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The Cellular Model of Eastern Oyster (Grassostrea Virginica) Shell Formation

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throughout Georges Bank and Mid-Atlantic. We examined each of these variables and their interactions to highlight possible causes of growth rate differences. Tag-recapture experiments in each area provided shell growth increments over time and were used to calculate instantaneous growth rates. Scallop population densities were estimated using underwater video quadrat counts at each location during the tagging experiments and on a larger spatial scale from the yearly SMAST video survey. Substrate type for each study area was also classified from the video surveys. Remote sensing (SeaWiFS) of Chlorophyll-a levels were used as a proxy for available phytoplankton, while shear stress, bottom temperature, and depth data were derived from the Finite-Volume Coastal Ocean Model (FVCOM). This work aims to advance scallop ecology by explaining the relationships between scallop growth, density and environmental conditions, which will improve rotational management.

THE PROMISE OF FOULING DETERRENCE AS A NATURAL MARINE ANTIFOULING STRATEGY

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Marine biofouling is the unwanted accumulation of bacteria, algae, plants and marine animals on submerged structures including ships. Unfortunately, man's attempts to develop effective antifouling coatings have had deleterious effects on marine life and a less toxic deterrent to cuprous oxide based paints is needed. Larval marine invertebrates have highly developed sensory organs which investigate surfaces prior to settlement, attachment and metamorphosis. We investigated this tactile chemical sense as a potential natural antifouling strategy by covalently linking the neuroendocrine hormone noradrenaline (NA) to poly-hydroxyethylmethacrylate and to poly-methacrylic acid polymer surfaces. NA was selected since it is well established that the soluble form it inhibits larval settlement in molluscs, barnacles, bryozoans and annelid tube worms, all of which are major macrofoulers. The NA conjugate polymer surfaces induced oyster cellular apoptosis when compared to negative controls and also deter the settlement of barnacle and oyster larvae. Fouling deterrence is a promising strategy in that only treated surfaces would deter biofouling thus eliminating the need to release of any toxic substances into the world's oceans.

THE CELLULAR MODEL OF EASTERN OYSTER (*CRASSOSTREA VIRGINICA*) SHELL FORMATION

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Nanocrystalline ceramics evolved from refractive (REF) cells over a billion years ago. We first discovered oyster REF cells in 2004. These cells produce calcite crystals by intracellular means and deliver them to the mineralization front. Subsequently, we have found that oyster cells enable simultaneous production and self-organization of organic and mineralized phases resulting in the extraordinarily strong nanocrystalline ceramic that forms the multi-lamellar shell. Cellular driven mineralization events include; mantle forms primary membrane for adherent hemocytes these cells adhere, aggregate, and organize the membrane by secreting a paracellular macromolecular complex (PMC); crystalline assemblies are formed either within cell masses or by individual cells; the mantle also organizes prismatic layer through organic wall secretions, vesicular bound calcium to augment mineralization is cellularly supplied and finally, a capping membrane also of vesicular origin terminates mineralization. The *transformative aspects* of this research are: a new understanding of molluscan shell formation from a cellular biology perspective which will further our understanding of the impact of ocean acidification on molluscs that inhabit estuarine, littoral and oceanic zones of the world ocean.

LONGTERM TRENDS IN PACIFIC OYSTER (*CRASSOSTREA GIGAS*) LARVAL ABUNDANCE AND RECRUITMENT IN PENDRELL SOUND, BRITISH COLUMBIA, CANADA.

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Pendrell Sound is an important area for the British Columbia shellfish industry; its unique geography and oceanography enables successful annual breeding of Pacific oysters (*Crassostrea gigas*) which can be utilized for seeding oyster farms. In 1959, the DFO