Occurrence and Distribution of Seagrass in Waters of Pulau Setindan, Johor

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***Abstract*:** The species composition and distribution of seagrass species in Pulau Setindan has never been evaluated, unlike the other islands of Johor where studies on seagrasses were assessed more extensively. In the present study, field surveys were carried out to investigate the seagrass distribution and species composition on the coastal areas of Pulau Setindan during period of July to August 2018. A total of six species from five genera were recorded, namely *Cymodocea rotundata, Cymodocea serrulata, Enhalus acoroides, Halodule uninervis, Halophila ovalis*, and *Thalassia hemprichii*. Results also indicated that seagrass beds were patchy and in the form of mixed beds, with more than two species of seagrasses coexisting. The coverage area was more than 10 ha and was concentrated on the shallow flats connecting Tanjung Genting on the mainland to Pulau Setindan. The dominant species found is *Cymodocea rotundata* with total percent cover of 29.77% and found in all sampling sites, followed by *Cymodocea serrulata* with total percent cover of 45.17%, occurring in 3 sites. Overall, seagrasses at Pulau Setindan is significant from a biological point of view as it is the closest representation of an undisturbed seagrass area of a non-marine park island in Johor. Thus, this study forms an initial step in understanding the seagrass community and provides a basis for future observations on the marine ecosystem of Pulau Setindan.

Keywords: Seagrass species, occurrence, species composition, distribution, Pulau Setindan

***Abstrak*:** Penilaian komposisi dan taburan spesies rumput laut di Pulau Setindan belum pernah dilakukan sebelum ini, tidak seperti di kepulauan lain di Johor di mana kajian ke atas rumput laut dijalankan secara meluas. Di dalam kajian ini, survei di lapangan telah dijalankan bagi mengetahui taburan dan komposisi spesies rumput laut di perairan Pulau Setindan mulai Julai hingga Ogos 2018. Sejumlah enam spesies daripada lima genus berjaya direkodkan, iaitu *Cymodocea rotundata, Cymodocea serrulata, Enhalus acoroides, Halodule uninervis, Halophila ovalis*, dan *Thalassia hemprichii*. Hasil kajian juga mendapati kawasan rumput laut adalah bertompok-tompok dan bercampur-campur, di mana lebih daripada dua spesies rumput laut ditemui di setiap lokasi. Kawasan liputan rumput laut adalah melebihi 10 ha dan tertumpu di perairan cetek yang menghubungkan Tanjung Genting di tanah besar dengan Pulau Setindan. Spesies dominan ialah *Cymodocea rotundata* dengan peratus litupan sebanyak 29.77% dan boleh ditemui di semua lokasi persampelan, diikuti dengan *Cymodocea serrulata* dengan peratus litupan sebanyak 45.17%, yang ditemui di 3 lokasi. Keseluruhannya, rumput laut Pulau Setindan adalah penting daripada sudut biologi memandangkan ianya mewakili kawasan rumput laut yang tak terganggu di luar kawasan taman laut Johor. Maka, kajian ini menjadi langkah awal dalam memahami komuniti rumput laut dan menyediakan asas kepada kajian seterusnya bagi ekosistem marin di Pulau Setindan.

Introduction

Seagrasses are submerged flowering plants, which thrive in shallow marine or estuarine waters generally below 10 m in depth as long as the environment is clear and photic (Choo, 2006). The habitats where seagrasses grow are usually along the coastal areas of the mainland, in between mangroves and corals, and at off-shore islands between the fringing corals and the open seas (Japar Sidik *et al.* 2006). In general, seagrass beds are considered a key factor for a healthy marine ecosystem as they provide primary food, refugia and nursery grounds for many fishes, invertebrates, turtles and dugongs (Japar Sidik *et al.* 2006; Muta Harah & Japar Sidik, 2013), and many coastal populations are directly dependent on these habitats for a living, especially the Southeast Asian countries (Unsworth and Cullen 2010). They also protect the coastlines against erosion and stabilizing the bottom substratum through the physical characteristics of their leaves and root-rhizome systems (Roushon *et al.* 2009; Sabri *et al.* 2013). Seagrasses are also reported to have potentially improved water quality at a particular environment (Japar Sidik *et al.* 1999; Sabri *et al.* 2013) and a potential bioindicator for trace metal pollution (Sidi *et al.* 2018). However, this flora does not been protected. They are only protected in areas where they fall within marine parks, and are not included in any national policies (Ponnampalam *et al.* 2014).

Currently, there are approximately 60 species of seagrasses in 12 genera recorded worldwide (Sabri *et al.* 2013). In Malaysia, a total of 16 species of seagrass belonging to 8 genera (Japar Sidik *et al.* 2016) were found scattered throughout 78 seagrass beds in both east and west Malaysia (Japar Sidik *et al.* 2006; Japar Sidik and Muta Harah 2011; Muta Harah and Japar Sidik 2013). The distribution of seagrasses in Peninsular Malaysia has been detailed in various publications and much attention was paid to the areas of southeast Johor, such as Merambong and Tanjung Adang (Japar Sidik *et al.* 2014; Sabri *et al.* 2013, Japar Sidik and Muta Harah 2011, Japar Sidik *et al.* 2006) and the east Johor islands such as Pulau Sibu, Pulau Tinggi and Pulau Besar (Japar Sidik *et al.* 1995; Azman *et al.* 2007; Lee *et al.* 2010). However, the seagrass bed in Pulau Setindan was undocumented.

Pulau Setindan is located approximately 1.5 km off the coast of Mersing, Johor. It is categorized as a resort island by the Department of Environment, Malaysia. At low spring tides the beach dries out landward of Pulau Setindan which is in excess of 1 km offshore. Thus, it is possible to walk from mainland to this island during this short period. Although the island is uninhabited, it is a favourite fishing spot among traditional fishermen. It has no protected status; therefore, visitors and fishing pressure are not controlled or monitored. However, the Johor state government has been planning for big-impacts developments and a boost in the tourism sector of Mersing town for the past 2 years, which involves land reclamation, building training walls, breakwaters, marina and so forth around coastal areas of Mersing. These activities may cause degradation or possible habitat loss of the seagrass beds in Pulau Setindan, which will affect the local communities that collect and catches for their livelihood in the area. Therefore, information regarding the occurrences and distribution are important for the protection and conservation of the seagrass beds. The objectives of this study are to conduct a preliminary biodiversity assessment on seagrass and to provide baseline information on seagrasses of Pulau Setindan.

Material and Methods

Field surveys were conducted from April to August 2018 at 4 random sites along the western side of the island (Fig.1) using line point intercept transect. Three teams (3 replicates) carried out at each site along 50 m transect tapes with a distance of 10 m from each other, and perpendicular to the island. A 50 cm x 50 cm quadrate was used to visually estimate the seagrass cover, using the modified method by McKenzie (2003). Estimated percent cover for all species were combined on a scale of 0-100% in each of the quadrate.

Surveys were conducted during high tide, neap tide and low tide. Seagrass specimens occurring at each site were collected and brought back to the laboratory, where they were identified with references by den Hartog (1970), Japar Sidik et al (1999), and Muta Harah and Japar Sidik (2013). They were then dried, placed and photographed with a complete notation of each specimen.

Figure 1: Map showing sampling locations in Pulau Setindan.

Results

Results indicated that the seagrass beds in Pulau Setindan was patchy and in the form of mixed beds, with more than two species of seagrasses coexisting. A total of six species from five genera were identified, namely *Cymodocea rotundata* Ehrenberg & Hemprich ex Ascherson, *Cymodocea serrulata* (R. Brown) Ascherson & Magnus, *Enhalus acoroides* (L.f.) Royle, *Thalassia hemprichii* (Ehrenberg) Ascherson, *Halodule uninervis* (Forsskål) Ascherson and *Halophila ovalis* (R. Brown) Hook. f. (Fig. 2). Among these species, *Cymodocea rotundata, Enhalus acoroides, Halodule uninervis* occurred in all 4 sites, followed by *Cymodocea serrulata* which were found in 3 out of 4 sites and finally *Halophila ovalis* which were only found in one site. Seagrass species were most diverse at Station 2 where all six species were present, followed by Station 3 with five species and finally Station 1 and 4 with four species respectively (Fig. 3).

Total coverage area of the seagrass beds around Pulau Setindan was estimated to be more than 10 ha and was concentrated on the shallow flats connecting Tanjung Genting on the mainland to Pulau Setindan. Figure 3 shows the percent cover of seagrass species at each site. Stations 1 and 2 are dominated by *Cymodocea rotundata* with the highest percent cover of 11.66% and 14.21% respectively, followed by *Thalassia hemprichii* with 10.78% and 11.37% percent cover respectively. *Cymodocea serrulata* dominated

Station 3 and 4 with highest percent cover of 30.88% and 27.05% respectively, followed by *Cymodocea rotundata* with 6.47% and 10.29% respectively. Averagely, *Cymodocea serrulata* has the highest percent cover with 45.17%, followed by *Cymodocea rotundata* with 29.77%. *Halophila ovalis* has the least percent cover with the average of 0.68%.

Figure 2: From left to right, top to bottom: (a) *Cymodocea rotundata,* (b) *Cymodocea serrulata,* (c) *Enhalus acoroides,* (d) *Thalassia hemprichii,* (e) *Halodule univernis*, and (f) *Halophila ovalis*.

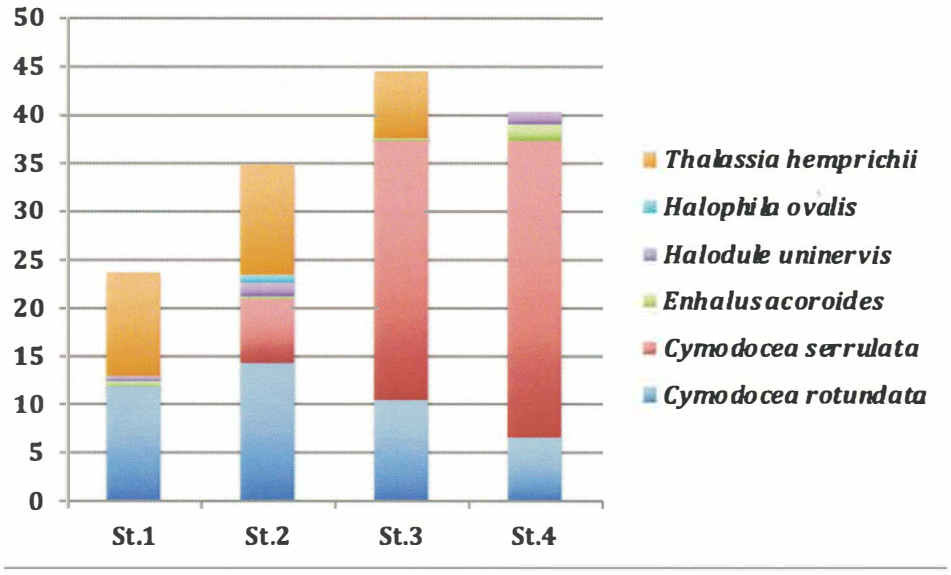

Figure 3: Comparison of percent cover of seagrass species in different stations

Discussion

In the present study, a total of 6 seagrass species were encountered, which is about half of the total seagrass species ever recorded in Malaysia. Comparing to the seagrasses recorded in the islands of Johor such as Pulau Sibu (4 species), Tinggi (6 species), Besar (5 species), Merambong shoals (10 species) and adjacent islands such as Pulau Perhentian (5 species) and Redang (3 species) (Japar Sidik *et al.* 2006; Muta Harah and Japar Sidik 2013; Sabri et al. 2013; Japar Sidik *et al.* 2014), the diversity of seagrass in Pulau Setindan is considered relatively high. However, the dominant species in Pulau Setindan (*Cymodocea* spp.) are not consistent with the dominant species found in the seagrass beds of adjacent islands such as Pulau Sibu and Pulau Tinggi (*Halodule* spp). This might be due to the different physical oceanic conditions such as fluctuations in water quality and turbidity caused by the seasonal north-east monsoon occurring from November to January (Zelina *et al.* 2000) that affect these areas. Seagrasses with small bodies and flaccid leaves such as *Halophila* spp. and *Halodule* spp. are more equipped for survival under extreme conditions where they are less vulnerable to wave actions and becoming detached, whereas large-bodied and wide-leaved seagrasses such as *Thalassia hemprichii* and *Cymodocea* spp. are more common in the relatively calm and sheltered areas (Muta Harah and Japar Sidik 2013). Large-bodied seagrasses (ie. *Cymodocea* spp. and *Thalassia hemprichii*) were found thriving in the waters of Pulau Setindan suggested that the area is sheltered and relatively calm, making it a suitable refugia and nursery ground for fishes and invertebrates. Despite the relatively large areas of seagrass bed in Pulau Setindan, no dugong feeding trails were spotted during the survey although there has been sighting reports of dugongs around Setindan area (Ponnampalam *et al.* 2014). Therefore, this might be a potential feeding ground for the dugongs. This is the first record of seagrasses conducted on this island and this information provides a basis for the future observations on the seagrass ecosystem of Pulau Setindan.

Conclusion

The data collected in this study will be very useful as baseline data for future study; as such in the future there will be a need to look at the impact caused by over-development or other economic activities such as land reclamation and tourism onto the marine environment and ecosystem of Pulau Setindan. In recent years, Mersing is experiencing a rapid economic development due to the boost in the tourism sector which sometimes conflicts with the preservation of the natural resources. Development projects in the Mersing Bay will be a potential threat to the seagrass beds and information regarding its occurrences and distribution are important for the purposes of conservations.

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