



Fisheries and Aquatics Bulletin

Edited by Janet A Cushing

Volume V, Issue 3

October 2006

From the Editor's Desk

I am constantly amazed by the wide breadth of research of our USGS scientists. I get a sense of the types of research being done not only by reading project description entries, but also by attending meetings such as the American Fisheries Society conference. And, of course, there is the Fisheries and Aquatics Bulletin. For this issue, we have an eclectic mix of articles for our Science Features that showcases the diversity of our research capacity. There are articles on cormorant/fishery relationships, whale shark genetics, fish morphometrics, and data collection and management techniques—and to think, this is just a small sampling of what's being done out there!

Also, starting with this issue is a new section called NFHI News that will provide updates on what's happening with the National Fish Habitat Initiative. For those of you who haven't heard about the NFHI, this is a nationwide endeavor by a consortium of Federal and State agencies, Tribal entities, environmental groups, and sportfishing organizations to restore, enhance, and conserve fish/aquatic habitat. This Initiative is one of the most exciting things happening right now in the fisheries and aquatics realm, and scientists may want to keep the NFHI on their radar screen, and actively engage in the NFHI partnerships.

With that, I hope you enjoy this issue of the FAB, and please contact me if you want to see particular items in this newsletter.

Science Features:

USGS Scientists Assist State and Federal Managers with Cormorant/Fisheries Conflicts

-Bob Ross, USGS Leetown Science Center

The double-crested cormorant (*Phalacrocorax auritus*) is a crow-sized waterbird with a burgeoning Great

Lakes population and a healthy appetite for fish, wild or cultured. The Lake Ontario population alone, which numbered less than 300 pairs prior to 1975, has increased at an average annual rate of 33% since then and now stands at 23,530 breeding pairs. Cormorants are opportunistic foragers in both benthic and pelagic lake habitats, and there are plenty of "forage" fish, including invasive species, in the lakes to feed on. However ongoing stocking programs involving both sportfish (salmonids

such as brown trout, *Salmo trutta*) and restoration of native species (lake trout, *Salvelinus namaycush*, and lake sturgeon, *Acipenser fulvescens*) are also potentially adversely impacted by the opportunistic piscivore. We are investigating the concerns of the fishing community, restoration managers, and wildlife diversity biologists.

Ecologists at USGS Great Lakes and Leetown Science Centers have been monitoring cormorant diets in Lake Ontario and the St. Lawrence River since 1992 in the largest cormorant diet study ever attempted. Through 2005 some 39,000 regurgitated digestive pellets representing 470,000 individual fish have been identified by forensic pellet analysis of hard-tissue remains, such as bones, otoliths, scales, and eye lens. In addition, the size of target sport (smallmouth bass), commercial (yellow perch), and pan fish (rock bass, *Ambloplites rupestris*, and pumpkinseed, *Lepomis gibbosus*) consumed by cormorants has been determined annually at selected locations through the use of otolith-fish-length allometric relations. Both temporal (seasonal) and spatial (island site) variation in the size of these species consumed by cormorants has been found.

Overall some two dozen species of fish have been found in the diet of Lake Ontario and St. Lawrence

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River breeding cormorants. However, depending on site location and phase of the nesting cycle, only a handful of species dominate diets, including alewife, yellow perch, threespine stickleback (*Gasterosteus aculeatus*), and in recent years round goby (*Neogobius melanostomus*). At St. Lawrence River islands, rock bass and pumpkinseed replace alewife and stickleback as dominant prey species. Major seasonal changes in diet composition occur at Little Galloo and Pigeon Islands in eastern Lake Ontario, where the influence of inshore-spawning alewife is observed during the chick-



Author recording foraging rates of double-crested cormorants at blind on Little Galloo Island, Lake Ontario.

Photo credit: Jim Johnson (USGS Great Lakes Science Center)

feeding phase of breeding cormorants.

Fish species of management concern, including the depleted lake trout and the sport fish smallmouth bass, were found to comprise less than 1% and 5%, respectively, of cormorant diets system-wide. Night stocking of lake trout has essentially eliminated this species from nesting cormorant diets. Even so, with the number of cormorant feeding days reaching 5 million (including growing chicks) at some island breeding colonies and daily consumption estimates of at least 10 fish per cormorant, even 1% of total seasonal consumption (500,000 fish) at a single colony, when extrapolated to the entire eastern basin of Lake Ontario, can lead to numbers of smallmouth bass taken by cormorants far exceeding those taken by anglers in the same part of the Lake. Clearly anglers and cormorants may “compete” for smallmouth bass. Estimates further suggest that cormorants may consume as many yellow perch as are harvested by commercial fisheries in the Lake.

The cormorant study has generated valuable unexpected outcomes, particularly with regard to invasive species. The exotic round goby, initially established in the upper Great Lakes through commercial-shipping ballast water release, was first detected in Lake Ontario fishery surveys (conducted annually by the Great Lakes Science Center) in 2002. That year we also found round goby otoliths and pharyngeal bones in cormorant samples at Snake Island from the Lake. Within 2 years of their first appearance in cormorant pellets, cormorant diets were saturated with round goby at Snake and Pigeon Islands, with 80-90% of all fish consumed being

round goby. Ironically, the double-crested cormorant may be considered both an invasive species (locally or at lake level) and one performing an important ecological service by controlling, to some extent, the invasive round goby. With the diet of round goby consisting primarily of dreissenid mussels in the Lake, an unusual trophic linkage now exists, where the principal prey/predators at three trophic levels are invasive species.

Little Galloo and St. Lawrence River island colonies are much slower at incorporating round goby in cormorant diets, though already in 2005 (2006 data not yet available) it was the leading prey species at Little Galloo. Interestingly, round goby incorporation into cormorant diets in Lake Ontario reflects the rate and spatio-temporal pattern of occurrence in lake-wide fishery surveys. This level of sensitivity to changes in fish populations suggests utility in tracking and predicting exotic fish invasions in rivers and lakes where cormorant nesting colonies occur. Concern about new invasions to the Great Lakes, such as Asian carps from the Mississippi River basin, could lead to further development of cormorant pellet analysis as a tool in the prevention, detection, or prediction of aquatic species invasions.

Editor's note: For more information, please contact Bob Ross by e-mail at rossr@usgs.gov.

Collaborative Effort for Whale Shark Conservation Genetics between the USGS Leetown Science Center and Mexico's Centro de Investigaciones Biologicas del Noroeste

-Rocky Ward, USGS Leetown Science Center

Over the last year the genetics staff at the USGS Leetown Science Center's Northern Appalachian Research Laboratory (NARL) have been collaborating with biologists from the Centro de Investigaciones Biologicas del Noroeste (CIBNOR), a Mexican federal research facility in La Paz, Baja California Sur to assist their efforts in understanding the biology of the whale shark (*Rhincodon typus*). Whale sharks are the largest fish species in the world and are distributed throughout the

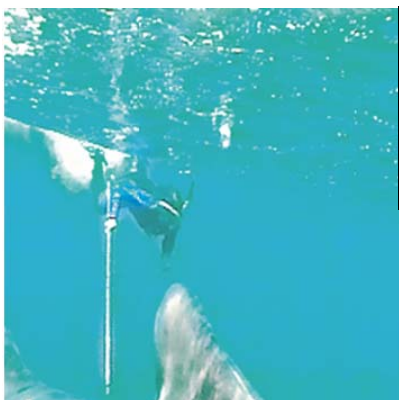


world's circumtropical waters, including the warm coastal waters of the United State's Pacific, Gulf, and Atlantic coasts. Whale sharks are listed as vulnerable on the World Con-

Photo credit: Ian Wright

ervation Union (IUCN) Red List of Threatened Species and are considered subject to directed and incidental capture in commercial fisheries. Management of this large, charismatic species is complicated by a global lack of information concerning their ecology, life history, and population genetics in U.S. and international waters. Information on population genetics is especially critical in determining their degree of population structure, including both the amount of migration between populations and genetic relationships among the various subpopulations, defining rational management units, estimating effective population size, and determining if significant inbreeding has occurred or if a population bottleneck is taking place.

Collaborators at CIBNOR are Dr. Ricardo Vazquez, principal investigator for marine organisms, and Ms. Deni Ramirez, a marine biologist and doctoral candidate. Ms. Ramirez has collected tissue samples (using a minimally-invasive skin sampling technique) throughout the distribution of the species. To date, their



Ms. Ramirez collecting tissue samples with a pole spear.

Photo credit: James Ketchum

research has focused on using a mitochondrial DNA marker to investigate population structure and the

development of a photo ID technique to track the movements of whale sharks over time, especially within the Gulf of California. The most current technology available to investigate population structure of any species involves the use of microsatellite DNA markers. Dr. Vazquez contacted Dr. Rocky Ward, a principal investigator for population genetics at NARL to request assistance in this project. He was especially interested in obtaining training in the development of microsatellite libraries. Dr. Vazquez was invited to visit the conservation genetics lab at NARL and receive training in the construction of microsatellite libraries. He arrived at NARL in late October 2005 and remained for three weeks. During this time he worked with Ms. Kristine Shaw, a genetics technician at NARL skilled in microsatellite marker development, and was trained in the recovery of genomic DNA, the use of restriction enzyme digestion, cloning of microsatellite DNA enriched fragments using bacterial vectors, selection and screening of putatively positive bacterial colonies, automated DNA sequencing, primer design and marker screening. Subsequently, Ms. Shaw has traveled to the CIBNOR facility in La Paz, Baja California Sur to assist in the evaluation of whale shark microsatellite

markers. Ms. Ramirez is now at NARL to screen the microsatellite markers for usefulness with her fish. She will soon be leaving but will return this winter to survey all of the whale shark samples she has collected.

Editor's note: For more information, please contact Rocky Ward by e-mail at rward@usgs.gov.

Investigating Methods for Identifying Fish Stocks

-Patrick M. Kocovsky and Jean V. Adams, USGS Great Lakes Science Center, and Charles R. Bronte, U.S. Fish and Wildlife Service (Green Bay)

Understanding stock structure of fish populations is a key element of fisheries management and conservation efforts in the Great Lakes and elsewhere. In general, a stock is a unique sub-population of fish of a particular species that generally does not spawn with other stocks. Because stocks are typically isolated from one another (at least at reproduction), individuals from one stock can vary in morphology and genetic composition from individuals from other stocks. The differences among stocks can result in differential growth, survival, and success in reproduction that can vary over time within a stock owing to various biotic and abiotic influences. These differences need to be considered when determining the exploitation levels for particular stocks. A population composed of multiple stocks has a greater potential to persist in a variable environment or over a large geographic area, because each stock is best adapted to a particular range of conditions.

The existence of stocks within a larger population and differences among stocks are of interest to fisheries biologists and researchers in at least two ways. For fishery managers, tailoring exploitation to specific stock biology and productivity provides the best opportunity for conservation of the population as a whole. Frequently, stocks are isolated only during spawning and become 'mixed' during the remainder of the year; hence knowing the stock structure and degree of mixing is an important management tool. For example, in a mixed-stock fishery, if one stock grows faster and reaches fishable sizes earlier, it may experience higher exploitation and may be reduced in abundance disproportionately to other stocks in the population. Failure to determine the stock structure of some species of Great Lakes fishes, such as lake herring (*Coregonus artedii*) and lake trout (*Salvelinus namaycush*), has contributed to sequential overfishing of separate stocks over time. This has masked the overall decline in the population, leading to local extinctions and loss of genetic diversity. For researchers, studying stock structure and differ-

ences among stocks provides insights into evolution of fishes and the process by which new species arise.

One method for identifying stocks is to examine morphological differences. A common method used is the truss protocol, which describes the shape of a fish through distances measured between anatomical landmarks (e.g. edge of operculum to the eye). Morphological measurements taken from fish collected from purportedly different stocks are typically subjected to a principal components analysis (PCA). Eigenvalues and eigenvectors from the PCA are interpreted to determine if morphological differences exist, and which morphological features differ among stocks. Typically, the first principal component represents overall fish size and provides no information on shape. The loadings on the second and third principal components are interpreted to determine how shape varies among groups. Texts on multivariate statistics typically recommend very large sample sizes when conducting PCA – up to 10 times the number of sampling entities (N , in our case fish), for every parameter (P , in our case morphological measurement) taken. In multivariate parlance this is typically referred to as the N/P ratio. When reviewing the literature where PCA is used in morphological analyses, we discovered that one-third of analyses used N/P less than 3 and two-thirds used N/P less than 10. We also discovered that no research had been done to validate the recommendations in texts, which were based entirely on theoretical grounds. This prompted us to research whether the high standard of $N/P=10$ was valid and necessary.

We used morphology data from siscowet lake trout from Lake Superior and yellow perch *Perca flavescens* from Lake Erie to investigate appropriate sample sizes needed for PCA. Siscowet lake trout is a deepwater morphotype that was found in the Laurentian Great Lakes but is now restricted to Lake Superior; similar morphotypes are also present in large lakes in Canada. Yellow perch in Lake Erie support one of the largest inland commercial and recreational fisheries in the country. Both of these species are believed to be composed of multiple stocks within their respective lakes. For our analysis we used morphological measures associated with the truss protocol. We collected 563 siscowet lake trout with gillnets and measured 31 morphological features, for a maximum N/P of about 18. We collected 119 yellow perch from commercial trapnets and measured 21 features, for a maximum N/P of about 5.6. From these data sets we randomly generated 1,000 sets of various sample sizes for each species and conducted PCA on each sample. For siscowet lake trout we evaluated N/P from 0.2 to 10 and for yellow perch we evaluated N/P from 0.2 to 5 and examined the changes in eigenvectors and eigenvalues across the ranges of N/P to determine when the estimates stabilized.

For both species, an N/P of about 5 was required to achieve stability of the eigenvalue of the second and third principal components (**Figure 1**), which typically best represent the amount of variation explained by morphological differences among groups. For siscowet lake trout, an N/P of about 5-10 was required to achieve stability of the loadings of the second and third principal components. For yellow perch, loadings seemed to begin to stabilize at N/P of about 5. We had

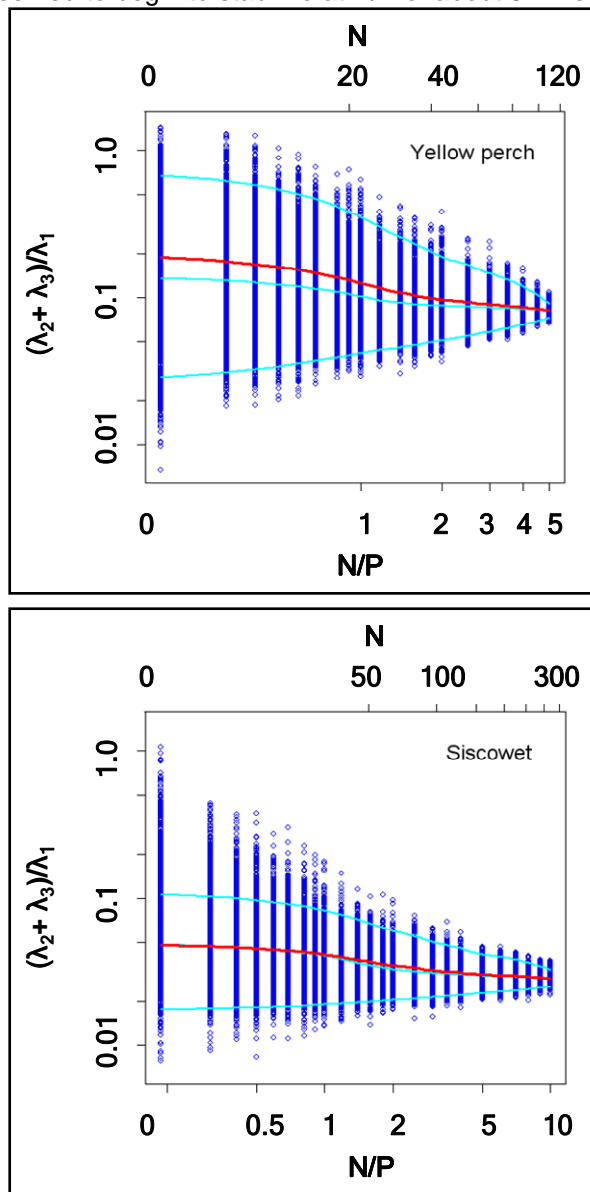


Figure 1. Variation in the second and third (shape) principal components related to sample size based on 1,000 simulations for each sample size. Variation is expressed as the ratio of the sum of the second and third eigenvalues to the first eigenvalue. Sample effort is represented as the sample size, N , and as the ratio of the sample size to the number of parameters, N/P . Plots are on the log-log scale. The red line represents the mean, cyan lines represent the median and the 95% quantile range.

too few yellow perch to evaluate N/P greater than 5.

These results agree with more conservative estimates in the theoretical literature that N/P of at least 5 to 10 are required for interpreting shape differences among groups of fish when using PCA on fish morphology data. Unfortunately, a majority of research papers we reviewed did not meet this standard. Several species descriptions and taxonomic revisions are based on N/P less than 5 and some less than 1, and suggest that the basis for these assignments is lacking. For our investigations of stock structure of siscowet lake trout and yellow perch in the Great Lakes, we have a better understanding of necessary sample sizes, and we will apply these results to subsequent investigations.

Editor's note: For more information, please contact Patrick Kocovsky by e-mail at pkocovsky@usgs.gov.

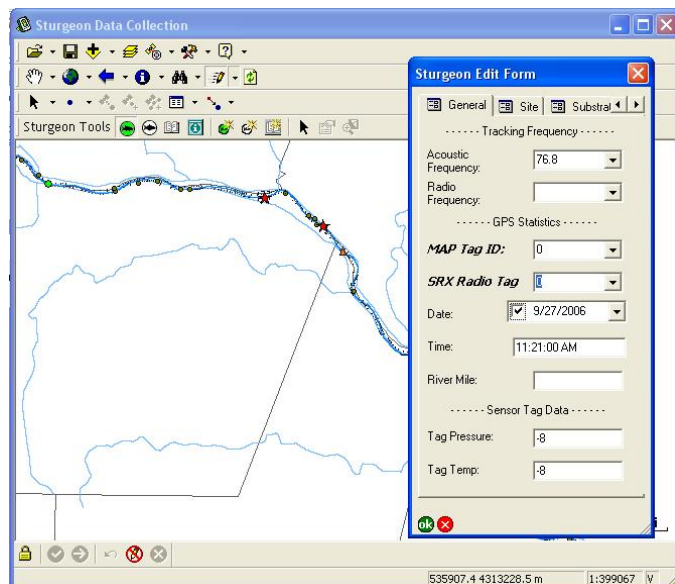


Figure 1. GIS database for sturgeon movements.

Integrating Data Collection and Management for Fisheries Research

-Kimberly Chojnacki, Emily Tracy-Smith, Sandy Clark, Aaron Delonay, and Chris Henke, USGS Columbia Environmental Research Center

Multidisciplinary research currently conducted at the Columbia Environmental Research Center, investigates sturgeon spawning movement and habitat use in the Lower Missouri River. An extensive telemetry effort using both pallid sturgeon (*Scaphirhynchus albus*) and shovelnose sturgeon (*Scaphirhynchus platyrhynchus*) relies on a customized ArcPad application to record sturgeon relocation events and search efforts, using custom forms to streamline data collection. A relational database schema has been developed to manage tabular data for each individual sturgeon, including initial capture and reproductive physiology. Relationships established between spatial data and database tables using mutually exclusive identifiers for each individual sturgeon allows summary reports and maps to be generated, integrating these sources. These links allow the spatial data to be maintained in its native format, while still being accessible through the database, making it possible to maintain data in a near-real time environment (**Figure 1**). Using dynamic segmentation in ArcGIS, movement maps are created for individual sturgeon, showing the release location, all relocation events, the last known relocation, and lines connecting the relocations to interpolate upstream and downstream movements (**Figure 2**). These maps in conjunction with several near-real time reports give a

sense of the movements of each individual sturgeon through space and time, allowing researchers to prioritize and schedule field crew efforts to track, map, and recapture sturgeon.

Editor's note: For more information regarding CERC's Missouri River research, please visit their website at http://www.cerc.usgs.gov/Research/missouri_river.htm.

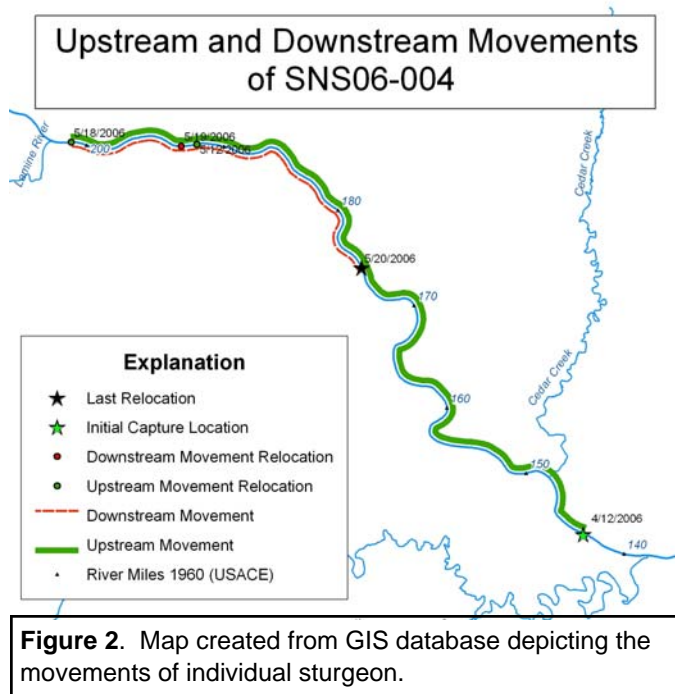


Figure 2. Map created from GIS database depicting the movements of individual sturgeon.

New Publications

Parasites dominate food web links

Citation: Lafferty, K. D., A. P. Dobson, and A. M. Kuris. 2006. Parasites dominate food web links. *Proceedings of the National Academy of Sciences* 103(30):11211-11216.

This paper by WERC researcher Kevin Lafferty, and others, describes how parasites can greatly affect food web statistics, such as nestedness (asymmetry of interactions), chain length, and linkage density. An electronic version of this paper is available at: www.pnas.org/cgi/doi/10.1073/pnas.0604755103

Paper on mercury in aquatic ecosystem

Citation: Wiener, J.G., B.C. Knights, M.B. Sandheinrich, J.D. Jeremiason, M.E. Brigham, D.R. Engstrom, L.G. Woodruff, W.F. Cannon, and S.J. Balogh. 2006. Mercury in Soils, Lakes, and Fish in Voyageurs National Park (Minnesota): Importance of Atmospheric Deposition and Ecosystem Factors. *Environmental Science and Technology*.

This publication from USGS scientists and university researchers strongly identify atmospheric deposition as the source of mercury contaminating fish living in [Voyageurs National Park](#). The article is accessible on the internet at: <http://pubs.acs.org/cgi-bin/asap.cgi/esthag/asap/pdf/es060822h.pdf>.

Ecological studies on trout

The following citations are published or in press renditions of talks given by Jason Dunham at the AFS meeting in September. The first paper describes a study in which landscape genetics is used to test hypotheses concerning landscape processes influencing the demography of Lahontan cutthroat trout in a complex stream network. The second paper discusses the effects of wildfire on stream habitat and aquatic vertebrates such as rainbow trout and frog larvae.

Citations: Neville, H., J. Dunham, M. Peacock. 2006. Landscape attributes and life history variability shape genetic structure of trout populations in a stream network. *Landscape Ecology* 21: 901-916.

Dunham, J.B., A.E. Rosenberger, C.H. Luce, B.E. Rieman. In Press. Influences of wildfire and channel reorganization on spatial and temporal variation in stream temperature and the distribution of fish and amphibians. *Ecosystems*.

White sturgeon habitat studies

Citations: Barton, G.J., R.R. McDonald, C. Berenbrock, J.M. Nelson, M. Donato, S. Ireland, and V. Paragamian. 2006. Understanding the altered dynamics of white sturgeon habitat, and spawning patterns, and assessing the feasibility of enhancing white sturgeon spawning habitat, Kootenai River: Idaho proceeding in the Joint 8th Federal Interagency Sedimentation and 3rd Federal Interagency hydrologic modeling conference, 8 p.

http://pubs.usgs.gov/misc_reports/FISC_1947-2006/pdf/1st-7thFISCs-CD/8thFISC/8thFISC_Barton.pdf

McDonald, R.R., G.J. Barton, J.M. Nelson, and V. Paragamian. 2006. Modeling hydraulic and sediment transport processes in white sturgeon spawning habitat on the Kootenai River: proceeding in the Joint 8th Federal Interagency Sedimentation and 3rd Federal Interagency hydrologic modeling conference, 8 p.

http://pubs.usgs.gov/misc_reports/FISC_1947-2006/pdf/1st-7thFISCs-CD/8thFISC/8thFISC_McDonald.pdf

These papers describe a multi-dimensional flow model to quantify stream habitat for white sturgeon, and the use of sediment transport models to study spawning locations.

NFHI News

National Fish Habitat Board

The National Fish Habitat Board (NFHB) meeting held its inaugural meeting in Colorado on Sept 22. A final version of the meeting and products will be circulated pending integration of final edits from meeting attendees. NFHB members elected John Cooper as Chair and Doug Hansen as Vice Chair. The NFHB adopted a final version of their charter based on the draft product drafted by the Core work Group. The charter will be circulated with the meeting notes.

The next meeting of the NFHB will be held in Washington, DC at AFWA headquarters on November 16, 2006 and will primarily focus on partnership issues.

AFS Partnership Workshop

The American Fisheries Society held two ½ day workshops in Lake Placid, NY to allow attendees to provide their ideas on National Fish Habitat Action Plan partnership criteria and considerations. Over 120 individuals participated in the two workshops. Attendees are

currently in the process of reviewing draft products and providing them to the workshop steering committee so that a final product can be completed and provided to the NFHB for consideration at their November 16 meeting. Background information and draft outputs can be viewed at: http://www.fishhabitat.org/_AFS/default.htm.

AFS Data Summit

The American Fisheries Society (AFS) Computer-User Section is organizing the National Fish Habitat Initiative Data Summit, which will be held in Salt Lake City at the end of this month. Background information has been updated and an agenda posted on the web site. Links to other related information have also been added to the following web site: <http://www.fisheries.org/cus/summit.htm>.

Midwest Driftless Area Restoration Effort

Trout Unlimited has made the Driftless Area a high priority for development of a Conservation Success Index (CSI) for 2007. CSI is a tool that helps understand the status of coldwater fish across species and watersheds, and provides a science-based road map for TU's conservation efforts in the coming years. CSI uses complex mapping software to analyze data collected by federal and state biologists as well as satellite data. CSI systematically categorizes population health and habitat conditions, identifying areas and watersheds where populations are strong and in need of protection, and pinpointing which threats require action. More information can be obtained at: <http://www.brookie.org/site/pp.asp?c=liKVL3POLvF&b=1611483> or by contacting Randy Hines at rkhines@usgs.gov, or Jeff Hastings at jhastings@tu.org.

Meeting Notes

American Fisheries Society Meeting

This year's AFS Meeting, held in Lake Placid, NY, was very well represented by USGS. Fifty-six oral presentations and over 20 poster presentations were given by USGS researchers. The 19 symposium topics were very diverse, and oftentimes it was difficult to choose which talk to attend at any particular time. The USGS booth had a steady number of visitors, including many USGS scientists. Thank you to those of you who volunteered to man the booth! Among the many evening socials was the USGS All Hands reception on the Tuesday evening, which was well attended; Bob Szaro, Chief Scientist for Biology, gave an update on happenings at the national level.

12th Annual Drug Approval Coordination Workshop

This August workshop, organized by USGS, USFWS, and the Univ. of Wisconsin-LaCrosse, was attended by 87 participants. Of those participants, 18 were representing pharmaceutical companies interested in aquaculture drugs. The first session included presentations by representatives from the U.S. Food and Drug Administration's Center for Veterinary Medicine. The presentations were well prepared, informative, and captivating. The balance of the workshop included presentations concerning the development and status of aquaculture drugs under investigation. Included in those sessions were insightful presentations by researchers and a number of drug company representatives. A number of workshop participants were impressed and appreciated the Upper Midwest Environmental Sciences Center tour where they were introduced to the comprehensive capabilities of the Center.

7th International Congress on the Biology of Fish

The meeting was held in St. Johns, Newfoundland, one-time cod capitol of the world. The talks were focused on the basic biology, physiology, and science of fish (e.g. "The anal gland in roach; Form and function"). Mike Parsley, fisheries research scientist at the USGS Columbia River Research Laboratory, Western Fisheries Research Center, was an invited speaker in the Telemetry symposium and moderated one afternoon session. This was very much an international meeting, and offered a good opportunity for USGS to mingle with scientists from other cultures.

Funding Opportunities

North Pacific Research Board 2007 Request for Proposals

The North Pacific Research Board (NPRB) announces the release of its regular 2007 Request for Proposals (RPF). This RFP is similar in form and content to past NPRB requests for proposals, with research priorities structured around the NPRB Science Plan. Funds available for the regular 2007 RFP total \$3.895 million. Proposals must be submitted online by **1 December 2006**, 5:00 p.m. Alaska Standard Time. The Online Proposal Submission System will be available between 1 November and 1 December 2006.

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Bering Sea Integrated Ecosystem Research Program (BSIERP)

Implementation of the previously announced Bering Sea Integrated Ecosystem Research Program (BSIERP) will occur with the release of a special RFP later in October 2006. It will envision a 6-year comprehensive program from 2007 through 2012-2013, run by a multi-institutional, multi-disciplinary team, and may include a partnership with the National Science Foundation. It will involve integrated research to improve our understanding of ecosystems processes that underpin the highly productive resources of the Bering Sea Large Marine Ecosystem and their response to natural and human-induced variability. The BSIERP RFP will entail a call for **pre-proposals due 22 November** and then formal invitations for full proposals. For more information visit their website at http://www.nprb.org/research/2007_RFP.htm

Development of Environmental Health Outcome Indicators

The EPA announced the following funding opportunity for research on environmental indicators. Federal agencies are not eligible to compete. Perhaps you know of a state, tribal, university, or NGO interest. If so, please pass this along. **The closing date is December 14, 2006.** Details are available online at http://es.epa.gov/ncer/rfa/2006/2006_star_ephi.html.

FishAmerica Foundation Fisheries Research Grants

Research grants are awarded for projects that address regional or national sport fisheries issues such as management studies, large-scale habitat and water quality assessments, stock enhancement/ tagging studies, and economic evaluation. For 2007, FishAmerica will fund projects that further the National Fish Habitat Action Plan. The Request for Proposals, Application and Reporting Requirements will be posted shortly at: <http://www.fishamerica.org/grants/>.

Upcoming Meetings

Short Notice Alert!

Chesapeake Watershed Forum

The first annual Chesapeake Watershed Forum will be held **November 17-19, 2006**, at the U.S. Fish & Wildlife National Conservation Training Center in Shepherdstown, West Virginia. Seven Tracks (including Water-

shed Science) are planned for the Chesapeake Watershed Forum that will include more than 45 Sessions, 8 Open Discussions, 3 Computer Labs and 2 Field Trips. On-site lodging in private rooms, meals, and all Forum sessions, including labs and field trips are included in the registration fee of \$100.00 per person. **All attendees must pre-register, no walk-in registrations or walk-in attendance is permitted. Forum registration closes on October 31, 2006.** Register at: <http://www.acb-online.org/project.cfm?vid=265>.

3rd National Conference on Coastal and Estuarine Habitat Restoration

December 9-13, 2006 in New Orleans, Louisiana
Through 81 concurrent sessions, nearly 200 posters and three special workshops, the Conference Program will explore the state-of-the-art in all aspects of restoration, and at all scales. Register at: <http://www.estuaries.org/?id=4>

Workshop on Shrimp Diseases and Diagnostic Procedures

The workshop, sponsored by the USDA Marine Shrimp Farming Program and the USDA Animal Plant Health Inspection Services, will take place at the University of Arizona this **December 18-20, 2006**. The workshop will focus on the OIE, U.S. Marine Shrimp Farming Program listed diseases, emerging diseases, and other significant diseases of penaeid shrimp and their diagnostic procedures. **Questions regarding the course should be directed to Dr. Donald Lightner (dvl@u.arizona.edu) or Dr. Carlos Pantoja (cpantoja@u.arizona.edu).**

Alaska Marine Science Symposium

This is the only annual marine science symposium that focuses solely on the marine ecosystems of Alaska, and will take place **January 21-24, 2007**, at the Anchorage Hilton. It provides an outstanding opportunity for scientists to inform others about their research and to network with the many others that comprise the vibrant research community working in Alaska. **Abstracts must be submitted by Monday, November 20, 2006.** Because of the many support sponsors, including the USGS Alaska Science Center, there is no registration fee. However, attendees must still register online at the symposium website (www.alaskamarinescience.org).

2nd International Symposium on Diadromous Fishes

This symposium will take place **18-21 June 2007** in Halifax, Nova Scotia, Canada. It will review the current state of scientific knowledge with respect to biology, ecology, and conservation of diadromous fishes (including anadromous, catadromous, potamodromous, and amphidromous species). The symposium theme will address how recent alterations to the environment and human activity have affected diadromous fishes with respect to their sustainability and role in aquatic ecosystems. **The deadline for Oral Paper and Poster abstract submission is extended until 1 January 2007.** For further information, contact Alex Haro, S. O. Conte Anadromous Fish Research Center, U. S. Geological Survey by phone at (413) 863-3806, or by email at Alex.Haro@usgs.gov. Further information can also be found at: <http://www.anacat.ca/index.php>.

The 3rd North American Workshop on Rainbow Smelt

This workshop will follow the Diadromous Fishes Symposium on **22-23 June 2007**, in Halifax, Nova Scotia. Information on this workshop can be found at this website: http://www.anacat.ca/dl/smelt_workshop_2007.pdf.

Go to Great Links

<http://www.usgs.gov>

National – New Research Strategy Aims to Reduce Human Impacts of Harmful Algal Blooms

A new report, [Harmful Algal Research and Response: A Human Dimensions Strategy](#), proposes a detailed plan for the research necessary to address harmful algal blooms and associated negative impacts. Specific research needs identified in the report include assessing the socio-cultural and economic impacts of harmful algal blooms; developing outreach strategies that reduce public exposure; identifying susceptible populations; enhancing interagency and stakeholder coordination; and identifying strategies to reduce the impacts of algal toxins in recreational and drinking waters. The report was developed by NOAA and a host of federal and academic partners. The report can be found at:

<http://www.nccos.noaa.gov/stressors/extremeevents/hab/HDstrategy.pdf>.

Gulf of Mexico – Harmful Algal Bloom Forecast System Established in Texas

A new harmful algal bloom forecast system developed by NOAA is now in place along the coast of Texas. This system is geared to predict harmful algal blooms (or “red tides”) caused by the highly toxic algae *Karenia brevis*. The blooms are known to cause fish kills, shellfish toxicity, water discoloration, and respiratory distress in humans. The forecasting system uses observations made by Texas state agencies with NOAA imagery and models to supply improved information on the location, extent, and potential for development or movement of the blooms in the Gulf of Mexico. Go to: <http://www.csc.noaa.gov/crs/habf/>.

Report on the Status of West Coast Highly Migratory Species

The [Status of the U.S. West Coast Fisheries for Highly Migratory Species Through 2005](#) – a Stock Assessment and Fishery Evaluation (SAFE) report published in September 2006 -- is now available on the Pacific Fishery Management Council's website, at: http://www.pcouncil.org/hms/hmssafe/0906safe/06SAFE_0828.pdf.

Seafood Choices: Balancing Benefits and Risks

In response to a request from NOAA, the Institute of Medicine of the National Academies reviewed evidence on the benefits and risks associated with seafood consumption to recommend ways to guide U.S. consumers in making seafood selections to meet their needs. The study committee reviewed the evidence and developed recommendation and models for federal agencies to provide consumer guidance in making seafood choices. The report can be obtained at: <http://iom.edu/CMS/3788/23788/37679.aspx>.

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Thank you to all those who have contributed material to this issue of the FAB: our Science Features authors, Robin Schrock, Marcia Nelson, Jeff Meinertz, Mike Parsley, Randy Hines, Gloria Maender, and Gary Barton.

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