Sea Grant
Texas

9th Annual Sea Grant Researcher Conference

October 7, 2010
8:00 a.m. to 4:15 p.m.

October 8, 2010
8:30 a.m. to 12:00 p.m.

University of Texas
Marine Science Institute, Visitor Center Auditorium
750 Channelview Drive
Port Aransas, TX

The conference speakers will be researchers and Sea Grant extension personnel who are currently supported by the Texas Sea Grant College Program. Results of ongoing research will be presented in a public forum. Faculty, staff and students with interests in marine science from universities throughout the state, as well as other interested parties are welcome to attend. A list of speakers and subject areas is attached.

For additional information, contact Peggy Foster at 979/845-1245 or at pfoster@tamu.edu

TAMU-SG-10-113 September 2010 60 NA10OAR4170099 C/A/F-1

Tour of the Floating Classroom Program vessel *Karma*

Russell Miget

Sea Grant Extension Service, NRC=2800-Unit 5840, 63 Ocean Drive, Corpus Christi, TX 78412, russ.miget@tamucc.edu

Texas Sea Grant, along with Texas AgriLife Extension, operate a 57 foot converted shrimp trawler, *Karma*, as part of its Floating Classroom Program. During two hour excursions into Corpus Christi Bay, students in grades 4-12 participate in collecting and observing marine life from microscopic plankton to adult fish, crabs and shrimp. Through hands-on demonstrations students also are introduced to the differences in marine vs. terrestrial food webs as well as concepts such as salinity, density and heat capacity. "Opportunistic" learning occurs as students observe dolphins, pelicans and ocean-going ships crossing the bay. This tour will introduce participants to a variety of "activities aboard the *Karma*."

Agenda

October 7, 2010

8:00	*Introductions and Purpose of Meeting* by **Robert Stickney**
8:15	**Deana Erdner** – "Genetic Analysis of Nitrogen Limitation in the Texas brown tide alga, *Aureoumbra lagunensis*"
8:45	**Josh Wilkenfeld/Tzachi Samocha** – "Advances in Broodstock Grow Out, Maturation, and Reproduction of the Northern White Shrimp, *Litopenaeus setiferus*, at the AgriLife Research Mariculture Laboratory, Corpus Christi, Texas"
9:15	**Del Gatlin** – "Development of Aquafeeds for Red Drum and Shrimp using Seafood-Processing Wastes"
9:45	*Break*
10:00	**Granvil Treece** – "The Annual Texas Sea Grant Marine Shrimp and Marine Finfish Culture Short Course"
10:30	**Jae-Young Ko** – "A Comparative Study of Money-and Energy-Based Valuations of Ecosystem Services for Improving Water Quality in Armand Bayou, Galveston Bay"
11:00	**Dewayne Hollin** – "Safety & Survival Training for Commercial Fishermen Using a Drill Conductor Program"
11:30	**Troy Holcombe** – "Bathymetry of the Northwestern Gulf of Mexico from the Continental Shelf to the Mexico Basin"
12:00	*Lunch Break (Researchers and Sea Grant Personnel) UTMSI Cafeteria*
1:30	**Antonietta Quigg** – "Influence of Nutrient Load on Phytoplankton Communities in Galveston Bay"
2:00	**Julie Massey** – "Galveston Bay Area Master Naturalists - Volunteers Implementing the Galveston Bay Plan"
2:30	**Kerry Whilden** – "Field Measurement of Exchange Flows for the Corpus Christi Ship Channel"
3:00	**Gary Graham/Mike Haby** – "Introduction and Evaluation of More Fuel Efficient Cambered Doors, Netting, and Propellers to the Gulf Shrimp Fishery"
3:45	**Melanie Khanh Phuong Truong** – "Laboratory Experiments on Flows Through Created Coastal Wetlands"
4:15	*Adjourn*

Agenda

October 8, 2010

8:30 **Logan Respess** – "The John A. Knauss Marine Policy Fellowship State Onboarding for National Success"

9:00 **Jonathan Gain** – "Prevalence of *Hematodinium* in *Callinectes sapidus* in the Corpus Christi and Aransas Bay Systems"

9:30 **Rhonda Cummins** – "Simply Messing About in Boats"

10:00 **Terrie Looney** – "Camp SeaPort"

10:30 **Patrick Larkin** – "Development of DNA Microsatellite Markers for the Seagrass *Halodule wrightii*"

11:00 **Russ Miget** – "Tour of the Floating Classroom Program vessel Karma"

12:00 *Adjourn*

Camp SeaPort

Terrie Looney

Sea Grant Extension Service, 1225 Pearl Street, Suite 200, Beaumont, TX, tslooney@ag.tamu.edu

The Port of Port Arthur began a small day camp for students in the Pt. Arthur area as a public service/ awareness for local youth in 2008 and 2009. Looney and Cummins-CEA-CMRs assisted with the planning and program for 2009. The Port asked that program development and planning be led by Texas Sea Grant Extension in 2010.

The five day program seeks to educate local youth about the maritime industry and potential jobs available. Local maritime workers share their career paths and job responsibilities. 15 students experience boat and river tours with groups such as the Sabine Pilots Association and US Coast Guard. They leave with an understanding of the economic impact of the Port to the local community as well as the knowledge that good paying jobs are available in their own back yard.

Development of DNA Microsatellite Markers for the Seagrass *Halodule wrightii*

Patrick D. Larkin

Dept. of Physical & Environmental Sciences, Texas A&M University – Corpus Christi, 6300 Ocean Drive, Corpus Christi, TX78412, patrick.larkin@tamucc.edu

Genetic variation is increasingly recognized as an important component of species management and conservation. A lack of genetic variation can lead to inbreeding and a loss of evolutionary potential. Estimates of genetic variation typically rely upon polymorphism in genomic, mitochondrial or plastid DNA. We are developing a set of polymorphic markers based on microsatellite sequences from the seagrass *Halodule wrightii* (Ascherson), the dominant seagrass in Redfish Bay and the Upper Laguna Madre. Microsatellites are small (2-6 nucleotide), repetitive, tandemly arranged sequences found in the genomes of most species. They are the marker of choice for population genetic analysis due to their relative abundance, high degree of polymorphism, and ability to distinguish homozygotes from heterozygotes. While a number of markers appear fixed for one allele in *H.wrightii* others show abundant polymorphism, especially in populations from the Laguna Madre.

the prevalence of *Hematodinium* in blue crabs in two bay systems on the central Texas coast. Blue crabs were sampled using various techniques four to six times per month July-November 2009 and March-August 2010. Overall catch-per-unit-effort was extremely low during the first set of sampling events, presumably due to a year-long drought and the presence of red tide. To date, 32 crabs out of a total 348 were infected with the parasite. Salinities at the sampling sites ranged from 0.42 to 45, with a majority of infected individuals being found in the lower end of the salinity gradient. *Hematodinium* does not appear to be the leading cause for blue crab decline; however, it may be one of many compounding factors that are contributing to low populations. It is possible that recent environmental stressors have fragmented blue crab populations, making it difficult for the parasite to spread.

Simply Messing About in Boats

Rhonda Cummins

Sea Grant Extension Service, 186 County Rd 101, Suite 1, Port Lavaca, TX, rdcummins@ag.tamu.edu

Whether on the river bank, along the gulf coast, or any other body of water boats can make the difference in our lives. The 1908 children's classic "The Wind in the Willows" by Kenneth Grahame says it best when Rat explains to Mole "Believe me, my young friend, there is NOTHING--absolute nothing--half so much worth doing as simply messing about in boats… simply messing about in boats--or WITH boats". An avid sailor, Agent Cummins in Calhoun County is sharing her love and knowledge of all things nautical to help address community identified issues for youth and families. Calhoun County has over 500 linear miles of coastline and covers approximately 519 square miles of water within the Matagorda and San Antonio Bay systems. Still rural and relatively undiscovered, the county's population will increase as more people move to the Texas coast and as more people acquire vacation homes in the area. Cummins is developing unique programs to meet educational and outreach goals to help the coastal community's residents understand their impact on the estuary. Important elements include integrating critical thinking and math skills with boatbuilding; introducing relevant literature; teaching boater safety and environmental awareness from the water level; developing community partnerships; reaching new audiences and involving new volunteers.

Genetic Analysis of Nitrogen Limitation in the Texas brown tide alga, *Aureoumbra lagunensis*

Marco Agostoni and Deana Erdner

University of Texas Marine Science Institute, 750 Channel View, Port Aransas, TX , derdner@mail.utexas.edu

The initiation, persistence, and termination of harmful algal blooms (HABs) can all be influenced by nutrient availability. Recent studies have highlighted the role of both organic and inorganic nitrogen sources in HAB dynamics. The pelagophyte *Aureoumbra lagunensis* causes ecosystem disruptive algal blooms and is responsible for the longest recorded harmful algal bloom (1989-1997). Because of *Aureoumbra's* small size and its inability to use nitrate, it has been hypothesized that its ability to use ammonium and organic nitrogen, especially at low concentrations, contributed to the unusual persistence of this bloom. This project aimed to assess the response of *Aureoumbra* to inorganic and organic nitrogen sources by examining the expression of genes responsible for nitrogen assimilation, with an eventual intent of developing expression assays that are indicative of nitrogen source use and/or sufficiency in *Aureoumbra*. Large volume batch cultures of *Aureoumbra* were grown with either ammonium or urea as a nitrogen source. Physiological characteristics (C:N, chlorophyll *a* cell-^{1}, and F_v/F_m) were monitored throughout the growth period, and the expression of the *AMT-1, AMT-2* and *UREC* genes was assayed at early-, mid- and late-exponential phases. The results show that *Aureoumbra* can use both ammonium and urea, and that it is well adapted to low-nutrient environments. The transcript levels of only one gene, *AMT-^{1}*, varied in response to changing nitrogen concentration, and only to ammonium. The results of this study contribute to our understanding of how algae in general cope with low nutrient availability and should ultimately help to define the dynamics of these HAB events.

Advances in Broodstock Grow Out, Maturation, and Reproduction of the Northern White Shrimp, *Litopenaeus setiferus*, at the AgriLife Research Mariculture Laboratory, Corpus Christi, Texas

Joshua S. Wilkenfeld and Tzachi M. Samocha

Texas AgriLIFE Research, AgriLIFE Research Mariculture Laboratory, 4301Waldron Rd, Corpus Christi, TX 78418, josh.wilkenfeld@gmail.com, t-samocha@tamu.edu

A multi-state effort supported by the National Sea Grant College Program followed by additional funding from the Texas Sea Grant Office resulted in achieving significant progress towards the possible development of a sustainable live bait shrimp farming industry in the southeastern states of the USA and along the Gulf Coast.

A high density (785 and 650 PL/m^3) live bait shrimp production study was conducted in two EPDM-lined greenhouse-enclosed raceways (RWs) inoculated with water previously used in a 62-day nursery trial, and stocked with fifteen to twenty-day old *L. setiferus* postlarvae. Another trial was done at a lower density (40/m^3) in 7 m^3 tank under a shade to study the effect of stocking density on growth. After about 140 days the mean weight of the shrimp in the lower density was 9.7 g while the average weight of the shrimp at the high densities was 3.8 g and 4.6 g for the RWs stocked at 650 and 785 PL/m^3, respectively.

Other research focused on the development of the viral-pathogen-free breeding populations of this species. Three cohorts of F4 generation PL were produced at the facility during 2009. In December 2009 and early January of 2010, approximately 300 shrimp from each of these cohorts were brought indoors for growout to broodstock size for the 2010 PL production cycle. The shrimp were stocked in three 3.7 m diameter maturation tanks (29/m^2) in a temperature-controlled, closed recirculating, biosecure system.

Beginning average weights at the start of the indoor phase were 10.8 g, 7.0 g, and 6.5 g, for Cohorts 1, 2, and 3, respectively. After about 171 days of grow-out that included three cullings, the populations had been reduced to about 120/cohort (11/m^2), and the shrimp had reached average weights of 28.4 g, 26.0 g, and 25.4 g for the three cohorts, respectively. Females averaged, 30.7 g, 27.5 g, and 29.1 g in the three cohorts at the time of ablation. To avoid sibling crosses, only males and females of different cohorts were allowed to mate.

Unlike the experience of 2009, no male-related mating or fertility problems were encountered during the production of the F5 VPF generation in 2010. All spawns were achieved through natural mating, without the use of artificial insemination. Key improvements in performance criteria from 2009 to 2010 were observed, including: 1) increase in the percent of mated females per day from 0.43% to 2.5%, 2) increase of hatching rate from 14% to 46%, and 3) increase of nauplii per fertile spawn from 13,000 to 24,000.

A grow-out production cycle of the F5 generation is currently under way using the same super-intensive, biosecure, zero-exchange management developed at the AgriLife Research Laboratory for commercial production of the non-native Pacific White Shrimp, *L. vannamei*.

Development of Aquafeeds for Red Drum and Shrimp using Seafood-Processing Wastes

Delbert Gatlin III[1], Alejandro Buentello[1], Mian Riaz[2], William Neill[1], Susmita Patnaik[3] and Addison Lawrence[1,3]

[1]Department of Wildlife and Fisheries Sciences, Texas A&M University System College Station, Texas 77843-2258
[2]Food Protein R&D Center, Texas Engineering Experiment Station, College Station, TX 77843-2476
[3]Shrimp Mariculture Project, Texas AgriLife Research, 1300 Port Street, Port Aransas, TX 78373

The John A. Knauss Marine Policy Fellowship State Onboarding for National Success

J. Logan Respess

Texas Sea Grant Extension Service, 2700 Earl Rudder Fwy. S., Suite 1800, College Station, TX 77845, l-respess@tamu.edu

The National Sea Grant College Program's (NSGCP) Dean John A. Knauss Marine Policy Fellowship provides a one-year paid fellowship in the legislative and executive branches of government in Washington, D.C., to students with an interest in ocean, coastal and Great Lakes resources and in the national policy decisions affecting those resources.

Upon completion, most fellows are offered jobs by their hosts and over time rise through the ranks of government. From the NSGCP's perspective, an important secondary benefit of these fellowships, is to spread the knowledge to other agencies and organizations of Sea Grant and its unique positioning to address pressing issues facing our nation. However, an informal poll, of Knauss fellows in 2008 revealed little if any understanding of Sea Grant, the Extension model or their state programs. As a result, Texas Sea Grant launched an "onboarding" project to better ground our fellows in the role of Texas Sea Grant and our projects and programs before their one-year Washington, D.C. experience. In 2009 a formal evaluation administered to all Knauss Fellows revealed:

85 percent reported a "fair or poor" "Understanding of the History of the Sea Grant Program"

67 percent reported a "fair or poor" "Understanding of the Role of Extension Agents."

49 percent reported a "fair or poor" "Understanding of the Areas of Sea Grant Expertise."

These and other similar results yield important implications for other state Sea Grant programs looking to strengthen the linkage between themselves and their Knauss Fellows

Prevalence of *Hematodinium* in *Callinectes sapidus* in the Corpus Christi and Aransas Bay Systems

Jonathan L. Gain, Kim Withers

Center for Coastal Studies, Texas A&M University-CC, TX, 78412, Jonathan.Gain@tamucc.edu

Hematodinium, a parasitic dinoflagellate, harms a variety of commercially important crustaceans and has been implicated in population declines of blue crab (*Callinectes sapidus*) on the Atlantic Coast. In Texas, the blue crab fishery has been characterized as senescent but the reasons for its decline are unclear. Incidence and prevalence of *Hematodinium* in Texas bays is not well-known. This study examines

Laboratory Experiments on Flows Through Created Coastal Wetlands

Melanie Troung[1], Scott A. Socolofsky[2], Jennifer L. Irish[3]

[1]Coastal and Ocean Engineering Division, Zachry Department of Civil Engineering, Texas A&M University, College Station, Texas
[1]kitana_25@tamu.edu , [2]ssocolofsky@civil.tamu.edu , [3]jirish@civil.tamu.edu

Waves and surge generated by hurricanes are one of the primary threats to the Texas coast wetlands regarding the environment and the economy. Understanding the hydrodynamic process that damages coastal habitats as well as hurricanes hazard and risks is critical to preserve coastal vegetation and quantify its benefits in coastal storm protection. The goal of this project is to quantify the impact of spatial coverage of segmented wetlands on wave hydrodynamics. Experiments will be conducted in the Haynes Coastal laboratory at Texas A&M University to study the impact of wave attenuation and wave refraction as well as the development of coherent structures in marshes fringes followed by the formation of possible eddies. The 3D Shallow Water Wave basin will host a series of large-scale experiments considering an idealized marsh shape.

Study of the marsh geometry in the Texas coast has been done in order to scale the experiment to the size of the 3D Wave Basin using a Froude number as well as a Reynolds number scaling. More particularly, averaged size and idealized shape of marsh segments in the area of Delehide Cove in the Galveston Bay are considered. Three sets of different wave conditions and water levels are going to be tested to acknowledge different intensities of storm surge. Identical tests with non- vegetated marshes and vegetated marshes are going to be run to compare the influence of the vegetation in storm conditions and three different spacing between marsh segments will be tested.

In the basin, normally incident regular waves will be generated on three water depths to take into account one emergent case and two submerge cases of the marsh segments. Water surface elevation will be measured to analyze the wave attenuation as a function of vegetation spatial coverage using wave gauges. The creation of rip current and the possible development of eddies will be measured at 3D point measurements using Acoustic Doppler Velocimeters (ADVs) to analyze the wave induced circulation structures at marsh fringes as a function of plant spatial coverage. The 2D- Particle Tracking Velocimetry technique (PTV) will be used to have an image based measurement technique measuring current flow in marsh fringes with a Lagrangian point of view. Data analysis will then allow us to determine the impact of discontinuous marsh segments on wave attenuation and wave refraction. Coherent structures such as rip current and circulation pattern created will be analyzed to study the change in the flow field in the passage of the waves.

There is considerable potential for increased efficiency and efficacy of US aquaculture through development of nutritious, cost-effective alternatives to traditional marine protein feedstuffs such as fishmeal whose global supply continues to increase in demand and price. Therefore, development of protein concentrates and complete diets from seafood processing wastes and co-products such as soybean meal represents a valuable opportunity to enhance the efficiency of seafood production through aquaculture, while limiting negative impacts of underutilized wastes produced during seafood processing and also sparing other marine proteins. In this study, seafood processing by-products from channel catfish, shrimp and marine fish processing plants were blended with soybean meal and subjected to dry extrusion to produce three distinct protein concentrates. Each product was analyzed for nutrient composition, heavy metal concentrations and then further characterized relative to fishmeal by determining nutrient and energy digestibility coefficients and conducting comparative feeding trials with red drum, *Sciaenops ocellatus* and Pacific white shrimp, *Litopenaeus vannamei*.

All three of the protein concentrates produced from channel catfish, shrimp and black drum processing wastes had crude protein levels ranging from 45 to 50% which is lower than menhaden fishmeal (~62%), but digestibility coefficients of the by-product meals for protein, organic matter and energy were comparable to those of menhaden fishmeal. In three separate comparative feeding trials with red drum, up to 80% of the dietary protein provided solely by menhaden fish meal could be replaced with the by-product meals, although the shrimp by-product consistently provided the highest weight gain and feed efficiency values. In similar feeding trials with shrimp, the three by-product meals could replace from 67 to 100% of the menhaden fishmeal in the diet without adversely affecting shrimp growth. The black drum product tended to yield the best responses in shrimp.

Based on these studies, blending of various seafood processing wastes with soybean meal and subjecting to dry extrusion resulted in nutritious protein concentrates that can substitute for considerable amounts of fishmeal in diet formulations for red drum and shrimp. Thus, the technology developed in this project may be applied to more efficiently utilize seafood processing wastes and spare fishmeal in diets of cultured fish and shrimp.

The Annual Texas Sea Grant Marine Shrimp and Marine Finfish Culture Short Course

Granvil Treece

Texas Sea Grant Extension Service, 2700 Earl Rudder Fwy. S., Suite 1800, College Station, TX 77845, g-treece@tamu.edu

This year marked the 25th year that this course has been offered by Texas Sea Grant. The first course was offered in 1986 and this year's course was conducted Sept. 22 to Sept. 28, 2010, by the Texas A&M University System (Texas Sea Grant College Program, Texas AgriLife Extension, Texas AgriLife Research) and The University

of Texas at Austin (UT Marine Science Institute and its Fisheries and Mariculture Laboratory) in cooperation with Texas marine shrimp and marine finfish farms, and the Texas Parks and Wildlife Department (TPWD). The course has always been conducted at the University of Texas Marine Science Institute (UTMSI), in Port Aransas and has experienced a very receptive and helpful staff at that facility through the years. From the suggestion of their director, Dr. Lee Fuiman, in 2008 the finfish curriculum was added and offering the marine finfish culture curriculum also helped to boost attendance.

During the 1980s and 1990s we offered a full service course with transportation, room and board, cafeteria, and overnight field trip to the Rio Grand Valley farms and processing plant as part of the registration fee. We also spent mornings in the classroom and afternoons in the wet lab working with algae culture and larval rearing, producing postlarval shrimp in 16 individual tanks. Now we offer the course at cost, without room and food included, and without the larval rearing work. The course started as a 10-day course but participants let us know during exit evaluations that they had problems getting off two weeks for a course, so we cut the course to 5 days. The course is scheduled in the Fall each year to coincide with the shrimp pond harvest, which is part of the two day tour to the field. However, we have had problems with hurricanes during this time of year.

Course participants are able to meet researchers and hear lectures from 17 specialists in the various fields. They meet producers and make future contacts during the course. They also get some hands-on demonstrations in the finfish wet labs at UTMSI/FAML. Hopefully the experiences gained in the course will help participants keep from re-inventing the wheel and making the same mistakes as others.

The strength of this course is the wealth of information available from very specialists available through the various Texas educational systems, private farms and other outside sources. Instructors from TAMU, UT, Texas State University, private consultants and the Texas Sea Grant staff are willing each year to share their valuable information and time. The course is accredited by the Texas A&M University System and 4.6 Continuing Education Units (CEUs).

We try to mix the indoor instruction with the outdoor tours for a balanced combination. It is always our goal to provide an outstanding educational event for an international audience that will sell itself in the future. We try to provide participants with a memorable experience and attempt to carry the flag high for all involved, especially the two flagship Universities in our state (Texas A&M University and the University of Texas).

A Comparative Study of Money-and Energy-Based Valuations of Ecosystem Services for Improving Water Quality in Armand Bayou, Galveston Bay

Jae-Young Ko[1], Allison Parnell[1] and Anna R. Armitage[2]

[1]Department of Marine Sciences, Texas A&M University, Galveston, TX, 77553, [2]Department of Marine Biology, Texas A&M University, Galveston, TX, 77553

The preserved Armand Bayou has provided multiple ecosystem services to local communities, even though wetlands area has significantly reduced in the Galveston

Because the shipping channel is much deeper than the surrounding bathymetry, the flow at the bottom of the channel is not the same as the flow at depths closer to the surrounding bathymetry. To measure this, surface drogues were deployed in and around the shipping channel and allowed to drift with the current. In addition, two types of ship-board measurements were taken. One bottom tracking ADCP was mounted to the ship and traversed the channel in intersecting tracks, and vertical profiles using the CTD were conducted in the deepest section of the channel. The data from these instruments will be analyzed and the experience gained from the field study of the Corpus Christi shipping channel will be very valuable in planning the upcoming tidal vortex field experiment.

Introduction and Evaluation of More Fuel Efficient Cambered Doors, Netting, and Propellers to the Gulf Shrimp Fishery

Gary L. Graham[1], Michael G. Haby[2]

[1]Texas Sea Grant Extension Service, P.O. Box 1125, West Columbia, TX 77486, glgshrimp@embarqmail.com
[2]Texas Sea Grant Extension Service, Texas AgriLife Research & Extension Ctr., 10345 Highway 44, Corpus Christi, TX 78406, m-haby@tamu.edu

Investigations into potential fuel savings in the subtropical shrimp trawl fishery have been conducted through use of cambered otter doors, high tech netting and installation of more efficient propellers. Extensive work involved modification of traditional cambered doors so that they could be effectively utilized in the shrimp fishery. Once modifications were perfected, in-depth evaluations and data collection indicated fuel savings from 10% to 28% aboard various trawlers. No loss of shrimp production was associated with this conversion. Additionally, Sapphire netting, an inexpensive, high density polyethylene webbing has been demonstrated and adopted aboard approximately 500 vessels. Investigations have indicated that trawls constructed of this material show about 0.5 to 1.5 gallons of fuel savings per hour as compared to traditional nets. Other economic benefits are also found with the use of this webbing material. Although various propeller configurations have been incorporated in the shrimp fishery, a paucity of data exists as to potential fuel savings. In comparing a traditional Kaplan propeller to the Rice Skewed Kaplan Wheel, a fuel savings of 0.9 gallons per hour during towing periods was documented. In this two part presentation, methods and rigging will be presented by Graham and economic evaluations will be discussed by Haby.

targets the *Plan's* priority issues such as habitat restoration, water quality and public awareness through their training, education and restoration activities.

GBA Master Naturalists currently conduct the following projects:

- Dune and prairie restoration at Galveston Island State Park
- Bray's Bayou Wetland Restoration Project where Master Naturalists collect water quality data for this marsh restoration project
- Continued restoration of more than 600 acres of prairie at Armand Bayou Nature Center, Sheldon State Park and the Texas City Prairie Preserve
- Teaching kids, educators and the public about local resources through hands-on activities and field trips

GBA Master Naturalists are dedicated monitors involved in monitoring bats, invasive species, amphibians, Monarch Watch, Hawk Watch, phytoplankton and sea turtle nesting.

The GBA Master Naturalist Program is 177 trained volunteers contributing 20,000 hours of volunteer service each year! Learn how Master Naturalists can help implement your next research project!

Field Measurement of Exchange Flows for the Corpus Christi Ship Channel

Kerri Whilden[1], Scott A. Socolofsky[2]

[1,2]Coastal and Ocean Engineering Division, Zachry Department of Civil Engineering, Texas A&M University, College Station, Texas 77843-3136, [1]kwhilden@tamu.edu, [2]ssocolofsky@civil.tamu.edu

One of the major transport mechanisms between an estuary and the ocean is the propagation of large two dimensional vortices. At the mouth of an inlet, tidal flow forces the formation of two vortices with opposite rotation. These vortices have lateral extents much greater than the water depth and are characterized as shallow flows. Tidal vortices aid in the transport of nutrients and sediment, flushing of contaminants, and distribution of larvae of certain fish. Estuaries depend on this exchange from the ocean to help maintain a prosperous environment. To better understand the mixing between an estuary and the ocean, a field experiment will be conducted to measure these large scale vortices.

To measure the propagation and formation of the vortex structures in the field, surface drogues, acoustic Doppler current profilers (ADCP), and CTD (conductivity, temperature, depth) casts will be utilized. Lagrangian surface drogues will supply passive tracer information about the flow field while one ship-mounted ADCP will produce spatial and temporal data on a specified track. Another ADCP is available for moored time series data and the CTD casts will enhance the data set by yielding profiles of salinity, temperature and dissolved oxygen with depth. The data obtained from these instruments will be evaluated to determine the significance of tidal vortices on inlet transport.

In preparation for the tidal vortex field experiment, all of the instruments were used in part of a study of exchange flows in the Corpus Christi shipping channel.

bay area due to subsidence and urbanization over the years. The objective of the study is to value the ecosystem service of improving water quality provided by the wetland ecosystem in Armand Bayou using a replacement cost technique. For the last three years, we collected water quality data and measured nutrient retention capacity of the research area. Based on the field data, we estimated economic aspects of the water quality improvements using a replacement cost technique. We designed a conventional wastewater treatment engineering plant (e.g., sand filtration method) for the equivalent nutrient removal capacity of Armand Bayou, based on publicly available data, and estimated the potential financial expenditures needed to build, operate, and maintain a wastewater plant in improving the same amount of water. Then we estimated potential financial cost savings coming from utilizing the natural wetland system in nutrient removal by comparing with the potential financial costs of the conventional wastewater engineering. We also estimated potential embodied energy savings coming from utilizing the natural wetlands in nutrient removal. The preliminary results of the study showed significant economic benefits of the preserved Armand bayou, and the comparative study of money-based and embodied energy-based valuations improved the validity and reliability of the non-market valuation study for the valuation of ecosystem service.

Safety & Survival Training for Commercial Fishermen Using a Drill Conductor Program

Dewayne Hollin

Texas Sea Grant Extension Service, 2700 Earl Rudder Fwy. S., Suite 1800, College Station, TX 77845, dhollin@tamu.edu

Commercial fishing is part of the Agriculture, Forestry and Fishing industry sector. Commercial fishing employs between 80,000-160,000 fishermen on approximately 80,000 fishing vessels in the U.S. The commercial fishing industry consistently experiences one of the highest occupational fatality rates in the country. In 2007, commercial fishermen had the most dangerous job in the United States, with an annual fatality rate that was 28 times greater than the rate of all U.S. workers (112 and 4 per 100,000, respectively).

The 1988 Commercial Fishing Industry Safety Act mandates that all documented commercial fishing vessels operating beyond the Boundary Line or with more than 16 persons on board conduct monthly emergency drills. U. S. Coast Guard regulations created by the Safety Act describes the drills, instructions and safety orientation that all persons on board fishing vessels are required to receive. Fishing industry safety records have highlighted the critical need to ensure fishermen are adequately prepared for emergencies at sea. Very few opportunities for fishermen to develop necessary safety and survival skills were available before the Safety Act. Statistics prove that accidents happen quickly, and with little or no warning, with limited time to perform basic emergency procedures. The concept of emergency preparedness training is to reduce the chances of panic and irrational behavior. Drill

conductor training is based on the principle that each crewmember is a piece of lifesaving equipment to each other.

This presentation will review the training materials, training techniques and hands on methods used by many of the certified drill conductor training programs offered around the U.S. and compare the basic types of training presented in most of the dozen U. S. Coast Guard certified courses offered. Subjects covered by all courses include: abandonment procedures from the vessel; fighting a fire in different locations on board the vessel; recovering an individual from the water; launching procedures for survival craft (life rafts); donning immersion suits and other wearable PFD's; making a voice radio distress call and using visual distress signals, and activating alarm systems.

Bathymetry of the Northwestern Gulf of Mexico from the Continental Shelf to the Mexico Basin

T. L. Holcombe, Willington Renteria and W. R. Bryant

Department of Oceanography, Texas A&M University, College Station, TX , tholcombe@ocean.tamu.edu

The objectives of this project, currently in progress, are to 1) patch together geographically-separated northwestern Gulf of Mexico bathymetry into an integrated readily-available and seamless bathymetric data base that is the best existing for northwestern Gulf of Mexico physiographic provinces, including the Continental Shelf, Continental Slope, and part of the Mexico Basin, 2) construct new large and detailed bathymetric maps of the whole region, and 3) illustrate the capability to derive (in near real time) map products from the bathymetric data base for various applications.

Earlier bathymetry of the northwestern Gulf area, and the point of departure for this project, is the IBCCA (Gulf of Mexico and Caribbean) bathymetry constructed about 10-20 years ago in a cooperative IOC/IHO (Intergovernmental Oceanographic Commission/ International Hydrographic Organization) sponsored project carried out by mapmaking agencies in the U. S., Mexico, and Cuba. The IBCCA bathymetry, currently available in digital form as a shapefile, has a contour interval of 20 meters on the Continental Shelf, and 100 meters elsewhere.

By way of comparison, the bathymetry that we are now synthesizing for the area has contour intervals of one meter on the Continental Shelf, and 10 meters elsewhere. Included in this mix of bathymetric data are most of the multibeam bathymetry collected by the NOAA Coast Survey, the U. S. Geological Survey, and Academic institutions in the last 20 years. The new bathymetry will provide a synoptic view of the northern Gulf of Mexico Continental Slope, and serve as a catalyst and guide for further studies of the geomorphology of this unique area, with its hundreds of salt-emplacement features including mounds, basins, and ridges; and its variety of sedimentary features including valleys, channels, basin fill, and slumps.

Influence of Nutrient Load on Phytoplankton Communities in Galveston Bay

Antonietta Quigg[1], Tyra Booe, Jamie Steichen, Rachel Windham, Samuel Dorado, Allison Mclnnes, and Yuelu Jiang

[1]Department of Marine Biology, Texas A&M University at Galveston, Galveston, TX 77553, quigga@tamug.edu

Examination of the impacts of freshwater inflow and bay circulation are priority areas for the Galveston Bay Estuary Program, specifically programs, which endeavor to define beneficial freshwater inflows necessary for salinity, nutrient and sediment loading regimes adequate to maintain productivity of economically important and ecologically characteristic species in Galveston Bay. With a rapidly expanding urban population in Texas, particularly in coastal municipalities, the challenge to meet human needs for water while maintaining critical freshwater inflows will be the greatest challenge in the coming decades. We present findings of a research program that specifically examines how phytoplankton community structure responds to the nutrient loading in freshwater inflows into the Galveston Bay estuary. We used resource limitation assays to examine the role of nitrogen (as nitrate), phosphate and silicate on phytoplankton productivity across spatial and temporal scales. We found that phytoplankton productivity is often nitrogen-limited and/or nitrogen and phosphate co-limited but never silicate limited. Depending on antecedent conditions, the response in the resource limitation assays can be related to freshwater inflows. This is more evident in the southern section of Galveston Bay relative to the northern section; consistent with phytoplankton in the southern section experiencing fewer nutrient pulses related to freshwater inflows. Phytoplankton communities were diatom dominated in the cooler months and cyanobacteria dominated in the summer months – this difference influenced the magnitude of the response in the assays but not the outcome. Our findings will ultimately be used to develop intense process-based understanding of the linkages between the magnitude of freshwater inflows and nutrient loading on primary productivity for the Galveston Bay ecosystem.

Galveston Bay Area Master Naturalists - Volunteers Implementing the Galveston Bay Plan

Julie Massey

Sea Grant Extension Service, 5155 Highway 3, Dickinson, TX, jmassey@ag.tamu.edu

Who are those Texas Master Naturalists?

Well…..Master Naturalists are trained volunteers dedicated to natural resource restoration and education. In the Galveston Bay Area, Master Naturalists are implementing the *Galveston Bay Plan* (Plan), a twenty- year management plan for Galveston Bay. The Galveston Bay Area (GBA) Master Naturalist Program