

## Marine Algae Collected during the Scientific Expedition to Bachok, Kelantan and the Islands of Terengganu with One New Record, *Pterocliadiella* for Malaysia

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**ABSTRACT** In 2008, a scientific expedition to Bachok (the new Marine Station), Kelantan and the vicinity of Terengganu, was organised by the Institute of Ocean and Earth Sciences (IOES), University of Malaya. The objective of the expedition was to collect and document the natural resources of Bachok and its vicinity. Our team collected and identified the marine algae resources of the area. A total of 133 taxa of marine algae and four taxa of seagrasses were compiled from the results as well as previous records for Kelantan and Terengganu. The marine algae comprise 3 families of Cyanophyta with 4 genera and 4 taxa; 10 families of Chlorophyta with 13 genera and 35 taxa; 16 families of Rhodophyta with 38 genera and 63 taxa; 4 families of Phaeophyta with 8 genera and 31 taxa. Only 35 taxa were collected during this present survey, the most from the Rhodophyta (14 taxa) followed by the Phaeophyta (12 taxa), the Chlorophyta (8 taxa) and the Cyanophyta (4 taxa). Of these, the Cyanophyta *Lyngbya*, *Oscillatoria*, *Microcoleus* and *Brachytrichia*; the Chlorophyta *Ulva compressa*, *Ulva flexuosa*, *Ulva intestinalis*, *Caulerpa serrulata* var. *boryana*; the Rhodophyta *Gelidiella acerosa*, *Gelidium pusillum*, *Actinotrichia fragilis*, *Acanthophora spicifera*; and the Phaeophyta *Dictyota ciliolata*, *Lobophora variegata*, *Padina antillarum*, *Hormophysa cuneiformis* and *Turbinaria conoides* are new records for Kelantan and Terengganu. The Rhodophyta *Pterocliadiella* is a new record for Malaysia. Two families of seagrasses with 3 genera and 4 taxa were collected and included in this checklist. A new species of *Halophila* will be studied further.

**ABSTRAK** Pada tahun 2008, Institut Sains Samudera dan Bumi (IOES) Universiti Malaya telah melancarkan satu ekspedisi saintifik ke Bachok (Stesen Marin Baru), Kelantan dan dikawasan persekitaran Terengganu. Objektif ekspedisi ini adalah untuk mengutip dan mendokumentasikan sumber semula jadi Bachok dan kawasan sekelilingnya. Kumpulan kami telah mengutip dan mengenal-pasti rumpair laut di kawasan tersebut. Sejumlah 133 takson rumpair laut dan empat takson rumput laut telah dikumpul rekod lama untuk kawasan Kelantan dan Terengganu. Rumpair laut terkandung 3 famili Cyanophyta 4 genera dan 4 takson; 10 famili Chlorophyta 13 genus dan 35 takson; 16 famili Rhodophyta 38 genus dan 63 takson; 4 famili Phaeophyta dengan 8 genus dan 31 takson. Hanya 35 takson telah dikumpulkan daripada ekspedisi ini. Kebanyakan adalah daripada Rhodophyta (14 takson), diikuti oleh Phaeophyta (12 takson), Chlorophyta (8 takson) dan Cyanophyta (4 takson). Cyanophyta *Lyngbya*, *Oscillatoria*, *Microcoleus* dan *Brachytrichia*; Chlorophyta *Ulva compressa*, *Ulva flexuosa*, *Ulva intestinalis*, *Caulerpa serrulata* var. *boryana*; Rhodophyta *Gelidiella acerosa*, *Gelidium pusillum*, *Actinotrichia fragilis*, *Acanthophora spicifera*; serta Phaeophyta *Dictyota ciliolata*, *Lobophora variegata*, *Padina antillarum*, *Hormophysa cuneiformis* dan *Turbinaria conoides* merupakan rekod baru bagi Kelantan dan Terengganu. Rhodophyta *Pterocliadiella* merupakan rekod baru Malaysia. Dua famili rumput laut dengan 3 genus dan 4 takson telah dikutip dan ditambah ke senarai semak ini. Satu species baru *Halophila* akan dikaji dengan selanjutnya.

**(Keywords:** marine algae, checklist, Bachok, Setiu Wetlands, Pulau Rawa, Pulau Perhentian)

### INTRODUCTION

In 2008, a scientific expedition was organised by the Institute of Ocean and Earth Sciences (IOES), University of Malaya to Bachok, the site of the new Marine Station of the institute. Bachok is situated in Malaysia's most northeastern state of Kelantan and

faces the South China Sea. Off the coastline in the vicinity of Bachok are several islands belonging to the neighbouring state of Terengganu; namely Pulau Perhentian Kecil, Pulau Perhentian Besar, Pulau Redang, Pulau Lang Tengah, Pulau Bidong Laut and Pulau Kapas. The objective of the expedition was to

collect and document the natural resources of Bachok and its vicinity. The specific objective of our research team was to survey and document the marine algae resources of the area. Several of the islands in the vicinity have been gazetted as Marine Parks. Fishing is a major activity in this area while tourism to the island resorts brings in much revenue to the states of Terengganu and Kelantan. The waters surrounding the islands of Redang and Perhentian are pristine, with coral reefs and the associated flora and fauna.

The first major checklist of the marine algae of Malaysia was published by Phang (1998) who recorded two hundred and sixty specific and infraspecific taxa (17 Cyanophyta, 92 Chlorophyta, 94 Rhodophyta and 57 Phaeophyta). A survey (1995-1999) on the systematics of Malaysian marine algae conducted by the University of Malaya in collaboration with Hokkaido University, Japan, resulted in many additions to the checklist. The present tally includes 386 taxa comprising Chlorophyta (13 families, 102 taxa), Rhodophyta (27 families, 182 taxa), Phaeophyta (8 families, 85 taxa) and Cyanophyta (8 families, 17 taxa) (Phang 2006, Phang et al. 2007). Sixty-six taxa were reported for Pulau Jarak, Sembilan Group of Islands and Pulau Perak, northwest coast of Peninsular Malaysia (Phang et al. 2008a). In 2008 (b), Phang et al. also published a revised checklist of marine algae from the Pulau Tioman group of islands. The checklist comprised 3 taxa of Cyanophyta, 36 taxa of Chlorophyta, 40 taxa of Rhodophyta and 19 taxa of Phaeophyta. Four new records were reported: *Dictyosphaeria versluisii* Weber-van Bosse from Kampung Mukut, *Actinotrichia fragilis* (Forsskal) Boergesen from Tanjung Layar, *Jania rubens* (Linnaeus) Lamouroux from Tanjung Layar and *Coelothrix* Boergesen from Teluk Tekek.

## MATERIALS AND METHODS

This report is a result of two collection trips carried out simultaneously from 15 till 18 June 2008; one focusing along the coastline starting from north of Bachok, Kelantan, southwards along the coastline of Terengganu down to the Setiu Wetlands; and the second on the islands nearest to Bachok (Figure 1). The locations sampled in Kelantan were Sungai Kemasin, Bachok; Sungai Melawi, Bachok; Tok Bali Jetty; Kuala Semarak, Sungai Semarak and Tumpat. Locations sampled in Terengganu were Pulau Perhentian Besar, Pulau Perhentian Kecil, Pulau Rawa, Kampung Penarik, Setiu; Pantai Bari, Setiu and the Setiu Wetlands. Habitats, from which the algae were collected, include mud, coral, sandy and rocky shores, mangrove, driftweed, wood, fish cage

and epiphytes (Figures 2-7). Collection was sparse along the coastline with more samples collected in Terengganu than Bachok. The samples were collected by snorkelling around the islands and by scraping off substrata like rocks and dead corals. All specimens were cleaned and processed into herbarium, or preserved in formalin for further examination back in the laboratory. The specimens were identified based on morphological and anatomical characteristics, using published keys and taxonomic papers. All specimens are deposited in the University of Malaya Seaweeds and Seagrasses Herbarium. A checklist was prepared from the list of identified specimens from this survey as well as from published records (Phang et al. 2007). Included in this checklist are four seagrasses including a possible new species of seagrass.

## RESULTS AND DISCUSSION

A preliminary checklist (Table 1) with a total of 133 taxa of marine algae and four taxa of seagrasses was compiled from the results as well as previous records for Kelantan and Terengganu. The marine algae comprise 3 families of Cyanophyta with 4 genera and 4 taxa; 10 families of Chlorophyta with 13 genera and 35 taxa; 16 families of Rhodophyta with 38 genera and 63 taxa; 4 families of Phaeophyta with 8 genera and 31 taxa. Of these, only 35 taxa were collected during this present survey, the most from the Rhodophyta (14 taxa) followed by the Phaeophyta (12 taxa), the Chlorophyta (8 taxa) and the Cyanophyta (4 taxa). Of these, the Cyanophyta *Lyngbya*, *Oscillatoria*, *Microcoleus* and *Brachytrichia*; the Chlorophyta *Ulva compressa*, *Ulva flexuosa*, *Ulva intestinalis*, *Caulerpa serrulata* var. *boryana*; the Rhodophyta *Gelidiella acerosa*, *Gelidium pusillum*, *Actinotrichia fragilis*, *Acanthophora spicifera*; and the Phaeophyta *Dictyota ciliolata*, *Lobophora variegata*, *Padina antillarum*, *Hormophysa cuneiformis* and *Turbinaria conoides* are new records for Kelantan and Terengganu. The Rhodophyta *Pterocliadiella* is a new record for Malaysia. Figures 8-20 show some of the species collected and identified.

Two families of seagrasses with 3 genera and 4 taxa were collected and included in this checklist. A new species of *Halophila* will be studied further. Figures 21-23 show some of the seagrasses collected and identified.





**Figure 2.** Collecting *Chaetomorpha* in the mangrove at Kuala Semarak, Kelantan.



**Figure 3.** Mangrove in Kuala Semarak at low tide showing abundant growth of *Chaetomorpha*.



**Figure 4.** Rocky shore at Pantai Bari, Setiu, Terengganu.



**Figure 5.** Collecting seaweeds at abandoned fish cages at Kampung Beris Tok Ku, Setiu, Terengganu.



**Figure 6.** Collecting seaweeds by snorkeling at the mangroves, Sungai Semarak, Kelantan



**Figure 7.** Collecting seagrass at the Pantai Sri Tujuh, Tumpat, Kelantan

Table 1. Checklist of Marine Algae of Kelantan and Terengganu.

TAXA	Collection No.	Date	Location	Coordinate		HABITAT
				N	E	
<b>Division Cyanophyta</b>						
<b>Order Oscillatoriales</b>						
<b>Family Ostillatoriaceae</b>						
1 <i>Lyngbya</i> C. Agardh ex Gomont	PSM10217 PSM10224 PSM10234-1 PSM10257 PSM10276 PSM10217	16-June-08 16-June-08 16-June-08 16-June-08 17-June-08 16-June-08	Pantai Bari, Setiu, Terengganu Kampung Beris Tok Ku, Terengganu Setiu Wetland, Terengganu Kuala Sg. Besut, Terengganu Kuala Semarak, Bachok, Kelantan Pantai Bari, Setiu, Terengganu	05°35.409' 05°41.143' 05°40.824' 05°53.492'	102°46.976' 102°42.529' 102°42.763' 102°28.799'	F
2 <i>Oscillatoria</i> Vaucher ex Gomont						
<b>Family Phormidiaceae</b>						
3 <i>Microcoleus</i> Desmazières ex Gomont	PSM10325	16-June-08	Flora Beach Resort, Pulau Perhentian Besar (St 6)	05°53.574'	102°45.203'	C
<b>Order Stigonematales</b>						
<b>Family Mastigodacteleaceae</b>						
4 <i>Brachytrichia</i> Zanardini ex Borne et Flahault	PSM10340	16-June-08	Flora Beach Resort, Pulau Perhentian Besar (St 6)	05°53.574'	102°45.203'	C
<b>Division Chlorophyta</b>						
<b>Order Ulvales</b>						
<b>Family Ulvaceae</b>						
5 <i>Ulva clathrata</i> (Roth) Gréville			Pulau Perhentian, Terengganu			
6 <i>Ulva compressa</i> Linnaeus	PSM10231 PSM10232 PSM10239 PSM10265-10266 PSM10270-1 PSM10256 PSM10240 PSM10259 PSM10218-10219 PSM10267	16-June-08 16-June-08 16-June-08 17-June-08 17-June-08 16-June-08 16-June-08 16-June-08 16-June-08 17-June-08	Pulau Redang, Terengganu Setiu Wetland, Terengganu Setiu Wetland, Terengganu Setiu Wetland, Terengganu Kuala Semarak, Bachok, Kelantan Kuala Semarak, Bachok, Kelantan Sungai Semarak, Kelantan Setiu Wetland, Terengganu Kuala Besut, Terengganu Pantai Bari, Setiu, Terengganu Kuala Semarak, Bachok, Kelantan	05°41.143' 05°41.143' 05°41.143' 05°51.954' 05°51.795' 05°51.907' 05°41.143' 05°40.824' 05°34.310' 05°53.492'	102°42.529' 102°42.529' 102°42.529' 102°29.598' 102°29.883' 102°29.643' 102°42.529' 102°42.763' 102°51.353' 102°28.799'	F F F F
7 <i>Ulva flexuosa</i> Wuifen						
8 <i>Ulva intestinalis</i> Linnaeus						
<b>Order Cladophorales</b>						
<b>Family Cladophoraceae</b>						
9 <i>Chaetomorpha aerea</i> (Dillwyn) Kützting			Pulau Redang, Terengganu			
10 <i>Chaetomorpha linum</i> (O.F. Müller) Kützting	PSM10216-2 PSM10368 PSM10258 PSM10270-2	15-June-08 17-June-08 16-June-08 17-June-08	Pulau Kerengga Kecil, Terengganu Kuala Semarak, Bachok, Kelantan De Iagoon, Pulau Perhentian Kecil (St 16) Kuala Besut, Terengganu Kuala Semarak, Bachok, Kelantan Pulau Kerengga Besar, Terengganu Pulau Redang, Terengganu Pulau Kerengga Besar, Terengganu Pulau Rawa (St 7) New Kampung Kaili, Bachok, Kelantan	05°51.978' 05°56.002' 05°40.824' 05°51.795'	102°30.372' 102°43.511' 102°42.763' 102°29.883'	C F
11 <i>Chaetomorpha</i> Kützting						
12 <i>Cladophora catenata</i> (Linnaeus) Kützting	PSM10348 PSM10255 PSM10233 PSM10235-1 PSM10235-2 PSM10237 PSM10242 PSM10258 PSM10268	17-June-08 16-June-08 16-June-08 16-June-08 16-June-08 16-June-08 16-June-08 16-June-08 17-June-08	Pulau Kerengga Besar, Terengganu Pulau Kerengga Besar, Terengganu Setiu Wetland, Terengganu Setiu Wetland, Terengganu Setiu Wetland, Terengganu Setiu Wetland, Terengganu Setiu Wetland, Terengganu Kuala Besut, Terengganu Kuala Semarak, Bachok, Kelantan	05°41.143' 05°41.143' 05°41.143' 05°41.143' 05°41.143' 05°41.143' 05°41.143' 05°40.824' 05°51.954'	102°40.591' 102°42.529' 102°42.529' 102°42.529' 102°42.529' 102°42.529' 102°42.529' 102°42.763' 102°29.598'	C Mg F F F F F F S F
13 <i>Cladophora coelothrix</i> Kützting [Syn: <i>Cladophora repens</i> Harvey]						
14 <i>Cladophora simpsonii</i> Harvey						
15 <i>Cladophora</i> Kützting						

TAXA	Collection No.	Date	Location	Coordinate	HABITAT	
				N E		
16	PSM10269	17-June-08	Kuala Semarak, Bachok, Kelantan	05°51.795'	102°29.883'	F
17	PSM10216-3	15-June-08	Pulau Redang, Terengganu Kuala Semarak, Bachok, Kelantan	05°51.978'	102°30.372'	
<b>Order Siphonocladales</b>						
<b>Family Siphonocladaceae</b>						
18			Pulau Redang, Terengganu			S
19			Pulau Redang, Terengganu Pulau Kerangga Besar, Terengganu Pulau Perhentian Besar, Terengganu Pulau Kerangga Besar, Terengganu			
20			Pulau Kerangga Besar, Terengganu			
<b>Family Valoniaceae</b>						
21	PSM10297 PSM10299 PSM10319 PSM10355	16-June-08 16-June-08 16-June-08 17-June-08	Tiga Ruang, Pulau Perhentian Besar (St 2) Tg. Genting, Pulau Perhentian Besar (St 3) Teluk Dalam, Pulau Perhentian Besar (St 5) Batu Mgong, Pulau Perhentian Kecil (St 11)	05°54.623' 05°54.264' 05°53.574' 05°54.625'	102°44.962' 102°44.316' 102°45.203' 102°43.608'	C C C C
<b>Order Bryopsidales</b>						
<b>Family Bryopsidaceae</b>						
22			Pulau Perhentian, Terengganu			
23			Pulau Kerangga Besar, Terengganu			
24			Pulau Kerangga Besar, Terengganu			
25			Pulau Perhentian Besar, Terengganu			
26	PSM10349	17-June-08	Pulau Rawa (St 7)	05°57.704'	102°40.591'	C
<b>Family Caulerpaceae</b>						
27			Pulau Kerangga Besar, Terengganu Pulau Kerangga Kecil, Terengganu Pulau Bidong Laut, Terengganu Pulau Bidong Laut, Terengganu			
28			Pulau Redang, Terengganu Pulau Perhentian, Terengganu Pulau Kerangga Besar, Terengganu Pulau Kerangga Kecil, Terengganu Pulau Perhentian Besar, Terengganu Pulau Perhentian Kecil, Terengganu Pulau Redang, Terengganu Pulau Kapas, Terengganu Pulau Bidong Laut, Terengganu Flora Beach Resort, Pulau Perhentian Besar (St 6) Flora Beach Resort, Pulau Perhentian Besar (St 6)	05°37.000' 05°37.000'	103°05.000' 103°05.000'	C C
29			Pulau Redang, Terengganu			
30			Pulau Perhentian, Terengganu			
31			Pulau Redang, Terengganu			
32	PSM10328-10330 PSM10331-10336	16-June-08 16-June-08	Flora Beach Resort, Pulau Perhentian Besar (St 6) Flora Beach Resort, Pulau Perhentian Besar (St 6)	05°37.000' 05°53.574' 05°53.574'	103°05.000' 102°45.203' 102°45.203'	C C
<b>Family Codiaceae</b>						
33			Pulau Redang, Terengganu			
<b>Family Halimedaecae</b>						
34			Pulau Kapas, Terengganu			
35			Pulau Redang, Terengganu			
36			Pulau Redang, Terengganu			

TAXA	Collection No.	Date	Location	Coordinate			HABITAT
				N	E		
<b>Family Udoteaceae</b>							
37 <i>Udotea cyathiformis</i> Decaisne (Syn: <i>Udotea sublittoralis</i> Taylor)			Pulau Redang, Terengganu	05°37.000'	103°05.000'		
<b>Order Dasycladales</b>							
<b>Family Polyphysaceae</b>							
38 <i>Acetabularia parvula</i> Solms-Laubach			Pulau Kerengga Besar, Terengganu				
39 <i>Acetabularia pusilla</i> (Howe) Collins			Pulau Redang, Terengganu				
<b>Division Rhodophyta</b>							
<b>Order Acrochaetiales</b>							
<b>Family Acrochaetiaceae</b>							
40 <i>Acrochaetium</i> Nagel			Pulau Bidong Laut	05°37.000'	103°05.000'		
<b>Order Nemaliales</b>							
<b>Family Liagoraceae</b>							
41 <i>Liagora ceranoides</i> Lamouroux (Syn: <i>Liagora leprosa</i> J. Agardh)			Pulau Redang, Terengganu				
<b>Order Gelidiales</b>							
<b>Family Gelidiellaceae</b>							
42 Gelidiales	PSM10324	16-June-08	Flora Beach Resort, Pulau Perhentian Besar (St 6)	05°53.574'	102°45.203'		C
	PSM10272	17-June-08	Hutan Paya Simpan, Sungai Semarak, Kelantan	05°51.607'	102°30.212'		Mg
	PSM10277	17-June-08	Kuala Semarak, Bachok, Kelantan	05°53.492'	102°28.799'		
	PSM10276	17-June-08	Kuala Semarak, Bachok, Kelantan	05°53.492'	102°28.799'		
	PSM10280	17-June-08	Kuala Semarak, Bachok, Kelantan	05°53.492'	102°28.799'		
	PSM10293	16-June-08	Tiga Ruang, Pulau Perhentian Besar (St 2)	05°54.623'	102°44.962'		C
43 <i>Gelidella acerosa</i> (Forsskal) J. Feldmann & G. Hamel (Syn: <i>Gelidiopsis rigida</i> (C. Agardh) Weber-van Bosse)	PSM10223	16-June-08	Pantai Bari, Setiu, Terengganu	05°34.310'	102°51.353'		
44 <i>Gelidella</i> Feldmann & G. Hamel	PSM10275	17-June-08	Kuala Semarak, Bachok, Kelantan	05°53.492'	102°28.799'		
45 <i>Gelidium pusillum</i> (Stackhouse) Le Jolis	PSM10344	17-June-08	Pulau Rawa (St 7)	05°57.704'	102°40.591'		C
46 <i>Pterocladia caloglossoides</i> (Howe) Dawson (Syn: <i>Pterocladia parva</i> Dawson)			Pulau Kerengga Besar, Terengganu				
47 <i>Pterocladella</i> Santelices & Hommersand	PSM10278	17-June-08	Pulau Kerengga Kecil, Terengganu	05°53.492'	102°28.799'		
	PSM10279	17-June-08	Kuala Semarak, Bachok, Kelantan	05°53.492'	102°28.799'		
<b>Order Gracilariiales</b>							
<b>Family Gracilariaceae</b>							
48 <i>Gracilaria verrucosa</i> (Hudson) Papenfuss ( <i>Gracilaria confervoides</i> Greville nom. illeg.)			Kuala Terengganu, Terengganu Pulau Redang, Terengganu				
<b>Order Bonnemaisoniales</b>							
<b>Family Falaxauraceae</b>							
49 <i>Actinotrichia fragilis</i> (Forsskål) Borgesen	PSM10353-10354 PSM10359	17-June-08 17-June-08	Batu Mngong, Pulau Perhentian Kecil (St 11) Pasir Mas, Pulau Perhentian Kecil (St 13)	05°54.625' 05°55.165'	102°43.608' 102°42.952'		C C
<b>Family Halymeniaceae</b>							
50 <i>Halymenia dilatata</i> Zanardini			Pulau Paku Besar, Terengganu	05°46.380'	103°02.290'		R
<b>Family Kallymeniaceae</b>							
51 <i>Callophyllis heanophylla</i> Setchell			Pulau Kerengga Kecil, Terengganu				
<b>Family Peyssonneliaceae</b>							
52 <i>Peyssonnelia inamoena</i> Pilger			Tanjung Guntong Laut, Pulau Perhentian Tanjung Batu Lepir, Pulau Perhentian	05°56.260' 05°53.080'	102°43.130' 102°44.220'		C, F

TAXA	Collection No.	Date	Location	Coordinate		HABITAT
				N	E	
			Teluk Gadung, Terengganu	05°54.320'	102°46.140'	
			Pasir Panjang Kecil, Pulau Redang, Terengganu	05°46.150'	103°02.030'	
			Tanjung Pasir Cina, Pulau Bidong Laut, Terengganu	05°36.360'	102°03.440'	
<b>Order Corallinales</b>						
<b>Family Corallinaceae</b>						
53 <i>Amphiroa anceps</i> (Lamarck) Decaisne			Pulau Perhentian Kecil, Terengganu			
54 <i>Amphiroa foliacea</i> Lamouroux			Pulau Redang, Terengganu			
			Pulau Perhentian Kecil, Terengganu			
			Pulau Redang, Terengganu			
55 <i>Amphiroa fragilissima</i> (Linnaeus) Lamouroux	PSM10289	16-June-08	Tiga Ruang, Pulau Perhentian Besar (St 1)	05°54.855'	102°45.250'	C
56 <i>Amphiroa tribulus</i> (Ellis et Solander) Lamouroux	PSM10292	16-June-08	Tiga Ruang, Pulau Perhentian Besar (St 2)	05°54.623'	102°44.962'	C
57 <i>Jania adhaerens</i> Lamouroux	PSM10360	17-June-08	Pasir Mas, Pulau Perhentian Kecil (St 13)	05°55.165'	102°42.952'	C
58 <i>Jania capillacea</i> Harvey			Pulau Redang, Terengganu			
59 <i>Jania decussato-dichotoma</i> (Yendo) Yendo			Pulau Redang, Terengganu			
60 <i>Lithophyllum dispar</i> (Foslie) Foslie [Syn: <i>Fosliella dispar</i> (Foslie) G.M. Smith]			Pulau Kerangga Besar, Terengganu			C
			Pulau Redang, Terengganu			
<b>Order Gigartinales</b>						
<b>Family Hypneaceae</b>						
61 <i>Hypnea pannosa</i> J. Agardh			Pulau Redang, Terengganu			
62 <i>Hypnea spinella</i> (C. Ag) Kützinger	PSM10315	16-June-08	Pulau Kerangga Kecil, Terengganu	05°53.168'	102°44.344'	C
63 <i>Hypnea</i> J.V. Lamouroux	PSM10223-1	16-June-08	Pantai Bari, Setiu, Terengganu	05°34.310'	102°51.353'	
<b>Order Rhodymeniales</b>						
<b>Family Champiaceae</b>						
64 <i>Champia compressa</i> Harvey			Mak Sinpain, Pulau Redang, Terengganu	05°48.020'	102°59.330'	C, F, R
65 <i>Gastroclonium compressum</i> (Hollenberg) Chang & Xia			Pulau Kerangga Besar, Terengganu			
			Pulau Redang, Terengganu			
<b>Family Rhodymeniaceae</b>						
66 <i>Chamaeobryis boergesenii</i> (Weber-van Bosse) Huisman			Teluk Gadung, Pulau Perhentian	05°54.320'	102°46.140'	
			Pasir Panjang Kecil, Pulau Redang, Terengganu	05°46.150'	103°02.030'	
			Tanjung Pasir Cina, Pulau Bidong Laut, Terengganu	05°36.360'	103°03.440'	
			Pulau Tenggol, Terengganu	04°48.570'	103°40.420'	
67 <i>Gelidiopsis intricata</i> (C. Agardh) Vickers			Pulau Kerangga Besar, Terengganu			C
<b>Order Ceramiales</b>						
<b>Family Ceramiaceae</b>						
68 <i>Anartichium tenue</i> (C. Agardh) Nageli [Syn: <i>Griffithsia tenue</i> C. Agardh]			Pulau Kerangga Kecil, Terengganu			E
69 <i>Antithamniionella elegans</i> (Berthold) J. Price & D. John [Syn: <i>Antithamniionella breocranosa</i> (Dawson) Wallaston in Womersley & Bailey]			Pulau Kerangga Kecil, Terengganu			
70 <i>Ceramium comiculatum</i> Montagne			Pulau Redang, Terengganu			
71 <i>Ceramium fimbriatum</i> Setchell & Gardner [Syn: <i>Ceramium gracilimum</i> (Kützinger) Griffiths & Harvey]			Pulau Kerangga Besar, Terengganu			E
72 <i>Ceramium floccidum</i> (Kützinger) Ardlisone			Pulau Redang, Terengganu			E
73 <i>Centrocerus cf. minutum</i> Yamada	PSM10288	17-June-08	Kuala Semarak, Bachok, Kelantan	06°12.430'	102°08.631'	
74 <i>Centrocerus</i> Kützinger	PSM10274	17-June-08	Kuala Semarak, Bachok, Kelantan	05°53.492'	102°28.799'	



TAXA	Collection No.	Date	Location	Coordinate		HABITAT
				N	E	
75 <i>Ceramium</i> Roth	PSM10350-2	17-June-08	Pulau Rawa (St 7)	05°57.704'	102°40.591'	E
76 <i>Pilothamnion coelicolum</i> (Dawson) Abbott			Pulau Redang, Terengganu			E
77 <i>Spyridia filamentosa</i> (Wulfen) Harvey			Pulau Perhentian, Terengganu			E
78 <i>Wrangalia argus</i> (Montagne) Montagne			Pulau Kerengga Kecil, Terengganu			E
<b>Family Dasyaceae</b>						
79 <i>Dasya iyengarii</i> Bergesen			Tanjung Batu Lepir, Pulau Perhentian, Terengganu	05°53.080'	102°44.220'	
80 <i>Heterosiphonia crispella</i> (C. Agardh) Wynne			Teluk Dalam Kecil, Pulau Redang, Terengganu	05°47.300'	103°00.530'	
81 cf. <i>Heterosiphonia</i> Montagne	PSM10216-1	15-June-08	Mak Simpan, Pulau Redang, Terengganu Kuala Semarak, Bachok, Kelantan	05°48.020'	102°59.330'	
<b>Family Delesseriaceae</b>						
82 <i>Hypoglossum cataglossoides</i> Wynne et Kraft			Pulau Karah, Terengganu	05°35.430'	103°03.500'	
<b>Family Rhodomelaceae</b>						
83 <i>Acanthophora spicifera</i> (Vahl) Bergesen	PSM10314	16-June-08	Teluk Kecil, Pulau Perhentian Besar (St 4)	05°53.168'	102°44.344'	C
	PSM10327,10339	16-June-08	Flora Beach Resort, Pulau Perhentian Besar (St 6)	05°53.574'	102°45.203'	C
	PSM10352	17-June-08	Batu Mngong, Pulau Perhentian Kecil (St 11)	05°54.625'	102°43.608'	C
	PSM10361	17-June-08	Pasir Mas, Pulau Perhentian Kecil (St 13)	05°55.165'	102°42.952'	C
	PSM10369	17-June-08	De Iagoon, Pulau Perhentian Kecil (St 16)	05°56.002'	102°43.511'	C
84 <i>Chondria armata</i> (Kützting) Okamura			Pulau Kerengga Kecil, Terengganu	05°36.360'	103°03.440'	R
85 <i>Herposiphonia pacifica</i> Hollenberg			Tanjung Pasir, Pulau Bidong Laut, Terengganu	05°44.190'	103°01.440'	C, R
86 <i>Laurencia articulata</i> Tseng			Pulau Kerengga Besar, Terengganu			
87 <i>Laurencia caducirarinulosa</i> Masuda et Kawaguchi			Pulau Kerengga Kecil, Terengganu			
88 <i>Laurencia calliclada</i> Masuda			Pasir Tiga Ruang, Pulau Perhentian, Terengganu	05°54.480'	102°45.130'	R
89 <i>Laurencia corymbosa</i> J. Agardh			Batu Tokong Daik, Pulau Tenggol, Terengganu	04°46.570'	103°41.170'	R
90 <i>Laurencia implicata</i> J. Agardh			Pulau Kerengga Besar, Terengganu			
91 <i>Laurencia majuscula</i> Kützting			Pulau Redang, Terengganu	05°45.170'	103°01.160'	
92 <i>Laurencia papillosa</i> (C. Agardh) Greville, Setchell et Gardner			Teluk Kalong Besar, Pulau Redang, Terengganu			
93 <i>Laurencia perforata</i> (Bory de Saint-Vincent) Montagne			Pulau Kerengga Besar, Terengganu			C
94 <i>Laurencia</i> Lamouroux	PSM10298	16-June-08	Pulau Kerengga Besar, Terengganu	05°54.623'	102°44.962'	C
	PSM10300	16-June-08	Tiga Ruang, Pulau Perhentian Besar (St 2) Tg. Genting, Pulau Perhentian Besar (St 3)	05°54.264'	102°44.316'	C
95 <i>Murrayellopsis dawsonii</i> Post			Pulau Kerengga Besar, Terengganu	05°53.350'	102°43.210'	C, R
96 <i>Neosiphonia savatieri</i> (Haroot) M.S.Kim et I.K.Lee			Tanjung Batu Payong, Pulau Perhentian, Terengganu			
97 <i>Polysiphonia coacta</i> Tseng			Pulau Redang, Terengganu	05°56.260'	102°43.130'	
98 <i>Polysiphonia scopulorum</i> Harvey			Tanjung Guntong Laut, Pulau Perhentian, Terengganu	05°54.320'	102°46.140'	
			Teluk Gadung, Pulau Perhentian, Terengganu	05°48.020'	102°59.330'	
			Mak Simpan, Pulau Redang, Terengganu	04°48.570'	103°40.420'	
			Pulau Tenggol, Terengganu			
			Pulau Redang, Terengganu			
99 <i>Polysiphonia subtilissima</i> Montagne	PSM10345	17-June-08	Pulau Rawa (St 7)	05°57.704'	102°40.591'	E, C
100 <i>Polysiphonia</i> Greville	PSM10362	17-June-08	Pasir Mas, Pulau Perhentian Kecil (St 13)	05°55.165'	102°42.952'	E
	PSM10238-1	16-June-08	Setiu welland, Terengganu	05°41.143'	102°42.529'	F



TAXA	Collection No.	Date	Location	Coordinate		HABITAT
				N	E	
<b>Family Sargassaceae</b>						
123 <i>Sargassum binderi</i> Sonder ex J. Agardh			Batu Chendering, Kuala Terengganu, Terengganu	05°16.120'	103°11.150'	
124 <i>Sargassum cervicome</i> Greville			Tanjung Lang, Pulau Redang, Terengganu	05°49.057'	103°00.015'	
125 <i>Sargassum crassifolium</i> J. Agardh [Syn: <i>Sargassum feidmanii</i> Pham]			Tanjung Gua Kawah, Terengganu	05°47.399'	103°02.347'	
126 <i>Sargassum heterocystum</i> (Kützting) Montagne			Pulau Rawa, Terengganu	05°57.795'	102°40.867'	
			Pulau Gemia, Terengganu			
			Teluk Kalong, Terengganu	04°16.920'	103°28.580'	
127 <i>Sargassum lilifolium</i> (Turner) C. Agardh var <i>conduplicatum</i> Grunow			Kuala Abang, Terengganu	04°49.670'	103°24.990'	
128 <i>Sargassum polycystum</i> C. Agardh			Tanjung Jara, Kuala Terengganu, Terengganu	04°48.910'	103°25.410'	
	PSM10373-10375	17-June-08	Pasir Mas, Pulau Perhentian Kecil (St 13)	05°55.165'	102°42.952'	D
	PSM10378	17-June-08	Pasir Tenggara, Pulau Perhentian Kecil (St 14)	05°55.462'	102°42.999'	D
	PSM10379-10380	17-June-08	Delagoon, Pulau Perhentian Kecil (St 16)	05°56.002'	102°43.511'	D
	PSM10376-10377	17-June-08	Pasir Mas, Pulau Perhentian Kecil (St 13)	05°55.165'	102°42.952'	D
129 <i>Sargassum</i> C. Agardh	PSM10290	16-June-08	Tiga Ruang, Pulau Perhentian Besar (St 1)	05°54.855'	102°45.250'	C
130 <i>Turbinaria conoides</i> (J. Agardh) Kützting	PSM10295	16-June-08	Tiga Ruang, Pulau Perhentian Besar (St 2)	05°54.623'	102°44.962'	C
	PSM10326	16-June-08	Flora Beach Resort, Pulau Perhentian Besar (St 6)	05°53.574'	102°45.203'	C
	PSM10351	17-June-08	Batu Ngong, Pulau Perhentian Kecil (St 11)	05°54.625'	102°43.608'	C
	PSM10365-10366	17-June-08	Pasir Mas, Pulau Perhentian Kecil (St 13)	05°55.165'	102°42.952'	C
131 <i>Turbinaria decurrens</i> Bory			Pulau Susu Dara	05°57.090'	102°39.430'	R
			Pulau Perhentian Kecil, Terengganu			
	PSM10291	16-June-08	Tiga Ruang, Pulau Perhentian Besar (St 1)	05°54.855'	102°45.250'	C
	PSM10296	16-June-08	Tiga Ruang, Pulau Perhentian Besar (St 2)	05°54.623'	102°44.962'	C
	PSM10367	17-June-08	Pasir Mas, Pulau Perhentian Kecil (St 13)	05°55.165'	102°42.952'	C
	PSM10371	17-June-08	Delagoon, Pulau Perhentian Kecil (St 16)	05°56.002'	102°43.511'	C
			Pulau Perhentian Kecil, Terengganu			
			Pulau Redang, Terengganu			
132 <i>Turbinaria ornata</i> (Turner) J. Agardh						
133 <i>Turbinaria tricosata</i> Barton						
<b>Division Magnoliophyta</b>						
<b>Order Hydrocharitales</b>						
<b>Family Hydrocharitaceae</b>						
134 <i>Enhalus acoroides</i> L.C. Rich ex Steud	PSM10341	16-June-08	Flora Beach Resort, Pulau Perhentian Besar (St 6)	05°53.574'	102°45.203'	C
135 <i>Halophila ovalis</i> (R. Br.) Hook. F.	PSM10247-10249	16-June-08	Setiu Wetland, Terengganu	05°41.143'	102°42.529'	S, M
136 <i>Halophila</i> sp.	PSM10271	17-June-08	Kuala Semarak, Bachok, Kelantan	05°51.757'	102°30.770'	S, M
	PSM10281	17-June-08	Kuala Semarak, Bachok, Kelantan	05°53.492'	102°28.799'	
<b>Order Potamogetonales</b>						
<b>Family Cymodoceaceae</b>						
137 <i>Halodule pinifolia</i> (Miki) den Hartog	PSM10226-10230	16-June-08	Setiu Wetland, Terengganu	05°41.221'	102°42.465'	S, M
	PSM10250	16-June-08	Setiu Wetland, Terengganu	05°41.143'	102°42.529'	S, M
	PSM10254	16-June-08	Setiu Wetland, Terengganu	05°40.857'	102°42.812'	S, M
	PSM10282-10283	17-June-08	Kuala Semarak, Bachok, Kelantan	05°53.492'	102°28.799'	
	PSM10284-10287	17-June-08	Pantai Sri Tujuh, Tumpat, Kelantan	06°12.982'	102°07.991'	

**Abbreviation:** Habitat: C: Coral, D: Driftweed, E: Epiphyte, M: Mud, Mg: Mangrove, R: Rock, Bedrock, Stones, S: Sand, W: Wood, F: Fish Cage, fishing Line, Fish Net, Highlighted taxa are from Phang et al. 2007

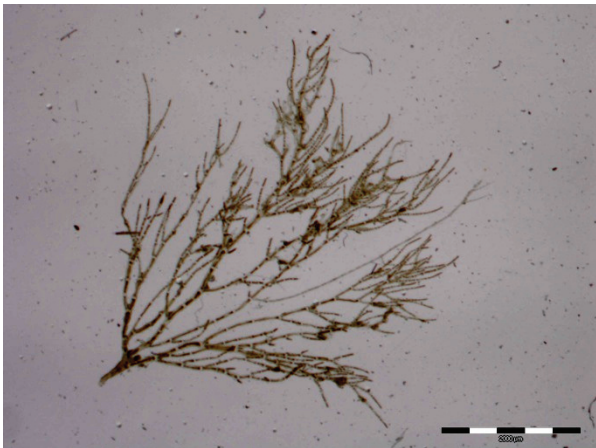


Figure 8. *Cladophora*

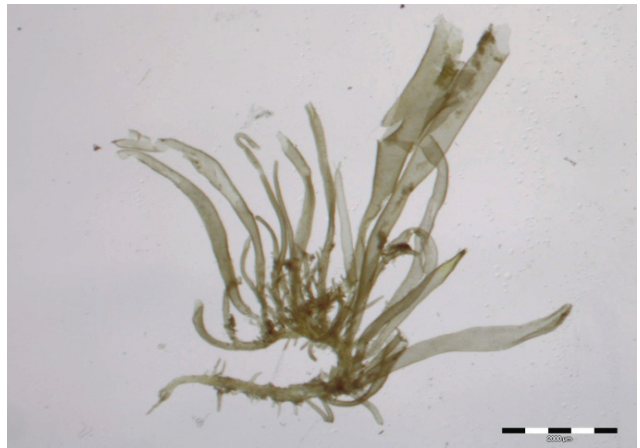


Figure 9. *Ulva compressa*



Figure 10. *Ulva flexuosa*



Figure 11. *Ulva intestinalis*



Figure 12. *Padina australis* (Herbarium)



Figure 13. *Padina japonica* (Herbarium).



Figure 14. *Padina tetrastromatica* (Herbarium)



Figure 15. *Padina* rhizoids (*Vaughaniella* phase)



Figure 16. *Actinotrichia fragilis* (Herbarium)



Figure 17. *Acanthophora spicifera* (Herbarium)



Figure 18. *Ceramium*



Figure 19. *Gelidiella*

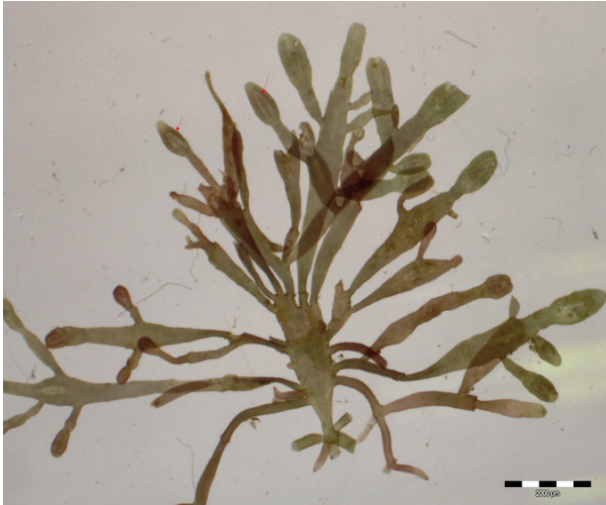


Figure 20. *Pterocladia* (New record for Malaysia)



Figure 21. *Halophila ovalis* (Herbarium)

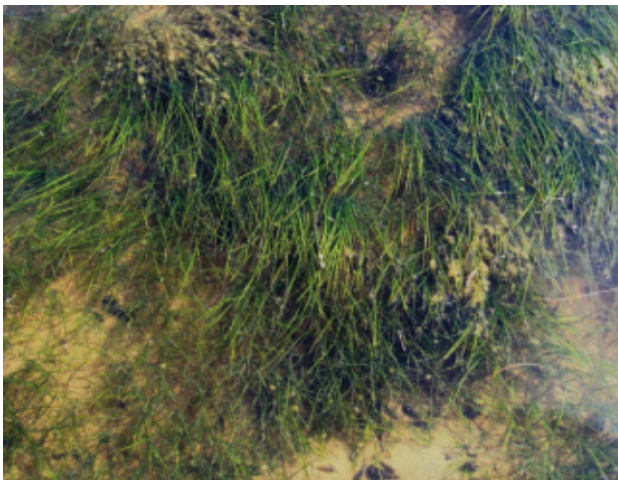


Figure 22. *Halodule pinifolia*



Figure 23. *Enhalus acoroides* (Herbarium)

The diversity (132 taxa) of marine algae reported for Kelantan and Terengganu in this paper is higher than that reported for the Pulau Tioman group of islands (98 taxa) also located in the South China Sea, and for the Pulau Perak, Pulau Jarak and Sembilan islands (66 taxa) which are located in the Straits of Malacca. Most of the taxa for Kelantan and Terengganu in this checklist are from published records; low species diversity as well as low abundance was observed during this survey. Lack of ecological and phenological data of tropical marine algae especially that from Malaysia, make it difficult to explain the low abundance.

Of the marine algae reported for Kelantan and Terengganu, some including *Ulva*, *Caulerpa*,

*Gracilaria*, *Hypnea*, *Acanthophora*, *Laurencia* and *Sargassum*, have economic importance and may be considered for cultivation.

In the Algae Research Laboratory, University of Malaya, research on the molecular taxonomy and phylogenetics of Malaysia seaweeds, specifically on *Gracilaria*, *Caulerpa*, *Sargassum*, Gelidiales and crustose algae are on-going. Selected genetic markers are used for unraveling taxonomic confusion as well as to understand the genetic diversity and evolutionary relationships amongst the Malaysian marine algae (Yow et al. 2009, Wong et al. 2007, Lim et al. 2007, and Wong et al. 2004).

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