

Contribution to the Knowledge of Marine Algae from Ranong, the Andaman Sea, Coast of Thailand

The Ranong coastal regions are characterized by the presence of rocky shores, coral reefs, shallow bays and coves that support a large variety of marine plants and animals. Among the marine plants the mangroves, seagrasses and marine algae are conspicuous. In January–July 1997, the Kasetsart University Research and Development Institute, in collaboration with the Faculty of Fisheries, and Ranong Coastal Resources Research Station, Kasetsart University, conducted a survey of marine organisms in the Ranong coastal region of the Andaman Sea, Thailand. The objectives were to gather environmental data and collect samples of marine organisms for systematic, ecological, and distributional studies. The present paper reports on the species diversity of marine algae and their distribution on the coast of Ranong, and also reports from previously unreported species from Thailand.

Ranong is located on the west coast of Thailand, the Andaman Sea at Lat. 9° 57'N and Long. 98° 35'E. This region is influenced annually by a long period of monsoon rains (April–December), and by extremely strong wind from the west Indian Ocean. Therefore, our study is based on samples collected from January to July, because observations are impossible after the month of July. Nine study sites (Fig. 1) were selected in the intertidal regions.

Site 1. Koh Ra consists of sandy-rocky shore from the east to the west coast, more or less exposed to strong waves.

Site 2. Haad Toong Nang Dam lies between Ranong and Phangnga Provinces. This region is characterized by mounds of sand-mud because of sediment from Khura canal, causing turbid seawater. This area is in a large basin which connects to the sea by a channel.

Site 3, Koh Khai Yai; Site 4, Koh Nui; Site 5, Koh Lan; and Site 6, Koh Luk Kham Tai, are small islands which consist of rocky-sandy shore, and coral reefs. Some parts are steep rocks and directly exposed to strong waves.

Site 7. Koh Luk Kham Tok is an island with the western part of a large embayment called Kao Kwai Bay, characterized by sandy shore with dead coral. The bay opens to the sea via a wide mouth which is rocky and slopes into the sea. The eastern shore is sandy, with, a large seagrass bed.

Site 8. Haad Hin Toong have rocky-sandy shore, more or less exposed to strong waves. Site 9. Pa Khamphuan is a large mangrove area, characterized by variety of mangrove flora and animals.

Samples were collected randomly by hand or by free-diving in shallow waters, except for a few locations where SCUBA equipment was used at greater depths. Specimens were collected from 18 January to 5 July in 1997, at the 9 study sites. The specimens collected were preserved in a solution of 4% formaldehyde and seawater or as dried specimens on

herbarium sheets. The specimens studied are deposited in the herbarium of the Department of Fishery Biology, Faculty of Fisheries, and at the Ranong Coastal Resources Research Station, Kasetsart University.

All mounts of specimens collected were made using 50% corn syrup (Karo Syrup, Corn Products, Inc.) solution in distilled water and containing a trace of phenol. Cross sections were prepared by hand, stained with 1% aniline blue and in 25% Karo Syrup. They were analyzed under an optical microscope (Nikon, Eclipse E600, Nikon Inc.) at 10, 20, 40 x magnification.

SMITH (1951), DESIKACHARY (1959), PHAM-HOANG HO (1969), TAYLOR (1972), ABBOTT & HOLLENBERG (1976), TRONO & GANZON-FORTES (1988), SCHNEIDER & SEARLES (1991), LEWMANOMONT & OGAWA (1995), were used for taxonomic determinations, supplemented by SILVA *ET AL.* (1987), SANTELICES (1988), ZHANG & XIA (1988), RODRIGUIZ & SANTELICES (1988), LEWMANOMONT (1994), LEWMANOMONT *ET AL.* (1995), MEÑEZ *ET AL.* (1996), SILVA *ET AL.* (1996).

Seventy-seven taxa at specific and infraspecific level of marine algae, distributed into 52 genera, were identified (Table 1). Of the identified species, there are 6 genera and 6 species of blue-green algae (cyanobacteria), 14 genera and 19 species of green algae, 4 genera and 12 species of brown algae, and 28 genera and 40 species of red algae. The total number of species found per site is also presented in Table 1. The greatest number was observed from Koh Nui (Site 4), whereas the smallest was from Haad Toong Nang Dam (Site 2) and Koh Luk Kham Tai (Site 6). The red algae were the most numerous. Among them, *Antithamnion cruciatum* with another one unidentified species of *Antithamnion* as well as *Asparagopsis taxiformis* and *Portieria hornemannii* are reported for the first time from Thailand (Fig. 2).

Our present knowledge of the marine algae of the Thai coast is indeed imperfect. There is very little information regarding the marine flora of the Andaman coast of Thailand. For instance, EGEROD (1974) reported 28 species of green algae and 9 species of brown algae from Phuket, Andaman Sea, of which 20 species were additional records for Thailand. In 1975, she included an other 31 species of green algae, 19 of which were new records for the Andaman Sea coast of Thailand (EGEROD, 1975). CHRISTENSEN & WIUM-ANDERSEN (1977) reported 39 species of benthic marine algae from Surin Island, west coast of Thailand. Furthermore, LEWMANOMONT *ET AL.* (1995) summarized the total number of marine algae known in Thai waters: 132 genera and 333 species.

The present study of species diversity of the Ranong marine algae is mostly based on red, green, and brown algae species, but a few species of cyanobacteria were also observed in the areas (Fig. 2). The number of species found per site was related to environmental heterogeneity. For example, Koh Nui (Site 4), where 32 species were found, is a site with a great diversity of environments provided by rocky-sandy shore, tidal pool, channeled currents, and relatively steep rock. At Haad Toong Nang Dam (Site 2), where there were only 3 species (*Avrainvillea erecta*, *Enteromorpha clathrata*, and *Gracilaria rubra*), there is a homogeneous mound of sand-mud and turbid seawater. However, the present environmental data may not be substantial enough as a basis to discuss their diversity in the region.

Moreover, the occurrence of the four newly reported red algae in the coast of Ranong is of interest for their distribution. These species have been reported as widely distributed in the Pacific coast of California (ABBOTT & HOLLENBERG, 1976), the Philippines

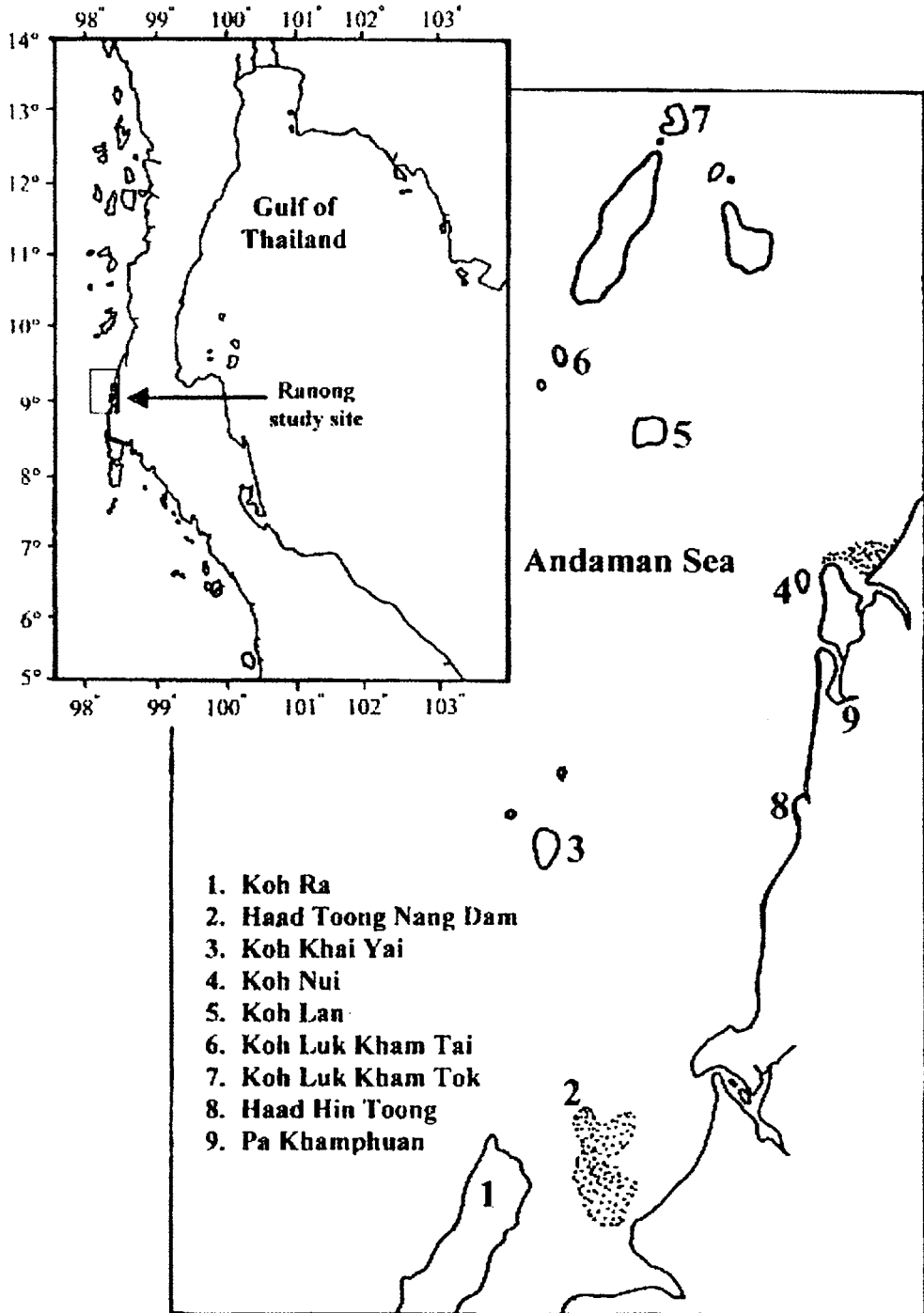


Figure 1. Study sites in Ranong, the Andaman Sea, coast of Thailand.



Fig 2(1)



Fig 2(2)



Fig 2(3)



Fig 2(4)

Figure 2. Some specimens of Cyanophyta (1–2), Chlorophyta (3), Phaeophyta (4), and Rhodophyta (5–10) collected from Ranong from 18 January to 5 July 1997.

(1) *Brachytrichia quoyi* (C. Ag.) Born. Et Flah. Thallus hollow, spherical to irregular shape, often folded. Blue green in color. Locality: Koh Nui Habitat: rocky-sandy shore, growing on rocks in upper intertidal zone, exposed during low tide.

(2) *Symploca hydroides* (Harvey) Kützing. Thallus spongy tuft, up to 5 cm tall, composed of filaments aggregated into small bundles, gray-green in color. Locality: Koh Kai Yai, Koh Lan, Koh Luk Kam Tok Habitat: Rocky-sandy shore, and coral reefs, plant grows on dead corals or bottom surface of shallow water.

(3) *Caulerpa microphysa* (Weber-van Bosse) J. Feldmann. Thallus bright green in color, cylindrical branching stolons; upright portions covered with clusters of small spheres, about 1 mm in diameter. Locality: Koh Kai Yai, Koh Luk Kham Tai Habitat: growing on rocks and dead coral fragments in intertidal zone.

(4) *Sargassum crassifolium* J. Ag. Thallus erect up to 22 cm high with short cylindrical axis arising from discoid holdfast; double edged, toothed, oval shaped leaflike blades, yellowish brown in color. Locality: Koh La, Koh Kai Yai, Koh Luk Kham Tok Habitat: grows on rocks and coral fragments in intertidal areas.



Fig 2(5)



Fig 2(6)



Fig 2(7)



Fig 2(8)



Fig 2(9)



Fig 2(10)

(5) *Asparagopsis taxiformis* * (Delile) Trevisan (new record). Plant consists of creeping portion and erect portion. Thallus soft with feathery erect branches up to 3-5 cm tall and have bushy branches arising from creeping stolons. Locality: Kuo Kwai bay, Koh Luk Kham Tok Habitat: highly shaded areas in shallow subtidal habitats with heavy water motion.

(6) *Portieria hornemannii* * (Lyngbye) P.C. Silva (new record). Thallus is dark red, erect, pyramidal with netted branches, to 6-13 cm tall, ultimate branchlets with inrolled tips. Locality: Kuo Kwai bay, Koh Luk Kham Tok Habitat: rocky shore with heavy water motion subtidal habitats.

(7) *Antithamnion cruciatum* * (C. Ag.) Nägeli (new record) Thallus filamentous, rosy red, tufted, 0.5 to 1.5 cm in length, branched to three or four orders; axes uniseriate, bearing alternate or opposite, gland cell present; cruciate tetrasporangia Locality: Koh Lan Habitat: rocky-sandy shore habitat, growing on dead coral, pebbles or epiphytic with other seaweeds in shallow water.

(8) *Gracilaria salicornia* (C. Ag.) Dawson. Thallus succulent, creeping to semierect, forming a rough entangled mass with root-like discs on the tips. Light to dark brown in color Locality: Koh Nui Habitat: rocky-sandy shore, growing on rocks in intertidal zone, exposed during low tide.

(9) *Titanophora pulchra* Dawson. Thallus pink in color, forming a ruffled clump, attached by small disc, expanding abruptly from a short stipe divided into palmate lobes, surfaces hilly, margins entire to small finger like branches. Locality: Koh Nui, Koh Kai Yai Habitat: on rocks and dead corals in intertidal or subtidal zones.

(10) *Catenella nipae* Zanardini. Creeping segmented thallus attached on mangrove roots by haptera developing from the tip of each segment. Branching dichotomous or trichotomous, dark brown to black in color. Locality: Pa Khamphan Habitat: attached to arial root of mangrove trees.

Table 1. Distribution of the marine algal species in Ranong, the Andaman Sea, coast of Thailand.

1 = Koh Ra, 2 = Haad Toong Nang Dam, 3 = Koh Khai Yai, 4 = Koh Nui, 5 = Koh Lan, 6 = Koh Luk Kam Tai, 7 = Koh Luk Kam Tok, 8 = Haad Hin Toong, 9 = Pa Kamphuan, + = presence, - = absence, * = newly record

Species	Habitat	Localities								
		1	2	3	4	5	6	7	8	9
CYANOBACTERIA										
<i>Brachytrichia quoyi</i> (C. Ag.) Born. Et Flah.	Rocky-sandy shore, and coral reef, steep rocks in some parts, and directly exposed to strong wave. Plants attached to stones "between tide-marks, tide pools	-	-	-	+	-	-	-	-	-
<i>Lyngbya majuscula</i> (Dillwyn) Harvey	Sandy-rocky shore (site 1), rocky-sandy shore (3, 4, 6, 8), plants grows on sandy-muddy bottom (1, 3, 4), or dead coral reef and tide pools (6, 8)	+	-	+	+	-	+	-	+	-
<i>Microcoleus chthonoplastes</i> (Mertens) Zanardini	Rocky-sandy shore. Grows on sand-mud bottom, entangled with other filamentous cyanobacteria	-	-	-	-	-	-	-	+	-
<i>Oscillatoria</i> sp.	Mangrove swamp, on muddy bottom beneath aerial roots of <i>Rhizophora</i>	-	-	-	-	-	-	-	-	+
<i>Scytonema</i> sp.	On rocks near the sea shore	-	-	-	+	-	-	-	-	-
<i>Symploca hydroides</i> (Harvey) Kützing	Rocky-sandy shore, and coral reefs, plant grows on dead corals or bottom surface of shallow water	-	-	+	-	+	-	+	-	-
CHLOROPHYTA										
<i>Anadyomene wrightii</i> Harv. ex J.E. Gray	Grows on corals, entangles with other seaweeds	-	-	-	+	-	-	-	-	-
<i>Avrainvillea erecta</i> (Berk.) A.Gepp et E.S.Gepp	Growing in muddy sandy substrates in shallow waters, in silty mud of Haad Toong Nang Dam between seagrasses, coral sand of Koh Nui	+	+	+	+	-	-	-	-	-
<i>Avrainvillea lacerata</i> Harv. ex J. Ag.	On rocks or dead corals of sandy bottom of intertidal habitat	-	-	-	+	-	-	-	-	-
<i>Boergesenia forbesii</i> (Harv.) J. Feld.	On rocks and dead coral fragments of middle intertidal habitat	+	-	-	-	-	-	-	-	-
<i>Bryopsis pennata</i> Lamour.	On rock of intertidal habitat of rocky-sandy shore, some parts exposed to waves	-	-	+	+	+	-	-	-	-
<i>Caulerpa microphysa</i> (Weber-van Bosse) J. Feld.	On rocks and dead corals in intertidal zone	-	-	+	-	-	+	-	-	-
<i>Caulerpa racemosa</i> (Forsskål) J. Ag. var. <i>peltata</i> (Lamour.) Eubank	On rocks, pebble, sandy bottom in intertidal zone	-	-	+	-	-	-	-	-	-

Species	Habitat	Localities								
		1	2	3	4	5	6	7	8	9
<i>Dictyota dichotoma</i> (Huds.) Lamour.	Attached on shells and pebbles in shallow water of rocky-sandy shore	-	-	+	-	+	-	-	-	-
<i>Dictyota cervicornis</i> Kützting	On pebbles and dead coral fragment of intertidal areas of sandy-rocky (1) shore or rocky-sandy shore (3)	+	-	+	-	-	-	-	-	-
<i>Padina japonica</i> Yamada	Growing on rocks and dead coral fragments in shallow water	+	-	+	-	-	-	-	-	-
<i>Padina minor</i> Yamada	On rocks and pebbles in intertidal areas	-	-	-	+	-	-	-	-	-
<i>Padina australis</i> Hauck	On rocks or shells in intertidal areas together with <i>P. minor</i>	-	-	-	+	-	-	-	-	-
<i>Padina tetrastromatica</i> Hauck	On rocks, pebbles and shells on sandy muddy substrate at intertidal zone	-	-	-	-	+	-	-	-	-
<i>Sargassum</i> sp.	Attached to stones, on rocks in intertidal zone, more or less exposed to strong waves	+	-	-	-	-	-	-	-	-
<i>Sargassum oligocystum</i> Montagne	Attached to rocks exposed to strong waves	+	-	-	+	-	-	+	-	-
<i>Sargassum crassifolium</i> J. Ag.	On rocks in intertidal and subtidal areas, exposed to strong waves	-	-	-	-	-	+	+	-	-
<i>Turbinaria ornata</i> (Turner) J. Ag.	On rocks and dead coral fragment in coral reef areas at mid littoral rocks	+	-	-	-	-	-	-	-	-
<i>Turbinaria decurrens</i> Bory de Saint-Vincent	On rocks and dead corals in reef flats of subtidal zone, exposed to strong waves	-	-	-	-	-	-	+	-	-
RHODOPHYTA										
<i>Acanthophora spicifera</i> (Vahl) Børg.	On dead corals and pebbles on sandy substrate in intertidal areas	-	-	+	+	-	-	-	-	-
<i>Amphiroa</i> sp.	Rocky-sandy shore, and coral reef habitat, attached to stones in coral reef at intertidal areas	-	-	-	+	-	-	-	-	-
<i>Amphiroa fragilissima</i> (Linn.) Lamour.	Sandy-rocky shore habitat, attached on dead coral, in shallow water	+	-	-	-	-	-	-	-	-
<i>Antithamnion cruciatum</i> * (C. Ag.) Nägeli	Rocky-sandy shore habitat, growing on pebbles in shallow water	-	-	-	-	+	-	-	-	-
<i>Antithamnion</i> sp.*	Rocky-sandy shore habitat, attached to dead coral in intertidal zone	-	-	+	-	-	-	-	-	-
<i>Asparagopsis taxiformis</i> * (Delile) Trevisan	Sandy shore with dead coral habitat. Plant grows on highly shaded areas in shallow subtidal habitats with heavy water motion	-	-	-	-	-	-	+	-	-

Species	Habitat	Localities								
		1	2	3	4	5	6	7	8	9
<i>Bostrychia tenella</i> (Lamour.) J. Ag.	On rocky shore and mangrove areas, grows on shaded rocks or beneath mangrove trees	-	-	-	+	-	-	-	-	+
<i>Caloglossa</i> sp.	Attached to arial root of mangrove trees or growing on dead shells	-	-	-	-	-	-	-	-	+
<i>Catenella nipae</i> Zanardini	Attached to arial root of mangrove trees in Pa Khamphuan	-	-	-	-	-	-	-	-	+
<i>Ceramium</i> sp.	On rocky-sandy shore, growing on pebbles, gravel or attached to <i>Sargassum</i> and <i>Padina</i> , more or less exposed to strong waves	-	-	+	+	+	-	-	+	-
<i>Centroceras</i> sp.	Growing together with <i>Ceramium</i> on small pebbles on rocky-sandy or sandy-rocky shores, more or less exposed to strong waves	-	-	-	-	-	-	-	+	-
<i>Champia parvula</i> (C. Ag.) Harv.	Rocky-sandy habitat, growing on old rope or fishing net entangled with <i>Chaetomorpha</i> <i>linum</i> , some parts exposed to strong surf	-	-	-	+	-	-	-	-	-
<i>Champia viellardii</i> Kützing	On rocky shore in intertidal zone, growing together with <i>Bryopsis pennata</i> , some part exposed to strong waves	-	-	-	+	-	-	-	-	-
<i>Erythrotrichia</i> sp.	On dead shells in intertidal habitat	-	-	-	-	-	-	-	+	-
<i>Hypnea</i> sp.	Growing on dead coral or pebbles in intertidal habitat	-	-	-	+	-	-	-	-	-
<i>Hypnea charoides</i> Sonder	Sandy-rocky shore habitat, growing on coral reef	+	-	-	-	-	-	-	-	-
<i>Hypnea pannosa</i> J. Ag.	Rocky-sandy shore, growing on rocks or dead corals in intertidal zone	-	-	+	-	+	-	-	-	-
<i>Hypnea valentiae</i> (Turner) Montagne	Growing on rocks and shells, exposed during low tide	+	-	-	-	-	-	-	-	-
<i>Galaxaura filamentosa</i> Chou	Cast ashore in sandy-rocky shore habitat	-	-	-	+	-	-	-	-	-
<i>Galaxaura obtusata</i> (Ellis and Solander) Lamour.	Specimens cast ashore, growing on small pebbles	+	-	-	-	-	-	-	-	-
<i>Gelidiella acerosa</i> (Forsskål) Feldmann et Hamel	Rocky-sandy shore, growing on rocks in upper to middle intertidal zone, exposed during low tide	-	-	-	+	+	-	-	-	-
<i>Gelidiopsis intricata</i> (C. Ag.) Vickers	Growing on rocks in intertidal habitat, exposed during low tide	-	-	-	+	-	-	-	-	-
<i>Gelidium pulsillum</i> (Stackhouse) Le Jolis	Rocky-sandy shore, growing on rocks in intertidal zone, exposed during low tide	-	-	-	+	-	-	-	+	-

Species	Habitat	Localities								
		1	2	3	4	5	6	7	8	9
<i>Gracilaria</i> sp.	Growing at a depth of 1–3 m, attaching by a small holdfast on rocks beneath <i>Sargassum</i> in clear water of the littoral zone.	-	-	-	+	-	-	-	-	-
<i>Gracilaria rubra</i> C.F. Chang et B.M. Xia	Growing on gravel and shells covered with sandy mud from low tide mark down to upper sublittoral zone, 1–3 m	-	+	-	-	-	-	-	-	-
<i>Gracilaria salicornia</i> (C. Ag.) Dawson	Rocky-sandy shore, growing on rocks in intertidal zone, exposed during low tide	-	-	-	+	-	-	-	-	-
<i>Halymenia</i> sp.	Growing solitary on rocks or corals in subtidal habitat in clear water at depth of 1–3 m	-	-	+	+	-	-	-	-	-
<i>Laurencia</i> sp.1	On mangrove habitat, attached on muddy bottom beneath mangrove trees, exposed during low tide	-	-	-	-	-	-	-	-	+
<i>Laurencia composita</i> Yamada	On rocky-sandy shore, growing on rocks, shells and pebbles in subtidal zone	-	-	+	+	+	-	-	-	-
<i>Laurencia cartilaginea</i> Yamada	On rocky-sandy shore, growing on rocks in subtidal habitat	-	-	+	-	-	-	-	-	-
<i>Leveillea jungermannioides</i> (Hering et Martens) Harvey	Epiphyte on <i>Sargassum</i>	-	-	-	+	-	-	-	-	-
<i>Lithophyllum</i> sp.	Encrusting algae, grows on rock faces	+	-	-	-	+	-	-	-	-
<i>Liagora farinosa</i> Lamour.	On dead corals in tide pools	+	-	-	-	-	-	-	-	-
<i>Liagora divaricata</i> Tseng	On dead corals of subtidal habitat	+	-	-	-	-	-	-	-	-
<i>Polysiphonia</i> sp.	On muddy-sandy areas in shallow water, attached to shells or gravel	-	-	-	-	-	-	-	-	+
<i>Peyssonnelia rubra</i> (Greville) J. Ag.	Grows on dead corals or shells in subtidal habitats of clear water	+	-	-	+	+	-	-	-	-
<i>Portieria hornemannii</i> * (Lyngbye) P.C. Silva	Attached to rocks and dead corals in intertidal and subtidal habitat	-	-	-	-	-	-	+	-	-
<i>Titanophora pulchra</i> Dawson	Attached on rocks and dead corals in intertidal or subtidal zones	-	-	+	-	+	-	-	-	-
<i>Tolypocladia glomerulata</i> (C. Ag.) Schmitz	Grows on dead corals in intertidal habitat	-	-	+	+	-	-	-	+	-
<i>Wrangelia argus</i> (Montagne) Montagne	Grows on dead corals or entangled with other seaweeds in intertidal areas	-	-	-	-	+	-	-	-	-
Total number		19	3	19	33	13	3	8	10	7

(SILVA *ET AL.*, 1987; MEÑEZ *ET AL.*, 1996), and southeastern Atlantic coast of the United States (SCHNEIDER & SEARLES, 1991). They have not been reported until now from the Andaman Sea coast of Thailand.

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REFERENCES

- ABBOTT, I. A., AND G. J. HOLLENBERG. 1976. *Marine algae of California*. Stanford, California, 827 pp.
- CHRISTENSEN, B., AND S. WIUM-ANDERSEN. 1977. Mangrove plants, seagrasses and benthic algae at Surin Islands, west coast of Thailand. *Phuket Mar. Biol. Cen. Res. Bull.* 14:1-5.
- DESIKACHARY, T. V. 1959. *Cyanophyta*. Indian Council of Agricultural Research, New Delhi. 686 pp.
- EGEROD, L. 1974. Report of the marine algae collected on the fifth Thai-Danish expedition of 1966, Chlorophyceae and Phaeophyceae. *Bot. Mar.* 17: 130-157.
- EGEROD, L. 1975. Marine algae of the Andaman Sea coast of Thailand: Chlorophyceae. *Bot. Mar.* 18: 41-66.
- LEWMANOMONT, K. 1994. The species of *Gracilaria* from Thailand. In I.A. ABBOTT (ed.), *Taxonomy of economic seaweeds with reference to some Pacific and Caribbean species, vol. IV*. California Sea Grant College Program, La Jolla: 135-148.
- LEWMANOMONT, K., AND H. OGAWA 1995. *Common seaweeds and seagrasses of Thailand*. Faculty of Fisheries, Kasetsart University, Bangkok, 163 pp.
- LEWMANOMONT, K., L. WONGRAT, AND C. SUPANWANID. 1995. *Algae in Thailand*. Office of Environmental Policy and Planning, Biodiversity Series vol.3, 334 pp.
- MEÑEZ, E. G., H. P. CALUMPONG, D. J. NEWMAN, AND J. A. WEST. 1996. An account of the red alga, *Portieria hornemannii* (Gigartinales, Rhizophyllidaceae), from the Philippines. *Nova Hedwigia, Beiheft* 112:161-170.
- PHAM-HOANG HO. 1969. Rong bien Vietnam: Marine algae of south vietnam. Ministry of Education and Youth, Trung-Tam Hoc-Lieu Xuat-Btan, Saigon. 557 pp. (in Vietnamese).
- RODRIGUIZ, D., AND B. SANTELICES. 1988. Separation of *Gelidium* and *Pterocladia* on vegetative characters. In I.A. ABBOTT (ed.), *Taxonomy of economic seaweeds with reference to some Pacific and Caribbean species, vol. II*. California Sea Grant College Program, La Jolla: 115-125.
- SANTELICES, B. 1988. Taxonomic studies on Chinese Gelidiales (Rhodophyta). In I.A. ABBOTT (ed.), *Taxonomy of economic seaweeds with reference to some Pacific and Caribbean species, vol. II*. California Sea Grant College Program, La Jolla: 91-107.
- SCHNEIDER, C. W., AND R. B. SEARLES. 1991. *Seaweeds of the southeastern United States, Cape Hatteras to Cape Canaveral*, Duke University Press, Durham and London, 553 pp.
- SILVA, P. C., P. W. BASSON, AND R. L. MOE. 1996. *Catalogue of the benthic marine algae of the Indian Ocean*. University of California Publications in Botany 79: xiv+1-1259.
- SILVA, P. C., E. G. MEÑEZ, AND R. L. MOE. 1987. *Catalog of the benthic marine algae of the Philippines*. Smithsonian Institution Press, Washinton, D.C. 179 pp.
- SMITH, G. M. 1951. *Marine algae of the Monterey Peninsula California*, Stanford University Press, Stanford, California. 622 pp.
- TAYLOR, W. R. 1972. *Marine algae of the eastern tropical and subtropical coasts of the Americas*. Ann Arbor, the University of Michigan Press, 870 pp.
- TRONO, G. C., Jr. AND E. T. GANZON-FORTES. 1988. *Philippine seaweeds*. National Book Store, Inc., Metro Manila, Philippines. 330 pp.

- ZHANG, J. AND B. M. XIA. 1988. Chinese species of *Gelidium* Lamouroux and other Gelidiales (Rhodophyta), with key, list, and distribution of the common species. In I.A. ABBOTT (ed.), *Taxonomy of economic seaweeds with reference to some Pacific and Caribbean species, vol. II*. California Sea Grant College Program, La Jolla: 115–125.

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