Details of Fisheries Products presented at A-Team Meeting, 11_06_03

The **Fish Data Query Tool**, **presented by Brian Ickes** was also presented and demonstrated at the fall Upper Mississippi Resource Conservation Committee also and is graphical fish data browser. Ickes demonstrated CPUE, the main metric for the A-Team members. He explained there were ¾ of a million annual estimates of CPUE over the last decade. How can managers use this more effectively? They needed a tool that was maintenance free, in a widely available technology, and was intuitive and visually appealing that would derive metrics from other databases. This tool draws on web databases for 3 population metrics and 3 community metrics—recommendations for what else are welcome. There is also basic life history information, which widens the audience—the public has another way to interface with our information. It doesn't require downloading any software. The user selects a metric, choose gear and stratum, species, and range of gears for a general overview. The user can also import annual estimates into a text file for transfer to other software. It is geared for status and trends. Explore it, use it, and provide feedback. It's available now through the UMESC's home page on their website.

Fish 10 yr. synthesis report, presented by Mike Steuck , IADNR

Primary author for the report is Mel Bowler (IADNR), the Pool 13 fish specialist. Many Partners were involved with it. Cumulatively, they captured 127 of 150 species listed in John Pitlo's UMRCC historical abundance list. LTRMP captured 39 fish species federally listed as species of concern, for a total of 50 listed species between the 5 states and the federal lists. 2002 was the lowest year in numbers of species caught, and that was the year after the gear drop. The top 10 species comprised 50% of the catch. Out of 3 million fish emerald shiner and gizzard shad were most numerous, with bluegills at number 3.

Benchmarks: One goal of report focused on establishing benchmarks in relative abundance for selected species, which has more utility with each additional year. The scales will be different for each species. For shovelnose sturgeon 1994 4 out of 6 field stations hit a high outlier. Carp probably had an unusually large year class 93, as evidenced by the proportional stock density in 1994.

Population: There are 191 graphs of length/frequency histograms in the report Notables are included in the text, and the rest will be in an appendix on a CD. Information on the distribution of exotics is summarized and readers can also assess abundance of certain exotics by looking at total catches for the lower 3 study reaches.

Habitat: Three case studies in the report use georeferenced habitat data to provide insight into habitat requirements for listed species. For example, 70% of weed shiners captured had some Submersed Aquatic Vegetation present and 71% were caught in midpool BWC aquatic areas or side channel borders. Habitat preferences of common UMR non-game fish not well understood. Generalists are more evenly distributed. The information collected can be used to refine, form, and test hypotheses. For example, an increasing trend in abundance of tolerant species signals temporal heterogeneity or instability. A increasing trend in intolerant species signals temporal stability or increased presence of a specific habitat. Thus non-game fish are valuable for assessing the effect of various habitats on fish species distribution. Marked declines in distinct non-game fish can be used to assess habitat conditions and quality. Their population metrics are not directly impacted by human exploitation. Having a network of field stations and using Stratified Random Sampling permits assessment of reach specific and systemic patterns and provides good insights for other species affected by human exploitation. Comparing temporal and spatial patterns of non game fish with future data and understanding differences will be a valuable tool for assessing ecosystem health and change.

Fisheries Autecology, presented by Dan Kirby, IADNR

The purpose of the autecology section is to take an in-depth look at UMRS fish populations as informed by the LTRMP fisheries database. The objective of work done up to this point was to identify the presence and relative importance of spatial and temporal trends in the following areas: 1) fish species distribution and frequency of occurrence, 2) length-frequency distributions, 3) rate of gain (condition), and 4) relative abundance. There is some overlap between this section and components of the 10-year report.

Species distribution and frequency of occurrence

- 136 fish species were captured through LTRMP stratified random sampling (SRS) in years 1993-2002 (134 from mainstem collection sites plus two additional from a tributaries).
- 47 species have been captured from all six LTRMP core study areas.
-The LTRMP has collected six “new” species since Pitlo et al. (1995) was completed for the UMRCC: bigeye chub, bleeding shiner, greenside darter, redspotted sunfish, silver carp, and white perch.
-The highest total species richness came from the Upper Impounded Reach (Pool 4, 8, and 13), followed closely by Open River.

Spatial trends in length-frequency distribution

-Spatial patterns are species dependent (e.g., for flathead catfish there were proportionally the most large fish in Pool 4, but for sauger there were proportionally the most large fish in Open River).
-Spatial differences were generally small for recreational species when compared to spatial differences for commercial species.

Temporal and Spatial trends in length-weight relationships

-Five species were analyzed. In the La Grange Pool black crappie, channel catfish, and sauger exhibited a rate of gain (change in weight per unit change in length) significantly higher than the UMRS average. This was due to short fish being below “UMRS-average” weight and long fish being above average weight.
-Rate of gain was significantly different among years for all species except sauger.
-Based on length-weight regression information it is possible to isolate species-specific responses to flood years. Flood years (‘93,’97,’01) caused decreased, increased, or no change in body condition depending upon the species and the flood. This highlights the

complexity of flood-year effects upon fish stocks and the need for an increased understanding of the importance of flood timing, duration, and intensity.

Temporal and Spatial patterns in fish relati ve abundance

-The relative abundance patterns of UMRS fish species are complex due to the size of the system, habitat heterogeneity, and temporal variability.
-We used variance decomposition to determine which factors are primarily responsible for the abundance of 50 widely distributed fish species within the system at any given place and time. We then used 3-dimensional plots and PCA to group species based upon the relative importance of factors determining abundance. This provides managers with a tool that can be used to determine which species are most likely to exhibit an abundance response to local habitat projects, year-to-year changes in system conditions, and reach-scale habitat change.

Synecology, presented by John Chick (ILINHS) and Valarie Barko (MODOC)

Jon Chick looked at spatial and temporal variation with respect to fish community patterns. He and Valarie used 2 parallel approaches. John looked across 6 regional areas and through time. Valerie examined patterns within the 6 reaches. An RTA is a Regional Trend Area and is the same as a study reach. They looked at presence/absence of species in 5 gear types. There were 16 species where power analysis showed adequate power for Chick's analyses, and he used 81 combinations of a species/mulit gear metric for his analyses; results are expressed in non-metric multi-dimensional scaling and are Ordination and Analysis of similarity multivariate ANOVA.

Valarie used Canonical Correspondence analysis (CCA) with covariables using 4 gears that were fished in all reaches: day electrofishing, large/small hoopnets, and minifykes – Results were expressed in non-metric multidimentional plots with no labels on the axes- it is interdirectional analysis based on a similarity matrix. How close or how far apart the points are expresses how similar of different the annual averages for one major aquatic area in 1 regular trend area in 1 year are, based on ANOVA. Clear differences between in spatial variation between upper and lower regional trend areas emerged. Variation among years explained very little of what was going on.

Then they did variance decomposition of each individual species with a Mantel correlation for the entire set of variables, the object being to pick out which habitat factors give the biggest variability. Since they only had a few habitat variables, it was easy for them to do. Secchi, temperature velocity, and vegetation abundance correlate most with patterns of fish similarity. Surface flow is greatest in lower portions. Sechhi is greatest in upper portions. Vegetation abundance and density and percent cover are larger in upper portions. Over all there was a significant correlation signal with vegetation abundance (.712).

For the multi-gear approach—they started with poolwide means from all 5 gears—standardized each species by assuming pool gear-overall mean of 0 and overall variability is one. Then they summed for each sp/pool/gear combination and ended up with a fish community matrix with a multi-gear index. This separates pools 13 and 4 and the lower 3 pools also. They can do same sort of habitat correlation form this. 1994 groups together. They took the average for every year and did the mulit-gear matrix. 1994 was a different year compared to all the others. The 1993 flood may be influencing this. Then they looked within each of the regular trend areas to see what's going on--can learn a lot by looking at differences in space. Upper spatial scales explain more of the variation than the habitat scale they stratified by. There were temporary effects from the 1993 flood. Association correlation must differentiate demographic effects from habitat effects. The closer you are, the more similar your fish communities are. When you look at habitat, the relationship is same. It was very challenging to pull those apart.

Valerie separated data into adult and Young Of Year (YOY) and considered the two as separate "species" for all analyses. She could see recruitment evidence or lack of it by looking at annual trends within reaches (e.g., floodplain fishes had high abundances after the large-scale flood event, but only briefly). In all reaches, water velocity and visibility (Secchi disk) were strong determinants of assemblage structure. Temperature was an important gradient in the two southernmost UMR reaches and in the Illinois River reach. Spatial variation was dominant in Chick's systemic analyses, but he could identify temporal variation within reaches when reaches were analysed separately. This shows the strength of program is across a large scale and with detailed information. Look at environmental predictors—current and secchi are major predictors throughout the system. Temporal differences in fish assemblages appear to be related to major floods and spates. Input of people on ground at all the field stations was instrumental for helping explain the patterns they observed. Our next step is to tie-in life history aspects of assemblages and examine shifts in biomass over the 10 year sampling period

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Questions to Chick—Did you try to tie in outpool sampling data and did that also show a gradient between upper and lower reaches? John Chick answered that the outpool study is in a separate report and is just a one-year snapshot. The outpool report cannot answer that question. There is a large data gap in middle reaches—we need to look closer in the middle pools. Pools 19 and 20 grouped differently.

John Sullivan asked if Chick saw differences in Pool 4's upper and lower sections. "Yes," Chick said. That raised the issue of distance and habitat structure over time. Distance stays constant in time but habitat maybe does not? John Chick replied that's possible but having only 6 study areas limits it. Longitudinal gradients in Dan Kirby's analyses were more important then lateral gradients, and year was the least important thing as far as predicting abundance. "The answer is space—look there," Chick stressed. Year explains only a tiny fraction of what is happening.

Non-native Fishes, presented by Kevin Irons (IRBS-INHS)

Manage information and develop useful product. The report is a 120pp report—Brian Ickes has the draft. Report is designed to be useful to public as well as research and management personnel. Over 4,3 million fish have been collected by LTRMP Fish Component dating back to 1989, of these, LTRMP has collected 12 non-native spp. and 4 (non-native) hybrids. Muskies stocked in some areas are considered non-native where they don't occur naturally. LTRMP catches document a longitudinal gradient from occurrence of 2 taxa in Pool 4 to a high of 12 taxa in La Grange Reach, Illinois River. Non-native species cost the American public $137 billion per year. Up to 46% of federally endangered species have been negatively impacted by invasive ones. Rassmusen (1998) documented 163 non-natives throughout the entire Mississippi River Basin. This high number of non-native species compares to the Great Lakes (162 species); the Great Lakes are often considered highly impacted by non-native species. However, only 17% of species are non-native in the UMRS. As an example of what has happened within the UMRS basin since 1989, the LTRMP has shown an increasing trend from 2 non-native fish species to 12 over the last 13 years in La Grange Reach, Illinois River. Non-native species can make up 5 to 60 percent of total annual fish catches (total numbers). Report documents history, biology, and catch summaries of each non-native species in LTRMP catches as well as documenting history and sources of info pertinent to the UMRS. It is important to note that the LTRMP has been able to catch non-native species fairly early in the invasion process. Therefore LTRMP will play a big role in documenting the future trend of non-native populations, as well as provide invaluable information on the native ones that are potentially affected. Although recently collected within the UMRS basin, LTRMP has not collected any black carp or giant snakeheads.

Non-native fish taxa collected by LTRMP 1989 – 2003.

CommonName	Family	GenusSpecies	Year first detected by LTRMP
Threadfin shad	Clupeidae	Dorosoma petenense	1989
Goldfish	Cyprinidae	Carassius auratus	1989
Grass carp	Cyprinidae	Ctenopharyngodon idella	1991
Common carp	Cyprinidae	Cyprinus carpio	1989
Carp x goldfish hybrid	Cyprinidae	Cyprinus carpio x auratus	1990
Silver carp	Cyprinidae	Hypopthalmichthys molitrix	1998
Bighead carp	Cyprinidae	Hypopthalmichthys nobilis	1991
Rudd	Cyprinidae	Scardinius erythrophthalmus	2002
Muskellunge	Esocidae	Esox masquinongy	1996
Tiger muskellunge	Esocidae	Esox masquinongy x lucius	1992
Rainbow smelt	Osmeridae	Osmerus mordax	1993
Brown trout	Salmonidae	Salmo trutta	1992
White perch	Percichthyidae	Morone americana	1992
White perch x yellow bass	Percichthyidae	M. americana x mississippiensis	2001
Striped bass	Percichthyidae	Morone saxatilis	1991
Hybrid striped bass	Percichthyidae	M. saxatilis x chrysops	1993

Fish Life History Database by Matt O'Hara (INHS)

The task assigned was to create a UMRS life history database for Mississippi River fishes. The work-group includes Brian Ickes, Matt O'Hara, Steve Delain, Terry Dukershein, Eric Gittenger and John Kalas. We need life history to fully understand fish populations and community structure. The life history database will integrate with LTRMP fish data to define further analyses. Our working definition of life history is "things that influence survival and production of fishes". Knowledge of life histories is critical for evaluating and planning effective habitat restoration (e.g., dredging, island construction, water level management, fish passage, etc…). It provides the foundation for the development of applied management tools (e.g., models, IBI metrics). We compiled data from diverse sources and created a master database to answer life-history questions. The standards we developed included use of primary literature only because we wanted to promote the use of only high quality data. We retained the capability in the database to flag and link gray literature as a "more information" column. We used data compiled from several researchers including Pegg, Koel, Galat, Wienmiller and Rose. We integrated their data into Microsoft Access database. We created 120 data fields with 204 fish species. All data is linked back to its primary literature source. Not all fields are complete if information is not yet available. 38 queries were created to parse out data into 4 major groups with several sub-groupings. Life history data and LTRMP data is being integrated in this example. (Meeting participants viewed a histogram provided by Dr. Mark Pegg). It illustrates feeding guild trait presence/absence for the 6 LTRMP study reaches. These are very similar until the lower (most southern) 3 pools, where plankivorous fish are more present. Looking at abundance data from those study reaches, it becomes clearer that there is a decrease from upper pools to lower pools in invertivores, and an increase of plankivorous fish going from upper pools to lower pools. This data can help with hypothesis generation. A draft report is in production. Data are incomplete but will be updated as more is published in time. We also can add from LTRMP data as it becomes available. The report is due June 1, 2004.