

Marine Algae of Perak Island, Jarak Island and the Sembilan Group of Islands in the Straits of Malacca

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ABSTRACT A preliminary checklist of marine algae from Pulau Jarak, Sembilan Group of Islands and Pulau Perak in the Straits of Malacca was compiled from two expeditions. The checklist of a total of 66 taxa, comprises one family of Cyanophyta with two genera and six taxa, seven families of Chlorophyta with 11 genera and 18 taxa, 12 families of Rhodophyta with 20 genera and 39 taxa, and two families of Phaeophyta with three genera and three taxa. One new record *Lyngbya confervoides* f. *violacea* is reported for the first time for Malaysia. The three islands have a low similarity in marine algal diversity.

ABSTRAK Satu senarai semak rintis alga marin dari Pulau Jarak, Kepulauan Sembilan dan Pulau Perak di Selat Melaka dari dua ekspedisi telah digabungkan. Senarai semak yang mengandungi sebanyak 66 taxa ini terdiri daripada satu famili Cyanophyta dengan dua genera dan enam taxa; tujuh famili Chlorophyta dengan 11 genera dan 18 taxa; 12 famili Rhodophyta dengan 20 genera and 39 taxa; serta dua famili Phaeophyta dengan tiga genera dan tiga taxa. Satu rekod baru *Lyngbya confervoides* f. *violacea* telah dilaporkan untuk kali pertama bagi Malaysia. Ketiga-tiga pulau ini mempunyai kesamaan yang rendah dalam kepelbagaian alga marin.

(marine algae, checklist, Pulau Perak, Pulau Jarak, Pulau Sembilan, Straits of Malacca)

INTRODUCTION

In June 2004, 32 scientists from the University of Malaya Maritime Research Centre (now known as the Institute of Ocean and Earth Sciences, IOES) went on a scientific expedition to some remote islands off the west coast of Peninsular Malaysia. This was the first of a series of Scientific Expeditions to the Seas of Malaysia (SESMA I). The islands of Perak and Jarak, in the Straits of Malacca, were last scientifically surveyed more than 50 years ago, by the British scientists from the Institute of Medical Research and the Forest Research Institute [1, 2, 3, 4, 5, 6].

Pulau Jarak (03° 58'N, 100° 06'E), a granitic island, is located 34 km from Lumut, Perak, and close to the Sembilan Islands. Pulau Jarak is about eight hectares in size, surrounded by waters of 30 fathoms

deep and is densely covered by vegetation. Audy in 1950 found that it had a "distinctive flora and fauna, very poor in tree species and containing especially rats, land-crabs and spiders". In 2004 and 2007, we found Pulau Jarak to be densely forested with rocky shores fringing most of the island's perimeter. Corals were found amongst sandy patches and here only filamentous turf algae were evident.

Sixteen kilometers south of Pulau Pangkor lies the Sembilan Group of Islands, made of Pulau Agas, Pulau Payong, Pulau Nipis, Pulau Lalang, Pulau Rumbia, Pulau Saga, Pulau Buloh, Black Rock and White Rock. Only the larger islands like Pulau Rumbia, Pulau Lalang and Pulau Buloh are vegetated. The coral reefs here harbour a high diversity of fish life.

Pulau Perak (5° 42' N, 98° 56'E) lies north-west of Pulau Pinang and south west of Pulau Langkawi. In 1950 Gibson-Hill described it as an oval-shaped island, composed of igneous rock veined with quartz, with limestone near sea level, rising steeply to an uneven sloping summit and devoid of vegetation. The island slopes were covered by "bird-lime giving it in full sunlight, the silvery appearance from which it gets its name". Breeding populations of boobys were the most important discoveries on this island. In our 2004 visit, Pulau Perak was discovered to be vegetated with figs, ferns and herbaceous plants, causing concern to the ornithologists, who feared the competition between the plants and birds for breeding sites. The most exciting find was the island's seascape which was a continuation of the landscape which plunges 85 metres vertically into the water's depths. This vertical wall is colonized by presumably the most diverse coral populations in the Straits of Malacca. The reefs are teeming with rich fish life while marine algae compete with the corals for space on the seascape.

Marine macroalgae commonly known as seaweeds, form an important component of the coastal and marine ecosystems, providing feeding, breeding and nursery grounds for the diverse marine and fishery life. Seaweeds, together with the phytoplankton (microalgae) and the

seagrasses (marine Angiosperms), serve as the main primary producers in the oceans, contributing to photo-oxygenation of the waters as well as carbon sequestration, thus assisting in the reduction of global warming.

The present tally of marine algae in Malaysia includes 381 taxa comprising Chlorophyta (13 families, 105 taxa), Rhodophyta (27 families, 186 taxa), Phaeophyta (8 families, 73 taxa) and Cyanophyta (8 families, 17 taxa)⁷. The marine algal flora has similarities to the algal flora of the Indo-Pacific region. Coral reefs support the highest diversity of species, followed by rocky shores and sandy-muddy areas.

In 2003 and 2004 two expeditions to the Langkawi Group of Islands produced a checklist of marine algae or seaweeds, comprising 84 taxa, with one taxon of Cyanophyta, 24 taxa of Chlorophyta, 49 taxa of Rhodophyta and 10 taxa of Phaeophyta⁸. The seaweed flora of Langkawi is quite distinct from that of Peninsular Malaysia and East Malaysia.

MATERIALS AND METHODS

The islands of Pulau Perak, Pulau Jarak and Sembilan were selected because little is known of their flora and fauna, in spite of having very



Figure 1. Route taken on the SESMA I Expedition.

interesting geological features (Figure 1). Pulau Perak is one of the furthest islands from the Malaysian shore in the Straits of Malacca, and interesting comparisons can be made of its marine algae species composition with that inhabiting the rest of the Malaysian waters. Two expeditions were made to the islands.

On the 4th of June 2004, the group of scientists set off on board the Reef Challenger, a research vessel. We arrived at Pulau Jarak at 11 am on 5 June 2004. Although three sites were surveyed in the 2004 expedition, only two sites yielded specimens. Collections were made by snorkelling and scuba, as well as from scrapings off rocks and tree roots along the shore. The journey continued on and we arrived at the Sembilan Group of Islands at 6.30am on 6 June 2004. Very strong waves and poor visibility again made the collection very difficult with samples collected only from one site at Pulau Lalang and two sites at Pulau Rumbia. We finally arrived at the highlight of the expedition, Pulau Perak in the early morning of 9 June 2004. Scuba revealed the dominance of filamentous red and green algae growing amongst the corals on the almost vertical slopes fringing the island. Collections were made at three sites, mainly by scuba.

The second expedition to Pulau Jarak and Sembilan was made from 23 to 28 November 2007. Two sites were sampled by scuba on 24 and 25 November 2007. Although two days were spent at Sembilan, algae were collected only from one site at Pulau Lalang. The absence of a prominent microalgae vegetation cover was noted especially during the second expedition (November 2007). A causal explanation of the underlying, ecological reason is difficult due to the short length of the visit to these sites, but a high abundance of grazers (especially black sea urchins) was noted. The third visit to Pulau Sembilan was made on 21-23 November 2008 and algae were collected at White Rock by snorkeling and scuba diving. 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.

RESULTS AND DISCUSSION

A preliminary checklist (Table 1) with a total of 66 taxa was produced. It comprises one family of Cyanophyta with two genera and six taxa, seven families of Chlorophyta with 11 genera and 18 taxa, 12 families of Rhodophyta with 20 genera and 39 taxa, and two families of Phaeophyta with three genera and three taxa (Figures 2-17). One new record *Lyngbya confervoides* f. *violacea* is reported for the first time for Malaysia. Seven Rhodophyta specimens remain unidentified. Insufficient materials, especially reproductive plants and the need to study the life-cycle of the specimens make the identifications difficult.

As most of the collections came from rock surfaces, amongst corals and epiphytic on artificial substrata like strings, the algae identified belonged mainly to filamentous species. Of the Chlorophytes, the only macroscopic species belonged to *Ventricaria*, *Valonia*, *Valoniopsis*, *Bryopsis* and *Caulerpa*. The Rhodophytes were the dominant group, as is expected of deep waters. They also belonged mainly to the filamentous types except for the coralline *Jania* and *Peysonnelia*. The largest algae belonged to the Phaeophytes, being *Dictyota*, *Lobophora* and *Hydroclathrus*.

Of the 36 genera, eight genera were common to Pulau Jarak and Pulau Sembilan, five genera common to Pulau Jarak and Pulau Perak and seven common to Pulau Sembilan and Pulau Perak. Only three genera (*Enteromorpha*, *Polysiphonia* and *Ceramium*) were found in all three sites.

CONCLUDING REMARKS

The waters around Pulau Jarak and Pulau Perak are relatively pristine as they are sited a distance from the west coast of Peninsular Malaysia, and therefore away from the effects of coastal pollution. The waters are also relatively deep, and quite different from other habitats which have contributed to the checklist of the marine algae of Malaysia. The present checklist comprises one family of Cyanophyta with two genera and six taxa, seven families of Chlorophyta with 11 genera and 18 taxa, 12 families of Rhodophyta with 20 genera and 39 taxa, and two families of Phaeophyta with three genera and three taxa. The marine algal flora of the three islands have a low similarity. These islands



Figure 2. *Lyngbya*



Figure 3. *Oscillatoria*



Figure 4. *Enteromorpha*



Figure 5. *Bryopsis pennata* (Herbarium specimen)



Figure 6. *Cladophora*

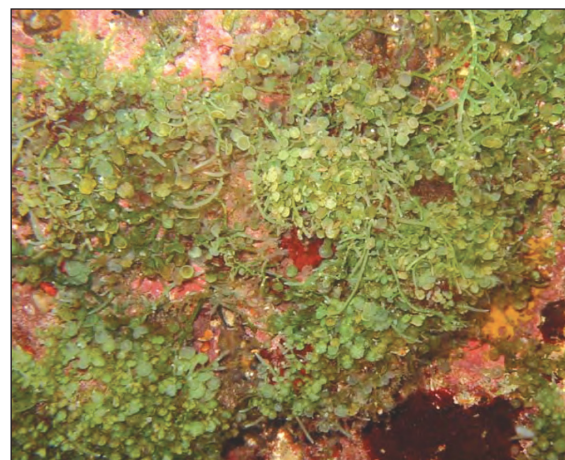


Figure 7. *Caulerpa peltata*





Figure 8. *Caulerpa peltata*

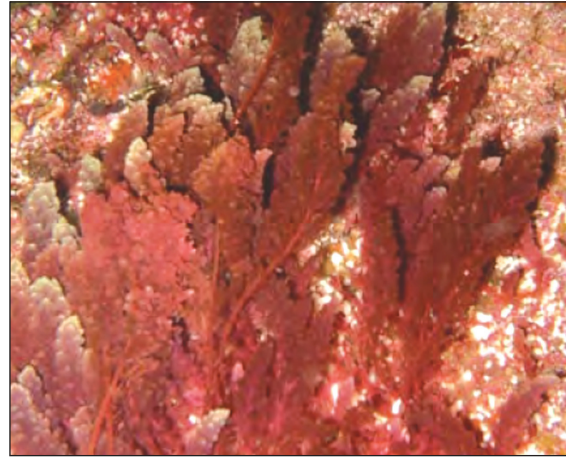


Figure 9. *Asparagopsis*



Figure 10. *Hypnea*

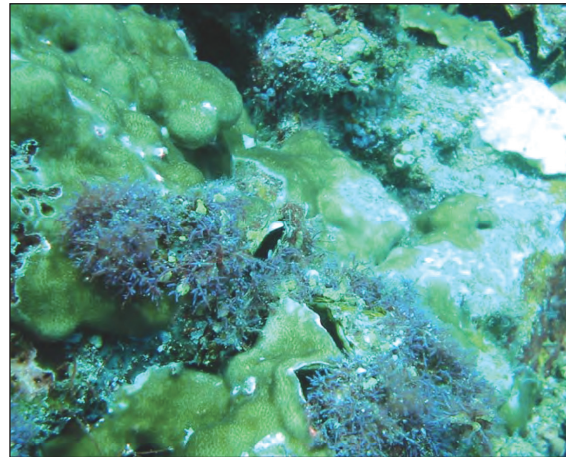


Figure 11. *Jania*

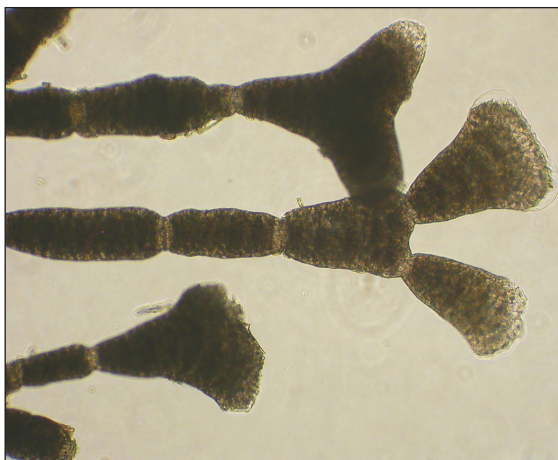


Figure 12. *Jania*



Figure 13. *Antithamnion*





Figure 14. *Herposiphonia*



Figure 15. *Herposiphonia*



Figure 16. *Dictyota friabilis* (Herbarium specimen)



Figure 17. *Lobophora variegata*



Table 1. Preliminary Checklist of Marine Algae (seaweeds) from Jarak Island, Perak Island and the Sembilan Group of Islands, Straits of Malacca.

| Taxa | Collection No. | Date | Location | Coordinates | | Substratum |
|--|----------------|-----------|----------------------|-------------|-------------|------------------------------|
| | | | | Latitude | Longitude | |
| Division CYANOPHYTA | | | | | | |
| Order Oscillatoriales | | | | | | |
| Family Homocotrichaceae | | | | | | |
| * <i>Lyngbya confervoides</i> f. <i>violacea</i> C. Agardh | PSM 9308 | 5-Jun-04 | Pulau Jarak | 03°58'31"N | 100°05'55"E | rocks |
| | PSM 9309 | 5-Jun-04 | Pulau Jarak | 03°58'31"N | 100°05'55"E | rocks |
| | PSM 9310 | 5-Jun-04 | Pulau Jarak | 03°58'31"N | 100°05'55"E | rocks |
| <i>Lyngbya cf aestuarii</i> (Mertens) Liebman | 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 |
| <i>Lyngbya</i> sp. 1 C. Agardh | PSM 9315-2 | 5-Jun-04 | Jetty, Pulau Jarak | 03°58'34"N | 100°06'04"E | nylon string |
| | PSM 9316-3 | 5-Jun-04 | Jetty, Pulau Jarak | 03°58'34"N | 100°06'04"E | rocks |
| | PSM 9321 | 5-Jun-04 | Jetty, Pulau Jarak | 03°58'34"N | 100°06'04"E | |
| | PSM 9404 | 24-Nov-07 | Jetty, Pulau Jarak | 03°58'32"N | 100°06'10"E | sandy & rocky |
| <i>Lyngbya</i> sp. 2 C. Agardh | PSM 9329 | 7-Jun-04 | Pulau Lalang Selatan | 04°00'23"N | 100°32'49"E | |
| Division CHLOROPHYTA | | | | | | |
| Order Ulotrichales | | | | | | |
| Family Ulotrichaceae | | | | | | |
| <i>Ulothrix</i> Kützting | PSM 9348 | 9-Jun-04 | Pulau Perak | 05°41'00"N | 98°56'14"E | on concrete support of jetty |
| | PSM 9349 | 9-Jun-04 | Pulau Perak | 05°41'00"N | 98°56'14"E | on concrete support of jetty |

| Taxa | Collection No. | Date | Location | Coordinates | | Substratum |
|---|----------------|-----------|----------------------|-------------|-------------|------------------------------|
| | | | | Latitude | Longitude | |
| | PSM 9350 | 9-Jun-04 | Pulau Perak | 05°41'00"N | 98°56'14"E | on concrete support of jetty |
| | PSM 9354 | 9-Jun-04 | Pulau Perak | 05°41'00"N | 98°56'14"E | |
| | PSM 9358-2 | 9-Jun-04 | Pulau Perak | 05°41'00"N | 98°56'14"E | corals |
| | PSM 9359-2 | 9-Jun-04 | Pulau Perak | 05°41'00"N | 98°56'14"E | corals |
| | PSM 9360-2 | 9-Jun-04 | Pulau Perak | 05°41'00"N | 98°56'14"E | corals |
| | PSM 9361-2 | 9-Jun-04 | Pulau Perak | 05°41'00"N | 98°56'14"E | corals |
| Order Ulvales | | | | | | |
| Family Ulvaceae | | | | | | |
| | PSM 9334 | 7-Jun-04 | Pulau Rumbia | | | |
| <i>Enteromorpha</i> sp. 1 Link | PSM 9386 | 9-Jun-04 | Pulau Perak | 05°41'00"N | 98°56'14"E | |
| <i>Enteromorpha</i> sp. 2 Link | PSM 9410 | 25-Nov-07 | Pulau Jarak | 03°58'32"N | 100°06'10"E | tree trunk |
| <i>Enteromorpha</i> sp. 3 Link | | | | | | |
| Order Cladophorales | | | | | | |
| Family Cladophoraceae | | | | | | |
| Cladophoraceae | | | | | | |
| <i>Chaetomorpha</i> sp. 1 Kützing | PSM 9372-3 | 9-Jun-04 | Pulau Perak | 05°41'00"N | 98°56'14"E | coral wall |
| | PSM 9325 | 7-Jun-04 | Pulau Lalang Selatan | 04°00'23"N | 100°32'49"E | |
| | PSM 9326 | 7-Jun-04 | Pulau Lalang Selatan | 04°00'23"N | 100°32'49"E | |
| | PSM 9330 | 7-Jun-04 | Pulau Lalang Selatan | 04°00'23"N | 100°32'49"E | |
| <i>Chaetomorpha</i> sp. 2 Kützing | PSM 9332 | 7-Jun-04 | Pulau Rumbia | | | |
| <i>Chaetomorpha</i> sp. 3 Kützing | PSM 9411 | 25-Nov-07 | Pulau Jarak | 03°58'32"N | 100°06'10"E | tree trunk |
| <i>Cladophora</i> cf. <i>patentiramea</i> | PSM 9306 | 5-Jun-04 | Pulau Jarak | 03°58'31"N | 100°05'55"E | tree trunk |
| | PSM 9307 | 5-Jun-04 | Pulau Jarak | 03°58'31"N | 100°05'55"E | tree trunk |
| <i>Cladophora</i> cf. <i>rhizoclonioidea</i> van den Hoek & Womersley | PSM 9415 | 26-Nov-07 | Pulau Lalang Selatan | 04°00'39"N | 100°54'38"E | sandy & rocky |
| <i>Cladophora</i> Kützing | PSM 9335-2 | 7-Jun-04 | Pulau Rumbia | | | |
| Family Siphonocladaceae | | | | | | |
| <i>Boodlea</i> G. Murray & De Toni | PSM 9387 | 9-Jun-04 | Pulau Perak | 05°41'00"N | 98°56'14"E | |
| <i>Struvea</i> Sonder | PSM 9405 | 24-Nov-07 | Pulau Jarak | 03°58'32"N | 100°06'10"E | on net |
| <i>Ventricaria ventricosa</i> (J. Agardh) Olsen & J. West | PSM 9372-4 | 9-Jun-04 | Pulau Perak | 05°41'00"N | 98°56'23"E | |

| Taxa | Collection No. | Date | Location | Coordinates | | Substratum |
|---|----------------|-----------|--------------------|-------------|-------------|----------------------------------|
| | | | | Latitude | Longitude | |
| Family Valoniaceae | | | | | | |
| <i>Valonia aegagropila</i> C. Agardh | PSM 9399-2 | 9-Jun-04 | Pulau Perak | 03°58'31"N | 100°05'55"E | rocks |
| <i>Valoniopsis</i> cf. <i>pachynema</i> (G. Martens) Borgesen | PSM 9312 | 5-Jun-04 | Pulau Jarak | 03°58'34"N | 100°06'04"E | dead corals |
| | PSM 9317 | 5-Jun-04 | Jetty, Pulau Jarak | | | Growing on tree trunk |
| | PSM 9331 | 7-Jun-04 | Pulau Rumbia | | | |
| | PSM 9333 | 7-Jun-04 | Pulau Rumbia | | | |
| Order Bryopsidales | | | | | | |
| Family Bryopsidaceae | | | | | | |
| <i>Bryopsis pennata</i> Lamouroux | PSM 9390 | 9-Jun-04 | Pulau Perak | | | corals |
| | PSM 9391 | 9-Jun-04 | Pulau Perak | | | corals |
| | PSM 9392 | 9-Jun-04 | Pulau Perak | | | corals |
| | PSM 9393 | 9-Jun-04 | Pulau Perak | | | corals |
| | PSM 9394 | 9-Jun-04 | Pulau Perak | | | corals |
| | PSM 9402 | 9-Jun-04 | Pulau Perak | | | corals |
| | PSM 9810 | 22-Nov-08 | Pulau Sembilan | 04°00'16"N | 100°30'34"E | dead corals / rock in swell zone |
| <i>Bryopsis</i> Lamouroux | PSM 9379-1 | 9-Jun-04 | Pulau Perak | 05°41'00"N | 98°56'14"E | coral wall |
| Family Caulerpacae | | | | | | |
| <i>Caulerpa peltata</i> Lamouroux | PSM 9353 | 9-Jun-04 | Pulau Perak | 05°41'00"N | 98°56'14"E | corals |
| | PSM 9353 | 9-Jun-04 | Pulau Perak | 05°41'00"N | 98°56'14"E | corals |
| | PSM 9364 | 9-Jun-04 | Pulau Perak | 05°41'00"N | 98°56'14"E | coral wall |
| | PSM 9365 | 9-Jun-04 | Pulau Perak | 05°41'00"N | 98°56'14"E | coral wall |
| | PSM 9403 | 9-Jun-04 | Pulau Perak | | | |
| Division RHODOPHYTA | | | | | | |
| Order Gelidiales | | | | | | |
| Family Gelidiaceae | | | | | | |
| Gelidiaceae | PSM 9335-1 | 7-Jun-04 | Pulau Rumbia | | | |
| <i>Gelidium</i> sp. 1 Lamouroux | PSM 9314 | 5-Jun-04 | Pulau Jarak | 03°58'31"N | 100°05'55"E | |

| Taxa | Collection No. | Date | Location | Coordinates | | Substratum |
|--|----------------|-----------|----------------------|-------------|-------------|---------------|
| | | | | Latitude | Longitude | |
| <i>Gelidium</i> sp. 2 Lamouroux | PSM 9416 | 26-Nov-07 | Pulau Lalang Selatan | 04°00'39"N | 100°54'38"E | sandy & rocky |
| <i>Pterocladia</i> J. Agardh | PSM 9374 | 9-Jun-04 | Pulau Perak | 05°41'00"N | 98°56'14"E | |
| Family Gelidiellaceae | | | | | | |
| <i>Gelidiella</i> sp. 1 J. Feldmann & G. Hamel | PSM 9316-4 | 5-Jun-04 | Jetty, Pulau Jarak | 03°58'34"N | 100°06'04"E | rocks |
| <i>Gelidiella</i> sp. 2 J. Feldmann & G. Hamel | PSM 9401-1 | 9-Jun-04 | Pulau Perak | | | coral wall |
| <i>Gelidiella</i> sp. 3 J. Feldmann & G. Hamel | PSM 9312-1 | 5-Jun-04 | Pulau Jarak | 03°58'31"N | 100°05'55"E | rocks |
| Order Bonnemaisoniales | | | | | | |
| Family Bonnemaisoniaceae | | | | | | |
| <i>Asparagopsis</i> Montagne | PSM 9347 | 9-Jun-04 | Pulau Perak | 05°40'50"N | 98°56'11"E | |
| | PSM 9389 | 9-Jun-04 | Pulau Perak | 05°41'00"N | 98°56'14"E | on rope |
| Order Cryptonemiales | | | | | | |
| Family Halymeniaceae | | | | | | |
| <i>Cryptonemia</i> J. Agardh | PSM 9370 | 9-Jun-04 | Pulau Perak | 05°41'00"N | 98°56'14"E | corals |
| | PSM 9373 | 9-Jun-04 | Pulau Perak | 05°41'00"N | 98°56'14"E | coral wall |
| | PSM 9378-3 | 9-Jun-04 | Pulau Perak | 05°41'00"N | 98°56'14"E | |
| | PSM 9380-1 | 9-Jun-04 | Pulau Perak | 05°41'00"N | 98°56'14"E | String |
| | PSM 9397-1 | 9-Jun-04 | Pulau Perak | | | |
| Family Peyssonneliaceae | | | | | | |
| <i>Peyssonnelia</i> Decaisne | PSM 9407 | 24-Nov-07 | Pulau Jarak | 03°58'32"N | 100°06'10"E | on rock |
| Order Corallinales | | | | | | |
| Family Corallinaceae | | | | | | |
| <i>Jania</i> sp. 1 Lamouroux | PSM 9372-1 | 9-Jun-04 | Pulau Perak | 05°41'00"N | 98°56'14"E | coral wall |
| | PSM 9376 | 9-Jun-04 | Pulau Perak | 05°41'00"N | 98°56'14"E | |
| | PSM 9377-2 | 9-Jun-04 | Pulau Perak | 05°41'00"N | 98°56'14"E | |
| | PSM 9378-2 | 9-Jun-04 | Pulau Perak | 05°41'00"N | 98°56'14"E | |
| | PSM 9380-2 | 9-Jun-04 | Pulau Perak | 05°41'00"N | 98°56'14"E | String |
| | PSM 9385-2 | 9-Jun-04 | Pulau Perak | 05°41'00"N | 98°56'14"E | |

| Taxa | Collection No. | Date | Location | Coordinates | | Substratum |
|-------------------------------|----------------|-------------|----------------------|-------------|-------------|---------------|
| | | | | Latitude | Longitude | |
| <i>Jania</i> sp. 2 Lamouroux | PSM 9375 | 9-Jun-04 | Pulau Perak | 05°41'00"N | 98°56'14"E | sandy & rocky |
| | PSM 9420 | 26-Nov-07 | Pulau Lalang Selatan | 04°00'39"N | 100°54'38"E | |
| Order Gigartinales | | | | | | |
| Family Hypneaceae | | | | | | |
| <i>Hypnea</i> sp. 1 Lamouroux | PSM 9313-1 | 5-Jun-04 | Pulau Jarak | 03°58'31"N | 100°05'55"E | |
| <i>Hypnea</i> sp. 2 Lamouroux | PSM 9316-1 | 5-Jun-04 | Jetty, Pulau Jarak | 03°58'34"N | 100°06'04"E | nylon string |
| <i>Hypnea</i> sp. 3 Lamouroux | PSM 9318 | 5-Jun-04 | Jetty, Pulau Jarak | 03°58'34"N | 100°06'04"E | dead corals |
| | PSM 9343 | 9-Jun-04 | Pulau Perak | 05°40'50"N | 98°56'11"E | |
| | PSM 9345 | 9-Jun-04 | Pulau Perak | 05°40'50"N | 98°56'11"E | |
| | PSM 9346 | 9-Jun-04 | Pulau Perak | 05°40'50"N | 98°56'11"E | |
| <i>Hypnea</i> sp. 4 Lamouroux | PSM 9357 | 9-Jun-04 | Pulau Perak | 05°41'00"N | 98°56'14"E | corals |
| | PSM 9362-1 | 9-Jun-04 | Pulau Perak | 05°41'00"N | 98°56'14"E | corals |
| | PSM 9366 | 9-Jun-04 | Pulau Perak | 05°41'00"N | 98°56'14"E | corals |
| | PSM 9367-2 | 9-Jun-04 | Pulau Perak | 05°41'00"N | 98°56'14"E | coral wall |
| | PSM 9371-2 | 9-Jun-04 | Pulau Perak | 05°41'00"N | 98°56'14"E | |
| | PSM 9379-3 | 9-Jun-04 | Pulau Perak | 05°41'00"N | 98°56'14"E | coral wall |
| | PSM 9382 | 9-Jun-04 | Pulau Perak | 05°41'00"N | 98°56'14"E | coral wall |
| PSM 9383 | 9-Jun-04 | Pulau Perak | 05°41'00"N | 98°56'14"E | coral wall | |
| PSM 9384-1 | 9-Jun-04 | Pulau Perak | 05°41'00"N | 98°56'14"E | coral wall | |
| Order Rhodymeniales | | | | | | |
| Family Champiaceae | | | | | | |
| <i>Champia</i> sp. 1 Desvaux | PSM 9362-2 | 9-Jun-04 | Pulau Perak | 05°41'00"N | 98°56'14"E | corals |
| <i>Champia</i> sp. 2 Desvaux | PSM 9421 | 26-Nov-07 | Pulau Lalang Selatan | 04°00'39"N | 100°54'38"E | sandy & rocky |
| Family Rhodymeniaceae | | | | | | |
| <i>Gelidopsis</i> Schmitz | PSM 9399-1 | 9-Jun-04 | Pulau Perak | | | |
| Order Ceramiales | | | | | | |
| Family Ceramiaceae | | | | | | |
| <i>Ceramium</i> | PSM 9372-2 | 9-Jun-04 | Pulau Perak | 05°41'00"N | 98°56'14"E | coral wall |

| Taxa | Collection No. | Date | Location | Coordinates | | Substratum |
|--|----------------|-----------|----------------------|-------------|-------------|---------------|
| | | | | Latitude | Longitude | |
| <i>Antithamnion</i> sp 1 Nägeli | PSM 9378-1 | 9-Jun-04 | Pulau Perak | 05°41'00"N | 98°56'14"E | sandy & rocky |
| <i>Antithamnion</i> sp. 2 Nägeli | PSM 9422 | 26-Nov-07 | Pulau Lalang Selatan | 04°00'39"N | 100°54'38"E | String |
| <i>Ceramium</i> sp. 1 Roth | PSM 9380-3 | 9-Jun-04 | Pulau Perak | 05°41'00"N | 98°56'14"E | on rock |
| <i>Ceramium</i> sp. 2 Roth | PSM 9408 | 24-Nov-07 | Pulau Jarak | 03°58'32"N | 100°06'10"E | sandy & rocky |
| <i>Ceramium</i> sp. 3 Roth | PSM 9417 | 26-Nov-07 | Pulau Lalang Selatan | 04°00'39"N | 100°54'38"E | dead corals |
| <i>Wrangelia</i> C. Agardh | PSM 9319 | 5-Jun-04 | Jetty, Pulau Jarak | 03°58'34"N | 100°06'04"E | |
| Family Delesseriaceae | | | | | | |
| <i>Hypoglossum</i> Kützting | PSM 9385-4 | 9-Jun-04 | Pulau Perak | 05°41'00"N | 98°56'14"E | |
| Family Rhodomelaceae | | | | | | |
| <i>Bostrychia</i> Montagne | PSM 9379-4 | 9-Jun-04 | Pulau Perak | 05°41'00"N | 98°56'14"E | coral wall |
| | PSM 9380-4 | 9-Jun-04 | Pulau Perak | 05°41'00"N | 98°56'14"E | String |
| | PSM 9385-3 | 9-Jun-04 | Pulau Perak | 05°41'00"N | 98°56'14"E | |
| <i>Chondria</i> C. Agardh | PSM 9418 | 26-Nov-07 | Pulau Lalang Selatan | 04°00'39"N | 100°54'38"E | sandy & rocky |
| <i>Herposiphonia</i> Nägeli | PSM 9311 | 5-Jun-04 | Pulau Jarak | 03°58'31"N | 100°05'55"E | rock and wood |
| <i>Herposiphonia</i> Nägeli | PSM 9412 | 24-Nov-07 | Pulau Jarak | 03°58'32"N | 100°06'10"E | on rock |
| <i>Laurencia</i> sp. 1 Lamouroux | PSM 9315-3 | 5-Jun-04 | Jetty, Pulau Jarak | 03°58'34"N | 100°06'04"E | nylon string |
| | PSM 9339 | 9-Jun-04 | Pulau Perak | 05°40'50"N | 98°56'11"E | |
| | PSM 9340 | 9-Jun-04 | Pulau Perak | 05°40'50"N | 98°56'11"E | corals |
| | PSM 9341 | 9-Jun-04 | Pulau Perak | 05°40'50"N | 98°56'11"E | corals |
| | PSM 9342 | 9-Jun-04 | Pulau Perak | 05°40'50"N | 98°56'11"E | corals |
| | PSM 9355 | 9-Jun-04 | Pulau Perak | 05°41'00"N | 98°56'14"E | |
| | PSM 9356 | 9-Jun-04 | Pulau Perak | 05°41'00"N | 98°56'14"E | |
| | PSM 9363 | 9-Jun-04 | Pulau Perak | 05°41'00"N | 98°56'14"E | corals |
| | PSM 9371-1 | 9-Jun-04 | Pulau Perak | 05°41'00"N | 98°56'14"E | |
| | PSM 9397-2 | 9-Jun-04 | Pulau Perak | 05°41'00"N | 98°56'14"E | |
| <i>Laurencia</i> sp. 3 Lamouroux | PSM 9400 | 9-Jun-04 | Pulau Perak | 05°41'00"N | 98°56'14"E | corals |
| <i>Laurencia</i> sp. 4 Lamouroux | PSM 9369 | 9-Jun-04 | Pulau Perak | 05°41'00"N | 98°56'14"E | |
| cf. <i>Lophocladia</i> (J. Agardh) Schmitz | PSM 9377-1 | 9-Jun-04 | Pulau Perak | 05°41'00"N | 98°56'14"E | |
| | PSM 9313-3 | 5-Jun-04 | Pulau Jarak | 03°58'31"N | 100°05'55"E | |

| Taxa | Collection No. | Date | Location | Coordinates | | Substratum |
|--|----------------|-----------|----------------------|-------------|-------------|---------------------------|
| | | | | Latitude | Longitude | |
| <i>Polysiphonia scopulorum</i> Harvey | PSM 9406 | 24-Nov-07 | Pulau Jarak | 03°58'32"N | 100°06'10"E | on net |
| <i>Polysiphonia</i> sp. 1 Greville | PSM 9313-2 | 5-Jun-04 | Pulau Jarak | 03°58'31"N | 100°05'55"E | |
| <i>Polysiphonia</i> sp. 2 Greville | PSM 9315-1 | 5-Jun-04 | Jetty, Pulau Jarak | 03°58'34"N | 100°06'04"E | nylon string |
| | PSM 9316-2 | 5-Jun-04 | Jetty, Pulau Jarak | 03°58'34"N | 100°06'04"E | rocks |
| <i>Polysiphonia</i> sp. 3 Greville | PSM 9379-2 | 9-Jun-04 | Pulau Perak | 05°41'00"N | 98°56'14"E | coral wall |
| | PSM 9384-2 | 9-Jun-04 | Pulau Perak | 05°41'00"N | 98°56'14"E | |
| | PSM 9385-1 | 9-Jun-04 | Pulau Perak | 05°41'00"N | 98°56'14"E | |
| | PSM 9388 | 9-Jun-04 | Pulau Perak | 05°41'00"N | 98°56'14"E | |
| <i>Polysiphonia</i> sp. 4 Greville | PSM 9423 | 26-Nov-07 | Pulau Lalang Selatan | 04°00'39"N | 100°54'38"E | sandy & rocky |
| Unknown red | PSM 9322 | 7-Jun-04 | Pulau Lalang Selatan | 04°00'23"N | 100°32'49"E | |
| Unknown red | PSM 9323 | 7-Jun-04 | Pulau Lalang Selatan | 04°00'23"N | 100°32'49"E | on boulders, strong waves |
| Unknown red | PSM 9324 | 7-Jun-04 | Pulau Lalang Selatan | 04°00'23"N | 100°32'49"E | |
| Unknown red | PSM 9327 | 7-Jun-04 | Pulau Lalang Selatan | 04°00'23"N | 100°32'49"E | on boulders, higher shore |
| Unknown red | PSM 9328 | 7-Jun-04 | Pulau Lalang Selatan | 04°00'23"N | 100°32'49"E | on boulders, higher shore |
| Unknown red | PSM 9381 | 9-Jun-04 | Pulau Perak | 05°41'00"N | 98°56'14"E | |
| Unknown red | PSM 9424 | 26-Nov-07 | Pulau Lalang Selatan | 04°00'39"N | 100°54'38"E | sandy & rocky |
| Unknown red | PSM 9398 | 9-Jun-04 | Pulau Perak | | | |
| Division PHAEOPHYTA | | | | | | |
| Order Dictyotales | | | | | | |
| Family Dictyotaceae | | | | | | |
| <i>Dictyota friabilis</i> Setchell | PSM 9344 | 9-Jun-04 | Pulau Perak | 05°40'50"N | 98°56'11"E | corals |
| | PSM 9367-1 | 9-Jun-04 | Pulau Perak | 05°41'00"N | 98°56'14"E | coral wall |
| | PSM 9401-1 | 9-Jun-04 | Pulau Perak | | | coral wall |
| <i>Lobophora variegata</i> (Lamouroux) Womersley ex Oliveira | PSM 9368 | 9-Jun-04 | Pulau Perak | 05°41'00"N | 98°56'14"E | coral wall |
| | PSM 9409 | 24-Nov-07 | Pulau Jarak | 03°58'32"N | 100°06'10"E | on net |
| Order Scytosiphonales | | | | | | |
| Family Scytosiphonaceae | | | | | | |
| <i>Hydroclathrus</i> Bory de Saint-Vincent | PSM 9351 | 9-Jun-04 | Pulau Perak | 05°41'00"N | 98°56'14"E | coral |

*: New Record

have a low species diversity (36 genera and 66 taxa) compared to the total flora of Malaysia (381 taxa) and the flora of Langkawi (84 taxa). Pulau Perak and Pulau Langkawi only share 15 genera in common. One new record of *Lyngbya confervoides* f. *violacea* is reported for the first time for Malaysia. There may be a few more records which have to be confirmed with more samples. The algae flora of Pulau Perak, Jarak and Sembilan therefore offers an interesting assemblage for further studies, especially with regards to tropical marine biodiversity and biogeography. Further collections have to be made at Pulau Perak as the coral ecosystem there is unique suggesting that the algal flora may also have unique features. In order to conserve their uniqueness, Pulau Perak and Pulau Jarak should be declared marine protected area.

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