MINISTRY OF COMMERCE AND INDUSTRY, EGYPT

FOUAD I INSTITUTE OF HYDROBIOLOGY
AND FISHERIES

NOTES AND MEMOIRS No. 36

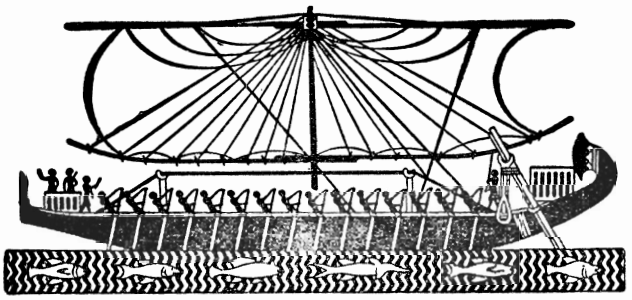
THE MARINE ALGÆ OF ALEXANDRIA

I.—A REPORT ON SOME MARINE ALGÆ COLLECTED FROM THE VICINITY OF ALEXANDRIA

BY

A. H. NASR, M.Sc.,

Assistant Director of the Marine Biological Station,
Ghardaqa, Egypt.



CAIRO
GOVERNMENT PRESS, BULÂQ
1940

MINISTRY OF COMMERCE AND INDUSTRY, EGYPT

The Marine Algæ of Alexandria

I.—A Report on Some Marine Algæ collected from the Vicinity of Alexandria

BY

A. H. NASR, M.Sc. (Cairo)

Introduction

The circumstances which prompted the writer to devote himself to a study of the Egyptian Marine Flora - apart from the opportunities and encouragement given him by the staff of Fouad I University — were the peculiarly interesting geographic position of Egypt with both extensive Mediterranean and Red Sea littorals.

The existing knowledge of the algal flora of these adjacent areas — the Eastern Mediterranean and the Red Sea Flora — is very limited and nothing short of extended visits to the adjacent European herbaria and contact there with the best known algologists could have enabled the writer to deal at all successfully with collections made from these areas. The collection of the Red Sea algæ was first made that of the Mediterranean later. In this latter enterprise the work was greatly helped by Dr. H. Faouzi, the Director of Fouad I Institute at Qayet Bey, Alexandria, who provided the writer with every facility for studying the algæ in this laboratory and also put his boats at the writer's disposal.

General Remarks

The Western Mediterranean shores have been lately thoroughly studied, especially those of the coast of France by Hamel (1931), of Banyuls by Feldmann (1937), of Italy by Funk (1927), of Algeria and Tunis by Feldmann (1934) : but the Eastern Mediterranean is little known. The need for solving the algal problems in the eastern part of this sea is now urgent.

It would be of great interest if collections could be made from the various localities on our Mediterranean coast. The study of collections from this area would be of interest in themselves, and would prepare the way for still more interesting comparative study of the Eastern Mediterranean Flora with its western counterparts. Incidently, the migration of certain species from the Mediterranean to the Red Sea forms a separate problem of study. This cannot be undertaken at our present state of knowledge and would require special excursions to the Suez Canal, particularly at the different seasons of the year.

The systematic work in this paper has been worked out mostly in the Thuret and Bornet Herbarium and partly in Montagne's Herbarium in the Paris National Natural History Museum, with the aid of Dr. G. Hamel and Dr. R. Lami whose generous help and keen interest in the work encouraged the writer to continue his researches on the Mediterranean.

It appears in the first instance that our Mediterranean Flora is different from our Red Sea Flora both in association and in the dominance or absence of certain species. In certain other respects one could find some resemblances, *e.g.* the Northern Red Sea Flora mostly derived from the Mediterranean Sea ; and this problem could be best discussed in detail in a separate forthcoming paper. The Suez Canal, in my view, plays an important role as a communication for algæ between the two seas. It was used for the migration of some species of northern origin not occurring in the Arabian Sea not at Cape Horn and these localities are the only two other possibilities for their transportation to the Red Sea.

The systematic list mentioned in this paper comprises 43 species, 11 of which are new records to our Egyptian Mediterranean shore. These species are : *Nemalion helminthoides, Bryopsis adriatica, Gracilaria dura, Gelidiella tenuissima, Erythrotrichia carnea, E. reflexa, Scytosiphon Lomentarius, Polysiphonia variegata, P. Gorgoniæ, Rhodochorton virgatulum*, and *Dictyopteris membranacea*. One record only is added to the general Mediterranean Flora, namely, *Polysiphonia Gorgoniæ*, which was recently discovered by the writer (Nasr 1939) in the Red Sea.

ALGAL FLORA

A.—Chlorophyceæ

Order 1.—*Ulvales*

Fam. 1.—*Ulvaceæ*

Gen. 1.—*Ulva* L.

Ulva fasciata Delile.

(Delile, Fl. d'Egypte, p. 153; Montagne, Flor. d'Algerie, p. 151; Ardissone, Phycologia Mediterranea, p. 195; Hamel, Chlorophycées des cotes françaises, 1931, p. 138, f. 41, 1.)

Wading along the shore in the neighbourhood of the Hydrobiological Institute at Qayet Bey, one cannot miss the presence of this fairly common alga. This species grows fixed to rocks by a disc giving rise to many proliferations which move gracefully with the waves as the tide rises.

The frond is about 10–40 cms. high and composed of two layers thick. The cells in both layers are arranged like palisade layer, *i.e.* perpendicular to the surface of the frond. As stated by Hamel (1931) the two layers at the margin of the frond separate easily and in this respect *Ulva fasciata* approaches *Enteromorpha linza*, from which the former differs only by the absence of the tubular base (Pl. I, Fig. 1).

This alga grows in sheltered places, but flourishes well in exposed places. A luxuriant growth of it was observed on the big rocky blocks of the breakwater bounding the windward side of the Eastern Harbour.

Locality.—Alexandria (Eastern Harbour).

Geogr. Distrib.—All warm seas.

(Herb. Nasr, No. 410.)

Gen. 2.—*Enteromorpha* Link.

1.—*Enteromorpha Linza* (L.) J. Ag.

(J. Agardh, Spec. Alg. p. 134, 1883; Hauck, Meeresalgen p. 427; Hamel, Chlorophycées des cotes françaises, 1931, p. 155, f. *e–g*; *Ulva Linza* Linné, Sp. 1633.)

The frond of this plant attains about 40 cms. height and possibly a little more, with a broadened thallus and attached to rocks by a small proliferating base. The thallus is composed of two layers of poligonal cells without regular order in surface view. These two

layers cohere except towards the perifery, a character by which this species is distinguished, forming in this respect a marginal canal at each edge.

This plant is very common at low water-mark in sheltered and in exposed localities. It can be recognized in the field by the undulating margin with air bubbles in the marginal canals.

Locality.—Alexandria (Eastern Harbour).

Geogr. Distrib.—Atlantic Ocean. Mediterranean Sea.

(Herb. NASR, No. 401.)

2. *E. compressa* (L.) Grev.

(Kuetzing, Tab. Phyc. VI, t. 38, I; Harvey, Phyc. Brit. pl. 335; Hamel, Chlorophycées des cotes françaises, 1931, p. 156; Feldmann, Marines Algues des cotes des Albères, Rev. Alg., t. IX, p. 52, 1937, Paris.)

The frond of this species is deep green in colour forming a hollow tube with cells irregularly arranged. The cells are about 8–10 μ large. The apical part of the thallus is obtuse and the basal part is attenuated.

This species is common in water polluted with organic material. It is found attached to rocks between the tide marks, forming a matted substratum which may cause any one collecting in its neighbourhood to slip.

Locality.—Alexandria (Qayet Bey).

Geogr. Distrib.—Cosmopolitan.

(Herb. NASR, No. 422.)

Order 2. *Siphonocladales*

Fam. 1. *Cladophoraceæ*

Gen. 1.—*Cladophora* Kuetz.

1. *Cladophora utriculosa* Kuetz.

(Kuetzing, phyc. gener. p. 269; Spec. Alg. p. 393; Tab. Phyc. III, t. 94; Hamel, Chlorophycées des cotes françaises, 1931, p. 25, f. 8; Feldmann, Algues des cotes des Albères, p. 63, 1937.)

This species grows on the shore of Alexandria forming small compact tufts epiphytic on *Corallina*, between the tide marks and hardly exceeds 6 cms. in height. In other localities in the Mediterranean it attains about 20 cms. In the Herbarium of Thuret, there is an excellent specimen of this species collected from Marseille which agrees well with our specimens.

The filaments are about 110–160 μ in diameter, not quite attaining the maximum diameter of specimens from the French coast recorded by Hamel (1931). The length of the cells in the filaments are about 3–5 times as long as broad. The cells in the ramules are about 70–90 μ, rarely 100 μ and about 2–4 times as long as broad.

This species is characterised by the rich ramification which is always unilateral. The ramules in our alga being pectinate, approach forma *lutescens* (Kuetz.) Hamel. This form was recorded by Ardissone in spring, while the Egyptian plant occurs in May.

Locality.—Alexandria (Qayet Bey).

Geogr. Distrib.—Atlantic Ocean, Mediterranean Sea.

(Herb. Nasr, No. 432.)

2. *Cl. ramosissima* (Drap.) Kuetz.

(Kuetzing, Spec. Alg. p. 396; Tab. Phyc. IV, t. 4, f. 11; Hamel, Chlorophycées des cotes françaises. p. 20, f. 7 c, 1931.)

This species forms on our shores tufts about 5–10 cms. long, growing in saucer-like pools on the rocky shore next to Qayet Bey Fort, where the strong waves of the sea just overflow these ditches. The alga is recognized by its main habit of the filaments which give rise to lateral opposite ramules generally many at the nodes. The specimens in herbarium should be dark green, characteristic to the group Rupestreæ, but the Egyptian specimens are not so dark green as others from the Western Mediterranean.

The filaments are about 110–180 μ in diameter and the segments are 2–4 times as long as broad, and rather longer than broad (often 4–6). The walls are lamellose especially at the basal region. The ramules are about 90–150 μ broad and $1\frac{1}{2}$ $3\frac{1}{2}$ times as long as broad, with somewhat swollen distal ends. The apical segments have rounded apices quite in accordance with Kuetzing figure quoted above.

Locality.—Alexandria (Qayet Bey).

Geogr. Distrib.—Atlantic Ocean, Mediterranean Sea, Adriatic Sea.

(Herb. Nasr, No. 458.)

3.—*Cl. pellucida* (Huds.) Kuetz.

(Kuetzing. Phyc. Germ. p. 208; Tab: Phyc. III, t. 83, 11; Hauck, Meeresalgen p. 451; Hamel. Quelques Cladophora des cotes françaises, 1931, p. 3, f. 1; Feldmann, 1937, p. 62.)

This alga was found growing near Qayet Bey under a projecting rock, which was resembling a cave in miniature, in quite similar habitat as found by Feldmann (1937) at Banyuls, where it was not directly visible to the collector.

The thallus is dark green and rigid with the basal segment bare and long, good characters by which the plant can be recognized even in the field. It attains about 5 cms., with verticillate branching at the top. It was firmly attached to rocks by basal rhizoids. The long basal segment is about 269–450 μ in diameter, and about 20 times as long as broad.

This species occurs rarely in the area investigated. It is stated by Hamel (1931) and Feldmann (1937) that this species occurs in the Mediterranean all the year round.

Locality.—Alexandria (Qayet Bey).

Geogr. Distrib.—Atlantic Ocean, Mediterranean Sea, Adriatic Sea.

(Herb. NASR, No. 431.)

Fam. 2.– *Valoniaceae.*

Gen. 1.—*Valonia* Ginn.

Valonia utricularis Ag.

(Agardh, C., Spec. Alg. p. 431 ; Hauck, Meeresalgen p. 469 ; Ardissone, Phyc. Medit. p. 163 ; Hamel, Chlorophycées des cotes françaises, p. 109.)

This alga forms a gregarious dark green utricles, about 10 mms. long and 2–5 mms. broad. The Egyptian specimens are robust, probably due to their presence in open localities. The thallus gives off utricles at the sides and near the apices. Though our specimens do not quite agree in measurements with the authentic species, yet they bear no resemblance to any other species.

The plant grows firmly attached to rocks in fissures and is not easily uprooted.

Locality.—Alexandria (Qayet Bey).

Geogr. Distrib.—Atlantic Ocean, Mediterranean Sea.

Order 3.—*Siphonales*

Fam. 1.—*Bryopsidaceæ.*

Gen. 1.—*Bryopsis* Lamour.

1.—*Bryopsis pennata* Lamour.

(Vickers, Phyc. Barb. 1908, pl. LII ; Weber-van Bosse, Algues du Siboga, p. 92 ; Taylor, Mar. Alg. of Florida, 1928, p. 93 ; Feldmann, Algues Marin. de la cote des Albères, 1937, Rev. Alg. p. 81, f. 24, 27 A.)

The frond of this alga bears pinnules arranged in a distichous manner. These pinnules are simple and have never been found

ramified in our plant nor in specimens collected by Feldmann (1937) at Banyuls.

The axis of the frond is simple, fixed to substratum by numerous rhizoids emerged at the base. In Crouan's Herbarium, I found a specimen of this species with a ramified axis, which is the exceptional case of the plant-habit.

The pinnules, in rare cases, may be unilaterally given and somewhat curved upwards. They are longer at the base than at the top of the frond in quite good agreement with Feldmann (1937).

Bryopsis pennata, from our shore, may in some way resemble *Br. plumosa* in the distichous habit of the pinnules, but the general triangular outlook of the ramified pinnules is a remarkable character for *Br. plumosa*.

Bryopsis pennata was known only from the Antilles, Florida and the Indian Ocean and was recently recorded from the Mediterranean by Feldmann (1937), who stated that " Il est donc nouveau pour la Mediterranée, où on le retrouvera sans doute dans d'autres localités".

This species grows in tufts attached to sponges fixed on iron bars below low water-mark in sheltered places in the Harbour.

Locality.— Alexandria (Eastern Harbour-Laboratory).

Geogr. Distrib. -Atlantic Ocean, Mediterranean Sea, Indian Ocean.

2.—*Br. adriatica* (J. Ag.) Menighini.

(Kuetzing, Tab. Phyc. t. VI. t. 79, 11 ; Feldmann, Alg. Mar. des Albères, 1937, p. 82, f. 25 B ; Hamel, Chlorophycées des cotes françaises, 1931, p. 69.)

This alga forms pyramidal tufts about 3–5 cms. high. The axis of the frond is ramified from the base to the apices, sometimes at the apices only. The pinnules are carried either in all directions or in two longitudinal rows at each side of the axis, as shown by Feldmann (1937). Hamel (1931) says that the pinnules in *Br. adriatica* are carried on the axis of the frond in all directions.

With regard to the regular arrangement of the pinnules, *Bryopsis adriatica* reminds us of *Br. plumosa*, but in the latter the pinnules are typically distichous. As a matter of fact there is no sharp specific distinction between the two species and this might be the reason why Hauck (1885) put his plant as a variety of *Br. plumosa*.

I quite agree with Hamel (1931) that the genus Bryopsis is extremely polymorphic and there is no clearly distinctive character for the species. Feldmann (1937) made an attempt to distinguish the different species of *Bryopsis* by the shape and dimensions of the chloroplasts.

Not even this feature is reliable, since these chloroplasts are variable in one and the same species. From Feldmann's figures (p. 80), *Br. pennata* has chloroplasts similar to those of *Br. monoica*, also the chloroplasts in *Br. cupressoides* resemble those of *Br. mucosa*.

Locality.—Alexandria.

Geogr. Distrib.—Mediterranean Sea, Adriatic Sea.

Fam. 2.—*Codiaceæ*

Gen. 1.—*Halimeda* Lamour.

Halimeda Tuna (Ellis et Sol.) Lamour.

(Lamouroux, 1812, p. 186; Hauck, Meeresalgen, p. 482; Ardissone, Phyc. Medit. p. 174; Barton, 1901, p. 11, pl. 1, f. 1–6; Funk, 1927, t. V.; Hamel, 1931, p. 81; Feldmann, 1937, p. 99; Nasr, 1936, p. 66.)

The thallus of this species is composed of articulated segments which are thickly calcified. The plants obtained from our Mediterranean coast are more robust than those from the Red Sea.

This alga occurs in deep water where it can be gathered by dredging.

Locality.—Alexandria (Infra-littoral Belt).

Geogr. Distrib.—All warm seas.

(Herb. Nasr, No. 442.)

Gen. 2.—*Codium* Stackh.

1.—*Codium elongatum* Ag.

(Agardh. Sp. Alg. p. 454; Boergesen, Mar. Alg. Canary Isles, 1925, p. 94, f. 39; Hamel, Chlorophycées des cotes françaises, 1930, p. 89, f. 28.)

The frond of this alga attains a great height, generally up to one metre, with dichotomous branching, where it is much flattened, about 2–4 cms. wide, thus forming a wide angle at the dichotomy (Pl. I, Fig. 2). These two features are good evidence for recognizing the plant on our shores.

The dimensions of the utricles are of specific importance. They are about 200–400 μ in diameter, rarely 500 μ and about 900–1.000 μ long.

Specimens with gametangia were gathered in May, while those from Algeria were observed in March. Gametangia are about 110–150 μ in diameter, rarely 170 μ and about 290–340 μ long. Hairs projecting

from the utricles were not observed, but few hair-scars, in contrast to the abundant hairs in the material gathered from the Canary Islands by Boergesen (1925.)

This alga is rather common in lagoons on our Mediterranean shore and is generally met with among the *Caulerpa*-association, which occurs below the tidal level.

Locality. Alexandria (Eastern Harbour, Sidi-Gaber).

Geogr. Distrib. West Indies, Canary Islands, Mediterranean Sea.

(Herb. NASR. No. 402.)

2. —*C. dichotomum* (Huds.) Setchell.

(Setchell, some early confusions, 1931, p. 357; Feldmann, Algues des Albères, p. 100, 1937; Nasr, Algæ, Publication of the Marine Biol. St. No 1, 1939.

C. tomentosum, Boergesen, 1925, Canary Isles, p. 93; Hamel, Chloroph. franç., 1931, p. 88; Hauck, Meeresalgen, p. 479; Ardissone, Phyc. Medit. p. 170.)

On the coast of Alexandria very rare specimens of *Codium*, *dichotomum*, formerly known as *C. tomentosum* can be seen. The plant is much smaller and slender than *C. elongatum*. The flattened thallus at the dichotomy is absent in *C. dichotomum*.

The utricles are about 110–170 μ broad, rarely 220 μ and 390–500 μ long, *i.e.* much smaller in dimensions as compared with *C. elongatum*. The gametangia were observed in May, but at Banyuls they were observed in August till September. These gametangia are about 65–90 μ broad and 135–155 μ long.

This alga occurs in deep water at about 7–10 fms.

Locality.—Alexandria.

Geogr. Distrib.—Warm and Temperate Seas.

(Herb. NASR, No. 457.)

Fam. 3.—*Caulerpaceæ*

Gen. 1.—*Caulerpa* Lamour.

Caulerpa prolifera (Forssk.) Lamour.

(Lamouroux, 1809, p. 30; J. Agardh, Sp. Alg. p. 11; Ardissone, Phyc. Medit. p. 166; Weber-van Bosse, p. 278; Hamel, 1930, p. 94.)

On our Mediterranean shore one cannot fail to find the very common *C. prolifera* in exposed as well as in sheltered localities and even harbours, extending from the lower littoral belt down to the middle

of the infra-littoral belt. The form growing in shallow water is robust and tufted, while plants growing in deep water have long, broad fronds with many proliferations (Pl. I, Fig. 3).

It grows on muddy sand places, forming dense beds of a distinct association profitable for many epiphytes. It was also recognized on the hard rocky substratum of the breakwater in the Eastern Harbour. In comparison with the region of Banyuls this association or even *Caulerpa prolifera* itself is absent, a remarkable case which does not escape the observer along the French coast. It was exceedingly rare at Villefranche.

Locality.—Alexandria (Western and Eastern Harbours, Camp-César, Abu-Qir Bay).

Geogr. Distrib.—Mediterranean Sea, West Indies, Florida, Bermuda, Canary Islands, Cadiz.

(Herb. NASR, No. 403.)

B.—PHAEOPHYCEÆ

Order 1.—*Chordariales*

Fam. 1.—*Chordariaceæ*

Gen. 1.—*Stilophora* J. Ag.

Stilophora rhizodes (Ehrbg.) J. Ag.

(J. Agardh, Spec. Alg. p. 85 ; Thuret, 1850, p. 29 ; Hauck, Meeresalgen, p. 385, f. 166 ; Newton, Handbook of British seaweeds, 1931, p. 162, f. 102 ; Kylin, Uber die Entwicklungsgeschichte der Phaeophyceen, 1933, p. 66 ; Hamel, Phaeophycées de France, 1930, p. 184.)

Of the genus *Stilophora* two species, namely, *S. rhizodes* and *S. tuberculosa*, are known from the Mediterranean. The former can be easily distinguished by having one kind of assimilating filaments and separate sori. The latter is characterised by possessing two kinds of assimilating filaments and confluent sori.

The thallus of our alga is about 12 cms. high and about 1 mm. in diameter at the base, tapering off smoothly towards the apices. The frond is solid and not gelatinous, with subdichotomous branching (Pl. 11, Fig. 4).

Towards the apices of the thallus, there are many assimilating filaments which are composed of 7–10 cells, 3–5 of which are terminal subspherical cells. The frond bears numerous more or less hemispherical sori, giving the plant a characteristic appearance.

The unilocular sporangia are sessile, pear-shaped to oval and about 24–28 μ broad, and 48–60 μ long, in quite accordance with the French specimens (Hamel, 1938). The unilocular sporangia were only observed in our specimens.

The plurilocular sporangia, according to Hamel (1938), are filiform and composed of one series of cells, 8–10 chambers, of about 5–8 μ in diameter.

The unilocular sporangia and the plurilocular sporangia have been recorded by Hamel (1938) either on the same thallus or on different individuals. According to Thuret (1850), the unilocular sporangia were recorded from deep water, while plurilocular sporangia were observed from shallow water specimens.

The Egyptian specimens were dredged at 8 fms. and were found epiphytic on *Cystoseira*.

Locality.—Abu-Qir Bay.

Geogr. Distrib.—Atlantic Ocean, Mediterranean Sea, Adriatic Sea.

(Herb. NASR, No. 440.)

Fam. 2.—*Scytosiphonaceæ*

Gen. 1.—*Scytosiphon* Ag.

The genus *Scytosiphon* belongs to *Scytosiphonaceæ*, a family characterised by the following peculiarities :—

(1) Filamentous, plurilocular sporangia found in sori covering a considerable area.

(2) Absence of unilocular sporangia.

(3) The presence of pseudohairs.

(4) The presence of a single chromatophore.

This family is represented on our Mediterranean coast by three genera which may be distinguished as follows :—

A.—Thallus tubular, cylindrical, sometimes with constrictions ... ... *Scytosiphon*

B.—Thallus vesicular, more or less spherical ... *Colpomenia*

C.—Thallus reticulate ... ... *Hydroclathrus*

Scytosiphon Lomentarius (Lyngb.) End.

(Endlicher, Gener. Plant., 1843, p. 25; J. Agardh, Sp. p. 126; Thuret et Bornet, 1878, p. 11; Hauck, Meeresalgen, p. 390, f. 169; Ardissone, Phyc. Medit. p. 117; Newton, Handbook of British sea-weeds, p. 178; Kylin, 1933, p. 47, f. 18; Hamel, Phaeophycées de France, 1939, p. 194, f. 43, 1.)

The thallus of this alga forms tufts about 5 cms. high, with simple tubular fronds about 2–3 mms. broad, and attenuating at both extremities. In some cases there are constrictions, but these are rare when compared with the European specimens (Pl. II, Fig. 5).

A transverse section of the frond will show the large inner cells coated with small peripheral cells containing the chromatophores. The plurilocular sporangia are composed of one series of cells forming short filaments and are irregularly placed on the whole surface of the thallus except at the base. Tufts of hairs are present. These hairs are about 8μ in diameter. According to Hamel (1938) the hairs in the European specimens are broader than our specimens, being 10–12μ in diameter.

The unilocular sporangia are not yet known. This species grows commonly in sheltered and in exposed sites between the tide marks.

Locality.- Alexandria (Sidi-Gaber), Abu-Qir.

Geogr. Distrib.- Atlantic, Mediterranean Sea, Adriatic Sea, Japan, Antarctic Ocean.

(Herb. Nasr, No. 443.)

Gen. 2.- *Colpomenia* Derb. et Sol.

Colpomenia sinuosa (Mertens) Derb. et Sol.

(Sauvageau, sur le C. sinuosa, 1927, p. 309; Funk, 1927, p. 352, Feldmann, Algues marines de la cote des Albères, 1937, p. 152.)

This species occurs on rocky places extending from the lower littoral belt to the middle infra-littoral. As compared with the Red Sea, our Mediterranean alga is not so common nor so luxuriant in growth where it occurs on the reef-flats of the Red Sea at Ghardaqa.

Locality.- Alexandria (Qayet Bey), Abu-Qir Bay.

Geogr. Distrib. Atlantic Ocean, Mediterranean Sea, Indian Ocean, Pacific Ocean.

Gen. 3. *Hydroclathrus* Bory

Hydroclathrus clathratus (Bory) Howe.

(Howe, M.A., in Britton and Millspauch, the Bahama Flora, New York, 1920, p. 590; Nasr, Algæ, Publications of the Marine Biological Station, Ghardaqa, No. 1, 1939;

H. cancellatus Savigny Egypt. tab. 1, fig. 2 ; Decaisne, Pl. Arab. p. 138 ;

Asperococcus clathratus (Bory) J. Ag. Sp. Alg. 1, p. 75 ; Ruprecht, Veg. Roth. Meer. p. 11 ; Fig. et De Not. Alg. mar. ross. p. 33 ; Zanardini, Plantarum. 1, R. Inst. Venetiis. Vol. VII, part II, 1858.)

The specimens belonging to this species are identical with the type. This alga was dredged from 8 fathoms at Abu-Qir Bay.

Locality.—Abu-Qir Bay.

Geogr. Distrib.—Most tropical seas.

(Herb. Nasr, No. 452.)

Order 3.—*Sphacelariales*

Fam. 1.—*Sphacelariaceæ*

Gen. 1.—*Halopteris* Sauv.

Reink divides the *Sphacelariales* into two groups according to the origin of the ramules. The *Acroblasteæ* Rke. (representing *Halopteris* and *Stypocaulon*, etc.) are the *Sphacelariaceæ* which would give rise to ramules produced directly from the apical cell. The *Hypacroblasteæ* Rke. (*representing Sphacella*, *Sphacelaria*, etc.) are the *Sphacelariaceæ* giving rise to ramules from a secondary cell, admitting a monopodial branching in both cases.

Sauvageau (1914) distinguished two groups on the French coasts, the *Holoblasteæ* and the *Hemiblasteæ*. The *Holoblasteæ* are characterised by having an apical lenticular lateral cell, which soon divides near the apices, forming a small terminal cell and big superior ones. The latter are elongated and form an apical ramule ; the small cell represents a terminal apical cell giving rise to ramule, axilary hair, or sporangia. The *Hemiblasteæ* are distinguished by having a normal ramule arising always from a young secondary cell, inserted between two walls on the axis—a primary superior wall and a secondary inferior wall. It is easy, then, to distinguish both groups microscopically. The ramules in the *Hemiblasteæ* are always inserted between two walls on the axis of the thallus, while in the *Holoblasteæ* they are opposite a wall. The ramification is monopodial in the *Hemiblasteæ* and sympodial in the *Holoblasteæ*.

The two genera *Halopteris* and *Stypocaulon* were created by Kuetzing (1843). Halopteris was distinguished by him as " stratum corticale continum ". According to Sauvageau (1914), this character is of no generic value and suggested the name *Halopteris* as it is prior to *Stypocaulon*, following in this respect the rules of nomenclature.

Halopteris scoparia (L.) Sauv.

(Sauvageau, Remarques, p. 349, 1914 ; Hamel, 1939, p. 263.

Stypocaulon scoparium Kuetzing, Phyc. Gener. p. 293 ; Newton, 1931, p. 197 ; *Sphacelaria scoparia* Lyngb., Hauck, Meeresalgen, p. 347.)

Halopteris scoparia is easily distinguished at first sight from *H. filicina*. The former forms compact lobed tufts of a deep brown colour, turning almostly to black in herbarium specimens (Pl. II, Fig. 6). The inferior thallus is absent and replaced by rhizoids arising at first instance from pericysts, forming a spongy mass of tissue at the base of the alga. The axis carries alternate and distichous pennæ which would often give rise to simple pointed pennules.

Our plant which was collected in summer, was sterile ; but, unilocular sporangia were recorded in other parts of the Mediterranean by Suavageau (1914), Funk (1927) and Feldmann (1937) in spring, autumn and winter.

The sexual organs are very rarely to be met with, but they were recognized from different plants by Sauvageau. He found the oogonia and antheridia in groups (3–5) in the axil of the pennæ. According to Sauvageau (1914) also, the unilocular sporangia are globular to ellipsoidal, 60–80 μ in diameter. The antheridia are 100–110 X 90–100 μ.

Locality.—Abu-Qir Bay.

Geogr. Distrib.—Mediterranean Sea, Atlantic, West Indies, New Guinea.

(Herb. Nasr, No. 441.)

Order 4.—*Dictyotales*

Fam. 1.—*Dictyotaceæ*

Gen. 1.—*Padina Adanson.*

Padina Pavonia (L.) Gaill.

(Greville, Alg. Brit. p. 62, t. 10 ; Ardissone, Phyc. Medit. p. 486 ; Hauck, Meeresalgen, p. 309, f. 129 ; Feldmann, Alg. Mar. côtes des Albères, 1937 ; Nasr, Algæ, 1939.)

This alga is very common only at Abu-Qir Bay together with many other members of the Fucales. Plants bearing tetrasporangia were gathered in May. These tetrasporangia are found in sori protected by a cuticularised indusium. The sori are arranged regularly with the region of hairs in the manner indicated by Hauck.

It occurs at the lower littoral and extends down to the infra-littoral belt.

Locality.—Abu-Qir Bay.

Geogr. Distrib.—Mediterranean Sea, Adriatic Sea. Atlantic Ocean, Red Sea, Indian Ocean, Pacific Ocean.

(Harb. NASR, No. 445.)

Gen. 2.—*Dictyopteris* Lamour.

Dictyopteris membranacea (Stackh.) Batters.

(Newton, Handbook of the British Sea-weeds, 1913, p. 216, f. 137 ; Feldmann, Alg. Mar. Cote des Albères, 1937, p. 179 ;

D. polypodioides (Desf.) Lamour., Hauck, Meeresalgen, p. 311 ; Boergesen, Marine Algæ from the Canary Islands, 1925, p. 95 ; Nasr, Marine Algæ from the Red Sea, Thesis, 1936.)

This unmistakable alga occurs in deep water attached to rocks by a small basal disc. The frond reaches about 15 cms. in height, traversed by a distinct midrib (Pl. III, Fig. 7). The plants collected at the end of May had discharged their tetrasporangia, which occur singly or lie in small groups on both surfaces of the frond.

The Egyptian plant agrees well with the European specimens. Plants gathered from Alberes by Feldmann (1937) were fertile in July–August, while according to Funk (1927), they were fertile in April–May in the Gulf of Naples. In the latter case they are identical with the Egyptian specimens.

Locality.—Abu-Qir Bay.

Geogr. Distrib.—Mediterranean Sea, Atlantic Ocean, Red Sea, South Coast of Africa, Japan, Tasmania, etc.

(Herb. NASR, No. 439.)

Order 5.—*Fucales*

Fam. 1.—*Sargassaceæ*

Gen. 1.—*Sargassum* Ag.

Sargassum linifolium (Turn.) J. Ag.

(J. Agardh, Sp. Sargass. Austr., 1889, p. 113 ; Kuetzing, Tab. Phyc. XI, pl. 24.)

This alga was gathered in two distinct sites, where it was very common below low water-mark. The first place was at Sidi-Gaber, an exposed position, where it was washed by the waves at neap tides and left in contact with air for a few seconds. The second place was at

Abu-Qir Bay, just at the base of the Fort, a locality well known for the common appearance of the *Phaeophyceæ*. In this locality the *Sargassum* association was more or less sheltered and occurred in the infra-littoral belt.

Sargassum linifolium was gathered in fruiting condition in May.

Locality. Alexandria (Sidi-Gaber), Abu-Qir Bay.

Geogr. Distrib. Mediterranean Sea.

(Herb. Nasr. No. 416.)

C.—Rhodophyceæ

Order 1.—*Bangiales*

Fam. 1.—*Bangiaceæ*

Gen. 1.—*Erythrotrichia* Aresch.

The genus *Erythrotrichia* is represented by simple or ramified filaments. All the species are monosiphonous at the base and enlarge by intercalary growth, but certain species have a kind of transverse division. The *Erythrotrichiæ* are all epiphytes and can be distinguished from *Bangia* by the formation of spores, the vegetative habits, the absence of rhizoids and the inferior cell of the thallus. *Erythrotrichia* is morphologically distinguished from *Porphyra*. The thallus in the former is filiform, while in the latter it is flat.

The sporangia, according to Rosenvinge (1931), are cut off from the vegetative cells in the polysiphonous part of the frond by longitudinal and somewhat oblique walls. They are smaller than the vegetative cell and are about 14–16 μ in diameter. The chromatophores in the sporangia are not so distinctly stellate as in the vegetative cells, but the pyrenoids are clearly distinguished.

The sexual reproduction was studied by Berthold (1882). According to this author, the spermatia are formed in the same way as the sporangia. A small cell is detached from a vegetative cell in the manner already described. This will form the spermatia. Each mother-cell is capable of producing more than one daughter cell successively. The spermatia are small, spherical, naked cells with a central nucleus.

The oogonia are not distinguishable from the ordinary vegetative cells; until the fixation of the spermatia, when they are easily recognized.

According to Hamel (1924) who adopted Berthold (1882) scheme in the classification of *Erythrotrichia*, our plant is placed in the group that possesses no disc in its primary thallus.

1.—*Erythrotrichia reflexa* (Cr.) Thur. in Herb.

(Hauck, Meeresalgen, p. 22; Hamel. Floridées de France, Rev. Algol. 1925, p. 288 ; Rosenvinge, Mar : Alg. Denmark, p. 615, 1931, f. 611–613 ;

Bangia reflexa Cr. Algues Marines du Finistère, III, 1852 ;

Porphyra reflexa Cr. Florule du Finistère, p. 132, pl. 10, f. 73, 1867.)

The Egyptian plants were epiphytic on young *Sargassum* leaves, growing on the rocks of the breakwater in exposed locality below water-mark. The young plants are cylindrical, monosiphonous filaments, attached to substratum by rhizoids emerging from the basal cell. I have noticed only two rhizoids. The Danish specimens, according to Rosenvinge (1931), possess several rhizoids forming a closely united branched cell filaments. The rhizoids in the Egyptian specimens are paler in colour when compared with the vegetative cells, in contrast to the deep purple colour of the Danish plants. In this respect the Egyptian specimens approach the authentic species described by Crouan as colourless.

The frond has the lower part consisting of a single row of cells extending for a considerable distance. The diameter of this region is 12--40 μ, agreeing with Rosenvinge (1931). The middle region is polysiphonous and flattened measuring about 32-80 μ. The apical region is attenuated and of the same thickness and structure as the base. Rosenvinge (1931) says that all the observed specimens on the Danish coast were unbranched and only once that he met with a branched thallus. It is also the same case with the Egyptian specimens.

According to Hauck (1885), however, the plant is simple or twicely branched.

Locality.—Alexandria (Eastern Harbour on the breakwater).

Geogr. Distrib.—Mediterranean Sea, Atlantic Ocean, Baltic Sea.

(Herb. Nasr, No. 424.)

2.—*E. carnea* (Dillw.) J. Ag.

(J. Agardh, Till. Alg. Syst. p. 15 ; Boeregesen, Mar. Alg. Canary Islands, 1925, p. 5, f. 1 ; Rosenvinge, Mar. Alg. from Denmark, 1909, p. 67, f. 8 ; Hamel, Floridées de France, p. 8 ; Nasr, Algæ, 1939.)

This species was found epiphytic on *Sphacelaria* interningled among *Asterocytis ornata* and on *Dictyopteris membrancea*. It is fixed to these plants by a basal expanded cell. The filament of this alga is always simple monosiphonous, about 12 μ, in diameter. Plants

living in the Adriatic and in the Baltic Seas, according to the measurement of Hauck's (1885) and Rosenvinge's (1909) respectively are of greater diameter than ours.

This alga was dredged from 8 fms. at Abu-Qir Bay.

Locality.—Abu-Qir Bay.

Geogr. Distrib. Atlantic Coast of Europe and North America, Mediterranean Sea, West Indies, Indian Ocean, Red Sea, Canary Islands.

Order 2.—*Nemalionales*

Fam. 1.—*Rhodochortonaceæ*

Gen. 1.—*Rhodochorton* Naeg.

Rhodochorton virgatulum (Harvey) Drew.

(Kathleen Drew. A Revision of the genera, Chantransia, Rhodochorton, and Acrochaetium, Univ. Calif. Public., 1928;

Acrochaetium virgatulum f. *secundatum* in Hamel Rev, Algol. Vol. IX, p. 140, f. 36;

Chantransia virgatula f. *secundata* (Lyngb.) Rosenvinge, 1909, p. 112, f. 40.)

This alga forms dense minute tufts about 1–2 mms. high, living epiphytic on the leaves of *Zostera*. The plant is fixed to the host by parenchymatous disc, which may give rise to short creeping filaments at an early period, in exact accordance with Rosenvinge (1909). From this disc erect filaments are given off, varying in number according to the size of the disc. The filaments are irregularly and unilaterally much branched, but a considerable distance from the base, recalling the corymb type with terminal hair.

The filaments are about 7–12 μ broad with cells 1–3 times as long as broad. The cells contain a single parietal chromatophore with an axile single pyrenoid.

The monosporangia are 16–20 μ long and 8–12 μ broad. The sporangia are sessile on the filaments, lateral or terminal and seated often in a unilateral manner, sometimes opposite.

The tetrasporangia were observed in the French as well as in the Danish specimens, but they were not recorded in the Egyptian plants.

As regards the habit and shape of the sporangia, this species may be related to *R. Sancti Thomas* (Boergs.) and to *R. leptonema* (Rosenvinge). The sporangia in *R. virgatulum* are much bigger and the filaments are much branched. In *R. leptonema* the filaments are only 4 μ in diameter.

Our specimens agree well with the plants described by the authors quoted above. This species occurs in exposed places.

Locality.—Alexandria (Camp-César).

Geogr. Distrib.—Mediterranean Sea, Baltic Sea, Atlantic Ocean.

Fam. 2.—*Nemalionaceæ*

Gen. 1.—*Nemalion Tozz.*

Nemalion helminthoides (Valley) Batters.

(Batters, Catalogue of the British Marine Algæ, Jour. Bot., 1902 p. 59 ; Cotton, Clare Island Survey, Proc. R I. Acad. Vol. 31 p. 133, 1912; Hamel, Floridées de France, Rev. Algol. Vol. IX part VI, p. 5 ;

Nemalion lubricum Duby, Ardissone, Phyc. Medit. p. 267 Hauck, Meeresalgen, p. 59 ; Preda, Flora Italica, p. 378 f. CXIX, 1909.)

The form growing on our Egyptian shore is either branching at the base, recalling in this respect the typical form of this species or giving off branches upwards (Pl. III. Fig. 8). In such a latter case it resembles *N. multifidum* (Weber et Mohe) J. Ag., which does not occur in the Mediterranean.

The typical form of *N. helminthoides* is not generally ramified, but some ramified specimens were collected, which agree well with Genova specimens, kept in Thuret Herbarium. This alga was found in exposed places on rocks placed on the upper littoral belt. It is, thus, left exposed to air for a considerable period and turns into a black thallus owing to this long exposure. It is firmly coherent to rocks, forming parallel filaments, distinguished at a distance. It occurs on our shores in spring and summer.

Locality.—Alexandria (Eastern Harbour), Sidi-Gaber, Stanley Bay.

Geogr. Distrib.—Atlantic Ocean, Mediterranean Sea, Adriatic Sea (Herb. Nasr, No. 423.)

Order 3. *Gelidiales*

Fam. 1. *Gelidiaceæ*

Gen. 1. *Pterocladia* J. Ag.

The genus *Pterocladia* is close to *Gelidium*, but it was due to Hamel that certain characteristic features common to both genera make them quite distinguishable. The cystocarps in *Pterocladia* are

unilocular in which carpospores are formed in chains. The apical ends of the cystocarps are considerably raised up from the surface of the thallus. The intercellular fibres are placed in the centre.

Pterocladia capillacea (Gmel.) Bornet et Thuret.

(Thuret, 1876, p. 57; Hamel et Feldmann, Floridées de France, VII, Rev. Algol. Vol. IX, p. 254, f. 30; Newton, Handbook of the British Sea-weeds, p. 265;

Gelidium corneum, var. *pinnatum* Grev. Alg. Brit. p. 142; Ardissone, Phyc. Medit. p. 285;

G. capillaceum Hauck. Meeresalgen, p. 190.)

This species forms large dense tufts about 5–20 cms. high, attached firmly to rocks at the lower limit of the littoral belt and quite distinct by its deep dull red colour (Pl. IV, Fig. 9). Luxuriant growth of this common alga is to be met with in open shores which are constantly washed by the strong waves of the high tides, forming an unmistakable association.

In transverse section the alga collected from Alexandria agrees well with those from Banyuls, in having the intercellular fibres placed in the medullary tissue. As regards this generic character the writer does not agree with Hamel in emphasizing it as a good character for the genus *Pterocladia*. I have a specimen of *Gelidium pusillum* from the Red Sea with the intercellular fibres localised in the centre of the medullary tissue.

This alga is generally covered by incrustations of *Epilithon membranaceum*.

Locality.—Alexandria (Eastern Harbour, northern part).

Geogr. Distrib.—English Channel, Mediterranean Sea, Adriatic Sea.

(Herb. Nasr. No. 405.)

Gen. 2.—*Gelidiella* Feldm. et Hamel

Gelidiella tenuissima (Thur.) Feldm. et Hamel.

(Feldmann et Hamel, Floridées de France, Rev. Algol. VII, p. 226, f. 11–12; *G. pannosa* (Born.) Feldm. et Hamel, Rev. Génér. Bot., t. 46, p. 7, 1934.)

This alga forms small tufts about 2–3 mms. high. The filaments are 80–120 μ in diameter and are cylindrical, generally simple, rarely ramified, with horizontal filaments which are attached to substratum. The plant is characterised by one apical growing cell, the absence of

fibres in the cortical cells and by the regular longitudinal series of the cortical cells.

According to Feldmann and Hamel, the sexual organs are not known. The plants collected from our shores in May were all sterile ; but plants from Biarritz and gathered in summer, carried tetrasporangia. These tetrasporangia are spherical to oval, 12–16 μ in diameter and tetrahedrally divided. They are grouped in certain terminal or more or less lateral stichidia, spatula-shaped, with rounded or mucronate apices.

G. pannosa approaches *G. Bornetii*, but the latter is distinguished by its larger thallus 12·5 mms. high, 150–300 μ broad.

The plant was dredged from 8 fms. deep at Abu-Qir Bay.

Locality.—Abu-Qir Bay.

Geogr. Distrib.—Atlantic Ocean, Mediterranean Sea.

Order 4. —*Cryptonemiales*

Fam. 1. —*Corallinaceæ*

Gen. 1. —*Amphiroa* Lamour.

Amphiroa Beauvoisii Lamour.

(De Toni, Sylloge Algarum, p. 1813 ; Bornet, Les Algues de Schousboe, 1892, p. 349 ; Funk, Algenvegetation des Golfs von Neapel, 1927, p. 437 t. IX, I.)

Judging by the external appearance of this species, one might easily mistake it for *Galaxaura*, but from the anatomical study of the thallus and the zonately divided tetrasporangia its true nature as *Amphiroa* can be established.

The frond is cylindrical, rigid, dichotomously branched and articulated (Pl. IV, Fig. 10). The segments are about 4–5 as long as broad and about 1·5 mms. broad, with obtuse apices. Plants bearing tetrasporangia were collected in May. The tetrasporangia are found in conical conceptacles raised out of the surface. These conceptacles are numerous.

The Egyptian alga agrees well with specimens gathered from Naples and kept in Paris National Natural History Museum. This alga occurs just below low water-mark in sheltered and in exposed localities, associated with *Corallina*.

Locality.—Alexandria (Qayet Bey Breakwater).

Geogr. Distrib.—Mediterranean Sea, Atlantic Ocean.

(Herb. Nasr, No. 425.)

Gen. 2.—*Corallina* Lamour.

Corallina mediterranea Aresch.

(In J. Ahardh, Sp. II, p. 568 ; Thuret et Bornet, Etudes Phycologiques, 1878, p. 93, pl. XLIX ; Ardissone, Phyc. Medit. p. 464 ;

C. officinalis var *cupressina* Decsne. Herbarium specimen collected from Alexandria and kept in Paris Museum.)

This species is very common on our Mediterranean shore at Alexandria and its neighbourhood. It forms a very distinct association at the lower littoral and upper infra-littoral belts in exposed places.

C. mediterranea is close to *C. officinalis*, but the former can be distinguished from the latter in the horned pedicellate conceptacles. In this respect our Egyptian plant agrees well with *Corallina mediterranea* identified by Solms-Laubach.

The plants gathered contain conceptacles with tetrasporangia zonately divided.

Locality.—Alexandria (Qayet Bey, Sidi-Gaber, Camp-César).

Geogr. Distrib.—Mediterranean Sea.

(Herb. Nasr, No. 412.)

Gen. 3.- *Melobesia* Lamour.

Melobesia farinosa Lamour.

Var. *Solmsiana* Falkg.

(Lemoine. Corallinaceæ of the Danish West Indies. 1917, p. 170, f. 165 d et e.)

According to Mme Lemoine this species is well characterised by the shape and position of the heterocyst which can be recognised from surface view with the need of sectioning which is a troublesome work in the case of the Corallinaceæ. The heterocyst is terminal, generally circular and uncoloured. The dense filaments forming the thallus are sinuous.

This alga was found on *Dictyopteris membranaceum* dredged from 8 fms. at Abu-Qir Bay close to the Fort.

Locality.—Abu-Qir Bay.

Geogr. Distrib.—Mediterranean Sea, Adriatic Sea.

Fam. 2.—*Squamariaceæ*

Gen. 1.—*Lithophyllum* Phil.

Lithophyllum pustulatum (Lamour.) Fosal.

(Foslie, Remarks on Northern Lithothamnion. Det Kgl. Norsk. Selsk. Skr. p. 117–128, 1905.)

Some plants of *Halimeda Tuna* were incrusted with *Melobesia farinosa* together with this species. It is easily recognized from *Melobesia* by its bigger conceptacles.

Locality.—Qayet Bey.

Geogr. Distrib.—Atlantic Ocean, Mediterranean Sea, Adriatic Sea, Pacific Ocean.

Gen. 2.—*Epilithon* Heydr.

Epilithon membranacea (Esp.) Heydr.

(Heydriche, F., Melobesiæ, Deutsch. Bot. Ges., 1897, bd. XV, heft 7, p. 408.)

The thallus of *Pterocladia capillacea* is found incrusted with this alga. According to Heydrich (1897) this plant is characterised by having tetrasporangia in sori and the cystocarps and antheridia in conceptacles. The tetrasporangia are zonately divided. As far as the morphological state is concerned, this alga resembles *Melobesia* from which it differs mainly in having tetrasporangia in sori, while *Melobesia* has tetrasporangia in conceptacles.

Locality.—Qayet Bey.

Geogr. Distrib.—Atlantic Ocean, Mediterranean Sea, Adriatic Sea.

Order 5.—*Gigartinales*

Fam. 1.—*Gracilariaceæ*

Gen. 1.—*Gracilaria* Grev.

1.—*Gracilaria confervoides* (L.) Grev.

(Greville, Alg. Brit. p. 123; Harvey, Phyc. Brit. t. 65; Hauck, Meeresalgen, p. 182, f. 77; Thuret et Bornet, Etudes Phycologiques. p. 80, pl. XL; De Toni, Sylloge Algarum, p. 431; Ardissone, Phyc. Medit. p. 237.)

The alga which the author refers to this species is very characteristic in the habit of its thallus. It attains a considerable height about 80 cms., or rarely more, with few ramifications, but sometimes richly branching. The branches are flagelliform and sensibly attenuating (Pl. IV, Fig. 11).

The plant occurs in deep water and was collected from material cast ashore after a strong wind. The specimens gathered about the end of May bear cystocarps.

The specimens gathered from Alexandria prove to be longer than those from other parts of the Mediterranean, which may be simply an ecological effect due to the physical conditions of the water, quite in accordance with some author's observations.

Locality.—Alexandria (Qayet Bey).

Geogr. Distrib.—Atlantic Ocean, Mediterranean Sea, Philippine.

(Herb. Nasr. Nos. 428 et 411.)

2.—*G. dura* (Ag.) J. Ag.

(J. Agardh, Alg. Medit. p. 151 ; Ardissone, Phyc. Medit. p. 239 ; Hauck, Meeresalgen, p. 183 ; Funk, Algenvegetation des Golfs von Neapel, 1927, p. 393, Preda, Flora Italica Cryptogama, p. 323, 1909 :

Sphaerococcus durus Ag. Sp. p. 310 ; Kuetzing, Tab. Phyc. XVIII, t. 78, f. c–d ;

S. Sonderi Kuetzing, Tab. Phyc, XVIII, t. 76, f. b–c.)

In referring my specimens to the above species, I have depended on a material collected by Delile 1808 from Alexandria and kept in Paris Museum and determined by Bornet as *G. dura*. Both Delile's specimens and mine, though in herbarium specimens they are not much alike, are anatomically the same.

The plant is cartilaginous, cylindrical with irregular dichotomous branching and was attached to rocks by a basal disc (Pl. V, Fig. 12). As far as the anatomy of the alga is concerned, there are two distinct kinds of cells, one smaller and arranged in palisade-like tissue. These are rectangular, radially arranged and filled with chromatophore granules. They end sensibly with the other large polygonal cells forming the central cavity. These cells are as rich in chromatphores as the peripheral cells.

Plants with cystocarps were collected in May. The cystocarps are sessile and have distinct ostiolate mamillæ. In this respect our plant resembles *G. divergens* (Ag.) J. Ag., but the former can be distinguished by the general habit of its frond. Funk (1927) observed the cystocarpic fructification of material from Naples in winter and spring.

The Egyptian specimens occur in deep water attached to Gastropod shells where they were dredged from 7–8 fms. deep at

Abu-Qir Bay. Preda (1909) recorded the same species along the Mediterranean coast of Italy at 80 ms.

Locality.—Abu-Qir Bay.

Geogr. Distrib.—Atlantic Ocean, Mediterranean Sea, Adriatic Sea.

(Herb. NASR, No. 435.)

Fam. 2.—*Gigartinaceæ*

Gen. 1.—*Gigartina* Stackh.

Of this genus two species are known from our Egyptian shore.

1.—*Gigartina Teedii* (Roth.) Lamour.

(J. Agardh, Sp. Alg. 11, p. 266; Harvey, Phyc. Brit. pl. 266; Hauck, Meeresalgen, p. 136, f. 54; Ardissone, Phyc. Medit. p. 168; De Toni. Sylloge p. 202.)

The frond of this alga is mostly membraneous, becoming cylindrical at the base and apices of the branches which are irregularly pinnated. The branches are attenuated and acute (Pl. V, Fig. 13).

Though the plant looks in appearance as *Pterocladia*, it can be easily distinguished from it by the inner structure of the thallus. It is medullated and covered with chains of very small cells. Our plant resembles specimens gathered from Naples by Martens 1838 and kept in Paris Museum.

This alga occurs in sheltered places on the western side of Qayet Bey.

Locality.—Qayet Bey.

Geogr. Distrib.—Mediterranean Sea, Atlantic Ocean.

(Herb. NASR., No. 405.)

2.—*G. acicularis* (Wulf.) Lamour.

(Lamouroux, Essai des Thalassophytes, 1813, p. 48; Kuetzing, Sp. Alg., p. 749; Tab. Phyc. Vol. 18, t. 1; Harvey, Phyc. Brit. pl. 104; De Toni. Sylloge Alg., p. 198; Hauck. Meeresalgen, p. 136; Preda, p. 357; Funk, p. 385.)

The frond of this species is cylindrical, deep purple red in colour, and about 3 cms. high. Branches are irregularly ramified, divaricate and curved (Pl. VI, Fig 16). The frond is composed of an internal layer of longitudinal anastomosing filaments which form the medullated cortex. These filaments pass horizontally outwards and divide dichotomously to form the moniliform filaments of the assimilating layer.

Judging from the herbarium specimens in Thuret Herbarium, *G. acicularis* from the Eastern Mediterranean is smaller in size than that from the Western Mediterranean. Our Egyptian plant collected in May was sterile : this is because the fruiting season of this species in the Mediterranean is in December, according to Funk (1927). The cystocarps are sessile subglobose and carried on the branches. The tetrasporangia are cruciately divided and grouped in sori.

This species grows as intricate tufts attached to rocks covered with a dense growth of *Corallina* in exposed places.

Locality.—Qayet Bey.

Geogr. Distrib.—Atlantic Ocean (from the English coast southwards to the Canary Islands) Mediterranean Sea, Adriatic Sea, West Indies, Canary Islands, Japan, Indian Ocean, Australia.

(Herb. Nasr, No. 434.)

Order 6. *Ceramiales*

Fam. 1.—*Ceramiaceæ*

Gen. 1.—*Ceramium* Ag.

1.—*Ceramium ciliatum* (Ellis) Ducl.

(Harvey, Phyc. Brit. t. 139 ; Ardissone, Phyc. Medit. p. 117 ; Hauck, Meeresalgen, p. 110 ; De Toni, Sylloge Alg., p. 1478 ; Mazoyer, 1938.)

This species (Pl. VI. Fig. 15) which occurs on the Egyptian Mediterranean shore but not on the Red Sea, is characterised by the presence of a whorl of spines emerged from the cortical zone. These spines are formed of 3–4 articulations. Branching is dichotomous with evoluted apices. Tetrasporangia are arranged in whorls on the cortical zone.

Plants carrying cystocarps were also gathered from a rocky part at Abu-Qir Bay in front of the Fort. The plant is yellowish in colour, attached to rocks between tide-marks and washed by the sprays of tide waves.

The Egyptian specimens are much more similar to those from Triest than others of the Mediterranean. Specimens from Triest are, however, deeper in colour than specimens gathered from Alexandria, which may be due to the effect of light intensity.

As it has been lately indicated by Mazoyer (1938), the Mediterranean species differs from the Atlantic in the number of cells forming the spines. The Egyptian specimens, as a matter of fact, agree with var. *robustum* (J. Ag.) Mazoyer. It was recorded in winter

as a common species on the North of Africa by Mazoyer (1938). On the Egyptian coast, however, this variety was very common in summer.

Locality.—Abu-Qir Bay.

Geogr. Distrib.—Atlantic Ocean, Mediterranean Sea, Adriatic Sea.

(Herb. NASR, No. 436.)

2.—*C. diaphanum* (Roth.) Harv.

(Harvey, Phyc. Brit. pl. CXCIII; Rosenvinge, Marine Algæ of Denmark, 1924, p. 376; Hauck, Meeresalgen, p. 107; Mazoyer, Les Ceramiées de l'Afrique du Nord, 1938, p. 325.)

This species occurs in abundance at Camp-César, where it was epiphytic on *Zostera*. The frond reaches a height of 6 cms. with irregularly dichotomous branching and a good number of secondary ramules. The filaments are about 350–110 μ in diameter, with inwardly curved apices. The cortical zones increases in growth upwards and downwards. Plants having tetrasporangia were gathered in May. These tetrasporangia are arranged in whorls along the cortical zones.

Ceramium diaphanum is very much similar to *C. strictum* and can be easily distinguished from it by having numerous secondary ramules.

Locality.—Alexandria (Camp-César.)

Geogr. Distrib.—Atlantic Ocean, Mediterranean Sea, Adriatic Sea.

(Herb. NASR, No. 417.)

3.—*C. rubrum* (Huds.) Ag.

var. *barbatum* (Kuetz.) J. Ag.

(Kuetzing, Sp. Alg. p. 687; Tab. Phyc. CXIII, t. 9. f. a, d, J. Agardh, Annal. Algol. 11, p. 26; Hauck, Meeresalgen, p. 109; Mazoyer, Bull. Soc. Hist. Nat. Afrique du Nord; 1938, p. 320.)

This variety is characterised by the unilateral ramification of the secondary ramules, directed towards the inner side of the dichotomy (Pl. VI, Fig. 17).

Our plant was common below low water-mark in exposed localities and occurs epiphytic on *Zostera*.

Locality.—Alexandria (Camp-César).

Geogr. Distrib.—Mediterranean Sea, Atlantic Ocean.

(Herb. NASR, No. 415.)

Fam. 2.—*Rhodomelaceæ*

Gen. 1.—*Polysiphonia* Grev.

1.—*Polysiphonia variegata* (Ag.) Zanard.
f. *divergens* (A. Ag.) De Toni.

(De Toni, Sylloge Algarum, p. 923; Preda, Flora Italica Cryptogama, p. 219, 1909:

P. divergens J. Ag. Sp. Alg. p. 952, 1851; Hauck, Meeresalgen, p. 237; Ardissone, Phyc. Medit. p. 381.)

This alga was found epiphytic on *Codium*, dredged from 3–4 fms. deep, forming tufts about 5 cms. high. The thallus was attached to this alga by means of rhizoids issuing from the basal cells of the main branch. These rhizoids end with a discoid lobed attachment. The thallus is never corticated and contains 7 pericentral cells about 160 μ in diameter near the base and attenuating off smoothly upwards. The ultimate branchlets are 40–80 μ thick. The articulations near the base are shorter than their diameter, becoming as long as broad a little distance upwards and then elongated in the middle of the thallus and becoming short again near the apices.

Branching is subdichotomous and in this respect it approaches the typical *P. variegata*. The latter differs in having a corticated frond with 6–8 pericentral cells. The branches are found in the axils of the trichoblasts, but shifted to one side as in the typical *P. variegata*. The apices of the frond are considerably curved and are characteristic of the species.

The growing point of the alga is clearly shown to be about 5-7 disc-cells, arranged one below the other, before dividing to form the polysiphonous frond. The tetrasporangia were only found in our specimens and occur in the other parts of the branches. They are proportionally small and the branches are not much swollen except from one side only, as figured by Boergesen (1918).

The Egyptian plant, like the European, is a characteristic lagoon alga living in the polluted water of the harbour. This phenomenon has been indicated by Harvey, Falkenberg (1901) and by Boergesen (1918).

Our specimens were dredged from 3–4 fms. deep in the Eastern Harbour. It was recorded by Hauck from Port-Said and some specimens are kept in Paris Museum.

Locality.—Alexandria.

Geogr. Distrib.—Atlantic Ocean, Mediterranean Sea, Adriatic Sea.

(Harb. Nasr, No. 421.)

2.—*P. Gorgoniæ* Harv.

(Harvey, Nereis-Bor. Amer., 1851, p. 39 ; J. Agardh, Sp. Alg. p. 979; De Toni, Sylloge Algarum p. 882.)

This fine alga was found epiphytic on *Enteromorpha compressa*. The frond grows solitary and reaches a height of 1–2 cms. The filaments are 220–100 μ in diameter and are flaccid, flabellately branched, with irregular dichotomous branches. It is composed of 4 pericentral cells with the articulations shorter than their diameter at the base and apices of the frond and 1–1½ times as long as broad in their utmost height. The plant is not corticated and carries cystocarps of the urceolate type. The trichoblasts have nothing to do with the branches. The cystocarps are globose, slightly urceolate, sessile or shortly pedicellate, about 220 μ long and 120 μ broad. The tetrasporangia are somewhat swollen and carried in series of about 8 spores in the ultimate ramules. The antheridiophores are cylindrical and are completely fertile, 110–125 μ long and about 35 μ broad.

The plant is attached to other algæ by means of rhizoids arising from the basal cells of the frond. The colour of the Egyptian alga is pale yellowish brown and agrees very much with specimens collected by Wright during the North Pacific Exploring Expedition 1853-1856 and kept in Paris Museum.

The authentic species was found parasitic on various corals at Key West as mentioned by Harvey : but the Egyptian plant was found on *Enteromorpha* together with *Ectocarpus*.

It is very interesting to find this species not only in the Egyptian waters but in the Mediterranean, where it is newly recorded to this sea. Its migration from the eastern part of the Indian Ocean into the Mediterranean is assumed to have taken place through an eastern direction *via* the Red Sea, since this alga occurs in this sea (Nasr 1939).

The Egyptian plant resembles *P. ferulacea* Sohr., but *Polysiphonia Gorgoniæ* is distinguished by the habit of the frond which is never caespitose nor having fastigiate corymbose ramules as found in *P. ferulacea*. *P. Gorgoniæ* may in some way bear resemblance to *Polysiphonia breviarticulata* (Ag.) Zanard, the Mediterranean species, but it can be also distinguished from the latter. *P. breviarticulata* is corticated at the base of the frond, but *P. Gorgoniæ* is never corticated.

Locality.—Alexandria.

Geogr. Distrib.—Key West, Florida, Red Sea.

Gen. 2.—*Spyridia* Harv.

Spyridia filamentosa (Wulf.) Harv.

(Harvey, Phyc. Brit. pl. 46 ; Kuetzing, Tab. Phyc. XII, t. 42, f. a–b ; Ardissone, Phyc. Medit. p. 193 ; Hauck, Meeresalgen, p. 115, g. 40–41 ; De Toni, Sylloge Algarum, p. 1427.)

This alga (Pl. VI, Fig. 14) agrees well with our plants from the Red Sea. It is common on the littoral belt in the neighbourhood of Abu-Qir Fort. The branches of this plant are much infected with diatoms. There is a marked difference, with regard to colour, between the Red Sea and the Mediterranean specimens. The former specimens were much bleached by the effect of strong illumination, while the latter specimens are still pale purple coloured.

All specimens gathered from our shores are sterile.

Locality.—Abu-Qir Bay.

Geogr. Distrib.—Atlantic Ocean, Mediterranean Sea, Adriatic Sea, Red Sea, Pacific Ocean.

(Herb. Nasr, No. 437.)

Gen. 3.—*Laurencia* Lamour.

Laurencia paniculata (Ag.) J. Ag.

(J. Agardh, Sp. Alg. p. 755 ; Yamada, Notes on Laurencia, Univ. Calif. Public. vol. 16, p. 192, pl. 3, f. a, 1931.)

In Paris Museum there are two excellent specimens of this species collected by Delile in 1801 from the shores of Alexandria. My plants (Pl. VI, Fig. 18) agree well with them. As Yamada (1931) has already pointed out in his classical work on *Laurencia*, the plant shows clearly the character of the group " Palisidæ " in which the epidermal cells are elongated radially.

The plant grows at the lower edge of the littoral belt in rocky places.

Locality.—Abu-Qir Bay.

Geogr. Distrib.—Mediterranean Sea, Adriatic Sea.

(Herb. Nasr, No. 453.)

Bibliography

AGARDH, C. A., 1820.—Species algarum rite cognitæ cum synonymis differentiis specificis et descriptionibis succinctis.

AGARDH, J., 1837.—Novæ species algarum quas in itinere ad oras maris rubri collegit Eduardus Rueppel, cum observationibus nonnullis in species rariores antea cognitas. *Anr. Sc. Nat. VIII, Bot.*

—1890.—Till algernes systematik. *Lunds Univ. Asskrift. t. XXVI.*

—1889.—Species Sargassorum Australiæ descriptæ et depositæ. Accidunt et singulis partibus Sargassorum earumque differentiis morphologicis in speciebus observationes nonnullæ nec non dispositionis specierum omnium generis, his differentis fundatæ, peniculum, cum 31 tabulis. *Kongl. Sven. Vet. Akad. hand. Stockholm, Bd. 23, No. 3.*

ARDISSONE, F., 1883.—Note alla Phycologia Mediterranea. *R. Inst. Lomb. de Sc. et Litt., ser. II. Varese.*

BARTON, E. S., 1901.—The genus Halimeda. *Siboga Expeditie, Monog. LX, Leiden.*

BATTERS, E. A., 1902.—A Catalogue of British Marine Algæ. *Suppl. Jour. Bot., XL. London.*

BERTHOLD, G., 1882.—Beiträge zur Morphologie und Physiologie der Meeresalgen. *Jarb. für wiss. Bot. Bd. 13. Leipzig.*

BOERGESEN, F., 1925.—Marine Algæ from the Canary Islands. *Det Kgl. Dansk. Vid. Biol. Medd., Copenhagen.*

BORNET, E., 1892.—Les Algues de Schousboe, recoltées au Maroc dans le Mediterranée de 1815 à 1829. *Mem. Doc. nat. d. Sc. nat. et Mat. de Cherbourg t. XXVIII, 8.*

BOSSE, W-VAN, A., 1913.—Liste des algues du Siboga. *Siboga Expeditiè monog. LIXa, Leiden.*

COTTON, A. D., 1912.—Clare Island Survey, Marine Algæ. *Proc. Roy. Irish Acad. Vol. XXXI, Part 15.*

CROUAN, P. L. ET H. M., 1852.—Algues marines exsiccata, Brèst.

CROUAN, P. L., 1852.—Algues Marines du Finistère, III, Paris.

—1867.—Florule du Finistère, Paris.

DECAISNE, J., 1839.—Plantes de l'Arabie Heureuse. *Arch. Mus. d'Hist Nat. II.*

DELILE, A. R., 1813.—Flore d'Egypte.

DE TONI, G. B., 1897–1905.—Sylloge Algarum, Vol. IV, Sect. I–IV.

DOSTAL, R., 1928.—Sur les organes reproducteurs de Caulerpa prolifera. *C.R. Acad. Sc. t. 187, Paris.*

DREW, K., 1928.—A Revision of the Genera Chantransia, Rhodochorton and Acrochaetium. *Univ. Calif. Public. Bot. Vol. 14, No. 5.*

ENDLICHER, S. L., 1843.—Genera Plantarum, suppliment III. Vindobonæ.

FELDMANN, J., 1937.—Marines Algues des côtes des Albères. *Rev. Algol. t. X.*.

FELDMANN, J., ET HAMEL. G., 1929.—Floridées de France. *Rev. Algol. Vol. VII.*

— 1934.—Observations sur quelques Gelidiacées. *Rev. Génér. de Bot. t. 46, Paris.*

FIGARI, A. ET DE NOTARIS, G., 1851.—Nuovi materiali per l'Algologia del Mar Rosso.

FOSLIE, M., 1905.—Remarks on Northern Lithothamnion. *Det Kgl. Norsk. Vid. Selsk. Skrift.*

FUNK, G., 1927.—Die Algenvegetation des Golfs von Neapel. *Public. della St. Zool. di Napoli, Vol. 7 supplemento.*

HAMEL, G., 1924.—Floridées de France. *Revue Algologique, t. I, Paris.*

— 1925.—Floridées de France. ibid, t. II et III.

— 1930.—Floridées de France. ibid, t. V.

— 1931.—Chlorophycées de cotes françaises. ibid, t. V.

— 1939.—Phaeophycées de France. ibid, (in the press).

HAMEL, G. ET FELDMANN, J., 1936.—Floridées de France. ibid, Vol. IX.

HARVEY, W. H., 1846–1851.—Phycologia Britannica, London.

— 1851.—Nereis Borealæ Americanæ, London.

HAUCK, F., 1885.—Die Meeresalgen, Bd. II, Leipzig.

HEYDRICH, F., 1897.—Melobesiæ. Ber. d. Bot. Gesell., XV.

HOWE, M. A., 1920.—The Behama Flora in Britton and Millspaugh, New York.

KUETZING, F. T., 1849.—Species Algarum, Leipzig.

— Tabulæ Phycologicæ,

— 1843.—Phycologia generalis, Leipzig.

KYLIN, H., 1933.—Uber die Entwichlungsgeschichte der Phaeophyceen. *Lunds Univ. Arssk. N.F. Avd. 2, Bd. 29, Nr. 7, Lund.*

LAMOUROUX, J. V. F., 1813.—Essai sur les genres de la famille des thallassiophytes non articulées. *Ann. du Mus. d'hist. nat., t. 20, Paris.*

— 1809.—Mémoire sur les Caulerpes, *Jour. de Bot.*

LEMOINE, P., 1911. Structure anatomique des Melobesiées application à la classification. *Ann. Inst. Oceanog. t. II, fasc. 2, Monaco.*

— 1917.—Corallinaceæ of the Danish West Indies, Copenhagen.

MAZOYER, G., 1938.—Les Ceramiées de l'Afrique du Nord. *Bull. Soc. Hist. Nat. de l'Afrique du Nord, t. 29, Alger.*

MONTAGNE, C., 1846.—Flore d'Algérie, Algues in Bory de St. Vincent, Exploration Scientifique de l'Algérie, Bot.

NASR, A. H., 1936.—General Study of the Marine Algæ of the Egyptian Red Sea Coast. Thesis, Cairo.

— 1939.—Algæ.—*Public. Mar. Biol. St., Ghardaqa, No. 1, Cairo.*

NEWTON, L., 1931.—A Handbook of the British Sea-weeds, London.

PREDA, A., 1909.—Bibliografia Algologica Introduzione alla Alghe in *Flora Italica Cryptogama, pars II, Algæ, Vol. I, Fasc. No. 1.*

REINKE, J., 1889.—Atlas Deutcher Meeresalgen, fasc. I, Kiel.

ROSENVINGE, K., 1909.—The Marine Algæ of Denmark, contribution to their Natural History, Part 1, Rhodophyceæ, *Mem. Acad Roy. Sc. et Lett. de Denmark, 7 scr. t. VII, No. 1,* Copenhagen.

— 1924.—ibid, t. VII, No. 3.

— 1931.—ibid, t. VII, No. 4.

RUPRECHT, F. J., 1849.—Vegetation des Rothen Meeres, *Act. Acad. T. VI,* Petersburg.

SAUVAGEAU, C., 1914.—Remarques sur les Sphacelariées, Jour. de Bot. Paris.

— 1927.—Sur le Colpomenia sinuosa Derb. et Sol., *Bull. St. Biol. Arcachon, t. 24,* Bordeaux.

SETCHELL, W. A., 1931. Some Early Algal Confusions. *Univ. Calif. Public. Bot. Vol. 17, No. 9,* Berkeley.

Taylor, W. R., 1928. The Marine Algæ of Florida, with special reference to the Dry Tortugas, *Carnegie Institution Public., No. 379.* Washington.

THURET, G., 1850. Richerches sur les zoospores des algues et les antheridies des cryptogames, *Ann. Sc. Nat. Bot. III,* Paris.

THURET, G. ET BORNET, E., 1878. Etudes Phycologiques, Paris.

VICKERS, A., 1908.—Phycologia Barbadensis, Iconographie des Algues Marines recoltées a l'Ile Barbade (Antilles), Paris.

YAMADA, Y., 1931.—Notes on Laurencia with Special Reference to the Japanese Species, *Univ. Calif. Public. Bot. Vol. 16,* Berkeley.

ZANARDINI G., 1858.—Plantarum in mari rubro hucusque collectarum, *I.R., Inst. Vol. VII, Part II,* Venetiis.

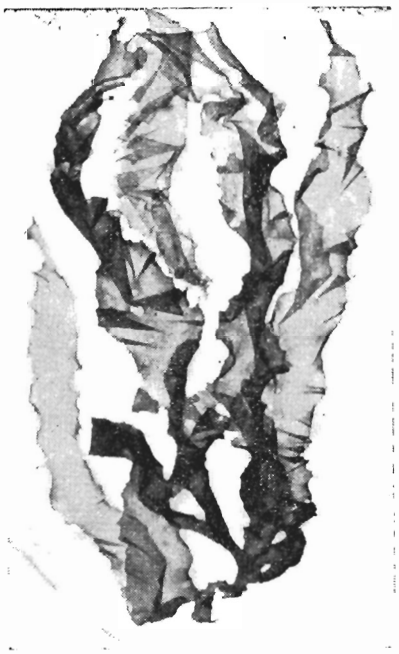


FIG. 1.—Ulva fasciata Delile. (× ½)

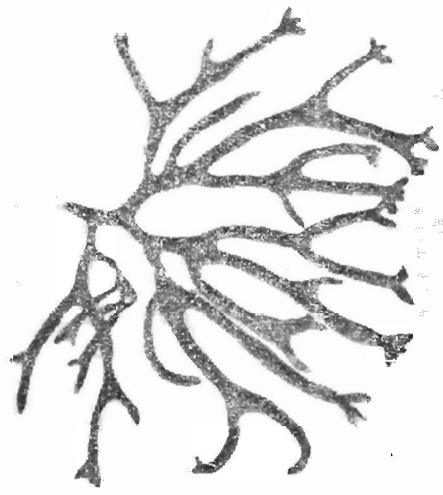


FIG. 2.—Codium elongatum Ag. (× ½)

FIG. 3.—Caulerpa prolifera (Forssk.) Lamour. (× ½)

FIG. .—Stilophora rhizodes (Ehrbg.) J. Ag. (× ½)

FIG. 5.—Scytosiphon Lomentarius (Lyngb.) End. (× 1/1)

FIG. 6.—Halopteris scoparia (L.) Sauv. (× 1/1)

FIG. 7.—Dictyopteris membranacea (Stackh.) Batters. (× ½)

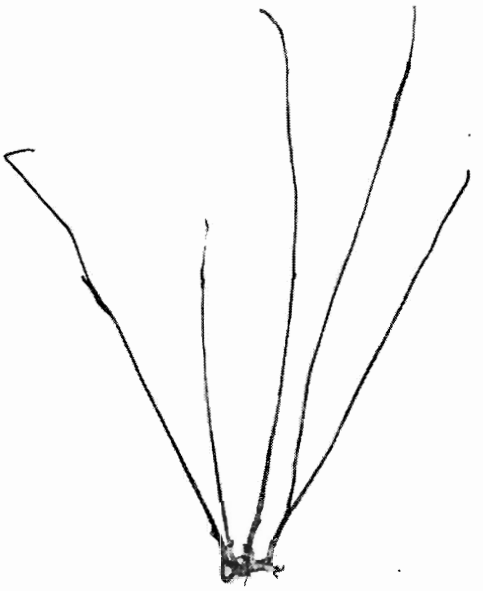


FIG. 8.—Nemalion helminthoides (Valley) Batters. (× ½)

FIG. 9.—Pterocladia capillacea (Gmel.) Bornet et Thuret. ($\times$ 1/1)

FIG. 10.—Amphiroa Beauvoisii Lamour. ($\times$ 1/1)

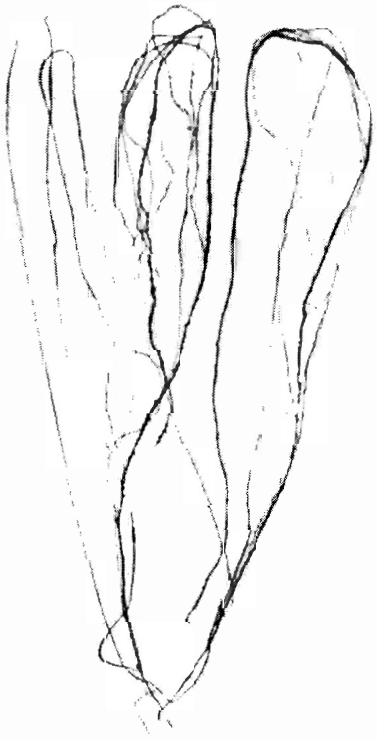


FIG. 11.—Gracilaria confervoides (L.) Grev. ($\times$ ½)

FIG. 12.—Gracilaria dura (Ag.) J. Ag. ($\times$ 1/1)

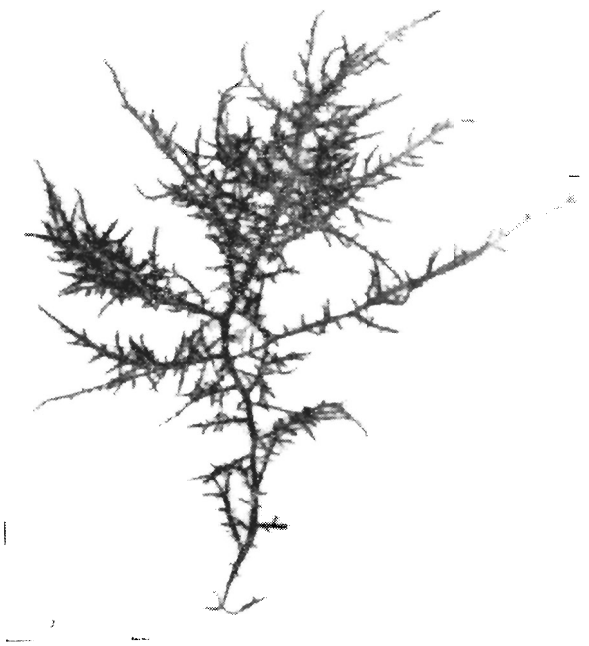


FIG. 13.—Gigartina Teedii (Roth.) Lamour. ($\times$ 1/2)

FIG. 14.—Spyridia filamentosa (Wulf.) Harv. (× 1/1)

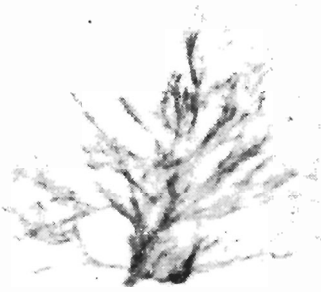


FIG. 15.—Ceramium ciliatum (Ellis.) Ducl. (× 1/1)

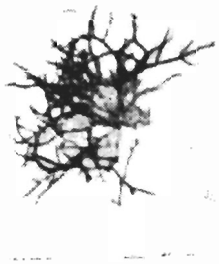


FIG. 16.—Gigartina acicularis (Wulf.) Lamour. (× 1/1)

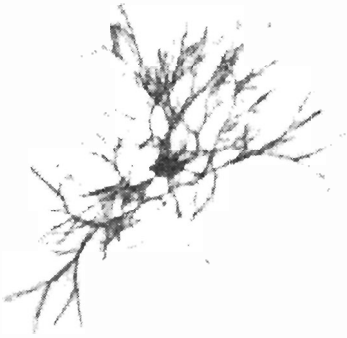


FIG. 17.—Ceramium rubrum (Huds.) Ag. (× 1/1)

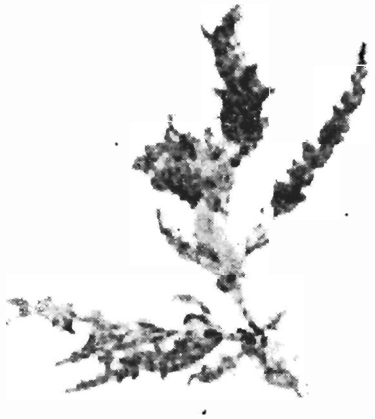


FIG. 18.—Laurencia paniculata (Ag.) J. Ag. (× 1/1)