New York Sea Grant: Current Research Projects (1998-2002)

Aquatic Nuisance & Exotic Species

Ballast Water Treatment and Management: Testing Biofilm Monitoring Systems for Risk Assessment of Harmful Introductions by Ships from European to North American Waters – Dr. Robert E. Baier, SUNY College at Buffalo

Project Number: R/EMS-9 Dates: 10/01/1999 – 09/30/2001 Funds: $104,035

Objectives:

1. To evaluate and compare two types of ballast biofilm monitoring devices on voyages of vessels transporting ballast water from the Mediterranean Sea to Chesapeake Bay.
2. To characterize the biofilm chemistry, morphology, and associated protists as functions of ballast water source, age, and interaction with surrogate ballast tank structural materials and coatings.

Rationale:

An important source of nonindigenous species transfer can be from ballast biofilms maturing upon, and sloughing from, ballast water compartment walls. This source of potential exotics must be assessed with regard to current structural materials and new

nontoxic, nonpolluting coatings [e.g. silicone paints] that can foster easy-release of biofouling deposits.

Cercopagis - A New Exotic Cladoceran to the Great Lakes – Dr. Joseph C. Makarewicz, SUNY College at Brockport

Project Number: R/CMB-20 Dates: 08/01/1999 – 09/30/2001 Funds: $304,699

Objectives:

1. To determine annual spatial and temporal patterns of *Cercopagis* (CP) abundance.
2. To identify the 'invasion corridor' of CP. This is an essential first step toward prevention of future invasions of the Great Lakes.
3. To determine the effect of insertion of a predator (CP) mid-way in the food chain on body burdens in top-level salmonine predators of sport fishing interest consumed by the public.
4. To determine a) clearance rates of CP on other zooplankton; 2) selectivity by CP on same; 3) effects of CP density (mutual interference?) and temperature on clearance rates.
5. To examine diet composition of alewife and, where possible, determine selectivity for different prey such as CP.
6. To evaluate the vertical distribution of CP and its spatial overlap with predators (alewife and smelt), prey (zooplankton), and competitors over 24 hr cycles during the spring and summer.
7. To determine the relative importance of CP as a zooplankton predator in Lake Ontario relative to other major planktivores (alewife, rainbow smelt, Mysis relicta).

Rationale:

Another Ponto-Caspian species *Cercopagis pengoi* (CP) (Cladocera, Cercopagidae) has recently invaded Lake Ontario. CP is a pelagic zooplankter native to the Black, Azov, Caspian and Aral Sea that has invaded the Baltic Sea and freshwater environments in Bulgaria, Ukraine and Russia. As of August 1998, several independent reports confirm the existence of CP in Lake Ontario (Makarewicz - August to November, maximum density = 330/m3), MacIsaac (August - maximum density = 322/m3), EPA (August data only, maximum density = ~500/m3) from all areas of the lake. Invasion of other Great Lakes by this species is likely.

From this project, a fundamental understanding of the population dynamics (seasonal and vertical distribution), genetic identity, behavior (vertical migration), environmental tolerances, life history and impact on the Lake Ontario food web (including levels of chlorinated hydrocarbons) of this new exotic species to the Great Lakes will be developed. These results may have implications for piscivore stocking policy.

If CP is an extra step in the food web, it has two important implications. First, biomagnification of chlorinated hydrocarbons would increase. Second, energy loss

through a longer food chain could be substantial and result in less forage fish productivity, less piscivore productivity and, ultimately lead to a reduction in stocking. The alewife response to CP is a key factor. Our results will allow the prediction of geographic and ecological impacts in the Great Lakes, pointing us in the direction of potential mechanisms of control and providing the necessary scientific background information for development of informed management policies of important Great Lakes fisheries that may be impacted. By identifying the invasion route through genetic analysis, identification of the vector and location of introduction is possible that will prevent new introductions and perhaps provide some understanding in how to reduce the spread of established populations.

Aquatic Nuisance Species Research and Outreach: Use of Bacteria for the Biological Control of Zebra Mussels – Dr. Daniel P. Molloy, NYS Museum, Biological Survey

Project Number: R/XG-12 Dates: 10/01/1999 – 09/30/2001 Funds: $363,290

Objectives:

1. To investigate the factors influencing the production and stability of a biotoxin produced by bacterial strain CL0145A - a biotoxin which has been demonstrated in the laboratory to have outstanding potential as an environmentally-safe and effective control agent for zebra mussels.
2. To identify satisfactory growth and biotoxin production conditions to allow cost-effective bacterial mass production and stable storage of the biotoxin.
3. To confirm the efficacy of this biotoxin in small- to large-scale field trials within raw-water dependent facilities.

Rationale:

In the interest of eliminating polluting pesticides and thereby protecting biodiversity, the Principal Investigator (PI) assisted a decade ago in the development of the bacterium, Bti, as the first biological agent for black fly control. This bacterium, because of its extraordinary nontarget safety, has now completely replaced broad-spectrum, chemical pesticides throughout North America for the control of these biting flies.

Funded primarily by the electrical utility industry, major breakthroughs have also recently occurred at the PI's laboratory in the development of another bacterium, strain CL0145A, as the first biological control agent for zebra mussels. Laboratory trials have demonstrated that, due to a highly selective biotoxin, dead cells of this bacterial strain are lethal to zebra mussels, but not to any nontargets tested (i.e., no mortality to ciliates, blue mussels, unionid mussels, fathead minnows, YOY brown trout, and YOY bluegill sunfish). Although a field trial with this bacterium was very encouraging (94% zebra mussel kill), it was small-scale due to severe limitations on bacterial culturing volume. Further field trials are impossible without the development of bacterial mass production technologies (i.e., large-scale fermentation and stable product storage).

Funds for scaling-up fermentation and conducting such field trials within facilities are

requested in this proposal. To facilitate such trials, the New York Power Authority has offered its facilities as test sites and the New York State Department of Environmental Conservation has pledged its full cooperation in issuing test permits. The proposed research is the next logical step in the path toward commercialization of this bacterium as an innovative, ecologically-safe, and effective zebra mussel control agent.

Ecological Constraints on Establishment of a Freshwater-Resident Population of Blueback Herring in the Mohawk/Hudson Drainage – Dr. Karin E. Limburg, SUNY College of Environmental Science & Forestry

Project Number: R/FBF-13 Dates: 02/01/2000 – 01/31/2002 Funds: $83,748

Objectives:

1. To examine key ecological and demographic parameters of blueback herring within the tidal, freshwater Hudson and the Mohawk River near Rome, New York.
2. To estimate the fraction of the spawning stock composed of resident individuals.
3. To determine if there are critical differences between resident and anadromous forms of blueback herring.

Rationale:

Blueback herring are a crucial forage species in the Hudson River, and at the same time, their population has been expanding westward through the New York State Lock and Canal System. They appear to be in the process of "landlocking," i.e., establishing a naturally freshwater-resident population in the Mohawk River. They also appear to be spilling over into the Great Lakes via Lake Ontario. However, very little is known about this population, and what its chances are for successful establishment and continued westward spread. This study proposes to examine critical population parameters of fish in the Mohawk in comparison to fish caught in the tidal, freshwater Hudson River, both in the spawning stock and in the young-of-year juveniles. This will include the use of otolith microchemistry to distinguish between resident and anadromous adults.

Aquaculture

Epizootiology of Atlantic Salmon Swim Bladder Sarcoma – Dr. Paul R. Bowser, Cornell University

Project Number: R/ABF-2 Dates: 02/01/2000 – 01/31/2002 Funds: $243,648

Objectives:

1. To determine the seasonality of expression of Atlantic salmon swim bladder sarcoma virus in feral and captive populations of Atlantic salmon.

Rationale:

Atlantic salmon swim bladder sarcoma was recently identified in the United States for the first time. It is having a serious impact on management decisions associated with Atlantic salmon restoration efforts. Governmental fishery managers and commercial aquaculturists have little information on the disease. The objective of this proposal is to determine if monitoring for presence of the disease must take into account the time of year during which fish are tested.

Sustainable Integrated Finfish/Nori Aquaculture for Bioremediation and Production of Food and Biochemicals: Culture and Mesocosm Studies – Dr. George P.Kraemer, SUNY College at Purchase

Project Number: R/A-28(CT) Dates: 02/01/2000 – 01/31/2002 Funds: $87015

Objectives:

1. To obtain growth and nutrient uptake information for native species of the seaweed *Porphyra* that would allow successful integration with finfish aquaculture farms.

Rationale:

Finfish aquaculture is a rapidly growing industry both locally and globally. On a global scale, it is a multi-billion dollar industry. High levels of nutrients wasted in fish farm effluent represent an economic loss for the fishfarm and a problem for the environment. Seaweed aquaculture is a multi-billion dollar industry in Asia. Annual production of seaweed *Porphyra* (nori) alone accounts for $US 1.8 billion. Commercial aquaculture of *Porphyra* in the northeast is in its infancy. Seaweed requires significant amounts of nutrients to grow. *Porphyra* in particular can uptake very high levels of nutrients. We propose that integration of *Porphyra* production with land based finfish farms can be both economically and ecologically attractive. The project will provide the *Porphyra* culture information needed to make this work.

Brown Tide

Investigation of the Past Occurrence of Brown Tides by Sediment Analysis for Specific Sterol Biomarkers – Dr. Jose L. Giner, SUNY College of Environmental Science & Forestry

Project Number: R/XBP-8 Dates: 02/01/2000 – 01/31/2002 Funds: $138,574

Objectives:

1. To test our hypothesis that brown tides have occurred in the Peconic Estuary prior to 1985 by conducting organic geochemical analysis of sediment cores for a sterol biomarker unique to *Aureococcus anophagefferens*.

2. To develop a chronology of brown tide blooms within the past 500 years in the Peconic Estuary and to investigate their correlation with climatic factors and micronutrients.

Rationale:

Brown tides have harmed the ecology and shellfish industries of the Peconic Bays as well as other bays along Long Island in recent years. The pre-1985 history of brown tides is presently unknown, nor are the causes or solutions to the problem. Using a geologically stable biomarker specific for the brown tide alga, this study will address the question of whether brown tides have occurred in years before the recent epidemic. If found, the sediment record of brown tides will be correlated with the sediment records of water temperature and inorganic nutrients to help us to understand these destructive outbreaks.

Trace Metals, Organic Carbon, and Inorganic Nutrients in Surface Waters of the Long Island Sound: Sources, Cycling and Effects on Phytoplankton Growth – Dr. Sergio Sanudo-Wilhelmy, SUNY at Stony Brook

Project Number: R/CMC-5 Dates: 06/01/2000 – 05/31/2002 Funds: $6,975

Objectives:

1. To establish levels of dissolved and particulate trace metals (Al, Ag, Cd, Co, Cu, Fe, Ni, Pb and Zn) as well as inorganic nutrients (NO3, NH4, PO4, H4SiO4) and organic (POC, PON, DOC) nutrients in surface waters of the LIS under high (Spring) and low (summer) runoff conditions.
2. To establish the relative importance of various sources (e.g., riverine inputs, sewage, urban harbors, etc) to the total supply of dissolved trace metals, organic carbon and nutrients in the LIS.
3. To evaluate the ability of nutrients (N, P, Si) and copper to control the intensity and fate of phytoplankton blooms in the different regions of the LIS.

Rationale:

This research will provide the first comprehensive measurements of trace metals in the water column of the LIS. Our investigation on the behavior and sources of trace metals, doc and inorganic nutrients will have multiple benefits to the understanding and management of the LIS. Our proposed research will also allow us to directly assess many of the scientific underpinning on which current models of hypoxia in LIS are based. For example, while estimates of N-loading to LIS are based on total N levels, only a fraction of total N is directly useable by the phytoplankton. Finally, our proposed incubation experiments will directly assess the impact of nutrients and trace metals on the intensity and fate of phytoplankton blooms in LIS.

Benthic-Pelagic Coupling and LI Brown Tide – Dr. Todd M. Kana, Bigelow Laboratory for Ocean Science

Project Number: R/CMB-21 Dates: 09/01/1999 – 08/31/2002 Funds: $593,898

Causes and Prevention of Long Island Brown Tides – Dr. Darcy J. Lonsdale, SUNY at Stony Brook

Project Number: R/CMB-23 Dates: 09/01/1999 – 08/31/2002 Funds: $348,514

The Effects of Microbial Food Web Dynamics on the Initiation of Brown Tide Blooms – Dr. Michael Edward Sieracki, Bigelow Laboratory for Ocean Science

Project Number: R/CMB-22 Dates: 09/01/1999 – 08/31/2002 Funds: $433,528

Coastal Processes

Bathymetric Evolution of a Tidal Inlet – Dr. Daniel C.Conley, SUNY at Stony Brook

Project Number: R/CCP-7 Dates: 02/01/2000 – 01/31/2002 Funds: $186,742

Objectives:

1. To sequentially characterize the large-scale bathymetry of Shinnecock Inlet with high resolution and accuracy.
2. To refine a quasi-3D model of nearshore sediment transport and bathymetric evolution to enable generic application.
3. To determine the relative importance of discontinuous and continuous bypassing in a tidal inlet with a disturbed ebb tidal shoal.

Rationale:

Recent research has show how inlet bypassing on a tidal inlet with a complete ebb tidal shoal is predominately of a continuous nature although discontinuous processes seem to exist. It is quite likely that the discontinuous processes may dominate in an where the ebb tidal platform is disturbed by maintenance dredging. Understanding if this is true and how bypassing occurs on such an inlet may provide management strategies to minimize impacts to down-drift shorelines.

Great Lakes Fisheries

Genetic Characteristics of Great Lakes and Atlantic Coast Sea Lamprey Populations – Dr. Isaac I. Wirgin, New York University School of Medicine

Project Number: R/XG-13 Dates: 07/01/2000 – 06/30/2001 Funds: $80,243

Objectives:

1. To survey genetic variation in sea lamprey Petromyzon marinus in native and non-native populations in Lake Ontario, Lake Erie, and coastal rivers of the northeast.

2. To estimate the genetic distance between Great Lakes and Atlantic coast populations to help evaluate the genetic risk in introducing putatively sterile males to Great Lakes systems.
3. To estimate gene flow rates.
4. To test whether sea lamprey show homing fidelity.
5. To estimate gene flow rates among rivers to use as surrogates for recolonization rates (assuming local eradication occurs).
6. To compare the genotypic frequencies among regions to help determine whether sea lamprey are native to Lake Ontario.

Rationale:

Landlocked sea lampreys are a chronic ecological and economic problem in the Great Lakes and other inland waters of New York State. Lampreys are the only anadromous fishes we are aware of that are parasitic. Our study will use a genetic approach to resolve whether both native and non-native populations of sea lamprey home in the manner of all other anadromous fishes studied, or whether they have adopted a different reproductive strategy, i.e., use of proximal, ecologically suitable but non-natal rivers. Knowledge of whether sea lamprey home, their stock structure, and gene flow among stocks (an approximation of recolonization rate) will help in steering and refining ongoing chemical lampricide programs and the use of sterilized males from Atlantic coast populations to reduce effective reproduction.

Factors Affecting Early Survival and Management of Lake Ontario Salmonine Populations – Dr. Patrick J. Sullivan, Cornell University

Project Number: R/FBF-12 Dates: 02/01/2000 – 01/31/2002 Funds: $795,556

Objectives:

1. To conduct a statistical synthesis of long-term historical and newly collected field data to estimate relationships between survival, growth, prey production, and physico-chemical variables (including nutrients, temperature, water clarity, and chlorophyll a).
2. To determine relative abundances, growth and survival of hatchery versus wild salmonines using stable isotopes deposited in otoliths in conjunction with conventional methods of marking and microstructural analysis of otoliths and scales.
3. To determine diet and distribution of salmonines in relation to distribution and relative abundance of prey organisms, using conventional field sampling techniques (e.g. seines, gillnets, plankton nets, and trawls) and acoustic surveys.
4. To determine effects of spatial scale and heterogeneity upon distribution and foraging behavior of young salmonines.
5. To use a simulation model developed from empirical relationships determined under objectives 1-4 to evaluate effects of oligotrophication processes upon dynamics of food web energy flows and the consequent impact upon survival and growth of young salmonines.

6. To develop a public outreach program to disseminate project results and information on present and future changes in Lake Ontario ecosystem.

Rationale:

For the past 30 years, Pacific salmon, brown trout and steelhead trout have provided the backbone of a Great Lakes sportfishing renaissance that has sustained commercial and economic development in many coastal New York communities. However, given recent changes in Lake Ontario, considerable uncertainty exists about appropriate management strategies for maintaining a healthy salmonine sport fishery. A multidisciplinary team will work with fishery scientists and managers, and provide them with techniques to evaluate early life history survival of salmonines in Lake Ontario, as well as quantify the increasing contribution of natural reproduction to this fishery.

Hard Clams

Reconstruction of the Effects of Brown Tide Blooms on the Growth of Hard Clams Using Shell Microgrowth Analysis – Dr. Robert M. Cerrato, SUNY at Stony Brook

Project Number: R/FBM-20 Dates: 02/01/2000 – 01/31/2002 Funds: $194,906

Objectives:

1. To use microgrowth increment patterns in both new and archived shell samples to assess the impact of brown tide (*Aureococcus anophagefferens*) blooms on the growth of the hard clam *Mercenaria mercenaria*.

Rationale:

The hard clam (*Mercenaria mercenaria*) is an important economic and commercial species that has significantly declined in Great South Bay. One factor that has potentially contributed to its decline is frequent blooms of the brown tide *Aureococcus anophagefferens*. An extensive archived shell collection coupled with quality data provide a unique 20 year sampling ensemble that will be used to test specific predictions concerning brown tide impacts on hard clam growth. The knowledge gained in this study will complement short-term laboratory research of brown tide effects and provide a more complete picture of brown tide impacts on bivalve growth. Municipal shellfish agencies, the private shellfish industry, and researchers in mid-Atlantic coastal areas affected by brown tide would benefit from this study.

Marine Fisheries

Effects of Size-Selective Mortality on the Evolution of Growth Rate in Fishes: Continued Empirical Simulation – Dr. David O. Conover, SUNY at Stony Brook

Project Number: R/FBM-21 Dates: 06/01/2000 – 05/31/2002 Funds: $262,549

Objectives:

1. To test the hypothesis that size-selective fishing and/or natural sources of mortality involving the size-dependent loss of individuals from a population will, over time, select for a change in the intrinsic rate of growth and related physiological traits of individuals in the harvested stock.
2. To develop the Atlantic silverside, *Menidia menidia*, as a model system for rapid evaluation of the effects of various forms of size-selective mortality on life history evolution in variable environments.

Rationale:

Natural populations of fishes are subjected to many sources of natural and fishing mortality that act in a size-dependent manner. Natural mortality typically selects for larger fish (bigger is better) while fishing mortality does the opposite (smaller is better from the fishes' point of view). Evidence is accumulating that both forms of size-selective mortality strongly influence the evolution of growth rate, and numerous other life history traits, but in opposite directions. By selecting for slower growth, the long term consequences of size-biased harvest strategies are in some cases detrimental to the long-term persistence and potential yield of the stock. Despite much concern about the problem, basic knowledge of the rate of growth rate evolution in response to size dependent mortality is lacking. This ongoing project is utilizing captive populations of the Atlantic silverside (*Menidia menidia*) to experimentally evaluate the rate of evolutionary change in growth rate, and correlated traits, in response to size-selective mortality. Preliminary data collected so far after one generation of selection suggests that the intrinsic rate of growth in our selected lines has evolved in response to size-based harvesting. But this project needs to be continued for additional generations (at least 6-8) to evaluate fully the magnitude of response and changes in correlated traits.

Habitat

Microbial Nitrogen Dynamics During Decomposition of *Phragmites australis* Compared to *Typha angustifolia* – Dr. Stuart Findlay, Institute of Ecosystem Studies

Project Number: R/CMB-18 Dates: 05/01/1998 – 04/30/2001 Funds: $189,289

Objectives:

1. To determine the density (g m-2) of both living plant biomass and litter of P. australis and *T. angustifolia* in study plots over an annual cycle. Concurrently, quantify the amount of (C, N, P) in living, standing dead and sediment associated litter over an annual cycle.
2. To determine rates of litter mass loss and changes in litter quality of standing dead shoots and sediment associated plant litter of *P. australis* and *T. angustifolia*. In addition, determine the predominant fungal taxa associated with decaying plant litter.

Rationale:

The known differences in nutrient sequestration, plant phenology and detrital quality between these two plants has led us to hypothesis that nutrient retention within biomass and timing of nutrient return during decomposition will show large differences. These differences may manifest themselves at the whole-marsh scale as differences in net nutrient removal/release from *Phragmites*-dominated versus *Typha*-dominated wetlands. The well-established fact that reed is encroaching rapidly in some sites has prompted serious plans for reed-removal. The justification for reed removal as well as complete understanding of the consequences of reed expansion requires knowledge of how these past and proposed species shifts affect a whole array of marsh functioning.

Zooplankton as Ecological Indicators of Functional Integrity of Freshwater Lake Ecosystems – Dr. Edward L. Mills, Cornell University

Project Number: R/CE-15 Dates: 02/01/2000 – 01/31/2002 Funds: $217,756

Objectives:

1. To test hypotheses of functional integrity in freshwater ecosystems using biomass-size spectra for phytoplankton and zooplankton.
2. To develop a zooplankton index functional integrity.

Rationale:

Currently, the Great Lakes and other freshwater bodies in North America are undergoing significant ecological change including declining productivity, changing fish communities, establishment of exotic species, and changes in water quality. Managers need indices that are not only responsive to anthropogenic stressors and degradation but also to management and restoration efforts. The most promising theoretical framework for assessing ecosystem functionality is based on normalized biomass size spectra. We propose to develop measures of ecological functionality that are rooted within a strong theoretical framework yet provide an applied basis for assessing ecological change.

Lobsters

Characterization of bacterial assemblages involved in the shell disease in the American Lobster, *Homarus americanus* – Dr. Andrei Y.Chistoserdov, SUNY at Stony Brook

Project Number: R/XG-14 Dates: 11/06/2000 – 05/05/2001 Funds: $18,214

Objectives:

1. To identify bacterial assemblages involved in development of shell disease, using classic culture techniques in conjunction with molecular characterization of these assemblages.

Rationale:

The causes of shell disease are not clear and no specific infectious agent has been connected with this disease, although mechanical damage of epicuticle and possible heavy metal and other water pollutants may have triggering effect. It is wildly accepted that the shell disease etiology is bacterial. Indeed, chitinolytic representatives of *Vibrio*, *Pseudomonas* and *Aeromonas* spp. can be easily enriched and/or isolated from lobsters with shell diseases. However, a modern paradigm of microbial ecology states that not more than 1% of bacteria present in the environment are culturable. It is likely, that classical techniques alone substantially under represented the complexity of bacteria involved in shell disease and likely miss real culprits of the disease. Therefore, molecular analysis of these bacteria is required.

Seafood Safety

Improving Risk/Benefit Tradeoff Abilities Among Noncommercial Fish Consumers Through Comparative Dietary Risk Information – Dr. Barbara A.Knuth, Cornell University

Project Number: R/SHH-9 Dates: 02/01/2000 – 01/31/2002 Funds: $207,989

Objectives:

1. Characterize the type and magnitude of responses among various target audiences presented with comparative dietary risk information associated with fish consumption health advisories;
2. Compare audience responses with potential fish consumption health advisory program risk management goals; and
3. Recommend approaches for incorporating comparative dietary risk information as part of health advisory risk communication programs.

Rationale:

Most U.S. states issue fish consumption health advisories to influence fish consumer behavior related to non-commercial fish in waters affected by chemical contaminants. States have urged federal assistance in developing a better approach to communicating information about health benefits as well as risks associated with fish consumption; anglers and fish consumers also have identified such information as important. A protocol for comparing benefits and risks has been developed but has not been tested with angling and fish-consuming audiences. By testing this protocol, this study would improve understanding of how potential fish consumers use and apply comparative dietary risk information in their fishing and fish consumption-related decisions.

Integrated Control Strategies for Pathogenic *Listeria monocytogenes* in the Fish Industry – Dr. Martin Wiedmann, Cornell University

Project Number: R/SHH-10 Dates: 02/01/2000 – 01/31/2002 Funds: $135,240

Objectives:

1. To monitor contamination of raw fish to further evaluate the importance of raw materials as sources for *L. monocytogenes*.
2. To determine whether *L. monocytogenes* can infect fish using fish tissue culture as well as inoculation of rainbow trout fingerlings.
3. To characterize resident *L. monocytogenes* in smoked fish plants and develop strategies for their elimination.
4. To determine the unique characteristics of *L. monocytogenes* strains which differ in their abilities to cause human disease using two *L. monocytogenes* isolated from widely distributed foods, one of which caused more than 100 human cases and one of which was not linked to any human cases.

Rationale:

Compliance with zero-tolerance for *L. monocytogenes* in ready to eat seafoods represents a significant challenge for the smoked fish industry. Our proposed project will determine the relative frequency and characteristics of *L. monocytogenes* with attenuated virulence or avirulence in cold-smoked salmon products. These data will provide the basis for proposing a new non-pathogenic or less pathogenic *Listeria* subset to the FDA. Regulatory recognition of avirulent *Listeria* spp., coupled with application of our proposed new technology for their rapid detection, may reduce the incidence of costly product recalls. We also propose development, validation and application of a molecular detection and tracking system for *L. monocytogenes*, followed by incorporation of this strategy into HACCP plans. This project will be conducted in close collaboration with the NY Sea Grant extension program and with NY State salmon processors.

Water Quality

Description of the scenario of meteorological forcing contributing to anomalies in water column temperature in Long Island Sound during 1997-1999 – Dr. Robert E. Wilson, SUNY at Stony Brook

Project Number: R/CE-16 Dates: 10/09/2000 – 04/08/2001 Funds: $8,014

Distribution and Toxin Profile of Toxic Cyanobacteria in New York State Drinking Waters – Dr. Gregory L. Boyer, SUNY College of Environmental Science & Forestry

Project Number: R/CTP-24 Dates: 02/01/2000 – 01/31/2002 Funds: $200,928

Objectives:

1. To develop the necessary analytical techniques to measure in situ concentrations of microcystins, cylindrospermopsin, anatoxin-a, anatoxin-a(S), and PSP toxins such as saxitoxin.
2. Test NY State drinking waters for the occurrence of cyanobacterial toxins and determine the concentrations of those toxins.
3. Test selected New York State waters for the occurrence of cyanobacterial toxins in the zebra mussel D. polymorpha. Associated with this will be to conduct limited experiments on the uptake of cyanotoxins (PSP toxins and microcystin) by zebra mussels to determine their assimilation efficiency.

Rationale:

Cyanobacterial toxins are receiving increasing attention as a problem for human drinking water supplies. The World Health Organization has established an allowable microcystin level of 1 ppb in drinking water. New York State currently lacks both the facilities to measure these toxins and the knowledge if they currently meet the WHO guideline. This proposal will establish background data on the distribution of cyanobacterial toxins and toxic species in Lake Ontario, Lake Oneida and its associated tributaries. Zebra mussels will be investigated as an integrative biomonitor and to evaluate their potential role in movement of toxins through the food chain.

Predicting Dissolved Oxygen Trends in the Tidal, Freshwater Hudson River: The Unrecognized Role of Introduced Species – Dr. Jonathan J. Cole, Institute of Ecosystem Studies

Project Number: R/CMB-24 Dates: 02/01/2000 – 01/31/2002 Funds: $247,637

Objectives:

1. To collect spatially and temporally intensive measurements of DO in the tidal freshwater river.
2. To bring together and synthesize other existing records of DO for this part of the system, along with records on freshwater flow in the Hudson and on regional wind speed in the Hudson Valley.
3. To generate a spatially explicit mechanistic model of DO dynamics in the Hudson and include the role of macrophytes.

Rationale:

In aquatic environments, dissolved oxygen (DO) is critical master variable that both affects and integrates numerous components of the ecosystem. Understanding how introduced species (in this case the zebra mussel and the water chestnut) DO can provide useful predictions about future DO conditions in the river.

Bioaccumulation and Trophic Transfer of Thallium in Great Lakes Plankton Communities – Dr. Nicholas S. Fisher, SUNY at Stony Brook

Project Number: R/CTP-26 Dates: 02/01/2000 – 01/31/2002 Funds: $276,355

Objectives:

1. To determine the bioaccumulative potential of thallium in the freshwater microbial food web, focussing on key species of phytoplanton and zooplankton in Lakes Erie and Ontario.
2. To develop a bioenergetic-based kinetic model that predicts thallium concentrations in zooplankton and evaluates the relative importance of food and water as sources.

Rationale:

Thallium contamination of the Great Lakes environment must be viewed as an emerging issue. This research will assess the bioaccumulation of the toxic heavy metal thallium by organisms at the bottom of the aquatic food chain (phytoplankton, zooplankton) in order to produce a predictive contaminant bioaccumulation model and to identify the key factors responsible for the biogeochemical cycling of this element in the aquatic environment. The information collected from this study will aid in the establishment of realistic water quality guidelines for this element in the Great Lakes ecosystem.

Estrogenicity of Municipal Sewage Treatment Plant Effluents: Vitellogenic and Estrogen Receptor Responses in Striped Bass – Dr. Anne E.McElroy, SUNY at Stony Brook

Project Number: R/CTP-25 Dates: 02/01/2000 – 01/31/2002 Funds: $177,761

Objectives:

1. To access the estrogenicity of New York Municipal Sewage Treatment Plants (MSTPs) effluent.
2. To characterize levels of estrogenic compounds in NY MSTP effluent.
3. To determine which compounds are most likely responsible for the effects observed and assess effective concentrations of each through dose-response studies.

Rationale:

In Europe levels of natural and synthetic steroids, and alkylphenol ethoxylate metabolites have been measured in sewage treatment plant receiving waters at concentrations sufficient to cause estrogen disruption in laboratory animals. Evidence that endocrine disruption is occurring in wild caught fish has also been reported. There are almost no data in US waters on levels of these contaminants in sewage effluent or estrogenic responses in exposed organisms. The proposed work will provide this data for one of the most densely populated areas of the U.S., New York City.