

THE MARINE ALGAE OF THE SOUTHERN COAST OF IRAN, PERSIAN GULF, LENGEH AREA

J. Sohrabipour, T. Nejdatsari, M. Assadi and R. Rabei

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The study was carried out on three stations at the coasts of Lengeh province at the south of Iran and north of the Persian Gulf. 119 species of algae collected and identified from this area are presented. These include 29 Chlorophyceae (3 new), 31 Phaeophyceae (4 new), and 59 Rhodophyceae (2 new).

Jelveh Sohrabipour and Reza Rabei, Natural Resources Researches center of Harmozgan province, Bandarabbas, P. O. Box. 79145-1468, -Iran. –TaHER Nejdatsari, Department of Biology, University of Tehran, Tehran, Iran. – Mostafa Assadi, Research Institute of Forests and Rangelands. P. O. Box. 13185-116, Tehran, Iran.

Key words. Persian Gulf, Oman sea, Marine algae, Lengeh area.

جلبکهای دریایی سواحل جنوب ایران، منطقه بندر لنگه، خلیج فارس
جلوه سهرابی پور، طاهر نژاد ستاری، مصطفی اسدی و رضا ربیعی

این مطالعه در سه محل از سواحل بندر لنگه در جنوب ایران، در سواحل شمالی خلیج فارس انجام شد. ۱۱۹ گونه از جلبکهای جمع‌آوری و شناسایی شده منطقه که شامل ۲۹ گونه جلبک سبز (۲ گونه گزارش جدید)، ۳۱ گونه جلبک قهوه‌ای (۴ گونه گزارش جدید) و ۵۹ گونه قرمز (۲ گونه گزارش جدید) می‌باشد معرفی می‌گردد.

Introduction

Iran has coastal lines about 1260 km along the Persian Gulf and the Oman Sea. The Persian Gulf extended from the Strait of Hormuz in the south to Shatt Al-Arab (Arvand river) in the north. The Gulf probably formed during the late Pliocene. The Persian Gulf is a shallow epi-continental sea which covers the Arabian shelf platform with water depth of less than 100m (average depth 35m) and semi-enclosed sea surrounded by semi-arid and arid zone subjected to semi-tropical or tropical temperature. Temperature of coastal water of the Gulf ranging from 10–36°C annually (Basson & al. 1977). The Lengeh province located at central north part of the Persian Gulf (map 1). Annual rainfall less than 50mm which mainly occurred in winter (fig. 1). Mean monthly temperature varies from 17 to 35°C (fig. 2). Mean monthly salinity of seawater ranging between 37 to 39ppt. but may rise to 42ppt. in rock pools of the upper parts of intertidal regions. Tidal regime of the area is predominantly semi-diurnal (El-Gindy & Hegazi, 1996) which the spring tides occurred during the day times in autumn and winter and in night times in spring and summer (Fig. 3). Main geological formations of the area belong to Miocene periods and include the Fars group which consist of Gachsaran-Razak, the Mishan-Guri and the Aghajari-Lahbari formations. The rocks of the area mainly represent the strata of the Miocene and consist of green- gray marl and limestone and coral reef at some area of the intertidal regions.

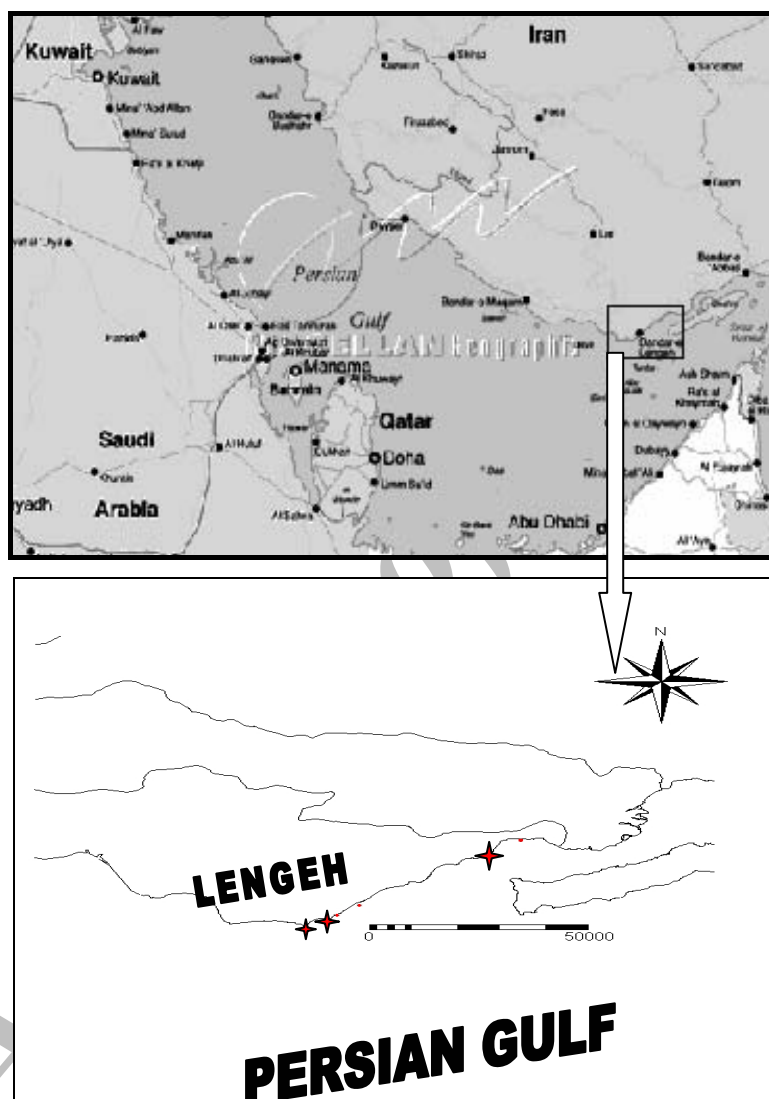
Information on the marine flora of the Persian Gulf is very scarce in the literature. The first publication about marine algae of the Persian Gulf by Endlicher and Deising (1845) describing 6 Phaeophyceae and 2 Rhodophyceae. Borgesen (1939) described 103 species of marine algae from seashores of Bushire and Kish (Quais) island on the north of Persian Gulf and Arabian regions of Persian Gulf. 79 species of the list belonged to Iranian coast of Persian Gulf. Nizamuddin and

Gessner (1970) described 67 species of algae from the Persian Gulf and Gujarat seashores in Pakistan along coast of the Oman sea. More recent information were provided by Sohrabipour & Rabei (1996 and 1999) describing 153 species of marine algae from coastal lines of Iranian islands and coast of Hormozgan province, 103 species were new records for Iran and 67 species new for the Persian Gulf. Marine algae of the Arabian regions of the Persian Gulf also were studied in aspect of taxonomy and ecology (Basson 1979a, 1979b & 1992; Basson et al 1977; Jones 1986; Al-Hasan & Jones 1989; De Clerck & Coppajan's 1996). The people that live along the Persian Gulf coast are fishermen who gets their income mostly from the sea. Seaweeds are valuable resources and have been exploited in many countries in the world (Critchley & Ohno, 1998), and perhaps they could also be an alternative to the dwellers of the Iranian coast on the Persian Gulf. Considering the paucity of data about the seaweed flora of Iran this paper is meant as a first step to catalogue the flora of the region, what will work as a baseline for further projects with more applied goals.

Material and methods

The survey was done on three stations located at 26° 32' 66" N /54° 52' 62" E (station1), 6° 34' 84" N /54° 55' 24" E (station2) and 26° 47' 10" N /55° 17' 33" E (station 3). Distance between 1 and 2 stations are about 5 km and between stations 2 and 3 about 43 km (Map 1). The samples collected from supratidal to subtidal zones of the intertidal regions of the selected stations. Each station was sampled monthly for one year from September 2001.

Collected specimens were fixed in formalin 5% in seawater and later some of them were mounted on herbarium sheet for following identification deposited in the Algal Herbarium of Agriculture and Natural Resources Researches Center of Hormozgan.



Map1 : Locality of stations in Lenghe area (red sign).

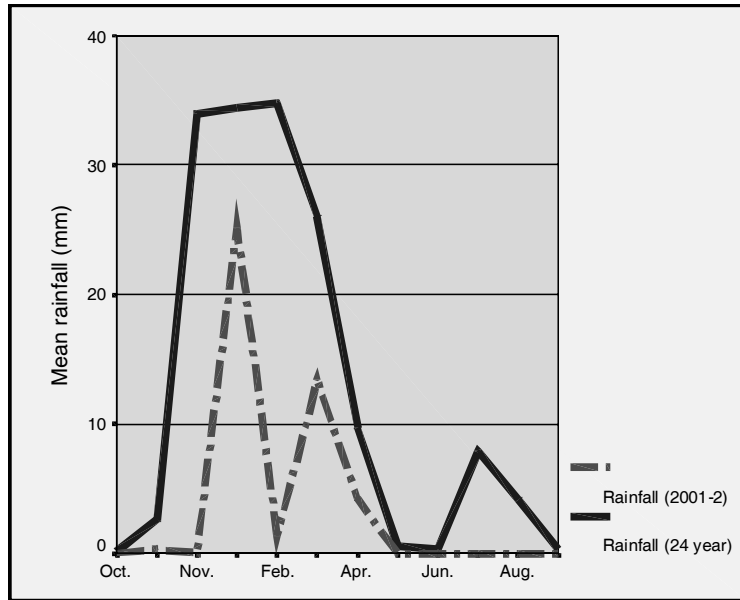


Fig.1: Mean monthly Rainfall in Lenghe.

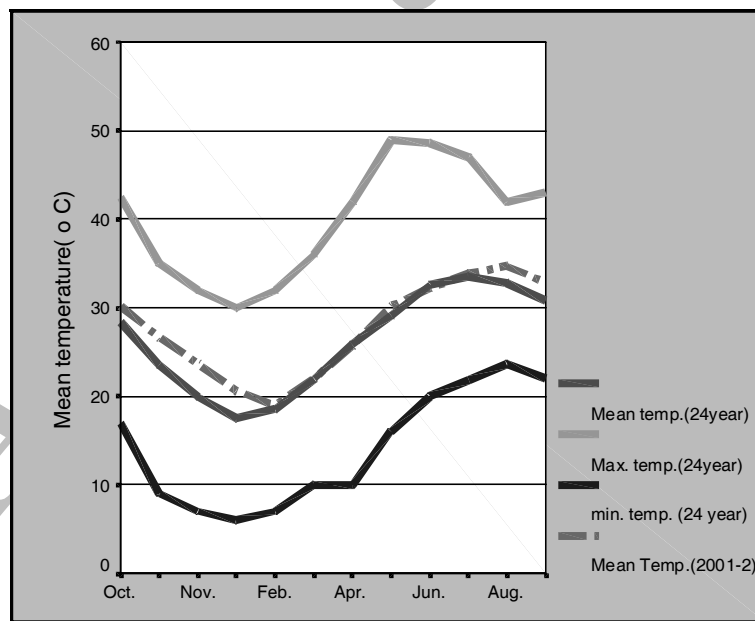


Fig.2: Mean monthly temperature in Lenghe.

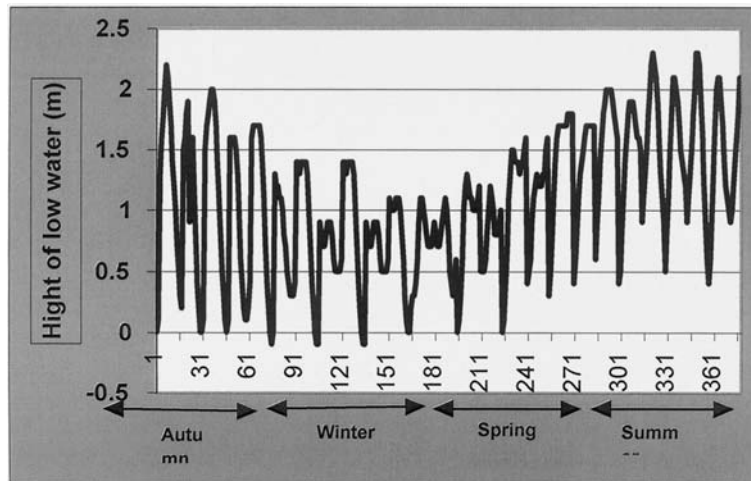


Fig 3: Height of water in daily low water in different seasons of year.

Results

The species are listed in alphabetical order under each class. *sign showed the species are new for Iran flora and ** are new for Iran and the Persian Gulf flora.

RHODOPHYTA

BANGIOPHYCEAE

GONIOTRICHALES

GONIOTRICHACEAE

Chroodactylon ornata (C. Agardh) Basson

Stylonema alsidii (Zanardini) K. Drew

BANGIALES

ERYTHROPELTIDACEAE

Erythrocladia irregularis Rosenvinge

Erythrotrichia carnea (Dillwyn) J. Agardh

ACROCHAETIALES

ACROCHAETIACEAE

Acrochaetium robustum Børgesen*

NEMALIALES

HELMINTHOCLADIACEAE

Liagora distenta (Mertens ex Roth) J. V. Lamouroux

GALAXAURACEAE

Scinaia tsingalensis C. K. Tseng

Galaxaura lapidescens (Ellis et Solander) Lamouroux

Galaxaura rugosa (Ellis et Solander) J.V. Lamouroux

GELIDIALES

GELIDIELACEAE

Gelidiella acerosa (Forskål) Feldman et Hamel

Gelidiella myriocladia (Børgesen) Feldmann & Hamel *

GELIDIACEAE

Gelidium crinale (Turner) Lamourox

Gelidium pusillum (Stakhouse) Lejolis

WURDEMANNIACEAE

Wurdemannia miniata (Duby) Feldmann & Hamel *

CORALINALES

CORALLINACEAE

Hydrolithon farinasum (J. V. Lamouroux) D. Penrose & Y. M. Chamberlain

Jania adhaerens J.V. Lamouroux

Jania rubens (Linnaeus) Lamouroux

Jania tenella (Kützing) Grunow

GRACILARIALES

GRACILARIACEAE

Gracilaria canaliculata Sonder

Gracilaria corticata (J. Agardh) J. Agardh

Gracilaria foliifera (Forskål) Børgesen

Gracilaria salicornia (C. Agardh) Dawson
Gracilariopsis longissima Steentoft, Farnham
 & Ervine

GIGARTINALES**SOLIERIACEAE**

Sarconema filiforme (Sonder) Kylin
Solieria filiformis (Kützing) Gabrielson
Solieria australis Harvey = *Solieria rubusta*
 (Greville) Kylin

HYPNEACEAE

Hypnea cervicornis J. Agardh
Hypnea cornuta (Kützing) J. Agardh
Hypnea pannosa J. Agardh
Hypnea spinella (C. Agardh) Kützing

RHODYMENIALES**RHODYMENIACEAE**

Rhodymenia sp.

CHAMPIACEAE

Champia compressa Harvey
Champia globulifera Børgesen
Champia parvula (C. Agardh) Harvey

CERAMIALES**DASYACEAE**

Dasya baillouvia (S. G. Gmelin) Montagne
Heteroiphonia crispella (C. Agardh) M. J.
 Wynne

CERAMIACEAE

Aglaothamnion cordatum (Børgesen)
 Feldman–Mazoyer
Centroceras clavulatum (C. Agardh)
 Montagne
Centroceras bellum Setchel & Gardner
Corallophila apiculat (Yamada) R. Norris
 = *Centroceras clavulatum*
Ceramium cimbricum H. E. Petersen
 = *Ceramium fastigiatum* (Wulfen ex Roth)
 Harvey
Ceramium flaccidum (Harvey ex Kützing)
 Adrisson

Spyridia filamentosa (Wufen) Harvey

RHODOMELACEAE

Acanthophora spicifera (Vahl) Børgesen
Chondria arcuata Hollenberg **
Chondria dasyphylla (Woodward) C. Agardh
Chondria bernardii P. Dangard
Digenea simplex (Wulfen) C. Agardh
Herpsiphonia secunda (C. Agardh) Ambronn
Laurencia intricata Lamouroux
Chondrophycus paoillosus (C. Agardh)
 Garbary & Harper
 = *Laurencia papillosa* (C. Agardh) Greville
Laurencia majascula (Harvey) Lucas
Laurencia obtusa (Hudson) Lamouroux
Laurencia snyderiae E. Y. Dawson
Leviellea jungermanioides (Hering et Mertens)
 Harvey

Polysiphonia codicolla Zanardini ex
 Frauenfeld

Polysiphonia scopulorum var. *villum* (J.
 Agardh) Harvey

Polysiphonia crassicolis Børgesen

Tolypiocladia glomerulata (C. Agardh)
 Schmitz

PHAEOPHYTA**ECTOCARPALES****ECTOCARPACEAE**

Bacheltioa antillarum (Granow) Gerloff
Feldmania irregularis (Kützing) Hamel
Hincksia mitchelliae (Harveg) P. C. Silve

SPHACELARIALES**SPHACELARIACEAE**

Sphacelaria rigidula Kützing

DICTYOTALES**DICTYOTACEAE**

Dictyota dichotoma (Hudson) Lamouroux
Dictyota divaricata Lamouroux
Dictyota indica Sonder ex Kützing
Lobophora variegata (Lamourax) Womersley
Padina australis Hauck

Padina minor Yamada*
Padina tenuis Thivy
Padina antillarum (Kützinger) Piccone = *P. tetrastromatica* Hauck
Padina pavonica (Linnaeus) Baily
Padina borgesseni Allender & Kraft
Stoichospermum marginatum (C. Agardh) Kützinger
Spatoglossum variables Figail & Denotaris

DICTYOSIPHONALES**SCYTOSIPHONACEAE**

Colpomenia sinuosa (Mertens ex Roth) Derbes
Lyngaria stellata (Børgesen) Børgesen
Rosenvingea intricata (J. Agardh) Børgesen **
Rosenvingea floridana (W. R. Taylor) W. R. Taylor
Scytosiphon doyti M. Wynne**

FUCALES**CYTOSEIRACEAE**

Cytoseira myrica (S. G. Gmelin) C. Agardh
Cytoseira trinodis (Forskål) C. Agardh
Hormophysa cuneiformis (J. F. Gmelin) P. C. Silva

SARGASSACEAE

Sargassum angustifolium C. Agardh
Sargassum boveanum J. Agardh
Sargassum crassifolium J. Agardh
Sargassum fluitans (Børgesen) Børgesen
Sargassum latifolium (Turner) C. Agardh
Sargassum oligocystum Montagne
Sargassum vulgare C. Agardh

CHOLOROPYTA**ULVALES****ULVACEAE**

Enteromorpha clathrata (Roth) Greville
Enteromorpha compressa (Linnaeus) Greville
Enteromorpha flexuosa (Wulfen ex Roth) J. Agardh
Enteromorpha intestinalis (Linnaeus) J. Agardh
Enteromorpha prolifera (O. F. Muller) J. Agardh
Ulva lactuca Linnaeus

CLADOPHORALES**CLADOPHORACEAE**

Chaetomorpha aerea (Dillwyn) Kützinger
Chaetomorpha californica F. S. Collins
Chaetomorpha crassa (C. Agardh) Kützinger
Chaetomorpha gracilis (Kützinger) Kützinger
Chaetomorpha linum (O. F. Muller) Kützinger
Cladophora flexuosa (Griffiths) Harvey
Cladophora echinus (Biasoletto) Kützinger
Cladophora kōeiei Børgesen
Cladophora nitellopsis Børgesen
Cladophora sericioides Børgesen
Rhizoclonium tortuosum (Dillwyn) Kützinger

SIPHONOCLADACEAE

Cladophoropsis sundanensis Reinbold*
Cladophoropsis membranacea (C. Agardh) Børgesen

VALONIACEAE

Dictyosphaeria cavernosa (Forskål) Børgesen

SIPHONALES**BRYOPSIDACEAE**

Bryopsis pennata var. *secunda* (Harvey) Collin & Harvey
Bryopsis plumosa (Hudson) C. Agardh

CAULERPALES**CAULERPACEAE**

Caulerpa sertularioides f. *farlowii* (Weber-Van Bosse) Børgesen
Caulerpa sertularioides (S. G. Gmelin) Howe f. *sertularioides**
Caulerpa fastigiata Montagne*
Caulerpa taxifolia (Vahl) C. Agardh

CODIACEAE

Codium papillatum C. K. Tseng & W. J. Gilbert

UDOTEACEAE

Avrainvillea calithina Olsen-Stojkovich

DASYCLADALES**POLYPHYSAEAE**

Acetabularia calyculus J. V. Lamouroux

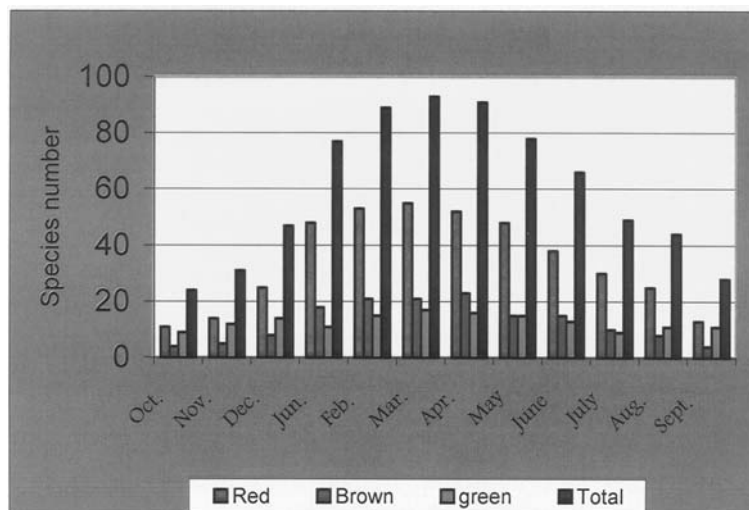


Fig. 4: Monthly algal species richness in Lengeh area.

Discussion

This survey showed the occurrence of 119 species of algae in Lengeh area comprising 13 genera and 29 species of Chlorophyceae, 13 genera and 31 species of Phaeophyceae, 33 genera and 59 species of Rhodophyceae. The Persian Gulf occurred in the Indo-west pacific province of tropical regions (Lüning 1990, Sheppard & al 1996) and R/p ratio in this survey became 1.97 that resembles to the ratio in other studies in Persian Gulf. The ratio estimation in Børgesen study (1939) is 1.9, in Basson checklist 1.8, in De Clerck and Coppjans (1996) 1.8 and in previous report from Hormozgan province (Sohrabipour and Rabei, 1999) is 2.1. The case reveals that more species of red algae should be present in Persian Gulf that must be identified. However in this study a number of species from some genera such as *Laurencia*, *Ceramium* and *Polysiphonia* remained unknown. Most of Chlorophyceae especially different species of *Chaetomorpha* and *Cladophora* are abundant in warm months of the year but species

richness increase between January to May (Fig. 4) and between August to December the species richness seriously was decreased which correspond with the high temperature, evaporation and desiccation in these months. Tide template of the area is important factor which affect on algal diversity. Tide in the area is predominantly semidiurnal that have two unequal low water and two high water. From late summer the low water occurred in day time (6 a.m. to 6 p.m.) and height of water in low water seriously decreased (Fig. 4). Beside humidity also decreased in these month and local winds blowing increased that caused intensive damages on algal vegetation. In winter air temperature, light intensity and day length were decreased and on the other hand humidity and rainfall increased which all these conditions caused increasing of species diversity. Occurring of high water in night times during winter protect algal vegetation from low temperature in night times. In spring height of water in low tides increased and low water occurred in night which this case protect

algal vegetation from high temperature and light intensity during day time. In summer gradually high temperature, solar radiation and high evaporation result in decreasing of species diversity. *Cystoseira myrica* and *Laurncia snyderiae* cover large area of the seashores of the investigated areas throughout of the year. It appeared that these species are very tolerant to environmental condition of the area. *Chaetomorpha linum* has also progressing growth in the warm months that mixed with other *Chaetomorpha* spp. and *Cladophora* spp. The case support the Dawson (1981) that believed the species are sunny plants because mostly abundant in the upper parts of the intertidal zone. *Sargassum* spp. has high growth in June and July and *Padina* spp. abundant in autumn and winter. These species are main producers in the area at different season of the year. The result and information obtained in the study are useful for economical exploiting of seaweeds in this area that can use for management of mariculture of seaweeds and extraction of different products of algae.

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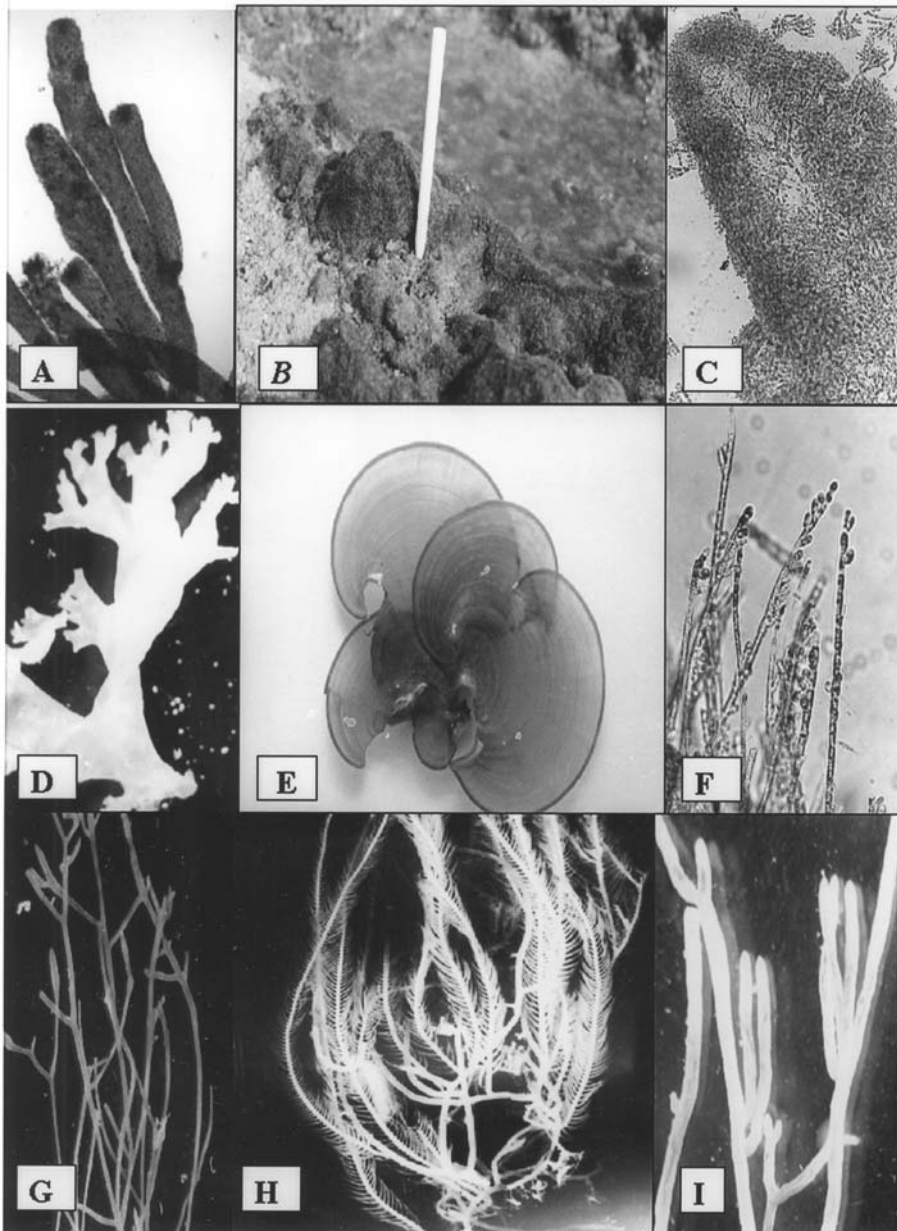


Plate 1: A: *Chondria arcuata* 70x; B: *Cladophoropsis sundanensis*; C: *Liagora distenta* 70x; D: *Rosenvingea intricata* 20x; E: *Padina minor* 4x; F: *Acrochaetium rubustum* 170x; G: *Wurdemannia miniata* 20x; H: *Caulerpa sertularioides* f. *sertularioides* 4x; I: *Caulerpa fastigiata* 20x.