

2

SIRI PENYELIDIKAN & MAKLUMAT PERAIRAN MALAYSIA

RESEARCH & INFORMATION SERIES OF MALAYSIAN COASTS

**EKOSISTEM MARIN MALAYSIA:
PENYELIDIKAN PANTAI TIMUR JOHOR DARUL TAKZIM
MALAYSIA MARINE ECOSYSTEM:
THE STUDIES OF JOHOR DARUL TAKZIM EAST COAST**

Penyunting / Editors
Che Abd. Rahim Mohamed
Fathul Karim Sahrani
Masni Mohd. Ali
Zaidi Che Cob
Norhayati Ahmad



**Pusat Penyelidikan Ekosistem Marin (EKOMAR),
Fakulti Sains dan Teknologi, UKM
Marine Ecosystem Research Centre (EKOMAR),
Faculty of Science and Technology, UKM**

Seagrass Biodiversity of Pulau Tinggi, Johor

Azman Abdul Rahman, Ramlan Omar, Wan-Lotfi Wan Muda,
Zaidi Che Cob & Othman Hj Ross

Marine Ecosystem Research Centre (EKOMAR),
Faculty of Science and Technology, Universiti Kebangsaan Malaysia

ABSTRACT

A total of ten seagrass species from two families (Hydrocharitaceae and Cymodoceaceae) were reported from Pulau Tinggi, Johor. All specimens were collected subtidally from 5–13 m depth. The seagrass flora comprises of *Halophila decipiens*, *H. ovalis*, *H. spinulosa*, *H. minor*, *Cymodocea rotundata*, *C. serrulata*, *Halodule pinifolia*, *H. uninervis*, *Syringodium isoetifolium* and *Enhalus acoroides*. All of the species have been reported from the South China Sea and these represent 56% of the total regional numbers recorded. The total coverage area of the seagrass beds was estimated to be 21,400 m² around Pulau Tinggi.

Keywords: seagrass; biodiversity; Pulau Tinggi; distribution; Malaysia; *Halophila decipiens*; *H. ovalis*; *Cymodocea rotundata*; *C. serrulata*; *Halodule pinifolia*; *H. uninervis*; *Syringodium isoetifolium*; *Enhalus acoroides*.

Introduction

Seagrasses are one of the most widespread communities inhabiting the shallow waters of tropical and temperate regions of the world (Den Hartog 1970; Phillips and McRoy 1980). To date they comprise only about 60 described species worldwide, of which 18 species are found in, and adjacent to the coastal waters of South China Sea (UNEP 2004). Knowledge of seagrass in Malaysia is inadequately documented and is limited to Peninsular Malaysia (Den Hartog 1970; Phang 1989; Kushairi 1992; Japar 1994; Sidek et al 1999; Phang 2000). There has been only a single study carried out from the waters of Sabah, East Malaysia (e.g. Norhadi 1993). In a more recent study, Phang (2000) listed fifteen species of seagrass flora from Malaysian waters. Considering the fact that 60 seagrass species have been recorded worldwide with Indo-West pacific as one of the richest and most diverse centre for flora and fauna, it is possible that additional seagrass species would be discovered from this region. More studies should be done focusing on specific locality that would be a favourable habitat for seagrass. One of the known areas of seagrass occurrence along the east coast of Malay Peninsula is the East Johor Island

Archipelagos (EJIA) consisting 13 small islands off Mersing, Johor. Pulau Tinggi as one of the biggest island in the EJIA and has been chosen as a pilot survey site. The purpose of this study was to determine the species composition and distribution of seagrass around Pulau Tinggi. It is hoped that this kind of study would add to the knowledge on seagrass in the coastal ecosystems of Malaysia.

Materials and Methods

Pulau Tinggi (2°18'N; 104°07'E), is located about 30 km southeast of Mersing, Johor (Figure 1). With a total area of about 16 km², Pulau Tinggi is considered to be one of the biggest islands from the EJIA, comprising 13 islands namely Pulau Harimau, Pulau Mensirip, Pulau Goal, Pulau Tengah, Pulau Hujung, Pulau Rawa, Pulau Sibul, Pulau Mentigi, Pulau Sibul Hujung, Pulau Pemanggil, Pulau Besar and Pulau Aur.

Seagrass was collected subtidally (depth range from 5-13 m) around Pulau Tinggi from May to September 2007. The surveys were conducted by visual inspection using SCUBA divers. For each site, visual inspection of seagrass was determined by 4-8 SCUBA divers. Buoys were deployed by the divers to determine the area covered by seagrass at each designated site. Detailed information on seagrass species composition, GPS readings, and brief habitat descriptions were also noted. Voucher specimens of seagrass occurring at each site were collected for records and further taxonomic identification. Seagrass species identification was based on reference keys by Den

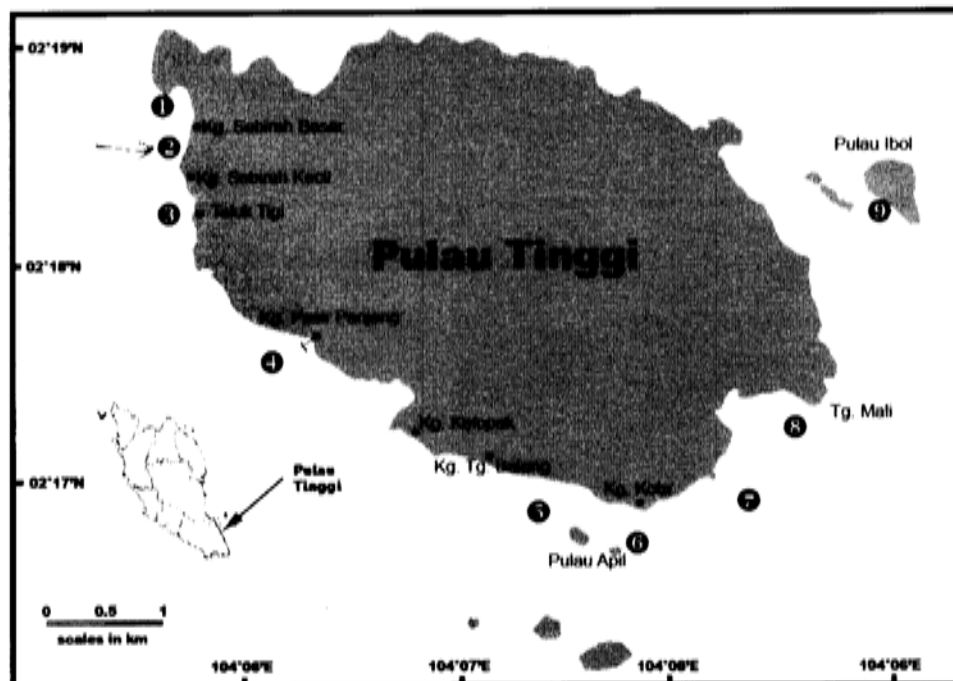


FIGURE 1: Location of the Nine Study Sites at Pulau Tinggi

Hartog (1970). A total of 9 sites comprising of about 21,400 m² of area were observed and sampled for marine seagrass. Specimens of seagrass were deposited at the Herbarium, Universiti Kebangsaan Malaysia for future reference.

Results

A total of ten seagrass species from five genera and two families were identified from Pulau Tinggi. These include *Halophila decipiens*, *H. ovalis*, *H. spinulosa*, *H. minor*, *Cymodocea rotundata*, *C. serrulata*, *Halodule pinifolia*, *H. uninervis*, *Syringodium isoetifolium* and *Enhalus acoroides* (Table 1). Among these species, *Halodule uninervis* occurred among six of the nine study sites and were the most observed ubiquitous species. This was followed by *Halophila ovalis* and *Cymodocea rotundata* which occurred at five of the nine study sites. Seagrass species were most diverse at Station 2 (Kg. Sebirah Kecil) and Station 5 (Kg. Tg. Balang), in which six species were present. In general, there were two to six seagrass species at the respective sites around the coast of Pulau Tinggi.

TABLE 1: Species Composition and Distribution of Seagrass Species at Nine Study Sites of Pulau Tinggi. *H.d*: *Halophila decipiens*; *H.o*: *H. ovalis*; *H.s*: *H. spinulosa*; *H.m*: *H. minor*; *C.r*: *Cymodocea rotundata*; *C.s*: *C. serrulata*; *H.p*: *Halodule pinifolia*; *H.u*: *H. uninervis*; *S.i*: *Syringodium isoetifolium*; *E.a*: *Enhalus acoroides*

St. No.	Location GPS	Substrate Type	Sampled Area (m ²)	Sampling Date	Seagrass Species										
					<i>H.d</i>	<i>H.o</i>	<i>H.s</i>	<i>H.m</i>	<i>C.r</i>	<i>C.s</i>	<i>H.p</i>	<i>H.u</i>	<i>S.i</i>	<i>E.a</i>	
●	02°18.683'N, 104°05.575'E	sandy	2,912	6 July 2007					✓					✓	
●	02°18.490'N, 104°05.575'E	Muddy + sandy	3,868	7 July 2007	✓		✓		✓	✓	✓	✓	✓	✓	
●	02°18.162'N, 104°05.614'E	sandy	2,000	7 July 2007			✓							✓	
●	02°17.567'N, 104°06.070'E	sandy	1,770	6 May 2007					✓					✓	
●	02°16.740'N, 104°07.760'E	Muddy + sandy	2,945	5 May 2007					✓	✓	✓	✓	✓	✓	✓
●	02°16.833'N, 104°07.283'E	Muddy + sandy	3,531	5 May 2007			✓		✓					✓	
●	02°16.952'N, 104°08.235'E	sandy	3,703	9 Sept 2007	✓	✓		✓							
●	02°17.213'N, 104°08.449'E	sandy	17	8 Sept 2007		✓	✓								
●	02°18.195'N, 104°08.845'E	sandy	643	9 Sept 2007	✓	✓									

Total coverage area of the seagrass beds around Pulau Tinggi was estimated to be 21,400 m². A comprehensive study concerning the percentage of seagrass species coverage at each site will be published in the forthcoming papers. However spatial variations in the area covered by seagrass were evident (Table 1). The most extensive coverage of seagrass was observed at Station 2 (Kg. Sebirah Kecil) with a total area of 3,868m². Seagrass cover at Station 7 (Teluk Pinang), occupying of about 3,703 m² ranked second. Next was Station 6 (Kg. Kota) covering approximately 3,531 m². Other stations observed i.e. Station 5 (Kg. Tg. Balang), Station 1 (Kg. Sebirah Besar), Station 3 (Teluk Tigi), Station 4 (Marine Park Jetty), Station 9 (Pulau Ibol) and Station 8 (Tg. Mali), recorded 2,945 m², 2,912 m², 2,000 m², 1,770 m², 643 m² and 17 m² respectively.

Discussion

The coast of Pulau Tinggi is densely covered by diverse seagrass species. However, these seagrasses are poorly understood and no published scientific information regarding seagrass in Pulau Tinggi is available yet except for Affendi et al. (2005) who reported the occurrences of four seagrass species. After a whole-island survey, a total of ten seagrass species from five genera and two families were determined on Pulau Tinggi, six of which represent new records for the locality. The seagrass species reported from the South China Sea region were summarized by UNEP (2004). For example, in Malaysia alone, eleven seagrass species were reported. Vietnam has the highest number of known seagrass species in the world, with 14 species. Thailand and Indonesia share the same number of recorded species with twelve. The Philippines recorded ten known seagrass species and finally Cambodia with only eight species. The number of seagrass species collected in Pulau Tinggi was 16.7% of the total species number in the world and 56% of the total regional number recorded. Our results showed that although Pulau Tinggi is a small island (with approximately 17 km of total coastline), the seagrass are rather diverse as compared with the relatively long-coastlines of previously studied areas (e.g. Thailand, Indonesia, Philippines and Cambodia). Moreover the present study developed an important addition to the poorly documented marine flora of Malaysia.

In conclusion, the relatively large area of seagrass bed recorded and the diversity of seagrass species found in Pulau Tinggi indicated that the seagrass resource is very abundant. These seagrass beds must be conserved through adequate management to maintain the marine ecological processes of Pulau Tinggi.

Acknowledgement

This study was supported by the Ministry of Science, Technology and Innovation under Grant 04-01-02-SF0172. We are grateful to Idris, M.H., Shamsul B., Husdy, S., Zuhaimi, S., Delwyn, L., Malveen, C., for field assistance. Many thanks are also due to the Marine Park Section, Department of Fisheries, Malaysia.

References

- Affendi, Y. A., Jillian, O, S.M. Phang, Azhar, H., Faedzul, R., Rosmadi, F. 2005. Dugongs In Peril: The Conservation and Protection of Dugongs in Johor, Malaysia. In: TITAN Chemicals Corp Bhd United Nations Development Programme Report. Universiti Malaya Maritime Research Centre.
- Den Hartog, C. 1970. The Sea-Grasses of the World. North-Holland Publishing Co. pp. 275.
- Japar, S.B. 1994. Status of seagrass resources in Malaysia. In: Wilkinson, C., S. Sudara and C.L. Ming (eds). Proceedings of the Third ASEAN-Australia Symposium on Living Coastal Resources. Vol. 1. pp. 283-289.
- Kushairi, M. 1992. The areas and species distribution of seagrass in Peninsula Malaysia. Paper presented at First National Symposium on Natural Resources 23- 26 July 1992. FSSA, UKM. Kota Kinabalu, Sabah.
- Philips, R.C. and C.P. McRoy. 1980. Handbook of seagrass biology, an ecosystem perspective. Garland STPM Press, New York. p. 353.
- Norhadi I. 1993. Preliminary study of seagrass flora of Sabah, Malaysia. *Pertanika J. Trop. Agric. Sci.* 16: 111-118.
- Phang S.M. 1989. Seagrasses – a neglected natural resource in Malaysia. Proc. 12th Annual Seminar of the Malaysian Society of Marine Sciences, 269-278.
- Phang S.M. 2000. Seagrasses of Malaysia. University of Malaya Botanical Monographs No. 2. University of Malaya: Kuala Lumpur.
- Sidik B.J., Z.M. Harah, A.M. Pauzi & S. Madhavan. 1999. *Halodule* species from Malaysia – distribution and morphological variation. *Aquatic Botany*, 65 (1-4): 33-45.
- UNEP. 2004. Seagrass in the South China Sea. UNEP/GEF/SCS Technical Publication No. 3.