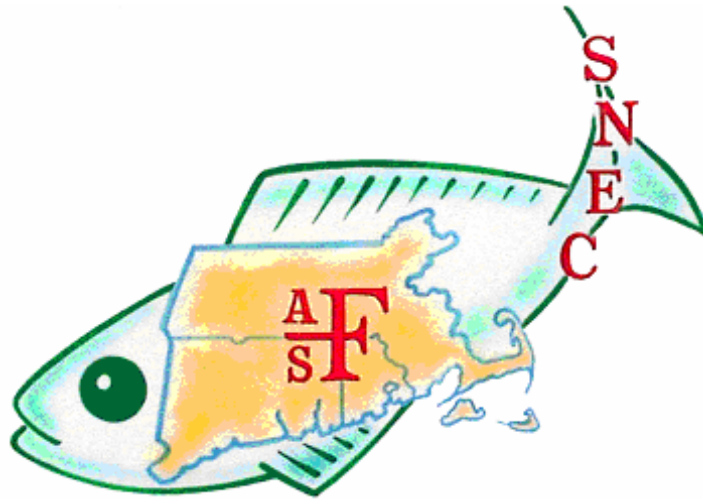


Southern New England Chapter

American Fisheries Society

2010 Winter Meeting



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January 28, 2010

**University of Connecticut, Avery Point
Groton, CT**

Program

AGENDA FOR SNEC AFS 2010 WINTER MEETING THURSDAY JANUARY 28, 2010

- 8:20-8:50 *Registration and Coffee*
- 8:50-9:00 **Opening Comments.** Ken Sprankle, SNEC President
- 9:00-9:20 **Interpopulation differences in the osmoregulatory physiology of alewife (*Alosa pseudoharengus*) in Connecticut.*** Jonathan P. Velotta, Stephen D. McCormick, David M. Post, and Eric T. Schultz, *University of Connecticut Department of Ecology and Evolutionary Biology, Storrs, CT 06269-3043*
- 9:20-9:40 **Developing a systems approach to fishery science and management: A first iteration for New England fisheries.** Azure D. Westwood¹ and Emily Keiley², ¹*University of Massachusetts Dartmouth, School for Marine Science & Technology, Fairhaven, MA 02719*; ²*University of Massachusetts, School for Marine Science and Technology, New Bedford, MA 02744-1221*
- 9:40-10:00 **Determining acoustic receiver range in a shallow northeastern estuary with complex bathymetry: The role of habitat, depth and tide.*** Cristina G. Kennedy^{1,2,3,6}, Martha E. Mather^{1,2,3}, John T. Finn^{2,3}, Linda A. Deegan⁴, and Sarah M. Pautzke⁵, ¹*University of Massachusetts (UMASS), Massachusetts Cooperative Fish and Wildlife Research Unit, Amherst, MA 01003*; ²*UMASS, Department of Natural Resources Conservation, Amherst, MA 01003*; ³*UMASS, School of Marine Sciences*; ⁴*Marine Biological Laboratory, Ecosystems Center, Woods Hole, MA 02543*; ⁵*Western Pacific Fishery Management Council, Honolulu, Hawaii 96813*
- 10:00-10:20 **Prey selection in crustacean-eating fishes following the invasion of the Asian shore crab *Hemigrapsus sanguineus* in Long Island Sound.*** Kari B. Heinonen and Peter J. Auster, *University of Connecticut, Department of Marine Sciences, Groton, CT 06340*
- 10:20-10:40 *Break*

- 10:40-11:00 **Seasonal variation in smooth dogfish *Mustelus canis*, catch and diet from a longline survey in Buzzards Bay, Massachusetts.*** Derek N. Perry^{1,2} and G.B. Skomal^{2,3}, ¹*University of Massachusetts, School for Marine Science & Technology, New Bedford, MA 02744;* ²*Massachusetts Division of Marine Fisheries, Coastal Lobster Program, New Bedford, MA 02744;* ³*Massachusetts Division of Marine Fisheries, Massachusetts Shark Research Program, Vineyard Haven, MA 02568*
- 11:00-11:20 **Validation of an otolith ageing method for American shad *Alosa sapidissima*.** William Duffy¹, Richard McBride¹, Mike Hendricks², Kenneth Oliveira³, ¹*National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Woods Hole, MA 02543;* ²*Pennsylvania Fish and Boat Commission, Benner Spring Fish Research Station, State College, PA 168012;* ³*University of Massachusetts Dartmouth, Dartmouth, MA 02747*
- 11:20-11:40 **A GIS based investigation of climate change on habitat suitability for two species of concern in the Gulf of Maine.*** Eric Heupel, *University of Connecticut Avery Point, Department of Marine Sciences, Groton, CT 06340*
- 11:40-12:00 **Assessing the generality of temporal shifts in river herring demography and life history: Size, age, and spawning history structure of the Connecticut river blueback herring run.** Justin P. Davis, Eric T. Schultz, Katie E. Gherard, and Jonathan P. Velotta, *University of Connecticut, Department of Ecology and Evolutionary Biology, Storrs, CT 06269*
- 12:00-12:20 ***Awards and Business***
- 12:20-1:10 ***Lunch***
- 1:10-1:50 **Poster Speed Presentations**
- 1:50-2:40 **Poster Session**
- 2:40-3:00 **Advanced scientific diving technology.** Jeff M. Godfrey, *University of Connecticut, Marine Sciences and Technology Center, Groton, CT 06340*
- 3:00-3:20 **Association between diet and epizootic shell disease in the American lobster (*Homarus americanus*) around Martha's Vineyard.*** N. David Bethoney¹, Brad Stevens², Kevin Stokesbury¹, Mark Altabet¹, Michael Tlusty³, ¹*University of Massachusetts Dartmouth, School of Marine Science and Technology, New Bedford, MA 02740;* ²*University of Maryland Eastern Shore, Princess Anne, MD 21853;* ³*New England Aquarium, Boston, MA 02110-3399*

- 3:20-3:40 **Implementing improvements in the collection of marine recreational fishing information.** Paul Perra¹, David Van Voorheses², and Robert Andrews², ¹*National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS), Gloucester, MA 01930*; ²*NOAA NMFS, Silver Spring, MD 20910*
- 3:40-4:00 **Movements and spawning patterns of winter flounder in the Gulf of Maine: observations using passive acoustic telemetry.*** Greg DeCelles and Steven Cadrin, *National Oceanic and Atmospheric Administration, University of Massachusetts, Cooperative Marine Education and Research Program, School for Marine Science and Technology, Fairhaven, MA 02719*
- 4:00-4:20 **Restoration of a pasture stretch of the Mount Hope River utilizing a natural channel design approach.** Brian D. Murphy, *Connecticut Department of Environmental Protection, Inland Fisheries Division, Habitat Conservation and Enhancement Program, Marlborough, CT 06447*
- 4:20-4:40 **Use of HabCam imagery to assess the status of rare fish species in an offshore marine protected area (Gulf of Maine).** Peter Auster¹, Kari Heinonen¹, Eric Heupel¹, Danielle Calini¹, Scott Gallager², Amber York², ¹*University of Connecticut, Department of Marine Sciences and Northeast Underwater Research Technology and Education Center, Groton, CT 06340*; ²*Woods Hole Oceanographic Institution, Woods Hole, MA 02543*

* Denotes student paper

Poster Session

- P1 **Estimating batch fecundity in Connecticut river herring.** Jeffrey N. Divino, Justin P. Davis, Katie E. Gherard, and Eric T. Schultz, *University of Connecticut, Department of Ecology and Evolutionary Biology, Storrs, CT 06269-3043*
- P2 **Performance of a large marine protected area in the Gulf of Maine: Inside-outside comparisons of fish microhabitat structure.**** Kari B. Heinonen¹, Peter J. Auster¹, and James Lindhom², ¹*University of Connecticut, Department of Marine Sciences, Groton, CT 06340*; ²*California State University Monterey Bay, Monterey, CA 93940*
- P3 **Evaluating effects of water withdrawals and impoundments on fish assemblages in Connecticut streams.**** Yoichiro Kanno and Jason C. Vokoun, *University of Connecticut, Department of Natural Resources and the Environment, Storrs, CT 06269*
- P4 **Sensitivity mapping for energy facility siting analysis in the marine environment.** Matthew D. Johnson, Danielle A. Reich, and Jennifer A. Bennett, *Natural Resource Group, LLC, Providence, RI 02903*
- P5 **The effects of biogenic oyster reefs on infaunal and epifaunal community structure in Rhode Island estuaries.**** Todd Massari and David L. Taylor, *Roger Williams University, Department of Marine Biology, Bristol, RI 02809*
- P6 **Characterizing the swimming performance of burbot for fish passage.**** Daniel Watrous¹, Jason C. Vokoun¹, Theodore Castro-Santos², Alex Haro², ¹*University of Connecticut, Department of Natural Resources and the Environment, Storrs, CT 06269*; ²*S. O. Conte Anadromous Fish Research Laboratory, U. S. Geological Survey, Biological Resources Discipline, Turners Falls, MA 01376*

** Denotes student poster

ABSTRACTS

Use of HabCam imagery to assess the status of rare fish species in an offshore marine protected area (Gulf of Maine). Auster, Peter¹, Kari Heinonen¹, Eric Heupel¹, Danielle Calini¹, Scott Gallager², Amber York², ¹*University of Connecticut, Department of Marine Sciences and Northeast Underwater Research Technology and Education Center, Groton, CT 06340*; ²*Woods Hole Oceanographic Institution, Woods Hole, MA 02543*; danielle.calini@uconn.edu

The ability to produce continuous linear high resolution imagery of the seafloor at the scale of kilometers, with coincident data on oceanographic conditions, will enable ecologists to answer questions about the distribution of biological diversity in ways that have been previously unavailable. Data sets derived from time series of such imagery will enable analysis of the dynamics of biodiversity, the distribution of key species, and associated environmental and biological drivers. While dominant species are often the focus of monitoring efforts, rare species are of particular interest to marine protected area managers. HABCAM, a towed habitat mapping camera system, has been used to conduct periodic surveys in Stellwagen Bank National Marine Sanctuary since April 2008. Here we report on approaches and preliminary analysis of imagery from a July-August 2008 cruise that produced approximately 300,000 high-resolution digital color images of the seafloor. The distribution of habitats across the entire survey path was quantified by broadly classifying every tenth image (e.g., boulder, cobble-pebble, ... mud) at three levels (i.e., primary, secondary, tertiary) based on area of coverage. All fish in images were enumerated and decision rules avoided double or triple counting due to image overlap. Forty-two taxa (5112 image frames, 5326 individuals) were observed. Chi-square tests of homogeneity of distribution were calculated for each species based on their distribution across habitat types. Expected values were weighted by percent representation of each habitat type. Most species exhibited non-random distributions. Rare fish were identified from this survey. Those with particular habitat affinities and clumped distributions are most amenable spatial management options.

Association between diet and epizootic shell disease in the American lobster (*Homarus americanus*) around Martha's Vineyard. Bethoney, N. David¹, Brad Stevens², Kevin Stokesbury¹, Mark Altabet¹, Michael Tlusty³, ¹*University of Massachusetts Dartmouth, School of Marine Science and Technology, New Bedford, MA 02740*; ²*University of Maryland Eastern Shore, Princess Anne, MD 21853*; ³*New England Aquarium, Boston, MA 02110-3399*; nbethoney@umassd.edu

This study tested the hypothesis that diet is associated with epizootic shell disease (ESD) in American lobsters (*Homarus americanus*) from Martha's Vineyard using $\delta^{15}\text{N}$ ratios as

dietary indicators. Forty eight lobsters were randomly divided into three groups of 16 and exposed to one of three dietary treatments (100% herring, 100% wild prey, or 50% mix of both) for 5 months. To determine if lobster tissue $\delta^{15}\text{N}$ levels reflected diet, tissue samples were taken before experimental feeding, at two week intervals for two months, then monthly for the final two months. Additionally, 180 tissue samples from wild lobsters with varying degrees of ESD were collected. Initial $\delta^{15}\text{N}$ diet levels were $11.28 \pm .15$, $9.15 \pm .22$, $5.96 \pm .09$ for the herring, mixed, and wild diets respectively and significantly different (ANOVA, $p < .001$). Final $\delta^{15}\text{N}$ diet levels were significantly higher ($11.59 \pm .15$, $9.32 \pm .26$, $6.41 \pm .23$ respectively, 2-Factor ANOVA, $p < .001$) but still maintained the same relative difference (2-Factor ANOVA, $p > .05$). These preliminary results suggest that lobsters feeding on these diets will have significantly different $\delta^{15}\text{N}$ tissue levels. If so, then $\delta^{15}\text{N}$ levels from wild lobsters can be used to infer relative fish consumption. With this inference, tissue $\delta^{15}\text{N}$ levels can be tested for a correlation with ESD severity and therefore a link between diet and ESD.

Assessing the generality of temporal shifts in river herring demography and life history: Size, age, and spawning history structure of the Connecticut River blueback herring run. Davis, Justin P., Eric T. Schultz, Katie E. Gherard, and Jonathan P. Velotta, *University of Connecticut, Department of Ecology and Evolutionary Biology, Storrs, CT 06269; justin.davis@ct.gov*

The recovery of depleted populations can be impaired by changes in life history and population structure that often occur when adult mortality rates are elevated. Such changes appear to have occurred in a species of anadromous river herring, the alewife (*Alosa pseudoharengus*), that has recently undergone a precipitous and unanticipated decline. Over four decades, there has been a change in the age, size and spawning history of adults in the alewife run at Bride Brook, a small coastal stream in Connecticut: adults are on average 2 years younger, 10% smaller and are now predominantly first-time spawners. Such changes reduce the number of year-classes participating in a spawning run and also are likely to reduce offspring size; both effects exacerbate population vulnerability. To assess whether similar changes have occurred in other regional river herring runs, we sampled the Connecticut River run of blueback herring (*A. aestivalis*), which has also recently declined. All herring collected for three years were measured; subsamples were retained for assessment of species, sex, age, spawning history, and reproductive condition. Both scales and otoliths were used to estimate age. The two structures provided comparable levels of inter-reader agreement but poor agreement on age of individual fish. Comparison of 2005-07 blueback herring size, age, and spawning history in the Connecticut River to historic data indicate temporal shifts similar to those discovered in the Bride Brook alewife run. The congruence in demographic and life history shifts across species and river systems may reflect shared population stressors occurring during marine residence when populations mix.

Movements and spawning patterns of winter flounder in the Gulf of Maine: observations using passive acoustic telemetry. DeCelles, Greg and Steven Cadrin, *National Oceanic and Atmospheric Administration, University of Massachusetts, Cooperative Marine Education and Research Program, School for Marine Science and Technology, Fairhaven, MA 02719; gdecelles@umassd.edu*

Despite its recreational and commercial importance, the movement patterns and spawning habitats of winter flounder in the Gulf of Maine are poorly understood. To address these uncertainties, 72 adult winter flounder were tracked using passive acoustic telemetry in the southern Gulf of Maine between 2007 and 2009. A total of 117,250 detections were recorded, allowing the spawning behavior and seasonal distribution of winter flounder to be inferred. Residence time within estuarine habitats was highly variable (2-91 days), and was not related to fish size. Flounder were nearly absent from the estuary during the fall and winter months, and were most abundant in the estuary from late spring to early summer. The seasonal distribution of tagged flounder appeared to be strongly related to water temperature. Two sympatric contingents were identified, which exhibited divergent spawning migrations. One contingent remained in coastal waters during the spawning season, while a smaller contingent migrated to estuarine habitats to spawn. Recognition of population structure and spawning behavior is critical for understanding population dynamics, managing sustainable fisheries and protecting Essential Fish Habitat.

Estimating batch fecundity in Connecticut River herring. Divino, Jeffrey N., Justin P. Davis, Katie E. Gherard, and Eric T. Schultz, *University of Connecticut, Department of Ecology and Evolutionary Biology, Storrs, CT 06269-3043; jeffrey.divino@uconn.edu*

Annual fecundity is commonly used to assess the reproductive potential of fish stocks. It can be difficult to accurately measure in fishes exhibiting “group-synchronous” ovarian development, such as river herring, because only a subset of developing oocytes are ready to be ovulated. In such cases, the number and size of advanced oocytes provide a more accurate estimate of present spawning output (batch fecundity). We analyzed reproductive measures of anadromous alewives (*Alosa pseudoharengus*) and blueback herring (*A. aestivalis*) sampled in Bride Brook and the Connecticut River, respectively, during the spring spawning run in 2006. Preserved oocytes were spread into monolayers and digitally imaged for analysis. We detected two distinct developmental stages: a smaller (~0.4 mm diameter) batch of unripe oocytes and a larger (~0.7 mm) group of mature eggs that were fully yolked. Enumeration of fully-yolked oocytes revealed that relative batch fecundity was similar between alewife and blueback herring in April and early May, averaging *ca.* 450 mature oocytes/g body mass. As expected, batch fecundity increased with female size; mature oocyte size also increased with female size. Oocyte number and size varied with date. Adult alewives out-migrating from spawning grounds retained unripe oocytes but had no mature oocytes. The effort required to distinguish stages of egg development and calculate batch fecundity yielded additional insights and can be coupled with quantification of spawning frequency to more accurately estimate river herring reproductive potential.

Validation of an otolith ageing method for American shad *Alosa sapidissima*. Duffy, William¹, Richard McBride¹, Mike Hendricks², Kenneth Oliveira³, ¹*National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Woods Hole, MA 02543;* ²*Pennsylvania Fish and Boat Commission, Benner Spring Fish Research Station, State College, PA 168012;* ³*University of Massachusetts Dartmouth, Dartmouth, MA 02747;* william.duffy@noaa.gov

The reliability of accurate age information for American shad *Alosa sapidissima* has come into question over the last decade; there is a need for research into an alternative structure for ageing purposes. Therefore, this study explored the use of otoliths as an ageing structure for American shad using otoliths from known age fish from the Delaware River. Fifty-four whole otoliths were placed in mineral oil and viewed with a dissecting microscope under reflected light. Alternating hyaline and opaque bands were considered a full year, and the hyaline bands were counted to determine the age. Because the shad were recaptured on their spawning grounds the edge of the otoliths was considered the final annulus. The reading and interpretation of annuli was performed with a high degree of accuracy to the known age. The percent agreement (PA) was 79.2, and the coefficient of variation (CV = SD/mean) was 2.72. The same otoliths were read a second time and a precision test was conducted; (PA = 76.5; CV = 3.15). The use of otoliths was also more accurate than scales obtained from the same fish (PA = 52.0; CV = 6.93). Because these otoliths are from known age fish, these results validate this ageing method using otoliths for the Delaware River for ages (4, 5, 6, 7, and 9). The otolith is a suitable ageing structure for shad from all populations; however, a validation study needs to be conducted for each river system.

Advanced scientific diving technology. Godfrey, Jeff M., *University of Connecticut, Marine Sciences and Technology Center, Groton, CT 06340;* jeff.godfrey@uconn.edu

In 1982 scientific diving meeting the conditions outlined by OSHA was exempted from commercial diving regulations thus scientific divers have freedom to adopt new modes of diving. The first advanced mode introduced was nitrox. The elevated percentage of oxygen allowed divers increased bottom time or decreased risk for decompressions sickness.

In 2003 AAUS introduced standards establishing training guidelines for trimix and decompression procedures using open-circuit scuba. Trimix uses helium, which reduces narcosis. Organizations adhering to mixed gas and decompression standards have completed several projects in the 150 to 300 foot range with few incidents. 300 foot dives are the practical limit of open-circuit technology due to the large quantities of gas required.

Unlike open-circuit scuba, rebreathers recirculate all or part of the gas, reducing the amount needed. To aid members in adopting rebreather technology AAUS promulgated standards for rebreather diving in 2005. The standard includes oxygen, semi-closed and closed circuit rebreathers, (CCR). CCRs offer many advantages to scientists, including increased bottom time or reduced decompression time, reduced costs and bubble noise. With CCRs 300 foot dives with 25 minute bottom times are now safely completed in just

over two hours. The trade off is increased initial cost and training requirements and there is a perception that CCRs are dangerous.

Several organizations use advanced diving modes but adoption has been slow. We need a different model if these diving tools are to be widely available. Creating regional centers for training at qualified universities would resolve current issues. These centers would provide training and proficiency opportunities and make equipment and expertise available in the region. It is also incumbent on programs using advanced diving modes to closely supervise their programs and maintain statistics if we are to eliminate the perception that risk is high.

Prey selection in crustacean-eating fishes following the invasion of the Asian shore crab *Hemigrapsus sanguineus* in Long Island Sound. Heinonen, Kari B. and Peter J. Auster, *University of Connecticut, Department of Marine Sciences, Groton, CT 06340;* *kari.heinonen@uconn.edu*

Marine biological invasions are increasing on a global scale and can have severe impacts on native ecosystems. Policies and approaches focusing on the reduction of impacts caused by invasions employ methods to reduce the abundance and distribution of invasive species, but many of these methods have not proven very successful or cost-effective. Native predators may be an important factor regulating the long-term dynamics of invading species, and ecologists have been urged to focus on the responses of native predators to invasive prey. Here, we examined prey selection in native crustacean-eating fishes following the invasion of the Asian shore crab *Hemigrapsus sanguineus* in Long Island Sound. Laboratory experiments were conducted to determine whether crustacean-eating fishes prefer *Hemigrapsus* over native prey species when offered paired comparisons, and how predator size and habitat type influence prey selectivity. Field studies were conducted to determine the relative importance of *Hemigrapsus* in the diets of crustacean-eating fishes for which gut content analysis was conducted on individuals collected from a range of subtidal habitats. Results of laboratory experiments demonstrated that *Hemigrapsus* is a preferred prey item, and that predator size and substrate type significantly affect feeding habits. Results of gut content analyses demonstrated that *Hemigrapsus* is a common prey item of the crustacean-eating guild of fishes, but consumption rates vary with habitat type and season. These findings allow us to better understand the potential role that native predators have to act as a natural biological control, providing the community with a form of ecological resistance.

Performance of a large marine protected area in the Gulf of Maine: Inside-outside comparisons of fish microhabitat structure. Heinonen, Kari B.¹, Peter J. Auster¹, and James Lindholm², ¹*University of Connecticut, Department of Marine Sciences, Groton, CT 06340;* ²*California State University Monterey Bay, Monterey, CA 93940;* *kari.heinonen@uconn.edu*

Bottom-contact fishing gear reduces seafloor habitat complexity through the removal of

structure-forming species, the removal of ecosystem engineers, and by smoothing the seafloor surface. Reduction in seafloor habitat complexity has been shown to decrease survivorship of juvenile fishes that use biologic and geologic microhabitat structures on the seafloor as refuge from predators and currents. The Western Gulf of Maine Closure (WGOMC) is a marine protected area, which excludes the use of mobile fishing gear. In order to determine the effect of the closure on microhabitat composition, time series of triplicate photographic and video transects were conducted nearly annually at four stations (i.e. mud, sand, gravel, and boulder substrates) both inside and outside of the closed area between 1998 and 2005. SEABOSS and ISIS camera systems were the primary platforms for image acquisition and cameras were configured in an identical fashion. Here, we report on the results of multivariate analyses contrasting years to evaluate patterns in microhabitat composition within and between years, substrates, and fishing treatments from the still photographic images. Results of 2-D non-metric multidimensional scaling (MDS) and hierarchical clustering demonstrate that biotic and geologic attributes of habitat changed over time at all sites. Further, there were greater degrees of dissimilarity between paired sites after closure indicating a response due to the degree of protection from fishing effects. Direct effects of fishing are absent inside the closed area and while changes infer “recovery” of inside sites, the independent trajectories of both inside and outside sites over time do not indicate that habitats exhibit resilience to disturbance.

A GIS based investigation of climate change on habitat suitability for two species of concern in the Gulf of Maine. Heupel, Eric, *University of Connecticut Avery Point, Department of Marine Sciences, Groton, CT 06340; eric.heupel@uconn.edu*

Climate change will shift distributions of terrestrial and marine organisms based on changes in reproductive processes, survival of recruits, and movement of adults. For some marine organisms a change of just a few °C can significantly affect life histories. The Intergovernmental Panel on Climate Change (IPCC) predicts changes in water temperatures, from the surface to depths of 300m, of as much as 2.6 °C. For fishes in the Gulf of Maine these changes may cause reproductive and migratory shifts, population change, meta population shifts and possibly local, or regional extinctions for commercially and ecologically important fish. The Atlantic wolf fish (*Anarhichas lupus*) and the cusk (*Brosme brosme*), listed as Species Of Concern under the Endangered Species Act, have habitat requirements that indicate they may be at risk for negative climate change induced changes within the Gulf of Maine. Here I report on a geographic information system (GIS) approach for predicting impacts of climate change on marine species and results of that approach for *A. lupus* and *B. brosme* over a temperature range from present mean temperatures to the IPCC model A2 year 2100 sea surface temperature.

Evaluating effects of water withdrawals and impoundments on fish assemblages in Connecticut streams. Kanno, Yoichiro and Jason C. Vokoun, *University of Connecticut,*

*Department of Natural Resources and the Environment, Storrs, CT 06269;
yoichiro.kanno@uconn.edu*

Balancing aquatic conservation and water supply is becoming a major global issue for urban landscapes. The purpose of this study was to evaluate the ecological effects of stream-flow alterations via water withdrawals and impoundments on fish assemblage structure. Electrofishing data were collected at 33 wadeable streams in Connecticut. Fish sampling was conducted directly downstream of water withdrawals for municipal and agricultural water supply, and study sites differed in potential water withdrawal rates and the presence of impoundments. Generalized linear regression analysis showed that water withdrawal rate was more important than other natural and anthropogenic factors (e.g. landcover and stream size) in explaining several fish assemblage metrics. Stream sites with high withdrawal rates were generally characterized with lower proportions of fluvial dependent individuals (fish which need flowing water to complete a portion of their life history) and benthic invertivores (fish which feed on bottom-dwelling stream insects), and had a greater percent composition of macrohabitat generalists, particularly members of the family Centrarchidae. Some assemblage metrics responded linearly with increasing magnitude of water withdrawals, but others were non-linear. Results are consistent with ecological theory that alteration of the natural flow regime will impact stream biota.

Determining acoustic receiver range in a shallow northeastern estuary with complex bathymetry: The role of habitat, depth and tide. Kennedy, Cristina G.^{1,2,3,6}, Martha E. Mather^{1,2,3}, John T. Finn^{2,3}, Linda A. Deegan⁴, and Sarah M. Pautzke⁵, ¹*University of Massachusetts (UMASS), Massachusetts Cooperative Fish and Wildlife Research Unit, Amherst, MA 01003*; ²*UMASS, Department of Natural Resources Conservation, Amherst, MA 01003*; ³*UMASS, School of Marine Sciences*; ⁴*Marine Biological Laboratory, Ecosystems Center, Woods Hole, MA 02543*; ⁵*Western Pacific Fishery Management Council, Honolulu, Hawaii 96813*; *cgkenned@cns.umass.edu*

Acoustic telemetry is an important tool for quantifying fish movements and is increasingly being used in estuaries and other shallow coastal systems. The interpretable use of telemetry depends on knowledge of the range in which a receiver can hear a transmitter. Ranges in shallow tidal systems with complex bathymetry can be highly asymmetrical and can vary substantially in space and time. Currently, no standard protocol exists for measuring ranges in these environments. In 2006 and 2009, as part of our research on habitat use and movements of migratory striped bass within Plum Island Sound, Massachusetts, we developed such a methodology using acoustic monitoring and tracking receivers. We also tested the effects of engine noise and listening period on the ability of a receiver to hear a transmitter. Ranges were compared across sites that differed in habitat (river vs. sound), depth (flat vs. drop off) and tide (high vs. low). The linear distance that a receiver heard a transmitter ranged from 44 to 406 m at high tide and from 37 to 284 m at low tide. The average range of a receiver for both low and high tides varied from 0.002 to 0.196 km². Motor noise did not interfere with the receiver's ability to detect transmitters. Variation in range was related to habitat, depth and tide. Our standardized protocol will allow this highly

applicable technology to be used in a variety of different environments and will facilitate comparisons across sites, systems, years, and studies.

Sensitivity mapping for energy facility siting analysis in the marine environment.

Johnson, Matthew D., Danielle A. Reich, and Jennifer A. Bennett, *Natural Resource Group, LLC, Providence, RI 02903; dareich@nrg-llc.com*

Natural Resource Group, LLC (NRG) is an environmental consulting firm that assists clients with the environmental assessment and permitting of offshore and onshore energy developments, including pipelines, electric transmission lines, wind farms, and liquefied natural gas terminals. A key challenge in energy facility siting is balancing the needs of the diverse interests and resources that could be affected by the project (e.g., effects on tidal wetlands, essential fish habitat, commercial and recreational fishing) while complying with regulatory standards. NRG has recently developed an environmental/regulatory sensitivity mapping tool which highlights areas within a given geographic area that a NEPA/EIS practitioner or permitting agency would likely consider less desirable for facility siting. This tool uses GIS to generate a sensitivity surface analysis that integrates spatial data sets with an assessment of environmental and regulatory factors influencing energy facility siting and also outputs a geospatial gradient ranging from areas with the fewest environmental sensitivities (optimal) to areas with the most environmentally sensitivities (less optimal). This gradient represents an overall or blended sensitivity for the given geographic area of interest and is a useful screening tool to compare the likely relative environmental/regulatory difficulty of siting a facility in any given location within the geographic area of interest.

The effects of biogenic oyster reefs on infaunal and epifaunal community structure in Rhode Island estuaries. Massari, Todd and David L. Taylor, *Roger Williams University, Department of Marine Biology, Bristol, RI 02809; tmassari539@g.rwu.edu*

The Eastern Oyster (*Crassostrea virginica*) is an ecologically important species that provides multiple ecosystem services, including the potential to increase complex habitat for resident marine fauna. The objective of this study was to determine if the presence of restored oyster reefs in Narragansett Bay (RI, USA) had significant effects on sediment nitrogen and carbon, and the abundance and diversity of benthic infaunal invertebrates, mobile epifaunal invertebrates, and finfish. During the summer of 2009, oyster reef (OR) and non-oyster reef (NOR) control sites were sampled on a biweekly basis using a combination of baited traps and benthic core samples. These data were used to determine if there were any differences in sediment characteristics and community structures of the OR and NOR sites. Time series data were also analyzed to determine if the community structure of these habitats significantly changed over the course of the summer sampling period. This study aims to evaluate the role of *C. virginica* biogenic reefs as an effective tool to restore coastal and estuarine habitats along the Atlantic coast.

Restoration of a pasture stretch of the Mount Hope River utilizing a natural channel design approach. Murphy, Brian D., *Connecticut Department of Environmental Protection, Inland Fisheries Division, Habitat Conservation and Enhancement Program, Marlborough, CT 06447; brian.murphy@ct.gov*

Poor agricultural practices along an approximate 1,000 ft. section of the Mount Hope River caused streambank instability, channel widening, erosion/sedimentation and degradation of riparian and instream habitats. Restoration objectives were to: (1) restore and stabilize over 1,000 ft. of streambank and channel, (2) restore over 1,000 ft. of a 25 ft. wide vegetative riparian buffer with native vegetation, (3) install electric fencing to exclude beef cattle from restored riparian areas, (4) restore instream fish habitats, and (5) utilize natural channel design techniques.

Streambanks were stabilized with a combination of bank placed boulders, logs, erosion control fabric and vegetation. Portions of the river were filled-in and narrowed to create a low flow channel 32-36 feet wide; bankfull width 38-49 feet. A bankfull bench was created to allow two-year frequency (bankfull discharge events) and greater to access the floodplain and reduce near bank shear stresses/erosion. Several boulder cross-vane and J-hook grade control structures were installed to deflect streamflow away from streambanks and into the thalweg. These structures also create pool mesohabitats to facilitate summer fish survival. Tree and rootwad structures were installed to protect streambanks from erosion and provide large woody habitat cover.

Measures for determining project success included pre and post monitoring of permanent channel cross-sections and assessment of channel and streambank stability after major storm events. Since project completion in 2006, the river has experienced six bankfull events (1,000 cfs) or greater. Analysis of geomorphic metrics such as cross-section area, depth and width/depth ratio revealed that most pool mesohabitats created by construction of cross-vanes and J-hooks have continued to scour and function as designed although there is a gradual trend towards aggradation of streambed materials. While still early in the post-restoration evaluation process, this stretch of river has established a well-developed riparian zone, stable channel morphology and no significant erosion has been observed.

Implementing improvements in the collection of marine recreational fishing information. Perra, Paul¹, David Van Voorheses², and Robert Andrews², ¹*National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS), Gloucester, MA 01930;* ²*NOAA NMFS, Silver Spring, MD 20910;* *paul.perra@noaa.gov*

The 2007 amendments to the Magnuson-Stevens Fishery Conservation and Management Act called for improvement of the surveys used in the United States to determine the catch and effort associated with marine recreational fishing. In addition, a national saltwater angler

registry is required for anglers in states currently not collecting appropriate angler contact information through a license or permitting program. We will discuss the status of extensive efforts to improve survey methods and put in place the national saltwater angler registry by January 2010.

Seasonal variation in smooth dogfish *Mustelus canis*, catch and diet from a longline survey in Buzzards Bay, Massachusetts. Perry, Derek N.^{1,2} and G.B. Skomal^{2,3},

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Cape Cod, Massachusetts is generally regarded as a natural barrier to the northern range of smooth dogfish *Mustelus canis*, although they have been observed farther north. This study was designed to characterize and quantify the feeding ecology of smooth dogfish where there is significant overlap with higher densities of American lobster *Homarus americanus*. Consumption of lobster by predators such as smooth dogfish is thought to be extensive in this area, and may have led to the drastic decline in local abundance of the lobster over the last decade. The survey was conducted from May through October of 2008 in Buzzards Bay, Massachusetts. A total of twelve random stratified stations were sampled each month within three depth strata; 0-10 m, 11-20 m, and >21 m. Preliminary analysis of the 233 dogfish collected found CPUE was greatest in the earlier months of the survey largely because of the abundance of male smooth dogfish. The sex ratio was dominated by males in May and June and then shifted toward females in the summer months. A dramatic decrease in the number of males occurred in July which coincided with peak water temperatures within the bay during the same period. The diet of the smooth dogfish consisted mostly of crustaceans, with lobster, rock crab *Cancer irroratus*, and mantis shrimp *Squilla empusa*, being some of the most common prey items. Preliminary analysis suggests that smooth dogfish may be an under estimated predator of the American lobster, but the extent to which they impact the lobster population in Buzzards Bay remains to be determined.

Interpopulation differences in the osmoregulatory physiology of alewife (*Alosa pseudoharengus*) in Connecticut. Velotta, Jonathan P., Stephen D. McCormick, David M. Post, and Eric T. Schultz, *University of Connecticut Department of Ecology and Evolutionary Biology, Storrs, CT 06269-3043; jonathan.velotta@uconn.edu*

Genetic and functional trait differences among populations are important considerations in species conservation and management. In alewife (*Alosa pseudoharengus*), a species of conservation concern, population differences in life history traits and feeding morphology have been found. In particular, alewives in CT and elsewhere occur in both anadromous and landlocked (freshwater only) forms, which differ in multiple traits. Genetic analysis reveals that landlocked populations are distinct from each other and are independently derived from

the anadromous ancestral stock. Nothing is known about differences in osmoregulatory physiology that have arisen as landlocked populations have adapted to a freshwater-only life cycle. We are investigating whether landlocked alewives exhibit reduced osmoregulatory function in salt water and/or enhanced osmoregulatory function in freshwater as compared to anadromous alewives. Young-of-year alewives from landlocked and anadromous populations have been experimentally challenged with a range of salinity levels. Indices of whole-organism osmoregulatory performance, abundance and activity of ion transport proteins and chloride cell morphology are being measured. Landlocked alewives show indications of reduced salt water tolerance, but show no evidence as yet for enhanced freshwater function relative to anadromous alewives.

Characterizing the swimming performance of burbot for fish passage. Watrous, Daniel¹, Jason C. Vokoun¹, Theodore Castro-Santos², Alex Haro², ¹*University of Connecticut, Department of Natural Resources and the Environment, Storrs, CT 06269;* ²*S. O. Conte Anadromous Fish Research Laboratory, U. S. Geological Survey, Biological Resources Discipline, Turners Falls, MA 01376; daniel.watrous@uconn.edu*

Burbot (*Lota lota*) are a species of greatest conservation need near the southern extent of the species range and a state-endangered fish in Connecticut where impassable dams limit habitat availability. This study investigated burbot swim speed and fatigue time relationships for consideration in designing fish passage in streams. The burbot in this study were collected from Vermont (where they are not endangered) and implanted with PIT tags and then placed in an experimental flume where controlled water velocities were presented to fish volitionally. Fish entered the flume at night and were monitored by an incremental antennae system in the flume and locations were recorded by a data logger. After interpreting the raw readings from the data logger, passage attempts were modeled within a survivorship regression function to describe swimming performance. Burbot demonstrated both prolonged and sprint swimming techniques to maximize passage success at higher experimental velocities. Overall, however, burbot swimming capabilities are lower than for fish more commonly used in fish passage design. Project designs are currently under development for two dams in Connecticut that if successfully pass burbot, would expand ranges and perhaps increase population size. The study results also add to a growing bank of information regarding fish swimming performance being studied at the USGS S.O. Conte Anadromous Fish Research Center, making multi-species passage designs more attainable.

Developing a systems approach to fishery science and management: A first iteration for New England fisheries. Westwood, Azure D.¹ and Emily Keiley², ¹*University of Massachusetts Dartmouth, School for Marine Science & Technology, Fairhaven, MA 02719;* ²*University of Massachusetts, School for Marine Science and Technology, New Bedford, MA 02744-1221; awestwood@umassd.edu; ekeiley@umassd.edu*

Fisheries science and management in New England is a complicated interplay of many

forces. Given the complexity of this decision making environment, the School for Marine Science & Technology is using a systems dynamics approach to describe and better understand fisheries in New England to suggest policies that will meet both management and stakeholder objectives. The systems approach is capable of evaluating the impact of policy measures and providing a systematic way of suggesting policies decisions that will result in optimum solutions. We are members of a 17-person research team to develop this approach utilizing a blend of traditional fisheries practices as well as knowledge from fields of computer simulation modeling and operations research. As a first iteration, we have utilized software to diagrammatically outline the fisheries science and management data flow process in New England from source to product. As a way to highlight and test the capabilities of this approach, we describe the Fisheries Management Plan (FMP) process and timeline for one managed fishery (the Northeast Skate Complex). True to the systems philosophy, the project involves several iterations which will be reviewed and enhanced by stakeholders intrinsic to the process. Detailed schematic diagrams of the fisheries science and management process will be examined to determine where improvements can be suggested with respect to improving the efficiency and effectiveness of fisheries data collection and use. The ultimate goal will be to deliver a more mature version of the project end product and our recommendations to science administrators, fishery managers and stakeholders for consideration in fisheries decision-making.