3-2008

Who's Eating Whom? Identification and Quantification of Deep-Pelagic Prey Fishes in the North Atlantic Ocean

A. Heger
Harbor Branch Oceanographic Institution, Inc

Tracey Sutton
Harbor Branch Oceanographic Institution, Inc, tsutton1@nova.edu

He, Z., The Ohio State University/Department of Civil and Environmental Engineering and Geodetic Science, Columbus, USA, he.74@osu.edu;
Marron, C. A., The Ohio State University/Department of Food, Agricultural, and Biological Engineering, Columbus, USA, marron.3@osu.edu;
Chin, Y. P., The Ohio State University/School of Earth Sciences, Columbus, USA, yo@geology.ohio-state.edu;
Weavers, L. K., The Ohio State University/Department of Civil and Environmental Engineering and Geodetic Science, Columbus, USA, weavers.1@osu.edu

PHOTODEGRADATION OF CIPROFLOXACIN AND METOLACHLOR IN NATURAL AND CONSTRUCTED WETLANDS

Photodegradation of ciprofloxacin and metolachlor was carried out in one natural and three constructed wetland waters (Old Woman Creek (OWC), Olentangy River Research Park, Waterman Farm Wetland, and Defiance County Wetland) to examine the effects of natural photosensitizers (DOM, nitrate and iron) on the photofate of synthetic organic contaminants. Ciprofloxacin underwent rapid degradation through direct photolysis (33.71 and 0.9353 hr^{-1} at pH8 and pH4, respectively), whereas the degradation of metolachlor was relatively slow (0.01 and 0.1038 hr^{-1} at pH8 and pH4, respectively). Compared to direct photolysis, wetland waters reduced the rate of ciprofloxacin degradation, especially at pH8, due to light screening by wetland waters. Metolachlor degradation was enhanced 2-15 times in wetland waters, with OWC water acting the most effectively. The addition of a strong iron complexing ligand, fluoride, significantly decreased metolachlor degradation, indicating iron played an important role in photosensitized degradation. The addition of 2-20 μM of iron promoted metolachlor degradation in OWC water by 50-100% at pH4, while no significant enhancements were observed for other wetland waters. Current studies are optimizing the photodegradation through altering the concentrations of different photosensitizers.

Head, E., Fisheries and Oceans Canada, Darmouth, Canada, HeadE@mar.dfo-mpo.gc.ca;
Melle, W., Institute of Marine Research, Bergen, Norway, webjoern.melle@imr.no;
Broms, C., Insitute of Marine Research, Bergen, Norway, cecilie.broms.aarnes@imr.no;
Pepin, P., Fisheries and Oceans Canada, St. Johns, Canada, PepinP@dfo-mpo.gc.ca

COMPARATIVE ANALYSIS OF THE ECOLOGY OF CALANUS FINMARCHICUS IN CANADIAN AND NORWEGIAN SUB-ARTIC SEAS

The Labrador and Norwegian Seas are both important overwintering areas and distribution centres for Calanus finmarchicus. Both provide springtime source populations to the adjacent shelves and/or shelf seas, which are seasonally ice covered and which are home to commercially important fish and invertebrate stocks. In the Norwegian and Barents Seas there is inter-annual variability in C. finmarchicus abundance, which is linked to the NAO index. A high NAO index is accompanied by strong south-westerly winds leading to enhanced influx of Atlantic water, warm temperatures and higher C. finmarchicus abundances. By contrast, in the Labrador Sea between 1994 and 2006 there were no discernible changes in the abundances of overwintered C. finmarchicus in spring, or of juveniles in summer, despite large variations in the NAO and a sustained annual warming trend of >1oC. In both the Labrador and Norwegian Seas areal egg production rates are highest in the pre-bloom period and in both there are spatial differences in the magnitude and timing of recruitment. These latter differences will be discussed in relation to local spring bloom dynamics. The descent of C. finmarchicus from the surface to overwintering depths appears to be earlier in the Norwegian Sea than the Labrador Sea, perhaps because it is farther north and has an earlier cessation of phytoplankton growth.

Healy, G. F., University of Miami, Miami, USA, ghealy@projectinstar.org;
Zaragoza, M., Broward County Schools, Ft. Lauderdale, USA, mzaragoza@projectinstar.org;
Swart, P. K., University of Miami, Miami, USA, pswart@rsmas.miami.edu

PROJECT INSTAR: LESSONS LEARNED OVER 10 YEARS OF PROVIDING OCEAN SCIENCE RESEARCH TO K-12 TEACHERS

For ten years, Project INSTAR has engaged over 400 teachers from Miami-Dade County Public Schools in authentic research and field activities with real scientists focusing on coastal, marine and atmospheric environments. The two-week Institute introduces teachers to a wealth of current science topics that enhances their knowledge of scientific content, and exposes them to hands-on field and laboratory research, as well as state-of-the-art equipment and technology that they can use in the classroom. Participants receive 3 graduate credits, as well as, educational materials and classroom equipment that they can use back in the classroom with their students. These teachers have potentially impacted over 60,000 students about the importance and enjoyment in understanding the science, nature, and beauty of the south Florida ecosystems and positively influenced our future workforce and scientifically literate leaders. This presentation will highlight the lessons learned and modifications made over the years that have made this program a success. Examples such as marketing and recruitment strategies, funding avenues, graduate credit issues, collaborations between university departments, and school year follow-up will be emphasized.

Hearn, C. J., ETI Professionals Inc, St Petersburg, USA, clifford_hearn@yahoo.com

MODELING PROPOSED HABITAT RESTORATION IN SEMI-TROPICAL SHALLOW COASTAL TIDAL WETLANDS

A modeling study of a coastal tidal wetland in Florida is reported which considers the influence of proposed dredged ponds on geomorphology and freshwater habitat. The ponds would connect to the main tidal creek, that runs through the wetland, and be upstream of the existing fresh to salt water interface. The central question is whether the ponds could ameliorate past anthropogenic reductions in freshwater habitat without causing other negative environmental impacts. Extensive topographic/bathymetric and habitat surveys of the wetland were made together with a two year monitoring program of water flow parameters. Hydrodynamic modeling in very shallow coastal wetlands faces significant challenges from both the complex topography, and small spatial scales, that control water flow, as well as from the spatially inhomogeneous roughness created by submerged vegetation. The extremely non-linear tidal excursions are found to influence both vegetative habitat and advective/diffusive transport of materials in the wetland. The tidal prisms of the dredged ponds are predicted to cause changes in tidal erosion and deposition which could affect wetland geomorphology especially in the lower reaches, and mouth, of the tidal creek.

Hecht, M. W., Los Alamos National Laboratory, Los Alamos, USA, mhecht@lanl.gov;
Hunke, E. C., Los Alamos National Laboratory, Los Alamos, USA, eclare@lanl.gov;
Maltrud, M. E., Los Alamos National Laboratory, Los Alamos, USA, maltrud@lanl.gov

A BROAD-RANGING FORMULATION OF LATERAL MIXING

A specification of lateral viscosity is developed, involving the combined application of biharmonic and Laplacian forms. Related to that of Chassignet and Garraffo [2001], our prescription can be applied across a wide range in model resolution. Initially developed as a viscous parameterization within a strongly eddying ocean model, the prescription may also be incorporated into tracer mixing schemes.

Heffner, D. M., University of South Carolina, Columbia, USA, dheffner@geol.sc.edu;
Subrahmanyam, B., University of South Carolina, Columbia, USA, sbulusu@geol.sc.edu

INDIAN OCEAN ROSSBY WAVES EXAMINED USING HYCOM SIMULATIONS AND MULTIPLE SATELLITE SENSORS

In this presentation we demonstrate that Rossby waves can be observed in sea surface salinity (SSS) in the Indian Ocean by using simulations of the 1/12° global Hybrid Coordinate Ocean Model (HYCOM). Further, the dynamical processes by which Rossby waves affect SSS is examined using satellite derived parameters such as Sea Surface Height (SSH), Sea Surface Temperature (SST), and ocean color, along with model simulations from HYCOM. The propagation speeds, calculated from a Radon Transform are comparable with new theoretical speeds for Rossby waves. We hope that this study will lead to exploration of Rossby waves in satellite derived SSS from future salinity missions - Soil Moisture and Ocean Salinity (SMOS) and Aquarius.

Heger, A., Harbor Branch Oceanographic Institution, Fort Pierce, USA, a.heger7@gmail.com;
Sutton, T. T., Harbor Branch Oceanographic Institution, Fort Pierce, USA, tsutton@hboi.edu

WHO'S EATING WHOM? IDENTIFICATION AND QUANTIFICATION OF DEEP-PELAGIC PREY FISHES IN THE NORTH ATLANTIC OCEAN

Understanding the structure and functioning of marine ecosystems requires accurate knowledge of trophic interactions. Trophic ecology studies generally underestimate prey diversity due to the difficulties imposed by digestion. Further, this degradation leads to uncertainty in the quantification of prey biomass (i.e., energy flow between various ecosystem components). Trophic interactions in the deep sea are poorly known relative to coastal ecosystems due to an incomplete inventory of meso-and bathypelagic species composition. The CoML field project MAR-ECO has increased our knowledge of the faunal structure of the mid-North Atlantic. Deep-pelagic fish specimens from the 2004 MAR-ECO expedition provided a basis for an anatomical reference collection, described here, which will allow a better understanding of interactions among higher trophic levels. A library of 1674 images of diagnostic 'hard part' anatomical features (e.g. dentaries, otoliths, premaxillae) from 40 species of meso-and bathypelagic fishes has been compiled, with corresponding length and weight regressions for each feature. The aims of this project are to increase the taxonomic resolution of trophic analyses and gain insight into ecosystem functioning as it relates to biodiversity in deep-marine habitats.

Heil, C. A., Florida Fish and Wildlife Conservation Commission, St. Petersburg, USA, Cindy.Heil@myfwc.com;
Bronk, D., Virginia Institute of Marine Science, Gloucester, USA, bronk@vims.edu
Mulholland, M., Old Dominion University, Norfolk, USA, mmulholl@odu.edu;
O'Neil, J. M., University of Maryland Center for Environmental Science, Cambridge, USA, joneil@hpl.umces.edu;
Bernhardt, P., Old Dominion University, Norfolk, USA, PBernhar@odu.edu;
Murasko, S., Florida Fish and Wildlife Conservation Commission, St. Petersburg, USA, Sue.Murasko@myfwc.com;
Havens, J., University of South Florida, St. Petersburg

EFFECTS OF DAYLIGHT SURFACE AGGREGATION BEHAVIOR ON NUTRIENT DYNAMICS OF A KARENIA BREVIS BLOOM

Karenia brevis exhibits migratory behavior in which cells concentrate in a narrow ~5 cm surface layer during daylight and disperse randomly at night. The hypothesis that this aggregation behavior significantly enhances productivity and nutrient cycling was examined in a west Florida bloom in October, 2001. During daylight hours,K. brevis concentrations in the 5 cm surface layer were enhanced 131% (+241%) compared with a 0-1 m integrated water sample. Nutrient concentrations and bacterial and primary productivity were also elevated within the surface layer. Uptake of a variety of nitrogen compounds was greater in the surface layer compared with underlying depths, with the greatest enhancement evident in urea uptake rates. These data suggests that the surface aggregation layer within blooms is an area of increased bacterial and K. brevis activity and that the classic dinoflagellate migration paradigm of a downward migration for access to elevated nitrogen con-