

# CONTRIBUTION OF THE RED SEA ALIEN SPECIES TO STRUCTURING SOME BENTHIC BIOGENOSIS IN THE LEBANON COAST (EASTERN MEDITERRANEAN)

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## Abstract

Some Red sea alien species and thermophilic species have successfully colonized the coast of the Levantine basin and formed a particular facies in the infralittoral biocenosis. With regard to this, the Lebanon coast represents an excellent natural laboratory to check those important biotic and climatic changes.

**Keywords :** *Eastern Mediterranean, Phytobenthos, Zoobenthos, Species Introduction.*

## Introduction

Pères and Picard [1] pointed out the high frequency of thermophilic species in the Levantine basin, but did not mention Red Sea alien species (RA). Possibly, the role of those species in structuring the Mediterranean biocenosis was still insignificant 40 years ago. The coast of Lebanon represents an interesting area to study the biotic changes related to the RA [2] and the 'tropicalisation' of the Mediterranean [3], since the study of the Lebanese biota has progressively increased [4-9]. Actually, RA have outcompeted or replaced native species locally in the inshore benthic communities (0-40m depth).

The biota of the supralittoral-midlittoral rocks and the littoral fringe (0-2m depth) are similar to the rest of the Mediterranean coast [1], with the addition of the corallinacea facies *Lithophyllum trochanter*, *Tenarea undulosa* and *Neogoniolithon brassica-florida* with the vermetid *Dendropoma perforatum*. However, the Red Sea bivalve *Brachidontes pharaonis* is particularly dominant on eutrophic sectors; and, together with *Balanus perforatus* and *B. trigonus*, forms a facies on exposed shallow zones (0-2m depth).

Biocenosis of small boulders and pebbles (0-1m depth): This interesting habitat (in sheltered sites) presents some frequent RA, as *Cerithium scabricum* and *Ergalatax obscura* (gastropods) and *Pyura momus*, *Rhodosoma turcicum* and *Phallusia nigra* (ascidians). Biocenosis of the infralittoral algae (0-35m depth): The RA macroalgae *Codium taylori* and *Cladophoropsis patentiramea* (chlorophytes) and *Styopodium schimperi* (phaeophyte) dominate that biocenosis in late summer. Among the sessile fauna, some RA are abundant: *Lytocarpus philippinus* (hydrozoan), *Malvifundus regulus*, *Spondylus spinosus* and *Chama pacifica*; (bivalves) and *P. nigra* (ascidian). In exposed shallow zones (1-5m depth), *S. spinosus* and *Ch. pacifica* cover completely the rock, and forming a particular facies. Among the more frequent RA and/or warm benthic mobile fauna: *Hermodice carunculata* (polychaete), *Strombus persicus* (gastropod), *Charybdis helleri* (decapod), *Synaptula reciprocans* (holothurian) and the fishes, *Siganus luridus*, *S. rivulatus*, *Sparisoma cretense* and *Sargocentrum rubrum*. Fouling community (0-20m depth): *B. perforatus* and *B. trigonus*, and *B. pharaonis* have been the dominant species at the shallowest zone (0-5m depth). Deeper (5-20m depth), ascidians dominate, with the cosmopolitan *Styela plicata*, *S. partita* and *Microcosmus exasperatus*, and the RA *P. momus*, *P. nigra* and *Symplegna brakenhielmi*. Other RA are frequent: *Spirobranchus tetraceros* (polychaete), and the bivalves *S. spinosus*, *M. regulus* and *Pinctada radiata*.

Biocenosis of the coralligenous (35-40m depth): Although impoverished with regards to the other Mediterranean sectors, it presents the typical components of the Mediterranean: macroalgae (*Lithophyllum*, *Mesohyllum*, *Peyssonnelia*, *Osmundaria*, *Palmophyllum* spp.). The poriferans are dominant (*Axinella*, *Agelas*, *Dysidea*, *Petrosia*, *Phorbas*, *Spirastrella* spp.); with the madreporarians (*Phyllangia* and *Madracis* spp.) and bryozoans (*Sertella*, *Margaretta* spp.). Although the influence of the RA species does not appear significant, some of them are frequent: *S. persicus*, *S. spinosus*, *Ch. pacifica*, *S. reciprocans* and *S. rubrum*. Biocenosis of the semi-dark and dark caves (0-10m): The poriferans (*Sycon*, *Axinella*, *Chondrosia*, *Cliona*, *Crambe*, *Ircinia*, *Petrosia*, *Phorbas*, *Pleraplysilla*, *Microscleroderma*, *Gastrophanelia* spp.) and the madreporarians (*Polycyathus*, *Phyllangia*, *Oculina*, *Madracis* spp.) are dominant. Some RA species are present in that biocenosis: the serpulid *Pomatoleios kraussii*; the molluscs *Hypselodoris infucata*, *Petalocochus glomeratus*, *S. spinosus* and *Ch. pacifica*; the ascidians *H. momus* and *Ph. nigra*; and the fish *Pempheris vanicolensis*. Biocenosis of sandy mud (25-40m depth) is

represented by the association *Halophila stipulacea* and *Caulerpa scapelliformis* with the RA gastropod *Rhinoclavis kochi*.

## Discussion

Some important changes occur in the Levantine basin, due to the RA and the 'tropicalization' of the Mediterranean (1,2), particularly in the infralittoral zone (0-35m depth), and to a lesser degree in the circalittoral. The marked seasonal changes in the macroalgae cover are noteworthy: in spring and early summer, the phaeophytes dominate the upper strata (*Cystoseira* spp., *Dictyota fasciola*, *Dictyopteris polypodioides*, *Halopteris scoparia*, *Padina pavonica*, *Sargassum vulgare*, *Taonia atomaria*); in late summer and autumn, that phaeophyte canopy disappears (also due to the herbivorous pressure?), and the permanent turf of corallinacea (*Amphiroa*, *Corallina*, *Jania*, *Lithophyllum*, *Neogoniolithon* spp.) dominates the photophilic surfaces. Some rocky infralittoral sectors (exposed zones, sheltered boulders, photophilic and sciaphilic surfaces, fouling communities) can be dominated by RA: macroalgae (*C. taylori*, *C. patentiramea*, *L. lallemandii*, *S. schimperi*), Cnidaria (*L. philippinus*), Polychaeta (*S. tetraceros*, *P. kraussii*), molluscs (*S. persicus*, *C. scabricum*, *E. obscura*, *R. kochi*, *B. pharaonis*, *S. spinosus*, *Ch. pacifica*, *P. radiata*, *M. regulus*), crustaceans (*Ch. helleri*), echinoderms (*S. reciprocans*), ascidians (*P. momus*, *P. nigra*, *R. turcicum*, *S. brakenhielmi*).

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## References

- 1 - Pères, J.M. & Picard, J. 1964. Nouveau manuel de bionomie benthique de la Mer Méditerranée. *Rec. Trav. St. Mar. Endoume*, 31(47): 1-133.
- 2 - Galil, B. and Zenetos, A. 2002. A sea change - exotics in the Eastern Mediterranean Sea. In *Invasive Aquatic Species in Europe. Distribution, Impacts and Management*. E. Leppakoski et al. (eds.). Dordrecht: Kluwer Academic Publishers: 325-336.
- 3 - Streftaris, N., Zenetos, A. and Papanathanassiou, E. 2005. Globalisation in marine ecosystems : The history of non-indigenous marine species across European seas. *Oceanogr. Mar. Biol. Ann. Rev.*, 43: 419-453.
- 4 - Bitar, G. and Bitar-Kouli, S. 1995a. Aperçu de bionomie benthique et répartition des différentes faciès de la roche littorale à Hannouch (Liban-Méditerranée Orientale). *Rapp. Comm. Int. Mer Médit.*, 34: 19.
- 5 - Bitar, G. and Kouli-Bitar, S. 1998. Inventaire des Mollusques marins benthiques du Liban et remarques biogéographiques sur quelques espèces *Mésogée*, 56: 37-44.
- 6 - Bitar, G. & Kouli-Bitar, S. 2001. Nouvelles données sur la faune et la flore benthiques de la côte Libanaise. Migration Lessepsienne. *Thalassia Salentina*, 25: 71-74.
- 7 - Bitar G. and Zibrowius H., 1997. Scleractinian corals from Lebanon, Eastern Mediterranean, including a non-lessepsian invading species (Cnidaria: Scleractinia). *Sci. Mar.*, 61 (2): 227-231.
- 8 - Bitar G., Harmelin J.G., Verlaque M., Zibrowius H., 2000. Sur la flore marine benthique supposée lessepsienne de la côte libanaise. Cas particulier de *Styopodium schimperi*. *Mednature*, 1: 97-100.
- 9 - Zibrowius, H. and Bitar, G. 2003. Invertébrés Marins Exotiques sur la Côte du Liban. *Leban. Sci. J.*, 4 (1): 67-74.