2009-10 New York Sea Grant
Omnibus Research Projects
(Listed by Institution)

Total Federal Funds for these 14 research projects for 2009-2010: $2,292,083
Total Matching Funds 2009-2010: $1,347,844

School of Marine and Atmospheric Sciences, Stony Brook University
Stony Brook, New York

Title: Natural tracers of submarine groundwater discharge into Long Island Sound
Principal Investigators: Kirk J. Cochran, Henry J. Bokuniewicz
Sea Grant 2009/2010: $84,637, $76,959
Cost-Share 2009/2010: $93,969, $53,385
Scholar funds 2009/2010: $23,000, $23,000

Nitrogen inputs into Long Island Sound from submarine groundwater discharge (SGD) are very poorly understood. Without this understanding, management plans to limit nitrogen loading into the Sound will lack consideration of this input source and will be less successful in reaching desired goals. This research team plans to quantify submarine groundwater discharge (SGD) to Long Island Sound (LIS) using naturally occurring geochemical tracers, specifically, the radium isotopes and radon-222. The team will determine radium isotope balances for Long Island Sound at times of maximum and minimum water column stratification and permit the magnitude of SGD to be estimated on a Sound-wide basis. The researchers will also identify and sample directly sites of likely discharge along the sandy sediments off the north shore of Long Island. Measurements of the nitrogen species in shallow groundwater in these areas will permit estimates of nitrogen inputs via SGD.

Title: The role of sediments in nitrogen cycling and eutrophication in the Peconic Estuary
Principal Investigators: Robert C. Aller**,** Christopher J. Gobler
Sea Grant 2009/2010: $57,222, $63,990
Cost-Share 2009/2010: $75,900, $69,766
Scholar funds 2009/2010: $46,000, $46,000

Because nitrogen often limits primary production in many coastal environments, enhanced anthropogenic nitrogen loading has often been a primary factor responsible for progressive eutrophication and undesirable changes in these environments. These changes such as hypoxia, nuisance algal blooms and the subsequent loss of marine life have led many municipalities to control the amount of nitrogen loading in their coastal environments in an effort to maintain their quality for the benefit of coastal communities and businesses. In shallow coastal waters, the sediments play an important role in nitrogen cycling as both source and sink for nitrogen in the water column. Despite the widely recognized importance of benthic processes in controlling nitrogen dynamics, export, and storage, the role of sediments in this context has been examined only rarely in New York estuaries. This project will examine the role sediments play in nitrogen

dynamics in the Peconic Estuary including the relative importance of processes in the nitrogen cycle, mechanistic processes and temporal variation patterns. This will provide a better understanding of the nitrogen cycle in this estuary which is required for predictive models and the design of successful management plans.

Title: Managing brown tide: Nitrogen physiology of *Aureococcus anophagefferens* within the plankton community context
Principal Investigators: Jackie L. Collier, Christopher J. Gobler
Sea Grant 2009/2010: $47,155, $46,986
Cost-Share 2009/2010: $51,500, $58,997
Scholar funds 2009/2010: $53,000, $54,780

Brown tides caused by the plankton *Aureococcus anophagefferens* have had major impacts on Long Island waters for more than two decades. Bloom concentrations of *A. anophagefferens* can cause mortality in larval and juvenile stages of hard clams and have been a factor in the decline of the hard clam fishery as well as the bay scallop fishery and the loss of eelgrass meadow habitat. Due to the ecological impacts on economically important shellfisheries in Long Island from brown tide bloom, the importance of successful management and recovery plans hinges on adequate knowledge of bloom dynamics, ecology and physiology. This study will provide important information using traditional and molecular genetic techniques to characterize the entire plankton community (phytoplankton, bacteria, small zooplankton) during bloom and nonbloom conditions. Additionally the project will examine the incorporation of nitrogen from nitrate, ammonium, urea, and glutamate into the DNA of *A. anophagefferens* and other plankton, and to directly examine the physiological status of *A. anophagefferens* in situ.

Title: Cumulative impacts of multiple stressors on eelgrass populations in New York estuaries
Principal Investigators: Bradley J. Peterson, Christopher J. Gobler
Sea Grant 2009/2010: $57,861, $59,040
Cost-Share 2009/2010: $52,697, $54,876
Scholar funds 2009/2010: $46,000, $46,000

Eelgrass (*Zostera marina*) is a marine plant that forms beds in shallow protected coastal areas such as bays, coves, estuaries and tidal creeks. Eelgrass beds are important habitats in coastal waters because they provide critical nursery habitat for many juvenile fish and shellfish of ecological, commercial and recreational importance to local communities and economies. Eelgrass habitats have been subjected to many stresses that have reduced the extent of beds throughout its range. This has resulted in negative impacts on fish and shellfish populations that benefit from eelgrass habitat. Local management efforts have met with little success in restoring former areas of eelgrass habitat. The primary potential stressors on eelgrass populations in NY coastal waters include habitat modification, algal

bloom light shading, sulfide toxicity, and increased water temperature. This project strives to systematically quantify the effects of these stressors both individually and when combined on eelgrass productivity, distribution and reproductive success through a series of laboratory, mesocosm and field experiments. The data from this project will be used in predictive models of eelgrass populations and the Great South Bay ecosystem, allowing the effectiveness of alternative ecosystem-based management strategies to be assessed.

Title: Functional genomics investigations of hard clam immune response and resistance against QPX infection
Principal Investigators: Bassem Allam, Jackie Collier, Mark Fast
Co-Principal Investigator: Arnaud Tanguy**,** University of Pierre and Marie Curie (Paris 6), Roscoff, France
Sea Grant 2009/2010: $83,261, $83,981
Cost-Share 2009/2010: $55,914, $59,296
Scholar funds 2009/2010: $24,000, $24,720

Progress in understanding factors affecting QPX disease development in the hard clam is limited by the lack of information regarding clam immune responses toward the infection. In this project, the research team plans to develop and use functional genomics approaches to characterize transcriptional signatures of the immune response against QPX in susceptible and resistant clam strains and to investigate the molecular bases of the effects of environmental factors on QPX disease development. This project will combine "traditional" (cellular and biochemical assays) and functional genomics techniques to provide an integrative assessment of the clam immune response towards the QPX parasite. This approach will allow the discovery of biomarkers and molecular mechanisms characteristic of both resistance to, and dysfunctions caused by, QPX.

Cornell University
Ithaca, New York

Title: Regulation of *Phragmites australis* invasions by seedling-and rhizome-associated microbes
Principal Investigator: Eric B. Nelson, Department of Plant Pathology and Plant-Microbe Biology
Co-Principal Investigator: Bernd Blossey, Department of Natural Resources
Sea Grant 2009/2010: $70,286, $70,286
Cost-Share 2009/2010: $35,143, $35,143

Wetlands have been subjected to invasions of an invasive strain of common reed (*Phragmites australis*) that have been difficult to control. This has led to wetlands

comprised of large stands of common reed with native species crowded out. In situations where control of common reed is desirable, it has been difficult to do once it has become established. Using strategies that target other stages of the invasion process have not been explored. Initial seedling establishment and colonization of *P. australis* during invasions may be particularly amenable to control. Recent evidence suggests that differential sensitivity of invasive and native plants to soil pathogens may facilitate invasions. This project will explore how pathogens and other root- and rhizome-associated microbes differentially affect invasive and native populations of *P. australis* as a means of explaining the invasive success during early stages of the invasion. Understanding how *P. australis* invasions are facilitated at this stage will provide the foundation for developing new and potentially more effective management strategies.

Title: Birdsong as an Indicator of Sublethal Polychlorinated Biphenyl (PCB) Bioavailability in the Environment
Principal Investigator: Timothy J. DeVoogd, Department of Psychology and Field of Neurobiology and Behavior
Co-Principal Investigator: André A. Dhondt, Bird Population Studies, Cornell Lab of Ornithology; Department of Ecology and Evolutionary Biology
Sea Grant 2009/2010: $24,255, $23,247
Cost-Share 2009/2010: $27,816, $29,252

Polychlorinated biphenyls (PCBs) are environmental contaminants that biomagnify up the food chain and reach levels that can harm the development and physiology of birds and mammals. Though there has been much research into the effects of PCBs on animals, there is still much to be learned. This study will examine the impacts of sublethal PCB exposure on singing behaviors in songbirds. In preliminary studies, researchers have found that PCBs interfere with the development of brain systems involved in producing song, and that some song characteristics are altered in birds living near Hudson River areas contaminated with PCBs. They hypothesize that these findings are related: that birds in the wild also show altered song system anatomy, and that this results in deficits in song. Experiments are planned to test these hypotheses, and to develop non-destructive indicators of sublethal PCB-levels in the environment.

Title: Assessment of Viral Hemorrhagic Septicemia Virus egg transformation
Principal Investigators: Paul R. Bowser, James W. Casey, Rodman G. Getchell, College of Veterinary Medicine
Sea Grant 2009/2010: $98,270, $100,231
Cost-Share 2009/2010: $49,788, $51,280

The emergence of viral hemorrhagic septicemia virus (VHSV) in the Great Lakes Basin has been a serious issue for fisheries in the Great Lakes. VHSV is considered to be an extremely serious disease for which no treatment exists. VHSV can cause serious fish losses as well as significant economic losses, especially to commercial aquaculture and

bait dealers. This project plans to use new genetic tools and zebrafish infection studies to investigate the natural in vivo infectious cycle for the Great Lakes isolate of VHSV (VHSV-GL). From this work, an improved understanding of the transmission of VHSV will emerge that will provide information to help develop better biosafety protocols and decontamination methods.

Title: Development of genomics-based methods to determine effective combinations of growth inhibitors for *Listeria monocytogenes* on cold smoked salmon
Principal Investigators: Martin Wiedmann, Teresa M. Bergholz, Department of Food Science
Sea Grant 2009/2010: $30,423, $31,798
Cost-Share 2009/2010: $42,743, $44,360
Scholar funds 2009/2010: $29,870, $31,395

The pathogen *Listeria monocytogenes* causes a potentially severe foodborne disease that kills about 500 people annually in the U.S. alone. This pathogen typically contaminates food in low numbers that are unlikely to cause human disease; however, it can grow to levels that can lead to human disease during refrigerated storage of many ready-to-eat (RTE) foods such as smoked fish. Control of *L. monocytogenes* is a top priority and represents a considerable challenge for all food processors, as this pathogen is commonly found in raw materials and in most environments. While combinations of lactate and diacetate can be effective at preventing growth of *L. monocytogenes*, there is a need for effective alternative growth inhibitors. This project seeks to use genomics-based methods to identify effective combinations of growth inhibitors for *L. monocytogenes* on cold smoked salmon. The data will be used to develop a screening method to assess the efficacy of new growth inhibitors, which will be confirmed by inoculation trials on commercial cold smoked salmon. Results will be used to develop initial guidance and data that will help industry reformulate smoked fish to inhibit *L. monocytogenes*.

Title: Forecasting ecosystem effects of a new invader, *Hemimysis anomala,* in Lake Ontario
Principal Investigator: Lars G. Rudstam, Department of Natural Resources
Co-Principal Investigator: Theodor Schaner, Ontario Ministry of Natural Resources
Federal Collaborators: Maureen G. Walsh, Brian F. Lantry; USGS Great Lakes Science Center
Sea Grant 2009/2010: $98,557, $90,521
Cost-Share 2009/2010: $49,506, $45,286

The "bloody-red shrimp," *Hemimysis anomala*, is a recent exotic aquatic invader to the Great Lakes first reported in November of 2006. It is likely that the small shrimp-like crustacean was brought over from Europe via ballast water tanks. It is unknown for now what the likely impact on the Great Lakes will be. In Europe, their effects have ranged from marginal to severe and the risk for food web disruption in America is predicted to

be high. This research team plans to conduct a series of field and laboratory studies to elucidate the basic biology, distribution, and role of *H. anomala* in Great Lakes food webs. The studies will investigate such aspects as diet, feeding rates, habitat preferences, growth rates, temperature and light preferences. The information from these studies will be used to help predict the likelihood that *Hemimysis* will contribute to food web disruption in the Great Lakes and provide valuable information useful for effective management of this new invader.

Buffalo State College
Buffalo, New York

Title: Improved Predictions of Condition and Growth in Alewives: Effects of Dietary Fatty Acids, Temperature, and Ration
Principal Investigator: Randal J. Snyder, Department of Biology
Sea Grant 2009/2010: $48,357, $41,356
Cost-Share 2009/2010: $24,657, $24,657

Alewives are an important component of Great Lakes food webs. Understanding and accurately forecasting alewife condition and growth remain a high priority in adaptive management of Great Lakes fisheries. This study uses captive alewives to examine how temperature, ration size, and prey composition influence alewife growth and condition. Given the dramatic changes that are still occurring in Great Lakes food webs, it is useful to develop accurate measures of alewife condition and growth to support important management decisions. This research will improve the ability to optimize salmonine stocking rates, to forecast how changes in food webs or abiotic factors will affect alewife populations, and better predict the impact of alewives on their prey populations.

Clarkson University
Potsdam, New York

Title: Winter Assessment of Microbial Biomass and Metabolism: Testing the Importance of Winter Productivity to Summer Hypoxia in Lake Erie
Principal Investigator: Michael Twiss, Department of Biology
Co-Principal Investigator: Steven W. Wilhelm, Department of Microbiology, University of Tennessee-Knoxville
Sea Grant: $108,147 *(a 24 month project)*
Cost-Share: $58,417

An important impact on fisheries in Lake Erie is the development of summertime hypoxia. Though hypoxia in the lake has been well monitored and studied, preliminary field work carried out by researchers on Lake Erie in February 2007 and 2008 has revealed the remarkable discovery of discrete areas of high plankton biomass and productivity. The importance of this phenomenon relates to the expected degradation of this biomass during summer months that contributes to the hypoxia in the lake. This project will further study this phenomenon by sampling on Lake Erie in February 2009 and 2010 and conducting experiments to measure concentrations of plankton, photosynthetic efficiency, rate of photosynthesis, bacterial production, growth, and grazing. Experiments will also measure the balance of production versus consumption of organic carbon during the period of ice cover. This study will provide important additional data for refinement of lakewide predictive models of oxygen depletion and allow for improved management of hypoxia.

State University of New York College of Environmental Science and Forestry
Syracuse, New York

Title: Constraints and Motivations Related to Bass Fishing along the Lake Ontario Coast
Principal Investigators: Diane M. Kuehn, Valerie A. Luzadis, Department of Forest and Natural Resources Management
Sea Grant 2009/2010: $69,130, $35,586
Cost-Share 2009/2010: $51,626, $47,314
Scholar funds 2009/2010: $21,000, $21,000

The economy of New York's Lake Ontario region is based to a great extent on sportfishing. Over the last 15 years, the decline in the number of anglers (particularly nonresident anglers) in the region has severely impacted coastal businesses and the economy. One helpful strategy to create a sustainable coastal economy would be to increase fishing participation by residents of the Lake Ontario region. This would provide an opportunity for businesses and tourism promoters to tap into an underutilized and large resident market group. Redirecting promotional and business efforts to this resident angler market becomes increasingly important as further declines in nonresident anglers (the focus of past tourism promotions) are expected due to rising travel costs and a sluggish national economy. The main goal of this study is to contribute to a sustainable coastal economy in the Lake Ontario region by providing information to coastal businesses and tourism promotion agencies on the motivations, constraints, and facilitators associated with resident bass fishing.

2009-10 New York Sea Grant
Omnibus Research Projects
(Listed by Institution)

New York University
School of Medicine
Tuxedo, New York

Title: Vulnerability of Hudson River Atlantic Sturgeon to Coastal Bycatches
Principal Investigator: Isaac Wirgin, Department of Environmental Medicine, NYU School of Medicine
Collaborator: Tim King, Aquatic Ecology, Leetown Science Center, USGS
Consultant: John Waldman, Department of Biology, Queens College of New York
Sea Grant: $200,794 *(a 24 month project)*
Cost-Share: $104,556

The Atlantic sturgeon (*Acipenser oxyrinchus*) once supported lucrative commercial fisheries throughout much of its North American distribution. These fisheries collapsed and, as a result, a coast-wide moratorium on the harvest of Atlantic sturgeon was implemented in 1998 to restore populations to historic levels. This measure has not been successful in restoring most populations to desired levels. This project will build on previous NYSG-funded research and study the impacts of bycatch on the recovery of different Atlantic sturgeon populations. The research team will use genetic mixed stock analysis to determine the contributions of adult and subadult Atlantic sturgeon from the Hudson River to bycatch in various coastal fisheries extending from Maine to Georgia and in different gear types. By quantifying the contributions of individual populations to bycatch, managers will be better informed in determining the effects of bycatch on individual populations and if necessary regulate damaging fisheries to reduce bycatch on the most vulnerable sturgeon populations.