

# ABSTRACT BOOK



# CERF 2013

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TOWARD RESILIENT COASTS AND ESTUARIES,  
SCIENCE FOR SUSTAINABLE SOLUTIONS

3-7 NOVEMBER 2013 • SAN DIEGO, CALIFORNIA, USA  
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**Please note:** This book includes all of the CERF 2013 abstracts as of September 25, 2013. Program changes after that date are not reflected in this book. Abstracts are listed in alphabetical order by the first author's last name. The index in the back of the book provides an alphabetical listing of all authors and the page number of their respective abstracts.

specifically to support aquatic microbial research. Since 1999 over 300 FlowCAMs in over 40 countries have been put to use for the purpose of the study and monitoring of microorganisms in both fresh and marine systems. Building upon advances in technology, input from the user community, and expanded resources, engineers at Fluid Imaging Technologies, manufacturer of the FlowCAM, have transformed the FlowCAM of 1999, and now build an instrument that is vastly improved when compared to the first unit built. We present here a brief evolution of the FlowCAM, focusing on the current state of technology of the instrument. Data from various applications will be discussed, along with a candid assessment of strengths and limitations of the instrument.

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#### SEAGRASS PHOTO-PHYSIOLOGICAL RESPONSES IN A NATURAL HIGH-CO<sub>2</sub> ENVIRONMENT

The atmospheric concentration of CO<sub>2</sub> has been steeply increasing over the last 200 years, with an associated increase of total dissolved inorganic carbon (Ci) and a decrease of the oceans' pH. Seagrasses are among the most productive marine ecosystems, but yet little is known on the effects of high-CO<sub>2</sub>/low pH on their photosynthetic physiology and the ecological consequences. Marine CO<sub>2</sub> seepage areas have been used as natural laboratories to investigate the performance of marine organisms under long-term exposure to high-CO<sub>2</sub> levels that mimic the future ocean. In this work we conducted a series of experiments comparing the photophysiology of the seagrasses *Posidonia oceanica* and *Cymodocea nodosa*, growing in the vicinity of submarine CO<sub>2</sub> vents around the islands of Vulcano and Panarea (Aeolian Archipelago, Southern Tyrrhenian Sea, Italy). Plants growing close to CO<sub>2</sub>-seepage sites were compared with plants from control sites. Automated chlorophyll fluorometers were deployed for 24-hour periods to examine the changes in photosynthetic efficiency and energy quenching mechanisms. Samples were collected at predawn and noon and analyzed for pigment composition, antioxidant capacity, and soluble carbohydrates. Differences in gene and protein expression were evaluated as a function of Ci levels. Stable carbon isotopes ( $\delta^{13}C$ ) were also analysed to investigate the contribution of volcanic CO<sub>2</sub> to seagrass productivity. Both *P. oceanica* and *C. nodosa* plants growing in CO<sub>2</sub>-seepage sites showed lower allocation of PSII-absorbed energy to photochemistry ( $\Phi_{II}$ ), while presenting higher proportions of energy dissipation by non-photochemical pathways (down-regulation,  $\Phi_{NPQ}$  and other energy losses,  $\Phi_{NO}$ ). As well, diel photosynthesis-irradiance curves (ETR-I), built with data acquired over the 24-hour deployments, showed lower photosynthetic rates in plants from CO<sub>2</sub> seepage sites. This unexpected pattern of photosynthetic activity will be discussed in light of the complementary data.

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#### ECOLOGICAL AND BIOENERGETICS TRADE-OFFS OF JUVENILE SALMON REARING IN THE INTERMITTENT RUSSIAN RIVER ESTUARY, CALIFORNIA USA

Juvenile salmon occupying seasonally intermittent estuaries must accommodate conflicting trade-offs among potential limiting factors of food availability, bioenergetic growth conversion and environmental stress, which likely contributes to the plasticity of their growth and life history structure. Depending on the interannual variability of river flow, coastal wind regimes and local management pressures, juvenile sub-yearling steelhead, *Oncorhynchus mykiss*, and Chinook salmon, *O. tshawytscha*, rearing in the Russian River estuary face different frequencies and durations of estuary closure that influence habitat opportunity and the capacity of available prey to support growth. Shifts in estuary volume, water quality, stratification, and prey distribution and production provide potentially conflicting trade-offs for increased availability of euryhaline, oligohaline or tidal freshwater epibenthic prey more stressful environmental conditions. Sampling of juvenile salmon distribution, diet and prey availability in the summers of 2009-2011, while never during freshwater lagoon conditions, indicated that flooding of estuary margins potentially expanded carrying capacity by redistributing juvenile salmon and prey, and potentially expanding prey production, along the estuarine gradient. Bioenergetic modeling of potential *O. mykiss* growth under observed fish diet composition and temperatures over 10-29 d periods of estuary closure indicated that fish in the lower and possibly the middle reaches

of the estuary could be buffering stressful temperatures. However, differences between modeled and empirical growth (higher) suggested that different estuary reaches offered significantly different prey energetic values, consumption rates varied, or the fish could be taking advantage of lower temperature, somewhat hypoxic waters. Plasticity of juvenile salmon rearing patterns in intermittent estuaries like the Russian River could account for their surprising resilience and performance.

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#### MODEL SENSITIVITY AND ROBUSTNESS IN THE ESTIMATION OF LARVAL TRANSPORT

A popular method for predicting larval transport in estuaries and the coastal ocean is through the use of coupled ocean circulation and particle tracking models, termed "biophysical" models. This study investigates the sensitivity of larval transport predictions to three input parameters universally required for particle tracking in biophysical models; the number of particles released, the particle release depth, and the particle tracking time. Using a three-dimensional biophysical model of the Southern California Bight, estimates of larval transport are quantified using a two-dimensional vertically-integrated particle density distribution (PDD) and the difference between PDDs is assessed using the fraction of unexplained variance (FUV). Overall, our study shows that larval transport predictions are sensitive to changes in all three input parameters and that the parameters should be carefully selected in order to obtain robust estimates of larval transport. We also observed that the sensitivity scales with the strength of mixing in the system. For the number of particles released, the FUV falls off rapidly as the number of particles increases. A minimum number of particles is identified that guarantees robustness of model predictions; this number increases as the complexity of the circulation patterns increase. For the particle release depth, the FUV between PDDs grew linearly as particles are released farther apart. The FUV is also inversely proportional to the strength of vertical mixing as the FUV is smaller during the winter when a deep mixed layer and weak stratification are present than in the summer when the system is strongly stratified. For the particle tracking time, the FUV between daily PDDs is much larger for short tracking times of 15 days or less than for longer tracking times of 20 days or more, showing a dependence on the length of time the particles take to be evenly mixed throughout the system.

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#### MODELING BLUE CRAB (*CALLINECTES SAPIDUS*) GROWTH IN THE CHESAPEAKE BAY

The blue crab, *Callinectes sapidus*, supports one of the most important fisheries in the Chesapeake Bay. Managing a fishery requires a detailed understanding of the biology and population dynamics of the species involved. Mathematical modeling serves as a powerful tool in fisheries management by providing the ability to estimate population status and simulate potential management strategies before implementation. However, most present day applications in the Chesapeake Bay, due to a lack of understanding of blue crab growth, only use general estimates of growth rates. These approaches ignore several important aspects of blue crab growth and development such as the potential for growth rates to change over time, differences in growth rate by sex, and growth in discrete stages. Our objective was to develop a sex-specific discrete growth model for *C. sapidus* in the Chesapeake Bay. This study first adapts a previously developed, individual-based modeling approach and revises estimates of the parameters (growth per molt, molt frequency, and probability of maturation) using data from an annual winter dredge survey in the Patuxent River. We used a maximum likelihood function. Our model should provide a more reliable projection of blue crab growth in the Chesapeake, and the method could be easily adjusted and applied to different regions where blue crabs are present.

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#### INFLUENCE OF PROPAGULE FLOTATION AND LIGHT AVAILABILITY ON ESTABLISHMENT AND PRODUCTIVITY OF MANGROVES TRANSGRESSING POLEWARD

Global climate change events are driving the expansion of mangroves into salt marsh habitat along the Atlantic coast of Florida. The ability of mangroves to migrate poleward and displace salt marsh is due to a combination of factors, two of the main being the ability of propagules to float long distances and for seedlings to establish. To examine the differences