Northeast Fisheries Science Center Reference Document 01-17

Collected Abstracts of the Northeast Fisheries Science Center's Seventh Science Symposium Westbrook, Connecticut December 11-13, 2001

compiled by

Renee Mercaldo-Allen, Joseph Choromanski, Mark S. Dixon, James B. Hughes, Douglas R. Lanyon, Catherine A. Kuropat, Christopher Martin, and John J. Ziskowski

December 2001

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01-02 **Update Assessment of American Plaice in the Gulf of Maine - Georges Bank Region for 2000.** By L. O'Brien and C. Esteves. [A report of Northeast Regional Stock Assessment Workshop No. 32.] February 2001.

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01-07 **Proceedings of the 14th Canada-USA Scientific Discussions, January 22-25, 2001, MBL Conference Center, Woods Hole, Massachusetts.** By S. Clark and R. O'Boyle, convenors. May 2001.

01-08 **TRAC Advisory Report on Stock Status: A Report of the Fourth Meeting of the Transboundary Resources Assessment Committee (TRAC), St. Andrews Biological Station, St. Andrews, New Brunswick, April 17-20, 2001.** [By the 4th Transboundary Resources Assessment Committee Meeting.] July 2001.

01-09 **Results of a Field Collection of Biopsy Samples from Coastal Bottlenose Dolphin in the Mid-Atlantic.** By J. Nicolas, D.C. Potter, C.W. Potter, and P.E. Rosel. July 2001.

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01-13 **Elemental Composition of Fish Otoliths: Results of a Laboratory Intercomparison Exercise.** By V.S. Zdanowicz. September 2001.

01-14 **Identification of Seasonal Area Management Zones for North Atlantic Right Whale Conservation.** By R.L. Merrick, P.J. Clapham, T.V.N. Cole, P. Gerrior, and R.M. Pace, III. October 2001.

01-15 **Bycatch Estimates of Coastal Bottlenose Dolphin (*Tursiops truncatus*) in U.S. Mid-Atlantic Gillnet Fisheries for 1996 to 2000.** By D.L. Palka and M.C. Rossman. November 2001.

01-16 **Causes of Reproductive Failure in North Atlantic Right Whales: New Avenues for Research -- Report of a Workshop Held 26-28 April 2000, Falmouth, Massachusetts.** By R.R. Reeves, R. Roland, and P.J. Clapham, editors. November 2001.

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Renee Mercaldo-Allen, Joseph Choromanski, Mark S. Dixon, James B. Hughes, Douglas R. Lanyon, Catharine A. Kuropat, Christopher Martin, and John J. Ziskowski

National Marine Fisheries Serv., 212 Rogers Ave., Milford, CT 06460-6490

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Northeast Region
Northeast Fisheries Science Center
Woods Hole, Massachusetts

December 2001

Northeast Fisheries Science Center Reference Documents

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Seventh NEFSC Science Symposium

December 11-13, 2001
Water's Edge Resort
Westbrook, Connecticut

Tuesday December 11, 2001

7:30-8:30 a.m. **Registration**, Coffee, Muffins, Danish

8:30-9:00 a.m. **Opening Remarks**
Renee Mercaldo-Allen, NEFSC/Milford Laboratory
Michael Sissenwine, NEFSC Science and Research Director
Douglas R. Lanyon, NEFSC/Milford Laboratory

Session I: Crustaceans

Ambrose Jearld, Jr., Session Chair
Chief, Research Planning and Coordination Staff

9:00 a.m. **Shell disease prevalence and severity in offshore American lobster populations** (Abstract No. I-1)
Diane Kapareiko, Richard A. Robohm, John J. Ziskowski, George R. Sennefelder, and Anthony Calabrese, NEFSC/Milford Laboratory

9:20 a.m. **Reassessing biodiversity estimates for decapod crustaceans off the eastern United States: the importance of new species discoveries, improved taxonomy, and new phylogenetic hypotheses** (Abstract No. I-2)
Martha S. Nizinski, NEFSC/National Systematics Laboratory

9:40 a.m. **Environmental monitoring on lobster traps** (Abstract No. I-3)
James Manning, NEFSC/Woods Hole Laboratory

10:00 a.m. **Attack and avoidance behavior between large and small blue crabs, *Callinectes sapidus*, in the laboratory** (Abstract No. I-4)
Linda L. Stehlik and Carol J. Meise, NEFSC/James J. Howard Marine Sciences Laboratory

10:20-10:40 a.m. **BREAK**

Session II: Environmental Studies

Thomas T. Noji, Session Chair
Chief, Ecosystems Processes Division

10:40 p.m. **Polychlorinated biphenyl fingerprints in young-of-the-year bluefish** (Abstract No. II-1)
Ashok D. Deshpande, NEFSC/James J. Howard Marine Sciences Laboratory

11:00 p.m. **Patterns in biochemical condition of some young-of-the-year demersal fishes: the price of seasonal migration** (Abstract No. II-2)
Vincent G. Guida, NEFSC/James J. Howard Marine Sciences Laboratory

11:20 p.m. **Benthic invertebrate assemblages at *Spartina alterniflora* marshes reestablished after an oil spill in the Arthur Kill (NY/NJ)** (Abstract No. II-3)
Joseph J. Vitaliano, Robert N. Reid, and David B. Packer, NEFSC/James J. Howard Marine Sciences Laboratory

11:40 p.m. **Habitat and species associations of fish, megafauna, and benthic infauna in the New York Bight Apex** (Abstract No. II-4)
Sukwoo Chang, Joseph J. Vitaliano, and Frank W. Steimle, NEFSC/James J. Howard Marine Sciences Laboratory

12:00 p.m. **The role of local wintertime atmosphere heat flux in determining springtime temperature variability in the northern Mid-Atlantic Bight during 1965-1973** (Abstract No. II-5)
Maureen H. Taylor and David G. Mountain, NEFSC/Woods Hole Laboratory

12:20-1:30 p.m. **LUNCH**

Session III: Protected Species

Wendy L. Gabriel, Session Chair
Chief, Fisheries and Ecosystems Monitoring and Analysis Division

1:30 p.m. **The Right Whale Sighting Advisory System: locating right whales, advising mariners and battling nausea** (Abstract No. III-1)
Kelly Houle, NMFS/NERO

1:50 p.m. **The Right Whale Sighting Advisory System: who knows a right whale from a left whale anyway?** (Abstract No. III-2)
Patricia A. McGinn, NMFS/NERO

2:10 p.m. **Northeast Fisheries Science Center aeriel surveys for right whale (*Eubalaena glacialis*) 1998-2001** (Abstract No. III-3)
Timothy V.N. Cole, Frederick W. Wenzel, and Amy E. Renner, NEFSC/Woods Hole Laboratory

2:30 p.m. **A review of current NMFS scientific management efforts to recover the North Atlantic right whale (*Eubalaena glacialis*)** (Abstract No. III-4)
Richard L. Merrick, NEFSC/Woods Hole Laboratory

2:50 p.m. **An overview of the Northeast Fisheries Science Center Sea Turtle Program** (Abstract No. III-5)
Cheryl E. Ryder, NEFSC/Woods Hole Laboratory

3:10-3:30 p.m. **BREAK**

Session IV: Results of the Town Meetings

John Boreman, Session Chair
Deputy Center Director

3:30-5:00 p.m. **Presentation/Discussion**

5:30 p.m. **DINNER**

Wednesday December 12, 2001

7:30-8:30 a.m. **Registration**, Coffee, Muffins, Danish

Session V: Aquaculture

Anthony Calabrese, Session Chair
Chief, Aquaculture and Enhancement Division

8:30 a.m. **Introduction**
Mark Dixon, NEFSC/Milford Laboratory

Aquaculture: Good for the economy, good for the environment, good for you!
Sandra Shumway, UConn Department of Marine Sciences

9:00 a.m. **Stock enhancement: moving from wishful thinking toward sound ecology** (Abstract No. V-1)
Ronald Goldberg, Jose Pereira, and Paul Clark, NEFSC/Milford Laboratory

9:20 a.m. **Bay scallop spawning and rearing methods** (Abstract No. V-2)
David J. Veilleux, NEFSC/Milford Laboratory

9:40 a.m. **An experimental system for evaluating shellfish recirculating nursery systems** (Abstract No. V-3)
James C. Widman, Jr., NEFSC/Milford Laboratory

10:00-10:20 a.m. BREAK

10:20 a.m. **Rotifer production on microalgal diets: a quantitative approach to developing a feeding strategy** (Abstract No. V-4)
Mark S. Dixon, Gary H. Wikfors, NEFSC/Milford Laboratory
Bethann Balazsi, Southampton College

10:40 a.m. **Microalgal production to further science and aquaculture** (Abstract No. V-5)
Barry C. Smith and Gary H. Wikfors, NEFSC/Milford Laboratory

11:00 a.m. **An overview of the NOAA diving program** (Abstract No. V-6)
Barry C. Smith, NEFSC/Milford Laboratory

Session VI: Senior Manager Presentations

John Boreman, Session Chair
Deputy Center Director

11:20 a.m. **Expanding opportunities**
Ambrose Jearld, Chief, Research Planning and Coordination Staff

11:35 a.m. **Habitat characterization and resource management**
Thomas T. Noji, Chief, Ecosystems Processes Division

11:50 a.m. **Census of marine life**
Michael Vecchione, Director, National Systematics Laboratory

12:05-1:30 p.m. LUNCH

Session VII: Flounder Biology and Ecology

Dr. Mary Fabrizio, Session Chair
Chief, Behavioral Ecology Branch

1:30 p.m. **Settlement dynamics and the distribution of early juvenile winter flounder in a Northwest Atlantic estuarine nursery** (Abstract No. VII-1)
John P. Manderson, Jeffrey P. Pessutti, Carol J. Meise, Donna L. Johnson, and Patricia A. Shaheen, NEFSC/James J. Howard Marine Sciences Laboratory

1:50 p.m. **Winter flounder avoidance of sediment biogeochemicals** (Abstract No. VII-2)
Andrew F.J. Draxler, NEFSC/James J. Howard Marine Sciences Laboratory
Jessica A. Siclare, Saint Joseph's University

2:10 p.m. **Growth rates of juvenile winter flounder, *Pseudopleuronectes americanus*, as determined from otoliths, under varying environmental conditions** (Abstract No. VII-3)
Carol J. Meise, Donna L. Johnson, Linda L. Stehlik, John P. Manderson, and Patricia A. Shaheen, NEFSC/James J. Howard Marine Sciences Laboratory

2:30 p.m. **Size-related shifts in habitat associations of young-of-the-year winter flounder (*Pseudopleuronectes americanus*): field observations and laboratory experiments** (Abstract No. VII-4)
Beth A. Phelan, John P. Manderson, NEFSC/James J. Howard Marine Sciences Laboratory
Allan W. Stoner, NMFS/Alaska Fisheries Science Center
Allen J. Bejda, NEFSC/James J. Howard Marine Sciences Laboratory (retired)

2:50 p.m. **Ecological biogeography and species diversity of the flatfishes (Order Pleuronectiformes)** (Abstract No. VII-5)
Thomas A. Munroe, NEFSC/National Systematics Laboratory

3:10-3:30 p.m. **BREAK**

Session VIII
Posters
3:30-5:00 p.m.

Multi-decadal temperature records from New England's coastal waters (Abstract No. VIII-1)
Cristina Bascuñán, James Manning, Maureen H. Taylor, and David G. Mountain, NEFSC/Woods Hole Laboratory

Shell size and color of bay scallops from genetic lines as factors in prey preference by crabs (Abstract No. VIII-2)
Joseph Choromanski, Sheila Stiles, NEFSC/Milford Laboratory
Jessica Vinokur, Vassar College

A clear case of overfishing in Room 25 (Abstract No. VIII-3)
Gary H. Wikfors and Mark S. Dixon, NEFSC/Milford Laboratory

Waquoit Bay Watershed Ecological Risk Assessment Project: using science to support management (Abstract No. VIII-4)
David D. Dow, NEFSC/Woods Hole Laboratory

Salpidae and Thaliacea on the Northeast Continental Shelf (Abstract No. VIII-5)
Michael D. Ford, NESDIS/NODC
Sharon A. McLean, Jerome Prezioso, NEFSC/Narragansett Laboratory

Variability in capture of egg and larval fish species between two pelagic samplers: bongo vs MOCNESS (Abstract No. VIII-6)
Donna L. Johnson, NEFSC/James J. Howard Marine Sciences Laboratory

Distribution and variability of zooplankton biomass of the U.S. Northeast Shelf Ecosystem (Abstract No. VIII-7)
Joseph Kane, NEFSC/Narragansett Laboratory

RNA concentration as an indicator of growth in young-of-the-year winter flounder (*Pseudopleuronectes americanus*) and tautog (*Tautoga onitis*) (Abstract No. VIII-8)

Catherine A. Kuropat, Renee Mercaldo-Allen, NEFSC/Milford Laboratory
Elaine M. Caldarone, NEFSC/Narragansett Laboratory
Ronald Goldberg, NEFSC/Milford Laboratory
Beth A. Phelan, NEFSC/James J. Howard Marine Sciences Laboratory
Frederick P. Thurberg, NEFSC/Milford Laboratory

Critical Sightings Program placard (Abstract No. VIII-9)

Amy E. Renner, Tim V.N. Cole, NEFSC/Woods Hole Laboratory
Blair Mase, NMFS/SEFSC
Dana L. Hartley, Pat Gerrior, NERO/Woods Hole Laboratory

Applications of age and measurement data for Atlantic salmon scales using image analysis (Abstract No. VIII-10)

Erin Livensparger and Ruth E. Haas-Castro, NEFSC/Woods Hole Laboratory

***Sirolpidium zoophthorum*, new evidence of its effects on larval bay scallops** (Abstract No. VIII-11)

Christopher Martin, NEFSC/Milford Laboratory

Restoration and assessment of urban salt marsh habitat damaged by a severe oil spill (Abstract No. VIII-12)

Dave B. Packer, Joseph J. Vitaliano, NEFSC/James J. Howard Marine Sciences Laboratory
Carl Alderson, NYC Parks and Recreation/Salt Marsh Restoration Team

Seasonal abundance of *Temora longicornis* on the Northeast Continental Shelf of the United States based on 24 years of ecosystems monitoring data (Abstract No. VIII-13)

Jerome Prezioso and Joseph Kane, NEFSC/Narragansett Laboratory

NOAA CoastWatch remote sensing applications for the NMFS Northeast Region (Abstract No. VIII-14)

Grayson Wood, NEFSC/Narragansett Laboratory

Axial skeletal deformities in winter flounder from Boston Harbor and Georges Bank (Abstract No. VIII-15)

John J. Ziskowski, NEFSC/Milford Laboratory
Holly Hansen, Secaucus, NJ
Jose J. Pereira, NEFSC/Milford Laboratory
Marianne Farrington, New England Aquarium
Jay M. Burnett, NEFSC/Woods Hole Laboratory

5:30 p.m. DINNER

Thursday December 13, 2001

7:30-8:30 a.m. **Registration**, Coffee, Muffins, Danish

Session IX: Atlantic Salmon

Fredric M. Serchuk, Session Chair
Chief, Resource Evaluation and Assessment Division

8:30 a.m. **Infectious salmon anemia in Maine-cultured Atlantic salmon** (Abstract No. IX-1)
Sharon A. MacLean, NEFSC/Narragansett Laboratory

8:50 a.m. **Smolt production dynamics in endangered Atlantic salmon populations** (Abstract No. IX-2)
John F. Kocik, NEFSC/Orono Field Station
Timothy F. Sheehan, NEFSC/Woods Hole Laboratory
Kenneth F. Beland, Maine Atlantic Salmon Commission
Jennifer FitzGerald, NEFSC/Woods Hole Laboratory

9:10 a.m. **Characterizing rearing history of Pleasant River smolts using scale image analysis** (Abstract No. IX-3)
Ruth E. Haas-Castro, John F. Kocik, and Christopher M. Legault, NEFSC/Woods Hole Laboratory

9:30 a.m. **Stock-specific measures of marine growth for three remnant populations of Atlantic salmon, *Salmo salar*, from eastern Maine** (Abstract No. IX-4)
Timothy F. Sheehan, NEFSC/Woods Hole Laboratory
John F. Kocik, NEFSC/Orono Field Station
Ernest Atkinson, Maine Atlantic Salmon Commission

9:50 a.m. **Origin and distribution of Atlantic salmon post-smolts in Penobscot Bay, ME** (Abstract No. IX-5)
Craig A. Tinus and Russell W. Brown, NEFSC/Woods Hole Laboratory

10:10-10:30 a.m. **BREAK**

Session X: Technology/Gear

Michael Vecchione, Session Chair
Director, National Systematics Laboratory

10:30 a.m. **Use of a large-mesh panel to reduce the flatfish bycatch in the small-mesh bottom trawls used in the New England silver hake fishery** (Abstract No. X-1)
Henry O. Milliken, III, NEFSC/Woods Hole Laboratory

10:50 a.m. **An efficiency comparison of a standard 8-ft NEFSC sea scallop dredge and one rigged with rock-excluding chains** (Abstract No. X-2)
Victor A. Nordahl, Jr., NEFSC/Woods Hole Laboratory

11:10 a.m. **Fisheries acoustics at the NEFSC** (Abstract No. X-3)
Peter Chase, William L. Michaels, J. Michael Jech, William J. Overholtz, Wendy L. Gabriel, and Elizabeth Pratt, NEFSC/Woods Hole Laboratory

11:30 a.m. **Introducing the Fisheries Scientific Computer System (FSCS)** (Abstract No. X-4)
Nancy McHugh, NEFSC/Woods Hole Laboratory
David Benigni, Thomas N. Stepka, and Dennis P. Shields, NOAA/Office of Marine and Aviation Operations

11:50 a.m. **Results for recent NIST intercomparison exercises from the Organic Group of the J. J. Howard Marine Science Laboratory** (Abstract No. X-5)
Bruce W. Dockum, NEFSC/James J. Howard Marine Sciences Laboratory

12:10 p.m. **Remote sensing and GIS applications for protected species** (Abstract No. X-6)
Chris Orphanides and Grayson Wood, NEFSC/Narragansett Laboratory

12:30 p.m. **Closing Remarks**

12:45 p.m. **LUNCH**

NEFSC Science Symposium Steering Committee/Milford Laboratory

Joseph Choromanski
Mark S. Dixon
James B. Hughes
Douglas R. Lanyon
Catherine A. Kuropat
Christopher Martin
Renee Mercaldo-Allen
John J. Ziskowski

Shell disease prevalence and severity in offshore American lobster populations

Diane Kapareiko, Richard A. Robohm, John J. Ziskowski, George R. Sennefelder, and Anthony Calabrese
NOAA/NMFS/NEFSC, 212 Rogers Ave., Milford, CT 06460-6490

During the period 1990-1992, 15,004 lobster from 146 commercial catches at nine offshore canyon sites surrounding the 106-Mile Sewage-Sludge Disposal Site were examined for signs of shell disease. Overall, 1,184 lobster (7.9%) had lesions. Females were more affected by this condition than males. Shell-lesion occurrence was independent of carapace length (CL), but strongly related to location (proximity to the 106-Mile Dumpsite as well as to the 12-Mile Dumpsite). Data collection for the shell-disease study included not only evaluation of presence or absence of disease, but also measurements of lesion size and carapace length. This was done in anticipation of developing a method that would determine the percentage of total surface area of each lobster affected by shell disease; this percentage is the basis of a Disease Severity Index (DSI). An estimate of lobster surface area could be derived mathematically from carapace length, for both male and female lobster in our database, using the formula $y = 1.1034 + 1.9677 * \log(CL)$. The percentage of surface area covered by shell lesions, multiplied by 10^3, provides a DSI that may allow better statistical correlations between mean disease severity and site of lobster collection.

Regression Tree analysis of this multi-variate database indicated that, unlike prevalence, the most important variable affecting the DSI was carapace length. Overall, DSI's for smaller lobsters ($CL < 95$ mm), were significantly higher ($p < 0.02$) than larger lobsters, regardless of sex or location. Small females had significantly higher DSI's ($p < 0.04$) than large females. Males showed no significant differences when similarly compared. A complete non-parametric regression analysis of our DSI in relation to proximity to the 106-Mile Site, may indicate whether sewage sludge dumping had any effect on the severity of shell disease lesions in offshore American lobster populations.

Reassessing biodiversity estimates for decapod crustaceans off the eastern United States: the importance of new species discoveries, improved taxonomy, and new phylogenetic hypotheses

Martha S. Nizinski
NOAA/NMFS, National Systematics Laboratory, National Museum of Natural History, Washington, DC 20560-0153

The decapod crustacean fauna inhabiting estuarine, neritic, and continental shelf waters off the East Coast of the United States (Maine to central Florida) is rich and diverse. Although seemingly well known, decapod faunal composition and taxonomy in this region continues to change. The decapod fauna off the eastern United States now comprises 366 species of which 65% are crabs, 30% shrimps, 3% thalassinids, and 2% lobsters. Ten species new to science have been discovered since 1982, when the last comprehensive review of the decapod fauna from this region was completed. Thirty-two species have either been reassigned to different genera (15 of which are newly described) or placed in synonymy. Sixteen higher-level taxonomic changes (new superfamily, family, and subfamily designations; elevation of subfamilies and subgenera to families and genera, respectively) have also taken place. New methods, access to new material, and recent investigations into higher-level systematics provide the foundation for better understanding of evolutionary relationships and constructing more meaningful hypotheses to address questions, not only in the field of systematics, but also those in comparative biology.

Environmental monitors on lobster traps

Session I: Crustaceans
Abstract No. I-3
ORAL PRESENTATION

James Manning
NOAA/NMFS/NEFSC, 166 Water St., Woods Hole, MA 02543-1026

The NOAA-funded "Northeast Consortium" provides support to the fishing industry to conduct collaborative research with scientists. The Environmental Monitors on Lobster Traps (eMOLT) is one such project. Phase I, beginning in year 2000, distributed temperature probes to over 50 New England lobstermen represented by four associations (Atlantic Offshore, Mass, Maine, and Downeast). These small (~3 cm) instruments cost less than $100, internally-record hourly temperatures with an accuracy of less than 0.1°C, and last for several years. They are deployed for multiple months at fixed locations distributed throughout the Gulf of Maine from the canyons on the southern side of Georges Bank to the mouth of the St. John River. Phase II, this year, provides a set of 9 Seabirds for monitoring salinity changes as well. The objective will be to occupy the same locations annually to obtain an index of both large-scale/long-term variability as well as a means of potentially tracking pockets of water mass that advect through the region. Phase III, next year, calls for setting up a series of computer stations/data management centers along the coast to help participants in downloading and documenting their deployments. Understanding the biological significance of the physical variability will be a secondary (but potentially worthwhile) byproduct of the results and one that the participating lobstermen enthusiastically await. Details are posted on the project website http://www.nefsc.nmfs.gov/~jmanning/emolt.html , including links to, for example, "Results from the Field," "Data Access," and much more.

Keywords: temperature, lobster, environmental monitoring

Attack and avoidance behavior between large and small blue crabs, *Callinectes sapidus*, in the laboratory

Linda L. Stehlik and Carol J. Meise
NOAA/NMFS/NEFSC, 74 Magruder Rd., Highlands, NJ 07732

Cannibalism by large blue crabs is a well-recognized source of mortality of juveniles of the same species. We initially determined the probability of being cannibalized with a series of experiments in 2.3 and 0.9 mm diameter tanks, pairing one adult crab >120 mm carapace width with a juvenile from one of the size classes ranging from 20-29 mm to 100-109 mm CW. At size classes > 50-59 mm, prey crabs were almost never eaten.

Experiments were then conducted in 0.9 m diameter tanks to determine the mechanisms of attack and avoidance. After releasing the predators, the arenas were videotaped for 24 hr. Predator crabs exhibited behaviors such as inspect, stalk, chase while swimming, lunge with one chela outstretched, corral, consume, or maintain distance if the prey crab was large. Prey crabs used swimming escape, maintaining distance, autotomy, and burial to avoid capture. Prey 20-39 mm could bury completely in the sand, and if they did so before the predator detected them, they were never attacked. If they did not bury, they were usually consumed. Some stood behind the central standpipe where they were hard to see, and it was awkward for a large crab to reach around with its chelae.

Several field studies of blue crab vulnerability to predation have used tethering to keep the prey in one location. Tethering is controversial because in some studies, the tether causes unusual behavior, such as entanglement or inability to bury. Our predation rates were lower than those from laboratory studies with tethered crabs, although the maximum size of vulnerability remained similar.

Polychlorinated biphenyl fingerprints in young-of-the-year bluefish

Ashok D. Deshpande
NOAA/NMFS/NEFSC, 74 Magruder Rd., Highlands, NJ 07732

Estuaries provide important summer nurseries for the young-of-the-year bluefish where they may also be exposed to the varying levels of endocrine disrupting chemicals such as the polychlorinated biphenyls. Bluefish from a relatively pristine estuary will be conceivably subjected to a lesser polychlorinated biphenyl body burden than bluefish from a relatively contaminated estuary. Navesink River, Little Egg Harbor, Great South Bay, Newark Bay, and Hudson River are the five representative estuaries within the New York Bight ecosystem with varying degrees of habitat degradation in relation to the polychlorinated biphenyls. Preliminary data collected thus far suggests estuary specific polychlorinated biphenyl fingerprint differences between young-of-the-year bluefish from the Newark Bay and those from the Great South Bay.

Patterns in biochemical condition of some young-of-the-year demersal fishes: the price of seasonal migration

Vincent G. Guida
NOAA/NMFS/NEFSC, 74 Magruder Rd., Highlands, NJ 07732

The accumulation of storage lipids, especially triacylglycerides (TAG), plays a vital role in the ability of YOY fishes to survive seasonal migrations and/or overwintering. In order to better understand the importance of habitat and timing in preparation for migration, I investigated the time-course and spatial distribution of storage lipids in YOY scup (*Stenotomus chrysops*) and black sea bass (*Centropristis striata*) at stations representing differing habitats within the Inner New York Bight and Lower New York Bay. Freeze drying and dry grinding of fish allowed analysis of whole fish over a large size range, analysis of the same subsamples for both lipids and protein and expression of results on a dry weight basis. Use of thin layer chromatography with flame ionization detection for lipid class analysis allowed me to distinguish small differences in TAG content within a larger background of structural lipids. Similar temporal patterns were observed in both species: little TAG accumulation (<0.5% of dry mass) was evident in fish during August, with significantly greater, though variable TAG levels (maximum 3% of dry mass) in fish during October. Water content in both species showed the inverse pattern: greater during August, less during October. Clear size thresholds for the initiation of TAG accumulation were apparent in both species: 50 mm standard length for *S. chrysops* and 40 mm standard length for *C. striata*. Results are discussed with respect to similar lipid deposition patterns for other migratory demersal fish and the trade-off between fat deposition and growth for YOY migrants.

Keywords: black sea bass, scup, lipids, ontogeny

Benthic invertebrate assemblages at *Spartina alterniflora* marshes reestablished after an oil spill in the Arthur Kill (NY/NJ)

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In January 1990, an oil spill damaged salt marshes along the banks of the Arthur Kill (New York and New Jersey). In the years following the spill, *Spartina alterniflora* seedlings were planted at many of the damaged sites and successfully reestablished at these sites. In 1996, the Coastal Ecology Branch began a study to compare the benthic invertebrate assemblages at the reestablished *S. alterniflora* marshes to those at nearby existing marshes in the Arthur Kill. Oligochaetes, nematodes, and the small tube-building polychaete, *Manayunkia aestuarina* were the dominant taxa in the study. Significant differences were found in the abundances of all invertebrate individuals, oligochaetes, and nematodes between the September and May sampling times but not between reestablished and existing marshes. Benthic invertebrate community structural was similar at reestablished and existing marshes. Recovery time for these benthic invertebrate measures is estimated at three to four years following planting of the *Spartina* seedlings.

Habitat and species associations of fish, megafauna, and benthic infauna in the New York Bight Apex

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In the study, multivariate statistical procedures were used to investigate distribution abundance associations among fish species collected during the 12 mile dump sites monitoring in the New York Bight apex, and to further examine habitat associations between individual fish species and benthos, and between fish species and environmental habitat variables from a synoptic data base of three domains (fish, benthos and habitat). The analysis of integration and synthesis of using these synoptic data sets is a unique case, even though the scope of the data base is limited in time and space. Disturbance and alteration of fish habitat in the New York Bight apex with fluctuation of characteristics of surrounding waters in time and space are explored. The approach of using habitat and species associations can be better understood the essential fish habitat relationships of fish resource in the New York Bight apex, and can be extended to be a part of total fisheries management that includes biotic and abiotic effects among fish and megainvertebrate communities and their ecosystems.

The role of local wintertime atmospheric heat in determining springtime temperature flux variability in the northern Mid-Atlantic Bight during 1965-1973

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This project examines the role of local atmospheric forcing in the transition from relatively cold to warmer springtime temperatures in the northern Middle Atlantic Bight region during 1965 -1973. A one-dimensional water column model is run for eight consecutive winter seasons with the local surface heat flux used as the only external forcing. Historical data from the Nantucket Light Ship along with modeled radiation estimates for New York and Boston are used in the heat flux calculations. Two model simulations were made for each winter season and the results allow for both a qualitative and quantitative comparison of the modeled output with the observed regional temperature variability and with the observed temperature changes measured at Nantucket Lightship. Variability in the local atmospheric heat flux during the wintertime was shown to be a dominant factor in determining springtime temperature conditions during the study period. Regression residuals indicate that advective processes may have contributed to the observed temperature variability, although it is believed that the advective influence is secondary to the local surface heat flux in the northern Middle Atlantic Bight.

The Right Whale Sighting Advisory System: locating right whales, advising mariners, and battling nausea

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The Northeast Right Whale Sighting Advisory System (SAS), implemented in1997, currently serves as the most effective method of disseminating timely sightings data to mariners. With a population estimated at approximately 300-350 individuals, the North Atlantic right whale, *Eubalaena glacialis*, remains critically endangered despite long-term bans on hunting. The National Marine Fisheries Service, US Coast Guard, State of Massachusetts, and other organizations, have coordinated efforts for the RW SAS to survey both coastal and offshore waters. These include the Great South Channel and Cape Cod Bay Right Whale Critical Habitats, Gulf of Maine, Georges Bank, southern New England, and Bay of Fundy. Four dedicated platforms, including three aircraft and one vessel, collect data on the location of right whales from January to June. The RW SAS is operational year-round, providing current right whale location data from surveys and verified opportunistic reports to the maritime industry and fishing community via multi-media sources.

During the 2001 NMFS NER season over 14,000 trackline nautical miles were surveyed, with 508 individual right whales sighted. Data obtained from flights include positions of right whales and other marine mammals, fishing gear, commercial shipping traffic, and environmental data. Right whale photographs are taken, identifying characteristics are recorded, and behaviors are noted. Further, on-scene advisories are given to vessels approaching right whales to deter whale and ship encounters. Occasionally, the aerial survey team is called to verify reports of entangled and floating dead whales, and to offer aerial support during disentanglement attempts. This past June and July, the team assisted in disentanglement of right whale #1102, also known as Churchill. From the sightings, 140 right whale faxes were sent out between January and 15 October 2001, alerting mariners of right whale presence. This sighting information is provided to reduce the likelihood of ships colliding with, or striking right whales. Ship strikes and entanglements in fixed fishing gear are the two primary sources of human caused mortality to right whales.

The Right Whale Sighting Advisory System: who knows a right whale from a left whale anyway?

Session III: Protected Species
Abstract No. III-2
ORAL PRESENTATION

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The Northeast Right Whale Advisory System (SAS) provides timely right whale sighting information to mariners in an effort to reduce ship strikes with the critically endangered North Atlantic right whale (*Eubalaena glacialis*). Sightings reported to the SAS are from dedicated right whale survey efforts and opportunistic sightings. Dedicated sightings are typically obtained from aerial and ship surveys specifically engaged in conducting right whale research, such as NMFS (Northeast Fisheries Science Center and Northeast Region), Massachusetts Division of Marine Fisheries, Center for Coastal Studies, and the New England Aquarium. Opportunistic sightings are reports of right whales (or other marine mammals), provided by sources not specifically engaged in carrying out dedicated right whale surveys. These sources include the US Coast Guard and Navy, Massachusetts Environmental Police, fast ferries, party boats, commercial dredges, whale watch, fishing, recreational, and commercial vessels.

Opportunistic sightings are important to the SAS for a number of reasons. Vessel operators, naturalists and protected species observers provide reports from areas not covered by dedicated surveys. Many opportunistic reports also occur during periods when surveys are not conducted. These reports greatly enhance the effectiveness of the SAS. Each opportunistic sighting is verified through a series of standard questions. An aircraft with experienced marine mammal observers may also be sent to validate reports. Opportunistic sightings have increased in number since the implementation of SAS. Ideally, increased opportunistic sightings from the entire western Atlantic would benefit the right whales' plight, since their yearly migrations are from the Bay of Fundy to off the coast of Florida and Georgia. An immediate area of concern is the Mid-Atlantic where very little aerial or ship surveying occurs. At the present time limited opportunistic sightings are received from the Mid-Atlantic area, which includes the large and busy shipping ports of New York, New Jersey, and Norfolk, Virginia. Until dedicated surveys can be conducted in this area, we must rely on opportunistic sightings. Expanded outreach and educational efforts are needed to heighten awareness of the right whales' vulnerability to collisions with ships to encourage increased participation from within the marine community.

Northeast Fisheries Science Center aerial surveys for right whales (*Eubalaena glacialis)*, 1998-2001

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Aerial surveys for North Atlantic right whales (*Eubalaena glacialis*) were conducted by the Northeast Fisheries Science Center (NEFSC) during the spring and fall of 1998, and in the spring of 1999, 2000 and 2001. The study area encompassed waters from eastern Long Island (72°51' W) east to the Hague Line (66°40' W), and from the New York shipping lanes and the southern edge of Georges Bank (40°21' N) north to the entrance of Penobscot Bay (43°40' N). The objectives of the surveys were: (1) to census offshore areas where systematic sighting effort had been largely absent; and (2) to photographically identify individual right whales in these areas to improve knowledge of population structure, with an emphasis on capturing animals that do not occur in more intensively studied coastal habitats. Surveys were flown at 100 knots and at an altitude of 230 meters (750 feet) in high-wing aircraft equipped with bubble windows. Environmental factors affecting sighting conditions were logged on all flights. During the surveys, 37,912 kms of transect lines were completed (316 hours of effort), and a total of 328 sightings of right whales made. Sightings primarily occurred in the vicinity of the Great South Channel and on the Northern Edge of Georges Bank. Right whales were also observed in areas not previously documented. A comparison of the photographs taken in 1999 and 2000 of right whales sighted to an existing catalogue of individuals found 92 known individuals. In 1999, two identified individuals were sighted only during the NEFSC's survey effort, and five in 2000 -- one of which had not been resighted since 1988. The 'recapture' of these individuals is likely to affect estimates of vital rates for the population, and underscores the importance maintaining systematic survey efforts.

A review of current NMFS scientific and management efforts to recover the North Atlantic right whale (*Eubalaena glacialis*)

Session III: Protected Species
Abstract No. III-4
ORAL PRESENTATION

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Despite 30 years of protection under the Endangered Species Act, the North Atlantic right whale (*Eubalaena glacialis*) has shown little recovery. Indeed, recent analyses suggest that survival rates and population abundance levels have declined. Lack of recovery is partially due to continued anthropogenic mortality, due primarily to entanglement in fixed fishing gear and ship strikes. The 1994 amendments to the Marine Mammal Protection Act provided an important tool for the reduction of gear interactions through the development of take reduction plans. On July 22, 1997, NMFS published the first results of this process as included in the Atlantic Large Whale Take Reduction Plan. The Plan contained a number of approaches to reducing gear interactions. Some dealt with modifications to fishing gear, while others dealt with fishing time and area closures in critical right whale habitat areas. Since 1997, NMFS and the Atlantic Large Whale Take Reduction Team (ALWTRT) have monitored the efficacy of the plan and made significant modifications to the Plan in February 1999 and in December 2000. However, entanglements and associated mortalities of right whales have continued. This has led to the development, beginning in February 2000, of a revised strategy to further reduce gear interactions. This strategy, which is currently undergoing implementation, has three elements: 1) additional time-area closures to all but whale safe gear, 2) additional gear modifications in other areas, and 3) enhanced monitoring of the Plan's effectiveness. The most significant of these elements are likely the additional gear restrictions. First, areas with predictable annual concentrations of right whales will be considered for Seasonal Area Management (SAM). Such areas would have specific boundaries and pre-designated. Specification of additional SAM zones continues the management approach used in 1997 in establishing the Cape Cod Bay and Great South Channel Restricted Areas for right whale conservation. Second, areas without predictable concentrations may be considered for Dynamic Area Management. In these areas, additional gear restrictions will not be invoked unless concentrations of right whales have been found by qualified observers. Once concentrations are seen, NMFS will invoke a minimum two week restricted area around the animals. With these management measures in place, NMFS efforts to recover the North Atlantic right whale will now turn to dealing with ship strike mortalities.

An Overview of the Northeast Fisheries Science Center Sea Turtle Program

Session III: Protected Species
Abstract No. III-5
ORAL PRESENTATION

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Data from aerial and shipboard surveys, fisheries observer programs, strandings and mark-recapture and telemetry studies indicate that four species of turtles migrate northward along the continental shelf of the eastern U.S. to forage in highly productive, nearshore habitats during the spring, summer and fall months. These include primarily early life history stages of cheloniid loggerhead (*Caretta caretta*), Kemp's ridley *(Lepidochelys kempii)* and green (*Chelonia mydas*) turtles; and sub-adult and adult leatherback turtles (*Dermochelys coriacea*). Although numerous studies have been conducted on the behavior and ecology of turtles in the northeast, it was not until 2000 that a dedicated National Marine Fisheries Service (NMFS) sea turtle program was established in the Northeast Region. Staff of the Northeast Fisheries Science Center (NEFSC) and the Northeast Regional Office (NERO) finalized a five-year research and management plan to direct the northeast sea turtle program in December 2000. The objectives of the five-year plan are: (1) to prioritize, support, and direct future research on sea turtles; (2) identify and assess the status of loggerhead, Kemp's ridley, green and leatherback sea turtle stocks; and (3) to reduce the estimated bycatch associated with fishing activities. Many of the initiatives in 2001 were directed toward investigating sea turtle mortality in Virginia state waters. Elevated sea turtle strandings are documented annually in Virginia during the migration in May through June. The magnitude of this stranding event has increased in recent years and includes primarily decomposed loggerheads and secondarily, Kemp's ridley and green turtles. Turtles examined by necropsy were found to be in good health prior to their death, supporting an anthropogenic source of mortality. In 2001, NMFS undertook a comprehensive investigation of possible factors contributing to this mortality, with the goal of instituting an effective management plan to reduce future mortalities. This program consisted of: (1) inshore and offshore aerial surveys to record sea turtle sightings and commercial fishing activity; (2) near 100 percent observer coverage in the large mesh monkfish gillnet fishery; (3) alternative platform coverage of the large mesh black drum and sandbar shark gillnet fisheries; (4) alternative platform surveys of pound net leaders; and (5) support for sonar surveys of pound net leaders and gillnet gear. Data collected under these initiatives and previous studies of Chesapeake Bay turtle entanglements suggested that pound nets with large mesh and stringer leaders were the most likely cause of sea turtle strandings in Chesapeake Bay during the spring of 2001. NMFS is currently working with the state of Virginia and the pound net industry to enact management measures that will reduce future sea turtle entanglements in pound net leaders.

Stock enhancement: moving from wishful thinking toward sound ecology

Session V: Aquaculture
Abstract No. V-1
ORAL PRESENTATION

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Since the late 1870s, many releases of hatchery-reared juvenile fishes were conducted in Europe and the United States to attempt stock enhancement. Results of these efforts were largely inconclusive, since the fate of the stocked fish could not be determined adequately. Beginning in the early 1990s, a renewed interest in stock enhancement emerged, utilizing newly developed fish-marking techniques and a rigorous experimental approach. Presently, microscopic coded-wire tags provide a way to follow the survival of released fish and biochemical or morphological genetic markers can identify their progeny. Recent ecological experiments in many different locations and for a number of species have provided statistically valid, quantitative examples of successful stock enhancement. Adaptive models have been applied, which have systematically identified optimal timing, size at release, stocking density, and release habitats, resulting in cost-effective stock enhancement programs. Concurrently, codes of practice for responsible enhancement have been established, where risks and benefits are evaluated. Field studies have been conducted at Milford Laboratory to investigate potential stock enhancement for bay scallops, *Argopecten irradians* and tautog, *Tautoga onitis*. We have characterized nursery habitats for these species and have begun to explore different enhancement strategies. Our results indicate there is good potential for using aquacultural methods for enhancement when natural recruitment is poor and habitat and environmental conditions are not limiting.

Keywords: stock enhancement, experimental design, bay scallops, tautog

Bay scallop spawning and rearing methods

Session V: Aquaculture
Abstract No. V-2
ORAL PRESENTATION

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Methods for spawning and rearing of bivalve mollusks established at the Milford Laboratory over the past forty years have led to the development of a commercial aquaculture industry. Currently, the Milford Lab is focusing on aquaculture techniques for the bay scallop, *Argopecten irradians irradians*. The bay scallop has been selected because of limited wild fishery yield, high market value, and rapid growth. The methods will be described for the laboratory requirements, conditioning of brood stock, spawning, sampling, larval rearing, feeding, pathogen control and handling. Our results provide insight on how to achieve batches of post-set scallop spat, ready for any need, such as stock enhancement, or experimental research. These methods can be extrapolated easily to a commercial scale.

An experimental system for evaluating shellfish recirculating nursery systems

Session V: Aquaculture
Abstract No. V-3
ORAL PRESENTATION

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Economical biofiltration of shellfish rearing systems presents unique challenges to the aquaculture industry. Due to these challenges, recirculating systems are used extensively in finfish rearing, but are not used in commercial shellfish culture. It will be an "open" system with the addition of at least 10% replacement seawater each day. Each recirculating system will be composed of a biofilter, ultraviolet disinfection, solids removal unit, and protein skimmers to maximize water quality. Determining which commercially available biofiltration systems are compatible with shellfish culture must be the first step. Shellfish culture relies on live algal culture for nutritional purposes, however many commercial finfish culture systems are incompatible with live algae. Process control technology will be used to minimize human intervention (labor costs and biases) throughout the grow-out period. Food consumption will be monitored in order to track food conversion efficiency ratios. Waste production will be monitored and modeled in order to maximize stocking densities of the system while minimizing filtration needs. To increase stocking densities, we will attempt to minimize periodic ammonia peaks based on the data that are collected. Management of the system with neural networks or fuzzy logic will be explored once enough empirical data are collected. Commercial controllers and their conversion for use in the system will be presented. Data gathered from these experiments will be incorporated into an economic model to determine commercial feasibility. A brief review of the current state of bay scallop culture in New England will be presented along with the hurdles that need to be overcome to allow a single-season crop.

Rotifer production on microalgal diets: a quantitative approach to developing a feeding strategy

Session V: Aquaculture
Abstract No. V-4
ORAL PRESENTATION

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Live food production is a critical component in the successful culturing of finfish. Consistent production of microalgal biomass and the efficient conversion of that biomass into live food lead to reliable nutrition of cultured fish. A series of small-scale experiments designed to optimize microalgal diets, establish a feeding protocol, and define rearing conditions for rotifers (*Brachionus plicatilis*) was conducted.

The microalga strain PLY429, *Tetraslemis chui*, yielded the greatest rotifer production when compared to several commonly-used strains. A constant density of 6 million microalgal cells per milliliter and initial low rotifer stocking densities resulted in rapid reproduction and high overall production. Under these conditions rotifer populations doubled in as little as 2 days, and reached a maximum density of over 2000 per milliliter in 6 days. While higher algal densities produced slightly greater yields, conversion efficiencies were lower.

A spectrophotometer was used to monitor algal densities, algal cells were added manually to maintain the target density, and rotifers were counted manually. There is good potential to automate the entire process using "off the shelf" technology. This potential will be explored in upcoming experiments.

Microalgal production to further science and aquaculture

Session V: Aquaculture
Abstract No. V-5
ORAL PRESENTATION

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To study organisms, the need to grow them in the laboratory often occurs. This is a type of aquaculture. In aquaculture a food chain is established as a course of necessity. If bivalve mollusks are to be grown, all life stages require a microalgal diet. Many species of finfish feed on rotifers and/or brine shrimp in their early feeding stages. Rotifers and brine shrimp feed on microalgae. So, to grow species important to aquaculture, their food must also be grown and in adequate supply. Further, the microalgae must also be nutritionally appropriate for the animal to be grown. Other reasons to grow microalgae include the presence of extractable pigments and other chemicals that are abundant in some strains.

To optimize production, aquaculture companies will grow their organisms with several considerations: House the organism in the most favorable environment possible to minimize physiological stress; Grow them as densely as possible to make best use of space; Feed the organism as much of the proper feeds as needed to get maximum growth. This requires large amounts of microalgal biomass to be grown cost effectively.

The above holds true not only for the animals to be grown but also for the plants. Microalgae need a stable environment within thermal and saline optima. Light of an acceptable wavelength and intensity is required for photosynthesis as well as the proper ratios of nutrients. Contaminants must be excluded or controlled to reduce loss. Once these basic criteria are met, the process can be optimized. To maximize the algal biomass produced, increased nutrients leading to increased density is often preferable to increased volume.

Culture strategy plays a major role in algal production. Batch culture is labor intensive and may not support maximum yield from nutrients. Continuous culture (chemostats and turbidostats) can be unreliable. Semi-continuous culture, so far, is the most economical and reliable strategy, because it combines benefits of continuous culture (opportunity for process control and less labor) and batch culture (better control over modifications to harvest rate in response to changes in culture performance).

Keywords: aquaculture, algae

An overview of the NOAA diving program

Session V: Aquaculture
Abstract No. V-6
ORAL PRESENTATION

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Many of the inquiries into the aquatic environment require us to enter the water, not only to observe first hand the organisms and events that occur, but also to accomplish a variety of other tasks. Ships, docks, and other structures need periodic inspection and repair. Monitoring and sampling equipment need installation and regular service. When equipment is lost, it must be recovered to avoid not only monetary loss but also to salvage the scientific information and continue with the given research program. These tasks and more are performed under a wide range of conditions; from crystal clear waters to zero visibility, from tropical seas to ice diving, year-round. Further, the level of complexity ranges from single dives to tending the Aquarius habitat to the "Monitor Project" recovery. The NOAA Diving Program, part of the Office of Marine and Aviation Operations, is the authority that makes sure we enter the water safely and efficiently.

Over 300 divers, 35 Unit Diving Supervisors, and six people staffing the NOAA Diving Center perform over 11,000 dives per year with a safety level of 99.98%. The majority of the dives are less than 60 feet deep. Other dives can be over 100 feet deep. Most diving uses open circuit SCUBA but several other breathing systems can be employed. The range of tools used is dictated by the task undertaken. Some jobs require sample collection or video documentation while other endeavors may require air chisels or jack hammers.

Keywords: NOAA, diving

Settlement dynamics and the distribution of early juvenile winter flounder in a Northwest Atlantic estuarine nursery

Session VII: Flounder Biology and Ecology
Abstract No. VII-1
ORAL PRESENTATION

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Simultaneous surveys with experimental traps and beam trawls were performed to examine the effects of supply-side and post-settlement processes on the distribution of early juvenile winter flounder in the Navesink River/Sandy Hook Bay estuarine system, New Jersey. We measured patterns of settlement with the traps that were constructed of 3mm mesh, captured flounder <7 days post-metamorphosis, but prevented the emigration of older fish and excluded predators. Juvenile distributions resulting from settlement as well as post-settlement mortality and emigration were measured with 1-m beam trawls. Similar numbers of newly-settled flounder were collected in traps in the Navesink River and Sandy Hook Bay from April through June, 2000, but the timing of settlement varied in space. Fish settled approximately two weeks earlier in the river (April-May) than in the bay (May-June) as a result of geographic variation in spring warming. Juveniles were abundant in trawls within the river, where distributions were correlated with the settlement pattern measured with traps. Within the bay, however, juveniles were rare in trawls and their distributions were not correlated with settlement. Juvenile winter flounder are generally more abundant in the Navesink River than Sandy Hook Bay during early summer trawl surveys and our results suggest that this pattern is primarily the result of spatial variation in the strength of post-settlement processes (mortality and/or emigration) rather than variability in the total supply of newly settled fish. However, regional variation in settlement timing could influence the intensity of post-settlement mortality through the size dependent mortality processes.

Winter flounder avoidance of sediment biogeochemicals

Session VII: Flounder Biology and Ecology
Abstract No. VII-2
ORAL PRESENTATION

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The location of juvenile winter flounder (*Pseudopleuronectes americanus*) habitat at the sediment-water interface in estuaries subjects these fish to environments characterized by intense biogeochemical gradients in both space and time. Changes in habitat quality variables (dissolved oxygen, sulfide, nitrite, ammonium, etc.) of behavioral significance to macrobionts can occur on scales as small as millimeters and hours. Even in high energy areas of the Hudson-Raritan Estuary with coarse sandy substrates, oxygen disappears in the upper few millimeters of the sediment, and water column oxygen concentrations have been observed to decrease from 250 μM to less than 30 μM in a few days. Bejda *et al.* (1992) showed that such periodic reductions of oxygen concentrations (to 70 μM) have major growth rate implications for young-of-the-year (YOY) winter flounder. To simulate exposure to biogeochemicals at the seabed, wild caught YOY winter flounder were held in a sand-bottomed, vertical-flow tank in which half the sediment area was perfused with manipulated seawater. Temperature was maintained at 20±0.5°C during 26 experiments while temporally changing biogeochemical gradients and fish locations were recorded. The fish responded to declining O_2 at approximately 100 μM (3.2 mg/L) by moving to more oxygenated water. Increasing sulfide concentrations produced a more complex response apparently requiring in excess of 15-20 μM sulfide to elicit avoidance. Exploratory trials with nitrite (50 μM) and ammonium (100 μM) showed no clear avoidance reaction though the fish appeared to be in distress.

Growth rates of juvenile winter flounder, *Pseudopleuronectes americanus*, as determined from otoliths, under varying environmental conditions

Session VII: Flounder Biology and Ecology
Abstract No. VII-3
ORAL PRESENTATION

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Fluctuations in juvenile winter flounder growth rates have been attributed to large-scale fluctuations in temperature, and smaller scale factors such as predator/prey abundances. This study examines individual growth rates of wild field-caught species as determined through otolith increment counts, and laboratory, through changes in standard length of juvenile winter flounder throughout the settlement period (April-July). The duration of the settlement season for laboratory fish kept at a constant temperature and fed wild zooplankton, had highly variable growth rates that declined significantly during the settlement period. General additive models were used to examine field growth rates and their relationship to environmental variables. In studies using caged fish, relationships between growth rate and temperature results were curvilinear; we found a significant positive linear relationship with growth rate. While growth rate variability remained high throughout the settlement period, growth rates increased and growth rate variability decreased as fish size grew, indicating possible size selectivity for growth.

Session VII: Flounder Biology and Ecology
Abstract No. VII-4
ORAL PRESENTATION

Size-related shifts in habitat associations of young-of-the-year winter flounder (*Pseudopleuronectes americanus*): field observations and laboratory experiments

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Size-related changes in the preference young-of-the year winter flounder (*Pseudopleuronectes americanus*) (15-69 mm SL) for vegetation and sediment structure were examined in field surveys and laboratory experiments. In the field, winter flounder were generally more abundant in vegetated habitats, but sediment relationships changed with body size. Generalized additive modeling indicated that capture probabilities for 10-49 mm SL fish were higher on sediments with a mean grain diameter < 0.5 mm, while fish 50-95 mm were more frequently collected on sediments of approximately 1.0 mm. In the laboratory, winter flounder (15-69 mm SL) were offered choices between 1) vegetated substrate [either eelgrass (*Zostera marina*) or macroalgae (*Ulva lactuca*)] and unvegetated azoic sand, 2) two vegetation types (eelgrass and macroalgae), and 3) a selection of azoic sediments of different sediment grain sizes. Winter flounder preferred vegetated substratum (either eelgrass or macroalgae) to unvegetated substratum but the strength of preference for macroalgal habitats increased with body size. In the sediment selection experiment, small individuals (<40 mm SL) preferred fine sediments while larger individuals (>40 mm SL) preferred coarse-grained substrata. Burial ability increased with body size and fish generally avoided avoided sediments (gravel) that prevented burial. Our field and laboratory experiments suggest that juvenile winter flounder show size-related changes in habitat selection. Early juveniles appear to prefer fine- grained sediments, while larger and older individuals are more strongly associated with vegetated habitats and coarser grained substrata.

Keywords: habitat, winter flounder, sediment, vegetation, size

Ecological biogeography and species diversity of the flatfishes (order Pleuronectiformes)

Session VII: Flounder Biology and Ecology
Abstract No. VII-5
ORAL PRESENTATION

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Over 716 species of flatfishes are currently recognized worldwide with species distributed from northern polar waters to southern boreal seas. From a global perspective, patterns of flatfish species diversity are strongly asymmetrical; north temperate and polar flatfish species number about 115 (ca. 17% of total diversity); flatfish diversity in southern temperate and subantarctic waters is considerably lower (only 4% of total diversity); freshwater flatfishes (only 2% of total diversity) are relatively rare, but undescribed species, especially in South America, continue to be discovered. The greatest diversity of flatfish species (ca. 466 species, 68%+ of total diversity) occurs in shallow (100 m or less), tropical, marine waters on the inner continental shelf and in nearshore neritic habitats. Approximately 36% of flatfish species occur in neritic habitats, 272 species (39% of total diversity) inhabit inner continental shelf habitats, 153 species (22%) live on the outer shelf and upper slope, and 18 species (3%) occur only on the continental slope. Species diversity varies widely among the 13 different flatfish families currently recognized: the Paralichthodidae, Psettodidae, Citharidae, Scophthalmidae and Achiropsettidae are families of low species diversity; the Samaridae, Rhombosoleidae, Poecilopsettidae and Achiridae are families with medium species diversity. The most diverse flatfish families include the Pleuronectidae, Paralichthyidae, Cynoglossidae, Bothidae and Soleidae.

Keywords: flatfish, Pleuronectiformes, species diversity, biogeography

Multi-decadal temperature records from New England's coastal waters

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Water temperature has been collected on a near-daily basis for over a decade at nearly a dozen locations along the New England coast by various state, federal, and commercial institutions. These records have now been archived in a common ORACLE database and are available on the web. While NMFS labs have made a significant contribution to this set with time series from Woods Hole beginning in ’60's, Milford in the ’70's, and Narragansett in the ’80's, there are several other non-NMFS sites maintained, for example, by the Northeast Utilities power plants and the states of Massachusetts and Maine. The Division of Maine Resources in Boothbay Harbor now has nearly a century of data.

Now that these datasets are merged, how should we analyze the collective set? What does it say about long-term variability of our coastal waters? Can we track the transport of Canadian source water as it enters into and out of the Gulf of Maine and how important is the influx of remote sources relative to the local runoff and surface heating? These are questions that we can now begin to address and, while we have barely begun, there are some interesting preliminary results. The inter-annual variability of temperature anomalies (after removing seasonal cycles) is fairly coherent throughout the New England region. The sites mentioned above all recorded warm periods in ’84, ’91, and ’95 and cold periods in ’87/88, ’93, and ’96. There are some indications of warming in recent decades that are most evident in the early ’90's and during the winter months but this trend falls off in very recent years.

Shell size and color of bay scallops from lines as factors in prey preference by crabs

Session VIII: Posters
Abstract No. VIII-2
POSTER PRESENTATION

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In the course of bay scallop aquaculture research conducted at the National Marine Fisheries Service Laboratory in Milford, CT, excess scallops were donated to Connecticut municipal shellfish commissions for free planting in area waters. The practice of free-planting or tossing seed scallops (10-40 mm) directly into the water has come under scrutiny because of the observable decreasing return in the number of adults (>60 mm) caught by recreational fisherman in the towns that have such policies. Field studies of bay scallops have suggested a variety of causes for population fluctuations including habitat loss, genetic inbreeding depression, and predation. It is generally known that crab predation can be a major factor in survival and growth of bay scallops for reseeding or stock enhancement efforts, especially in sites devoid of eel grass which can serve as a refuge for small scallops.

To evaluate crab predation on scallops and to test the influence of shell color on predator selection of prey, an experimental study was conducted with green crabs (*Carcinus maenas*) and blue crabs (*Callinectes sapidus*) in the laboratory. Six treatment aquaria with ambient flowing seawater were established with a single crab and 10 scallops. A seventh aquarium, with 10 scallops and no crab to check for non-predator related mortality, was used as a control.

Four separate trials were run with scallops in each of the following size classes: 10, 20, 30 and 40 mm shell height. Trials were duplicated with a second set of crabs and scallops. Observations were made at 1, 6, 20, and 48 hours for each study. Results indicated that larger-sized scallops had higher survival rates, indicating some degree of refuge from predation by green crabs.

The availability of scallops with different shell colors from our genetic lines provided an opportunity to conduct predator preference experiments. With scallops of similar size (~ 15 mm.) but with shell colors of white, yellow, stripe or brown there was a tendency for the lighter colored scallops to become the early meals. This tendency could have a prominent impact on restocking efforts and is being studied further.

The inclusion of the blue crabs to the experiments was due to a visual increase in the population by divers where we have found our broodstock. The blue crab showed to be as aggressive a predator as the green crabs and through its size, allowed very little refuge for any of the scallop prey.

In addition, damage to scallop shells was manifested in a characteristic appearance which could be used in identifying mortality by crab predation in the field.

A clear case of overfishing in Room 25

Session VIII: Posters
Abstract No. VIII-3
POSTER PRESENTATION

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Experiences encountered in aquaculture research can provide unexpected insight into the principles of fisheries science. One such experience began with the introduction of a non-native species into an aquaculture environment – brine shrimp (*Artemia*) appeared mysteriously in a mass culture tank of microalgal strain UTEX2341, *Nannochloropsis* sp. The vector for this introduction may have involved human error, but we will attribute it to "The Brine Shrimp Faerie" to avoid controversy. We viewed the presence of a population of predators in our algal culture as an opportunity to explore the potential for polyculture, i.e., would it be possible to manage algal growth, algal removal by feeding brine shrimp, and brine shrimp population growth and harvest sustainably? Does this question sound vaguely familiar to anyone?

The experience proceeded as follows: Milford personnel using brine shrimp to feed larval fish harvested both algae and brine shrimp on an "as needed" basis, without benefit of statistical analysis of data. Harvesters recorded removal of algal culture and brine shrimp, while we recorded additions of new water and algal nutrients. Fishing mortality (F) and catch per unit effort (CPUE) were calculated with appropriate modifications for algal and brine shrimp population dynamics and tracked for 14 weeks. For the first 3 weeks, F remained below 0.2, and CPUE remained stable in the range of 0.35-0.75 Artemia per liter of algal culture. When removal of brine shrimp was accelerated (F>0.2), CPUE fell accordingly. One ten-day period with no brine shrimp harvest seems to have resulted in some recovery of the population, but several subsequent large harvests (F>0.4 in a short time span) resulted in a local extinction of the brine shrimp. In our case, the tank was drained, washed, re-filled, and re-inoculated with algae. If only it were this simple everywhere...

Waquoit Bay Watershed Ecological Risk Assessment Project: using science to support management

Session VIII: Posters
Abstract No. VIII-4
POSTER PRESENTATION

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In 1993 the U.S. Environmental Protection Agency (EPA) and the Waquoit Bay National Estuarine Research Reserve (WBNERR) established a partnership to develop a watershed-based ecological risk assessment case study for this coastal embayment on Cape Cod, MA. The Waquoit Bay watershed is 53 sq km in size, while the bay itself encompasses 4 sq km. A conceptual model of the watershed linked human activities to ecological stressors and their ecological impacts, identifying the endpoints for evaluating these effects. For example, residential development (activity) leads to increased nutrient enrichment (stressor) from septic systems and fertilizer usage which results in the loss of eelgrass beds/bay scallop populations (ecological effects) in the bay, with eelgrass habitat being the assessment endpoint and % eelgrass cover being the measurement endpoint.

Fuzzy set analysis was utilized to qualitatively evaluate the 8 water-based assessment endpoints (migratory fish, freshwater biota, wetland habitat, pond trophic status, toxic contamination, eelgrass habitat, estuarine invertebrates, and estuarine fish) in relation to the 6 dominant manmade stressors (toxic chemicals, altered flow, suspended sediments, nutrients, physical habitat alteration, and harvest pressure). This analysis identified nutrient enrichment, dissolved phosphorus in the freshwater ponds and dissolved nitrogen in Waquoit Bay, as the dominant stressor within the watershed. The Risk Analysis Phase of this project contracted with the Boston University Marine Program (BUMP) to develop a coupled Nutrient Loading Model (NLM)/Estuarine Loading Model (ELM) which predicted dissolved inorganic nitrogen (DIN) concentrations in the bay from nitrogen loading from the watershed based on nitrogen input from the atmosphere, fertilizer use, and septic systems.

A hypothetical management application of the NLM/ELM models suggested that nitrogen loading from the watershed would have to be reduced from the current 28 Kg N/ha yr to 21 Kg N/ha yr in order to achieve the 30% coverage of eelgrass in the bay proper which occurred in the early 1970's. Another potential management application examined the impact of nitrogen loading on the disappearance of the bay scallop populations in the early 1980's. It appears that eelgrass cover is a more sensitive indicator of nitrogen enrichment than is bay scallop harvest levels.

Salpidae and Thaliacea on the Northeast Continental Shelf

Session VIII: Posters
Abstract No. VIII-5
POSTER PRESENTATION

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Measurements of salp (Tunicata, Thaliacea) populations on the Northeast Continental Shelf have revealed information about the spatial and temporal trends of these grazers. A long time series of plankton measurements taken by the National Marine Fisheries Service provided an unprecedented collection of observations to analyze. Abundance and distribution of salps (enumerated as Salpidae and Thaliacea) has been determined from an approximately 24-year time series, from 1977 to the present, of species abundance measured by Bongo net tows taken on the Northeast Continental Shelf. Monthly, the highest concentrations of salps occurred between July and November. The Northeast Continental Shelf study area (approximately 35N - 46N, 66W - 77W) was divided into four regions (Middle Atlantic Bight, Southern New England, George's Bank, Gulf of Maine). A meridional trend is revealed with higher concentrations in the southern regions. We find several events of extreme salp concentration throughout this time series. Some events had a peak salp concentration of ~1 x 10^4 specimens * m^{-3}. The dynamics (location, magnitude, and duration) of these events are explored as well as the relationships between accompanying physical oceanographic measurements.

Variability in capture of egg and larval fish species between two pelagic samplers: bongo versus MOCNESS

Session VIII: Posters
Abstract No. VIII-6
POSTER PRESENTATION

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Gear comparisons were made of the catching efficiencies between the $1m^2$ Multiple Opening-Closing Net and Environmental Sensing System (MOCNESS) and the paired 0.61m Bongo sampler, as part of the GLOBEC Broadscale surveys on Georges Bank. Monthly surveys were implemented from January through June of 1996 and 1997. The bank-wide assessment provided the necessary information on distribution, abundance, growth and mortality/survival estimates of key ichthyoplankton species.

Differential rates of capture by year, season, depth, and light regime revealed significant differences between the two samplers. Ratios of the mean standardized catches under 10 m^2 of sea surface area indicate a 4:1 difference in capture between the MOCNESS versus Bongo sampler. For all survey stations in which both sampling gears were deployed, larval fish were captured at 350 MOCNESS stations (97% occurrence) while the Bongo stations contained larval fish at 345 stations (96%) occurrence. Analysis of individual taxa revealed significant differences in the catch ratios in 13 of the 15 species examined.

Distribution and variability of zooplankton biomass of the U.S. Northeast Shelf Ecosystem

Session VIII: Posters
Abstract No. VIII-7
POSTER PRESENTATION

Joseph Kane
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Zooplankton plays a key role in marine ecosystems, both as a link between primary producers and higher trophic levels and as a major prey item of larval fishes. This poster presents information describing the distribution, annual cycle, and interannual variability of zooplankton biomass within the Northeast Shelf ecosystem for the years 1977 – 2000. Additionally, early spring zooplankton standing stock levels from 1972 -2000 were compared to the North Atlantic Oscillation (NAO), an index of atmosphere variability over the North Atlantic Ocean.

RNA concentration as an indicator of growth in young-of-the-year winter flounder (*Pseudopleuronectes americanus*) and tautog *(Tautoga onitis*)

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This study evaluates white muscle tissue RNA concentration as an indicator of short-term fish growth. Young-of-the-year winter flounder (*Pseudopleuronectes americanus)* and tautog (*Tautoga onitis)* were grown in short-term caging experiments (1994-1995) within three north Atlantic estuaries and five habitat-types. RNA concentration (μg/mg wet tissue wt.) was significantly correlated with instantaneous growth rate in winter flounder, measured as length (r=0.83) and weight (r=0.79) and in tautog, measured as length (r=0.69) and weight (r=0.73). Estuary-and habitat-specific differences in growth rate, as determined by RNA concentration, were similar to those determined by measuring instantaneous growth. These results validate the use of RNA concentration as an indirect measure of growth in young-of-the-year winter flounder and tautog.

Critical Sightings Program placard

Session VIII: Posters
Abstract No. VIII-9
POSTER PRESENTATION

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The Critical Sightings Program (CRISP) placard has been developed to facilitate more comprehensive and real-time reporting of offshore sightings of right whales, and entangled or dead whales of any species. The placard was designed primarily for use by the U.S. Coast Guard. However, it is available to other federal and state agencies whose activities are likely to encounter marine mammals, including the Department of Defense Marine Mammal Awareness Program (where the placard is posted on their website). The placard is not intended for use by merchant or other civilian vessels.

The placard is laminated with information on both sides about reporting strategies and identifying whales. We have an agreement from the U.S. Coast Guard to keep the placard on the bridge of all Coast Guard vessels and Coast Guard Stations from Maine to Texas. The placard is also being distributed to any interested state and research organizations.

Applications of age and measurement data for Atlantic salmon scales using image analysis

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Accurate age and growth information is essential for the successful management of any fish population. The NEFSC's Atlantic Salmon Research and Conservation Task (ASRC) uses Optimas 6.5.1 to efficiently extract growth and age information from Atlantic salmon scales. Optimas is an image analysis software program that enables measurements to be extracted from digital or real time video images. For endangered Atlantic salmon populations we typically age the fish using scales and then quantify scale growth by extracting a series of measurements including circuli spacing, annuli spacing, and focus morphology (the center portion of the scale). These variables are used in studies involving comparative growth and maturation, discrimination between naturally reared and hatchery reared fish, and stock discrimination. The ASRC Image Analysis lab provides a means to quantify the age and growth data collected from Atlantic salmon populations. This information is essential for understanding the age structure, life history, and ecology of these fish to better manage and restore these depleted populations.

Sirolpidium zoophthorum, new evidence of its effects on larval bay scallops

Session VIII: Posters
Abstract No. VIII-11
POSTER PRESENTATION

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First observed in bivalve mollusc larvae at Milford over forty years ago this phycomycetous fungus appears to be endemic in cultures of bay scallop larvae at this laboratory. It completes its brief life cycle in affected larvae. Biflagellate zoospores released from mature thalli are infective. Clonal cultures have been obtained from scallop larvae and maintained successfully on enriched seawater agar. In limited experiments, this fungus appears to cause heavy mortality under simulated hatchery conditions.

Restoration and assessment of urban salt marsh habitat damaged by a severe oil spill

Session VIII: Posters
Abstract No. VIII-12
POSTER PRESENTATION

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Few scientific studies have focused on *restored* salt marshes (restored because of a severe environmental impact) as opposed to *created* or *constructed* marshes (created in response to mitigation). In 1990, a 576,000-gallon oil spill seriously damaged marshes of the Arthur Kill, the strait separating Staten Island, NY from NJ. The Salt Marsh Restoration Team of NYC Parks implemented a multi-year restoration and monitoring project to restore marshes directly impacted by the 1990 spill. To date, restoration activities included the successful reintroduction of over 9 acres of Arthur Kill-propagated salt marsh cordgrass, *Spartina alterniflora*. SMRT has been monitoring several parameters in oiled marshes that were replanted and oiled marshes left for natural recovery, including *Spartina* biomass/density, ribbed mussel (*Geukensia demissa*) density, fish abundance/diversity, frequency/duration of feeding of wading birds, and sediment total petroleum hydrocarbons (TPH) in replanted and unplanted sites. In 1996 the National Marine Fisheries Service's James J. Howard Marine Sciences Laboratory extended the study by characterizing and assessing the structure and function of replanted, unplanted, and reference marshes. Studies included sediment chemistry, contaminant analyses, macrobenthic surveys, and stomach content analyses of mummichogs (*Fundulus heteroclitus*). Results are presented from the two investigations. A quantitative assessment of these marshes may allow us to evaluate our ability to restore this habitat's functional attributes, and identify indicators of habitat and living resource health and recovery within a heavily urbanized and degraded estuary.

Seasonal abundance of *Temora longicornis* on the Northeast Continental Shelf of the United States based on 24 years of ecosystem monitoring data

Session VIII: Posters
Abstract No. VIII-13
POSTER PRESENTATION

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Seasonal abundance of *Temora longicornis* from four regions of the northeast continental shelf were plotted with Surfer using MARMAP and Ecosystem Monitoring Bongo tow data from the years 1977-2000. Maximum abundance for this neritic species was in the coastal waters of the Middle Atlantic Bight (MAB) in the late spring. *Temora longicornis* also reached peak abundance during late spring in Southern New England, (SNE) Georges Bank, (GB) and Gulf of Maine, (GOM) but with the numbers decreasing with increasing latitude. The lowest abundances were found in early autumn in the MAB and SNE, in winter on GB and in early spring in the GOM.

NOAA CoastWatch remote sensing applications for the NMFS Northeast Region

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For 11 years, the NOAA CoastWatch Program has processed and distributed NOAA's satellite remote sensing products to researchers and environmental managers throughout the continental U.S., Alaska and Hawai'i. Given the wide range of environmental conditions and ecological issues that occur within U.S. coastal waters, 8 regional CoastWatch nodes were established where the further development of remote sensing products would address local management concerns.

With advancements in computer hardware and software, and the cumulative expertise within the CoastWatch Program, environmental satellite data and image products have reached a high level of quality, versatility and timely production. This poster presents a sample of the products that have been developed for the northeast U.S. coastal ecosystem and descriptions of how they are being used.

Axial skeletal deformities in winter flounder from Boston Harbor and Georges Bank

Session VIII: Posters
Abstract No. VIII-15
POSTER PRESENTATION

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An X-ray study of 390 winter flounder collected from Boston Harbor and Georges Bank in 1989, 1992, and 1995 has revealed the presence of eight types of deformities of the vertebral columns of affected fish: accessory processes, spinal curvature, complex-vertebrae, reduced-accessory processes, fused vertebrae, deformed centra, deformed accessory processes, and reduced centra. LOGISTIC REGRESSION testing of the overall axial skeletal anomaly prevalence, done simultaneously for the predictor variables: LOCATION, SEX, AND AGE shows that the 33.1% prevalence in Boston Harbor flounder is significantly higher than the 14.7% prevalence found in Georges Bank fish ($P = 0.000$). Only the first four deformities listed above, however, occur at significantly higher prevalences within Boston Harbor fish; i.e., at $P < 0.05$ levels. Although an excess number of deformed flounder were found in Boston Harbor, we explored the contributions of SEX and AGE as predictor variables since flounder catches from both locations were composed of fish with differing ages and sex, introducing statistical bias. Fitting a CLASSIFICATION TREE to this multi-variate date base elucidated relationships between DEFORMITY OCCURRENCE, LOCATION, SEX AND AGE, showing that older female flounder from Boston Harbor were most affected by axial skeletal deformities. A DISEASE INTENSITY INDEX based on the deformity "counts" and "types" for affected fish was determined. Using POISSON REGRESSION testing as well as fitting REGRESSION TREES to this multi-variate data base, it was found that DEFORMITY INTENSITY INDICES are not necessarily higher within Boston Harbor flounder compared to fish collected on Georges Bank. Index values are higher in younger males from Boston Harbor, but the magnitude of the deviance of the POISSON REGRESSION is too great and the variables DISEASE INDEX, LOCATION, SEX, AND AGE are not well-modeled, in this case.

Infectious salmon anemia in Maine-cultured Atlantic salmon

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Infectious salmon anemia is a viral disease of Atlantic salmon, principally those in culture environments. The disease was first reported in Norway in 1984 and subsequently has been reported from Scotland, Faroe Islands, Canada, and the US. Genetic sequencing indicates two strains of virus: the Norwegian/Scottish strain and the North American strain. As indicated by its name, the disease is characterized by internal hemorrhaging resulting in severe anemia. Mortality rates typically are 50%. Currently more than 50% of the culture sites in Maine's Cobscook Bay are diseased and fish health management plans are being implemented to limit the spread of the disease to other areas in Maine. There is concern for the potential impact of this virus on Atlantic salmon restoration efforts and on this endangered species. The presentation will discuss efforts to control this disease, vaccine development, bay-area management, coordinated US-Canada fish health management plans, research planned, and impacts on the Atlantic salmon restoration project.

Smolt production dynamics in endangered Atlantic salmon populations

Session IX: Atlantic Salmon
Abstract No. IX-2
ORAL PRESENTATION

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US Atlantic salmon populations with a substantial naturally reproducing component are restricted to eight rivers in eastern Maine, listed as endangered. Adult assessments conducted since 1992 have indicated that abundance has declined and remains low. To identify causes for this decline, we initiated a program to quantify smolt production in the Narraguagus River and index production in the Pleasant and Sheepscot Rivers. In the Narraguagus and Pleasant Rivers, we conducted annual geographically-stratified basinwide estimates of large parr (>130 mm) abundance using electrofishing in late summer. From April until June, we monitored the emigration of Atlantic salmon smolts in all three rivers using rotary screw fish traps. In the Narraguagus River, parr estimates have ranged from 11,700 to 27,000 and corresponding emigrating smolt estimates ranged from 1,800 to 3,600. Even in years with substantial increases in large parr production (126%), smolt production has increased only modestly (3%) in the Narraguagus. In the Pleasant and Sheepscot Rivers, the smolt population has numbered less than 1,000. Our studies have also identified smolts in the Pleasant River that are of commercial aquaculture origin, confirming a fish-management concern. Total smolt production in these watersheds is well below the estimated production capacity of 300/ha and warrants continued study to determine mechanisms responsible for low production.

Keywords: salmon, endangered, smolt

Characterizing rearing history of Pleasant River smolts using scale image analysis

Session IX: Atlantic Salmon
Abstract No. IX-3
ORAL PRESENTATION

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Atlantic salmon in eight Maine rivers were listed in November 2000 as endangered under the Endangered Species Act. The Northeast Fisheries Science Center has monitored smolt production in Maine rivers from 1996 onwards. Atlantic salmon in the Pleasant River constitutes one of the eight remnant populations now protected under the Act. To monitor smolt production in this river, we deployed a rotary screw trap during early April-June in 1999, 2000, and 2001 at Columbia Falls. Scale samples were collected from 382 of 617 smolts captured in 1999 and 120 of 160 smolts caught in 2000. Tissue samples were also collected from a portion of the fish for genetic analysis. Although most smolts in both years were of wild origin, many of these fish exhibited fin deformities, coloration, and body form that suggested they were of hatchery origin. We therefore attempted to determine the feasibility of using scale characteristics to differentiate smolts into three categories: wild origin, early escaped hatchery origin, and hatchery origin. Our results will be important in determining the magnitude of hatchery origin and hatchery escaped fish in the Pleasant River, and in evaluating the efficacy of actions that have been taken to enhance the survival of wild fish.

Stock specific measures of marine growth for three remnant populations of Atlantic salmon, *Salmo salar*, from eastern Maine

Session IX: Atlantic Salmon
Abstract No. IX-4
ORAL PRESENTATION

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We monitored stock-specific marine growth rates for two years from three Atlantic salmon populations in eastern Maine. Individuals were spawned at a federal hatchery and reared to smolt stage at commercial facilities. Approximately 1,000 individuals from each stock were transferred to two marine sites for two sea-winters of marine grow-out. We tagged each individual with an elastomer injection to allow for stock differentiation. Individuals at each site were reared in a single sea-cage and experienced similar environmental influences and growing conditions. Biological sampling occurred approximately every other month. Standardized photographs were taken of a random sample of individuals after two years of grow-out, and Truss Analysis (multivariate morphometrics) was conducted on the photographs. We tested for stock-specific differences in growth with univariate and multi-variate techniques. Significant differences in growth were evident at each site. Significant differences in growth, between populations reared within a common environment, indicate that these populations do harbor some genetic uniqueness. This information maybe useful in understanding the ecological implications of subtle genetic differences and may help managers better understand the dynamics of these stocks while developing conservation plans.

Origin and distribution of Atlantic salmon post-smolts in Penobscot Bay, ME

Session IX: Atlantic Salmon
Abstract No. IX-5
ORAL PRESENTATION

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The fate of out migrating post-smolt Atlantic salmon is poorly understood because monitoring is extremely difficult once they have left the rivers and entered the marine environment. Over a two year period, the NEFSC Atlantic salmon task has developed a coordinated research program focused on hatchery and naturally reared Atlantic salmon smolts in the Penobscot watershed, which is the largest remaining population of wild Atlantic salmon in the United States. This coordinated program involves the marking and release of 170,000 – 180,000 hatchery smolts, a rotary screw trap monitoring program at the head of tide, and an estuary and near shore marine trap survey program. In May, 2000 the NOAA- fisheries Atlantic salmon working group implemented a pair trawl sampling approach to the capture and live release of post-smolts based on technology originated by investigators in Norway and Canada. We pair trawled a modified mid-water trawl with an aluminum catch box at the cod end throughout Penobscot Bay and near shore waters of the Gulf of Maine. Our total catch was 1458 Atlantic salmon post-smolts with a handling mortality of 7.9%. Of those fish, 608 scale samples were taken and preliminary analysis suggests that 3.2% were naturally reared. Besides length, weight and condition we took 87 blood and 139 gill samples for analysis of smolt physiology. These data complete a physiology data series of marked hatchery reared pre-smolts that will yield a far better understanding of smolt physiology in a natural system. Ninety-nine stomachs were removed from mortalities and analyzed for contents. Those data suggest that post-smolts shift from feeding on riverine drift to being opportunistic piscivours soon after entering the marine system. Recovery of 355 elastomere marked fish will allow for evaluation of the relative contribution of different hatchery release groups to the post-smolt population. A rough understanding of migration routes was gained by catch data. A follow-up cruise in Spring 2002 will expand the spatial and temporal scale of sampling to further explore trends in near shore marine distribution. This sampling technique has demonstrated considerable potential for evaluating post-smolt biology at a critical life history stage.

Use of a large-mesh panel to reduce the flatfish bycatch in the small-mesh bottom trawls used in the New England silver hake fishery

Session X: Technology/Gear
Abstract No. X-1
ORAL PRESENTATION

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Bottom trawls that utilize small mesh to capture smaller fish are subject to bycatch limits when they are used in areas where larger regulated species reside. Bycatch of regulated flatfish in the small-mesh bottom trawl fishery for silver hake (*Merluccius bilinearis*, Gadidae) in the Northwest Atlantic is a concern of management because the silver hake are captured in areas that juvenile flatfish frequent. An evaluation of flatfish and silver hake behaviors using low light underwater cameras suggested that the two species could be separated within the mouth of a bottom trawl. Using alternating tows, four different large-mesh panels positioned in the lower belly of the trawl were separately evaluated, and one proved effective at reducing flatfish bycatch while not reducing the catch of silver hake. A large-mesh panel constructed of 1.6 mm diameter, orange colored nylon twine in the lower belly resulted in a 73% reduction in flatfish catch, while not affecting the catch of silver hake.

An efficiency comparison of a standard 8-ft NEFSC sea scallop dredge and one rigged with rock excluding chains

Session X: Technology/Gear
Abstract No. X-2
ORAL PRESENTATION

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Commercial fishermen dredging in the Northwest Atlantic for the sea scallop, *Placopecten magellanicus*, regularly rig their 15-ft scallop dredges with rock excluding chains. Some commercial scallopers believe that rock chains prevent gear damage, reduce repair time, and limit damage to the catch caused by large rocks found in hard bottom habitats. Hard bottom is generally considered to be habitat with medium to large cobbles and boulders mixed with sand and gravel. The number of vertical chains (up and downs) and the number sweep chains (ticklers) a scalloper decides to rig over the mouth of the dredge varies between scalloper, and habitat type. Another belief held by many scallopers is that scallop dredge catch efficiency is increased by adding a number of chains when fishing on hard bottom. The Northeast Fisheries Science Center has conducted a standard sea scallop survey since 1975 deploying an 8-ft dredge without rock excluding chains. Lately, some questions have been raised by the Invertebrate Sub-Committee regarding dredge efficiency on hard bottom habitats. The committee's opinion is that a bias exists in standard dredge tows that capture large rocks or large amounts of substrate. A large rock or boulder may change the performance of a dredge and reduce the efficiency during a standard dredge tow. In response to this, a two part paired dredge tow experiment was conducted in the spring and summer of 2001 to address the issue of dredge efficiency differences on two different bottom types. The study was designed to compare numbers and size frequencies of scallops, finfish bycatch, and substrate retention and exclusion between a standard scallop dredge and one rigged with rock chains. Twenty-one pairs of dredge tows were occupied on hard bottom on the western side of the Great South Channel and twenty-eight pairs of dredge tows were occupied on soft bottom in and around the Nantucket Lightship Closed area. Analysis of covariance will be used to test for the differences in catch and calculate a calibration factor for the dredge fitted with the set of rock chains. Paired *t*-test and contingency tables will be used to test for differences in by-catch and substrate. A Kolmogorov-Smirnov test will be used to detect differences length frequency distribution. Based on this study, the NEFSC will decide whether to implement the use of rock chains during the standard scallop survey. Results were not available from the study at this time, but will be presented at the NMFS 2001 Science Symposium.

Fisheries acoustics at the NEFSC

Session X: Technology/Gear
Abstract No. X-3
ORAL PRESENTATION

Peter Chase, William L. Michaels, J. Michael Jech, William J. Overholtz, Wendy L. Gabriel, and Elizabeth Pratt
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Underwater acoustic technology is being implemented by the NEFSC as an alternative approach to commercial landings and bottom-trawl surveys for obtaining abundance and biomass indices of pelagic fish species in the Gulf of Maine and Georges Bank regions. Since 1995, acoustic cruises have been conducted using a multiple-frequency Simrad EK500 scientific echosounder (12 kHz single beam, and 38 and 120 kHz split beams), midwater trawls, and underwater video. Beginning in 1998, acoustic surveys using standardized survey designs have been conducted to estimate spawning stock biomass of Atlantic herring (*Clupea harengus*). Midwater trawl gear is used to verify species composition and underwater video is used to record fish behavior. Integration of acoustic data with oceanographic and biological databases at the NEFSC significantly enhances the utility of fisheries acoustic methods for pelagic fish assessment. Research topics of the fisheries acoustics group include comparisons of survey designs and statistical approaches (e.g., classical and geostatistical), in situ and laboratory measurements of acoustic backscatter by individuals, and theoretical modeling and visualization of acoustic backscatter by individuals and aggregations of fish.

Introducing the Fisheries Scientific Computer System (FSCS)

Session X: Technology/Gear
Abstract No. X-4
ORAL PRESENTATION

Nancy McHugh[1], David Benigni[2], Thomas N. Stepka[2], and Dennis P. Shields[2]
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A sophisticated data acquisition system has been designed by the Office of Aviation and Marine Operations (OMAO) and the Northeast Fisheries Science Center (NEFSC) specifically to digitally collect all critical fishery-independent data aboard fisheries research vessels. The Fisheries Scientific Computer System (FSCS) is responsible for collecting such data as species, catch weights, individual fish lengths and weights, gender and maturity, as well as stomach content data. Station and oceanographic data are also collected and integrated into the system. Once data are collected for a given station, they are subsequently passed on to an ORACLE database ingestion application, which enables data to be audited before it is examined on shore.

FSCS now replaces manual data recording which shaves months off the time required to make cruise data available to researchers. The system performs all sub-sampling calculations and runs real time audit checks to find data entry errors. Data can be sent back to shore electronically to provide researchers with up to date catch information and to check for any inconsistencies. The hardware suite consists of two redundant network servers and each of the following at three sampling locations: PC with touch-screen terminal, electronic fish measuring board, electronic weight scale, bar code scanner and label printer. FSCS went fully operational during the 2001 NEFSC spring bottom trawl survey and is currently being implemented on the NOAA ships Albatross IV and Delaware II during bottom trawl, scallop and hydroacoustic surveys.

Keywords: data entry at sea, fisheries data acquisition

Results for recent NIST intercomparison exercises from the Organic Group of the J. J. Howard Marine Science Laboratory

Session X: Technology/Gear
Abstract No. X-5
ORAL PRESENTATION

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The organic laboratory at the James J. Howard Marine Science Laboratory at Sandy Hook has participated in the National Institute of Standards and Technology (NIST) Intercomparison Exercise Program for Organics in the Marine Environment for many years. In this yearly program, NIST conducts a yearly interlaboratory comparison exercise to provide a mechanism for participating laboratories, from the federal, state/municipal, university/college, private, and international sectors, to evaluate the quality and comparability of their analytical methodology in the measurement of selected organic contaminants in marine samples. The organic contaminants include selected polyaromatic hydrocarbons (PAH), chlorinated pesticides, and polychlorinated biphenyls (PCB) which are extracted from mussel or fish homogenates or wetted marine sediment. The analyte results determined by the organic group at the Howard Laboratory for recent exercises will be presented.

Remote sensing and GIS applications for studies on protected species

Session X: Technology/Gear
Abstract No. X-6
ORAL PRESENTATION

Chris Orphanides and Grayson Wood
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The use of satellites and remote sensing technology for synoptic observation of large areas of the marine environment has been well developed over the past 20 years. For most part, scientific use of these satellite data has been largely limited to studies of physical oceanographic processes. Recent adaptations of geographical information systems (GIS) for use in the marine environment have shown that they are an important medium by which physical and biological information can be co-analyzed. This notion is well represented by the applications of sea-surface height measurements and other satellite-derived information to a number of investigations in the Central Pacific, specifically (a) the dispersion and transport of lobster larvae and (b) the behavior patterns of sea turtles.

The present project, underway at the Narragansett Lab, makes use of GIS tools to analyze the data from a number of sea-viewing satellite sensors and from fisheries observer logs, in order to focus on sea turtle by-catch within the Atlantic longline industry. Information collected in this manner will be combined with actual tracking data gathered by NEFSC tagging operations in 2002. Preliminary analyses suggest that sea turtle habitat in the marine environment is closely linked with ocean fronts, and that sea turtles may often congregate along the edges of warm core rings and zones of convergence. These and other habitat preferences are being investigated on various spatial and temporal scales through assessing the correlation between sea turtle location and satellite derived measurements of sea-surface temperature, locations of persistent fronts, chlorophyll concentrations, upwelling / downwelling, and other habitat parameters.

Keywords: protected species, remote sensing, satellite imagery, GIS, sea turtles

APPENDIX A

List of Attendees

Alix, Jennifer
Allen, Jane
Allen, Renee
Bascuñán, Cristina
Blogoslawski, Walter
Boreman, John
Broughton, Betsy
Busch, Donna
Calabrese, Anthony
Caldarone, Elaine
Cerino, David
Chang, Sukwoo
Chase, Peter
Choromanski, Joe
Clark, Paul
Cole, Tim
Denecour, Joyce
Deshpande, Ashok
Despres, Linda
Dixon, Mark
Dockum, Bruce
Dow, David
Draxler, Andy
Fabrizio, Mary
Feeney, Sylvia
Ford, Michael
Gabriel, Wendy
Goldberg, Ronald
Green, John
Guida, Vince
Haas-Castro, Ruth
Houle, Kelly
Hughes, Jim
Jearld, Ambrose
Jech, Michael
Johnson, Donna
Kane, Joseph
Kapareiko, Diane
Kocik, John
Kramer, William
Kuropat, Cathy
Lanyon, Doug
Livenspargar, Erin
MacLean, Sharon
Manderson, John
Manning, Jim
Martin, Chris
McCarthy, John
McGinn, Patricia
McHugh, Nancy
Merrick, Richard
Michaels, William
Milliken, Henry
Mountain, David
Munroe, Thomas
Mustafa, Helen
Nizinski, Martha
Noji, Thomas
Nordahl, Victor
Palmer, Joan
Paulson, Anthony
Perry, Dean
Phelan, Beth
Pitchford, Steve
Prezioso, Jerome
Reid, Robert
Renner, Amy
Reppucci, Gina
Robohm, Richard
Rosendale, John
Ryder, Cheryl
Serchuk, Fred
Sharack, Beth
Sheehan, Timothy
Shumway, Sandy
Sissenwine, Michael
Smith, Barry
Stehlik, Linda
Stiles, Sheila
Taylor, Maureen
Thurberg, Fred
Tinus, Craig
Vecchione, Michael
Veilleux, David
Vitaliano, Joseph
Whittingham, Amy
Widman, James
Wikfors, Gary
Wood, Grayson
Ziskowski, John

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STANDARD
MAIL A

Publications and Reports of the Northeast Fisheries Science Center

The mission of NOAA's National Marine Fisheries Service (NMFS) is "stewardship of living marine resources for the benefit of the nation through their science-based conservation and management and promotion of the health of their environment." As the research arm of the NMFS's Northeast Region, the Northeast Fisheries Science Center (NEFSC) supports the NMFS mission by "planning, developing, and managing multidisciplinary programs of basic and applied research to: 1) better understand the living marine resources (including marine mammals) of the Northwest Atlantic, and the environmental quality essential for their existence and continued productivity; and 2) describe and provide to management, industry, and the public, options for the utilization and conservation of living marine resources and maintenance of environmental quality which are consistent with national and regional goals and needs, and with international commitments." Results of NEFSC research are largely reported in primary scientific media (*e.g.*, anonymously-peer-reviewed scientific journals). However, to assist itself in providing data, information, and advice to its constituents, the NEFSC occasionally releases its results in its own media. Those media are in four categories:

NOAA Technical Memorandum NMFS-NE -- This series is issued irregularly. The series typically includes: data reports of long-term or large area studies; synthesis reports for major resources or habitats; annual reports of assessment or monitoring programs; documentary reports of oceanographic conditions or phenomena; manuals describing field and lab techniques; literature surveys of major resource or habitat topics; findings of task forces or working groups; summary reports of scientific or technical workshops; and indexed and/or annotated bibliographies. All issues receive internal scientific review and most issues receive technical and copy editing.

Northeast Fisheries Science Center Reference Document -- This series is issued irregularly. The series typically includes: data reports on field and lab observations or experiments; progress reports on continuing experiments, monitoring, and assessments; background papers for scientific or technical workshops; and simple bibliographies. Issues receive internal scientific review, but no technical or copy editing.

Fishermen's Report -- This information report is a quick-turnaround report on the distribution and relative abundance of commercial fisheries resources as derived from each of the NEFSC's periodic research vessel surveys of the Northeast's continental shelf. There is no scientific review, nor any technical or copy editing, of this report.

The Shark Tagger -- This newsletter is an annual summary of tagging and recapture data on large pelagic sharks as derived from the NMFS's Cooperative Shark Tagging Program; it also presents information on the biology (movement, growth, reproduction, etc.) of these sharks as subsequently derived from the tagging and recapture data. There is internal scientific review, but no technical or copy editing, of this newsletter.

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