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GROWTH AND ULTRASTRUCTURAL CHANGES IN *DICTYOSPHAERIUM PULCHELLUM* EXPOSED TO COPPER (CHLOROCOC-CALES, CHLOROPHYCEAE)

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In an assay addressing the toxicity of copper to *Dictyosphaerium pulchellum*, a 48 hours' exposure of axenic cultures of the alga to metal concentrations ranging from 0 to 300 mg L⁻¹ caused a significant decrease in the growth rate and cell chlorophyll content. Extracellular mucilage removal by controlled sonication before exposure to copper emphasized chlorophyll content reduction, but not cellular density diminution. Because mucilage acts as a cation interchanger, these results suggested that, during at least the first 48 hours, division rates might be affected by lower Cu⁺² concentrations than chlorophyll content. Ultrastructural observations showed that the normal organization of the chloroplasts was altered; they presented dilated lamellae, irregularly arranged with practically no stacking. Copper precipitates were mainly observed outside the plasmalemma or within the extracellular mucilage. Electron probe microanalysis confirmed these observations, showing only minor precipitates inside the cells.

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TEMPORAL AND SPATIAL PRODUCTION OF AGGLUTININS IN MARINE MACROALGAE FROM THE MEXICAN CARIBBEAN

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The presence or absence of secondary metabolites in algae has been long discussed. There are several hypotheses to explain the synthesis of secondary metabolites in algae as a response to herbivory pressure, competence or predation. In this work we made a screening test of chlorophyte and rhodophyte species collected in different sites of the Caribbean sea in order to test them for agglutinins. The extracts were prepared in a phosphate buffer solution 100-mM, pH 7.2 and filtered using 0.22 µm Millipore filters. Agglutination tests were done in microtiter-plates using for-

malinized rabbit and human A, O, B erythrocytes. Agglutination titer was recorded and expressed as the reciprocal of the highest dilution showing positive results. A total of 31 samples were analyzed; seven Chlorophyta species and 11 Rhodophyta showed agglutinating activity. The species that showed activity variation included the chlorophytes, *Caulerpa cupressoides*, *Caulerpa paspaloides*, *Halimeda opuntia* and *Penicillus capitatus* and the rhodophytes, *Chondria litoralis*, *Digenea simplex*, *Gracilaria cornea* and *Laurencia obtusa*. The agglutinating activity of *Liagora farinosa* is reported for the first time. This research indicates that ecological pressures are an important factor in seaweeds agglutinins synthesis.

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GRAPPLING WITH CONFLICT AMONG INFORMATION SOURCES IN RECONSTRUCTION OF THE EARLY EVOLUTION OF LAND PLANTS

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Although a close relationship between embryophytes (land plants) and charophycean green algae has been discussed for over a hundred years, the precise nature of this relationship remains uncertain. This is largely because of difficulty reconstructing the phylogeny of the basal members of this group. Recent analyses of SSU rDNA, *rbcL*, and concatenated chloroplast genes have all produced different phylogenies, and none is fully compatible with morphological data. Noteworthy conflict is apparent in the positions of the unicellular flagellate *Mesostigma* and the filamentous epiphyte *Chaetosphaeridium*. Several phenomena could result in such incongruence, including problems with the underlying data (taxon ID, sequence determination, alignment, etc.), choice of analytical method, lack of resolution with one or more of the datasets, unrecognized paralogy, and horizontal gene transfer. We have examined each of these possible sources of incongruence, and have determined that several factors underlie the apparent conflict among phylogenies. When these factors are taken into account a consensus molecular phylogeny begins to emerge. Despite the long divergence time in question, the prospects for reconstruction of land plant phylogeny are good.

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EFFECT OF NITROGEN ADDITION ON A MIXED SPECIES PHYTOPLANKTON BLOOM

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The Laguna Madre of Texas is a hypersaline lagoon that in recent years has been dominated by the brown tide alga, *Aureoumbra lagunensis* although a *Synechococcus*-like sub-dominant is typically present. Dominance of *A. lagunensis* is thought to be due at least in part to its nitrogen competitive abilities. A mesocosm study was performed to determine if an increase in ambient nitrogen concentration would lead to a shift in the dominant alga. Twelve fiberglass cylinders enclosing 1.2 cubic meters of Laguna Madre water were deployed for 16 days. Four times during this period, ammonium was added (N+ mesocosms) to half the mesocosms to achieve a post-addition concentration of approximately 40 mM. The average initial particulate N/P ratio was 40/1 (SD = 2.9) which recent evidence indicates is within the range of N/P ratios for N-limited *A. lagunensis*. In control mesocosms, total cell biovolume (TCB) of *A. lagunensis* cells dropped after 4 days by a factor of four and then increased to a level slightly above the day 0 value by day 16. In N+ mesocosms, *A. lagunensis* TCB was unchanged after 4 days then doubled by day 16. Despite the differences in final yield, growth rates of *A. lagunensis* in the two treatments were similar. The *Synechococcus*-like organism, showed a four-day lag before TCB in both treatments increased although at a slower rate in the control mesocosms. By the end of the experiment, TCB of *A. lagunensis* was two to six-times greater than that of sub-dominant. Despite the nitrogen treatment, *A. lagunensis* retained dominance.

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PHYTOPLANKTON COMMUNITY STRUCTURE: TEMPORAL VARIABILITY IN A TROPICAL UPWELLING ECOSYSTEM

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The Cariaco Basin (Southeastern Caribbean Sea) is the largest anoxic basin of oceanic character. Its sur-

face waters are affected by coastal upwelling during boreal winter and spring. Historical information on the phytoplankton communities in the basin is scarce. In November 1995, an oceanographic time-series station was established at 10.5°N - 64.66°W. In this study changes in the structure of the phytoplankton community in the upper 100-m layer were studied. Monthly samples to determine phytoplankton abundance and pigment composition (HPLC) were collected from November 1995 to January 1999; water temperature was used as proxy for upwelling. Surface waters reached temperatures $\leq 24^\circ$ C during the upwelling season, and surpassed 26° C during the rest of the year. A total of 300 species were found. Generally, the highest number of cells (>500 cells ml⁻¹) were measured from January to April every year. Diatoms were the dominant group in terms of abundance, species composition (168 species) and pigments (Chl *c* and fucoxanthin) during this period. The abundance and marker pigment concentration (peridinin, but- and hex-fucoxanthin) for other groups support this observation. During the rest of the year diatom and total abundance decreased markedly (<100 cells ml⁻¹). Small organisms (<5 μ m) became dominant. The maximum concentration values of zeaxanthin and But- and Hex-Fuco in this period indicated the presence of cyanobacteria and prymnesiophytes. The sparse and relatively low concentration of Chl *b*, lutein and prasinoxanthin indicated that chlorophytes and its allies are a minor floral component.

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ADVANCES IN A MONOGRAPH OF THE GENUS *GRACILARIA* (RHODOPHYTA) IN THE MEXICAN ATLANTIC

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Some species of the genus *Gracilaria* Greville (Gracilariales, Rhodophyta) are the main source of agar. For that reason, the taxonomic study of the taxon has become relevant for many scholars. In order to bring the Mexican floristics knowledge of the genus into the state-of-the-art about it, we have initiated the needed monography. The character definition has proved to be the most important task. We have found that the most reliable characters for the species delimitation are: general form of the thallus, length and width; form of the axes, length and width; branching pattern; number of axes from the holdfast; form of the holdfast; presence of constrictions at the base of the branches or not; color; length of the segments; consistency; form of the apices; length and thickness of the stipes; surface texture of the