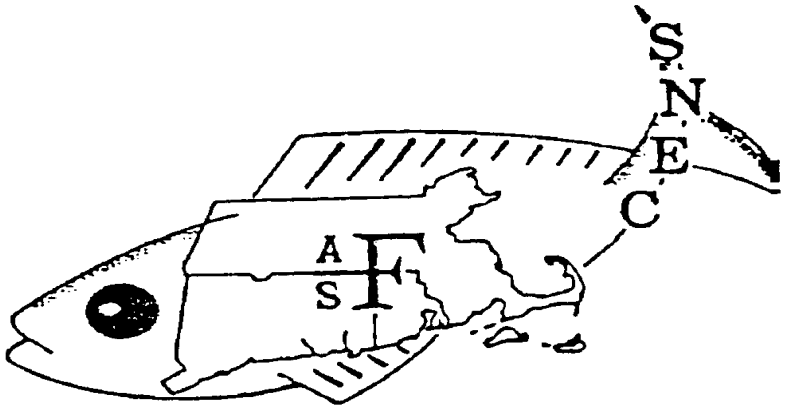
Southern New England Chapter

American Fisheries Society

2008 Winter Meeting



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January 9, 2008

Doyle Conservation Center
Leominster, MA

Program

AGENDA FOR SNEC AFS 2008 WINTER MEETING
WEDNESDAY JANUARY 9, 2008

8:30-9:00 ***Registration and Coffee***

9:00-9:10 **Opening Comments.** Justin Davis, SNEC President

9:10-9:30 **The status of proposed Federal aquaculture legislation in offshore waters: It's relevance to southern New England.** Harold C. Mears, *National Marine Fisheries Service, Northeast Region, Gloucester, MA 01930*

9:30-9:50 **Invasion of the striped scourgefish: quantifying the impact of a rebounding piscivore on anadromous alosines in the Connecticut River.** Justin Davis and Eric Schultz, *Department of Ecology and Evolutionary Biology, University of Connecticut, Storrs, CT 06269-3043*

9:50-10:10 **The effect of spatial scale and sampling effort on distribution of fish diversity.*** Chiu-Yen Kuo, *Department of Marine Sciences, University of Connecticut, Groton, CT 06340*

10:10-10:30 **Recent national and northeast trends in Federal Aid in Sport Fish Restoration expenditures: Fish and habitat versus fishing and boating.** Ronald J. Essig, *U.S. Fish and Wildlife Service, Division of Federal Assistance, Hadley, MA 01035*

10:30-10:50 ***Break***

10:50-11:10 **Describing how fish use habitat: A new approach using geospatial modeling.** Jose J. Pereira[1], Eric T. Schultz[2], and Peter Auster[3], [1]*National Marine Fisheries Service, Milford, CT 06460;* [2]*Department of Ecology and Evolutionary Biology, University of Connecticut at Storrs, Storrs, CT 06269;* [3]*Deparment of Marine Sciences, University of Connecticut at Avery Point, Groton, CT 06340*

11:10-11:30 **Methyl mercury in sunfish from two Massachusetts ponds.*** Tobias Stover and William G. Hagar, *Biology Department, University of Massachusetts, Boston, MA 02125*

11:30-11:50 **Emigration timing and emigrant characteristics in juvenile anadromous alewife.** Benjamin Gahagan[1] and Eric Schultz[2], [1]*Department of Natural Resources Management and Engineering;* [2]*Department of Ecology and Evolutionary Biology, University of Connecticut, Storrs, CT 06269-4087*

11:50-12:10 **Thermostability of the pleuronectid yolk protein, lipovitellin.*** Sean M. Lucey[1], Francis Juanes[1], and Joseph G. Kunkel[2], [1]*Department of Natural Resources Conservation;* [2]*Department of Biology, University of Massachusetts, Amherst, MA 01003*

12:10-1:00 ***Lunch***

1:00-1:50 ***Poster Session and Award Presentations***

1:50-2:40 ***Keynote presentation:*** **Of jacare, piranhas and candiru: Conserving biological diversity and aquatic ecosystems in South America.** Barry Chernoff, *Earth and Environmental Sciences and Biology Department, Wesleyan University, Middletown, CT 06459-0170*

2:40-3:00 **Measuring environmental effects on squid distribution in Nantucket Sound at multiple spatiotemporal scales.** Owen C. Nichols, Kevin Stokesbury, and Steve Cadrin, *NOAA/UMass Cooperative Marine Education and Research Program, University of Massachusetts, School for Marine Science and Technology, New Bedford, MA 02744*

3:00-3:20 **Projecting mixed-species yield of New England groundfish.*** Nikki Jacobson and Steve Cadrin, *NOAA/UMass Cooperative Marine Education and Research Program, University of Massachusetts, School for Marine Science and Technology, New Bedford, MA 02744-1221*

3:20-3:40 **Developing and enhancing northern pike fisheries in Connecticut.** Christopher McDowell, Timothy Barry, James Bender, and Edward Machowski, *Connecticut Department of Environmental Protection, Inland Fisheries Division, Marlborough, CT 06447*

3:40-4:00 **Procedures for efficiently producing high-quality fecundity data on a small budget.** Nikolai Klibansky and Francis Juanes, *Department of Natural Resources Conservation, University of Massachusetts, Amherst, MA 01003*

* Denotes student paper

Poster Session

A laboratory study of predator-prey behavioral interactions between bluefish (*Pomatomus saltatrix*) and longfin squid (*Loligo pealeii*).** Suzanne Carlson[1], Michelle Staudinger[2], Francis Juanes[2], and Roger Hanlon[3], [1]*Hampshire College, Amherst, MA 01002;* [2]*Department of Natural Resources Conservation, University of Massachusetts, Amherst, MA 01003;* [3]*Marine Biological Laboratory, Marine Resources Center, Woods Hole, MA 02543*

Factors influencing bioaccumulation of trace heavy metals by the blue mussel (*Mytilus edulis*).** Stacey A. Helming[1], Stephen K. O'Shea[1], and David L. Taylor[2], [1]*Department of Chemistry;* [2]*Department of Marine Biology, Roger Williams University, Bristol, RI 02809*

Recent innovations and applications of the Target Fish Community (TFC) Approach: 2000 – 2008. Jeffrey D. Legros, *Northeast Instream Habitat Program, Department of Earth and Environment – GeoProcessing Laboratory, Mount Holyoke College, South Hadley, MA 01075*

Spatial variations in otolith microchemistry for *Tautoga onitis* in Narragansett Bay.** Ivan Mateo[1], Dave Bengtson[1], and Edward Durbin[2], [1]*Department of Fisheries, Animal and Veterinarian Sciences, University of Rhode Island, Kingston, RI 02881;* [2]*University of Rhode Island, Graduate School of Oceanography, Narragansett, RI 02882*

The utilization of reef-ball artificial structures for fish habitat restoration in Mount Hope Bay, RI.** Kara McKeton and David L. Taylor, *Department of Marine Biology, Roger Williams University, Bristol, RI 02809*

Effects of feeding ecology and diet history on mercury bioaccumulation in temperate flatfishes.** Eric J. Payne and David L. Taylor, *Department of Marine Biology, Roger Williams University, Bristol, RI 02809*

Warm water discharge from power plants located in the coastal zone in the northeast. John Ziskowski[1], Robert Murchelano[1], James H. Ridinger[2], Chet Zawacki[3], Byron Young[3], [1]*National Marine Fisheries Service, Milford Laboratory, Milford, CT 06460*; [2]*Real Estate Management, Miami, Fl 33162*; [3]*New York Department of Environmental Conservation, Albany, NY 12233*

** Denotes student poster

ABSTRACTS

A laboratory study of predator-prey behavioral interactions between bluefish (*Pomatomus saltatrix*) and longfin squid (*Loligo pealeii*).

Suzanne Carlson[1], Michelle Staudinger[2], Francis Juanes[2], and Roger Hanlon[3], [1]*Hampshire College, 893 West St., Amherst, MA 01002;* [2]*Department of Natural Resources Conservation, University of Massachusetts, Amherst, MA 01003;* [3]*Marine Biological Laboratory, Marine Resources Center, Woods Hole, MA 02543; 860-490-1801, smc05@hampshire.edu*

Knowledge of predator-prey interactions is important in helping understand factors influencing natural mortality in squid populations. Despite their importance as a prey resource, inclusion of squid in predator-prey laboratory studies has been limited. The present study examined behavioral interactions between bluefish (*Pomatomus saltatrix*) and longfin squid (*Loligo pealeii*). In a series of behavioral trials conducted at the Marine Biological Laboratory, Marine Resource Center, we tested an existing theoretical model of cephalopod defense behavior, and evaluated the sequence and frequency of decisions made by squid when attacked by bluefish. Over the course of summer 2007, 35 behavioral trials were conducted. Preliminary results using video analysis suggest that squid utilize a combination of primary and secondary defense tactics to deter bluefish attacks. The most frequent anti-predator defense strategy was to keep entirely still and rely on their ability to camouflage for protection (crypsis). Bluefish are highly visual predators, therefore squid were often forced to perform secondary (deimatic or protean) defense maneuvers in addition to crypsis such as mid-water arm posturing, color change, inking, and jetting. Bluefish represent a highly active, visual predator. Further work will also examine squid's response to a "lie and wait" predator, summer flounder (*Paralichthys dentatus*), to determine how squid anti-predator defense decisions are influenced by predator attack strategy.

Of jacare, piranhas and candiru: Conserving biological diversity and aquatic ecosystems in South America. (*keynote presentation*)

Barry Chernoff, *Earth and Environmental Sciences and Biology Department, Wesleyan University, Middletown, CT 06459-0170; 860-685-2452, bchernoff@wesleyan.edu*

South America has the most diverse freshwater ichthyofauna in the world, with more than 3,000 named species and more than 100 new species added yearly. The aquatic ecosystems of South America are highly diverse as well. Conservation of both aquatic ecosystems and their attendant biotas face major challenges including poor identification of resources, effects of long distance dispersal and complex life histories, deforestation, habitat alteration, over-fishing, and myths. The presentation will provide an overview of the biotic diversity of fishes and their habitats and discuss our understanding of these resources. Results from studies in Brazil, Ecuador, Paraguay, Peru, and Venezuela will demonstrate that communities of fishes are not randomly distributed as once believed and that faunistic

differences associated with macrohabitats and local regions can be identified. The major opportunities for conservation will also be discussed and will include estimates of the values of the fisheries in relation to proposed development of ecosystem altering projects, such as dams or establishment of connections among drainages.

Invasion of the striped scourgefish: quantifying the impact of a rebounding piscivore on anadromous alosines in the Connecticut River.

Justin Davis and Eric Schultz, *Department of Ecology and Evolutionary Biology, University of Connecticut, 75 North Eagleville Road, Storrs, CT 06269-3043; 860-295-9523, justin.davis@po.state.ct.us*

Striped bass (*Morone saxatilis*) are an ecologically and economically important marine finfish distributed along the eastern seaboard of the U.S and Canada. Populations of this top-level predator have increased to historic levels in recent decades, prompting concerns about impacts on prey populations. In the Connecticut River, annual returns of anadromous alosines (blueback herring *Alosa aestivalis* and American shad *A. sapidissima*) have drastically declined in the last two decades. Increased seasonal presence of striped bass over this period suggests that heavy predation during vernal migrations may account for alosine declines. In order to quantitatively test this hypothesis, we sampled striped bass (*Morone saxatilis*) in the Connecticut River during spring 2005-07. Here we present analysis of diet composition, feeding strategy, and per-capita consumption rates. Diet composition varied with predator size. Alosines were observed primarily in guts of larger (> 50 cm TL) striped bass, and feeding specialization for alosines was positively correlated with striped bass size. Estimates of striped bass per-capita consumption rates were calculated using the Adams model for predatory warmwater fish. Consumption estimates derived from individual sampling events were regressed against alosine abundance to characterize predator functional response. Future analyses will combine these results with mark-recapture abundance estimates to quantify population-level consumption of anadromous alosines by striped bass.

Recent national and northeast trends in Federal Aid in Sport Fish Restoration expenditures: Fish and habitat versus fishing and boating.

Ronald J. Essig, *U.S. Fish and Wildlife Service, Division of Federal Assistance, 300 Westgate Center Drive, Hadley, MA 01035; 413-253-8504, Ron_essig@fws.gov*

Since 1950, Federal Aid in Sport Fish Restoration (SFR) has had the dual mission of the restoration and management of sport fish populations and the provision of fishing and boating opportunities. State and Territorial fisheries agency expenditures totaling $707 million (federal) during FY 2003-2005 were examined within the accomplishments portion of the Federal Aid Information Management System (http://faims.fws.gov). Results of this national snapshot of recent SFR funding show 46% devoted to fish population and habitat work and 54% devoted to recreation. Percentages of expenditures by type of grant were: research and survey (32%), fish production and stocking (23%), boating and fishing access (22%), habitat protection and improvement (9%), aquatic resource education (6%), and

coordination, administration, planning and outreach (8%). These national percentages were similar to those in the northeast. For both the entire country and the northeast, percentages of expenditures by type of grant over the past 16 years (FY 1990-2005) showed declining trends in research and survey work and increasing trends in aquatic resource education and fish production and stocking. There was also a significant increasing trend in boating access funding in the northeast. Fifty-four percent of SFR funding in the northeast was devoted to fish population and habitat work and 46% was devoted to recreation. There were no significant trends in fish and habitat versus fishing and boating over the 16-year period either nationally or in the northeast.

Emigration timing and emigrant characteristics in juvenile anadromous alewife.

Benjamin Gahagan[1] and Eric Schultz[2], [1]*Department of Natural Resources Management and Engineering;* [2]*Department of Ecology and Evolutionary Biology, University of Connecticut, Storrs, CT 06269-4087; 860-486-1874, benjamin.gahagan@uconn.edu*

The anadromous alewife, *Alosa pseudoharengus*, is a major food source for many predators in the coastal ecosystems of the Northwest Atlantic. In the last 15 years alewife abundance has drastically declined, stimulating studies of factors influencing the success of each life stage. The focus of this study is juvenile emigration, particularly with respect to its timing and seasonal changes in emigrant characteristics. We studied emigration from Bride Lake, a 29 ha water body connected to Long Island Sound by an approximately 3.5 km long seasonally intermittent stream. Bride Lake is the site of a relatively large anadromous alewife run in Connecticut. Continuous monitoring from mid-June to early August 2006 revealed multiple emigration peaks. Emigration rate declined in mid-July although substantial numbers of juveniles remained in the lake. Emigration rate is greatest a day or two after rainfall. During the peak migration period, most emigration occurred in the mid-morning hours. Analysis of daily age and size revealed that emigrants were larger at age and were in better condition than lake residents during the peak migration period. These results indicate that individual factors interact with local conditions to trigger emigration behavior. The results vary from those of studies in other parts of New England, suggesting regional variations in alewife developmental processes.

Factors influencing bioaccumulation of trace heavy metals by the blue mussel (*Mytilus edulis*).

Stacey A. Helming[1], Stephen K. O'Shea[1], and David L. Taylor[2], [1]*Department of Chemistry;* [2]*Department of Marine Biology, Roger Williams University, One Old Ferry Rd., Bristol, RI 02809; 860-964-1080, shelming209@hawks.rwu.edu*

To model the bioavailable concentration of toxic heavy metals in sediments and water in an estuarine environment, the sedentary blue mussel (*Mytilus edulis*) was chosen as an indicator species. Sediments (0-2 cm) and *M. edulis* were collected from six sites in Narragansett Bay, Rhode Island, and examined for trace heavy metal concentration. Metal contaminants in sediments were correlated with the total organic carbon content and grain size distribution of the sediments. Mean differences in *M. edulis* and sediment metal

concentrations were examined across sites using analysis of variance models. Moreover, correlations between site-specific *M. edulis* and sediment concentrations were investigated using regression analysis. Heavy metal analysis was completed on a DMA-80 (total mercury) and ICP-MS (lead, cadmium, silver, and selenium). Grain size was differentiated by dry sieving, while total organic carbon was determined by ashing sediments in a Muffle Furnace (550 ˚C, 5 hr).

Projecting mixed-species yield of New England groundfish.

Nikki Jacobson and Steve Cadrin, *NOAA/UMass Cooperative Marine Education and Research Program, University of Massachusetts, School for Marine Science and Technology, 838 South Rodney French Blvd, New Bedford, MA 02744-1221; 508-910-6358, jacobson.n@gmail.com*

New England groundfish are harvested in multispecies fisheries and are managed under a single Fishery Management Plan. Current practice is to determine fishing limits through single-species projection models that allow for stock rebuilding or sustainable yield. Effectiveness of alternative harvest scenarios for achieving management targets is then evaluated using multispecies patterns of catch per effort, by season and location. However, the current mixed-species analyses are static, in that they do not project population dynamics. Our approach incorporates the dynamic aspects of single-species projections with technological interactions for multispecies evaluations. The computational approach extends a traditional (but seldom applied) mixed-species yield-per-recruit model by incorporating stock-recruitment relationships. Multispecies catchability coefficients (derived from study fleet, observer and logbook data) are disaggregated by season, area, gear, and target species. This multispecies projection approach provides short-term evaluation of alternative management scenarios, including optimal days-at-sea and time-area closures that achieve stock rebuilding and sustainable yield targets.

Procedures for efficiently producing high-quality fecundity data on a small budget.

Nikolai Klibansky and Francis Juanes, *Department of Natural Resources Conservation, University of Massachusetts, Amherst, MA 01003; 508-495 2199, nikolaifish@hotmail.com*

Though fecundity estimation has typically been very time consuming, efficient methods have recently been developed. Building on these developments we describe procedures for efficiently producing precise, accurate, fecundity estimates for highly fecund Atlantic cod, using a low cost laboratory setup. Capturing images with a standard flatbed scanner and analyzing them with free image analysis software (total equipment cost ≈ $100) we were able to process individual samples in as little as 5 minutes. We show a strong relationship between mean oocyte diameter (range 200 – 900μ) and oocyte density ($r^2 = 0.971$, n = 50), and thus are able to estimate fecundity using gravimetric and auto-diametric methods. Testing the precision of the auto-diametric method we find estimates produced by both methods to be highly correlated ($r^2 = 0.961$, n = 26). The success of these methods should assure fisheries scientists that fecundity estimation is no longer the daunting task it once was, and catalyze further production of fecundity data.

The effect of spatial scale and sampling effort on distribution of fish diversity.

Chiu-Yen Kuo, *Department of Marine Sciences, University of Connecticut, 1080 Shennocossett Rd., Groton, CT 06340; 860-405-9099, Chiu-Yen.Kuo@uconn.edu*

Marine protected areas are an important tool to conserve marine habitats. Understanding the distribution of fish diversity across a range of spatial scales is important to maximize efficiency when selecting areas for conservation attention. In this study geospatial approaches were used to analyze and examine patterns of fish diversity in the Gulf of Maine – Georges Bank Large Marine Ecosystem. The distribution of fish diversity, from 1975 to 2004, was examined at multiple spatial scales (10x10 km^2, 20x20 km^2, 40x40 km^2, and 80x80km^2). Coastal areas of Gulf of Maine were initially identified as hotspots at fine spatial scales. However, initial results demonstrated that the distribution of diversity hotspots was strongly correlated with the density of sample sites. A random sample method based on matching sample density in each cell, at each cell size, was used to sub-sample data to reduce the effect of variation in effort. A subsequent analysis demonstrated the locations with the highest species richness shifted from coastal areas to Georges Bank. Interestingly, whether sampling effort was considered or not, the form of the Species-Area Relationship (SAR) from both analyses was similar to other studies focused on a diverse range of habitats and taxa. This study illustrated how species diversity hotspots and species distribution patterns varied with the spatial scale of observation and sampling effort. Future studies will focus on spatial scale and efficiency related to representation of diversity.

Recent innovations and applications of the Target Fish Community (TFC) Approach: 2000 – 2008.

Jeffrey D. Legros, *Northeast Instream Habitat Program, Department of Earth and Environment – GeoProcessing Laboratory, Mount Holyoke College, South Hadley, MA 01075; 413-627-1602, jlegros@umass.nrc.edu*

Since Bain and Meixler's (2000) inception of the Target Fish Community Approach as a concept, and their initial application of the method as part of an ecohydrology study of the Quinebaug River (Connecticut & Massachusetts), their concept has evolved into an effective and efficient ecological assessment tool which has been applied on various rivers throughout Southern New England by multiple agencies and organizations. The purpose of this poster is to recognize the importance of this method and describe some of the recent innovations that have served to increase the efficiency, utility and effectiveness of the approach. In outlining the evolution of the approach, from its conceptual inception through its past applications and recent methodological developments, I will illustrate the ability of the approach to be applied at regional zoogeographic scales as an ecological assessment tool for specific river and stream macrohabitat types. I will also infer potential implications of such applications as they pertain to fisheries conservation in general, and in particular, to the objectives of the National Fish Habitat Initiative.

Thermostability of the pleuronectid yolk protein, lipovitellin.

Sean M. Lucey[1], Francis Juanes[1], and Joseph G. Kunkel[2], [1]*Department of Natural Resources Conservation;* [2]*Department of Biology, University of Massachusetts, 160 Holdsworth Way, Amherst, MA 01003; 508-495-2011, slucey@student.umass.edu*

Marine teleosts are oviparous animals that utilize yolk proteins in the development of their embryos. A major source of nutrition is the yolk protein lipovitellin (Lv). Recent studies have also linked Lv to the osmotic uptake of water which allows fish to produce pelagic eggs. Despite Lv's importance, the majority of research has centered on the yolk pre-cursor, vitellogenin (Vg). Vg is a good indicator of estrogenic toxins and easier to harvest than Lv since it resides in the blood stream. Lv must be extracted from an ovary or ovulated eggs and separated from other cellular components. Prior research showed that winter flounder, *Pleuronectes americanus*, Lvs, and several other fish species' Lvs are thermally stable. This allowed us to isolate Lv via heat denaturation. We further quantified its thermal characteristics using differential scanning calorimetry (DSC). We compared Lvs from four different members of the Pleuronectid family and found them to all have similar denaturation characteristics suggesting that this property has been conserved throughout the family. Knowledge of protein structure and stability characteristics will lead to a better understanding of the evolution of reproduction in marine teleosts.

Spatial variations in otolith microchemistry for *Tautoga onitis* in Narragansett Bay.

Ivan Mateo[1], Dave Bengtson[1], and Edward Durbin[2], [1]*Department of Fisheries, Animal and Veterinarian Sciences, University of Rhode Island, Kingston, RI 02881;* [2]*University of Rhode Island, Graduate School of Oceanography, Narragansett, RI 02882; 401-316-7326, imateo32@cox.net*

The dependence of fish production and population dynamics on dispersal and migration among multiple habitats, viz., connectivity, is a critical property of marine populations. Connectivity rates determine colonization patterns of new habitats, the resiliency of populations to harvest, and the design of marine protected areas (MPAs). Quantifying exchange rates in marine organisms is, however, extremely difficult because natal origins of adults are almost invariably unknown. This lack of knowledge is primarily due to the difficulty of conducting mark-recapture studies in species that are characterized by the production of large numbers of small pelagic offspring that suffer high mortality rates. Recently, tagging techniques using natural isotopic and elemental markers have been developed for species that are not able to be tagged or recaptured using conventional approaches. Chemical habitat tags in the otoliths of juvenile fish have been used to differentiate individuals from different estuarine/riverine systems, alternative types of nearshore habitats, including estuary versus rocky reef, and estuary versus subtidal sandflats. In addition, through chemical analysis of the juvenile core of adult otoliths, the habitat tag has been used to determine the proportion of an adult population that had resided in specific juvenile habitats. This study seeks to evaluate the feasibility of using otolith trace element signatures of the estuarine-dependent finfish tautog, *Tautoga onitis*, to determine the contribution of different nursery areas to adult stocks in Rhode Island.

Developing and enhancing northern pike fisheries in Connecticut.

Christopher McDowell, Timothy Barry, James Bender, and Edward Machowski, *Connecticut Department of Environmental Protection, Inland Fisheries Division, 209 Hebron Road, Marlborough, CT 06447; 860-295-9523, cpmcdowell@po.state.ct.us*

Though not native to Connecticut, records indicate that northern pike were present in the Connecticut River at least as early as the mid-1800s. The first known introduction of pike into a Connecticut lake occurred at Bantam Lake in 1971. Soon thereafter, the Connecticut State Board of Fish and Game developed its first managed spawning marshes in a tributary to this lake to enhance the pike population level by augmenting natural reproduction. With the success of this fledgling experiment, marsh management was expanded over the years and currently the Inland Fisheries Division manages seven marshes for fingerling pike production. From these marshes we produce, on average, 16,000 fingerlings annually that have been used to develop and/or augment pike populations in seven water bodies. The pike program has been cost-effective and successful in increasing the quality and diversity of fishing opportunities for Connecticut anglers. We have created popular new fisheries, which consistently yield trophy-size fish. Directed angler effort has increased over time, which has resulted in overall increases in angler usage among the lakes. Introduction of pike has resulted in improved growth and size structure of stunted white perch in one instance. No negative effects on other fish populations or fisheries have yet been detected.

The utilization of reef-ball artificial structures for fish habitat restoration in Mount Hope Bay, RI.

Kara McKeton and David L. Taylor, *Department of Marine Biology, Roger Williams University, One Old Ferry Rd., Bristol, RI 02809; kmcketon918@hawks.rwu.edu*

In August 2006, Roger Williams University (Bristol, RI) initiated a habitat restoration project in Mount Hope Bay using innovative artificial reef structures (Reef-ball®). This pilot study focused on testing the feasibility of Reef Ball® technology as a restoration tool for fish habitat. Fish assemblage at an artificial reef site (AR), a natural rocky reef (NR), and a non-reef site (control) were monitored using an underwater camera system from June-November 2007 (# of observations = 14, 7, and 14 for the AR, NR and control, respectively). Overall, the average fish abundance was greater at the AR (15 ± 3.2 fish observed per 4 min) than the NR (11 ± 3.5 fish observed per 4 min) and control site (3 ± 1.4 fish observed per 4 min). Cunner (*Tautogolabrus adspersus*) was the dominant species at the AR (26% of total catch) and NR (42%), while the scup (*Stenotomus chrysops*) was dominant at the control site (54%). Species diversity was highest at the AR (species richness = 8; Simpson's index = 4.84) and lowest at the control site (species richness = 4; Simpson's index = 2.56). During July 2007, 20-25% of all labrids observed at the reefs sites were age-0 juveniles. Conversely, total fish abundance reached peak levels in mid-October because of the large influx of black sea bass (*Centropristis striata*) (mean size = 8.5 ± 1.3 cm total length; size range = 5.5–12.1 cm total length) to the reef sites (AR and NR). Reef Ball® technology has the potential to serve as a restoration tool through evidence of initial recruitment and fish attraction by various species.

The status of proposed Federal aquaculture legislation in offshore waters: It's relevance to southern New England.

Harold C. Mears, *National Marine Fisheries Service, Northeast Region, One Blackburn Drive, Gloucester, MA 01930; 978-281-9243, harry.mears@noaa.gov*

Proposed Federal legislation for the development of offshore aquaculture continues to be considered by Congress. The biggest challenges we face today to an expanded aquaculture industry are: lack of a regulatory framework in Federal waters; a complicated yet improving regulatory process for coastal waters; and competition for high-value land and coastal water uses. This talk will focus on the National Marine Fisheries Service's support of the legislation, working in partnership with the States and aquaculture industry, with an emphasis on Southern New England.

Measuring environmental effects on squid distribution in Nantucket Sound at multiple spatiotemporal scales.

Owen C. Nichols, Kevin Stokesbury, and Steve Cadrin, *NOAA/UMass Cooperative Marine Education and Research Program, University of Massachusetts, School for Marine Science and Technology, 838 South Rodney French Blvd, New Bedford, MA 02744; 508-910-6389, onichols@umassd.edu*

Critical to the emerging concept of "Ecosystem-Based Fishery Management" is an understanding of the relationships between oceanic and climatic processes and the distribution and abundance of commercially exploited marine species. A seasonal fishery for longfin inshore squid (*Loligo pealeii*) occurs in Nantucket Sound. The objectives of this study are to characterize patterns of squid distribution and relationships with environmental variables, and define the spatiotemporal scales at which such relationships exist. Squid catch and fishing effort were documented using logbooks at commercial fish weirs in northeastern Nantucket Sound from April through September 2007. Seawater temperature and salinity were recorded using data loggers affixed to individual weirs. Preliminary results indicated substantial variability in squid relative density among dates and trap locations. Archived environmental data (wind speed/direction, ambient light) from weather stations around the Sound will be used to supplement the data already collected. Weir sampling will continue in 2008, along with deployments of the SMAST Acoustical-Optical Platform (AOP) to assess diel patterns of squid catches in individual weirs. To assess interannual variation, archived weir and trawl landings, trawl survey abundance indices, and environmental data will be collected from the appropriate state and federal agencies.

Effects of feeding ecology and diet history on mercury bioaccumulation in temperate flatfishes.

Eric J. Payne and David L. Taylor, *Department of Marine Biology, Roger Williams University, One Old Ferry Rd., Bristol, RI 02809; 508-207-7795, epayne604@hawks.rwu.edu*

The winter flounder, *Pseudopleuronectes americanus,* and the summer flounder,

Paralichthys dentatus, support valuable recreational and commercial fisheries in Narragansett Bay, Rhode Island. A possible human health risk occurs from consuming these flatfish if they bioaccumulate appreciable levels of mercury (Hg) over time. Factors impacting Hg concentrations in fish tissue, however, vary based on species-specific life history characteristics, such as feeding ecology and diet history. In this study, winter and summer flounder were collected throughout the Narragansett Bay Estuary from June to August (2006 and 2007). Tissue samples from different life stages of each flatfish (juveniles and adults) were analyzed for total Hg concentration using atomic absorption spectroscopy, and Hg data were analyzed relative to fish body size and predicted age. Moreover, the effect of trophic processes on species-specific Hg bioaccumulation rates were assessed using stomach content and nitrogen stable isotope analyses of target species. Hg bioaccumulation rates were greater in summer flounder relative to winter flounder, and this was attributed to the feeding ecology of summer flounder and their higher trophic level status in the estuary.

Describing how fish use habitat: a new approach using geospatial modeling.

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A better understanding of habitat requirements is mandated by recent federal fisheries law. One way to approach this issue is to examine factors that influence distribution. We are investigating how distribution changes with abundance, which is of particular interest in exploited populations that undergo large changes in abundance. Three theories have been proposed for the relationship between marine fish abundance and distribution: the Constant Density Model (CDM), the Proportional Density Model (PDM), and MacCall's Basin Model (MBM). The CDM predicts that the population's range expands and contracts with changes in global abundance while local density does not vary. Habitat quality varies and the best habitats, conferring the highest fitness, remain occupied at lowest abundance. The PDM predicts that range remains constant and that local density varies with changes in abundance. Local density is highest in habitats that confer the highest fitness. The MBM predicts that there is density-dependent habitat use, such that both local density and species range vary with changes in abundance. Fitness should be the same across habitats because of these density-dependent processes. We are testing these theories using geospatial modeling and National Marine Fisheries Service trawl survey data. We test for changes in range by mapping non-zero catches at high and low population levels. We test for fitness changes across habitats by assessing spatial autocorrelation in fitness metrics (weight-at-length, weight-at-age). The analyses are being conducted on a benthivore (yellowtail flounder, *Limanda ferrugineus*), a pelagic planktivore (Atlantic herring, *Clupea harengus*), a piscivore (silver hake, *Merluccius bilinearis*), and a demersal omnivore (haddock, *Melanogrammus aeglefinus*).

Methyl mercury in sunfish from two Massachusetts ponds.

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Methyl mercury is a pollutant of tremendous concern because it can be introduced into many trophic levels within an ecosystem through methylation of inorganic mercury by aquatic bacteria. Biomagnification of methyl mercury poses a serious health threat to piscivorous wildlife and to anglers who consume freshwater fish. A recent technique (Mohammadi *et al.* 2005 Microchim Acta 149: 251-257) that measures the levels of methyl mercury in saltwater fish tissue using an Invertase enzyme assay was evaluated to test the effectiveness of this enzymatic technique in freshwater fish. The levels of methyl mercury contamination were investigated in two species of sunfish; *Lepomis gibbosus* (Pumpkinseed) and *L. macrochirus* (Bluegill) from two southeastern Massachusetts ponds. Fish samples were obtained by electrofishing. Fish age was determined by counting the growth annuli of scale samples taken from the fish. Muscle tissue samples were processed to extract methyl mercury in toluene before reaction with Invertase enzyme and sucrose in acetate buffer. A standard curve was constructed using methyl mercury chloride in standard concentrations in toluene. Preliminary results suggest that this technique might be another method for determining methyl mercury concentrations in freshwater fish. More testing and work is needed to perfect the protocol to produce more consistent results.

Warm water discharge from power plants located in the coastal zone in the northeast.

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Responding to alarming reports of numerous diseased striped bass (*Morone saxatilis*) being caught by sport fishermen from the warm water effluent of the Northport power plant in January 1973, we mounted a gill-net operation the following month, February 1973, to survey this population of fish. Of the 98 bass that we surveyed for gross lesions, 21 (21.4%) exhibited slight to severe lymphocystis lesions with attendant fin erosion. Length range was 274-400 mm SL. Surface seawater temperature at point of capture was 12 ^{o}C and 1^{o}C in surrounding waters. Lymphocystis was confirmed by histological analysis. A control site in the Hudson River at Croton Bay was sampled in March by bottom trawl resulting in the capture of 78 striped bass of comparable size range: 241-475 mm SL. Water temperature at point of capture was 5^{o}C. None of the fish exhibited signs of lymphocystis disease. Thirty-four years later, there are still reports of diseased striped bass being caught in warm water effluents from power plants during the winter. In January 2007, the Narragansett Bay Keeper, John Torgan, reported a 30% prevalence of diseased bass among his catch in the vicinity of the Manchester Street power plant in the Providence River. This disease is believed to be caused by a virus which invades skin cells causing them to enlarge up to 500 times normal size. Virus particles are continuously shed from infected fish and can easily infect other bass in the crowded conditions existing in the vicinity of a warm water

discharge. Also, the warm water temperatures may accelerate infection rate and intensity. The degree to which this disease is widespread among over-wintering striped bass near power plants on the Atlantic coast is not known.