

the strongest expression of hypoxia and OA as coupled stressors from the mid-continental shelf to the surf-zone.

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#### SEDIMENT DYNAMICS AND THE DELAWARE ESTUARINE TURBIDITY MAXIMUM

This project aims to characterize and describe the along and cross-channel sediment dynamics in the middle reach of the Delaware estuary. Data was collected over the course of two years, including 4 cross-channel tidal surveys, several mooring arrays, and 8 along channel surveys spanning over 200 km up-channel from the mouth. Suspended sediment concentrations (SSC) from water samples were correlated with optical backscatter (OBS) point measurements and Acoustic Doppler Current Profiler (ADCP) backscatter signals. These correlations were used to describe the spatial and temporal distribution of sediment in the estuary. Sediment fluxes were then estimated using SSC and velocity data from the cross-channel tidal surveys and mooring arrays. Despite seasonal variability of the along-channel sediment distribution, the time variability of the cross-channel distribution seems to be driven mostly by the lateral dynamics. This analysis will determine whether the cross-channel sediment suspension and transport affect the along-channel sediment distribution. This has significant implications, as previous studies have shown sediment resuspension to affect the along-channel distribution of primary productivity by limiting the light availability.

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#### MOORED OBSERVATIONS OF TIDAL AND SPRING NEAP VARIATION IN STRATIFICATION AND EXCHANGE FLOW ACROSS SIX ESTUARIES

Over the past decade we have deployed arrays of Doppler Current meters and CT sensors in a number of estuarine systems. This includes the Hudson River Estuary, Newark Bay, The Passaic River, Raritan River, Delaware Bay and the James River. All of these deployments lasted 6-weeks or more and thus contained several spring neap cycles. In general all of these systems exhibited marked spring/neap variability in stratification while some show a strong spring neap variation in estuarine exchange flow. In contrast there was significant scatter in the tidal period variability in stratification across these systems with some (such as the Delaware Bay) showing enhanced stratification on the flood tide while other (such as the Passaic River) exhibiting enhanced stratification during the ebb tide. These data sets will be analyzed to relate the spring/neap variability in both estuarine exchange flow, vertical stratification and tidal period variability in salinity to the Horizontal Richardson Number (Simpson Number) and aspects of channel morphology.

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#### ENVIRONMENTAL TOLERANCES AND DRIVERS OF DEEPWATER SEAGRASS CHANGE - IMPLICATIONS AND TOOLS FOR COASTAL DEVELOPMENT MANAGEMENT

While research has focused on shallow water coastal seagrasses over the last 20 years, little is known of the ecological role, tolerances and drivers of their deepwater (>10) counterparts. Within the Great Barrier Reef World Heritage Area, deepwater seagrasses are estimated to occupy more than 35,000 km<sup>2</sup> of the reef lagoon. These deepwater meadows are often within the footprint of port and shipping activity where dredging, associated plumes and ship movements are major threats to their long term survival. We present initial findings from an ongoing research program to determine the drivers of seasonal and inter-annual change in deepwater tropical seagrasses. Seagrass abundance, seed bank status and recruitment, productivity, irradiance and temperature along with detailed spectral profiles have been measured in three geographically distinct deepwater seagrass meadows since early 2012. Manipulative lab experiments were initiated in mid-2013 to assess the adaptive photophysiological characteristics of the plants. This research will identify key environmental cues which will be used in developing local management strategies for mitigating coastal developmental impacts along the Great Barrier Reef.

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#### A COMMENT ON ENHANCING HORSESHOE CRAB (*TACHYPLEUS TRIDENTATUS*) POPULATION SIZE BY LARVAE REARING AND JUVENILE RELEASE IN TAIWAN

Horseshoe crabs (*Tachyplesus tridentatus*) is nearly local extinction in Taiwan. To enhance *T. tridentatus* population size, larvae rearing and releasing has been processed through years in Taiwan. The growth rates of larvae under laboratory rearing were various and most larvae died during its molting, despite the water quality controlled strictly. The diet prepared for 2nd instar larvae was mostly composed of *Artemia* spp larvae due to convenience. Such unitary food resource might cause nutrient deficiency on early instar larvae. So, we suggest to provide diverse food including macro-algae and seagrass for well nutrition. Since 1990s, tens of thousands of early instar larvae per year were released to coastal areas. Due to difficulty to mark or tag on horseshoe crab larvae, new scientific survey methods should be established to examine this releasing effects. Based on the high mortality rate in early instar larvae, we suggest to release 3rd or older instar larvae instead of early instar larvae. Since its weak locomotion ability and the necessity for hiding from predator, horseshoe crab larvae should be released in late afternoon on an intertidal wet flat beach during low tide. For long term conservation purpose, the optimal releasing location would be a unpolluted bay, where three types of habitats occur nearby: (1) spawning area, littoral zone with coarse sand, which facilitates oxygen penetrating for embryo development, (2) juvenile nursing ground, intertidal zone with fine sand and silt, providing organic matter as food and coverage for hiding, and (3) adult living area, where ca. 20 – 30 meter depth at the continental shelf. After a long run, the releasing site may be assigned as a protected area, for maintaining a stable horseshoe crab population.

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#### VARIATIONS OF PHYTOPLANKTON COMMUNITY IN SHENZHEN BAY, CHINA

Seasonal and interannual phytoplankton succession in Futian Mangrove Reserve of Shenzhen Bay was analyzed during the period 2008–2012. Total number of phytoplankton was composed of 158 taxa, belonging to 6 phyla, 7 classes and 53 genera. Among those, class Bacillariophyceae were 114 species (72.1%), Class Chlorophyceae were 23 species (14.5%), Class Dinophyceae were 8 species (5.1%), cyanophyceae were 6 species (3.8%), Euglenophyceae were 5 species (3.2%) and Cryptophyceae were 2 species (1.3%). Phytoplankton succession, with fall-winter diatom blooms and summer cyanobacterial blooms, was probably driver by changes in nutrients, water temperature and turbulence. Phytoplankton abundance in the investigated period showed the highest value as  $5.2 \times 10^7$  cells/L in 2009 and the lowest value as  $1.4 \times 10^5$  cells/L in 2008. Phytoplankton abundance in 2009 was highest in summer, fall and winter during this study, fluctuating between  $9.4 \times 10^6$  and  $5.2 \times 10^7$  cells/L, while that in 2012 was highest in spring with  $2.7 \times 10^6$  cells/L. It has shown a considerable decrease in spring phytoplankton abundance during 2008–2011, compared to that from the period 2001–2002. While summer phytoplankton abundance varied from  $1.1 \times 10^6$  and  $9.4 \times 10^6$  cells/L during 2008–2012, compared to that varied from  $3.0 \times 10^6$  and  $3.7 \times 10^6$  cells/L during 2001–2002. Keywords: Phytoplankton, diatom, Shenzhen Bay, succession Funded by the Natural Science Foundation of China under contract No: 41276100 and the Natural Science Foundation of Fujian Province of China under contract No: 2011J01279 Email: chencc@xmu.edu.cn

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#### BIOGEOCHEMICAL PROCESSES OF THE FORMATION OF HYPOXIA WATER OFF THE CHANGJIANG ESTUARY

Hypoxia zone at the Changjiang estuary is one of the largest coastal hypoxia zones in the world, but the understanding of distribution and formation mechanism of the hypoxia water is very preliminary. We have carried out five comprehensive summer cruises since 2006