February 2007 Issue No. 15 Editor: George Jordan

PALLID STURGEON RECOVERY UPDATE

-The latest in recovery and management actions –

Research, Recovery, and Management Efforts-

Missouri River, (above Fort Peck Dam), Montana

There have been only four instances where juvenile pallid sturgeon were released in this reach between 1998-2005:

· **1998** a total of 732 yearling pallids were released.

· **2002** a total of 2,063 yearling pallids were released.

· **2004** a total of 3,050 yearling pallids and 158 three year old pallids were released.

· **2005** a total of 33,300 fry, 2,480 fingerlings, and 693 yearling pallid sturgeon were released.

Stocking densities, age of stocked fish, acclimation and growth of stocked fish, and location of release sites are all important aspects for evaluating survival and ultimately recruitment of the released hatchery juvenile pallid sturgeon.

The study area is a 184mile reach of the Missouri River immediately upstream of the Musselshell and Missouri rivers confluence to near Fort Benton, Montana.

A considerable effort is directed each year at evaluating the success of these releases. A variety of sampling methods are used including trammel drift netting, setline sampling, angling, and trawling.

A total of 69 pallid sturgeon were captured this year (2005) consisting of two adults, 42 hatchery 1997 year class, 24 hatchery 2004 year class, and one hatchery 2005 year class pallid sturgeon.

A preliminary population estimate of the surviving 1997 pallid group was completed using a multiplecensus (Schnabel) type estimator model. Individual PIT tag numbers were used for the marks to identify if the fish was a new or previously sampled fish. For the 2005 estimate a total of 75 fish were classified as marked, while on the recovery run a total of 29 pallids and were classified as captured fish for estimate purposes; seven of these fish were recaptures from the previous years. The estimated population number of 1997 year class in the Robinson Bridge area (RM 1887 – 1925) was 307 (for this 38 mile reach). A total of 732 pallid sturgeon (1997 year class) were released into RPMA 1 on August, 1998, therefore, the survival rate for the 1997 year class is 42%. This is a minimum estimate because it does not include potentially other 1997 pallid sturgeon that may be in upriver areas. It appears that the observed 42% estimated survival rate is greater than predicted. Some conditions required for using the Schnabel estimator model were probably violated for this estimate conducted over the three year period. Therefore, this estimate is considered to be preliminary until a more appropriate model is used.

For more information contact:

Bill Gardner
Montana Department of Fish, Wildlife and Parks
2358 Airport Road
PO Box 938
Lewistown, MT 59547
Phone: (406) 538-4658 ext225
E-mail: FWplew@tein.net

Share what you are doing. Others are interested in your research results or other efforts for conservation of pallid sturgeon and/or other elements of its ecosystem. Submissions of articles and associated materials are welcome. Please send a hard copy, disc copy or email (preferred) to:

George Jordan
U. S. Fish and Wildlife Service
2900 4th Avenue North, Room 301
Billings, MT 59101
(406)247-7365
george_jordan@fws.gov

February 2007 Issue No. 15 Editor: George Jordan

PALLID STURGEON RECOVERY UPDATE

-The latest in recovery and management actions –

Fort Peck flow modification biological data collection plan summary of 2005 activities -

The Missouri River Biological Opinion developed by the U. S. Fish and Wildlife Service formally identified that seasonally atypical discharge and water temperature regimes resulting from operations of Fort Peck Dam have precluded successful spawning and recruitment of pallid sturgeon *Scaphirhynchus albus* in the Missouri River below Fort Peck Dam.

In response, the U. S. Army Corps of Engineers (USACE) proposes to modify operations of Fort Peck Dam to enhance environmental conditions for spawning and recruitment of pallid sturgeon. Modified dam operations include releasing warm surface water over the Fort Peck Dam spillway.

The Fort Peck Flow Modification Biological Data Collection Plan (hereafter Fort Peck Data Collection Plan) was implemented in 2001 to evaluate the influence of proposed flow and temperature modifications on physical habitat and biological response of pallid sturgeon and other native fishes. Research and monitoring activities conducted during 2005 as part of the multiyear Fort Peck Data Collection were similar to those activities conducted during 2001 – 2004. For 2005, primary research and monitoring activities included:

1) measuring water temperature and turbidity at several locations downstream from Fort Peck Dam,

2) examining movements and relocating adult pallid sturgeon, paddlefish *Polyodon spathula*, blue suckers *Cycleptus elongatus*, and shovelnose sturgeon, *Scaphirhynchus platorynchus,* in the Missouri River between Fort Peck Dam and Lake Sakakawea, and in the lower Yellowstone River,

3) quantifying larval fish distribution and abundance,

4) quantifying the reproductive success of shovelnose sturgeon and pallid sturgeon based on captures of young of year sturgeon, and

5) assisting in the collection of adult pallid sturgeon for the propagation program.

The Fort Peck Data Collection Plan is supported by the USACE, and jointly implemented by the Montana Department of Fish, Wildlife, and Parks and the U. S. Geological Survey (USGS) Columbia Environmental Research Center.

Similar to 2001 through 2004, proposed flow modifications were not implemented in 2005 due to inadequate precipitation and insufficient reservoir levels.

Trawling was conducted between July 19 and September 7 at four sites in the Missouri River upstream from the Yellowstone River confluence (ATC), four sites in the Missouri River downstream from the Yellowstone River confluence (BTC), and four sites in the Yellowstone River. A total of 535 trawls were conducted on eight sampling events. Trawling efforts resulted in a total of 178 young of year sturgeon. Eleven young of year sturgeon were sampled from the Missouri River ATC, 155 young of year sturgeon were sampled from the Missouri River BTC, and 12 young of year sturgeon were collected from the Yellowstone River. Tissue samples from all young of year sturgeon were collected. Genetic analyses are being conducted to differentiate the young of year individuals as pallid sturgeon or shovelnose sturgeon.

Also, 44 juvenile pallid sturgeon were sampled during 2005. Three individuals did not carry any identifying marks (e.g., PIT tags, elastomere, coded wire tags)

PALLID STURGEON RECOVERY UPDATE

-The latest in recovery and management actions –

indicative of hatchery origin progeny. It was suspected that these were surviving progeny from the larval pallid sturgeon drift study conducted in 2004. Therefore, fin clips for genetic analyses were collected. Genetic analyses from one individual positively identified this fish as progeny from the 2004 larval drift study. Tissue samples from the other two individuals are currently being analyzed, and it is highly likely that these individuals will also represent progeny from the 2004 larval drift study.

For more information contact:

Dr. Pat Braaten
U. S. Geological Survey
Columbia Environmental Research Center, Fort Peck Project Office
East Kansas Street
Fort Peck, MT 59223
Phone: (406)526-3523
E-mail: patrick_braaten@usgs.gov

Lower Yellowstone River pallid sturgeon studies -

Although there is evidence that pallid sturgeon may successfully spawn in the Yellowstone River below Intake Diversion (river kilometer 115), long downstream drift times following hatching preclude recruitment. Larval pallid sturgeon likely drift into Sakakawea Reservoir and die. Therefore, establishing spawning populations far upstream of reservoirs is necessary if natural recruitment is to occur. However, no stocking has occurred above Intake Diversion partly because these habitats were considered unsuitable; pallid sturgeon are thought to prefer habitats downstream of the diversion with lower gradients, wider valleys, and sand substrates. To assess suitability of the Yellowstone River above Intake Diversion, post-stocking dispersal patterns of telemetered juvenile hatchery-reared pallid sturgeon released below Cartersville Diversion (rkm 379) were compared to those of fish released below Intake Diversion. Cartersville pallid sturgeon dispersed longer distances downstream than Intake pallid sturgeon, although half of the Cartersville fish remained above Intake Diversion. Irrespective of release site, pallid sturgeon dispersed into reaches in River Breaks ecoregions characterized by high complexity and dynamic channel processes. Fish were evenly distributed between higher gradient cobble-gravel reaches and lower gradient fines-sand reaches. Initial results suggest that parts of the Yellowstone River upstream of Intake Diversion are suitable for pallid sturgeon stocking, and Intake Diversion restricted pallid sturgeon movements. Juvenile fish moved upstream to Intake Diversion but were not able to move above the dam.

For more information contact:

Matthew Jaeger
Montana Department of Fish, Wildlife and Parks
2068 Hwy 16
Glendive, MT 59330
Phone: (406) 687-3057
E-mail:
matthew_jaeger@yahoo.com

PALLID STURGEON RECOVERY UPDATE

-The latest in recovery and management actions –

Post stocking movements of juvenile pallid sturgeon in the Missouri River, below Fort Randall Dam, South Dakota-

Ultrasonic telemetry was used to track seasonal and diel movements of age3 Hatchery reared juvenile pallid sturgeon *Scaphirhynchus albus* stocked in the Missouri River below Fort Randall Dam, South Dakota during 2000 to 2002. The riverine section of the Missouri River and the downstream reservoir, Lewis and Clark Lake, were extensively sampled at approximately two week intervals to relocate as many fish as possible from spring through fall. Thirteen individual fish were intensively followed for 24 hours (total trackings = 21) to assess diel movements. A total of 227 relocations were observed from 22 tagged fish; 20 fish were relocated at least once with 16 fish found multiple times. In 2000, fish were found only upstream of the stocking site, whereas; in 2001 and 2002 the entire riverine portion of the Missouri River was used. In all years, no fish were relocated in the reservoir. Mean (± 2 SE) homerange size, defined as the distance (km) between the furthest upstream and downstream locations, was significantly smaller in 2000 (8.3 ± 5.8) compared to 2001 (29.3 ± 8.8) and 2002 (28.9 ± 15.0). Intensive tracking of individual fish found no significant difference in daily movements (km/d) among years and diel periods (i.e. dawn, daytime, dusk, night); however, fish were significantly more active in fall compared to spring and summer. Our three year study indicates that movements of juvenile pallid sturgeon based on shorter studies (i.e. < 1 year) should be interpreted cautiously as hatchery reared fish may not have acclimated to the Missouri River environment until the second year after stocking.

For more information contact:

George Jordan
U. S. Fish and Wildlife Service
2900 4th Avenue North, Room 301
Billings, MT 59101
Phone: (406) 247-7365
E-mail: george_jordan@fws.gov

Evaluation of the shovelnose sturgeon and pallid sturgeon population densities in the Platte River, Nebraska, 2000-2004 –

Little is known about the population densities of *Scaphirhynchus spp*. that inhabit rivers in the central US and this limits the evaluation of management options for these fishes. As part of a study to determine habitat use and movements of shovelnose sturgeon, *Scaphirhynchus platorynchus*, and pallid sturgeon, *S. albus*, we sampled fish using drifted gillnets and trammel nets during May-September 2000-2004, on the lower Platte River, Nebraska.

Catch per unit area was calculated for each net run. Area of suitable habitat was estimated using data from USGS gages and ongoing GIS analyses. Confidence limits were estimated using the rank 25th and 75th percentile catch values. A probability of capture coefficient was developed based on the frequency of captured radio-tagged fish when drifting nets over their known location.

Over the four years of sampling, 1129 shovelnose sturgeon and 5 pallid sturgeon were captured in 323 gill net and 213 trammel net runs. After applying the probability of capture coefficient of 0.308, our median population estimate was 9.6 shovelnose sturgeon/ha with confidence limits from 9.2 to 27/ha. The pallid sturgeon catch was 0.44% of the shovelnose sturgeon catch. Based on their relative abundance, we estimate that the pallid sturgeon population in the

PALLID STURGEON RECOVERY UPDATE

-The latest in recovery and management actions –

lower Platte river to be 0.042/ha with confidence limits from 0.040 to 0.12/ha. We consider these to be survey level population estimates since the fish are from an open population with access to the Missouri River and sampling occurred over a variety of discharge levels, water conditions, and times when fish may have been concentrated for spawning activity or dispersed during migration. Based on these density values we estimate the lower Platte River's shovelnose sturgeon population is between 23,000 and 69,000, and the pallid sturgeon population is between 103 and 303.

For more information contact:
Dr Ed Peters
6270 N County Road M
Loretta, WI 54896
Phone: (715) 266-2550
E-mail: epeters@unlnotes.unl.edu

Pallid Sturgeon Population Assessment Program- Standardized monitoring of the pallid sturgeon was initiated in 2001. In addition to pallid sturgeon, the program is inclusive of 8 additional native Missouri River species. The program area covers the Missouri River from Fort Peck Dam to the mouth near St. Louis (excluding reservoirs) as well as the lower Kansas River. Goals of the program are to provide the information to detect population changes and determine habitat use in pallid sturgeon and native species populations in the Missouri River basin. The program has undergone an independent scientific review including statistical power analysis. The program has been gradually implemented since 2001 and reached full implementation in 2006 covering the 13 designated river segments. Program reports for each segment are available on the web. http://im4.nwo.usace.army.mil/intro/dms.dmsintro.main

For more information Contact:
Mark Drobish
U. S. Army Corps of Engineers
Yankton, SD 57078
Phone: (402) 667-2582
E-mail:
Mark.r.drobish@usace.army.mil

MMR Pallid Sturgeon Studies

Range-wide population structure identified via microsatellite analysis – Recent work by Dr. Ed Heist and research assistant Aaron Schrey at Southern Illinois University has expanded on earlier genetic work to explore structuring in the pallid sturgeon population.

Microsatellite analysis of 16 loci for 539 tissue samples from *Scaphirhynchus* (approximately 60 from the upper Missouri River, approximately 60 from the middle Missouri River, close to 100 from the lower Missouri River, 150 from the middle Mississippi River, and 100 from the Atchafalaya River) indicate reproductive isolation among most sample areas. Significant F_{st} values were identified in all comparisons except the Lower Missouri River samples when compared against the middle Mississippi and Atchafalaya river samples. Three genetic groupings were also identified; a well differentiated upper Missouri River Group and two less differentiated lower Missouri-Middle Mississippi, and Atchafalaya river groups.

For more information contact:
Dr. Ed Heist
Department of Zoology
Southern Illinois University,
Carbondale.
Phone: (618) 453-4131

Middle Mississippi pallid sturgeon status study- Southern Illinois University, Missouri Department of Conservation, and the US Army Corps of Engineers ERDC biologists and researchers have been working on a joint project to assess the status of pallid sturgeon in the Middle Mississippi River. This

PALLID STURGEON RECOVERY UPDATE

-The latest in recovery and management actions –

project began in 2002 and concluded in 2005.

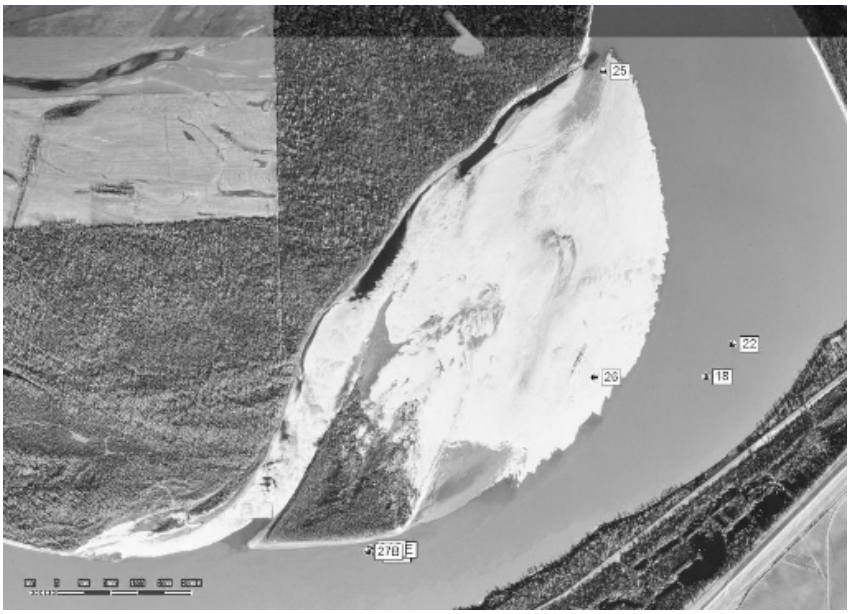
Dr. Jim Garvey (Southern Illinois University) provided a summary presentation at the Middle Basin Pallid Sturgeon Workgroup meeting that identified, with a total of 64,000 hours of effort, 11,549 shovelnose sturgeon and 143 pallid sturgeon were collected utilizing both random and directed sampling with trotlines, gill-nets (2 and 3 inch) and trawling. Telemetry data suggest that movements are associated with increasing river stage, and popular destinations for the study fish included: 1) Chain of Rocks at river mile 189, 2) Meramec River confluence at river mile 158, 3) Kaskaskia River confluence at river mile 115, 4) Grand tower area at river mile 79, and 5) the Thebes are at river mile 44. Using fin ray ageing techniques and mortality estimates, the data suggest, that for all gears combined, pallid sturgeon mortality is approximately 37% in the Middle Mississippi River. Population estimates for this reach ranged from 1600 to 4900 pallid sturgeon.

For more information contact:
Dr James Garvey
Dept. of Zoology, Southern Illinois Univ., Carbondale, IL 62901-6501
Phone: (618) 453-2609
Fax: (618) 453-6095
E-mail: jgarvey@siu.edu

Mississippi River spawning and rearing habitat characterization-

US Army Corps of Engineers-ERDC biologists have been characterizing spawning and rearing habitat at the Mhoon Bend gravel bar (River miles 685-689, Lee Co., AR) in the Mississippi River. Twenty larval and juvenile Scaphirhynchus specimens (22-223 mm TL) as well as several paddlefish larvae were captured with a 10-ft mini-trawl between April and July 2006. All larval specimens were preserved in ethanol for genetic analysis, and sent to Robert Wallus and Darrel Snyder for morphological analysis. Five of the twenty specimens were tentatively identified as pallid sturgeon by both taxonomists.

In 2006, they also captured 22 adult pallid sturgeon in the Lower Mississippi River. Collecting effort was, for the most part, split between spawning and rearing habitat and notched dikes (separate studies). In total, we set 106 60-hook trotlines, 49 90-ft experimental-mesh gillnets, 7 150-ft gillnets, and pulled the 10-ft mini-trawl 116 times. All pallid sturgeon were captured with trotlines.



Mhoon bend gravel bar.

PALLID STURGEON RECOVERY UPDATE

-The latest in recovery and management actions –

Two of the adult specimens were captured in December at river mile 121.5 (I-310 Bridge near Kenner, LA), which is currently the most downstream Mississippi River pallid capture to date.

For more information contact:
K. Jack Killgore, Ph.D
Research Fishery Biologist
Environmental Lab EE-A
Engineer Research & Development Center
3909 Halls Ferry Road
Vicksburg, MS 39180
Phone: (601) 634-3397
E-mail:
Jack.Killgore@erdc.usace.army.mil

Hatchery fish found in Atchafalaya River-
The first documented occurrence of pallid sturgeon passing from the Mississippi River into the Atchafalaya River occurred in 2006. The fish has been attributed to either the 1992 year class (stocked in 1994) or the 1997 year class of pallid sturgeon spawned and released from Missouri's Blind Pony Fish hatchery.

For more information contact:
Jan Dean
US Fish and Wildlife Service,
Natchitoches Natl. Fish Hatchery
615 South Drive
Natchitoches, LA 71457
Fax: 318-352-5324
E-mail: Jan_Dean@fws.gov

Expansion of Mississippi River telemetry project-
Paul Hartfield has received 75K from USFWS Ecological Services (for the next 5 years) to initiate two studies in the Mississippi/Atchafalaya rivers.

One project will look at population demographics of pallid sturgeon on the Atchafalaya River, Bobby Reed, Louisiana Wildlife and Fisheries and Recovery Team member, and Jan Dean, USFWS and Recovery Team member, will be conducting this project. Stationary telemetry stations will be established at strategic locations on the Atchafalaya River to monitor the movement of telemetered pallid sturgeon below the Old River Control Complex. The project will have a mark recapture component to better understand the population size in this area. They also plan to put the tags in the fish to get other information (temp, depth, movement etc.).

Plans are to do the same thing from the Ohio River confluence to the Gulf of Mexico on the Lower Mississippi River. This project includes Arkansas and Tennessee, US Coast Guard, local departments of transportation, USGS, and others.

For more information contact:
Paul Hartfield
US Fish and Wildlife Service,
Jackson Field Office
6578 Dogwood View Parkway, Suite A
Jackson, MS 39213
Fax: 601-965-4900
E-mail: Paul_Hartfield@fws.gov

PCR test for iridovirus nearing completion –
Efforts, to develop a useful, non-lethal, and sensitive test to detect the pallid sturgeon iridovirus, were initiated in 2005. In 2006 a preliminary test has been developed that will need to undergo extensive validity testing. Initial results look promising.

For more information contact:
Dr. Ron Hedrick
University of California
One Shields Ave
Davis, CA 95616
Phone: (530) 752-3411
E-mail: rphedrick@ucdavis.edu

Pallid Sturgeon Habitat Assessment and Monitoring Program -
The Habitat Assessment and Monitoring Program (HAMP) focuses on both physical and biological monitoring of habitat creation efforts that are intended to benefit the pallid sturgeon. Long term acreage goals are currently 20,000 acres of aquatic habitat diversity in the channelized reach of the Missouri River. The HAMP program was initiated in 2004 with data collection beginning in 2005. Rather

PALLID STURGEON RECOVERY UPDATE

-The latest in recovery and management actions –

than an exclusive focus on pallid sturgeon, shovelnose sturgeon and other native species are sampled to provide more synoptic indicators of habitat changes likely to affect pallid sturgeon and to increase the statistical power available to document environmental change over time. A three phase independent scientific review of the program was conducted in 2005 and 2006 and power analysis is occurring in 2007. The information derived from the HAMP will guide future habitat creation efforts.

For more information Contact:
Craig Fleming
U. S. Army Corps of Engineers
Yankton, SD 57078
Phone: (402) 667-2880
E-mail:
Craig.a.fleming@usace.army.mil

Pallid Sturgeon Propagation Program

The USACE has funded a series of construction/facility improvement projects at State and Federal hatcheries (i.e., Bozeman Fish Technology Center, Miles City State Fish Hatchery, Garrison Dam National Fish Hatchery, Gavins Point National Fish Hatchery, Blind Pony State Fish Hatchery and the Neosho National Fish Hatchery). The intent of these projects is to increase the propagation capabilities facilitating the collective success of these hatcheries to meet the population augmentation needs of the pallid sturgeon. Figure 1 shows the propagation capability of the hatcheries currently rearing pallid sturgeon as part of the Missouri River Recovery Program. Additionally, the USACE provides supplemental support to these facilities on an annual basis to assist with operational costs associated with propagating pallid sturgeon.

For more information Contact:
Mark Drobish
U.S. Army Corps of Engineers
Yankton, SD 57078
Phone: (402) 667-2582
E-mail:
Mark.r.drobish@usace.army.mil

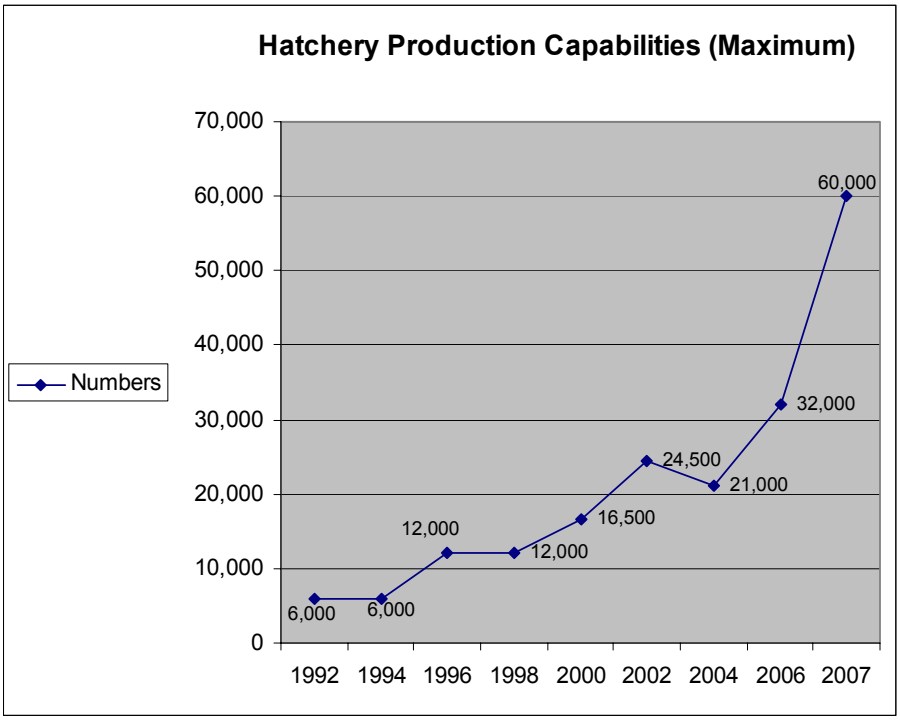


Figure 1. Collective capability for rearing pallid sturgeon over time as hatchery infrastructure was expanded. Numbers are based on recommended rearing densities and fish reaching a size of 175 millimeters.

February 2007 Issue No. 15 Editor: George Jordan

PALLID STURGEON RECOVERY UPDATE

-The latest in recovery and management actions –

Preliminary designs developed for Intake Dam Fish Passage Project - Conceptual designs to address upstream fish passage and entrainment issues at the US Bureau of Reclamation's Lower Yellowstone Project are nearing completion at the 10% design level. This project is being developed to address concerns about effects this structure has on pallid sturgeon and to insure compliance with the Endangered Species Act (ESA).

Intake Dam on the Yellowstone River

Initially, it appears as though a "rock ramp" is a viable option to facilitate movements upstream and an in-canal screen structure is planned to reduce or eliminate entrainment concerns.

The next key steps including compliance with the National Environmental Policy Act and formal consultation with the Service in accordance with the ESA.

For more information contact:
Brent Esplin
US Bureau of Reclamation
2900 4th Avenue North ,
PO Box 30137
Billings, MT 59107-0137
Phone: (406) 247-7489
E-mail: Besplin@gp.usbr.gov

Article in Smithsonian Magazine – A freelance writer spent time with crews in 2006 during broodstock collection efforts. The story is in the current (March) issue of the Smithsonian Magazine or online at: http://www.smithsonianmagazine.com/issues/2007/march/sturgeon.php

---

Pallid Sturgeon morphometric analysis- Pallid sturgeon captured in the Middle and Lower Mississippi River (i.e., below St. Louis, MO) are morphologically very similar to shovelnose sturgeon. Available empirical data are limited to a few studies based on low sample sizes from disjointed populations. Geneticists are currently searching for markers that will differentiate the two species, but the need for unequivocal species-specific field characters remains. Continuation of commercial fishing for shovelnose sturgeon in some states necessitates an immediate tool for accurate field identifications. Previous studies of lower basin river sturgeon classified individuals with simple morphometric character indices and interpreted intermediacy as interspecific hybridization. In this study, morphometric variation among Scaphirhynchus specimens from the Middle and Lower Mississippi River is examined for evidence of hybridization. Data were compared for large (>250 mm SL) hatchery-reared and wild pallid and wild shovelnose specimens. Specimens were compared using two morphometric character indices, two morphometric/meristic character indices and principal components analysis.

Results indicate substantial morphological variation among pallid sturgeon below the mouth of the Missouri River. The amount of variation appears to decrease downstream in the Mississippi River. Sheared principal components analysis of morphometric data shows complete separation of shovelnose and pallid sturgeon specimens, whereas character indices indicate overlap. Both character indices and sheared principal components analysis demonstrate that pallid sturgeon in the Lower

PALLID STURGEON RECOVERY UPDATE

-The latest in recovery and management actions –

Mississippi River are morphologically more similar to shovelnose sturgeon than are pallid sturgeon from the Upper Missouri River. This similarity, explained in previous studies as hybridization, may be the result of latitudinal morphometric variation and length-at-age differences between populations of the upper and lower extremes of the range.

For more information contact:
Catherine E. Murphy
JAYA Contractor
Environmental Lab EE-A
Engineer Research & Development Center
3909 Halls Ferry Road
Vicksburg, MS 39180
Phone: (601) 634-4233
E-mail: cmurphy@jayacorp.com

Bioenergetics Modeling

Dr. Robert Klumb with the U.S. Fish and Wildlife Service, Great Plains Fish and Wildlife Management Assistance Office, in collaboration with Dr. Steven Chipps, South Dakota Cooperative Fish and Wildlife Research Unit at South Dakota State University, have been advising three graduate students' research towards development of a pallid sturgeon bioenergetics model with applications to improved understanding of the trophic ecology of the Missouri River. Bioenergetics models estimate fish growth by incorporating physiological processes such as feeding rate, metabolism, quality of food, and habitat conditions such as water temperature and prey availability.

Physiological components required to parameterize the bioenergetics model were derived from consumption and growth studies conducted by Elizabeth Wright. She found the optimum feeding rate for juvenile pallid sturgeon was 28° C and their thermal tolerance exceeded 30° C. Energy partitioning by juvenile pallid sturgeon was similar to other sturgeon species; the amount of consumed energy allocated to waste, metabolism and growth was 13.6, 48.3 and 38.1% respectively. Evaluation of the bioenergetics model revealed that model predictions were within 6% of observed values measured in the laboratory.

To assess prey availability for pallid sturgeon, Kristen Berg collected over 2,300 macroinvertebrate samples in the Missouri River (2005 and 2006) below Fort Randall and Gavins Point dams. Additionally, Kristen assessed pallid sturgeon summer diet in relation to available prey from 31 fish, non-lethally sampled, with gastric lavage during 2006.

Bryan Spindler (master's student) is evaluating spatial patterns in growth potential of juvenile pallid sturgeon below Fort Randall Dam using the bioenergetics model by linking past pallid sturgeon captures from three years of annual monitoring, with availability of marcorinvertebrate and fish prey. Water temperature, as well as, water depths and velocities were measured with an acoustic doppler current profiler during 2006.

Results of all three projects will increase our understanding of juvenile pallid sturgeon feeding ecology and growth dynamics in the Missouri River and allow future researchers to identify important rearing areas using bioenergetics modeling. Funding for all three projects was provided by a State Wildlife Grant administered by South Dakota Department of Game Fish and Parks with additional funding provided by Western Area Power Administration.

For more information contact:
Dr. Rob Klumb
U.S. Fish and Wildlife Service
Great Plains Fish & Wildlife Management Assistance Office
420 S. Garfield Ave. Suite# 400
Pierre, South Dakota 57501
Phone: (605)224-8693 ext. 28
E-mail: robert_klumb@fws.gov

February 2007 Issue No. 15 Editor: George Jordan

PALLID STURGEON RECOVERY UPDATE

-The latest in recovery and management actions –

Genetic markers and archived tissue samples identify progeny of captive-bred pallid sturgeon in the wild -

The ability to distinguish-captive origin and natural-origin individuals in the wild is critical for evaluating the impact of captive breeding programs on natural populations. Continued persistence of pallid sturgeon (*Scaphirhynchus albus)* in the Missouri River is largely dependent on captive breeding efforts that spawn natural-origin adults in fish hatcheries and release their progeny into the wild. Prior to release, hatchery-origin individuals are physically marked so they can be distinguished from natural-origin individuals when recaptured. During the years 2004 to 2006, 24 unmarked juvenile pallid sturgeon were collected in the Missouri River downstream of Gavins Point Dam, South Dakota, (between river mile 490 and river mile 801) that were presumed natural-origin. However, these individuals were similar in size to hatchery-origin fish released in this area, raising concerns that these individuals were actually hatchery-origin fish with lost or malfunctioning tags. We used microsatellite based parentage analysis to determine if the unmarked fish were members of hatchery families that had been released in this area. This retrospective genetic tagging approach revealed that 23 of 24 unmarked fish were indeed hatchery-origin. The origin of the remaining fish remains unknown because genetic samples were not available from all of the families released below the dam and this fish may have originated from one of these un-sampled families. These results provide important insight into the conservation status of endangered pallid sturgeon as well as provide data important for guiding management decisions. Our results also demonstrate the efficacy of using genetic tags as an alternative or complimentary approach to physically marking individuals.

For more information contact:
Pat DeHaan
U.S. Fish and Wildlife Service, Abernathy Fish Technology Center, 1440 Abernathy, Conservation Genetics Program, Creek Road, Longview, WA 98632, USA
Phone: (360)425-6072 ext. 331
Email: Patrick_DeHaan@fws.gov

Assessment of temperature effects on rearing *Scaphirhynchus* in hatchery environments –

Kevin Kappenman and Dr. Molly Webb at the Bozeman Fish Technology Center have completed a study to determine the optimal rearing temperature for survival, growth, and fish condition in shovelnose sturgeon. This experiment will be conducted with pallid sturgeon in the fall of 2007. After a 90-day exposure to temperatures ranging from 8 to 30°C, juvenile shovelnose sturgeon maintained at 24°C had the highest average body weight, but the average weight of these fish did not differ statistically from the weight of fish maintained between 16 and 28°C. The average weights at 8, 10, and 12°C were significantly lower than the weights in all temperature treatments except 14 and 30°C. The total mortality did differ significantly between treatments with no mortality seen at 14, 16, and 18°C and the highest mortality seen at 28 and 30°C. Water temperatures of 16-20°C appear to provide the optimal conditions for growth, condition factor, and survival of shovelnose sturgeon in captivity.

Kevin Kappenman and Dr. Webb have determined the developmental rates in pallid and shovelnose sturgeon embryos at temperatures ranging from 8 to 28°C. The lethal temperatures were 8 and 28°C and 8 and 26°C for shovelnose and pallid sturgeon embryo development, respectively. There were no statistically

significant differences in survival at 12 to 24°C, with the highest survival to hatch seen between 12 and 20°C. The developmental rates of pallid and shovelnose embryos are similar to those described for white sturgeon and lake sturgeon.

For more information contact:
Dr. Molly Webb or Kevin Kappenman
U.S. Fish and Wildlife Service
Bozeman Fish Technology Center
4050 Bridger Canyon Road,
Bozeman, MT 59715
Phone: (406) 994-9907, (406) 994-9917
Email: Molly_Webb@fws.gov, Kevin_Kappenman@fws.gov

MISSOURI RIVER BANK STABILIZATION AND NAVIGATION PROJECT (BSNP) FISH AND WILDLIFE MITIGATION

The Missouri River Bank Stabilization and Navigation Project (BSNP) Fish and Wildlife Mitigation was authorized for construction in Section 601(a) of the Water Resources Development Act (WRDA) of 1986. Section 334(a) of the WRDA 1999 modified the project by increasing the amount of acreage to be acquired and/or mitigated. The total amount of land authorized for mitigation is currently 166,750 acres. The project is authorized to mitigate for fish and wildlife habitat losses attributed to construction of the Missouri River BSNP and will acquire, develop and preserve native aquatic, wetland, and upland habitats on individual mitigation sites. The project location is in and adjacent to the Missouri River from Sioux City, Iowa to the mouth near St. Louis, Missouri; a distance of 735 river miles.

Development of riverine aquatic habitat has been completed at numerous BSNP mitigation sites. This effort has emphasized development of side channels and chutes and completing within-river habitat improvements. Most of this work has been accomplished by dike notching, river structure modifications, bank sloughing, excavation, and dredging. Through September 30, 2006, river structure modifications have been made at 18 mitigation sites, side channels have been preserved, re-opened, or work has been initiated at 21 mitigation sites, and reconnecting floodplain habitats to the river has been completed or started at 19 mitigation. Many of the mitigation sites have had levees that were immediately adjacent to the river channel, when purchased by the project. In some cases, active levees have been realigned farther landward from the river channel and at other locations, such as Overton North, abandoned levees have been breached in several locations to improve floodplain connectivity. At many locations, side channels have also been developed to encourage high flows to spread out across the floodplain.

Biological and physical monitoring of 13 constructed chutes/backwaters was initiated in 2005. This monitoring and evaluation effort is being conducted by the Nebraska Game and Parks Commission, Iowa Department of Natural Resources, Missouri Department of Conservation, and the U. S. Fish and Wildlife Service. The proposed field sampling protocol was field tested and refined as needed in 2005 and field sampling was initiated in 2006. This monitoring of the constructed chutes/backwaters will include three field seasons and include both annual and final reports. Initial annual progress reports are scheduled to be submitted to the Corps in April of 2007.

For More Information Contact:
Glenn Covington
U.S. Army Corps of Engineers
Kansas City, MO. 64106
Phone: (816) 389-3141
Email:
William.g.covington@usace.army.mil

PALLID STURGEON RECOVERY UPDATE

-The latest in recovery and management actions –

Blood exploration leads to interesting findings-

Dr. Molly Webb and Dr. Alan Allert have been analyzing blood chemistry in adult pallid sturgeon since 2004. These researchers have found 10 blood plasma parameters that may be used as indicators of stress in pallid sturgeon. The change in these parameters indicate that there are physiological changes associated with stress that affect energy balance, organ function, and antibody production.

Blood parameters also prove useful in development of a less-invasive method for assessing sexual maturity.

Dr. Webb has applied the use of blood plasma steroid concentrations, to determine sex and stage of maturity in pallid sturgeon. This project began in 2004. Using plasma testosterone and estradiol, 93% of the pallid sturgeon adults in the upper basin have been correctly classified by sex and stage of maturity. Of the 7% of the misidentified fish, 5% of the ripe females were misidentified as immature females due to low estradiol concentrations. The researchers believe that the estradiol concentrations were very low in these females due to fatty gonads resulting in decreased production of estradiol. Two percent of the females were misidentified as immature females at ovulation which can be explained physiologically as steroid synthesis and secretion decreases significantly following ovulation.

Linda Beck at the BFTC and Dr. Dusan Palic at Iowa State University have developed assays to assess heterophil function. Heterophils are an important component of the immune system and can be used to assess immune function. These researchers have found that stress does suppress immune function in pallid and shovelnose sturgeon. These researchers in collaboration with Drs. Webb and Allert will be looking for correlations between the blood chemistry parameters and the immune function parameters associated with stress to determine if there is a potential relationship between these factors.

For more information contact:

Dr. Molly Webb
U.S. Fish and Wildlife Service
Bozeman Fish Technology Center
4050 Bridger Canyon Road,
Bozeman, MT 59715
Phone: (406) 994-9907
Email: Molly_Webb@fws.gov,

February 2007 **Issue No. 15** **Editor: George Jordan**

PALLID STURGEON RECOVERY UPDATE

-The latest in recovery and management actions –

Editor's note: I admit that I have been somewhat remiss in getting this update prepared and distributed. The content herein highlights many of the great efforts that have occurred since the last update (2004). It does not pay tribute to **all** the great work that is being conducted in the field or behind the scenes that are helping us improve our understanding of the species and ultimately assisting with recovery. There are far too many people deserving credit. However, I believe you know who you are and I say; "*Thank you for what you do.*"