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MARINE ALGAE COLLECTED DURING THE MARINE BIODIVERSITY MINI EXPEDITION 2012 TO SEMBILAN GROUP OF ISLANDS, PERAK WITH ONE NEW RECORD, *Parvocaulis parvulus* (Solms-Laubach) S. Berger *et al.* FOR MALAYSIA

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ABSTRACT In May 11 -15, 2012, the Institute of Ocean and Earth Sciences, University of Malaya organized a marine expedition to the Sembilan Group of Islands, Perak (Malaysia). The objective of the expedition was to document the marine biodiversity in the waters around the islands and the coastal zone as well as documenting physical parameters. Marine algae were among the targeted groups of taxa. A total of 51 algal specimens were collected. All specimens are deposited as herbarium in the University of Malaya Seaweed and Seagrass Herbarium. The algae comprised one family, one genus and three putative species of Cyanophyta; five families, six genera and 13 putative species of Chlorophyta; seven families, ten genera and 13 putative species of Rhodophyta and one family, one genus and one putative species of Phaeophyceae. Of these, the chlorophyte *Parvocaulis parvulus* (Solms-Laubach) S. Berger *et al.* is a new record for Malaysia. In 2008, Phang *et al.* reported that a total of seven families and nine putative species of marine algae were collected during the Scientific Expeditions to the Seas of Malaysia (SESMA) I and II from the Sembilan Group of Islands (Pulau Lalang and Pulau Rumbia) Perak. Of these, an addition of six families and 11 putative species were collected during this present survey.

ABSTRAK Pada Mei 11-15, 2012, Institut Sains Samudera Dan Bumi, Universiti Malaya telah mengelolakan satu ekspedisi marin ke Kepulauan Sembilan, Perak, Malaysia. Objektif expedisi ini adalah untuk mendokumentasikan biodiversiti marin serta parameter fikizal di kawasan perairan persekitaran dan juga di zon persisiran pantai kepulauan ini. Alga marin merupakan salah satu kumpulan taksa sasaran tinjauan ini. Sejumlah 51 spesimen alga telah dikutipkan. Semua specimen ini telah disimpankan sebagai herbarium di dalam Herbarium Rumpair dan Rumput Laut Universiti Malaya. Alga tersebut merangkumi satu famili, satu genus dan tiga spesies putatif Cyanophyta; lima famili, enam genera dan 13 spesies putatif putative Chlorophyta; tujuh famili, sepuluh genera dan 13 spesies putatif Rhodophyta dan satu famili, satu genus dan satu spesies putatif Phaeophyceae. Di antara ini, chlorophyte *Parvocaulis parvulus* (Solms-Laubach) S. Berger *et al.* merupakan rekod baru bagi Malaysia. Pada tahun 2008, Phang *et al.* melaporkan bahawa sejumlah tujuh famili dan sembilan spesies putatif alga marin telah dikutipkan dari Kepulauan Sembilan (Pulau Lalang and Pulau Rumbia), Perak dalam Ekspedisi Saintifik ke Lautan Malaysia (SESMA) I dan II. Berbanding dengan ini, sebanyak enam famili dan 11 spesies putatif tambahan telah dikutipkan dalam ekspedisi tinjauan baru ini.

(Keywords: marine algae, checklist list, Sembilan Group of Islands)

INTRODUCTION

In May 11 -15, 2012, the Institute of Ocean and Earth Sciences (IOES), University of Malaya organized a marine expedition to the Sembilan Group of Islands, Perak, Malaysia. This is a cluster of islands located 16 km south of Pulau Pangkor, 27 km south of Lumut and about 18.5 km from the mouth of Perak River (Sungai Perak), Perak, Peninsular Malaysia (**Figure 1**). In general, the Sembilan Group of Islands is underlain by granites, particular made up of porphyritic to coarse grained biotite granite [1, 2]. These islands have limited coastal plains. The majority of the island shorelines are either bare granite outcrops or accumulation of granite boulders. All the islands have steep slopes and only limited beaches found on the islands; long sandy beaches are only found at isolated coves on Pulau Rumbia and on the eastern side of

Pulau Lalang [2]. There are few shallow water areas and the majority of the seafloor of the shallow areas is dominated by sandy or rocky substrate. Sport fishing is the major activity in this area and recently SCUBA diving tourism too. The larger islands Pulau Rumbia and Pulau Lalang serve as a safe anchorage for fishing boats.

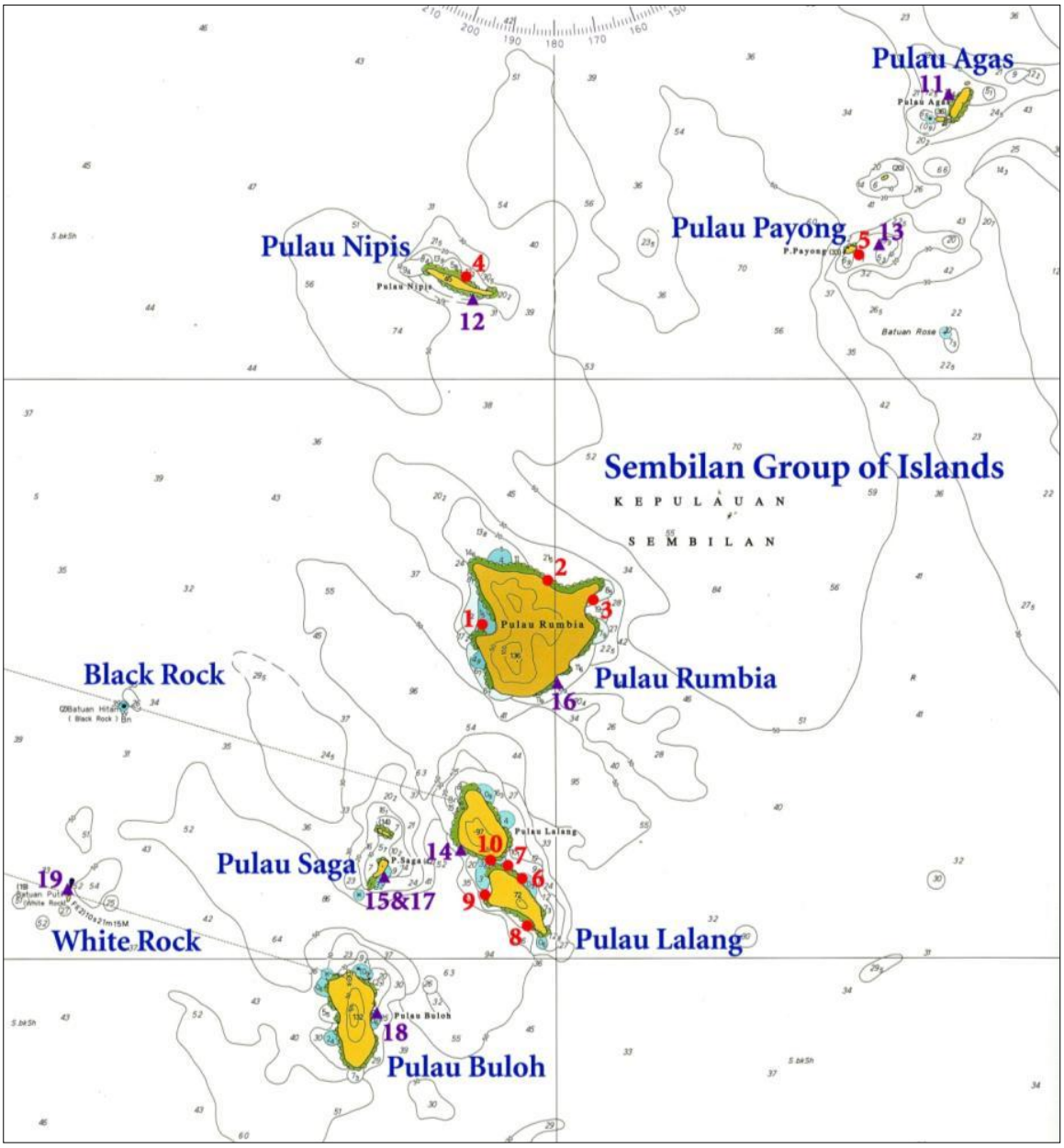

Figure 1. Map of the Sembilan Group of islands with subtidal (dive) and coastal sites

1- 19: Visited sites number; ●: Coastal sites; ▲: Subtidal (dive) sites

For this survey, our research group aimed to document the marine algae in the coastal waters of the islands. Marine marco-algae or seaweeds in common play an important role in the coastal and marine ecosystem. They serve as one of the primary producers in the marine ecosystem, providing breeding grounds for marine organism as well as contributing in carbon sequestration [3, 4].

During two expeditions to the Pulau Jarak, Sembilan Group of Island (Pulau Rumbia and Pulau Salang) and Pulau Perak in the Straits of Malacca in June 2004 and November 2007, a total of 66 seaweed putative species were recorded and a preliminary checklist of marine algae from the above mentioned expedition was reported [3]. This checklist reported a total of 22 algal families: one family with two genera and six putative species of Cyanophyta, seven families with three genera and three putative species of Chlorophyta, 12 families with 20 genera and 39 putative species of Rhodophyta and two families with three genera and three putative species of Phaeophyceae. *Lyngbya confervoides* f. *violacea* C. Agardh was reported for the first time for Malaysia [3].

MATERIAL AND METHODS

The marine algal samples were collected by wading, snorkelling, and SCUBA diving, and also from intertidal tree roots and rocks. A total of eighteen sites and eight islands were visited during the three sampling days (12–14 May 2012). The sampled locations were Pulau Rumbia, Pulau Lalang, Pulau Payong, Pulau Nipis, Pulau Agas, Pulau Saga, Pulau Buloh and White Rock **(Table 1) (Figures 1-6).**

Figure 2. Sandy beach at Pulau Lalang Selantan, Perak

Figure 3. Rocky shore at Pulau Lalang Selantan, Perak

Figure 4. Pulau Lalang Utara, Perak

Figure 5. Pulau Rumbia, Perak

Figure 6. Pulau Payong, Perak

Underwater visibility varied from less than 1 m at Tukun Jepun to more than 8 m at White Rock. Sampled habitats varied from sandy and rocky shores, tidal pools, coral reef, coral rubble and tree roots. All collected samples were cleaned and processed into pre-herbarium specimens at the end of each sampling day. Subtidal samples were preserved in 5% formalin in seawater. Later, all the collected specimens were processed in to herbarium back in the Algae Research Laboratory, University of Malaya. The specimens were indentified based on morphological and anatomical characteristics by referring to the published taxonomic papers and keys. All specimens are deposited as herbarium in the University of Malaya Seaweed and Seagrass Herbarium. A checklist was prepared from the identified specimens of this survey as well as from the published records [3]. Sørensen's similarity coefficient (QS) [5] was used to determine the seaweed diversity similarity.

Table 1: List of intertidal (1-12) collection sites and dive (13-19) sites during the Marine Biodiversity Mini Expedition 2012 to the Sembilan Group of Islands, Perak, Malaysia

Site	Date	Location	Coordinate		Remark
			Latitude (N)	Longitude (E)	
1	12 May 2012	Pulau Rumbia	04^{o} 01’ 43.5”	100^{o} 32’37.0”	Sandy and rocky; water depth: 2-3 m
2	12 May 2012	Pulau Rumbia	04^{o} 01’ 56.7”	100^{o} 32’56.7”	Sandy and rocky; water depth: 1.7 -3.7 m
3	12 May 2012	Pulau Rumbia	04^{o} 01’ 51.7”	100^{o} 33’11.2”	Sandy, soft coral; water depth: 1.7 m
4	12 May 2012	Pulau Nipis	04^{o} 03’ 31.5”	100^{o} 32’31.1”	
5	12 May 2012	Pulau Payong	04^{o} 03’ 37.6”	100^{o} 34’35.9”	
6	13 May 2012	Pulau Lalang Selatan	04^{o} 00’ 24.1”	100^{o} 32’48.7”	Sandy beach;
7	13 May 2012	Pulau Lalang Selatan	04^{o} 00’ 29.2”	100^{o} 32’44.4”	Sandy
8	13 May 2012	Pulau Lalang Selatan	04^{o} 00’ 10.7”	100^{o} 32’51.4”	Sandy and rocky; water depth: 5 m
9	13 May 2012	Pulau Lalang Selatan	04^{o} 00’ 19.7”	100^{o} 32’37.6”	Sandy and rocky; water depth: 2-3m
10	13 May 2012	Pulau Lalang Utara	04^{o} 00’ 33.3”	100^{o} 32’40.5”	Sandy and rocky; water depth: 1.5 m
11	12 May 2012	Pulau Agas	04°04’28.0”	100°35’01.4”	Maximum dive depth: 14.6 m
12	12 May 2012	Pulau Nipis	04° 03’23.9”	100° 32’ 34.6	Maximum dive depth: 17.4 m
13	12 May 2012	Tukun Jepun	04°03’41.4”	100°34’39.5”	Maximum dive depth: 11.2 m
14	13 May 2012	Pulau Lalang	04°00'35.3"	100°32'30.2"	Maximum dive depth: 14.0 m
15	13 May 2012	Pulau Saga	04°00’25.4”	100°32’05.6”	Maximum dive depth: 14.9 m
16	13 May 2012	Pulau Rumbia	04°01’26.0”	100°32’59.6”	Maximum dive depth: 13.4 m
17	14 May 2012	Pulau Saga	04°00’25.4”	100°32’05.6”	Maximum dive depth: 13.6 m
18	14 May 2012	Pulau Buloh	03°59’42.6”	100°32’03.0”	Maximum dive depth: 15.0 m
19	14 May 2012	White Rock	04°00’22.1”	100°30’29.0”	Maximum dive depth: 19.9 m

RESULTS AND DISCUSSION

A preliminary marine algae checklist (**Table 2**) with a total of 30 spesies putatif was compiled from the survey as well as from the previous records reported by Phang *et al.* [3] for the Scientific Expeditions to the Seas of Malaysia (SESMA) I and II from the Sembilan Group of Islands. The marine algae comprise one family, one genus and three putative species of Cyanophyta; five families, six genera and 13 putative species of Chlorophyta; seven families, ten genera and 13 putative species of Rhodophyta and one family and one putative species of Phaeophyceae. Of these, a total of 17 putative species were collected during this survey and it comprised one family, one genus and one putative species of Cyanophyta, four families, five genera and eight putative species of Chlorophyta, five families, six genera and seven putative species of Rhodophyta and one family, genus and one putative species of Phaeophyceae. *In situ* pictures of some taxa and pictures of selected herbarium-dried specimens are shown in **Figures 8-29**.

Figure 7. Grazing activity by fish, Pulau Lalang, Perak

Figure 8. *Lyngbya* C. Agardh

Figure 9. *Lyngbya* C. Agardh

Figure 10. *Ulva* Linnaeus

Figure 11. *Chaetomorpha* Kützing

Figure 12. *Cladophora* Kützing

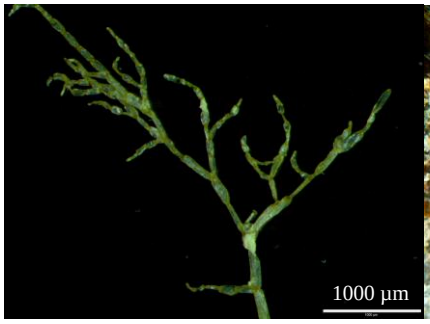

Figure 13. *Cladophora* Kützing (Herbarium; PSM12714)

Figure 14. *Bryopsis pennata* Lamouroux

Figure 15. *Bryopsis pennata* Lamouroux (Herbarium; PSM12701)

Figure 16. *Parvocaulis parvulus* (Solms-Laubach) S.Berger *et al*.

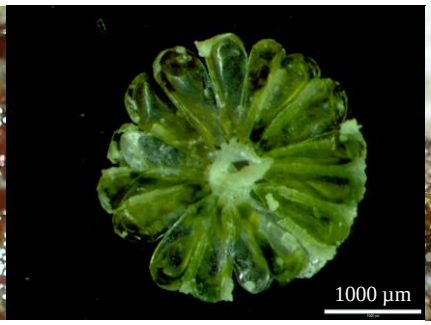

Figure 17. *Parvocaulis parvulus* (Solms-Laubach) S.Berger et al. (Herbarium; PSM12719)

Figure 18. *Gelidiopsis* F. Schmitz

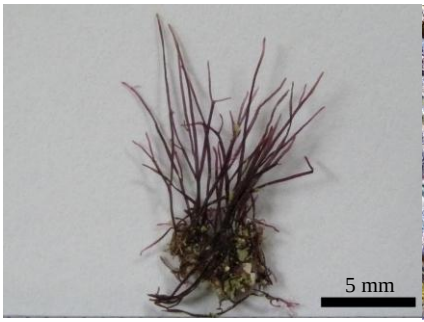

Figure 19. *Gelidiopsis* F. Schmitz (Herbarium; PSM12721)

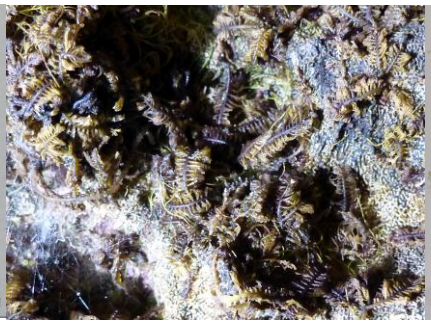

Figure 20. *Bostrychia tenella* (Lamouroux) J. Agard

Figure 21. *Bostrychia tenella* (Lamouroux) J. Agard (Herbarium; PSM12694)

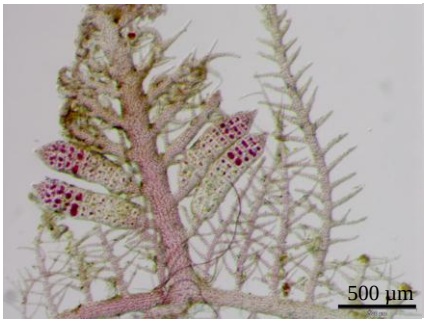

Figure 22. *Bostrychia Montagne* in Ramon de la Sagra (tetrasporophyte) (Herbarium; PSM12696)

Figure 23. *Gelidium* Lamouroux (Herbarium PSM12692)

Figure 24. *Pterocladiella* B.Santelices & Hommersand (Herbarium; PSM12704)

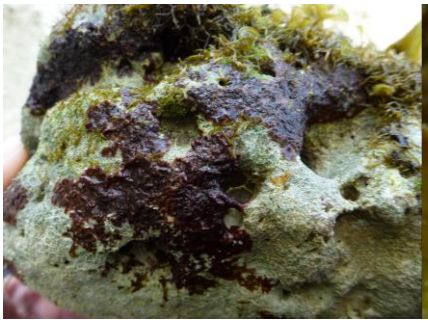

Figure 25. *Peyssonnelia* Decaisne

Figure 26. *Jania* Lamouroux

Figure 27. *Jania* Lamouroux (Herbarium; PSM12715)

Figure 28. *Padina* Adanson

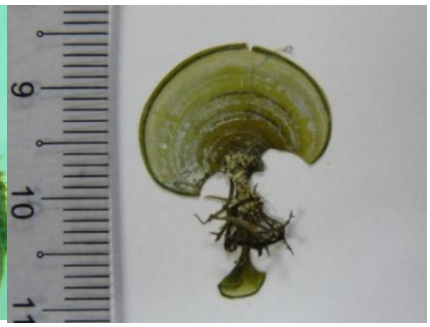

Figure 29. *Padina* Adanson (Herbarium; PSM12717)

Parvocaulis parvulus (Solms-Laubach) S. Berger *et al.*, *Ulva intestinalis* Linnaeus, *Bryopsis pennata* Lamouroux, *Pterocladiella* sp. B. Santelices & Hommersand, *Gelidiopsis* sp. F. Schmitz, *Peyssonnelia* sp. Decaisne, *Bostrychia tenella* (Lamouroux) J. Agardh and *Padina* sp. Adanson are new records for the Sembilan Group of Islands and the former species (*P. parvulus*) is a new record for Malaysia. One Cyanophyta specimen and one Rhodophyta specimen from the recent expedition and six Rhodophyta specimens from the previous survey by Phang *et al.* [3] remained unidentified. Insufficient diagnostic characters (e.g. reproductive structures) make the identifications difficult.

A relatively low seaweed species diversity (30 taxa out of 377 taxa recorded for Malaysia [6]) was found in the Sembilan Group of Islands. Tubular *Ulva* and filamentous chlorophytes such as *Chaetomorpha* and *Cladophora* dominated the upper intertidal zone and rhodophytes were found to be more dominant in the lower intertidal zone. Seaweed biomass was low in this area except for *Lyngbya* species, which was found growing abundantly on rock, coral rubble or the seafloor at the intertidal zone surrounding Pulau Lalang. At dive sites only *Bryopsis* sp. was collected. Cyanophytes and red algal crusts were observed but not collected at dive sites. The majority of the marine algae collections of this survey belonged mainly to the filamentous type of seaweed and some coralline species (*Peysonnelia* and *Jania*). It was not clear why the subtidal algal diversity was so low, but grazing activity by herbivores might be the cause (**Figure 7**).

Of the 18 genera, 11 genera were common members of the seaweed flora of the East coast of Peninsular Malaysia and 13 genera were common to seaweed flora of west coast of Peninsular Malaysia [6]. Based on Sørensen's similarity coefficient (QS) [5], at the genus level, the seaweeds of the Sembilan Group of Island showed low similarity to the West coast of Peninsular Malaysia (QS = 0.2826) and East coast of Peninsular Malaysia (QS = 0.2529). A comparison of the Sembilan Group of Island seaweeds with the seaweed checklist for Langkawi island [7] which is located about 273 km North of the Sembilan Group of Island shows low similarity both at genus level (QS = 0.2778) and species level (QS = 0.0351). Based on the Pulau Perak and Pulau Jarak seaweed checklist [3], the Sembilan Group of Island seaweeds show a moderate similarity to the seaweed flora of Pulau Jarak (which is situated 5 km to the West) (QS = 0.4242) and low similarity to Pulau Perak (about 256 km Northeast of the Sembilan Group of Island) (QS = 0.2927) at genus level. In summary, low species diversity as well as abundance of seaweeds was observed during the most recent survey. The limited number of sampling trips to this group of islands and only in the period May to November makes it difficult to appreciate the low abundance of marine algae in this area. Other studies such as water quality, interaction with ocean physical and chemicals factors should be included in consideration to determine the low number of marine algae species in this area. However, this survey was able to provide us some baseline data on the biodiversity of marine algae at the Sembilan Group of Island.

ACKNOWLEDGEMENT

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Table 2: Checklist of marine algal collections from the Sembilan Group of Islands, Perak Malaysia.

TAXA	Herbarium Voucher No.	Date	Location	Coordinate		Habitat
				Latitude (N)	Longitude (E)	
Division Cyanophyta						
Order Oscillatoriales						
Family Oscillatoriaceae						
Lyngbya ?aestuarii (Mert.) Liebm	PSM 9413	26-Nov-07	Pulau Lalang Selatan	04°00'39"N	100°54'38"E	sandy & rocky
	PSM 9414	26-Nov-07	Pulau Lalang Selatan	04°00'39"N	100°54'38"E	sandy & rocky
Lyngbya sp1 C. Agardh	PSM 9329	07-Jun-04	Pulau Lalang Selatan	04°00'23"N	100°32'49"E	
Lyngbya sp2 C. Agardh	PSM 12680	12-May-12	Pulau Rumbia	04°01'43.5"N	100°32'37.0"E	sandy & rocky
	PSM 12705	13-May-12	Pulau Lalang Selatan	04°00'24.1"N	100°32'48.7"E	sandy
	PSM 12706	13-May-12	Pulau Lalang Selatan	04°00'24.1"N	100°32'48.7"E	sandy
	PSM 12707	13-May-12	Pulau Lalang Selatan	04°00'24.1"N	100°32'48.7"E	sandy
	PSM 12709	13-May-12	Pulau Lalang Selatan	04°00'29.2"N	100°32'44.4"E	sandy
	PSM 12710	13-May-12	Pulau Lalang Selatan	04°00'29.2"N	100°32'44.4"E	sandy
	PSM 12723	13-May-12	Pulau Lalang Selatan	04°00'19.7"N	100°32'37.6"E	sandy & rocky
	PSM 12724	13-May-12	Pulau Lalang Selatan	04°00'19.7"N	100°32'37.6"E	sandy & rocky
	PSM 12728	13-May-12	Pulau Lalang Utara	04°00'33.3"N	100°32'40.5"E	sandy & rocky
Incertae sedis						
Unknown cyanophyte	PSM 12720	13-May-12	Pulau Lalang Selatan	04°00'19.7"N	100°32'37.6"E	sandy & rocky
Division Chlorophyta						
Order Ulvales						
Family Ulvaceae						
Ulva Linnaeus	PSM 9334	07-Jun-04	Pulau Rumbia			
	PSM 12690	12-May-12	Pulau Rumbia	04°01'43.5"N	100°32'37.0"E	sandy & rocky
	PSM 12700	12-May-12	Pulau Payong	04°03'37.6"N	100°34'35.9"E	
	PSM 12711	13-May-12	Pulau Lalang Selatan	04°00'29.2"N	100°32'44.4"E	sandy
	PSM 12712	13-May-12	Pulau Lalang Selatan	04°00'29.2"N	100°32'44.4"E	sandy

Ulva intestinalis Linnaeus	PSM 12681	12-May-12	Pulau Rumbia	04°01'43.5"N	100°32'37.0"E	sandy & rocky
	PSM 12718	13-May-12	Pulau Lalang Selatan	04°00'19.7"N	100°32'37.6"E	sandy & rocky
	PSM 12727	13-May-12	Pulau Lalang Utara	04°00'33.3"N	100°32'40.5"E	sandy & rocky
Order Cladophorales						
Family Cladophoraceae						
Chaetomorpha sp1 Kutzing	PSM 9325	07-Jun-04	Pulau Lalang Selatan	04°00'23"N	100°32'49"E	
	PSM 9326	07-Jun-04	Pulau Lalang Selatan	04°00'23"N	100°32'49"E	
	PSM 9330	07-Jun-04	Pulau Lalang Selatan	04°00'23"N	100°32'49"E	
Chaetomorpha sp2 Kutzing	PSM 9332	07-Jun-04	Pulau Rumbia			
Chaetomorpha sp3 Kutzing	PSM 12682	12-May-12	Pulau Rumbia	04°01'43.5"N	100°32'37.0"E	sandy & rocky
	PSM 12683	12-May-12	Pulau Rumbia	04°01'43.5"N	100°32'37.0"E	sandy & rocky
Chaetomorpha sp4 Kutzing	PSM 12684	12-May-12	Pulau Rumbia	04°01'43.5"N	100°32'37.0"E	sandy & rocky
	PSM 12685	12-May-12	Pulau Rumbia	04°01'43.5"N	100°32'37.0"E	sandy & rocky
	PSM 12686	12-May-12	Pulau Rumbia	04°01'43.5"N	100°32'37.0"E	sandy & rocky
	PSM 12687	12-May-12	Pulau Rumbia	04°01'43.5"N	100°32'37.0"E	sandy & rocky
	PSM 12697	12-May-12	Pulau Rumbia	04°01'51.7"N	100°33'11.2"E	sandy
	PSM 12698	12-May-12	Pulau Rumbia	04°01'51.7"N	100°33'11.2"E	sandy
	PSM 12725	13-May-12	Pulau Lalang Selatan	04°00'19.7"N	100°32'37.6"E	sandy & rocky
Cladophora ?*rhizoclonioidea* van den Hoek & Womersley	PSM 9415	26-Nov-07	Pulau Lalang Selatan	04°00'39"N	100°54'38"E	sandy & rocky
Cladophora sp 1 Kützing	PSM 9335-2	07-Jun-04	Pulau Rumbia			
Cladophora sp 2 Kützing	PSM 12688	12-May-12	Pulau Rumbia	04°01'43.5"N	100°32'37.0"E	sandy & rocky
	PSM 12689	12-May-12	Pulau Rumbia	04°01'43.5"N	100°32'37.0"E	sandy & rocky
	PSM 12691	12-May-12	Pulau Rumbia	04°01'43.5"N	100°32'37.0"E	sandy & rocky
	PSM 12713	13-May-12	Pulau Lalang Selatan	04°00'29.2"N	100°32'44.4"E	sandy
	PSM 12714	13-May-12	Pulau Lalang Selatan	04°00'29.2"N	100°32'44.4"E	sandy

Order Siphonocladales						
Family Valoniaceae						
Valoniopsis cf. *pachynema* (G. Martens) Børgesen	PSM 9331	07-Jun-04	Pulau Rumbia			Growing on tree trunk
	PSM 9333	07-Jun-04	Pulau Rumbia			
Order Bryopsidales						
Family Bryopsidaceae						
Bryopsis pennata Lamouroux	PSM 12701	12-May-12	Pulau Payong	04°03'37.5"N	100°34'35.9"E	
	PSM 12702	12-May-12	Pulau Payong	04°03'37.5"N	100°34'35.9"E	
	PSM 12703	12-May-12	Pulau Payong	04°03'37.5"N	100°34'35.9"E	
Bryopsis J.V.Lamouroux	PSM 12729	12-May-12	Pulau Agas	04°04’28.0”N	100°35’01.4”E	7 m depth
	PSM 12730	12-May-12	Tukun Jepun	04°03’41.4”N	100°34’39.5”E	5 m depth
	PSM 12731	14-May-12	Pulau Saga	04°00’25.4”N	100°32’05.6”E	13 m depth
Order Dasycladales						
Family Polyphysaceae						
Parvocaulis parvulus (Solms-Laubach) S. Berger, U. Fettweiss, S. Gleissberg, L.B. Liddle, U. Richter, H. Sawitzky & G.C. Zuccarello	PSM 12719	13-May-12	Pulau Lalang Selatan	04°00'19.7"N	100°32'37.6"E	sandy & rocky
Division Rhodophyta						
Order Gelidiales						
Gelidiales	PSM 9335-1	07-Jun-04	Pulau Rumbia			
Family Gelidiaceae						
Gelidium sp1 Lamouroux, nom. cons	PSM 9416	26-Nov-07	Pulau Lalang Selatan	04°00'39"N	100°54'38"E	sandy & rocky
Gelidium sp2 Lamouroux, nom. cons	PSM 12692	12-May-12	Pulau Rumbia	04°01'43.5"N	100°32'37.0"E	sandy & rocky
	PSM 12693	12-May-12	Pulau Rumbia	04°01'43.5"N	100°32'37.0"E	sandy & rocky

Family Pterocladiaceae						
Pterocladiella B.Santelices & Hommersand	PSM 12704	12-May-12	Pulau Payong	04°03'37.5"N	100°34'35.9"E	
	PSM 12725	13-May-12	Pulau Lalang Selatan	04°00'19.7"N	100°32'37.6"E	sandy & rocky
Order Peyssonneliales						
Family Peyssonneliaceae						
Peyssonelia Decaisne	PSM 12716	13-May-12	Pulau Lalang Selatan	04°00'29.2"N	100°32'44.4"E	sandy
Order Corallinales						
Family Corallinaceae						
Jania sp1 Lamouroux	PSM 9420	26-Nov-07	Pulau Lalang Selatan	04°00'39"N	100°54'38"E	sandy & rocky
Jania sp2 Lamouroux	PSM 12715	13-May-12	Pulau Lalang Selatan	04°00'29.2"N	100°32'44.4"E	sandy
Order Rhodymeniales						
Family Champiaceae						
Champia Desvaux	PSM 9421	26-Nov-07	Pulau Lalang Selatan	04°00'39"N	100°54'38"E	sandy & rocky
Family Lomentariaceae						
Gelidiopsis F. Schmitz	PSM 12721	13-May-12	Pulau Lalang Selatan	04°00'19.7"N	100°32'37.6"E	sandy & rocky
	PSM 12722	13-May-12	Pulau Lalang Selatan	04°00'19.7"N	100°32'37.6"E	sandy & rocky
Order Ceramiaceae						
Family Ceramiaceae						
Ceramium Roth	PSM 9417	26-Nov-07	Pulau Lalang Selatan	04°00'39"N	100°54'38"E	sandy & rocky
Order Ceramiales						
Family Rhodomelaceae						
Bostrychia tenella (Lamouroux) J. Agardh	PSM 12694	12-May-12	Pulau Rumbia	04°01'43.5"N	100°32'37.0"E	sandy & rocky
	PSM 12695	12-May-12	Pulau Rumbia	04°01'43.5"N	100°32'37.0"E	sandy & rocky
	PSM 12699	12-May-12	Pulau Rumbia	04°01'51.7"N	100°33'11.2"E	sandy

Bostrychia Montagne in Ramon de la Sagra	PSM 12696	12-May-12	Pulau Rumbia	04°01'43.5"N	100°32'37.0"E	sandy & rocky
Chondria C. Agardh	PSM 9418	26-Nov-07	Pulau Lalang Selatan	04°00'39"N	100°54'38.0"E	sandy & rocky
Polysiphonia Greville	PSM 9423	26-Nov-07	Pulau Lalang Selatan	04°00'39"N	100°54'38.0"E	sandy & rocky
unknown red	PSM 9322	07-Jun-04	Pulau Lalang Selatan	04°00'23"N	100°32'49"E	sandy & rocky
unknown red	PSM 9323	07-Jun-04	Pulau Lalang Selatan	04°00'23"N	100°32'49"E	on boulders, strong waves
unknown red	PSM 9324	07-Jun-04	Pulau Lalang Selatan	04°00'23"N	100°32'49"E	
unknown red	PSM 9327	07-Jun-04	Pulau Lalang Selatan	04°00'23"N	100°32'49"E	on boulders, higher shore
unknown red	PSM 9328	07-Jun-04	Pulau Lalang Selatan	04°00'23"N	100°32'49"E	on boulders, higher shore
unknown red	PSM 9424	26-Nov-07	Pulau Lalang Selatan	04°00'39"N	100°54'38.0"E	sandy & rocky
unknown red	PSM 12720	13-May-12	Pulau Lalang Selatan	04°00'19.7"N	100°32'37.6"E	sandy & rocky
Division Heterokonta						
Class Phaeophyceae						
Order Dictyotales						
Family Dictyotaceae						
Padina Adanson	PSM 12717	13-May-12	Pulau Lalang Selatan	04°00'29.2"N	100°32'44.4"E	sandy