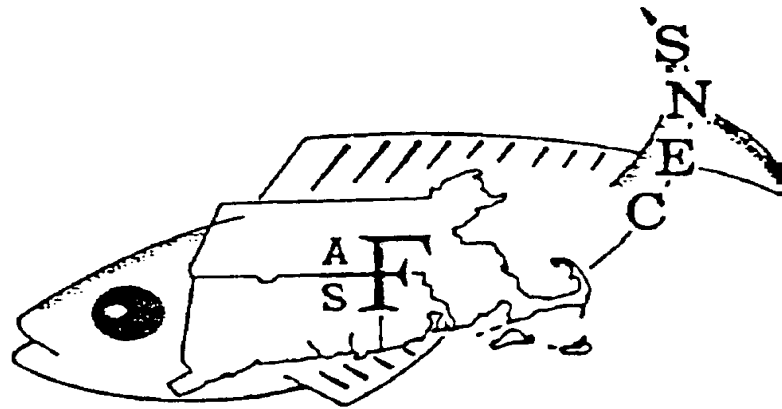


Southern New England Chapter

American Fisheries Society

2007 Summer Meeting



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June 27, 2007

University of Rhode Island
Kingston, RI

Program

AGENDA FOR SNEC AFS 2007 SUMMER MEETING WEDNESDAY JUNE 27, 2007

- 8:30-9:00 *Registration and Coffee*
- 9:00-9:10 **Opening Comments.** Ruth Haas-Castro, SNEC President
- 9:10-9:30 **Biological characterization of American shad (*Alosa sapidissima*) and river herring (*Alosa pseudoharengus* and *Alosa aestivalis*) populations in Massachusetts coastal streams.** John J. Sheppard¹, Phillips D. Brady¹, Michael P. Armstrong², ¹*Massachusetts Division of Marine Fisheries, New Bedford, MA;* ²*Massachusetts Division of Marine Fisheries, Gloucester, MA*
- 9:30-9:50 **Bioaccumulation of total mercury in bluefish (*Pomatomus saltatrix*) from Narragansett Bay, Rhode Island.** David L. Taylor, *Department of Marine Biology, Roger Williams University, Bristol, RI*
- 9:50-10:10 **Stock assessment of chambo (*Oreochromis* sp.) in the southeast arm of Lake Malawi.*** Richard Bell and Jeremy Collie, *Graduate School of Oceanography, University of Rhode Island, Narragansett, RI*
- 10:10-10:30 *Break*
- 10:30-10:50 **A model facility for pursuing environmental projects on privately owned ecologically important properties.** James M. Tripp, Sandra Millan-Tripp, and Scot T. Tripp, *Tributary Mill Conservancy Inc., Old Lyme, CT*
- 10:50-11:10 **Assessing habitat quality for *Menidia* spawning via biochemical analysis of zooplankton.*** Barry Volson and David Bengtson, *Department of Fisheries, Animal & Veterinary Science, University of Rhode Island, Kingston, RI*

- 11:10-11:30 **Changes in the assemblage of fishes and macroinvertebrates near Millstone Point, CT over the past 30 years.** Donald J. Danila and Donald F. Landers, Jr., *Millstone Environmental Laboratory, Waterford, CT*
- 11:30-11:50 **The effects of spatially complex population structure in Gulf of Maine Atlantic cod, *Gadus morhua*.*** Danielle A. Reich, *Department of Fisheries, Animal, & Veterinary Science, University of Rhode Island, Kingston, RI*
- 11:50-12:20 **Business Meeting**
- 12:20-1:10 **Lunch**
- 1:10-1:50 **Poster Session**
- 1:50-2:40 **The future of fishery science in North America.** Brian Rothschild, *School for Marine Science and Technology, University of Massachusetts Dartmouth, New Bedford, MA*
- 2:40-3:00 **Is biocomplexity important for New England Atlantic cod (*Gadus morhua*) resources?** Jon Loehrke, David Martins, and Steve Cadrin, *NOAA/UMass Cooperative Marine Education and Research Program, University of Massachusetts, School for Marine Science and Technology, New Bedford, MA*
- 3:00-3:20 **Effects of a 40-year, fixed station, weekly trawl survey on the benthos.** Melanie M. Schroeder¹, Joseph DeAlteris¹, Candace Oviatt², Jeremy S. Collie², ¹*Department of Fisheries, Animal, & Veterinary Science, University of Rhode Island, Kingston, RI;* ²*Graduate School of Oceanography, University of Rhode Island, Narragansett, RI*

* Denotes student paper

Poster Session

Monitoring of fish and invertebrates on an artificial reef in Mount Hope Bay, RI.

Nichole Daigle^{1,2}, Karin Tammi², and David L. Taylor², ¹*Center for Economic and Environmental Development*, ²*Department of Marine Biology, Roger Williams University, Bristol, RI*

Juvenile alewife emigration in a small coastal system. Benjamin Gahagan, *Department of Ecology and Evolutionary Biology, University of Connecticut, Storrs, CT*

Trace heavy metal analysis of a benthic food chain in Narragansett Bay, Rhode Island.

Stacey A. Helming¹, Loong Fat Ho², David L. Taylor², and Stephen K. O'Shea¹, ¹*Department of Chemistry*, ²*Department of Marine Biology, Roger Williams University, Bristol, RI*

Variability in the total mercury concentrations of winter flounder (*Pseudopleuronectes americanus*) and summer flounder (*Paralichthys dentatus*) in Narragansett Bay, RI.

Eric J. Payne and David L. Taylor, *Department of Marine Biology, Roger Williams University, Bristol, RI*

Mercury bioaccumulation rates in striped bass (*Morone saxatilis*) and tautog (*Tautoga onitis*) in Narragansett Bay, RI, and the potential implications to human health. Maria N. Piraino and David L. Taylor. *Department of Marine Biology, Roger Williams University, Bristol, RI*

Implementing the remote set technique for oyster restoration using artificial reef structures in Mount Hope Bay, RI. Kari Pohl^{1,2}, Karin Tammi², and David L. Taylor²,

¹*Center for Economic and Environmental Development*, ²*Department of Marine Biology, Roger Williams University, Bristol, RI*

Correlation analysis of young-of-the-year winter flounder, bluefish, and tautog relative to bioavailable mercury concentrations in Narragansett Bay, Rhode Island. Joseph T. Szczebak

and David L. Taylor, *Department of Marine Biology, Roger Williams University, Bristol, RI*

ABSTRACTS

Stock assessment of chambo (*Oreochromis* sp.) in the southeast arm of Lake Malawi.

Richard Bell and Jeremy Collie, *Graduate School of Oceanography, University of Rhode Island, South Ferry Rd, Narragansett, RI 02882, 401-874-6663, brell@gso.uri.edu*

We assessed the status of the chambo (*Oreochromis* sp.) stock in the southeast arm of Lake Malawi, the third largest lake in Africa. Chambo, one of the most important food fish, has shown a sharp decline in catch over the last twenty-years. We used a delta-generalized linear model to standardize a time series of catch and effort data (1976 – 2004) from a wide array of vessel types, which contained a high proportion of zeros. The delta-model is the product of two separate generalized linear models. The first component, the binomial model, determines the probability of a given haul resulting in a non-zero catch-per-unit-effort (CPUE). The second component fits the non-zero CPUE with a gamma generalized linear model. The multiple factors affecting the CPUE (vessel size, gear type, fishing area) are removed resulting in a relative index of abundance. A non-equilibrium Graham Schaefer surplus production model was fit to the index of abundance to estimate the total biomass in the southeast arm of the lake. The “one way trip” exhibited by the data resulted in a range of parameter values which fit the model well. The stock reached its peak in the 1982 (13,000 tonnes) and dropped quickly thereafter due to high harvest rates through the mid 1980s. There was a slight reprieve in the late 1980s when the population stabilized at roughly 6000 tonnes. The harvest rate increased in the early 1990s and the stock declined to its current level around 2000 tonnes. Increasing fishing effort due to the build up of the mechanized fleet in the 1970s roughly doubled the annual yield in the 1980s leading to overfishing. A reduction of the average 2000s harvest rate by half would be required to return the stock to the biomass level at maximum sustainable yield. The stock assessment will form the baseline of chambo biomass from which to measure change and determine the effectiveness of different restoration activities.

Monitoring of fish and invertebrates on an artificial reef in Mount Hope Bay, RI.

Nichole Daigle^{1,2}, Karin Tammi², and David L. Taylor², ¹*Center for Economic and Environmental Development*; ²*Department of Marine Biology, Roger Williams University, One Old Ferry Rd, Bristol, RI 02809, ndaigle79@hotmail.com*

In August 2006, Roger Williams University in Bristol, RI initiated a habitat project using artificial Reef-ball[®] structures. The purpose of the project was to investigate the dual benefits of the artificial structures for finfish habitat and oyster restoration. Reef-balls[®] are designed to promote growth of oysters and provide a sanctuary for fish. A reef site was established off the shoreline of Mount Hope Bay. The area of the site is 400 square feet and are placed in 10 to 15 feet deep waters. The site is divided into four sections and in each section five Lo-Pro Reef Balls[®] were placed for a total of twenty artificial structures. Fish

and invertebrates were collected weekly (August- November) at two sites, non-Reef Balls and Reef Balls[®], using unbaited Gee “minnow” wire mesh traps and blue rectangular wire traps. There were two traps of each type set at both sites for a total of four traps. After 24 hours of fishing, the four traps were retrieved and analyzed for species present, abundance, and size. Significantly more fish were collected at the reef site vs. the non-reef sites, with an average catch of 1.98 ± 2.42 and 0.52 ± 0.78 fish per trap, respectively ($t = 2.16$, $p < 0.05$). There were more invertebrates collected at the reef site than the non-reef site, but differences were not significant ($t = 0.65$, $p = 0.52$). Black sea bass (*Centropristis striata*) was the most abundant fish collected at the reef sites, comprising 63% of the catch (size range= 7.5-20.5 cm TL, mean size = 12.7 ± 5.2 mm TL). The use of reef balls offers tremendous opportunities to continue observing the productivity of the newly established benthic community.

Changes in the assemblage of fishes and macroinvertebrates near Millstone Point, CT over the past 30 years.

Donald J. Danila and Donald F. Landers, Jr., *Millstone Environmental Laboratory, PO Box 128, Waterford, CT 06385, 860-447-1791, Donald.J.Danila@dom.com*

We examined changes in the fish and macroinvertebrate fauna (113 taxa in all) near Millstone Point in the Connecticut waters of eastern Long Island Sound using data from a standardized long-term trawl survey completed biweekly since June 1976. Effort-adjusted catch of each taxon at three stations was summed over a June-May year. We found no differences in the number of taxa, but significant differences in total annual catch and diversity by station. After data sub-setting and appropriate transformation, we used multivariate analyses of hierarchical clustering and nonmetric multidimensional scaling (MDS) ordination to examine temporal and spatial differences. These analyses used only one-half of the taxa, but those species represented 99.9% of the total catch. Fourteen to sixteen taxa accounted for about 50% of average group similarity, with the 1970s, 1980-87, 1988-2000, and 2001-05 forming clusters. Over the long-term, we saw a near complete loss of some taxa, including bay scallop, sticklebacks, rainbow smelt, lumpfish, and sea raven. These species were replaced by taxa having more southerly geographical affinities, such as black sea bass, Atlantic menhaden, spotted hake, and smallmouth flounder. Each of the three stations had specific taxa representing distinctly different habitats, which ranged from estuarine to more marine. We found clustering and MDS to be complimentary techniques in explaining variability in species associations over time and space. Moderately abundant species rather than ubiquitous forms were often the best discriminators among sets of years or stations. No negative trends were found in taxa or abundance that were indicative of community stress. Differences in assemblages were rather likely related to species preferences, and habitat conditions. We attribute most long-term changes to increases in ambient water temperature and localized habitat changes. Fishes more commonly associated with mid-Atlantic waters dominate the present assemblage, with cool-water fishes in decline.

Juvenile alewife emigration in a small coastal system.

Benjamin Gahagan, *Department of Ecology and Evolutionary Biology, University of Connecticut, 75 North Eagleville Rd, Storrs, CT 06269, 860-486-4694, benjamin.gahagan@uconn.edu*

The alewife, *Alosa pseudoharengus*, is an ecologically significant herring (family Clupeidae) species that has historically been found in great abundance in the State of Connecticut. This alewife is an important forage fish and comprises a major food source for many predators in the coastal ecosystems of Connecticut. In the last 15 years the number of alewife has drastically declined for as yet undiscovered reasons. Alewife prefer to spawn in lentic environments and juvenile alewife spend their initial life stages in the spawning ground. After a period of time to mature the juvenile fish emigrate from the natal environment into salt water. These stages of alewife development are important because the growth and successful emigration of larvae and juvenile fish influences the strength of resulting year classes in the adult population (Kosa and Mather, 2001). I conducted a study to investigate the driving forces in juvenile emigration in the Bride Lake system, which supports one of the strongest alewife runs in Connecticut. Emigrants were collected weekly while resident fish, those remaining in the lake, were sampled twice a month to compare developmental states and ages of emigrating and non-emigrating fish. The results show variations in size, age, and condition of emigrating and resident fish over the duration of emigration for Bride Lake and indicate state dependent emigration of juveniles from the lake. These results also differ from previously published studies conducted in similar small coastal systems, suggesting regional variations in alewife developmental processes.

Trace heavy metal analysis of a benthic food chain in Narragansett Bay, Rhode Island.

Stacey A. Helming¹, Loong Fat Ho², David L. Taylor², and Stephen K. O'Shea¹,
¹*Department of Chemistry*; ²*Department of Marine Biology, Roger Williams University, One Old Ferry Rd, Bristol, RI 02809, shelming209@hawks.rwu.edu*

There have been few studies investigating the bioaccumulation and trophic transfer of the trace metals cadmium, lead, and mercury in the estuarine food web of Narragansett Bay, Rhode Island. These metals are known to be toxic to humans, and the consumption of sport fish, such as tautog (*Tautoga onitis*), demonstrates the risk of secondary poisoning in humans by bioaccumulation. Preliminary results suggest that trace heavy metals in the surface sediments (0-2 cm) correlates to the metal concentration consumed by important prey species, such as the blue mussel (*Mytilus edulis*). Mercury levels measured in the surface sediments from six sites ranged between 0.044 ppm in the Sakonnet River to 2.24 ppm in the Taunton River, with an average of 0.65 ppm \pm 0.32 across the sites. Lead ranged from 9.09 ppm in the Sakonnet River to 12.56 ppm in the Taunton River, while cadmium ranged from 12.55 ppm to 9.09ppm, respectively. Using atomic absorption spectroscopy and inductively-coupled plasma-mass spectroscopy, further relationships between trace metals in prey and trophic transfer to sport fish will reveal how these concentrations relate to each other, fish size, and species.

Is biocomplexity important for New England Atlantic cod (*Gadus morhua*) resources?
Jon Loehrke, David Martins, 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, 508-910-6393, jloehrke@umassd.edu*

The biocomplex theory of fisheries resources shows that a stock complex, composed of numerous individual spawning populations, is more robust to environmental variability and large fishing pressure than less structured populations. The primary mechanism of sustainability is local adaptation and a diverse array of life-history characteristics. Atlantic cod (*Gadus morhua*) in the U.S. waters are managed as two distinct stocks, yet multiple spawning groups exist within each stock boundary. Genetic investigations indicate considerable heterogeneous structuring between and among traditional stock boundaries. Furthermore, tagging studies show unique patterns of adult movement among spawning populations. Fine-scale genetic variation, persistence of discrete spawning groups, and patterns of adult movement suggest that biocomplexity should be considered in the management of New England Atlantic cod.

Variability in the total mercury concentrations of winter flounder (*Pseudopleuronectes americanus*) and summer flounder (*Paralichthys dentatus*) in Narragansett Bay, RI.
Eric J. Payne and David L. Taylor, *Department of Marine Biology, Roger Williams University, One Old Ferry Rd, Bristol, RI 02809, epayne604@hawks.rwu.edu*

The summer flounder, *Paralichthys dentatus*, and the winter flounder, *Pseudopleuronectes americanus* are both economically valuable finfish in Narragansett Bay, Rhode Island. A possible human health risk occurs from consuming these two species if the fish bioaccumulate appreciable levels of mercury (Hg) over time. Factors impacting Hg concentrations in fish tissue, however, are likely to vary based on species-specific life history characteristics. For example, winter flounder consume soft-bodied invertebrates, whereas summer flounder prey on higher trophic level species, including macrocrustaceans and forage fish. In this study, winter and summer flounder were collected from June to August 2006 in collaboration with the Rhode Island Department Environmental Management and the University of Rhode Island/Graduate School of Oceanography otter trawl surveys. Muscle plugs from collected specimens were excised from specific regions along the dorsal and lateral tissue and subsequently analyzed for total Hg using atomic absorption spectroscopy. Mean differences in tissue Hg concentrations between species were statistically analyzed relative to place of capture, body size, age, and diet.

Mercury bioaccumulation rates in striped bass (*Morone saxatilis*) and tautog (*Tautoga onitis*) in Narragansett Bay, RI, and the potential implications to human health.
Maria N. Piraino and David L. Taylor, *Department of Marine Biology, Roger Williams University, One Old Ferry Rd, Bristol, RI 02809, mpiraino346@hawks.rwu.edu*

Mercury bioaccumulates through the aquatic food chain and is found in various concentrations across fish species. Furthermore, mercury concentration may vary in fish tissue as a function of dietary differences, age, body size, and location. Consumption of contaminated fish is known to be hazardous to human health. Thus, the consumption of tautog (*Tautoga onitis*) and striped bass (*Morone saxatilis*), two important commercial and recreational fish in the Rhode Island area, may be a potential human health hazard. Tautog are bottom-dwelling fish who feed primarily on mollusks and crustaceans, whereas striped bass are pelagic and consume fish and macroinvertebrates. In this study, tautog and striped bass samples were collected from Narragansett Bay, Rhode Island, using otter trawls, beach seines, and rod & reel (June-August 2006). After recording length (cm) and weight (g) for each fish, mercury concentrations of whole body juvenile tautog, as well as dorsal lateral muscle tissue plugs of adult tautog and striped bass, were analyzed using atomic absorption spectrometry. Mercury concentrations increased as the size and age of tautog and striped bass increased; however, the rate of mercury bioaccumulation was greater in striped bass than in tautog. Nevertheless, the size of legal catch and human consumption differs between species (approximate age of legal catch is equal to 6 and 11 years for striped bass and tautog, respectively) such that tautog may pose greater human health risk.

Implementing the remote set technique for oyster restoration using artificial reef structures in Mount Hope Bay, RI.

Kari Pohl^{1,2}, Karin Tammi², and David L. Taylor², ¹*Center for Economic and Environmental Development*; ²*Department of Marine Biology, Roger Williams University, One Old Ferry Rd, Bristol, RI 02809, kpohl249@hawks.rwu.edu*

Populations of the Eastern Oyster (*Crassostrea virginica*) in Rhode Island have declined rapidly as urban development, fishing-pressure, disease, and pollution have increased. Recently, the use of artificial reefs has been employed to re-establish oyster beds. Artificial reefs, such as a Reef Ball®, provide a sheltered habitat for shellfish and finfish. Emulating Maryland and Florida's deployment of artificial reefs, Roger Williams University (RWU) researchers placed twenty Lo Pro Reef Balls® (.6m X .3m) into Mount Hope Bay off the RWU learning platform. The Reef Balls® were placed at a depth of 10 to 15 feet into a grid of 20m X 20m. Nine of these Reef Balls® were remote set with oysters spawned on July 3, 2006 in the RWU hatchery. In groups of three, the Reef Balls® were placed into 1000L blue tanks filled with 1µm-filtered seawater. Approximately 1.6 million eyed larvae were added to each tank between August 4 and August 7, 2006. After ten days of conditioning, the remote set Reef Balls® were positioned in the field. It was estimated that of the total 4.5 million oysters set onto the Reef Balls® approximately 1.6 million are expected to have survived over the winter due to post-set mortalities and over-wintering stress. Qualitative video footage taken in November 2006 shows the presence of oysters and other organisms on Reef Balls®. However, since this project was initiated only last summer, our investigation will continue this year as to the oyster survivability. Dive surveys and additional video work will continue in 2007 to show the progress of this project and the feasibility of remote setting onto artificial surfaces to restore oyster populations in Rhode Island.

The effects of spatially complex population structure in Gulf of Maine Atlantic cod, *Gadus morhua*.

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There is growing evidence that numerous fish stocks may be made up of several smaller reproductively isolated units. These spawning components vary in their ability to successfully produce new recruits each year due to mismatch with environmental conditions. Spawning aggregations have been identified for the Gulf of Maine Atlantic cod stock and extinction has been documented for approximately half of the historic aggregations. A spatially explicit, age-based projection model was developed to investigate the effects of complex population structure and spatially variable recruitment in Gulf of Maine Atlantic cod. The results of the analyses indicate that treating a stock with a complex population structure as a single stock leads to overestimates of spawning stock biomass, annual yield, and annual recruitment, and masks a steady decline in these parameters as spawning aggregations gradually become extinct. At F levels corresponding to the history of the Gulf of Maine fishery, initial biomass in an individual aggregation was a good predictor of the probability of extinction of that aggregation, particularly at low initial biomass. When the initial biomass approached or exceeded K for an aggregation, its probability of extinction did not approach zero, but stabilized at approximately 0.4. To achieve rebuilding of the Gulf of Maine Atlantic cod stock within 10 years, it was determined that $F=0$ was required. Since continued bycatch mortality in other fisheries would prevent $F=0$ even in the event of a closure of the Gulf of Maine cod fishery, a short time frame for rebuilding this particular stock may not be possible. With no fishing mortality, the stock is still only able to achieve half of carrying capacity, due to the loss of about 50% of the reproductive capacity of the stock. Based on the simulations in this study, the behavior of the Gulf of Maine Atlantic cod stock is more consistent with a stock with a complex population structure than a truly single stock. In light of this information and the findings of previous research, the current management measures for this stock may be inappropriate.

Effects of a 40-year, fixed station, weekly trawl survey on the benthos.

Melanie M. Schroeder¹, Joseph DeAlteris¹, Candace Oviatt², Jeremy S. Collie², *¹Department of Fisheries, Animal, & Veterinary Science, University of Rhode Island, Kingston, RI 02881; ²Graduate School of Oceanography, University of Rhode Island, South Ferry Rd, Narragansett, RI 02882, 401-486-7797, mschroeder@appsci.com*

Mobile fishing gear has been shown to adversely affect biological and physical characteristics of the seafloor. A station northeast of Fox Island, Narragansett Bay (41°34'N, 71°24'W) has been sampled weekly by otter trawl for over 40 years by the University of Rhode Island's Graduate School of Oceanography. This fixed-station survey provided a unique research opportunity to study the potential chronic effects of repeated trawling on a soft-bottom habitat. Biotic and abiotic characteristics were examined at three stations inside of the impacted area and compared with three stations in adjacent untrawled control sites. Alterations in benthic composition and signs of disturbance were studied.

Several multivariate analyses were carried out using PRIMER-E software including multi-dimensional scaling (MDS) and 2-way nested analysis of similarity (ANOSIM). No significant differences in taxonomic or feeding guilds were detected between impact and control areas. No major trends in species assemblage or substrate composition were identified between areas, making treatment effects undetectable. Within treatment variance exceeded between treatment variance, such that little evidence was found of impacts from repeated trawling. Despite the overall homogeneity of the benthos in the area, this outcome emphasizes localized natural patchiness when the habitat is investigated in sufficient detail.

Biological characterization of American shad (*Alosa sapidissima*) and river herring (*Alosa pseudoharengus* and *Alosa aestivalis*) populations in Massachusetts coastal streams.

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A multi-year study was initiated in the spring of 2004 to characterize the spawning populations of American shad, *Alosa sapidissima*, and river herring (alewife, *Alosa pseudoharengus*, and blueback herring, *Alosa aestivalis*) from seven river systems in Massachusetts. Weekly samples were collected throughout the spawning seasons of 2004 and 2005 and biological characteristics (sex ratios, size composition, age-structure, length-at-age and mortality rates) were estimated for each river system. Geographic comparisons were made among rivers to detect differences in biological characteristics between alewife populations from the northern and southern parts of Massachusetts. Analyses indicated some differences among runs. Sex ratios in all rivers did not differ significantly from 1:1, although the sex ratio within individual runs varied temporally. Spawning runs were composed primarily of ages 3 through 5 year old fish, and differences in age structures were detected among runs. Instantaneous total mortality (Z) was high in all runs (range 1.3 to 1.9). Truncated age structures were observed in several runs. Geographic comparisons of length-weight relationships and length-at-age relationships between spawning runs (ANCOVA, ANOVA) indicated that growth rates differ between rivers. However, these relationships were not significantly different between northern and southern regions and support the theory that each river is a discrete population. Additionally, over 250 American shad were sampled from the Merrimack River in 2004 and 200 were collected in 2005. Differences in sex ratios, size composition of males, and differences in age compositions were detected between weeks.

Correlation analysis of young-of-the-year winter flounder, bluefish, and tautog relative to bioavailable mercury concentrations in Narragansett Bay, Rhode Island.

Joseph T. Szczebak and David L. Taylor, *Department of Marine Biology, Roger Williams University, One Old Ferry Rd, Bristol, RI 02809, jszczebak887@hawks.rwu.edu*

Winter flounder (*Pseudopleuronectes americanus*), bluefish (*Pomatomus saltatrix*), and tautog (*Tautoga onitis*) are economically valuable finfish in Narragansett Bay, Rhode Island. These three species differ in size, diet, habitat utilization, and breeding patterns but are similar in that all young-of-the-year (YOY) exhibit estuarine residency. Estuarine systems, such as Narragansett Bay, are prone to anthropogenic contamination, subjecting the YOY to elevated concentrations of toxins, particularly bioavailable mercury (Hg). In this study, bioavailable Hg was measured in surface sediments (0-2cm) from 53 sites throughout Narragansett Bay. Moreover, YOY winter flounder, bluefish and tautog were collected in collaboration with the Rhode Island Department of Environmental Management juvenile finfish survey, and Roger Williams University fish traps and rod/reel. Sediment and whole body mercury concentrations were measured using combustion atomic-absorption spectrometry. Correlation analysis with regards to species, bioavailable Hg (sediment), body size, age, and diet was then conducted to assess any relationships that were present. Young-of-the-year *T. onitis* contained a significantly higher average whole body Hg concentration over *P. americanus* and *P. saltatrix*, whose concentrations were almost identical. Moreover, levels of mercury increased with both size and age for all three species. No correlation was observed in relation to bioavailable mercury in the sediments.

Bioaccumulation of total mercury in bluefish (*Pomatomus saltatrix*) from Narragansett Bay, Rhode Island.

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Mercury (Hg) is one of the most widespread and toxic environmental contaminants that adversely affects human health, and exposure occurs principally through the consumption of contaminated fish and shellfish. As a result, substantial effort has been dedicated to measuring Hg concentrations in edible fishes and the resulting data used to create consumption advisories. To this end, the following investigation analyzed total Hg concentration in the tissue of bluefish (*Pomatomus saltatrix*): a premier recreational finfish in southern New England. In June-August 2006, bluefish were collected from Narragansett Bay, Rhode Island, using otter trawls, beach seines, and rod & reel. Length (cm) and weight (g) were recorded for each captured bluefish, after which total Hg was measured in whole body samples (juveniles) and excised muscle tissue (adults) using the combustion atomic-absorption spectrometry method. The total Hg concentration of juvenile and adult bluefish increased significantly with increasing fish size and age. Moreover, rates of Hg bioaccumulation were greater in bluefish relative to other recreational finfish collected from Narragansett Bay (e.g., striped bass *Morone saxatilis*, summer flounder *Paralichthys dentatus*, and tautog *Tautoga onitis*), which is attributed to the feeding ecology of bluefish and their higher trophic level status in the estuarine system. Relative to other targeted finfish, however, bluefish may pose a lower risk to human health because limited fishing regulations for this species enable anglers to catch and consume smaller and younger individuals.

A model facility for pursuing environmental projects on privately owned ecologically important properties.

James M. Tripp, Sandra Millan-Tripp, and Scot T. Tripp, *Tributary Mill Conservancy Inc.*, Old Lyme, CT 06340, js.tripp@snet.net

The Tributary Mill Conservancy (TMC) has created a model facility for pursuing environmental projects on privately owned properties. This unique facility is located on the site where herring breed annually. Having worked closely with the property owner and representatives of the Connecticut Department of Environmental Protection, the facility has successfully reared Atlantic Salmon Eggs for restoration purposes and engaged with educational institutions, facilitating research projects for a better understanding of the Mill Brook ecology. This was accomplished using the special infrastructure of the property itself. This particular property is located on the first dam on a tributary to the Connecticut River. Though the height of the dam is less than ten feet, it was sufficient to construct a Natural Flow system for incubating the herring and salmon eggs. This approach was taken for two reasons, cost and survivability. One aspect of a natural flow hatchery is that the water quality is very dependant on the local conditions. Not only the standard water quality parameters such as temperature and PH but also more basic aspects such as silt entrainment. The first successful salmon hatching required hundreds of hours of cleaning time to counter the silt in the system. The cleaning was required to prevent the silt from building up on the Salmon eggs and suffocating them. For the second hatching an inline funnel filter was created to strip the silt from the flow. With the new filter operating, the eggs trays only required monthly cleaning saving over 600 hours in labor. This same system was used to successfully hatch Herring from the 2006 and 2007 breeding run.

Assessing habitat quality for *Menidia* spawning via biochemical analysis of zooplankton.

Barry Volson and David Bengtson, *Department of Fisheries, Animal & Veterinary Science, University of Rhode Island, Kingston, RI 02881, 401-874-7535, volson@gso.uri.edu*

In the Upper Pettaquamscutt River Estuary (UPR) and the Upper Point Judith Pond (UPJP), Rhode Island, the main forage fish are the silversides *Menidia menidia* and *Menidia beryllina*. The zooplankton communities in the UPR and UPJP are quite different, especially in spring when these two species ripen for spawning. The zooplankton community at UPR is dominated by calanoid copepods, suggesting a rather clean environment, whereas that at UPJP is dominated by polychaete larvae, suggesting a somewhat degraded environment. We study the effect of zooplankton composition, i.e., food quality, on the provisioning of the two species for reproduction and on reproductive success. We measured proximate composition and concentrations of essential fatty acids (EFAs) in the zooplankton food of *Menidia* species, their eviscerated carcasses, gonads, and the eggs they produce to trace the biochemical composition of prey to offspring. We also monitor weights of gonadal and somatic tissues, egg volume, percent hatch and larval length at hatch. For proximate composition, significant differences were only observed in lipids a) for zooplankton between estuaries, b) between *Menidia* spp., and c) between estuaries for each *Menidia*

species. For fatty acids, significant differences were only observed in the Σ n3, Σ n6 and Σ n9 fatty acids for zooplankton and for *M. menidia* gonads between estuaries. Despite the observed biochemical differences, no significant differences were found in unfertilized egg volume or % hatch between estuaries for either *Menidia* spp.; however, length at hatch for *M. menidia* at UPJP was significantly greater than that at UPR.