ORIGINAL PAPER

Assessing population structure of the wedge clam on sandy beaches in a shellfish protected area in Trang Province

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Abstract. The wedge clam, *Donax scortum* is a shallow-bottom bivalve, generally found on sandy beaches. This species is capable of reaching high population densities and is one of the most important bivalves to local economies in the Andaman coast of Thailand. Local fishers collect wedge clams by observing their siphons and digging with a PVC pipe tipped. A shellfish protected area was established in Trang Province as a management strategy for clam's conservation. This study aimed to compare the population structures of *D. scortum* in a shellfish protection area compared to a non-protected beach at Hat Pak Meng in 2018. The results showed that the 5–6 cm size class of *D. scortum* in the shellfish protected area was higher than those in non-protected areas. Recruitment of *D. scortum* was also observed in the shellfish protection area. This study shows the importance of *D. scortum* and sandy beach ecosystem services. The efforts from conservation groups and local communities in the Pak Meng and nearby areas can help conserve marine and coastal resources. The shellfish protection area can be a learning centre for tourists while promoting ecotourism in Trang Province.

Keywords: Andaman Sea, bivalves, conservation, *Donax scortum*, management, protected area

1. Introduction

The marine bivalves in genus Donax commonly inhabit the intertidal zone and are globally distributed in tropical and temperate regions (McLachlan and Brown 2006; Saeedi and Costello 2012). They are an important component of the shallow-bottom macrofauna of exposed sandy beaches. There are 12 species of the Donax have been reported in Thai waters (Nabhitabhata 2009). The *Donax scortum* is one of economic marine bivalves in the genus Donax, which is found along the coasts of; triangular-shaped with fine concentric striae. The shell colour pattern is varied; outer shell is yellowish brown or brownish black. In Thailand, this wedge clam is found only in the coasts of the Andaman Sea, particularly on sandy shores of Trang Province, particularly Hat Pak Meng Beach, where the highest abundance of wedge clam was reported. *D. Scortum* can be found all year round but is most abundant in some periods. According to Peerakeitkhachorn and Watanakul (1997), *D. scortum* at Hat Pak Meng is usually found in the intertidal zone with loamy sand substrate.

In general, Thailand has high shellfish consumption nationwide, especially in coastal communities. Last decade, the amounts of marine mollusks consumption fluctuated from 14,300 to 22,800 tonnes (DoF 2018). Local fishers have harvested *D. scortum* for a long time, particularly at Hat Pak Meng in Trang Province. Moreover, *D. scortum* is an economically important species in Thailand due to high demand for exports to Malaysia, Hong Kong, and Taiwan. Consequently, the wedge clam resource has been heavily exploited that raising a serious concern on the sustainability of the wedge clam resource (Amornjaruchit 1988; Peerakeitkhachorn and Watanakul 1997).

The human dimensions of marine conservation are thus increasingly recognized as important, and the ocean is heralded as the next frontier for natural resource conservation and development. (Bennett 2018). Most small-scale coastal fishers rely on marine resources for their income. Therefore, they normally occupy and use areas of high marine biodiversity when they use it intensively without conservation initiatives (FAO 2016). Consequently, the ecosystem could be threatened, which in turn influences the economic well-being of the local communities. The types of Marine Protected Areas (MPAs) were designed by conservation focus and the level of protection varying throughout the area (Kelleher and Kenchington 1991). Moreover, the preventing overexploitation of marine resources is frequently an important goal to pursue. Therefore, this study aimed to compare the *D. scortum* between shellfish protected area and non-protected area at Hat Pak Meng, Trang Province.

2. Materials and Methods

2.1 Study site and data collection

The study sites are located in Hat Pak Meng (7º 29´41.9´´N, 99º 19´37.4´´E). Hat Pak Meng is a 5 km-long sandy beach with a pine forest along the shore, starting from the north of the bay close to the small river called 'Klong Pak Meng' stretching southward until the canal, Klong Hla. The study sites are under a tropical climate. The average temperature and relative humidities are 24-34°C and about 77-84%, respectively. The rainy season starts from May to December which is influenced by the southwestern monsoon. The average rainfall is about 1,841.3 millimeters. Generally, tides along the Andaman Coasts are semidiurnal (Aungsakul et al. 2007) and the highest tide of about 3.53 meters was estimated (Hydrographic-Department 2017)

2.2 data collection

Ecological surveys were conducted using a line-transect method with traditional harvesting that was applied to study the abundance and distribution of the clam. The field surveys were conducted in collaboration with local fishers at Hat Pak Meng, Trang Province from January to September in the years 2018. The distribution and abundance of the *Donax scortum* were observed from the highest water level up to the lowest low tide area. Random sampling, area of 100 m2, 3 replicates on sand beaches the local fishers collected the clams by observing siphons of the clams and digging by a PVC pipe tipped. A total of 100 individuals of wedge clams were randomly selected to study size class that divided into 5 classes; 2.00–3.00, 3.01–4.00, 4.01–5.00, 5.01–6.00, and 6.01–7.00 cm

2.2 data collection

The density of wedge clam was expressed in individuals per 1,000 square meters, and the average size was expressed in average centimeter with standard derivation. The average density and average size of wedge clam, *D. scortum* between protected area and non-protected area were performed by using t-test in R Program version 3.5.0

3. Results

The highest density of wedge clam population in a protected area (105.20±31.98 individuals/1,000 m2) was significantly higher than that non-protected area (14.20±8.95 individuals/1,000 m2) (p=0.007) (Figure 3.). Moreover, the highest average size of D. scortum was found in protected area (4.96±0.94), but did not significantly different with non-protected area (4.53±0.66) (p=0.136). The length of wedge clam found at study sites ranged from 2 to 7 cm. The most dominant size class of *D. scortum* was found in range of 5.0–6.0 cm in both areas, while the lowest one was observed in a range of 2.0–3.0 cm at both areas as well. However, the size of *D. scortum* ranged of 6.0–7.0 cm was not found in non-protected areas (Figure 4.). Our surveys revealed that the distribution pattern of *D. scortum* was clumped and found at 80–650 meters from the highest tide level at Hat Pak Meng, as well as the suitable harvesting time of the wedge clam that will be when the tide level was lower than one meter (Figure 5.).

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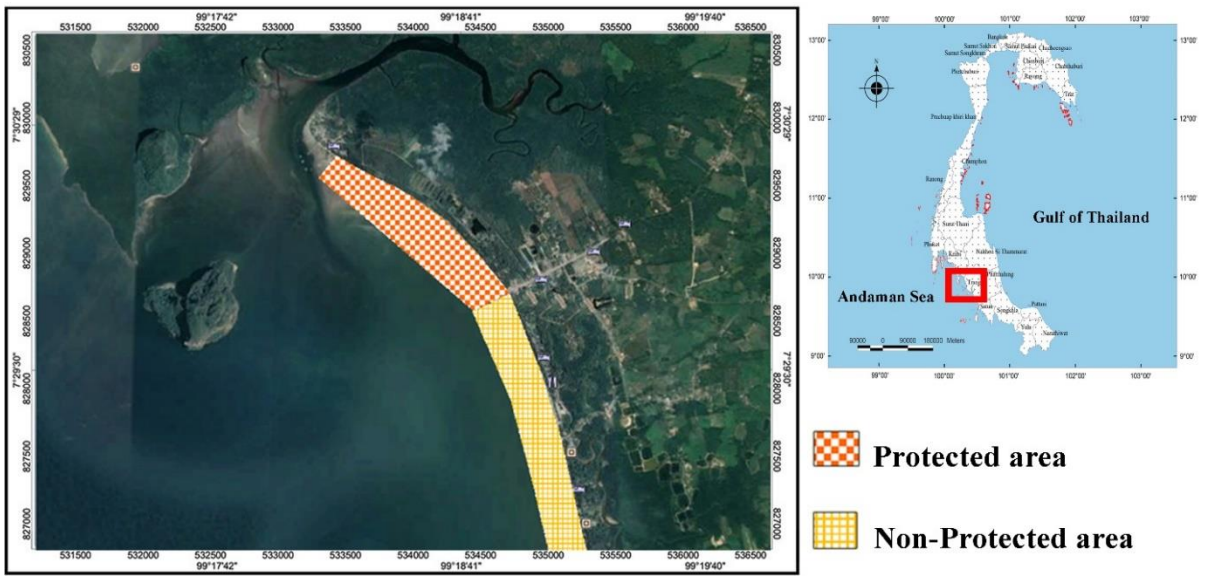

Figure 1. Location of research laboratory, OMG Sandworm Company Limited, Petchaburi, Thailand

Figure 2. Coastal people collecting wedge clams and size of wedge clams

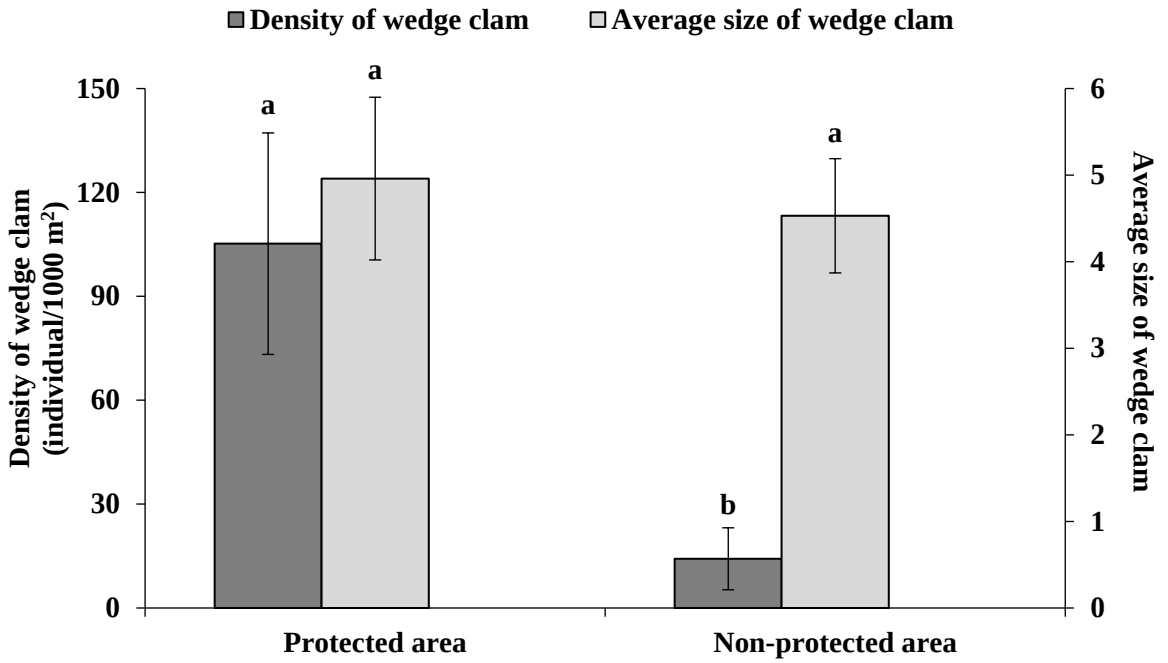

Figure 3. Density and average size of wedge clam between study sites at Hat Pak Meng

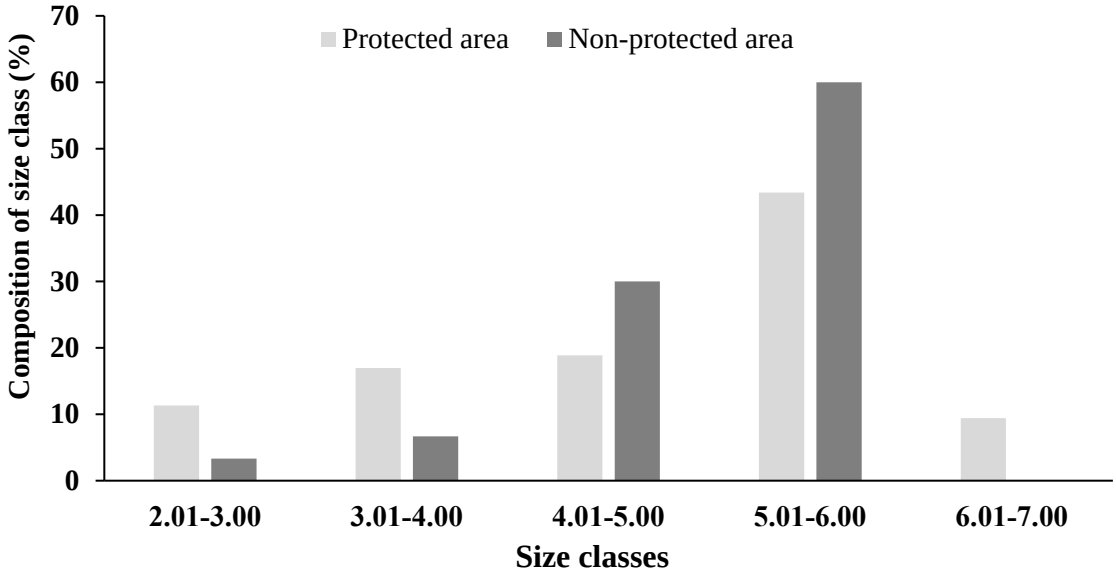

Figure 4. Composition of wedge clam size class between protected and non-protected areas

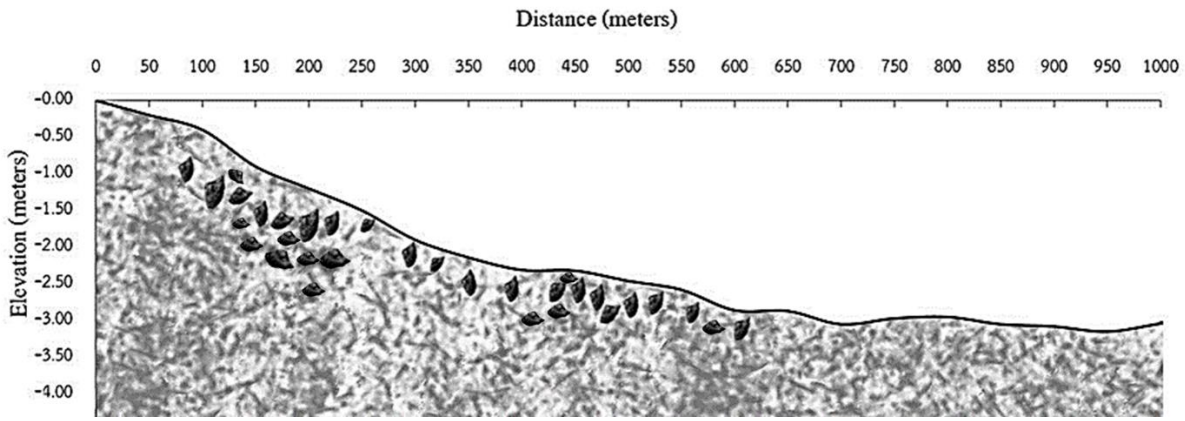

Figure 5. Distribution pattern of the wedge clam at Hat Pak Meng

4. Discussion

The abundance of *D. scortum* in the shellfish protected area is higher than that non-shellfish protected area. Moreover, the size of *D. scortum* is bigger than that non-shellfish protected area as well. Consequently, the effective regulations of shellfish protected areas at Hat Pak Meng are pursued. The size of *D. scortum* in our study is similar to the wedge shell, *D. scortum* from Karnataka coast that ranged from 33.51 to 69.36 mm and with a maximum length (69.8 mm) (Singh 2017). Moreover, Singh (2017) has been reported that the wedge shell *D. scortum* has a longer lifespan of approximately seven years.

The knowledge of their distribution, population dynamics, and the level of exploitation are still required, although the wedge clam had high economic value and market demand. Due to that, the wedge clam is found in few localities, hence statistical data is not always available. Additionally, studies on the wedge clam, especially on their ecological, biological, and fisheries aspects in Thailand are still limited. Thereby, the knowledge of population parameters of *D. scortum* in the Andaman coast of Thailand is essential for sustainable uses. The efforts of conservation groups and local communities in the Pak Meng area and nearby can assist to maintain the coastal resources. Moreover, this study indicates that the shellfish protected area can be a learning centre for tourists and promotes ecotourism in Trang Province as well.

Various studies indicate that the trans-disciplinary approach can reinforce the successful implementation of sustainable resource utilization by emphasizing knowledge Integration, collaboration, including participation of relevant stakeholders (Paterson et al. 2010; Wasson et al. 2015). Further studies will be done on population parameters of *D. scortum* and their recruitment in the Andaman coast of Thailand.

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