THE RAMON MARGALEF SUMMER COLLOQUIA
A view of the ocean from Barcelona

Conference Title:

The cells of ecosystem functioning in the Mediterranean Sea

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Abstract:

Deep-water formation at the surface of the Arctic region generates the great oceanic conveyor belt: the movement of water distributes nutrients and propagules, triggering ecosystem functioning at a planetary level. The Mediterranean Sea is a miniaturized ocean that functions in the same way as the global ocean. The incoming Gibraltar Current and the outgoing Intermediate Levantine Current exchange the water in the basin, but only in the first 500 m. Vertical mixing is linked to the presence of the three main sites of deep water formation (the cold engines) that represent the "Arctic" of the system: in the Gulf of Lions, the northern Adriatic and the north Aegean cold, oxygen-rich and dense surface waters sink through canyons and reach the deeper parts of the sub-basins, reviving them and pushing up the spent deep waters, rich in nutrients. Global warming might impair these cascading phenomena, and the northern Adriatic engine stopped already for a certain period. These large-scale phenomena are superimposed to smaller scale dynamics. A system of 500 canyons indents the Mediterranean shelf and might play a further role in linking the deep sea with coastal systems, since canyons induce the formation of upwellings that revive coastal systems with the nutrients accumulated in the deep. Canyons might act as auxiliary engines to the cold engines. The shape of the coast, furthermore, generates gyres and eddies that concentrate nutrients and propagules. The

portions of marine systems where production phenomena are generated by the intertwining of physical, chemical, biological and ecological processes are the cells of ecosystem functioning. Their identification, the understanding of their functioning, the detection of the links that connect them and the history of their evolution also linked to human use are a precondition to the management and protection of marine systems. In this framework the Mediterranean Sea is a small-scale replica of the global ocean: a gigantic macrocosm where global phenomena can be studied at ease.

References:

Boero F. 1994. Fluctuations and variations in coastal marine environments. P.S.Z.N.I: Marine Ecology 15 (1): 3-25.

Boero F. 1996. Episodic events: their relevance in ecology and evolution. P.S.Z.N.I: Marine Ecology 17: 237-250.

Boero F 2015 The future of the Mediterranean Sea ecosystem: towards a different tomorrow. Rendiconti Lincei 26: 3-12

Boero F, Belmonte G, Fanelli G, Piraino S, Rubino F. 1996. The continuity of living matter and the discontinuities of its constituents: do plankton and benthos really exist? Trends Ecol Evol 11 (4): 177-180.

Boero F, AC Kraberg, G Krause, KH Wiltshire 2014. Time is an affliction: why ecology cannot be as predictive ad physics and why it needs time series. Journal of Sea Research DOI: 10.1016/j.seares.2014.07.008

Britten GL, Dowd M, Minto C, Ferretti F, Boero F, Lotze HK 2014. Predator decline leatd to decreased stability in a coastal fish community. Ecology Letters 17: 1518-1525

Canepa A, Fuentes V, Sabatés A, Piraino S, Boero F, Gili JM 2014. Pelagia noctiluca in the Mediterranean Sea. in: KA Pitt and CH Lucas (eds) Jellyfish Blooms. Springer Science + Business Media Dordrecht, 237-266

Della Tommasa L, Belmonte G, Palanques A, Puig P, Boero F. 2000. Resting stages in a submarine canyon: a component of shallow-deep-sea coupling? Hydrobiologia 440: 249-260.

Marcus N, Boero F. 1998. Production and plankton community dynamics in coastal aquatic systems: the importance of benthic-pelagic coupling and the forgotten role of life cycles. Limnol. Oceanogr. 43 (5): 763-768.

Rivetti I, Fraschetti S, Lionello P, Zambianchi E, Boero F. 2014. Global warming and mass mortalities of benthic invertebrates in the Mediterranean Sea. PLoS ONE 9(12): e115655. doi:10.1371/journal.pone.0115655