

A Survey of the Marine Intertidal Macrogastropoda in the Northern Straits of Malacca

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A survey on the diversity of marine macrogastropoda in Pulau Songsong, Pulau Bidan and Pulau Telor on the Northern Straits of Malacca was conducted. Specimens were collected on rocky shores following NaGISA protocol and the number of marine macrogastropod were recorded. Distances and the number of the same species were converted into Relative Abundance unit (individuals per 100 m²). A total of 15 species of marine macrogastropoda were found from seven families namely Neritidae, Trochidae, Cerithiidae, Littorinidae, Turbinidae, Muricidae and Potamididae. Seven macrogastropoda species were newly recorded from these three islands. *Morula marginatra* was the most dominant species and Pulau Songsong had the highest genera and species diversity among the three islands.

Gastropoda is the largest and most diverse group in the Phylum Mollusca (Hickman *et al.* 2006). Gastropods are easily recognised by having single coiled shell. The visceral mass is usually covered by the shell (Berry 1963; Kerney & Cameron 1994). The shell shape varies and is absent in some groups, such as slugs and nudibranch (Kastoro *et al.* 2000). Marine gastropods are economically important as food, crafts, dye and anti-cancer drugs (Chandler *et al.* 2008; Benkendoff *et al.* 2009; Florez-Garza *et al.* 2012).

Wong & Arshad (2011) reported that there is an information gap on the diversity and species list, which leads to the difficulty in assessing the population lost rate for marine shelled molluscs in Malaysia. Through a collection of scientific writing and compilation done by Wong & Arshad (2011), there are about 581 species of marine molluscs (388 from Class Gastropoda and 206 from Class Bivalvia) listed in Malaysia.

The aim of this survey was to determine the diversity of marine macrogastropoda of Pulau Songsong, Pulau Bidan and Pulau Telor, which is located in the Northern Straits of Malacca during the Scientific Expedition of the Northern Straits of Malacca.

MATERIALS AND METHOD

A survey on marine macrogastropoda was conducted on 29 and 31 May 2012, at three islands (Pulau Songsong, 5°48'41.8"N 100°17'38.3"E; Pulau Bidan, 5°44'46.6"N 100°17'12.9"E; and Pulau Telor, 5°46'14.9"N 100°17'04.1"E) that are located at the northern Straits of Malacca (Figure 1). The survey was conducted on the intertidal areas during low tide. Specimens were collected on rocky shores following NaGISA protocol which uses the transect collection method and the numbers of marine macrogastropoda were recorded. Distances and the number of the same species were converted into Relative Abundance unit (individuals per 100 m²). Identification was done following Abbott (1991) and Kastoro *et al.* (2000) and the photographic of the specimens were recorded. All specimens were stored in 99% ethanol for preservation.

RESULTS AND DISCUSSION

The list of marine gastropoda species collected from the three islands at the northern Straits of Malacca was shown in Table 1. A total of seven families, nine genera and 15 species were recorded. Namely, *Nerita maxima*, *Nerita plicata*, *Monodonta labio*, *Monodonta canalifera*, *Nodilittorina biangulata*, *Lunella cinerea* and *Morula marginatra* were the first time recorded species from these three islands.

The common families were *Neritidae* and *Littorinidae*, with four species each. *Neritidae* and *Littorinidae* are the herbivore grazers on the rocky shores that can be found almost everywhere, across wide ecological zones (Abbot 1991; Little *et al.* 1996). *Morula marginata* was the most dominant species in Pulau Songsong with the density of 153 individuals per 100 m². Although *M. marginatra* can be found densely in Pulau Songsong, it was not found in Pulau Bidan and Pulau Telor. Kohn & Leviten (1976) reported that the members of the family Muricidae (genus

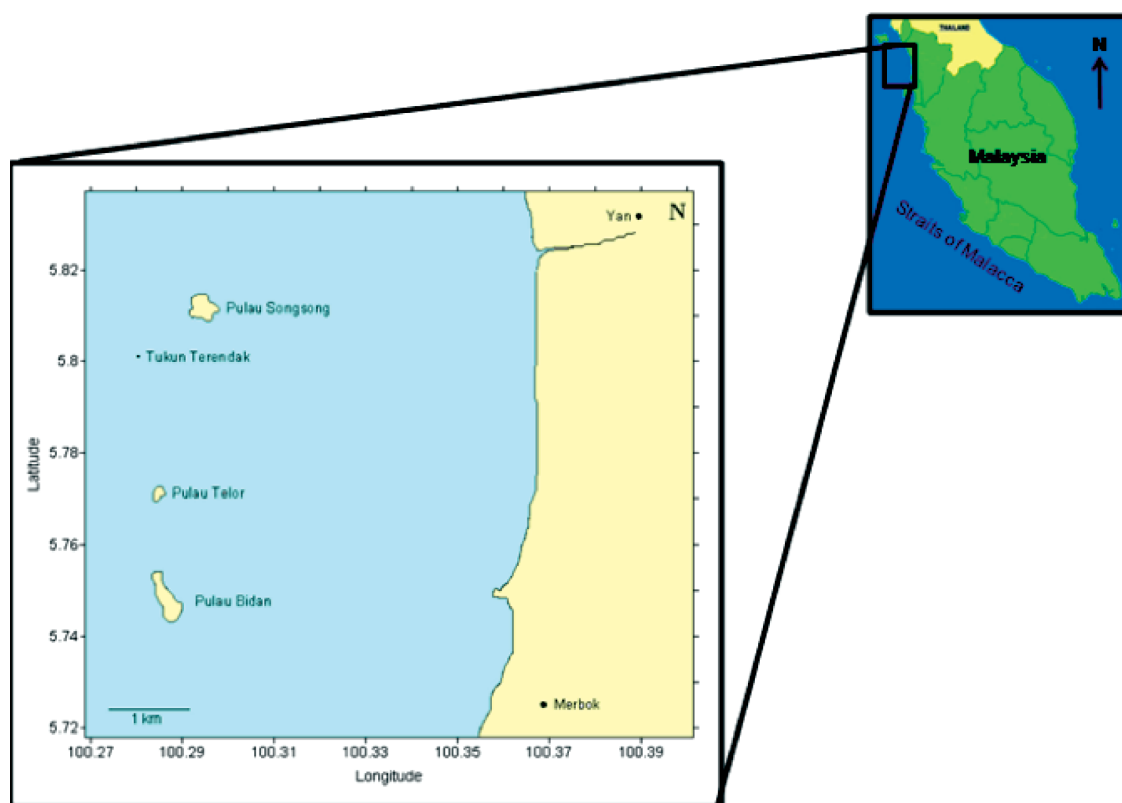


Figure 1. Location of the three islands at the Northern Straits of Malacca.

TABLE 1. THE DIVERSITY AND ABUNDANCE OF THE MARINE MACROGASTROPODA FROM PULAU SONGSONG (PSS), PULAU BIDAN (PB) AND PULAU TELOR (PT).

Family	Species	Number of individuals per 100 m ²			Total	Total of species
		Location				
		PSS	PB	PT		
Neritidae	Nerita articulata	0	70	3	73	4
	Nerita maxima	23	10	13	46	
	Nerita plicata	6	0	0	6	
	Nerita polita	3	0	0	3	
Trochidae	Monodonta labio	63	6	3	72	2
	Monodonta canalifera	26	0	0	26	
Cerithidea	Clypeomorus batillariaeformis	46	0	0	46	1
Littorinidae	Littorina undulata	0	40	30	70	4
	Littorina scabra	16	0	0	16	
	Nodilittorina pyramidalis	0	26	0	26	
	Nodilittorina biangulata	0	20	23	43	
Turbinidae	Lunella cinerea	6	0	0	6	1
Muricidae	Thais tuberosa	0	46	30	76	2
	Morula marginatra	153	0	0	153	
Potamididae	Cerithidea sp.	3	0	0	3	1
	Total number of species	9	7	6		
	Total number of genus	7	5	5		

Drupa) have depressed, limpet-like shell and disc-shaped foot, that help them to minimise the effects of strong water movements at high tide and water loss at low tide. The rocks in Pulau Bidan and Pulau Telor are larger compared to Pulau Songsong with sharp surface making it good refuges for the *M. marginatra*, while in Pulau Songsong the rocks are smooth and bare surface making it easy to spot and collect them.

Nerita articulata, *Littorina undulata*, *Nodilittorina biangulata* and *Thais tuberosa* can be found in Pulau

Bidan and Pulau Telor but not Pulau Songsong. This may be well due to the fact that *M. marginatra* feeds on other small gastropods (Taylor 1993), and is also a dominant predator on rocky shores (Claremont *et al.* 2012). *Nerita polita* and *Cerithidea* sp. were the least dense species with three individuals per 100 m² each, and only found in Pulau Songsong. Since Pulau Songsong has a larger sandy area, *Nerita polita* is buried in sand against intertidal rocks and only emerges during the night while most of the members from family Potamididae live in mangrove estuarine areas (Abbott 1991).

TABLE 2. COMPARISONS OF MARINE MACROGASTROPODA WITH OTHER STUDIES.

Family	Species	Current Study	Purchon & Purchon (1981)	Wong (2005)	Tan <i>et al.</i> (2007)
Muricidae	Morula musiva			✓	
	Morula marginatra	✓			
	Thais tuberosa	✓			
	Thais bitubercularis			✓	
	Thais lacera				✓
	Thais sp.				✓
	Thais rufotincta			✓	
	Chiroreus brunneus			✓	
	Chiroreus torrefactus			✓	
	Murex trapa		✓		
	Murex occa		✓		
Nassaridae	Nassarius livescens				✓
	Nassarius stolatus				✓
Neritidae	Nerita articulata	✓			
	Nerita maxima	✓			
	Nerita plicata	✓			
	Nerita polita	✓			
Trochidae	Monodonta labio	✓			
	Monodonta canalifera	✓			
	Monilea sp.				✓
Naticidae	Polinices tumidus				✓
	Natica tigrina				✓
Potamididae	Cerithedia undulata				✓
Littorinidae	Cerithedia sp.	✓			
	Littorina undulata	✓			
	Littorina scabra	✓			
	Nodilittorina pyramidalis	✓			
	Nodilittorina biangulata	✓			
Turbinidae	Lunella cinerea	✓			
	Marginella ventricosa				✓
Melongenidae	Pugilina cochlidium				✓
Turritellidae	Turritelia tereba				✓
Cultellidae	Cultellus lacteus		✓		
Strombidae	Strombus marginatus		✓		
Tonnidae	Tonna dolium		✓		
Ficidae	Ficus ficoides		✓		
Olividae	Oliva elegans		✓		
Volutidae	Melo melo		✓		
Veneridae	Timoclea scabra		✓		
	Total number of species	15	9	5	11

Pulau Songsong had shown the highest diversity of macrogastropoda population among the three islands, with seven genera and nine species of macrogastropoda. The lowest diversity site was Pulau Telor, with five genera and six species. *Nerita maxima* and *Monodonta labio* could be found in all the islands. Both species were commonly found on the intertidal rocky shores especially near the coral reef areas (Abbott 1991). The differences in species richness in the three islands may be due to different sampling efforts done. Six transects were laid in Pulau Songsong, which contributed to the high number of marine macrogastropoda collected while only two transects were placed in Pulau Bidan, and one in Pulau Telor. As Pulau Songsong is bigger than Pulau Bidan and Pulau Telor, it made the island more accessible as compared to the other two islands (Figure 1). Besides that, the Royal Malaysia Air Force used Pulau Songsong as a premise for shooting target practice. Thus, the island was not made open to public until the year 2009.

As compared to other studies by Purchon & Purchon (1981), Wong (2005) and Tan *et al.* (2007) on the Northern Straits of Malacca, the current study revealed higher diversity and abundance of marine macrogastropoda, although slightly lower than that of findings by Tan *et al.* (2007) (Table 2). This variation maybe caused by the different habitats of the current study with the previous studies as these three islands were mainly consist of rocky shores. Tan *et al.* (2007) found 14 species of marine macrogastropod from 12 genera on the seagrass bed in Pulau Gazumbo, a man-made island created from the dumped materials during the Penang Bridge construction in 1985. The numbers of specimens were collected from 15 transects during the sampling in Pulau Gazumbo while current study only have nine transects in total from the three islands. About 36% of their molluscs were found crawling freely on the seagrass bed looking for food. However, the species found in Tan *et al.* (2007) were not the same with current study which may be due to the fact that their study were conducted at a seagrass bed whereas the current study were rocky shores. Purchon & Purchon (1981) collected large marine specimens and did not mention the specific method used for their collection except the one that have economical values by fish trawl or from the fishermen. As for Wong (2005)'s study, she focussed on specimens from the Muricidae family, and found five species from three genera (*Morula*, *Thais* and *Chorus*) in Pulau Langkawi, Pulau Songsong and Pulau Pinang, which carried higher diversity as compared to the current study that had found only two species in terms of the Muricidae Family.

Thus, more intense study is needed to cover larger geographical areas and different habitats to get more diversity records for marine macrogastropoda in the Northern Straits of Malacca.

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APPENDICES

Table 1. The diversity and abundance of the marine macrogastropoda from Pulau Songsong (PSS), Pulau Bidan (PB) and Pulau Telor (PT).

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