by coastal communities that possess local or traditional knowledge regarding marine species, including horseshoe crabs. Information related to the occurrence, utilization, and handling of horseshoe crabs holds significant value in supporting conservation efforts (Berkes *et al*., 2000; Campos *et al*., 2018). In addition, direct field surveys on the presence of horseshoe crabs can provide quantitative data to complement and strengthen community-based knowledge. Combining ecological surveys with interviews enables a better understanding of the species' distribution and allows for deeper insight into local perceptions of its ecological importance. This study employs a multidisciplinary approach by integrating qualitative local knowledge with quantitative population assessments through field surveys—an approach that has not yet been applied in this specific area. This study was conducted as a preliminary investigation aimed at identifying the local knowledge and understanding of coastal communities regarding the presence of horseshoe crabs.

METHOD

The study was conducted in September 2023 across several coastal areas, including Panimbang, Anyer, Serang, Lontar, Kronjo, Mauk, and Tanjung Pasir. This study involved 25 respondents, comprising fishermen or crab mongers (11), local residents (5), local community members (5), and representatives from local government institutions (4). This research employed a qualitative approach using semi-participatory observation, involving interviews with fishermen, community

leaders, and relevant stakeholders, complemented by field observations (Kawulich, 2015). Interviews were conducted to explore respondents' experiences, knowledge, and perceptions regarding horseshoe crabs.

Subsequently, direct field observations were carried out at landing sites, where researchers participated in identifying horseshoe crabspecies, counting individuals, and recording the fishing gear used. Data analysis was conducted descriptively by categorizing the collected information and interpreting it according to recurring themes across the observation sites. The results were then visualized in the form of tables and graphs.

RESULT AND DISCUSSION

Based on respondents' perceptions across seven study sites, *Tachypleus gigas* (TG) was the most commonly recognized species. *Carcinoscorpius rotundicauda* (CR) was reported in four out of the seven locations, while *Tachypleus tridentatus* (TT) was not recognized by any respondents. These perceptions align with actual field data, which also showed TG to be the dominant species in terms of both frequency and quantity caught in fishermen's nets.

Table 1. Comparison of Respondent Perceptions and Actual Data

No	Location	Number of Horseshoe Crabs Caught (<1, <5, <10, < 15,>15)	Species of HSC Horseshoe crab: TG, TT, CR	Types of Fishing Gear	Actual Data (Gillnet)
1	Panimbang	<1	TG CR	Bottom gillnet Mini Bottom trawl	0
2	Anyer	<1	TG	Bottom gillnet	0
3	Serang	<10	TG CR	Bottom gillnet Trap Mini bottom trawl	4 TG 1 CR
4	Lontar	<15	TG	Bottom gillnet	8 TG
5	Kronjo	>15	TG CR	Bottom gillnet Trap Mini bottom trawl	16 TG
6	Mauk	>15	TG CR	Bottom gillnet	16 TG 1 CR

7	Tanjung Pasir	>15	TG CR	Mini bottom trawl Bottom gillnet	0

Source: Processed Data (2023)

The highest quantities were found in Kronjo and Mauk, with more than 15 *T. gigas* individuals per site; field observations recorded up to 16 individuals caught per gillnet unit. All horseshoe crabs were captured as bycatch in bottom gillnets, with the main target species being blue swimming crabs. Previous studies by Aini *et al*. (2021) indicated that T. gigas has wide genetic diversity, while Meilana *et al*. (2016) found that morphological identification in Subang showed a dominance of *T. gigas*, which was also frequently caught as bycatch in bottom gillnets (Supadminingsih *et al*., 2018). The lowest quantities were recorded in Panimbang and Anyer, with less than one individual per site, and no horseshoe crabs were captured during direct observations. However, based on the experience of both fishermen and local residents, T. gigas had previously been seen and encountered in the vicinity of their settlements.

All respondents from the seven locations were able to distinguish between the types of horseshoe crabs caught [Figure 2]. Respondents, including fishermen and local residents, reported recognizing two species of horseshoe crabs: the green horseshoe crab, *Tachypleus gigas*, and the "mimi pasung" is *Carcinoscorpius rotundicauda*. The green horseshoe crab (*T. gigas*) is characterized by a triangular, spined telson, whereas *C. rotundicauda*, commonly known locally as "mimi pasung," has a telson without spines. According to Meilana *et al*. (2020), respondents from the fishing community stated that they differentiate horseshoe crabspecies based on specific physical traits such as the shape of the telson, the presence or absence of spines on the opisthosoma, overall body size, and the particular habitats where the crabs are found. Several respondents noted that *Carcinoscorpius rotundicauda* is especially identifiable due to its lack of telson spines and its frequent occurrence in large numbers within estuarine areas adjacent to mangrove forests.

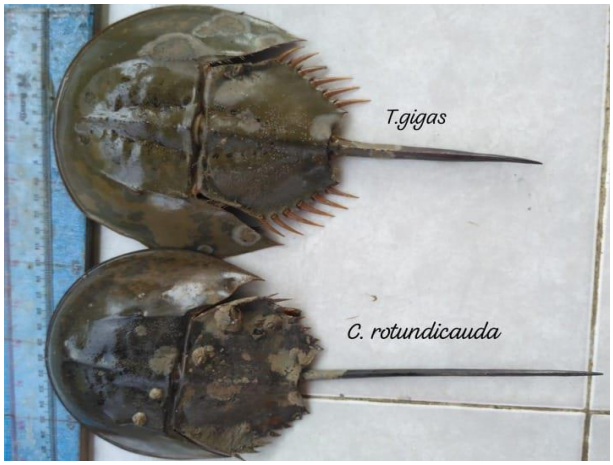

Figure 1. *Tachypleus gigas* and *Carcinoscorpius rotundicauda*
(Souces: Supadminingsih 2023)

The bottom gillnet emerged as the predominant gear for horseshoe crabcaptures, both in fisher perceptions (>15 individuals reported) and actual field observations. Secondary catches occurred in mini bottom trawls across four sites (Panimbang, Serang, Kronjo, and Mauk), while collapsible traps accounted for incidental catches at two locations (Serang and Kronjo). The highest verified catches originated from Mauk and Kronjo, with 16 *Tachypleus gigas* individuals and one *Carcinoscorpius rotundicauda* specimen recorded in Mauk. These sites exhibited greater fishing gear diversity compared to Anyer and Panimbang, where interview data indicated minimal catches (<1 individual) that aligned with null observational records. In Tanjung Pasir, respondents reported sustained catch volumes (>15 individuals) and encounters with both species, though field surveys revealed a localized shift from gillnets to traps during the study period, coinciding with zero observed captures.

This indicates that the distribution of horseshoe crabpopulations in Banten is uneven. Both actual data collection and local perceptions reveal that the number of horseshoe crabs (>15 individuals) found in Northern Banten is higher compared to Western Banten, specifically in Panimbang and Anyer. The observed differences in horseshoe crabnumbers highlight a distribution gap among the species, which may result in varying fishing pressures. In Northern Banten, fishing pressure tends to be higher due to the greater diversity of fishing gear being operated. Conversely, in Panimbang and Anyer, not only is the variety of fishing gear that captures horseshoe crabs limited, but the population of horseshoe crabs itself is also declining. According to Tan *et al*. (2012), a study conducted on Balok Beach, Kuantan, Pahang, Malaysia, found that horseshoe crabpopulations exhibited significant signs of decline. This was attributed to a combination of factors, including overfishing, habitat degradation, and a lack of public awareness regarding the importance of conserving this species.

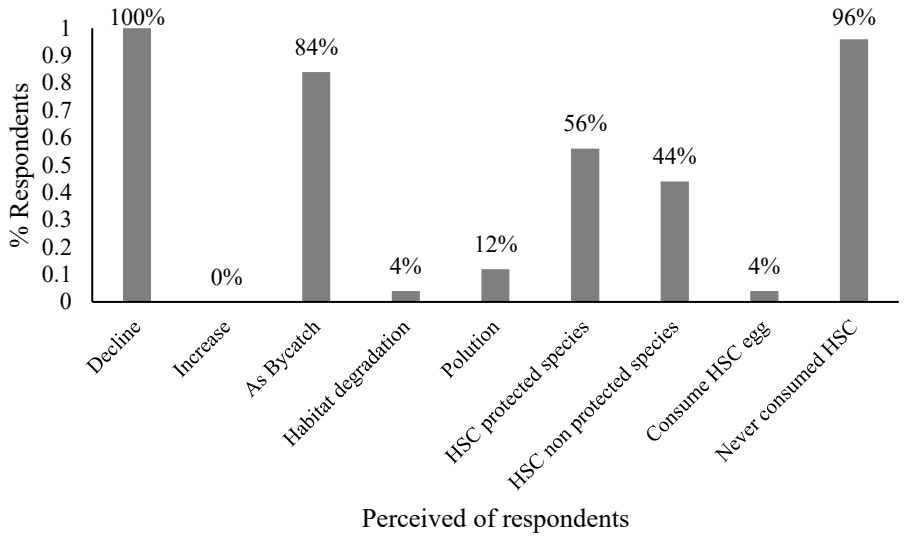

Figure 2. Perceived of Respondent

Participatory observations involving 25 respondents regarding perceptions of horseshoe crabpopulations, protection status, causes of population decline, and horseshoe crabconsumption are presented in Figure 2. All respondents reported being aware of or having encountered horseshoe crabs in the vicinity of the observation sites. Based on population perceptions, 100% of respondents indicated that horseshoe crabpopulations are declining, while none reported an increase. According to respondents in Banten, the primary cause of population decline (84%) is fishing activities, where horseshoe crabs are caught as bycatch rather than as target species. Pollution accounts for 12% of the perceived decline, and habitat degradation for 4%. Pollution is believed to originate from industrial activities near the observation locations, while habitat degradation results from the conversion of coastal areas into residential zones, accommodations, and aquaculture ponds.

A decline in horseshoe crabpopulations has been observed, though no such decrease has been formally documented in Indonesia. In contrast, countries such as Malaysia have reported population threats due to human exploitation, habitat loss, and insufficient local government protection (Noor Jawahir *et al*., 2017; Meilana *et al*., 2020). In Malaysia, high demand for horseshoe crabs for both consumption and medical purposes has driven illegal trade practices that are difficult to control. This situation is exacerbated by the lack of effective regulations and conservation programs, resulting in a continued decline in horseshoe crabpopulations (Faridah *et al*., 2015).

The decline in horseshoe crabpopulations indicates that local communities are aware of the species, can identify the types of horseshoe crabs they have encountered, and recognize the ongoing reduction in their populations. According to Cartwright-Taylor *et al*. (2011), exploitation and environmental habitat changes significantly affect the global decline of horseshoe crabpopulations, including in

Southeast Asia. The IUCN report that horseshoe crabs are often caught unintentionally in bottom gill nets, while habitat degradation and pollution also pose significant threats. Sedimentation and industrial waste can negatively impact their ecology (John *et al*., 2018).

Regarding respondents' knowledge of the protection status of horseshoe crabs, 56% were aware that horseshoe crabs are protected species, while 44% were not. Community understanding of horseshoe crabconsumption across seven locations in Banten is very low, with only 4% of respondents having ever consumed horseshoe crabs and 96% never having done so. Horseshoe crabs caught by fishermen are typically discarded back into the water. Fishermen often perceive horseshoe crabs as pests that can damage fishing nets, causing tears and requiring longer sorting times. According to Meilana *et al*. (2020), horseshoe crabs are frequently viewed as having negative economic impacts, such as damaging nets, largely due to the prevailing perception that these animals do not contribute meaningfully to the livelihoods of local fishers.

n the study area, the community is fully aware of the presence of horseshoe crabs (100%) and can differentiate between species. However, further information and outreach are needed to improve knowledge that horseshoe crabs are protected species. Regarding consumption, it can be concluded that horseshoe crabs are not part of the local dietary culture, resulting in a low potential for consumption in Banten. This contrasts with several regions in Southeast Asia, such as Vietnam, Thailand (Nguyen & Do, 2021), and Malaysia (Faridah *et al*., 2015), where horseshoe crabeggs are believed to have medicinal properties (Li *et al*., 2021) and are featured in unique culinary tourism, as seen in Kendal (Meilana *et al*., 2020). In these areas, horseshoe crabs may become targeted catches, even if they are often caught incidentally. This situation presents an opportunity to support horseshoe crabconservation strategies in Banten, given the low demand for consumption and the absence of a large market or significant demand, as seen in Thailand. Thus, there is still potential to support local conservation efforts. Furthermore, increasing awareness and understanding of the ecological and medical value of horseshoe crabs can be achieved through community-based education. According to Martin *et al*. (2018) and Sobral *et al*. (2017), local ecological knowledge can serve as an effective tool for monitoring fish catches and conserving biodiversity, as demonstrated in Tijucas Bay and the Araripe-Apodi National Forest.

CONCLUSSION

This primary study finds that *Tachypleus gigas* is the most commonly encountered species, particularly as bycatch in bottom gillnet fisheries. location in Kronjo and Mauk reported the highest occurrences of horseshoe crab, indicating localized hotspots of incidental capture. The majority of respondents perceived a clear decline in horseshoe crabpopulations, identifying bycatch as the dominant

driver, with lesser impacts from habitat degradation and pollution. Although over half of the respondents were aware that horseshoe crab is protected, a significant portion remained unaware of their legal status, and almost none had consumed the species. These insights underline that while local ecological knowledge exists, it remains limited in depth and conservation application.

A limitation of this study is the relatively small sample size and geographic scope, which may not fully represent all coastal communities in Indonesia. Future research should expand to broader regions and involve interdisciplinary approaches to develop culturally appropriate conservation strategies and sustainable fishery practices.

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