J. KAU: Mar. Sci., **vol. 12,** *Special Issue,* pp. 241-251 (1421 A.H. / 2001 A.D.)

Macroalgae Associated with Mangroves at Hurghada and Safaga of the Egyptian Red Sea Coast

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Abstract. The objective of this study is to survey the macroalgae inhabiting two mangrove habitats along the Red Sea coast in the vicinity of Hurghada and Safaga and to illustrate the distribution of macroalgal communities, species composition, relative abundance and average standing crop seasonally. The results revealed that, 23 species of macroalgae were recorded from the different sites of the two areas during the four seasons (9 species belong to Phaeophyta, 6 species to Rhodophyta and 8 species to Chlorophyta). The standing crop of macroalgae recorded at the two areas maintained their highest peak during spring and the lowest during winter season. The highest density of standing crop was recorded at Hurghada area. The results also show that, no significant differences were detected in the studied environmental factors at both areas except for some fluctuations were randomly noticed. Mangroves offered habitat that allows the delicate algae to grow at higher level than on sunlit beach.

Key words: Macroalgae, Mangrove, Standing crop, Species composition, and Environmental factors.

Introduction

Mangroves or mangals are assemblages of halophytic tree, shrubs, palms, and creepers that from dense thickets or forests in intertidal and shallow subtidal regions of tropical and subtropical waters. They thrive in protected embayment areas, tidal lagoons and estuaries (Kennish, 1994). Also, Macnae, (1968) stated that "mangrove" is a general term applied to a community of shrubs or trees that grow below the high-tide mark along tropical shores. The term is also used with reference to individual plant species, which occur within that community.

In Egypt, mangal vegetation is represented by *Avicennia marina* swamps along the Red Sea coast from Hurghada southwards. *Rhizophora mucronota* is locally presents in a very limited area of the southern section of the Red Sea coast of Egypt. The mangroves represent mosaic habitats containing both hard and soft habitats and provide living space for more than 2000 species of fish, invertebrates and epiphytic plants (Hamilton and Snedaker, 1984; Mandura *et al.*, 1988 and Saifullah, 1996).

Much has been written about the phytosociology of the mangrove trees, but studies including algal and animal association are rare (Walsh, 1974). Perhaps with the exception of the mangrove tree species, there is no species of algae or animal, which is specifically bound to the mangals (Por *et al.*, 1977). Mangrove trunks and pneumatophores are

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colonized by the same flora as are found on other substrates. In addition, there are a few species which are restricted to shaded environments (Day and Morgans, 1956). The extensive root system of *Avicennia marina* with its abundant pneumatophores extends down to about mid-tied. The mangrove stem, branches and pneumatophores provide a firm substratum raised above the mud. The submerged portions of mangrove roots frequently have dense growth benthic algae attached to them.

Macroalgae associated with mangroves is an area of study that, together with the lichens and fungi has not as yet received much attention (Snedaker and Snedaker, 1984 and El-Sharouny *et al.*, 1998). So, the present work to study the macroalgal flora associated with mangroves along the Egyptian Red Sea coast. Seasonal variations of the macroalgal flora, their biomass during different seasons as well as the effects of some environmental factors (Temperature, salinity, pH value, dissolved O_2, phosphate and sulphates) will be taken into consideration.

Materials and Methods

The main objective of the present investigation was to survey the macroalgal flora inhabiting the upper intertidal zone of the two mangrove regions along the Red Sea coast at Hurghada and Safaga. This was carried out through the establishment of two permanent transects in the two different localities for a period of four seasons extended from May 1997 to April 1998.

Study Site

The sites of study are at km 8 south Hurghada (Abu Minqar Island) and km 17 south Safaga. Mangroves in the studied areas are vary from bushy with sparse distribution as in south Safaga to a complete forest with high tree extending more than 7 m high in south Hurghada. In the two localities, the mangroves grow over old rocks of dead corals. Figure 1 shows the location map.

Sampling

Algal materials and sea water were collected seasonally of the two sites. The samples collected by using quadrate technique (Russell, 1977). A steel quadrate 50 × 50 and 25 × 25 cm were used. Such methods were more suitable for the sample size. Sequence of quadrates from the shore line seaward in the different sites were taken in order to understand the detailed structure of the cross section. Five quadrate samples were taken at each site. All algal populations growing within the quadrate were collected carefully with part of substrate using diverse knife and kept inside labeled bags. Macroalgae found on pneumatophores were also collected.

Taxonomical Studies

For taxonomic study, specimens of all different species were seasonally collected and kept in labeled plastic bags. Portion of these samples were fixed in 4% formaldehyde seawater solution. For further studies another portion was spread on Herbarium sheets. All species were listed and placed in the relevant genera and families. Herbarium sheets specimens were deposited in the herbarium of the Red Sea branch of the National Institute of Oceanography and Fisheries at Hurghada.

For the identification of algal species the references listed below were consulted in addition to herbarium specimens present in the library of Red Sea branch of the National Institute of Oceanography and Fisheries at Hurghada. Nasr (1939, 1940a and b, 1941, 1944, 1947 and 1955), Nasr and Aleem (1949), Aleem (1948; 1950), Farghaly (1975 and 1980), Negm (1988) and Feldmann (1951). Taxonomic classification of the algal species was made according to the system developed by Papenfuss (1955; 1968).

Algal plants were washed with water to remove any foreign material, then cleaned up from all visible epiphytes and pressed gently between cloth. The material was dried in oven at 80ºC until constant dry weight was reached. The biomass was determined for each species, algal group and all recorded algae in the two sites. The biomass was then expressed as gm dry weight per square meter.

Water Analysis

Salinity (‰), pH value, water temperature and dissolved oxygen content in mg/l were determined directly in the field using the Hydrolab (Surveyor 4). Air temperature was recorded by thermometer. Subsurface water samples were collected seasonally from all sites in clean polyethylene bottles of

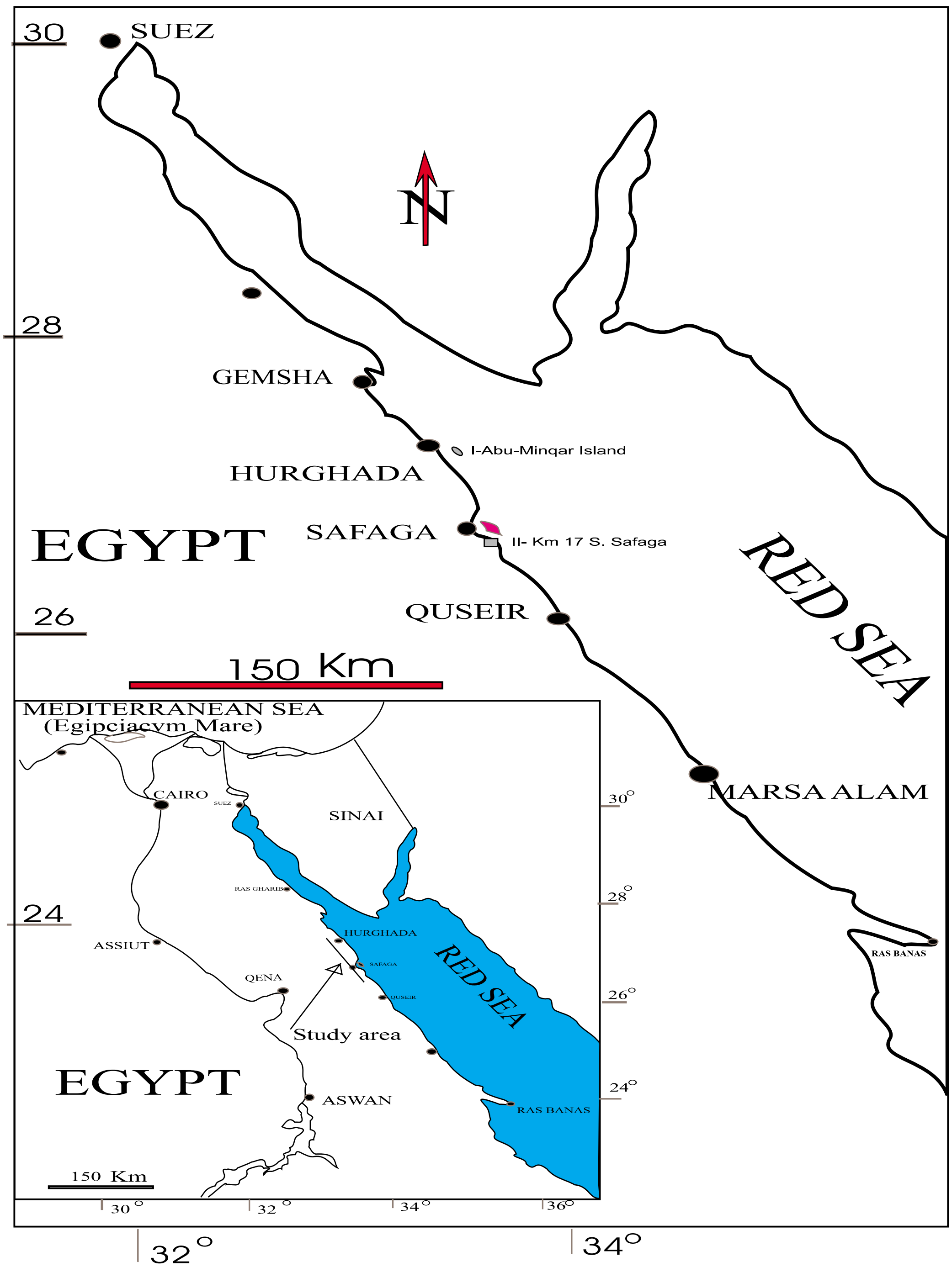

Fig. 1. Location map, Red Sea coast, Egypt.

one-liter capacity and transported to the laboratory. Phosphate content was determined according to Robinson and Thompson (1948). Sulphate content was estimated according to Harvey (1955). Nitrate content was determined by the phenol disulphonic acid method as stated by (Dickinson, 1950).

Results and Discussion

Some Hydrographic Parameters at the Mangroves Localities

The results of some physico-chemical characters of sampled water and at field the two studied localities are shown in Tables 1 and 2. Generally, it was apparent that no major differences could be detected in the chemistry of water the two localities. The life of marine algae will obviously vary with the environmental factors. The estimation of these physico-chemical conditions, as well as the biotic factors like mangroves vegetation controlling production in aquatic habitats of mangrove regions constitute the major goal of the present study.

With regards to salinity, it is well known that the marine algae growing in the littoral belt of mangrove regions have the ability to tolerate salinity variations. Salinity represents a dominant factor affecting both the local distribution and growth of algae (Burns and Mathieson, 1972). In addition, it has been found that salinity determine the rate of photosynthesis and respiration of *Gelidium stellata* (Mathieson and Burns, 1971).

The biomass of species decreased in the winter and gradually increased through the spring and early summer. Also, the standing crop of recorded of macroalgae at the two localities maintained its highest value during spring where temperature and light are more favorable for growth and reproduction of algae. This may be due to high temperature in spring and summer, which facilitate the uptake of nutrients. Negm (1988) reported that, at any concentration of the phosphate in the medium, the maximum photosynthetic rate was recorded at warmer temperatures.

Also, the results shown that, the phosphate content of water at the two localities tended to increase during autumn and winter, while it decrease during spring. In addition, the highest content of nitrate and sulphate content was recorded during autumn. This observation was accompanied by start of decaying of most algal thalli after completion their life cycles.

TABLE 1. Mean seasonal values of some physico-chemical characters of water at Transect I (South Hurghada).

Season	Air temp. ºC	Water temp. ºC	Salinity (‰)	pH	Dissolved O_2 (mg/l)	Phosphate (ppm)	Nitrate (ppm)	Sulphate (ppm)
Summer	35.2	29.5	42.2	8.5	4.9	0.1	0.1	0.3
Autumn	25.3	24.2	40.5	8.8	5.4	0.2	0.2	0.4
Winter	19.5	18.2	39.9	8.4	5.7	0.1	0.2	0.3
Spring	28.8	27.0	42.7	8.6	5.6	0.1	0.1	0.2

TABLE 2. Mean seasonal values of some physico-chemical characters of water at Transect II (South Safaga).

Season	Air temp. ºC	Water temp. ºC	Salinity (‰)	pH	Dissolved O_2 (mg/l)	Phosphate (ppm)	Nitrate (ppm)	Sulphate (ppm)
Summer	36.0	34.0	41.2	8.7	5.1	0.2	0.1	0.3
Autumn	24.1	23.5	40.5	8.8	5.6	0.3	0.1	0.4
Winter	19.0	19.2	39.5	8.5	5.8	0.2	0.2	0.3
Spring	26.5	25.0	40.0	8.6	5.6	0.2	0.1	0.2

The Floristic Study the Intertidal Marine Macroalgae Associated with Mangroves

Mangrove grow in sheltered saline waters and the shade provided by its foliage and the high humidity in dense growth cuts down the rate of desiccation and allows delicate algae to grow at higher level than on sunlit beach (Day and Morgans, 1965). The mangal is based on recycling of the mangrove tree products (Odium and Heald, 1975). The data showed that, 23 species were recorded in the two different localities throughout the period of study (Table 5). This number was nearly less than half the number of species (55 species) recorded in open sea shore at Hurghada (Negm, 1988). Thus, there is a limited diversity of marine species associated with mangroves as compared with the open sea shore. This is in agreement with the findings obtained by Por *et al.*, (1977). Moreover, they stated that species of algae associated with mangroves must be quite-water species, resistant to or requiring suspension-rich waters and silted bottoms; resistant to considerable fluctuations in salinity and temperature.

The distribution of standing crop in the two localities was represented in Table 3 and Fig. 2. It was clear that, the highest density was recorded at transect I (South Hurghada), with an annual average 967.47 g/m^2, while transect II (South Safaga) had annual average of 795.46 g/m^2. This difference in annual average may be due to the mangrove form. The mangrove at south Hurghada are more developed with tree heights reaching 7 m, while it was at individual localities frequency and less protected from the open sea at south Safaga. The abundance of algae could be resulted from the position of mangrove on the shore (King and Puttock, 1994).

TABLE 3. Total biomass of macroalgal population (g dry wt./m^2) in the two transects during the period of study

Season	Transect I (South Hurghada)	Transect II (South Safaga)
Summer	138.3	163.3
Autumn	193.0	108.7
Winter	89.0	47.9
Spring	547.2	475.6
Total	967.5	795.5

Seasonally, the standing crop of the algal communities varied greatly between 89 to 547.17 g/m^2 and 47.9 to 475.6 g/m^2 at transect I and II, respectively (Table 3 and Figure 2). Spring season had the highest density in the two transects where salinity and temperature had suitable levels. Winter was characterized by the lowest density of standing crop at the two transects, which had 89 g/m^2 and gm/m2 for transect I and transect II respectively. These results are in accordance the results obtained by (Dor, 1975; Schneider, 1975; Negm, 1988 and Coppejans and Gallin, 1989). The clear seasonal variations in the total algal biomass of the two mangroves region were due to the changes in hydrographic parameters (Salinity and temperature) during different season. Phillips *et al.*, (1994) reported that salinity, tidal inundation and wetting frequency do appear to be the dominant environmental factors affecting the distribution and horizontal zonation of macroalgae in mangrove regions.

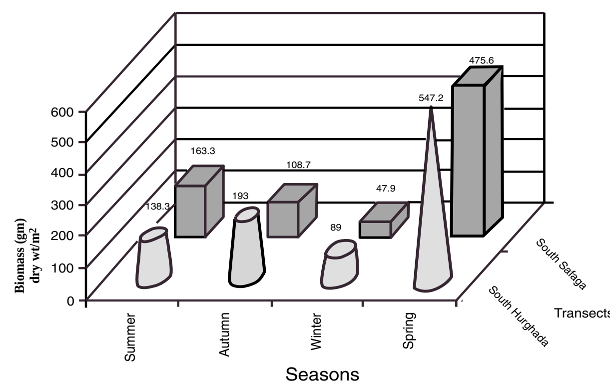

FIG. 2. Seasonal variation in the total biomass of algal populations in the two transects.

Table 5 showed clearly that the macroalgae associated with mangroves area comprises 23 species belong to 19 genera. Pheophyta represented by 9 species belong 7 genera. Phaeophyta contributed to 41.1% and 70.4% of the standing crop, with an annual average of 397.8 g/m^2 and 559.92 g/m^2 for transect I and II, respectively. The maximum density of Phaeophyta was recorded during spring (51%) in transect I, and during autumn (88%) in transect II (Table 4 and Fig. 3).

Light intensity seem to play an important role in the distribution of and habit (nature of growth) of different species of algae associated with mangroves. The algal species of the intertidal zone adjacent to mangroves and far from the shade provided by its trees affected by light intensity. High light intensity leads to photoinhibition and affect the metabolic activity and productivity of algae in the region far from the shade provided by mangrove trees. The results exhibited that, Phaeophyta were

TABLE 4. Seasonal variations in the biomass (g dry wt/m^2) and the present composition of the three main macroalgal in the studied transects.

Season	Transect I (South Hurghada)						Transect II (South Safaga)					
	Phaeophyta		Rhodophyta		Chlorophyta		Phaeophyta		Rhodophyta		Chlorophyta	
	Biomass	%	Biomass	%	Biomass	%	Biomass	%	Biomass	%	Biomass	%
Summer	36.8	27.0	55.0	40.0	46.5	33.0	78.6	48.3	83.4	51.0	1.2	0.7
Autumn	51.0	26.5	74.0	38.0	68.0	35.5	95.3	88.0	11.0	10.0	2.4	2.0
Winter	28.0	31.0	38.0	43.0	23.0	26.0	39.92	82.0	7.3	15.0	1.4	3.0
Spring	282.0	51.0	158.4	29.0	106.7	20.0	346.8	73.0	104.8	22.0	24.0	5.0

TABLE 5. A list of the recorded macroalgae, their seasonal biomass, total biomass and their relative densities at transects I and II during the period of summer 1997 and 1998.

Species	Transect I (South Hurghada)						Transect II (South Safaga)					
	Summer dry wt (g/m^2)	Autumn dry wt (g/m^2)	Winter dry wt (g/m^2)	Spring dry wt (g/m^2)	Total biomass	Relative density	Summer dry wt (g/m^2)	Autumn dry wt (g/m^2)	Winter dry wt (g/m^2)	Spring dry wt (g/m^2)	Total biomass	Relative density
1 – *Cystoseria myrica* (Gmel.) J. A.g	10.00	20.00	12.00	55.5	97.50	10.10	51.62	52.85	6.70	69.50	180.67	22.70
2 – *Cystoseria trinode* (Forsk.) J. A.g	14.00	16.00	10.00	40.00	80.00	8.30	+	6.40	3.90	39.10	49.40	6.20
3 – *Hormophysa triquetra* (L.) Kutz.	8.00	10.00	2.00	31.25	51.25	5.30	1.04	3.90	3.10	32.50	40.54	5.10
4 – *Hormophysa clathrus* Bory	+	–	+	17.27	17.27	1.80	–	–	+	44.40	44.40	5.60
5 – *Sargassum asperifolium* (Her. et Mert.) J. Ag.	–	–	–	64.00	64.00	6.60	1.95	10.00	1.60	45.20	67.75	8.50
6 – *Sargassum latifolium* (Tum.) Ag.	–	–	–	12.40	12.40	1.30	–	16.16	–	27.50	43.66	5.50
7 – *Sargassum denticulatum* (Forsk.) Boergs.	–	5.00	4.00	26.60	40.40	4.20	+	2.00	1.80	36.00	39.80	5.00
8 – *Padina pavonia* (L.) Lamour.	4.80	+	+	35.00	35.00	3.60	15.00	4.00	22.10	52.60	93.70	11.80
9 – *Turbinaria decurrens* Bory.	+	–	–	+	0.00	0.00	–	–	+	+	0.00	0.00
10 – *Digenea simplex* (Wulfen) C. Ag.	–	30.00	20.00	64.00	134.00	13.90	76.68	8.39	4.30	36.20	125.57	15.80
11 – *Laurancia obtusa* (Huds.) Lamour.	20.00	5.00	12.00	72.20	92.20	9.50	4.20	2.60	1.10	45.50	53.40	6.70
12 – *Laurancia papillosa* (Forsk.) Grev.	3.00	25.00	+	22.20	63.20	6.50	+	+	1.90	23.10	25.00	3.10
13 – *Hypnea valentia* (Tum.) Mont.	16.00	2.00	2.00	+	6.00	0.60	1.26	+	+	+	1.26	0.20
14 – *Jania rubens* (L.) Lamour.	2.00	+	+	+	0.00	0.00	1.30	+	+	+	1.30	0.20
15 – *Galaxaura obliongata* (Sol.) Lamour	+	12.00	4.00	–	30.00	3.10	–	–	–	+	0.00	0.00
16 – *Halimedia opuntia* (L.) Lamour.	14.00	60.00	20.00	84.00	204.00	21.10	–	–	–	11.70	11.70	1.50
17 – *Valonia ventricosa* J. Ag.	4.00	6.00	2.00	14.00	26.00	2.70	1.21	+	1.10	3.60	5.91	0.70
18 – *Enteromorpha intestinalis* (L.) Link.	+	–	+	+	0.00	0.00	–	–	+	–	0.00	0.00
19 – *Ulva lactuca* L.	–	–	+	+	0.00	0.00	–	2.40	0.30	4.90	7.60	1.00
20 – *Caulerpa serrulata* (Forsk.) Borg.	+	–	–	+	0.00	0.00	–	–	–	3.80	3.80	0.50
21 – *Caulerpa racemosa* (Forsk.) Ag.	–	2.00	–	+	2.00	0.20	+	–	–	+	0.00	0.00
22 – *Udotea Javensis* A. et. E.S. Gepp	2.50	+	1.00	8.75	12.25	1.30	–	+	–	–	0.00	0.00
23 – *Codium repens* (Cr.) Vickers.	–	–	+	+	0.00	0.00	–	–	–	+	0.00	0.00
Total biomass	138.30	193.00	89.00	547.17	967.47		163.26	108.70	47.90	475.60	795.46	
Total number of species	17.00	16.00	18.00	22.00			13.00	15.00	16.00	21.00		

(–) = absent (+) = present in neglected amount

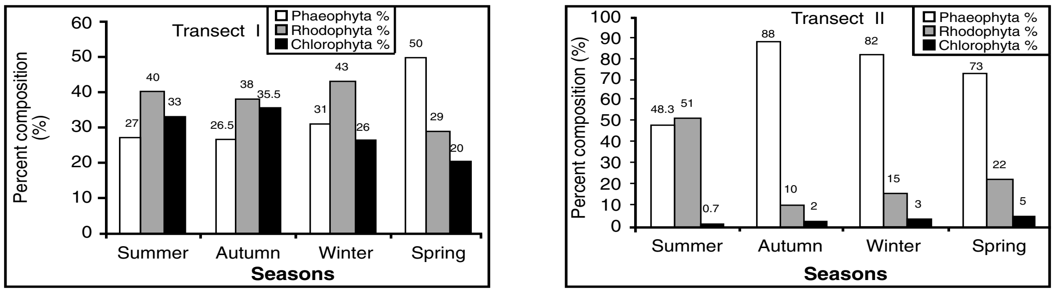

FIG. 3. Seasonal variations in the percent composition of the three main algal groups in transect I and II.

the dominant in the intertidal zone far from the mangrove trees. This may be due to high levels of carotenoids in brown algae, which protect the chlorophyll from photooxidation beside its function as antenna pigments. These results are in agreement with those obtained by Nasr (1955). Also, this may illustrate the high density of brown algae in south Safaga site, which was 70.4% compared with that of south Hurghada site, which was 41.1%. Since the mangroves at south Safaga were less developed and form small patches, so the light intensity in mangroves at south Safaga was higher than that at south Hurghada mangroves. So, various factors have been investigated in relation to the presence and absence and local abundance of mangrove algal species (Almodovar and Pagan, 1971; Beanland and Woelkerling, 1983; Davey and Woelkerling, 1985; Eston *et al*., 1992 and King and Puttock, 1994). The factors generally considered relate to desiccation, light availability or turbidity, salinity and the amount of shading.

The floristic composition of Phaeophyta is given in Table 5. *Cystoseira myrica* was the first brown alga in rank of occurrence where, it had 10.1% and 22.7% of the total biomass in transects I and II, respectively. This alga reached its maximum biomass during spring and autumn. *Cystoseira trinode* constituted 8.3% and 6.2% of the total catch. *Sargassum asperifolium* constituted 6.6% and 8.5% of total yield for transects I and II, respectively. *Hormophysa triquetra* constituted 5.3% at in transect I and 5.1% in transect II. This alga have two ecological forms in Red Sea, one with broad thallus characteristic of the sheltered shores like mangrove regions and the other with narrow thallus found in the exposed places. *Sargassum denticulatum* had 4.2% and 5% of the total biomass in the two transects. *Padina pavonia* was one of the important brown algae associated with mangroves and had 3.6% and 11.8% of total yield for transect I and II. *Sargassum latifolium* constituted 1.3% and 5.5% and *Hydroclathrus clathrus* constituted 1.8% and 5.6% of the total algal biomass in transects I an II, respectively.

The Chlorophytes in the studied areas include 8 species belong to 7 genera contributed to about 25.3% and 4% of the standing crop with annual average of 244.2 g/m^2 and 29 g/m^2 for transect I and II. The maximum density of Chlorophyta members was obtained during autumn in transect I (35.3%) and during spring in transect II (5%). Chlorophyta is the lowest group in contribution of the standing crop of the macrophytes associated with mangroves in the different sites of the two transects compared with the other groups, especially in case of transect II (Table 4 and Fig. 3).

Halimeda opuntia was the most important constituent of Chlorophyta at transect I contributed to 21.1% of the total algal biomass catched with annual average of 204 g/m^2. This species form large accumulations in many tropical places and is common at Abu-Minqar island in Red Sea (Nasr, 1947). The species *Valonia ventricosa, Udotea javensis* and *Caulerpa racemosa* were the remaining green algae which contributed to standing crop of algae, where they constituted 2.7%, 1.3% and 0.2% of the total algal biomass, respectively. Nasr (1947) stated that *Valonia ventricosa* found in nature under abnormal conditions, this has been found in very calm weather in summer, where the temperature rises and the water aeration is very poor. This plant occurs in sheltered places and generally under projecting rocks. The species *Halime-*

da opuntia, Valonia ventricosa, Ulva lactuuca and *Caulerpa serrulata* were the main members of Chlorophyta in transect II where they had 1.5%, 0.7%, 1% and 0.5% of the total algal yield (Table 5).

Rhodophyta members contributed to 33.6% and 26% of the total biomass, with annual average of 325.4 and 206.53 gm/m^2 for transects I and II, respectively. They were represented by 6 species belong to 5 genera distributed at the two transects, reaching maximum density during winter at transect I and during summer at transect II (Table 4 and Fig. 3). Our data was in conformity with the findings of Lambert *et al*., (1987) where they found that macroalgae are common on the aerial roots of mangroves within southern Africa estuarine and are dominated by members of the Rhodophyta.

Species composition of Rhodophyta showed significant seasonal variations in the two studied areas (Table 5). *Digenea simplex* was the most important constituent of Rhodophyta members and represented by 13.9% and 15.8% of the total biomass in transect I and II, respectively. This species forms a distinct association with *Jania rubnes.* This species forms a dense growth covers the bottom between mangrove trees and pneumatophores. *Laurencia obtusa* associated mangroves at transect I and II and contributed to 9.5% and 6.7% of total algal yield respectively. Likely, *Laurencia papilosa* species represented 6.5% and 3.1% of the total biomass at transect I and II. Specimens of this alga exposed to direct sunlight are colored yellow, while others in the shade are very deep purple. The species *Galaxaura oblongata* had 3.1% of the total algal biomass in transect I and contributed to 9.2% of red algal biomass. It was not represented either in the total algal biomass or red algal biomass in transect II due to its neglected recorded biomass. *Hypena valentia* consisted 0.6% and 0.2% of the total yield in for transects I and II, respectively (Table 5).

Generally, the majority of mangrove associated algae have a pantropical distribution (King and Puttock, 1994). Mangrove regions, although sheltered from weather extremes and wave action, experience variable salinities, a distinct tidal influence and changing sedimentary patterns with respect to suspended material and deposition. Such conditions are unfavorable for most marine algae (Lawson and John, 1982), but mangrove-associated algae have adapted to this environment.

The Habit and Distribution of Algae in Mangroves Regions

The intertidal zone of mangroves regions is characterized by scattered alga patches, which size and density depend on the nature of substrata and the ability of the species to tolerate the daily changes in temperatures, salinity and also the period of desiccation (Dryness) during low tide.

Macroalgae associated with mangroves are characterized by its high ability to tolerate seasonal changes in temperature, salinity, high organic matter and sedimentation caused by the wind from the beach. The majority of the algae which occur between mangrove trees and pneumatophores are belonging to Rhodophyta members like *Digenea simplex* and *Laurencia* sp. where, low light intensity sometimes we notice *Jania* sp. and *Cytoseira myrica* and *C. trinode* from brown algae. In some places these species grow and constitute a thin layer (about 5 cm) covered by sand or carbonate sediment to form what are known by algal turfs or algal lawns. As soon as, the water cover a few centimeters remains around the aerial roots even at low tide a carpet of the red alga *Digenea simplex* covers the bottom. This alga is mainly found along the edges of the *Avecennia marina* canopy.

On the shaded and protected areas there is abundant growth of *Halimeda opuntia*. In a few places where big *Avecennia* trees facing the open sea provide ample shading, there grows a particular assemblage of algae, *Valonia vertricosa, Hormophysa triquetra* and *Halmeda opuntia.* Whatever, rock bottom rises through the sediment of the mangrove lagoons and especially in the area of the coralligenous bar, a typical rocky flora becomes lesser amounts there appears also *Laurencia obtusa, Laurencia papilosa*, on slightly deeper bottoms *Cytoseira myrica*.

The Mangrove Lagoon

The lagoons are permanently filled with water. They are completely separated from the sea, even at low tides. The bottoms are about uniformly deep

– 0.80-1.50 m at high tide. The bottom is covered by a layer of mud (few millimeters in thick) followed by a deeper level of coarse organogenic sand intermixed with mud. The mud is chiefly mangrove-mud there is also a component of calcium carbonate. The grayish color of the sediment indicates deficient oxygenation; here we can see a growth of *Caulerpa* sp.

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الطحالب الكبيرة المصاحبة للمانجروف في منطقتي الغردقـة وسفاجا على الساحل المصري للبحر الأحمر

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المستخلص. أجرى هذا البحث لمعرفة الطحالب الكبيرة التي تنمو في منطقتين من مناطق المانجروف المطلة على البحر الأحمر في المنطقة المتاخمة لمدينتي الغردقة وسفاجا ودراسة توزيع المجموعات الطحلبية ، التركيب النوعي ، متوسط المحصول القائم موسميًا ومدى التأثير المحتمل للغطاء النباتي للمانجروف على توزيع وتركيب المحصول القائم للطحالب الكبيرة المرتبطة به . وقد أظهرت النتائج حصر ٢٣ نوعًا من الطحالب الكبيرة المصاحبة لنباتات المانجروف في منطقتي الدراسة (تسعة أنواع طحالب بنية ، ستة أنواع طحالب حمراء وثمانية أنواع طحالب خضراء) . كما أظهرت النتائج أن المتوسط الموسمي لقيم المحصول القائم في كل من منطقتي الدراسة بلغ أعلى قيمة له خلال فصل الربيع وأدنى قيمة له خلال فصل الشتاء . وسجلت أعلى قيمة للمحصول القائم في منطقة الغردقة . كما أظهرت النتائج أنه لاتوجد اختلافات بيئية جوهرية بين منطقتي الدراسة على مدار الفصول المختلفة باستثناء بعض التغيرات العشوائية في هذة الخصائص . يتضح من النتائج أن مناطق المانجروف توفر بيئة تسمح للطحالب الضعيفة للنمو بمعدلات عالية بالمقارنة بالمناطق الساحلية المفتوحة .