MID-ATLANTIC CHAPTER
OF THE
AMERICAN FISHERIES SOCIETY

2013 ANNUAL MEETING PROGRAM

Jacques Cousteau National Estuarine Research Reserve
Tuckerton, NJ
NOVEMBER 14th – 15th, 2013

WELCOME

On November 14th and 15th, the Mid-Atlantic Chapter of the American Fisheries Society is holding its Annual Meeting at the Jacques Cousteau National Estuarine Research Reserve. The National Estuarine Research Reserve System (NERRS) is a system of 27 reserves around the country (and Puerto Rico) developed to protect the biologically, ecologically, economically, and aesthetically important areas along our coasts known as estuaries. Estuaries occur, where our rivers meet the sea - where fresh and salt water mix to create a unique and very productive ecosystem vital to life both on land and in the sea. The Jacques Cousteau National Estuarine Research Reserve (JC NERR) is one of the 2 national estuarine reserves created to promote the responsible use and management of the nation's estuaries through a program combining scientific research, education, and stewardship.

The JC NERR encompasses approximately 115,000 acres in southeastern New Jersey, including a great variety of terrestrial, wetland and aquatic habitats within the Mullica River-Great Bay ecosystem. The Reserve is a concentrated patchwork of federal and state lands managed in partnership through a variety of agencies. With little more than 1% of the Reserve subjected to human development, this area is regarded as one of the least disturbed estuaries in the densely populated urban corridor of the Northeastern United States. Occurring within the unique New Jersey Pinelands forest ecosystem, on the coastal plain and the barrier islands of the coastal margin, the Mullica River-Great Bay estuary is of special ecological value. The high environmental quality of the habitats within the Cousteau Reserve are consistent with the objective of the Reserve system to preserve areas which retain a healthy ecosystem and provide the opportunity to serve the needs of long-term research and monitoring programs.

Directions to the Jacques Cousteau National Estuarine Research Reserve:
Jacques Cousteau Coastal Center
130 Great Bay Blvd.
Tuckerton NJ 08087
http://www.jcnerr.org/tuckerton.html
609-812-0649

Danish and coffee will be available during morning registration. Come early to check in and get a chance to wander the Center. Our Plenary Speaker is slated to be Tom Belton, a scientist with the New Jersey Department of Environmental Protection for 25 years, has investigated the impact of toxic chemicals on humans and wildlife. His latest book "Protecting New Jersey's Environment From Cancer Alley to the New Garden State" considers New Jersey's key environmental issues and champions the ways common citizens have sought justice when faced with unseen health threats.

The Chapter has reserved a block of rooms at the Sea Oaks Inn located at 99 Golf View Dr. Tuckerton, NJ 08087. In a country club setting, guests enjoy spacious & elegantly appointed, classic rooms with two full sized beds, working area, data port lamp, safes, complimentary high speed internet and coffee machine, along with complimentary bath amenities. There is also a 194 acre golf course at your disposal should you chose to purchase yourself a tee-time. Availability is limited. FREE student lodging (4 bunks per room) is also available for 16 occupants at the Jacques Cousteau Coastal Center.

Professional Lodging:

Sea Oaks Inn
99 Golf View Dr. Tuckerton, NJ 08087

The poster session, dinner social and raffle will take place on Thursday evening. This will be a great opportunity for mentorship and meeting the potential next generation of our profession. Proceeds from the raffle will be used to help fund student travel to future meetings (this year all students received free housing). Tickets will be sold during registration, breaks and lunch on the first day. Please consider donating an item to benefit the chapter! Second day will resume with presentations at the JCNERR. The MAC business meeting and lunch will be held at the nearby Hunting Shanty at the Tuckerton Seaport.

Business meeting and Concluding Lunch, Friday, 11/15
Tuckerton Seaport
120 W Main St #1 Tuckerton, NJ 08087
(609) 296-8868

Thank you and we look forward to seeing everyone in Tuckerton, NJ!

INSTRUCTIONS FOR AUTHORS

Oral Presentation Authors
During registration, electronic copies of talks should be brought to the podium at JCNERR (prior to the morning sessions). Authors are encouraged to bring presentations in two formats, flash drive and CD/DVD. Presentations should be 15-20 minutes and each will be followed by a 5-minute question and answer period. An award will be given for best student presentation at the conclusion of the meeting on Friday at the Hunting Shanty at the Tuckerton Seaport.

Poster Authors
Poster set up will begin at 4:00pm on Thursday November 14th at the JCNERR, so we ask that authors bring their poster with them when checking in.

The formal poster session will be held from 4:00pm –5:15pm, poster authors are asked to please remain by your poster to answer questions during this time. An award will be given for best student poster at the conclusion of the meeting on Friday at the Hunting Shanty at the Tuckerton Seaport.

CONFERENCE SCHEDULE

Day 1, Thursday Morning November 14th, 2013 * Denotes student presentation

8:00 – 9:30 Registration with Coffee and Pastries
Jacques Cousteau National Estuarine Research Reserve

9:30 - 9:40 Welcome and introduction
Bob Wallace, Chapter President

9:40 – 10:10 Plenary Presentation - Environmental and Ecological Research in Barnegat Bay (2012 – 2014)
Plenary Speaker – Tom Belton, NJDEP – Office of Science and author, "Protecting New Jersey's Environment From Cancer Alley to the New Garden State." (see, Plenary Speaker Bio, Pg.17)

10:10 – 10:30 Loss of Eelgrass Habitat in the Barnegat Bay-Little Egg Harbor Estuary, New Jersey
Michael J. Kennish,[1] Benjamin Fertig,[1] Gregg P. Sakowicz,[2] and Gina Petruzzelli[2]

10:30 – 10:50 Using local ecological knowledge to describe sea nettle population dynamics in Barnegat Bay, NJ*
Monica Chang, Taylor Donovan, Quinn Dunlea, Arianna Grace, Cassie Leahy, Meaghan Martin, Brooke Minotti, Bidemi Palmer, Sophia Porras, Russell Whitsitt, Zach Zega, and Talia Young

Break – (Check out donated raffle items / purchase raffle tickets)

11:00 – 11:20 The effect of ocean acidification on otolith growth in the mummichog (*Fundulus heteroclitus*) and the endangered red porgy (*Pagrus pagrus*)*
Stoneman, A.T.[1] and S. L. Smith[1]

11:20 – 11:40 Mapping the Scatterscape of Pelagic Side Scan Sonar Targets Relative to Oceanographic Features
Thomas M. Grothues[1], Arthur E. Newhall[2], James F. Lynch[2], Glen G. Gawarkiewicz[2], Kaela S. Vogel[3]*

11:40 – 12:00 Large Increases in Cormorants and the Red Alga, *Gracilaria* spp., Coincide With Reduced Abundances of Key Species in Massachusetts Bays
Clyde L. MacKenzie, Jr. and Peter Boyce

12:00 – 12:20 Suggestions for improving the management value of stock assessments: incorporation of index-based methods for trends in stock size and fishing mortality
Desmond M. Kahn, Ph.D.; Delaware Division of Fish and Wildlife

12:20 – 1:20 Lunch provided by The Gourmet Deli
Sandwich and Wrap platters, served on site at the JCNERR

1:20 – 1:40 The blue crab (*Callinectes sapidus*) stock of Delaware Bay; its fisheries, biology, and stock status
Richard Wong; Delaware Division of Fish and Wildlife

1:40 – 2:00 Impact of heated effluent from the Oyster Creek generating station on blue crabs, *Callinectes sapidus*, in Barnegat Bay, NJ.
Jivoff, Paul R.; Moritzen, Laura; Kels, Jade; McCarthy, Julie; Young, Amanda; Ferdinando, Pilar; Pandolfo, Frank; Tighe, Chelsea

2:00 – 2:20 A fatal reovirus of the blue crab, *Callinectes sapidus*, that has potential to impact the host throughout its range
Flowers, Emily M.[1]; Kahil Simmonds[1], Holly Bowers[2]; Eric J. Schott[1]

Break - Check out donated raffle items / purchase raffle tickets

2:30 – 2:50 Priority effects in commercial traps for black sea bass (*Centropristis striata*)*
Evan Kwityn[1], Mikaela Provost[1], Talia Young[1], and Olaf Jensen[1]

2:50 – 3:10 Black sea bass, Delmarva coral reefs and wind farms: the scale of things to come

Vincent G. Guida

3:10 – 3:30 Longterm Dynamics in Atlantic Surfclams: The Role of Bottom Water Temperature
Daphne Munroe, Diego Narváez , Enrique Curchitser , John Klinck , Eileen Hofmann , Roger Mann , Eric N. Powell

3:30 – 4:00 A pilot survey of polychlorinated biphenyls and chlorinated pesticides in the muscle, stomach content, and liver samples of shortfin mako, *Isurus oxyrinchus,* caught in the waters offshore of Long Island, New York
Ashok Deshpande, Bruce Dockum, Cameron Farrington, Nancy Kohler, and Lisa Natanson

4:00 – 4:20 Ocean acidification effects in the early life-stages of summer flounder, *Paralichthys dentatus*
R.C. Chambers, A.C. Candelmo, E.A. Habeck, M.E. Poach, D. Wieczorek, K.R. Cooper[1], C.E. Greenfield[1], B.A. Phelan

4:20 – 5:20 Poster Session
JCNERR paddock (see "Poster Panel Lineup" pg.7)

5:20 – 6:30 Free time
Check-in (Sea Oaks Inn/Student lodging); open conversation JCNERR

6:30 – 10:00 Dinner/Social
Calloways Restaurant & Bar, Annual raffle and 50/50

10:00 - 11:30 Mentoring Groups – JCNERR/President's Quarters

Day 2, Friday Morning November 15th, 2013

7:45 – 8:30 Light Breakfast items at Jacques Cousteau National Estuarine Research Reserve

8:30 – 8:50 An Assessment and Restoration Program of River Herring (Alewife and Blueback Herring) in the Rancocas Creek and Maurice River
Matthew Heyl and Lloyd Lomelino

8:50 – 9:10 Testing Atlantic Sturgeon Spring Habitat Selection With An Autonomous Underwater Vehicle*
Matthew Breece, Matthew Oliver, Keith Dunton, Dewayne Fox

9:10 – 9:30 A novel approach for assessing the impacts of targeted anchored gillnetting and identifying concentration areas of reproductively mature Atlantic sturgeon*
Amy M. Comer[1], Amanda Higgs[2], John A. Madsen[3] Dewayne A. Fox[1]

9:30 – 9:50 Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) interactions with commercial shipping in the Delaware River*
Alex M. DiJohnson[1 & 2], Matthew T. Fisher[1], and Dewayne A. Fox[2]

9:50 – 10:10 Assessing the Impacts of Recreational Angling on Sand Tigers and How Site Fidelity May Play a Role*
Kilfoil, James. Fox, Dewayne. Wetherbee, Brad. Carlson, John

10:10 – 10:30 SAFIS Goes App: Development of a hand-held application for fisheries trip reporting.
Julie Marie Defilippi, Atlantic Coastal Cooperative Statistics Program

Break

10:45 – 12:00 Business Meeting

12:00 – 1:30 Lunch (Buffet)
The Hunting Shanty at Tuckerton Seaport Village, Student awards presented

1:30 Conclusion and Closing statements *Student Award Ceremony; *Bob Wallace, Chapter President*

Abstracts

- **Plenary Presentation - Environmental and Ecological Research in Barnegat Bay (2012 – 2014)**
  Tom Belton
  NJDEP – Office of Science

- **Loss of Eelgrass Habitat in the Barnegat Bay-Little Egg Harbor Estuary, New Jersey**
  Michael J. Kennish[1], Benjamin Fertig[1], Gregg P. Sakowicz[2], and Gina Petruzzelli[2]
  [1]Institute of Marine and Coastal Sciences, Rutgers University
  [2]Rutgers University Marine Field Station

  Detailed studies of eelgrass *(Zostera marina L.)* beds in the Barnegat Bay-Little Egg Harbor Estuary, New Jersey, reveal a significant decline in plant biomass and the loss of essential habitat in the system. Extensive quadrat, core, and hand sampling conducted at up to 150 stations in the estuary during each of three sampling periods per year indicate that eelgrass biomass declined consistently over the 2004-2006 and 2008-2010 periods and overall from 2004-2010. The most acute loss was recorded in 2010 when biomass values dropped to the lowest levels ever recorded in the estuary (mean aboveground biomass = 7.7 g DW m-2; mean belowground biomass = 27.0 g DW m-2). Eelgrass areal cover also generally decreased through 2010, but the decline in plant biomass, a key water quality indicator, was most marked. Eelgrass biomass measurements in 2011 showed no improvement over the previous years of sampling. The loss of eelgrass habitat is attributed to nutrient enrichment, algal shading, and associated symptoms of eutrophication. Barnegat Bay-Little Egg Harbor is a highly eutrophic system, and the decrease of eelgrass due to nitrogen loading has important implications for the wide array of organisms that utilize this vital habitat.

- **Using local ecological knowledge to describe sea nettle population dynamics in Barnegat Bay, NJ**
  Monica Chang, Taylor Donovan, Quinn Dunlea, Arianna Grace, Cassie Leahy, Meaghan Martin, Brooke Minotti, Bidemi Palmer, Sophia Porras, Russell Whitsitt, Zach Zega
  Marine Academy of Technology and Environmental Sciences (MATES)
  Talia Young
  Rutgers University Marine Field Station

  For many residents of Barnegat Bay, the sea nettle (Chrysaora quinquecirrha) has become a problem, interfering with bay activities in the past decade. However, little is understood about factors that could have contributed to their population boom. In this study, students from the Marine Academy of Technology and Environmental Science (MATES) applied a local ecological knowledge (LEK) approach to this question and interviewed local bay users to determine the approximate year that the sea nettle population exploded. Reported first encounters ranged from 1986 to 2010 with most interviewees reporting their first encounters occurring in 2004. Through LEK we have been able to describe sea nettle population dynamics in a way that they have not been described before, potentially allowing us to analyze both environmental and anthropogenic effects that could have impacted sea nettle populations.

- **The effect of ocean acidification on otolith growth in the mummichog *(Fundulus heteroclitus)* and the endangered red porgy *(Pagrus pagrus)***
  Stoneman, A.T.[1] and S. L. Smith[1]
  [1]Delaware State University

  Otoliths are fish earbones composed of aragonite, a form of calcium carbonate. They are important structures that aid in hearing, balance, and acceleration. Since ocean acidification will adversely affect the oceanic carbonate system by decreasing the carbonate saturation state, otolith growth potential may be impacted. We tested the effects of OA on otolith growth on larval fish species with differing habitat requirements; an estuarine baitfish (mummichog, *Fundulus heteroclitus*), and a pelagic marine species (red porgy, *Pagrus pagrus*). We reared the larvae under three pCO2 concentrations: 380 ppm (control), 1000 ppm, and 2500 ppm over a period of 5 days. Otoliths were extracted, imaged using a scanning electron microscope, and surface area (sq µm) was

measured. We found that the mummichog otoliths did not change in size with increasing pCO2 levels. Red porgy otoliths significantly increased in size from the control to treatments; however we found no difference between treatments. Our results are consistent with the notion that the habitat of the larvae plays a significant role in determining the susceptibility of fish to the effects of OA.

- **Mapping the Scatterscape of Pelagic Side Scan Sonar Targets Relative to Oceanographic Features**
Thomas M. Grothues[1], Arthur E. Newhall[2], James F. Lynch[2], Glen G. Gawarkiewicz[2], Kaela S. Vogel[3]
[1]Rutgers University Marine Field Station
[2]Woods Hole Oceanographic Institution
[3]Department of Marine Biology, University of North Carolina Wilmington

Sonar reconnaissance of fishes for stock assessment and research has been an effective and minimally invasive method of gathering abundance and distribution data on scales of 10s to 100s of km since the 1950's. Yet, classification of fishes remains one of the greatest challenges of active sonar surveys. Many variables affect sonar reflection, including size, shape, orientation to the sonar source, the spatial relationship of individuals in a school to each other, and the number and distribution of individuals within a school. The long wavelengths of low frequency (typically <60kHz) that allow depth penetration provide poor small scale resolution for identifying objects. High frequency side scan sonar (600 – 900kHz), while imaging only over short ranges, can resolve individual fish and thus orientation and behavior relevant to understanding low frequency sonar returns and ecology. We demonstrate here that autonomous underwater vehicles (AUVs) offer a mechanism for putting side scan sonar transducers near potential targets together with telemetry, imaging, and oceanographic sensors, and can thus work together with low frequency sonar to develop holistic scatterscapes of oceanographic features, inclusive of information on species identity, orientation, behavior, abundance, individual size, and feature stability.

- **Large Increases in Cormorants and the Red Alga, Gracilaria spp., Coincide With Reduced Abundances of Key Species in Massachusetts Bays**
Clyde L. MacKenzie[1], Jr. and Peter Boyce[2]
[1] J. J. Howard Marine Sciences Laboratory, Northeast Fisheries Science Center
[2] Maria Mitchell Association, Nantucket

It is proposed that large increases in abundances of the double-crested cormorant *(Phalacrocorax auritus)* and the red alga *(Gracilaria spp.)* have modified the environments in two bays in Massachusetts in a way that has reduced abundances of other common species. In Cape Poge Pond on Martha's Vineyard and in Nantucket Harbor, cormorants now live in several roosts with up to 20 or more birds in each. They eat fish and other prey. The red alga grows in solid mats over the sand bottoms. The eelgrass blades have become less abundant and they are shorter. The numbers of small adult and juvenile fishes have declined from 9 to 3 species in the past several years; and of three abundant shrimp species only the grass shrimp remains but in reduced abundance. The cormorants prey directly on the fish, while the red alga competes for space with eelgrass and also covers its roots and rhizomes perhaps affecting the plants' respiration. The cover of the red alga also prevents several species of fish and the sand shrimp *(Crangon septemspinosa)* from living and feeding on the sand bottom. The grass shrimp *(Palaemonetes pugio)* and brokenback shrimp *(Hippolyte zostericola)* inhabit eelgrass canopies. The lower abundance of the eelgrass may explain the lower abundances of the shrimp. The double-crested cormorant feeds on shrimp in farm ponds in Central America and so it may prey on them in the bays in Massachusetts.

- **Suggestions for improving the management value of stock assessments: incorporation of index-based methods for trends in stock size and fishing mortality.**
Desmond M. Kahn, Ph.D.
Delaware Division of Fish and Wildlife

The decisions made in fishery management are often based on results of stock assessment models, which are usually described as scientific analyses. The reliability of such models can be negatively affected by both internal and external factors. An example of an internal factor is the tendency of catch-at-age models to develop

retrospective bias in parameter estimates. External effects can be important, because most assessment models assume an unchanging environment. Here I present ideas on dealing with both retrospective patterns and detecting bias in fishing mortality estimates due to changes in natural mortality. In both problems, relying more heavily on data, as opposed to strictly relying on model output, can improve the value of assessments to managers. Two assessments are used as examples: the ASMFC weakfish assessments of 2002-2009 and the TRAC assessment of Georges Bank yellowtail flounder of 2012. For estimates affected by retrospective bias, I advocate replacement of model output by an index-based approach. I also illustrate the use of relative F to evaluate model estimates of trends in fishing mortality. The advantage of relative F is that it is theoretically strong and requires minimal assumptions.

- **The blue crab *(Callinectes sapidus)* stock of Delaware Bay; its biology, fisheries, and stock status**
Richard A. Wong
Delaware Division of Fish and Wildlife

The blue crab is by far the most valuable commercial fishery resource in Delaware Bay. In 2012, its dock-side landings value was the highest ever recorded, exceeding $14 million dollars. Landings were the third-highest ever. After this historic 2012 fishing year, blue crabs have now become so scarce that the commercial industry is claiming 2013 the worst fishery season in decades. What happened? Delaware Division of Fish and Wildlife research and monitoring agree with the fishery's observations, and the blame fall squarely on very weak juvenile recruitment. Is this poor recruitment caused by overfishing, weather, density-dependence, predation, or is it just a normal occurrence? Delaware's research, monitoring, and stock assessment provide some insight into this question.

- **Impact of heated effluent from the Oyster Creek generating station on blue crabs, *Callinectes sapidus*, in Barnegat Bay, NJ**
Jivoff, Paul R.; Moritzen, Laura; Kels, Jade; McCarthy, Julie; Young, Amanda; Ferdinando, Pilar; Pandolfo, Frank; Tighe, Chelsea
Rider University

Oyster Creek nuclear generating station is a boiling water reactor power plant that obtains cooling water from Barnegat Bay. The cooling water is released as heated effluent into Barnegat Bay via Oyster Creek and this has occurred since 1969 yet we know very little about its impact on the Bay or its inhabitants. Various aspects of blue crab life history are influenced by temperature and, in New Jersey blue crabs are near the northern limit of their range, thus blue crabs represent a good model organism for examining the effects of heated effluent. We sampled blue crabs monthly (May-August, 2012-2013) with commercial-style traps at Oyster Creek and a nearby, thermally unimpacted tributary (Forked River). We used two traps at the mouth of each tributary, in physically (e.g., depth, bottom type) similar locations; however one trap at Oyster Creek was directly inside the effluent plume while the other was outside the plume. Thus, we were able to compare blue crab abundance, size, sex ratio and the developmental stage and size of broods from ovigerous females; (1) between tributaries, (2) between effluent at Oyster Creek and Forked River, and (3) between effluent and non-effluent locations at Oyster Creek. Water characteristics at Forked River were very similar to those at the non-effluent location at Oyster Creek but on average, the effluent water at Oyster Creek was warmer (by ~4oC) with slightly less dissolved oxygen (by ~1mg/L) than the non-effluent water at Oyster Creek. Blue crab abundance was significantly greater at the mouth of Oyster Creek than Forked River and inside the effluent plume as compared to Forked River and outside the plume. Abundance differences between inside and outside the plume did not vary temporally, however the difference between tributaries occurred in all months except July while the difference between the trap inside the plume versus Forked River was most pronounced in May when ambient temperatures were relatively cool. The sex ratio of crabs inside the effluent contained relatively more females as compared to Forked River and outside the plume. In addition, relatively more females at Oyster Creek held eggs in moderate and advanced stages of development than at Forked River. This difference also varied temporally with more females at Oyster Creek having advanced broods particularly early in the season and they exhibited a longer brooding season. Neither the size of crabs nor the size of female broods was influenced by tributary or trap location. These results suggest blue crabs prefer the warm effluent to ambient water and that preference is more pronounced in adult females during colder months. Access to a local source of warmer water

offered by the effluent may hasten egg development, however if females are indeed spawning at the mouth of Oyster Creek this may not be beneficial for the proper development or successful recruitment of the resultant larvae.

- **A fatal reovirus of the blue crab, *Callinectes sapidus*, that has potential to impact the host throughout its range**

Flowers, Emily M.[1]; Kahil Simmonds[1], Holly Bowers[2]; Eric J. Schott[1]
[1]Institute of Marine and Environmental Technology, University of Maryland Center for Environment Science
[2]Monterey Bay Aquarium Research Institute
[3]Department of Marine Biotechnology

Diseases have the potential to shape wild populations of marine species. However, because of a lack tools to easily identify and track disease agents, there are few studies on the impact of diseases throughout the life history of species in the wild. The blue crab, *Callinectes sapidus*, supports one of the most valuable fisheries along the Atlantic coasts of North and South America. Blue crab abundance in Chesapeake Bay and elsewhere undergoes dramatic fluctuations year to year. Assumed and measured factors influencing abundance include recruitment and predation, while the effects of disease are mostly unexplored. By taking a molecular biology approach to search for virus genomes in dying blue crabs, we discovered that a reovirus, termed RLV, was associated with nearly all of the mortality of crabs in soft shell production systems, and perhaps half of the broodstock mortality in a marine recirculating aquaculture crab hatchery. Experimental infections of RLV are always fatal to blue crabs. We developed a quantitative PCR method to detect the virus and subsequently documented RLV in wild blue crabs throughout their range in the USA. Current investigations are elucidating the prevalence of RLV in wild crabs from Massachusetts to the Gulf of Mexico. Prevalence of RLV varies widely in time and space, but is generally over 10% and localized outbreaks of over 40% are not uncommon. We are interested in investigating the possibility that fishing and aquaculture activities may contribute to the prevalence of RLV in the wild. Biotechnological tools such as those employed in this study, paired with collaborations with fishermen and managers, have the potential to revolutionize our understanding of the role of disease in natural mortality of marine species, and should lead to improved practices to sustain fished resources.

- **Priority effects in commercial traps for black sea bass *(Centropristis striata)***

Evan Kwityn[1], Mikaela Provost[1], Talia Young[1], and Olaf Jensen[1]
[1]Institute of Marine and Coastal Sciences, Rutgers University

Structure-oriented fish species, such as black sea bass (BSB) *(Centropristis striata)* and other demersal species, are impractical to assess by trawl surveys due to sampling inefficiencies over reefs, wrecks, or other structured habitats. Fish traps have been proposed as an alternative strategy for sampling structure-oriented species, but it is not known whether traps can be used to accurately measure abundance. Inaccuracies may result from priority effects in traps that result when fish already in the trap alter the rate at which other fish enter the trap. To test the role of priority effects in traps, catch per unit effort (CPUE) was compared among 30 traps seeded with BSB males, BSB females or no fish, each trap being evenly distributed between five natural wrecks and artificial reefs on the continental shelf of NJ. CPUE for both male and female BSB were frequently higher in traps seeded with a female BSB compared to control and male seeded traps. Male and female BSB displayed lower CPUE in traps seeded with a male BSB in comparison to control and female seeded traps. Our results suggest that priority effects exist in traps, producing variations in catch rates for male and female structure-oriented fish species.

- **Black sea bass, Delmarva coral reefs and wind farms: the scale of things to come**

Vincent G. Guida
U.S. Dept. of Commerce, NOAA, NMFS, J.J. Howard (Sandy Hook) Laboratory

Black sea bass (BSB: *Centropristis striata*) seek out structured hard bottom habitats during their warm season stay on the inner mid-Atlantic shelf. The Delmarva segment of the mid-Atlantic coast supports viable fisheries for BSB and other structure-seeking fishes despite a total lack of charted hard bottom. There are hard bottom areas, but they are not charted. Knowledge of their location from a local fisherman has led us to these Delmarva sites in the pursuit of understanding their extent and role in the ecology of BSB and other structure-seeking

fisheries resources species and the possible role of habitat conservation in fisheries stock management. Photographic transects were performed with the HabCam camera vehicle in late July, 2013. Photos and accompanying sensor data are providing information on physical habitat and organismal distributions, including black sea bass, two coral species, and many other organisms at a high spatial resolution. Preliminary results suggest a disperse distribution of small-scale hard bottom patches serving as adult BSB habitat and harboring corals. While BSB and other fisheries have been managed to date on large geographical scales, leasing small blocks of shelf for wind energy development is now forcing us to look at fish habitats and perhaps also management schemes on much finer scales.

- **Longterm Dynamics in Atlantic Surfclams: The Role of Bottom Water Temperature**
Daphne Munroe , Haskin Shellfish Research Laboratory, Rutgers University
Diego Narváez , Center for Coastal Physical Oceanography, Old Dominion University
Enrique Curchitser , Institute of Marine and Coastal Sciences, Rutgers University
John Klinck , Center for Coastal Physical Oceanography, Old Dominion University
Eileen Hofmann , Center for Coastal Physical Oceanography, Old Dominion University
Roger Mann , Virginia Institute of Marine Science
Eric N. Powell , Gulf Coast Research Laboratory, The University of Southern Mississippi

The Atlantic surfclam *(Spisula solidissima)* fishery in the Middle Atlantic Bight (MAB) continental shelf is one of the most valuable single species US commercial fisheries. Since 1997, populations from southern inshore regions of the clam's range have experienced significant mortality events, which have coincided with a general warming of bottom water temperatures (reaching 21-24˚C in September) along the MAB. The potential linkages between warming bottom temperatures and increased surfclam mortality and/or reduced growth are being addressed using a model that simulates the growth of post-settlement surfclam populations at specific locations on the MAB shelf. External forcing for the growth model is provided by a 50-year simulation (1958-2007) of bottom water temperature obtained from an implementation of the Regional Ocean Modeling System (ROMS) for the MAB continental shelf. The simulations show that surfclams experience high mortality (mortality > 0.20) during years when bottom water temperatures remain 1-2°C above average conditions for an extended time at each location. Further, simulations show that the magnitude of mortality is moderated by the existing population structure such that older, larger populations experience higher mortality than smaller, younger populations. These results provide a basis for analysing the mechanisms responsible for long-term changes in surfclam abundance distribution along the MAB.

- **A pilot survey of polychlorinated biphenyls and chlorinated pesticides in the muscle, stomach content, and liver samples of shortfin mako, Isurus oxyrinchus, caught in the waters offshore of Long Island, New York**
Ashok Deshpande, Bruce Dockum, Cameron Farrington, Nancy Kohler, and Lisa Natanson

Diet studies of shortfin mako, Isurus oxyrinchus, have established bluefish *(Pomatomus saltatrix)* as the dominant prey species in the inshore areas along the northeast coast of the United States (U.S.). Some bluefish populations, particularly those associated with the water masses in the vicinity of New York Bight and New Bedford Harbor have been shown to be moderately to highly contaminated with polychlorinated biphenyls (PCBs) and other toxic chemicals. To understand the significance of selective predation on bluefish in the trophic transfer of contaminants to the shortfin mako, we analyzed target PCB congeners and organochlorine pesticides in the muscle, stomach contents, and liver samples of seven specimens collected during a recreational shark fishing tournament at Montauk, New York. The levels of PCBs and pesticides in the liver samples were much higher than the levels measured in the muscle and stomach contents. The average liver PCB level (22.8 □g Aroclor/g), total DDT level (4.1 □g/g) and chlordane level (0.88 □g/g) was 192, 288 and 210, and 94, 138 and 71 times greater than the levels measured in the muscle and stomach contents, respectively. Differences in contaminant levels in the muscle and stomach contents were statistically insignificant. PCBs in the liver were 5.5 and 26 times greater than DDT and chlordane levels, respectively. PCBs in the liver samples correlated with DDTs (r = 0.9475) and chlordanes (r = 0.9389); and DDT and chlordane levels were also correlated (r = 0.9456). PCBs, DDTs, and chlordanes in the liver samples positively correlated with the body weight and fork length, which suggested continual and incremental exposure of shortfin mako to the

contaminants, as well as relatively unimportant growth-related dilution effects on the contaminant levels. Contaminant levels in the liver samples were relatively low in one male shortfin mako; however the overall gender specific differences in the contaminant concentrations were statistically insignificant. Higher PCB levels observed in the shortfin mako liver samples were in the range of PCB levels reported in the literature for the fillets of bluefish caught in the vicinity of highly contaminated New Bedford Harbor (3.99-40.6 □g/g). Elevated contaminant levels in the shortfin mako suggest the importance of bluefish as a vector in the transfer of contaminants to shortfin mako while feeding in the northeast U.S. coastal region.

- **Ocean acidification effects in the early life-stages of summer flounder, Paralichthys dentatus**
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  Ocean acidification effects on fish are expected to differ across species, be subtle, and interact with other stressors. An experimental framework was implemented that assessed the early life stage (ELS) responses of summer flounder *(Paralichthys dentatus)*, an important flatfish of the mid-Atlantic region of the USA, to a wide range of pH and CO2 levels. Survival of embryos was reduced by 50% below local ambient conditions (7.8 pH, 775 ppm pCO2) when maintained at the intermediate conditions (7.4 pH, 1860 ppm pCO2), and another 50% when at the most acidic conditions (7.1 pH, 4,715 ppm pCO2). Reduced survival of embryos at higher CO2 levels was consistent among three females used as sources of embryos. Sizes of larvae were altered by elevated CO2 levels with longer larvae in more acidic waters. Larvae were longer (but with less energy reserves) at hatching to midway through the larval period. Larvae from the most acidic conditions initiated metamorphosis earlier and at smaller sizes than those from more moderate and ambient conditions. Tissue damage was evident in older larvae from both elevated CO2 levels. CO2 affected cranial-facial features levels and these effects changed with larval age. Skeletal elements of larvae from ambient CO2 environments were comparable or smaller than those from elevated CO2 environments when younger (14 d and 21-d post-hatching) but larger at older ages (28 d). The impairment of ELS of summer flounder by elevated CO2 levels suggests that this species will be challenged by ocean acidification in the near future.

- **An Assessment and Restoration Program of River Herring (Alewife and Blueback Herring) in the Rancocas Creek and Maurice River**
Matthew Heyl and Lloyd Lomelino
New Jersey DEP

  The main objective of this three year program is to assess the status of river herring populations including adult and juvenile abundance. Year one includes research on sampling methods and verifying possible sampling locations. Years two and three will include collection of juvenile and adult fish which will allow the Division to develop indices of relative adult stock status and juvenile production. Sampling methods include the use of electrofishing equipment (Boat and Backpack), Gill nets, and Seine nets. Currently the program just completed year two of sampling, but data has not been analyzed. The ultimate objective is that this program will be funded in the future to allow long term assessment of River Herring production in these watersheds.

- **Testing Atlantic Sturgeon Spring Habitat Selection With An Autonomous Underwater Vehicle**
Matthew Breece, University of Delaware
Matthew Oliver, University of Delaware
Keith Dunton, Stony Brook University
Dewayne Fox, Delaware State University

  Overharvest and habitat destruction prompted the protection of Atlantic sturgeon *(Acipenser oxyrinchus oxyrinchus)* under the U.S. Endangered Species Act in 2012. Through the use of biotelemetry in the U.S. mid-Atlantic Bight we documented 395 Atlantic sturgeon in the near-shore coastal environment on a large passive

acoustic array. Coupling these telemetry data with sea surface temperature and ocean color from satellite observations we hypothesized a combination of water temperature and water type are the primary drivers of Atlantic sturgeon marine migratory behavior. Utilizing water classes developed from satellite ocean color as our dynamic sampling environment we conducted a near real-time, 90-day stratified sampling mission using a SLOCUM glider outfitted to detected and relay information on telemetered sturgeons to test this hypothesis. Forty-three Atlantic sturgeon were detected by the glider in offshore marine waters ranging 1-12 km from the coast and were associated with water types showing signs of terrigenous input (higher dissolved organic matter) at temperatures above 9°C. Through the coupling of multiple platforms we have begun to look at the drivers of marine habitat use and migration for Atlantic sturgeon, which we hope, can be used to minimize bycatch and facilitate the management and recovery of this imperiled species.

- **A novel approach for assessing the impacts of targeted anchored gillnetting and identifying concentration areas of reproductively mature Atlantic sturgeon**

Amy M. Comer[1], Amanda Higgs[2], John A. Madsen[3] Dewayne A. Fox[1]
[1]Delaware State University
[2]New York State Department of Environmental Conservation
[3]University of Delaware

Worldwide, sturgeons are recognized as one of the most imperiled groups of organisms. In 2012, Atlantic sturgeon *(Acipenser oxyrinchus oxyrinchus)* were listed under the ESA due to concerns over population declines. In June 2013, through a combination of passive mobile telemetry and high-resolution side-scan sonar, we assessed the distribution of reproductively mature Atlantic sturgeon in a 10km reach of the Hudson River, near Hyde Park, New York. Atlantic sturgeon were concentrated in three distinct regions. In the region of highest density, which was previously unknown, we conducted pre, during, and post surveys to evaluate the distribution and relative abundance of sturgeon during targeted gillnetting sampling efforts. We collected a total of nine reproductively mature Atlantic sturgeon, of which, the vast majority were imaged. Over the course of netting activities, the distribution of Atlantic sturgeon transitioned from small clusters to a more uniformly dispersed state. We also documented a corresponding decrease in relative abundance in the study area during sampling. Furthermore, Atlantic sturgeon were found utilizing a combination of sandy and muddy habitat. We recommend the use of high-resolution side-scan sonar to identify concentration areas of reproductively mature Atlantic sturgeon. Furthermore, when developing population estimates, the impact of sampling activities on sturgeon distribution and relative abundance should be considered.

- **Atlantic sturgeon *(Acipenser oxyrinchus oxyrinchus)* interactions with commercial shipping in the Delaware River***

Alex M. DiJohnson[1&2], Matthew T. Fisher[1], and Dewayne A. Fox[2]
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[2]Delaware State University

The industrial revolution of the late 1800s led to a significantly altered Delaware (DE) River. Resulting declines in water and habitat quality coupled with overharvest decimated all life stages of Atlantic sturgeon *(Acipenser oxyrinchus oxyrinchus).* In 2012, Atlantic sturgeon in the DE River were included in the New York Bight distinct population segment and listed as endangered under the Endangered Species Act. In the final ruling determination, NOAA-NMFS listed vessel strikes as one of the threats to the continued existence of Atlantic sturgeon in the DE River. This river, supporting the world's largest freshwater port (>3,000 deep draft vessels annually), exhibits increased levels of vessel strikes during the period of presumed spring spawning activity for Atlantic sturgeon. We selected a 5.3km reach of the DE River near Chester, PA due to its importance as a staging and presumed spawning area for Atlantic sturgeon. During a 78 day period extending from mid-April to early July, 2013, we maintained an array of 20 VEMCO Ltd. VR2W receivers and corresponding synchronization transmitters to provide insights on the behavior of Atlantic sturgeon. Commercial vessel traffic was assessed through the global Automatic Identification System which characterizes the vessel (e.g. name, type, draft, and beam) while providing plots of course and speed. During our study nine telemetered Atlantic sturgeon occupied the positioning array an average of 4.3 days intermittently from April 29 through June 28,

2013. Atlantic sturgeon tracks plotted in relation to vessel paths will allow for an examination of behavioral responses to the 143 observed vessels (65 tugs, 50 cargo container, 22 tankers, and six miscellaneous). Through our efforts we hope to provide an improved understanding of Atlantic sturgeon behavior with regard to vessel traffic while simultaneously accounting for the conservation and recovery efforts within an important component of the regional economy.

- **Assessing the impacts of recreational angling on sand tigers and how site fidelity may play a role.**
Kilfoil, James, Delaware State University
Fox, Dewayne, Delaware State University
Wetherbee, Brad, University of Rhode Island
Carlson, John, NOAA-SEFSC, Panama City Lab

The direct targeting of sand tigers (Carcharias taurus) is prohibited in both Federal and State waters off of the eastern United States. Despite these protections, a recreational catch-and-release fishery has recently developed in the mid-Atlantic. Working with volunteer anglers off the Delaware coast, 33 sand tigers (mean 201cm FL; range 146-248cm FL) were captured and fitted with external acoustic VEMCO Ltd tags in the summers of 2012 (n=25) and 2013 (n=8). The majority (57%) of shore-caught sand tigers were hooked posterior to the jaw, a factor often associated with increased mortality. Utilizing a large-scale passive acoustic array we observed one probable post-release mortality event. While initial estimates of post-release survival appear high, the results of this study should be viewed with caution given sand tigers' low reproductive output. Furthermore, the majority of telemetered sharks (86%) demonstrated strong site fidelity to areas of greatest fishing pressure (< 750 meters from coast). This site fidelity occurred interannually, with 67% of returning individuals demonstrating similar behavior in 2013. Prolonged exposure to areas of high angling effort can lead to animals being repeatedly subjected to capture events, as was observed in one individual caught three times in less than nine months. The cumulative impacts of these capture events remain unknown, but may greatly reduce fitness and survival probability of released individuals.

- **SAFIS Goes App: Development of a hand-held application for fisheries trip reporting.**
Defilippi, Julie Marie
Atlantic Coastal Cooperative Statistics Program (ACCSP)

The Atlantic Coastal Cooperative Statistics Program (ACCSP) is a cooperative state-federal program. The Standard Atlantic Fisheries Information System (SAFIS) has become a critical component of fisheries data reporting. SAFIS has undergone numerous revisions to accommodate changes in technology, the needs of Program Partners and end-user requests. Expanding the reporting options will help improve acceptance and reduce resistance amongst those required to report. ACCSP hired a contractor in June 2013 to develop hand-held software designed to transmit data in accordance with the existing API that is in compliance with the ACCSP Trip Reporting Standard. Rhode Island Department of Fish and Wildlife and Rhode Island Party Charter Boat Association (RIPCBA) will work in concert to recruit 10 RIPCBA captains for test pilot. Pilot data will be validated against traditional trip reports and port samples. A feedback mechanism built in to the application and exit interviews will provide end-user input. At the completion of the pilot, the basic hand-held software application will be available to any interested Program Partner at no cost. Interested vendors will be provided with source code to use in creating add-ons that could be made available for purchase. Capturing data in near real time during a fishing trip has the potential to increase data accuracy and precision and would allow collection of data not obtained via traditional reporting methodology, such as vessel position and speed.

Poster Panel Lineup

- **Monitoring cross-continental shelf movement of winter flounder (Pseudopleuronectes americanus).***
Kaycee Coleman, Thomas M. Grothues, Kenneth W. Able
Institute of marine and Coastal Sciences, Rutgers University

The objectives of this study are to understand the cross-continental shelf movements of winter flounder, *Pseudopleuronectes americanus*, off of New Jersey via several tagging methods to explore the possibility of a non-migratory contingent cryptic to assessment. We tagged 222 winter flounder with 150 marker tags, 60 archival tags and 12 acoustic tags in September 2012 at the "Mud Hole," a depositional feature at the head of the Hudson Shelf Valley. Acoustic signals telemetered by a roving boat and an autonomous underwater vehicle (AUV), were geolocated using Sound Pressure Level Weighted Center of Activity. These fish were tracked within a few kilometers of the release location as late as December. To evaluate the archival tag data, which records temperature, salinity, pressure, and a time stamp every 24 minutes, we developed a Monte Carlo Markov Chain and an Adaptive Kernel Density algorithm to obtain the most likely position of the fish as constrained by fit to environmental model data from Rutgers University's Regional Ocean Modeling System (ROMS). Since the majority of archival tags are still at large but expected to increase with the reopening of the commercial fishery, we validated the model by attempting to recover simulated (known) fish tracks with this algorithm.

- **Assessment of Fish Utilization on a Sub-tidal Oyster Restoration Area in a Mid-Atlantic Estuary***

Jenny Paterno, Lisa Calvo and David Bushek
Rutgers University, Haskin Shellfish Research Laboratory

Decreases in *Crassostrea virginica* (eastern oyster) populations have been documented in many estuaries along the North American Atlantic and Gulf of Mexico. This striking trend expanded the interest in oyster restoration. A substantial number of oyster restoration projects are executed in the southeastern United States and Gulf of Mexico where the reefs are primarily intertidal. Some methods used to evaluate these enhanced areas are not applicable to subtidal oyster habitats, especially when the visibility is near zero in the Delaware Bay.

The Gandy's Beach Oyster Restoration Enhancement Area (GBOREA) is a subtidal five acre plot located in the upper Delaware Bay. It was established by the New Jersey Department of Environmental Protection in 2007 in conjunction with Project PORTS (Promoting Oyster Restoration Through Schools) and Rutgers University. Project PORTS is a community-based oyster restoration program that engages local school children in stewardship by building shell bags that provide substrate for oyster larvae settlement that are subsequently planted on the GBOREA site. The GBOREA has been planted with spatted clam shell every year since its inception, but monitoring efforts of reef establishment and community development have been limited. The objective of this study is to compare the diversity and abundance of resident fishes, transient fishes and benthic macroinvertebrates on the GBOREA with nearby bottom types in the Delaware Bay.

Equipment used to explore these elements during the study included an otter trawl and benthic habitat trays. Side scan sonar data was collected via Rutgers University's autonomous vehicle REMUS on July 24, 2013. Each month from July through October 2013, six trawl samples were collected from seven sites in the Bay: GBOREA, three nearby non-oyster bottom locations containing mixtures of mud, sand and rocks, and three nearby mature oyster beds. All animals captured, except gelatinous species (mostly ctenophores and jellyfish), were identified to the lowest possible taxon, enumerated, measured and weighed. At the same frequency and at the same sites, trays were filled with benthic material from each site and deployed for one week, collected and then processed similarly.

Analysis the fish assemblage and community composition of a cultch-bottom enhancement project in this system will help determine the value of such efforts to help the local ecosystem. Preliminary analysis reveals there is little difference in the species composition amongst the benthic tray samples. However, the average number of species found on the GBOREA site is greater than the average species richness on the non-oyster bottom sites. Preliminary analysis of trawl data shows the average species richness on oyster bottoms is greater than on the GBOREA.
As expected, fish species composition changed seasonally as sampling progressed into fall.

- **Crab megalopae in the coastal ocean collected during the NOAA Estuarine and Coastal Shelf project**

Linda L. Stehlik
NOAA NEFSC James J. Howard Laboratory

The Ecology of Coastal Ocean Seascapes (ECOS) project linked hydrography with biology. In the New York

Bight (NYB) apex, the estuarine plume from the Hudson-Raritan watershed intersects with oceanic water masses originating from the south and the northeast. Sampling was conducted in spring, summer, fall, and late fall 2009, 2010, and 2011 in two areas. Each sampling day, the frontal boundary between water masses was located based on an initial reconnaissance, remotely sensed data, and predictive models (from IMCS Rutgers University and Stevens Institute of Technology). A transect was designated across the front, and plankton tows were made with a Tucker trawl at six or seven stations at upper and lower depths.

1416 crab megalopae were identified. Cancer sp. and Xanthidae were present throughout spring through fall. Carcinus maenas, Libinia sp. and Uca sp. megalopae were mainly present in summer. Cancer sp. was most abundant in 2011, and was present from June through November, particularly in water of northeast origin. Callinectes sp. was most prevalent in early fall, and its greatest abundance was in 2009. Most of the species were of estuarine origin; other oceanic species were occasionally collected.

- **Partitioning total mortality in the face of unknown levels of natural mortality when conducting stock assessments: two case studies.**
  Desmond M. Kahn
  Delaware Division of Fish and Wildlife

  A common practice in stock assessment is to input an assumed constant value of natural mortality into a model, often based on some information about life history, and then to fail completely to test this critical assumption. Yet hundreds of examples from ecology show that natural mortality of wild animals can vary dramatically among years. As part of such assessments, a widespread approach to estimation of fishing mortality is to use the formula F = Z – M. If the assumed M is biased, then F will be biased, even if Z is unbiased. This ad hoc approach to partitioning mortality fails to employ Baranov's definition of fishing mortality, F = catch/(mean stock size), or the alternative ratio formulation, F/Z = U/A (sensu Ricker 1975, p. 10). I will outline a hypothesis-testing approach, employing theoretically sound methods focused on correct estimation of fishing mortality without directly employing an estimate of natural mortality. Given total mortality, natural mortality can often be estimated as a byproduct of an accurate estimate of fishing mortality (sensu Beverton and Holt 1957, p. 238). I will present three case studies from the Mid-Atlantic region of the United States: Chesapeake Bay stocks of striped bass, the Delaware Bay stock of blue crabs, and the Mid-Atlantic stocks of weakfish. In all three cases, testing the assumption of constant natural mortality rejected that hypothesis, and the consequent revised estimation of fishing mortality gained increased accuracy.

- **Assessing Callinectes sapidus reo-like virus (RLV) prevalence and fishery impacts in the Chesapeake Bay***
  Emily M. Flowers[1]; Robert Aguilar[2]; Eric J. Schott[1]
  [1]Institute of Marine and Environmental Technology, University of Maryland Center for Environment Science
  [2]Smithsonian Environmental Research Center, Smithsonian Institution

  The Callinectes sapidus reo-like virus (RLV) is fatal to blue crabs and has been found from New York to the gulf coast of Florida. However, prevalence and factors influencing prevalence have not been well characterized. Possible means of transmission include direct contact with infected hemolymph, cannibalism/scavenging, and water-borne transmission. Fishery practices are of interest as crabs are placed in close contact and may sustain injuries during capture and sorting. In addition, soft-shell crabs can be produced by holding pre-molt crabs in flow-through shedding tanks for 2-10 days until they molt. This study assesses RLV at Chesapeake Bay sites exposed to varying degrees and types of fishery activity. RLV prevalence was measured in wild crabs from sites adjacent to and distant from shedding facilities. In June of 2012, the prevalence of RLV was three times higher at sites adjacent to shedding facilities. Overall, wild crabs had a prevalence of 30%. Of those crabs dying within shedding facilities, RLV prevalence was nearly 100%. Future work will include analysis of late summer 2012 samples from the same regions. In addition, naïve sentinel crabs will be placed at sampling sites to assess transmission.

- **Comparison of Fish Species Composition and Distribution in Barnegat Bay***
  Holly Kiang[1], Kenneth W. Able[2] and Thomas Grothues[2]
  [1]CUNY Macaulay Honors College

[2]*Rutgers University*

Knowledge of Barnegat Bay, New Jersey, fishes is limited due to a lack of continuous, comprehensive data collection. Juvenile fish assemblages from historical collections were compared to those from recent trawl collections at the same locations. Variation between years was caused primarily by absence of warm-water migrants in August and presence in October. Such migrants may become a more significant ecological factor.

- **Spatial and temporal comparison of larval fish sources and assemblages in Barnegat Bay, New Jersey***
  Maria Berezin, Kenneth W Able, Thomas Grothues

  Little is known about the supply of larval fishes into estuarine systems from multiple source points. Barnegat Bay, New Jersey is ideal for examining larval supply from multiple locations as it spans approximately 70 km of coastline (north to south) covering a total area of 1,730 km2. In this study, we compared the community composition of larval fishes from three different source types within the Barnegat Bay system: inlet (Point Pleasant and Barnegat Light), thoroughfare (Little Sheepshead Creek Bridge), and power plant (Oyster Creek generating station). Synoptic sampling was completed at these locations bimonthly using a 1 m plankton net with 1 mm mesh over three, thirty-minute replicate tows. Different sampling location types revealed variation between natural and more developed environments and allowed for the resolution of species composition between sites spatially, temporally, and by environmental parameter (i.e. temperature, pH, salinity). During 2012, 75 samples over 5 dates collected 9332 larvae from 63 different species. Dominant species included *Syngnathus fuscus, Anchoa mitchilli, Brevoortia tyrannus, Gobiosoma ginsburgi*, and *Anguilla rostrata*.

- **Meta-Analysis of Ocean Acidification Experiments on the Early Life-Stages of Marine Fishes**
  R.C. Chambers, A.J. Jensen[1], and D.J. Alcott[2]
  National Marine Fisheries Service / Northeast Fisheries Science Center
  National Oceanic and Atmospheric Administration (NOAA)
  [1]*College of Natural Sciences, Forestry, and Agriculture*
  University of Maine
  [2]*Department of Natural Sciences*
  University of Maryland Eastern Shore

  Marine fish early life-stages (ELS) have received increased attention regarding effects of ocean acidification (OA) because individuals in the ELS are a recruitment bottleneck and are least likely to be resilient to physiological challenges associated with OA. Only a small number (< 50) of publications currently exist on the ELS responses to OA but this literature is expanding rapidly. A framework was created for collecting critical contextual data for the experiments (e.g., phylogeny of the study species; details of the experimental design). Such metadata establishes a means of standardizing data reporting for future experiments and provides the raw material for our second objective: perform a meta-analysis of data drawn from relevant publications on OA effects on marine fish ELS. The metadata included text, tabular, supplemental, and graphical components. The meta-analysis was reduced to six primary ELS response variables (survival, length, and mass; otolith size and area; and behavioral response to predator cues) and tested four null hypotheses: no differences in ELS responses to OA i) among fish due to phylogeny, ii) between fish from major biomes, iii) between fish with different egg habitats; and iv) between embryonic versus larval stages. A strong bias exists in the study species (phylogeny) and source locations (biomes). Initial analyses suggest a greater susceptibility in fish with tropical distributions and pelagic eggs. The embryonic stage appears more sensitive than more advanced stages to OA exposure. Future experiments should standardize reporting of carbonate chemistry parameters and fully report data from all response variables in order to standardized datasets.

- **Using local ecological knowledge (LEK) to investigate the spread of northern snakehead (Channa argus) in the greater Philadelphia region***
  Paul Bowen, Emily Chea, Dat Do, Tina Dy, Onky Handoko, Kim Koing, Brian Lac, Aldercy Lam, Zavvia Lassiter, Elvis Lau, Jaysson McKnight, Minyi Nie, Hannah Tang, Kenya Williams, Paula Yann -Mastery Charter School
  Talia Young -Rutgers University

Invasive species are an economic and ecological problem. The government does keep track of them but invasive species can proliferate at a faster rate than the government can track. Local ecological knowledge (LEK) can be a good solution because the knowledge can come in much faster from the fishermen who are out there every day. We interviewed fisherman in the Pennsylvania and New Jersey area to find the range of the northern snakehead (Channa argus) in the Philadelphia region and compared our findings to the USGS sightings distribution map. We found snakeheads reported in creeks in Pennsylvania and New Jersey. All of the sightings that USGS had found were already covered by the fishermen who had no prior knowledge to it and there were actually many more areas that the fishermen knew of that were not yet checked by the government. The data from fishermen can be off since they are from personal accounts but there is basis in their knowledge. LEK can be a good, if less precise, solution for data on range of invasive species.

- **Dispersal of American Horseshoe Crab *(Limulus polyphemus)* Larvae**

Chandler Navara[1], Paola Lopez-Duarte[2], and Kenneth Able[2]
[1]Lehigh University
[2]Rutgers University Marine Field Station

Horseshoe crabs *(Limulus polyphemus)* have a wide distribution along the east and Gulf coasts of North America. They exhibit high tolerances to multiple environmental stressors (e.g., wide fluctuations in temperature and salinity) and are often referred to as 'living fossils' because their bodies have remained relatively unchanged for millions of years. Even though accurate estimates of horseshoe crab populations are not available, reports of their decline are widespread. Their uses in the biomedical and fishing industries have been cited as contributing factors, but habitat loss is thought to be the main factor driving the decrease in horseshoe crab numbers. The need for suitable habitat is particularly critical during the reproductive season, which peaks around May-June, when horseshoe crabs migrate to shallow areas and deposit their eggs on the beach. After an incubation period of approximately one month and during the time of high tide, larvae (trilobite larvae) hatch out from the eggs and enter the water column. The literature on adult horseshoe crabs is extensive, but little is known about larval dispersal and juvenile habitats, including their distribution. Identifying juvenile settlement areas is critical to conservation and stock enhancement efforts. The goal of this study was to monitor horseshoe crab larval abundances over multiple tidal and lunar cycles to better understand dispersal patterns in Great Bay, NJ. From June to August, we conducted weekly plankton samples during nocturnal ebb and flood tides. Trilobite larvae were sorted, counted, and kept in finger bowls in the laboratory to monitor the time of molting. The highest densities of larvae were recorded during ebb tides and around the time of full moon. Most larvae molted into first stage juveniles a week following collection. Our results suggest that most trilobite larvae are being carried downstream, swimming with ebbing currents, and likely reach nearby barrier islands or coastal areas before molting into juveniles.

- **BP Oil Spill Effects on the Abundance and Composition of Louisiana Marsh Fishes**

Jessica Valenti[1], Paola Lopez-Duarte[2], and Kenneth W. Able[2]
[1]The Richard Stockton College of New Jersey
[2]Rutgers University Marine Field Station

The coastal marshes of the Mississippi River Delta account for nearly 40% of the coastal wetlands within the continental United States. Tidal marshes are areas of high productivity that provide nursery habitat for various species of fish and other wildlife, protect against wave damage associated with storms, and help to stabilize the shoreline. These wetlands have suffered total losses of approximately 33,230 acres in recent years (1998-2004) and the majority of the loss has occurred in Louisiana. Stressors that continue to contribute to the decline of wetlands include artificial waterways, wave erosion, intrusion of salt water, and lack of sediment deposition. In addition, these marshes have been exposed to multiple oil spills, the greatest one being the BP Deepwater Horizon Oil Spill in April, 2010. The explosion of the DwH drilling platform resulted in the release of approximately 4.4 million barrels of crude oil, exceeding the Exxon Valdez oil spill by at least one order of magnitude. Even with extensive clean-up efforts offshore, the oil reached the shorelines of the Gulf States, where the distribution of oil in salt marshes was significant, but patchy. This event also impacted the livelihood of locals and the economy of the region. Over the next decade, the closure of these fishing grounds (37% of federal waters), some of the richest in the Gulf of Mexico, is estimated to result in total revenue losses of 3.7 billion USD from commercial fisheries, recreational fisheries, and mariculture. The purpose of this project is to

assess the long-term effects of the BP Oil Spill on the marsh fish assemblages in Louisiana. In the summers of 2012 and 2013, we sampled oiled and unoiled sites in Terrebonne and Barataria Bays. Most of our catch was dominated by four fish species: *Fundulus grandis*, *Adinia xenica*, *Poecilia latipinna*, and *Cyprinodon variegatus*. We recorded differences in fish composition and abundances between oiled and unoiled sites and across subhabitats (marsh edge, creek, pond, and depression). The same species were present in oiled and unoiled sites, but the relative abundances varied in two species. Different responses could be related to tolerance levels to stressors, reproductive strategies, and habitat use by different size classes.

Bio: Thomas J. Belton, M.A.

Mr. Belton is a marine biologist and a researcher within the Office of Science in the New Jersey Department of Environmental Protection. He has a BA in Classical Languages from St. Peter's College, attended both the University of Pennsylvania and City University of New York for graduate work in Biology and has an MA in Biological Oceanography from the City University of New York. Mr. Belton's chief responsibility at NJDEP is to develop water quality and multimedia assessment tools through applied research for NJDEP's water, air, and natural resource programs. In addition, he provides technical support and co-chairs several technical committees associated with the three national estuary programs in New Jersey. He is a principal investigator on a number of ongoing research projects including the development of new nutrient criteria for streams, lakes and estuaries; studies of salt marshes along the Jersey shore susceptible to sea level rise and he is the Research Coordinator for the Governor's Action Plan for Barnegat Bay. Mr. Belton teaches as an Adjunct Professor at various colleges in New Jersey including courses in marine biology, estuarine ecology, and environmental science. He is also the author of "Protecting New Jersey's Environment; From Cancer Alley to the New Garden State (Rutgers University Press)," which was named an Honor Book by the New Jersey Council for the Humanities for its success in making science and public policy studies accessible to the general public. See: http://rutgerspress.rutgers.edu/(S(bbhp4m552igyfr45gt54q355))/product/Protecting-New-Jerseys-Environment,44.aspx