

MACROPHYTES OF THE LEBANESE COAST (LEVANTINE BASIN) BIODIVERSITY AND DISTRIBUTION

Sami Lakkis^{1*} and Vanda Novel-Lakkis²

¹ Laboratory of Marine Ecology & Plankton, Department of Biology, Lebanese University, Beirut, Lebanon - slakkis@inco.com.lb

¹ National Centre for Marine Sciences, NCSR, Batroun, Lebanon

Abstract

A phytosociological study of the Phytobenthos was carried out along the coast of Lebanon during 1998-99. Samples were collected at six sites covering the supralittoral, mediolittoral and infralittoral zones. Floristic inventory, composition, abundance and taxonomic diversity of algal community were analyzed in relation with some environmental factors. A total of 243 taxa were identified, including three phanerogams. Different sources of pollution, resulted in reducing the biomass of macroalgae and the species diversity. Several Indo-Pacific species were found within the different phytocoenoses; most of them were introduced into the Levantine Basin through the Suez Canal. These Lessepsian migrant species into the Eastern Mediterranean formed new settlements of populations; some of them were highly spread to overcame other endemic species or even they replace them.

Key-words: Macrophytes, Lebanon, Biodiversity, Distribution, Phytosociology

Knowledge related to macroalgae of the Lebanese coast is very scarce. Few studies were done showing the coastal distribution and zonation of the community species and the impact of pollution on the distribution of the species (1;2). Other works on macroalgae were performed on Syrian coast (3), Palestinian coast (4;5;6) and Mediterranean Egyptian littoral (7). In this paper we present further information concerning the distribution of species and biodiversity of the algal community along the coast of Lebanon.

Material and methods

Six sampling stations were chosen along the coast of Lebanon from 10 km south of Beirut (34°55'N;35°33'E) to 71 km northern (33°55'N-35°28'E). All stations are typically coastal limestone platforms in the subtidal to wave-wash zone. They were sampled at two seasons: spring (April-May) and summer (July-August) during 1998-99. Sampling points covered the supralittoral, mediolittoral and infralittoral zones, according to the biogenic nomenclature (8;9). Intertidal stations were sampled directly, while for the sublittoral, we used scuba diving techniques. The taxonomic diversity was determined in using the formula: $D = S - 1 / \log B$, where S is the number of species found in the quadrat; log is the natural logarithm; B is the algal biomass in g/m².

Results and discussion

The marine flora of the Lebanese coast is poor in biomass contrasting with a rich taxonomic diversity. At all levels, 243 species were found including 25 Cyanophyta, 58 Chlorophyta, 29 Phaeophyta, 127 Rhodophyta, 3 Monocotyledones. The Phanerogams are represented by *Halophila stipulacea*, *Cymodocea nodosa* and *Zostera noltii*, the only Xanthophyte representative was *Vaucheria* sp. (10). Although the amplitude of the tide is very low (15-20 cm), the composition and the vertical distribution of algae are more or less similar to that of the west Mediterranean. However, some dissimilarity in the abundance and the seasonal distribution of the species between the two Mediterranean basins is reported. The most distinctive feature in the composition of the marine flora of this area is the presence of many introducing tropical species, mostly Indo-Pacific. **Supralittoral level** is dominated by *Hormathonema sphaericum*, *Hyella caespitosa*, *Anabaena* sp., *Oscillatoria nigroviridis*, *Chroococcus turgidus*, *Hydrocoleus lyngbyaceus*, *Phormidium ambiguum*, *Rivularia mesenterica*. In the **Intertidal zone** (mediolittoral) 148 species were reported from all stations. Upper mediolittoral is characterized tolerating species to exondation and dessication. Two associations characterize this level: *Porphyr* *leucosticta*-*Enteromorpha compressa* and *Nemalion*-*Polysiphonia* with many accompanying species. Lower mediolittoral is occasionally exposed to exondation; the algae are less tolerant to dryness. Two groups of species characterize this level: photophile group species of *Vermetus* platforms and group of *Laurencia paillosa*. **Infralittoral level** (subtidal) is the richest in species; maximum of 190 taxa were recorded in this zone; many of them are also common in the mediolittoral. The boundary between the medio and infralittoral is not clear because of the seawater level variations. However we can distinguish the limit between these two zones by the presence of two species that need a permanent immersion: *Cystoseira amentacea* and *Sargassum vulgare*, indicators of low-water tide. Many tropical and subtropical species are present in the infralittoral; mostly are introduced Lessepsian species of Indo-Pacific origin. Two assemblages characterize the upper subtidal: the first is *Jania-Bryopsis-Liagora*, the 2nd includes *Jania-Padina-Dasycladus*. This level present a calm photophile environment. Sediment substratum is characterized by the dominance of the three occurring phanerogams *Zostera noltii*, *Cymodocea nodosa* and *Halophila stipulacea* and by populations of *Caulerpa scalpelliformis*, *C. racemosa* and *C. prolifera*. characteristics of the Levantine Basin algal community. The main Indo-Pacific and Eritrean species introduced in the Mediterranean were reported by many authors (11-14). The most important are: *Acetabularia parvula*, *A. moebii*, *Caulerpa racemosa*, *C. scalpelliformis*, *Derbesia boergesenii*, *Styopodiumschimperii*, *Acanthophora delilei*, *Asparagopsis taxiformis*, *Hypnea hamulosa*, *Liagora farinos*, *Lophocladia lallemandii*; and the phanerogams: *Halophila stipu-*

lacea. 60% of the species present on the Lebanese coast are mentioned on Syrian coast (3) and 33% are common with the Red Sea (Table 1).

Table 1: Number of species common between Lebanese coast, Syrian coast and Red Sea

Taxa	Lebanon	Syria	Red Sea
Cyanophyceaea	25	13	3
Chlorophyceaea	59	29	18
Rhodophyceaea	126	77	34
Phaeophyceaea	29	22	24

In conclusion we can say that algal community of the Levantine Basin, including Lebanese coast may be distributed into six biogeographical groups:

Mediterranean group: *Corallina elongata* *Cystoseira* spp.

Tropical and Temperate Atlanto-Mediterranean group: *Cladophora prolifera*, *Amphiroa rigida*, *Dasycladus vermicularis*, *Anadyomene stellata*.

Circumtropical group: *Hypnea musciformis*, *H. hamulosa*, *H. cervicornis*, *Gelidium crinale*, *Gigartina acicularis*, *Bryopsis plumosa*, *Asparagopsis taxiformis*.

Warm Boreal: *Porphyr* *leucosticta*, *Callithamnion corymbosum*, *Taonia atomaria*.

Circumboreal: *Enteromorpha intestinalis*, *E. clathrata*, *Ulva rigida*.

Indo-Pacific group: *Liagora farinosa*, *Acetabularia parvula*, *Styopodium schimperii*, *Asparagopsis taxiformis*, *Caulerpa racemosa*, *C. mexicana*, *C. scalpelliformis*

References

- 1 - Basson P.W., Hardy J. T. and Lakkis V., 1976. Ecology of marine macroalgae in relation to pollution along the coast of Lebanon. *Acta Adriatica* 18:307-325.
- 2 - Lakkis S., Bitar G., Novel-Lakkis V., Zeidane R., 1996. Etude de la diversité biologique au Liban. Faune et Flore Marines et côtières. Publication No 5: 1-126. PNUE et Ministère de l'Agriculture, Beyrouth.
- 3 - Mayhoub H., 1976. Recherches sur la végétation marine de la côte syrienne. Etude expérimentale de la morphogenèse et le développement de quelques espèces peu connues. Thèse Doct. Etat, Univ. Caen: 1-286.
- 4 - Rayss T., 1954. Les algues tropicales de la Méditerranée orientale et leur origine probable. Rap. Comm. 8ème Congrès int. de Botanique, Paris, Sect. 17:148-149.
- 5 - Rayss T., 1955. Les algues marines des côtes de Palestine I. Chlorophyceae. *Bull. Sea Fish. Res. Stn. Haifa* 23:1-32.
- 6 - Safriel U.N. and Ritte U., 1986. Suez Canal migration and Mediterranean colonization. Their relative importance in Lessepsian migration. *Rapp. Comm. int. Mer Médit.* 29.5:259-63
- 7 - Aleem A.A., 1948. The recent migration of certain Indo-Pacific algae from the Red Sea into the Mediterranean with reference to their geographical distribution. *New Phytol.* 47:88-94
- 8 - Molinier R., 1960. Etudes des biocénoses marines du Cap Corse. *Végétatio* 9:121-312
- 9 - Pérès J.M., 1967. The Mediterranean. Distribution of phytobenthos along the coast of Lebanon (Levantine Basin, East Mediterranean). *Medit. Marine Science*, 1/2:143-164
- 10 - Lakkis S. and Novel-Lakkis V., 2000 - Distribution of phytobenthos along the coast of Lebanon (Levantine Basin, East Mediterranean). *Medit. Marine Science*, 1/2: 143-164
- 11 - Por F.D., 1978. Lessepsian migration. The influx of Red Sea biota into the Mediterranean by way of the Suez Canal. *Ecological Studies*, 23, Spring Verlag, Berlin, Germany, 228pp.
- 12 - Verlaque, M. et Boudouresque, C.F., 1991. *Styopodium schimperii* (Buchinger ex Kützting) Verlaque et Boudouresque *comb. nov.* (Dictyotales, Fucophyceae), algue de la mer Rouge récemment apparue Méditerranée. *Cryptog. Algol.* 12:195-211.
- 13 - Bitar G. and Bitar-Kouli, S., 1955a. Aperçu de bionomie benthique et répartition des différents faciès dans la roche littorale à Hannouche (Liban-Méditerranée orientale). *Rapp. Comm. int. Mer Médit.*, 34:19.
- 14 - Verlaque M., 1994. Inventaire des plantes introduites en Méditerranée: origines et répercussions sur l'environnement et les activités humaines. *Oceanol. Acta*, 17, 1:1-23.