

along the gradient. The communities transferred upstream did not recover a pristine structure but the increase in diversity, associated with the settlement of sensitive species, suggested elevated resilience potential.

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#### A POLYCHAETE METACOMMUNITY IN A MEDITERRANEAN ECOSYSTEM: WHICH THEORY CAN EXPLAIN THE OBSERVED PATTERNS IN THE GULF OF LIONS?

Community assemblages of polychaetes were determined after sampling of 92 sites along the Gulf of Lions in September-October 1998 at different depths and on different substrates (mud, sand and mud mix, sand). These data allowed us to investigate marine metacommunity patterns in a Mediterranean environment characterized by low densities associated to a high biodiversity. Polychaete densities were used to test two theoretical distribution models: the neutral vs the species sorting models. Neutrality assumes that species have identical properties and community structure only emerges from dispersal processes. Species sorting is based on niche differences as a condition for the coexistence between species; hence local abiotic and biotic conditions determine the community composition. It results in differences in the distribution of species abundances within the metacommunity. We modeled the niche aspects using a structured population model that we developed for marine metacommunities, based on differential growth among species and competitive interactions. We assessed if this model may yield the observed species abundance distributions, and if this match is better than the one obtained using the neutral metacommunity model.

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#### THE MICROBIAL MEMBRANE META-PROTEOME REVEALS DIVERSE PATTERNS OF PROTEIN EXPRESSION IN THE SOUTH ATLANTIC OCEAN

Although marine community and isolate DNA sequencing studies have rapidly expanded the known world of sequence diversity, very little is known about the expression of corresponding gene products in nature. Here we identified strong patterns of protein expression along vertical and horizontal gradients in the South Atlantic Ocean. Membrane proteins were extracted from the <0.8 µm fraction of eighteen South Atlantic gyre and coastal seawater samples, then proteolyzed and analyzed by LC-MS/MS on a linear ion trap-Orbitrap mass spectrometer. Resulting tandem mass spectra were interrogated against Global Ocean Survey (GOS) and microbial protein databases available through the CAMERA web site. Our data verified the ubiquitous expression of bacteriorhodopsin in surface waters (n = 10), archaeal ammonia monooxygenase expression in coastal surface and 150m gyre samples, and the expression of putative iron, nitrogen, and phosphate transport proteins. Community structural analysis of protein variability in the South Atlantic membrane meta-proteome supports known patterns in community structure. We are currently constructing 16S rDNA clone libraries to explore links between spatial variability in protein expression and community composition.

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#### SUBMERSIBLE HYDRO-OPTICAL APPLICATIONS FOR LIGHT - LIMITED OCEANOGRAPHY (SHALLO)

Better atmospheric correction of ocean color data requires a combination of oceanographic and atmospheric research approaches. To meet the needs of researchers interested in coastal AOP measurements and to obtain relevant atmospheric data, Biospherical Instruments has produced a new series of radiometers specifically designed to deploy in shallow waters. Developed with funding from NASA SBIR, microradiometer-based SHALLO systems combine features necessary to obtain AOP vertical profiles in just a few meters of depth (rapid sampling, slow free-fall descent), with sensors for global surface irradiance with shadow-band capability and GPS, all in one integrated system. In situ optical measurements are collected using C-OPS, (Compact Optical Profiling System). Only 7 cm in diameter, C-OPS measures 19-wavebands of downward irradiance and either upwelling radiance or irradiance. The radiometrically matching surface reference sensor provides simultaneous measurements of incident irradiance. The shadow-band accessory provides atmospheric measurements of direct/global and direct-normal irradiance and aerosol loading (Langley technique). Profiles were collected from San Diego Bay (3 m) using freefall profiling techniques with speeds less than 10 cm/s and vertical resolutions of less than 1 cm.

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 PHOSPHORUS UPTAKE BY FILAMENTOUS FRESHWATER ALGAE

Oligotrophic lakes that become more nutrient rich often experience enhanced growth of filamentous algae which may threaten the inherent isoeutic vegetation. In this study we developed an assay for studying the uptake of  $H_3^{32}PO_4^{3-}$  by filamentous green algae. The results could be fitted to the Michaelis-Menten enzyme kinetic model. The studied algae from oligotrophic lakes were *Oedogonium* sp. and *Spirogyra* spp. which showed  $V_{max}$  values of ~440 and 710 µg P gDW<sup>-1</sup> h<sup>-1</sup> and  $K_m$  values of 100 and 50 µg P l<sup>-1</sup>, respectively. Preincubations of *Oedogonium* for 14 days at only 5 µg P l<sup>-1</sup> decreased the  $K_m$  value to ~70 µg P l<sup>-1</sup>, whereas  $V_{max}$  was unchanged. A comparison with *Cladophora* sp. from a eutrophic lake showed both lower  $V_{max}$  and  $K_m$  values of 5.4 µg P gDW<sup>-1</sup> h<sup>-1</sup> and 41 µg P l<sup>-1</sup>. On basis of algal P concentrations it seems that *Cladophora* was nitrogen limited while *Oedogonium* and *Spirogyra* were phosphorus limited. These findings imply that if the phosphate concentration in oligo- to mesotrophic lakes can be lowered, growth of filamentous algae may be reduced accordingly.

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#### THE INFLUENCE OF LIGHT INTENSITY ON THE TRANSLOCATION OF FATTY ACIDS IN A ZOOXANTHELLAE / JELLYFISH SYMBIOSIS

The influence of light intensity on the translocation of fatty acids between zooxanthellae and tissues of the scyphozoan jellyfish *Cassiopea* sp was investigated by exposing jellyfish to 3 different light intensities (5%, 23% and 100% Photosynthetic Active Radiation: PAR) for 69 days. The jellyfish photo-adapted to the different light intensities (concentrations of zooxanthellae increased in the 100% PAR treatment, remained constant in the 23% PAR treatment and decreased in the 5% PAR treatments). Multivariate analyses indicated that the composition of fatty acids in the host tissues remained similar in the 100% and 23% PAR treatments but differed in the 5% treatment. The composition of fatty acids in the zooxanthellae remained similar only in the 100% treatment. Differences in the fatty acid compositions were largely driven by changes in the dinoflagellate markers 18:2ω6 and 18:4ω3. During the experiment, concentrations of both these fatty acids in the zooxanthellae decreased and concentrations in the host tissues increased in the 5% PAR treatment. These results indicate that light intensity and photosynthetic rates can influence the translocation of fatty acids between zooxanthellae and their hosts.

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#### CIESM TROPICALIZATION PROGRAM – TRACKING CHANGES IN MEDITERRANEAN MARINE BIODIVERSITY

In the Mediterranean Sea, which hosts some of the highest species endemism in the world, biodiversity changes are occurring at unprecedented rates. Investigating such changes is thus a matter of urgency. The expansion of exotic and native thermophilic species, to the detriment of those of boreal affinity, is currently observed along with warming of Mediterranean waters. This process of Mediterranean "tropicalization" remains poorly understood, based on occasional, usually local observations. The new CIESM Tropicalization Program aims at using key biological macrodescriptors of change to map and quantify the effects of tropicalization across the Mediterranean Sea. Leading experts in marine taxonomy, biogeography and climate change from 16 riparian countries are examining historic and current information on Mediterranean marine fauna and flora to identify species that have undergone significant changes in their geographic range of distribution and abundance. The project will develop a basin-scale, long-term monitoring network to detect the expansion/ retreat of these species in response to climate. An overview of biogeographic changes already detected in the Basin is presented, and implications for conservation of Mediterranean marine biodiversity discussed.

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#### DISSOLVED AND PARTICULATE ALGAL AND NON-ALGAL MATTER DISTRIBUTION RELATED TO HYDROGRAPHY IN SANTOS BAY (BRAZIL)

Recent reports have shown an increase in abundance of potentially toxic dinoflagellates in Santos Bay (Southeastern Brazilian Coast) that composes an estuarine complex influenced by domestic and industrial sewage. During 2006 and 2007, 8 surveys were conducted during spring and neap tides to establish relationships between phytoplankton