39 *th* Annual Meeting

14-18 November 2007
Ventura, California

Desert Fishes Council

Consejo de los Peces del Desierto

Wednesday, 14 Nov. 2007

17:00 - 20:00 Registration, reg. package pickup and submittal of presentations.
Location: Pierpont Hotel, Camulos Rooms - Pavilion.

17:00 - open Informal Social and discussions: Pierpont Hotel, TBA (check at registration)

Thursday, 15 Nov. 2007

09:00 - 12:00 GENERAL SESSION - 1 : Pierpont Hotel, Pavilion.

12:00 - 13:30 LUNCH

13:30 - 18:00 GENERAL SESSION - 2 : Pierpont Hotel, Pavilion.

19:00 - open DEVIL'S HOLE - Informal Discussion Session : Pierpont Hotel, Pavilion.

Friday, 16 Nov. 2007

09:00 - 12:00 GENERAL SESSION - 3 : Pierpont Hotel, Pavilion.

12:00 - 13:30 LUNCH

13:30 - 16:00 GENERAL SESSION - 4 : Pierpont Hotel, Pavilion.

16:00 - 17:00 POSTER SESSION / COFFEE BREAK : Pierpont Hotel, Pavilion & Veranda.

17:00 - 18:00 BUSINESS MEETING: Pierpont Hotel, Pavilion.

19:00 - open BANQUET: Pierpont Hotel, Pavilion.

Saturday, 17 Nov. 2007

09:00 - 13:00 GENERAL SESSION - 5 : Pierpont Hotel, Pavilion.

13:00 CLOSING REMARKS

Sunday, 18 Nov. 2007

08:00 - 17:00 FIELD TRIPS: meet at Pierpont Hotel, Front Lobby.
- Channel Islands
- Local Streams

Desert Fishes Council
Consejo de los Peces del Desierto

39 *th* Annual Meeting
GENERAL PROGRAM - with Abstracts

Thursday, 15 Nov. 2007

09:00 - 12:00 GENERAL SESSION - 1
Location: Pierpont Hotel, Pavilion.

2007-11-15 09:00 **OPENING REMARKS**

2007-11-15 09:15 **The Cuatrociénegas Scientific Research Station: Accomplishments during the first year of Peace Corps support and continued DFC support**

Vélez, Cristina E.*[1]; Hendrickson, Dean A.[2]; Brandewie, Chris H.[1]. (1-U.S. Peace Corps, México and Comisión Nacional de Áreas Naturales Protegidas de México, Cuatrociénegas, Coahuila, México; 2-University of Texas, Texas Natural Science Center and Section of Integrative Biology).

Thanks to the partnership between the Desert Fishes Council (DFC) and DESUVALLE (a local Mexican NGO), the Cuatrociénegas Scientific Research Station (CICC) opened its doors in May 2006. In January 2007 the U.S. Peace Corps provided two 2-year volunteer positions to the Cuatrociénegas Protected Area for Flora and Fauna (APFFCC), whose main job it is to staff the station with a full-time manager and GIS technician that coordinate all projects with the Reserve. Many changes occurred coincident with the arrival of Peace Corps Volunteers, including a move of the Reserve office, the retirement of the Reserve Director, and the expansion of the Reserve itself. Despite these changes, CICC staff was able to coordinate with APFFCC and DESUVALLE staff to successfully help organize, sponsor, and hold the Second Meeting of Cuatrociénegas Researchers in August 2007. This event was sponsored primarily by the APFFCC, but with smaller contributions from a large number of other groups, illustrating the CICC's increasing circle of collaborators. Like the first researchers meeting in August 2004, it was essentially equal in size to a normal DFC meeting, and generated much interest among researchers and the local community, as well as regional and national media. In conjunction with this same meeting, CICC organized a Cuatrociénegas box turtle (*Terrapene coahuila*) monitoring workshop, bringing experts together to discuss monitoring design and methodologies. The CICC manager incorporated conclusions from the workshop into the current turtle monitoring program, and the field work and database development for this project began. CICC will function as the monitoring program leader and database manager, while expenses for the project will be born by the reserve and outside funding. Last year's proposal for improvement of CICC's infrastructure and monitoring programs submitted to the "Wildlife Without Borders" program was unsuccessful, but another proposal will be submitted to the same program on the deadline date for this abstract. It seeks funds for training of APFFCC staff and local community members to improve and expand the turtle monitoring program and to develop and implement monitoring programs for the two cichlids (*Herichthys minckleyi* and *Hemichromis guttatus*) that the reserve is mandated to monitor. Because promotion of CICC is essential for its success, CICC staff presented a poster at the American Society of Ichthyologists and Herpetologists annual meeting in Saint Louis, and presented short talks in Spanish at the Second Meeting of Cuatrociénegas Researchers and to visitors from the University of Arizona's Consortium for North American Higher Education Collaboration (CONAHEC). The CICC manager attended the Organization of Biological Field Stations (OBFS) annual meeting in Junction, Texas, and made CICC an official member of that organization. The word is getting out about the CICC, researchers' use of the facility is increasing and thus helping to defray what DFC has to pay to keep the rent paid, and several possible new collaborations with the CICC are in the works. Members of DFC can help determine the future and success of CICC by providing input and continuing support to the station, as well as by serving as volunteers. We'll see you in Cuatrociénegas at next year's DFC meeting!

2007-11-15 09:30 **Status of Warner sucker in the Warner basin, Oregon**

Scheerer, Paul D.*[1]; Heck, Mike[1]; Jacob, Steve[1]. (1-Oregon Dept. Fish and Wildlife - Conservation and Recovery).

The Warner sucker, *Catostomus warnerensis*, is endemic to the Warner Valley, an endorheic subbasin of the Great Basin in southeastern Oregon and northwestern Nevada. This species was historically abundant and its historical range includes three permanent lakes, several ephemeral lakes, and three major tributary drainages. Warner sucker abundance and distribution has declined over the past century and it was federally listed as threatened in 1985 due to habitat fragmentation and threats posed by the proliferation of piscivorous non-native game fishes. In 2006, we conducted investigations in Hart and Crump Lakes to quantify the abundance of Warner suckers, to search for evidence of recent recruitment, and to estimate sucker abundance relative to nonnative fish abundance. We found the Warner sucker populations in Crump and Hart Lakes were severely depressed. The 2006 abundance estimates (CPUE) for suckers in the lakes were some of the lowest on record. In addition, we found little evidence of recent recruitment of suckers to the lake populations. The 2006 sucker size distribution was dominated by large, older fish and the average sucker length has increased steadily since the lakes were recolonized following their desiccation in 1992. We also found that the proportion of nonnative fish in the catch has increased during this time period. In 2007, we conducted distributional surveys and obtained population estimates of suckers in the Warner basin tributaries. We found the distribution of stream suckers to be patchy with distinct areas of relatively high abundance. The 2007 stream data will serve as a baseline to assess trends in abundance and changes of distribution of the stream populations over time.

2007-11-15 09:45 **Genetic relationship of *Cottus bairdi* in Butterfield Springs, Nevada, to other populations of *Cottus bairdi***

Shiozawa, Dennis K.*[1]; Christensen, Daniel[1]; Evans, R. Paul[2]. (1-BrighamYoung University, Department of Biology; 2-BrighamYoung University, Department of Micro and Molecular Biology).

In 1991 researchers with the U. S. Fish and Wildlife Service located a population of cottids in Butterfield Springs of the White River drainage in the Colorado River Basin of Nevada. This southernmost population of cottids in Nevada was believed to represent a relict native population of *Cottus bairdii*, though some concern existed it may have been introduced from Lake Creek in the Bonneville Basin. We compared specimens from Butterfield Springs with *C. bairdii* from both the Bonneville and Colorado River basins using mtDNA, including specimens from Lake Creek. The Butterfield Springs cottids are clearly not derived from Lake Creek and form their own unique lineage among Bonneville Basin and Colorado River Basin *C. bairdii*. This population should be carefully monitored and managed.

2007-11-15 10:00 **The use of multivariate statistics in long-term monitoring programs**

Kesner, Brian R.*[1]; Marsh, Paul C.[1]. (1-Native Fish Lab, Arizona State University).

A common objective of long-term stream monitoring is to detect trends in species composition or individual abundance. However, analysis is often focused on significant trends of individual species. The use of linear regression or Analysis of Covariance (ANCOVA) on data from monitoring programs is often problematic due to assumption violations, multiple zero counts, and extremely high variation between years and/or sites. These analyses fail to address the objective of detecting trends in species composition. In addition, there is an emerging consensus that significance tests on observational datasets are meaningless. Rarely used multivariate techniques can provide concise visual representations of species composition trends while avoiding the pitfalls of standard statistical techniques.

To demonstrate the advantages of a multivariate approach, a dataset from a long-term monitoring program in the Gila River Basin, Arizona was used. Initially, the data were analyzed using an ANCOVA on individual species data to detect trends amongst sites, reaches, and streams. Data were log transformed to meet statistical assumptions, but in some cases this caused the apparent trends in abundance to be reversed. In other cases, declines in total abundance of all species in a stream or reach masked or exaggerated trends for individual species. No trends were significant in cases where assumptions could be met. In contrast, a clear shift in species composition for the Gila River was evident in a biplot of results from Non-metric Multi-Dimensional Scaling (NMDS), a multivariate technique. A shift away from significance tests is long overdue for monitoring programs, and descriptive, multivariate techniques are recommended.

2007-11-15 10:15 **Investigations into the native fish fauna of the Goose Lake Basin using a statistically rigorous sampling design**

Heck, Michael P.*[1]; Scheerer, Paul D.[1]; Jacobs, Steven E.[1]. (1-Oregon Department of Fish and Wildlife, Native Fish Investigations Project).

The Goose Lake Basin is an arid watershed in south central Oregon and northeast California that supports nine native fishes, including the endemic Goose Lake redband trout (*Oncorhynchus mykiss* ssp.), Goose Lake lamprey (*Lampetra tridentata* ssp.), Goose Lake sucker (*Catostomus occidentalis lacusanserinus*), and Goose Lake tui chub (*Gila bicolor thalassina*). The last survey of fishes from the Goose Lake Basin was preformed in 1994 and was largely restricted to public land. In the summer of 2007, we conducted a statistically-based survey to determine the distribution and abundance of the watershed's native fishes. Sample sites were randomly chosen using the Environmental Protection Agency's Environmental Monitoring and Assessment Program (EMAP) protocol which selects representative sample sites from known fish distributions across a broad array of stream habitat and land ownership. At each sample site we used a variety of sampling methods to collect relative abundances and length distributions for all species encountered. Additionally, abundance of redband trout was estimated using multiple-pass removal electrofishing. Sampling began amid a severe drought resulting in many dry or puddled streams and water temperatures exceeding 30^{o}C. Despite these conditions, all nine native fish species, including six non-native species, were captured across 140 sample sites. We will describe distribution and abundance patterns of the nine native fish species and, where possible, compare these results to past findings.

2007-11-15 10:30 **Near extinction of the Río Salado darter, *Etheostoma segrex* (Percidae) and the role of water management and *Arundo donax* in its decline**

Hendrickson, Dean A.*[1]; Lang, Nick[2]; Lozano Vilano, Ma. de Lourdes[3]. (1-University of Texas, Texas Natural History Collection, Austin, Texas, USA; 2-Dept. Biology, St. Louis University, St. Louis, Missouri, USA; 3-Facultad de Biología, Universidad Autónoma de Nuevo León, Monterrey, Nuevo León, México).

The Río Salado darter, *Etheostoma segrex* Norris and Minckley 1997, is known from numerous collections dating from the early 1960's made at a small number of localities in the 15 – 20 km reach of the Río Salado de Los Nadadores in the vicinity of Sacramento and Celemania, Coahuila. Especially at the type locality, it was apparently common into the early 1990's, with some of the early collections in the 1960's and '70's containing more than 40 specimens. Attempts by the first author to collect it in 2000-2001 found very low numbers and in 2003 only 1 specimen could be located with considerable effort in a one-day search for it. We thus conducted a thorough survey for it in spring and fall 2006, sampling intensively throughout, as well as above and below documented range, and in previously un-surveyed areas elsewhere in the basin. Our survey was done by 6 to 7 trained collectors working 4 and 3 days in each spring and fall, respectively. We failed to find even one specimen in the spring effort, but the fall sample found 3 pairs distributed over a bit more than 1 km of river in the vicinity of the balneario Cariño de la Montana. All three pairs (released unharmed) were above or in the uppermost part of the massive stand of *Arundo donax*, an invasive, non-native grass, commonly knowns as Giant Reed, that chokes the river below Cariño de la Montaña. The pairs found in the *Arundo* were found in small openings in the *Arundo* canopy in areas where the river was wider and shallower and received some solar insolation. Throughout the dense *Arundo* stand below the three pairs, the river flowed at generally high velocity through a deep and narrow channel that was heavily shaded by overhanging *Arundo* and we found no darters nor their preferred sunny riffle habitat. Discharge of the river through this reach has greatly diminished since the original collections of the species were made, and flow throughout the system is highly manipulated for agriculture. The combination of these related factors, discharge reduction and altered hydrograph, as well as encroachment on the channel by *Arundo*, causing dramatic changes in channel morphology and solar insolation, appear responsible for the decline of this species. We predict the species will soon be extinct if concerted recovery efforts are not instituted in the very near future.

2007-11-15 10:45 **Native fish conservation and climate variability in the southwestern United States**

Duncan, Doug*[1]; Garfin, Gregg[2]. (1-US Fish and Wildlife Service; 2-University of Arizona).

The conservation of native fishes in the southwestern United States has always been reliant on finding water that isn't "used," or that does not have conflicts that make the site unavailable. Examples of issues that can render a site unsuitable or unusable for native fish are sport fisheries, low-quality effluent, non-indigenous fish, and livestock use. Climate change and drought also have the potential to drastically and negatively alter conservation activities for native fishes. In addition to the issues listed above, the multiple effects of human activities in a watershed also impact waters. Native fish conservation is also complicated because of potential conflicts with other rare aquatic species. The potential effects of climate change and drought need to be addressed by the time factor and uncertainty of effects. The precautionary principle should be adhered to when planning for native fish conservation. While there may not necessarily be solutions to the problems presented by drought and climate change, there are things that can be done to minimize their effects to native fishes in the southwestern United States.

2007-11-15 11:00 **Hybridization and population structure of the Zuni bluehead sucker (*Catostomus discobolus yarrowi*) in Arizona and New Mexico**

Schwemm, Michael R.*[1]; Schooley, Jason D.[1]; Marsh, Paul C.[1]; Dowling, Thomas E.[1]. (1-Arizona State University, School of Life Sciences).

The Zuni bluehead sucker (*Catostomus discobolus yarrowi*) is a distinctive member of the mountain sucker group (subgenus *Pantosteus*) endemic to the Zuni River basin. Past studies have indicated that this subspecies may have resulted from hybridization between *C. d. discobolus* and *C. plebeius*. We surveyed mitochondrial (cytochrome b) and nuclear DNA (recombination activation gene 1 and 2H2) sequences to examine patterns of variation within and among these three forms, focusing on populations from the upper Little Colorado River and adjacent drainages. Variable alleles identified by single-stranded conformational polymorphism (SSCP) analysis were sequenced and analyzed by phylogenetic and population genetic methods. Preliminary results from mtDNA reveal high levels of haplotypic variation (Nh = 22) across all samples of *discobolus* with some populations fixed while variation at both nuclear loci was limited. Variants typical of *C. plebeius* were also found in Rio Nutria, consistent with results published in the 1980's and hybrid origin of *C. d. yarrowi*. In addition, examination of mtDNA identified a unique lineage within *discobolus* principally occurring in middle reaches of the Little Colorado River (East Clear and Silver creeks, AZ).

2007-11-15 11:15 **National Fish Habitat Action Plan and More Fish Campaign**

Wolniakowski, Krystyna U.*[1]; Busiahn, Tom[2]; Estes, Christopher[3]; Stedman, Susan-Marie[4]; Cushing, Janet[5]. (1-National Fish and Wildlife Foundation, Portland; 2-U.S. Fish and Wildlife; 3-Alaska Dept. Fish and Game; 4-N.O.A.A. Fisheries, Maryland; 5-U.S. Geological Survey, Virginia).

In recent decades, gains have been made in reducing pollution and degradation of aquatic habitats, but they have not kept pace with impacts of population growth and land-use changes. Conservation leaders saw a need to increase voluntary action to conserve aquatic habitats and to improve coordination across boundaries and jurisdictions. The National Fish Habitat Action Plan is an investment strategy to maximize the impact of conservation dollars. Signed by State and Federal leaders in 2006, the Action Plan is partnership-driven, science-based and non-regulatory, modeled after the North American Waterfowl Management Plan. With oversight by a national board, the Action Plan works through regional-scale Fish Habitat Partnerships to set strategic priorities; to implement projects to protect, restore and enhance habitats; and to measure and communicate results. The Board has approved 4 FHPs to date, and several candidate partnerships, such as the Desert Fish Habitat Partnership, will be considered in the near future. By 2010, partners in the Action Plan will assess and report on the status of fish habitats across the United States and establish 12 or more Fish Habitat Partnerships in priority areas. Cost-share funds for Action Plan projects are available through the U.S. Fish and Wildlife Service and the National Fish and Wildlife Foundation. Other partners, such as the mine reclamation program of the Office of Surface Mining, also contribute funding. The Action Plan enlists many partners, such as local governments, corporations and landowners, to contribute to healthy aquatic habitats. Several hundred individuals and organizations have joined the Partners Coalition to support the Action Plan. The Action Plan brings together an unprecedented partnership to conserve aquatic habitats for both warmwater and coldwater fish in freshwater and marine habitats. The "More Fish Campaign" launched by NFWF raises awareness and funds to help support fish habitat conservation projects nationwide.

2007-11-15 11:30 **The Western Native Trout Initiative – road map for the proposed Desert Fishes Habitat Partnership?**

Voeltz, Jeremy*[1]; Meka, Julie[2]. (1-U.S. Fish and Wildlife Service; 2-Arizona Game and Fish Department).

In 2006 and 2007, the National Fish Habitat Action Plan's (NFHAP) Western Native Trout Initiative (WNTI) awarded the U.S. Fish and Wildlife Service (FWS) $250,000 to implement three recovery actions for the threatened Apache trout in Arizona. The FWS distributed the funds to the San Carlos Apache Tribe and Arizona Game and Fish Department to implement the projects. One barrier was constructed to extend existing Apache trout habitat by two miles on that particular stream. Two streams were chemically renovated to remove nonnative trouts and will be restocked with Apache trout; all three streams will count towards recovery of the species. This presentation will discuss WNTI's role in the recovery efforts for Apache trout and how the proposed NFHAP's Desert Fishes Habitat Partnership can meet the goals for conservation and recovery of desert fishes.

2007-11-15 11:45 **Desert Fishes Habitat Partnership: Preparing to meet National Fish Habitat Action Plan goals in arid landscapes**

Allan, Nathan[1]; Cantrell, Christopher J.*[2]; Sjoberg, Jon[3]. (1-Desert Fishes Council; 2-Arizona Game and Fish Department; 3-Nevada Department of Wildlife).

Over the past year we have made tremendous strides to meeting the required criteria of the National Fish Habitat Action Board to become a recognized partnership under the National Fish Habitat Action Plan. This presentation will be an up to date look at the Desert Fishes Habitat Partnership. We will discuss the scope of the partnership, who currently sits on the interim steering committee, accomplishments over the past year, and what we plan to achieve as a partnership in the future.

12:00 - 13:30 LUNCH

13:30 - 18:00 GENERAL SESSION - 2
Location: Pierpont Hotel, Pavilion.

2007-11-15 13:30 **Status of least chub, *Iotichthys phlegethontis*, in Utah**

Hines, Laura L.C.*[1]. (1-Utah Division of Wildlife Resources).

In 1995, the U.S. Fish and Wildlife Service determined that listing the least chub, *Iotichthys phlegethontis*, under the Endangered Species Act was warranted, and proposed to list the species as endangered with critical habitat. However following conservation actions under the management of the interagency Least Chub Conservation Agreement and Strategy, the Service withdrew the proposed rule.

The least chub, a small monotypic minnow endemic to the Bonneville Basin of Utah in the Great Basin of western North America, is faced with many threats including habitat loss through water diversion, development, and livestock grazing, and competition and predation by non-native fish introductions. The Least Chub Conservation Agreement and Strategy was initiated in 1998 in response to population declines evident through monitoring efforts. Several conservation actions were developed in the document and implemented with the goal of protecting and enhancing populations of least chub. Efforts that have taken place and that are underway include: habitat enhancement, habitat protection, restoring hydrologic conditions, nonnative species control, range expansion (surveys/inventory, baseline studies, genetic integrity, refuges/reintroductions), monitoring, mitigation, regulation, and information and education. Great achievements have been made to conserve, enhance, and protect the least chub populations since the initiation of the Conservation Agreement and Strategy. Yet, this past summer 2007, the least chub was again petitioned for listing under the Endangered Species Act. Since the first listing petition in 1995, many surveys and studies have provided valuable information and insight into least chub range, life history, and population status. Habitat enhancement projects and reintroductions have expanded the least chub range to more historical locations than before 1995. However new proposed water development projects threaten least chub populations in the Utah West Desert.

2007-11-15 13:45 **California Bioregion Report**

Parmenter, Steve*[1]; Yoshioka, Glenn[1]; Russi, Terry[2]. (1-California Department of Fish and Game; 2-Bureau of Land Management).

Owens pupfish were introduced to a new refuge pond (Mule Spring II) created by BLM. Remnant pupfish were encountered during trap surveys of the outflow ditch below Warm Springs refuge. Cattails have been successfully controlled in the upper pond at Warm Springs. Discussions with the landowner could lead to restoration of the lower pond, a Safe Harbor agreement, and reintroduction at this site. Pupfish habitat at artesian "Well 368" has contracted, possibly due to reduced flows. A single bass apparently devastated the pupfish population at BLM Spring, which recovered rapidly after removal of the predator. A UC Davis genetic study of Owens pupfish has begun. Owens tui chub populations investigated at Hot Creek are 2-3 times more abundant than reported in a 1986 study. A captive population of Long Valley dace was augmented from the single natural population, which appears to be at low abundance. Mohave tui chub populations appear stable. Plans are progressing to establish Mohave tui chub in new habitats at the private Lewis Center for Educational Research, interagency federal Desert Discovery Center, Mojave National Preserve, and Camp Cady State Wildlife Area.

2007-11-15 14:00 **Population status and habitat of the Saltillo chub, *Gila modesta***

Gómez Garza, Miguel Ángel*[1]; Chavarria Gallegos, Roberto[1]; Garza Tobon, Daniel[1]; Valdes Gzz., Arcadio[2]. (1-Consejo Mexicano de Peces del Desierto; 2-Universidad Autónoma Nuevo Leon).

The last population of Saltillo chub, *Gila modesta*, occurs near the city of Saltillo, Coahuila, in a little stream called "Los Chorros" at springs in the Zapaliname Mountains. The springs also contain exotic species, including variable platyfish, *Xiphophorus variatus* and mosquitofish, *Gambusia affinis*, and recently the owners of a nearby ranch added catfish *Ictalurus sp.*. Water diversions and pollution have dramatically reduced available habitat, and the last fish survive at only a few sites. The authors have been studying the Saltillo chub and its dramatic decline for the last two years.

2007-11-15 14:15 **Desert fishes research and management in Texas during 2007**

Edwards, Robert J.*[1]; Garrett, Gary P.[2]; Allan, Nathan L.[3]; Hubbs, Clark[4]. (1-University of Texas-Pan American, Department of Biology, Edinburg, TX 78539; 2-Texas Parks and Wildlife Department, HoH Fisheries Science Center, Ingram, TX 78025; 3-U.S. Fish and Wildlife Service, Austin, TX 78578; 4-University of Texas at Austin, Department of Integrative Biology, Austin, TX 78712).

A variety of conservation initiatives for desert fishes has been proposed or acted upon in the past year in Texas. Critical habitat was proposed for the Devils River minnow (*Dionda diaboli*); a reintroduction of Rio Grande silvery minnow (*Hybognathus amarus*) to the Big Bend region was proposed; and, the petition to list the San Felipe gambusia (*Gambusia clarkhubbsi*) as endangered was rejected. New pumps to maintain water in the pool and outlet at Phantom Lake Spring, one of the habitats of the endangered Comanche Springs pupfish (*Cyprinodon elegans*) and Pecos gambusia (*G. nobilis*), was completed. New refuge ponds were created for the Big Bend gambusia (*G. gaigei*) and Pecos pupfish (*C. pecosensis*). The Leon Springs pupfish (*C. bovinus*) is responding positively to its new "spawning territory" tiles and the lone population of Clear Creek gambusia (*G. heterochir*) is stable, although the earthen dam at the Clear Creek headwaters may need new repairs.

2007-11-15 14:30 **Translocation of Mexican stonerollers, *Campostoma ornatum*, in southeastern Arizona: A cooperative success**

Kline, S. Jason*[1]. (1-Arizona Game and Fish Department).

Rucker Creek, located on the western slopes of the Chiricahua Mountains in Southeastern Arizona, contains the last documented population of Mexican stoneroller, *Campostoma ornatum*, in the U.S. In June 2007, members of Arizona Game and Fish Department (AGFD), US Fish and Wildlife Service (USFWS), and the US Forrest Service (USFS) met at Rucker Canyon to capture *C. ornatum*, and remove rainbow trout, *Oncorhynchus mykiss*. Three teams split into three reaches to capture fish from Rucker creek with backpack electro shockers. We captured more than 200 stonerollers, removed an estimated 300 rainbow trout, and found small numbers of the Yaqui form of longfin dace, *Agosia chrysogaster* (mostly YOY's) in all reaches sampled. We double sorted all fish to ensure no trout were mixed in with the stonerollers, and moved 40 stonerollers above Rucker Canyon Dam to supplement the population above the dam. One hundred and fifty stonerollers were placed in fish haulers for transport to W. Turkey Creek and the remaining stonerollers were returned to lower Rucker Creek. Stonerollers taken to W. Turkey Creek were quarantined and treated for parasites with a saline bath and praziquantel at Austin's El Coronado Ranch (ECR). During the 24 hr quarantine, we sampled Big Tank for Yaqui catfish, *Ictalurus pricei*, with trammel and hoop nets. We also constructed and deployed catfish spawning structures into Big Tank. We captured 6 Yaqui catfish and found one of the fish to be gravid. Once the stonerollers' paraste treatment was complete, we stocked them into seven sites in W. Turkey Creek, 4 on the ECR, and 3 on USFS land. AGFD will monitor the new populations and supplement the stocking as needed.

2007-11-15 14:45 **Reintroduction of spikedace and loach minnow at Muleshoe Ranch**

Richardson, Mary*[1]; Blasius, Heidi[2]. (1-U.S. Fish and Wildlife Service, Arizona Ecological Services Office; 2-U.S. Bureau of Land Management, Safford District Office).

Spikedace (*Meda fulgida*) and loach minnow (*Tiaroga cobitis*), both listed as threatened species under the Endangered Species Act, are endemic to the upper Gila River basin of Arizona and New Mexico. Both species are in serious decline, with spikedace now common only in Aravaipa Creek, Arizona and portions of the Gila River, New Mexico. While presumed to still occur, spikedace populations in the Verde River and Eagle Creek, Arizona are much reduced. Loach minnow have a slightly wider distribution than spikedace, occurring in Arizona and New Mexico in the Blue and San Francisco rivers, Aravaipa Creek, portions of the upper Gila River in New Mexico, and some tributary streams to these rivers. Loach minnow are also presumed to occur in Eagle Creek. The last reintroduction efforts for either species occurred in 1968 and 1970, and those populations are now extirpated. In an effort to reverse the continuing decline of these species, management agencies have initiated captive propagation and reintroduction efforts. The first reintroduction effort in 27 years occurred this Fall at the Muleshoe Ranch Cooperative Management Area, which is managed by Bureau of Land Management, The Nature Conservancy, and the Forest Service. This reintroduction effort entailed a three-year planning process, including assessment of appropriate species, survey of suitable reintroduction sites, coordination with local landowners, relocation of the species, and development of a follow-up monitoring plan. The project was a coordinated effort between multiple agencies, including the Bureau of Land Management, U.S. Forest Service, U.S. Fish and Wildlife Service, the Arizona Game and Fish Department, the Arizona State Lands Department, Arizona State University, and The Nature Conservancy. This effort will serve as a pilot project to guide other reintroduction efforts for these species that are currently in the planning process.

2007-11-15 15:00 **Rio Grande silvery minnow conservation through augmentation and reintroduction**

Remshardt, W. Jason*[1]. (1-U.S. Fish and Wildlife Service, New Mexico Fishery Resouces Office).

This paper will detail the successes of the Rio Grande silvery minnow (*Hybognathus amarus*) stocking program, including lessons learned and how they will be applied in potential reintroduction efforts in Big Bend, Texas. Since June 2002, over 1,000,000 Rio Grande silvery minnow have been released into the Middle Rio Grande, New Mexico. Direct and indirect information indicates that hatchery raised individuals can be released back to the wild with excellent retention (97.5%) in or near original release sites, can be expected to survive at least 2 years after release, and ultimately can contribute to future spawning efforts. Propagation and augmentation is being used and/or considered for several native southwestern fishes as a management tool and the information from the Rio Grande silvery minnow program could assist in those efforts.

2007-11-15 15:15 **An assessment of long-term aquatic habitat change and Gila topminnow population trends for Cienega Creek, Pima County, Arizona**

Simms, Jeffrey R.*[1]; Bodner, Gita; Simms, Karen M.; Duncan, Douglas K.. (1-U.S. Bureau of Land Management; 2-The Nature Conservancy, Arizona Chapter; 3-U.S. Bureau of Land Management; 4-U.S. Fish and Wildlife Service).

Cienega Creek, Pima County, Arizona, currently supports the largest, most extensive Gila topminnow (*Poeciliopsis occidentalis*) population in the United States. Data were collected for 14 habitat parameters along 10 km of Cienega Creek in 1990 and 4 km in 4 separate reaches in 2000. Notable changes in aquatic habitat include increased overstory canopy, increased pool habitat area, increased instream cover, increased average pool depth and increased maximum pool depth. Topminnow population trend data was also collected over a 17 year period beginning in 1989. The upper half of the creek has shown a declining trend in topminnow abundance, including the loss of the species at 2 sites, while the lower portion of the creek has shown a relatively stable trend. As a result of Arizona BLM's riparian restoration strategy, a series of livestock exclosures have been constructed since 1990 to improve riparian and aquatic habitat conditions. The results of long-term monitoring indicate that riparian management is a "double edge sword" with both positive and negative consequences for Gila topminnow. The most detrimental aspects of riparian restoration to the Gila topminnow population appear to be heavy shading and large deposits of leaf litter that result in anoxic conditions that are exacerbated by low flow conditions related to a regional drought cycles.

2007-11-15 15:30 **Northeast Mexico Area, and Mexico National Coordinator reports**

Contreras-Balderas, Salvador[1]; Hendrickson, Dean A.*[2]. (1-Bioconservación A.C.; 2-Texas Natural Science Center, University of Texas at Austin).

The most outstanding activities of 2007 have been the development of three legislation projects. The first is the development of ecological flow regulation. It started as a proposal for a 10% standard flow. After two days of discussion the recommendation was to develop a model, considering the effects of width, depth, flow, and the fish community, and annual fluctuations to become adaptive. The second is the formulation of a model applying at least risk assessment, to regulate importations of aquatic species that pose high probability of becoming pests. In both projects most of the available information was provided by fish, and a few other species. The Mexican Official Norm 059 (Species at risk), was updated. Also, all three projects were handled by specialists with national representation. These projects, if approved, may provide more immediate benefits to conservation in arid zones, although they harbor some of the most threatened ecosystems in Mexico.

2007-11-15 15:45 **Report of a possible new pupfish, *Cyprinodon*, from the Río Sabinas basin, Coahuila, Mexico**

Garza Tobon, Daniel*[1]; Chavarria Gallegos, Roberto[1]; Gómez Garza, Miguel Ángel[1]; Valdes Gzz., Arcadio[2]. (1-Consejo Mexicano de Peces del Desierto; 2-Universidad Autónoma Nuevo Leon).

During recent sampling of springs and other waterbodies in the north of Coahuila, a possible new species of pupfish, *Cyprinodon*, has been encountered. It is located in an isolated spring near the Río Sabinas in Coahuila. Preliminary data suggest that it is closely related to the *Cyprinodon variegatus* complex.

2007-11-15 16:00 **Top-down and bottom-up effects on morphometric shape variation among populations of Utah chub, *Gila atraria***

Belk, Mark A.*[1]; Johnson, Jerald B.[1]; Schaalje, G. Bruce[2]. (1-Department of Biology, Brigham Young University; 2-Department of Statistics, Brigham Young University).

Shape is a complex, multivariate trait that determines in part how well an organism functions in its environment and thus its evolutionary fitness. Determining what ecological and evolutionary factors contribute to shape variation in a natural environment is central to understanding adaptation and evolution of shape. Utah chub, *Gila atraria*, is a widespread and variable cyprinid species native to the Bonneville Basin and upper Snake River drainage in the western U.S.A. We sampled populations with and without co-occurring predators and across a range of resource availability to determine effects of top-down (predation) and bottom-up (diet) forces on shape variation. Shape analysis was based on landmark-based geometric morphometrics methods. Both top-down and bottom-up forces affected shape of Utah chub and there was a significant interaction between the two. Both the magnitude and direction of shape change due to diet differed between predation environments. Effects of predation have primacy over effects of diet on shape variation consistent with the "life versus lunch" hypothesis. Shape variation in Utah chub exhibits a hierarchal response to multiple selective forces.

2007-11-15 16:15 **2007 Nevada Area Report: Overview and status of Nevada's desert fishes and rare amphibians; current research and management projects in the state**

Miskow, Eric*[1]; Goodchild, Shawn[2]; Heinrich, Jim[3]; Hobbs, Brian[3]; Sjoberg, Jon[3]; Clemmer, Glenn[1]. (1-Nevada Natural Heritage Program; 2-U.S. Fish and Wildlife Service, Southern Nevada Field Office; 3-Nevada Department of Wildlife).

Nevada waters contain 16 endangered and 6 threatened species of fishes as well as numerous un-described taxa. Brief updates on the population status of many will be presented: Ash Meadows pupfishes, *Cyprinodon* spp.; White River endemic fishes; Railroad valley tui chub, *Siphateles bicolor* ssp.; Railroad Valley springfish, *Crenichthys nevadae*; Moapa dace, *Moapa coriacea* and associated fishes in the head water springs of the Muddy River complex; new survey data and updates for relict dace, *Relictus solitarius*; current status of the Jarbidge population of bull trout, *Salvelinus confluentus*; preliminary status of several isolated tui chubs, *S. bicolor* spp., and speckled dace, *Rhinichthys osculus* spp. populations in Big Smoky and Monitor valleys. Survey data on the Amargosa toad, *Bufo nelsoni*, and the Columbia spotted frog, *Rana luteiventris*, are summarized. In addition to species updates, restoration efforts that enhance habitats for the Wall Canyon sucker, *Catostomus* sp., and the Railroad Valley springfish, *C. nevadae*, are discussed. A Nevada native fishes poster illustrated by Joseph Tomelleri and featuring 41 native and endemic fishes has been completed.

2007-11-15 16:30 **Characterization of genetic structure and levels of variation in wild and captive populations of Devils River minnow**

Conway, Carole A.*[1]; Fries, Joe N.[2]; Keeler-Foster, Connie[1]. (1-Dexter National Fish Hatchery & Technology Center, U.S. Fish & Wildlife Service; 2-San Marcos National Fish Hatchery & Technology Center, U.S. Fish & Wildlife Service).

We conducted the first population genetic analysis of Devils River minnow *Dionda diaboli* to address elements of the Recovery Plan for the species. Our goals were to determine whether there was geographic variation in the genetic structure of the species, to assess levels of variation, and to determine whether captive-bred stocks were genetically representative of source populations. We used seven microsatellite markers to genotype 268 tissue samples from four sites in the Rio Grande basin, Texas, and two captive-bred stocks from San Marcos National Fish Hatchery and Technology Center. We found highly significant differences between samples from the Devils River and Pinto Creek, sites that have been separated by Amistad Dam and Reservoir since 1969. We found no significant differences among samples from different sites within the Devils River basin. The sample from Pinto Creek had a very low level of variation relative to samples from the Devils River. However, there were no indications that Pinto Creek experienced a population bottleneck or that the level of inbreeding was significant. We found that the captive-bred stocks were representative of the wild populations in terms of allele frequency distributions and levels of variation.

2007-11-15 16:45 **Setbacks and progress in recovery of the Devils Hole pupfish during 2007**

Barrett, Paul J.*[1]; Wullschleger, John[2]; Sjoberg, Jon[3]. (1-U.S. Fish and Wildlife Service, Nevada Office; 2-National Park Service; 3-Nevada Department of Wildlife).

2007 presented a series of unforeseen challenges to recovery of the Devils Hole pupfish (*Cyprinodon diabolis*). The iconic nature of this species makes its status the subject of intense scrutiny both within and outside of the Desert Fishes Council. With the oversight comes additional funding and accountability. Several new biologists were added to the staffs of Death Valley National Park, U.S. Fish and Wildlife Service, and Nevada Department of Wildlife. Following firefighting and law enforcement models, the agencies established an ad hoc Incident Command Team that focuses solely on the recovery of the species. The Incident Command Team consults with the Devils Hole Recovery Team members individually and as a group and consuls with other biologists with specialized knowledge as needed to inform their recommendations.

Setbacks associated with the recovery include: 1) Limited success and the resulting decision to discontinue the use, at least temporarily, of both Hoover Dam and Point of Rocks Refugia, 2) Loss of most pure Devils Hole pupfish in captivity to a variety of maladies including nephrocalcinosis and lymphosarcoma.

Progress includes: 1) In Devils Hole, compared to 2006 counts, no decrease in the Spring seasonal pupfish survey and a 7% increase in the Autumn survey, 2) Establishment of a supplemental feeding regime in Devils Hole, 3) Bi-weekly larval surveys of Devils Hole, 4) Clarification of genetic questions surrounding the species, 5) Retrofitting, refurbishing, and isolation of Willow Beach National Fish Hatchery to maintain and research Devils Hole pupfish and hybrids, 6) Progress toward the construction of a new refuge and propagation facility near School Springs on Ash Meadows National Wildlife Refuge, and 7) Initiation of transparent decision-aiding process to inform future management actions.

2007-11-15 17:00 **Variation in visual estimates of abundance of adult and larval Devils Hole pupfish**

Bower, Michael R.*[1]. (1-Death Valley National Park).

Abundances of adult and larval Devils Hole pupfish (*Cyprinodon diabolis*) are known to fluctuate in response to both seasonal and annual variation in features of the environmental carrying capacity, such as primary and secondary production and physicochemical conditions. This multitude of potential sources of environmental variation operating at diverse temporal scales has complicated the isolation of factors that may be responsible for a recent decline in population size. Additionally, variation in visual abundance may be due to bias and methodological error, both of which may decrease accuracy of estimates. Variation within two primary response variables (i.e. adult and larval abundance) for the Devils Hole pupfish population could act to mask biologically meaningful responses by decreasing statistical power. Given the small size of the Devils Hole pupfish population, it is important to recognize biologically significant responses of the population to both prevailing habitat conditions and management prescriptions, and to separate these sources of variation in pupfish abundance estimates from those induced by sampling methodology. In this paper, variation within estimates of adult and larval Devils Hole pupfish abundance will be described with reference to several potential sources of imprecision and/or bias. A preliminary analysis of the statistical power of visual methods to detect changes in abundance will be presented.

2007-11-15 17:15 **Population assignment, hybridization, and genetic drift in refuge populations of the Devils Hole pupfish *Cyprinodon diabolis***

Zegers, Gerard P.*[1]; Baker, Sherri[1]; Echelle, Anthony[2]; Storey, Krista[1]; Keeler-Foster, Connie[1]. (1-Dexter National Fish Hatchery and Technology Center; 2-Oklahoma State University, Department of Zoology).

Refugial populations of Devils Hole pupfish, *Cyprinodon diabolis*, have been established to safeguard the species from extinction. The refuge populations have suffered from outright failure, dramatic fluctuations in population size, and possible hybridization with Ash Meadows Pupfish, *Cyprinodon nevadensis mionectes*. Twelve microsatellite loci were used in assignment tests to determine if 226 pupfish (held at Willow Beach National Fish Hatchery, salvage, and historic samples) belong to pure *C. diabolis*, *C. n. mionectes*, or Point of Rocks hybrid groups. Using maximum likelihood methodologies all fish fell into the three groups with 95 percent probability. Using Principal Components Analysis six putatively *C. diabolis* individuals failed to classify. Of the 62 *C. diabolis*, 56 were from the Hoover Dam refugium and the remaining six (the same fish that failed to classify) came from Devils Hole. Our results confirm the hybridization event at Point of Rocks and suggest that significant genetic drift has taken place within the Hoover Dam refugium.

2007-11-15 17:30 **Have refuge programs for the Desert pupfish complex been effective in conserving genetic diversity?**

Echelle, Anthony A.*[1]; Koike, Haruku[1]; Loftis, Dustin[1]; Van Den Bussche, Ronald A[1]. (1-Oklahoma State University, Department of Zoology).

Successful management of artificially propagated stocks of threatened organisms is measured largely on the basis of how much of the wild genetic diversity is preserved. Refuge stocks of the federally endangered Desert Pupfish complex, *Cyprinodon macularius* and *C. eremus*, have been maintained in semi-natural situations in a variety of private and public facilities since the 1970s. In this analysis, we examined microsatellite DNA variation in most wild populations (7 loci for each species) and 30 refuge populations (4 loci for each species), some of which have been maintained since the 1970s. These included 10 refuge lineages (31 populations), each comprising a group of populations descended from an original translocation from the wild. Wild populations showed high within-population genetic diversity (avg. heterozygosity = 0.84-0.93; alleles/locus = 11.9-17.1). About 22% of total genetic diversity in the wild populations was attributable to differences between the two species. Within species, only about 3% of total diversity was attributable to differences among populations. Individual refuge populations showed consistently large declines from the diversity present in the wild. However, global diversity of the refuge programs for the two species was within the range of variation in wild populations. The global effective population size (N_e) of the refuge program between the present and the time of the original translocations from the wild was 742 (95% CI = 477-1156) for *C. eremus* and 1059 (CI = 777-1404) for *C. macularius*. These are moderately greater than the minimum (N_e = 500) recommended by some authors for longterm preservation of evolutionary adaptability. The effectiveness of the refuge program can be heightened by implementing artificial immigration among lineages and by periodic inoculation from wild populations, in combination with genetic monitoring.

2007-11-15 17:45 **Possible environmental/behavioral manipulations to increase population size in (*Cyprinodon diabolis*)**

Liu, Robert K.*[1]. (1-Ornament Magazine).

Population levels of *Cyprinodon diabolis* are at a historic low, with high natural mortality in the natural population. This situation may encourage the transfer of more specimens to artificial sanctuaries and aquarium breeding attempts, although both these means have failed in producing additional fish for re-introduction. Traditionally, changes in temperature, photoperiod, water quality or quantity, spawning substrate, food quality/quantity and physical, but not visual, isolation have induced spawning in cyprinodonts. The author will discuss application of these techniques to *Cyprinodon* and other cyprinodonts. Most of these manipulations are difficult in situ, although feeding at Devils Hole has been initiated but there have been no published observations on resulting behavior (although the Los Angeles Times, 2/6/07, reports a remote camera at the site; coupled with an underwater camera, an overhead digital camera could be invaluable in capturing data on feeding, reproductive and other behavior on the crucial shallow shelf.). No doubt an isolation method was used in the aquaria breeding attempts, but in this case it is not a lack of spawning, but low hatch rates and no survival of larvae that are the problem. Correlation of number of spawning acts to number of eggs recovered, as well as tracking rates of fertilization and at what stage embryos or larvae died will provide vital information if we are to have any success with this most difficult to breed of *Cyprinodon* species. If the recent finding of lymphosarcoma in one specimen is widespread in the population, it also may be a contributing factor to low reproductive success and the decline of the population in Devils Hole within the last few years.

Friday, 16 Nov. 2007

09:00 - 12:00 GENERAL SESSION - 3
Location: Pierpont Hotel, Pavilion.

2007-11-16 09:00 Estuarine habitat type and restoration: Implications for evolution, speciation and endangerment: A tale of two goby genera *Gillichthys* and *Eucyclogobius*

Jacobs, David K.*[1]; Ellingson, Ryan A.[1]; Earl, Dent A.[1]; Louie, †Kristina D.[1]; Bardeleben, Carolyne[1]; Swift, Camm C.[2]; Findley, Lloyd T.[3]. (1-UCLA, Dept. of Ecology and Evolutionary Biology; 2-Los Angeles County Museum of Natural History; 3-CIAD, A.C.-Unidad Guaymas en Estudios de Calidad, Conservacio`n y Desarrollo Sustentable).

Gillichthys and *Eucyclogobius* are two west coast estuarine goby genera. *Eucyclogobius* resides in the seasonally closed estuarine habitat produced by the Mediterranean climate of the State of California. *Gillichthys* is a denizen of muddy channels and pits in estuarine settings that are often more continually open to the sea – it is distributed from the State of California around Baja California and the Gulf of California. Population differentiation and potential speciation occur on a very local scale in *Eucyclogobius*; local metapopulation dynamics and local genetic differentiation appear to be controlled by the closure process related to seasonal stream flow. *Eucyclogobius* is negatively impacted by anthropogenic opening of estuaries, and the most genetically distinct southern *Eucyclogobius* appear to be at risk of extinction due in part to efforts to "restore" estuaries to open conditions. In contrast, *Gillichthys* differentiates genetically on a regional scale and may benefit from opening of estuaries. However, a genetically distinct *Gillichthys* endemic to the estuary of the Colorado River could be at risk due to the elimination of fresh water in that system.

2007-11-16 09:15 Population genetic analysis and DNA barcoding allows detection of cryptic variation in the *Gammarus pecos* (Crustacea: Amphipoda) species complex

Seidel, Richard A.*[1]; Lang, Brian K.[2]; Berg, David J.[3]. (1-Dept. of Zoology, Miami Univ., Oxford, Ohio; 2-New Mexico Dept. of Game and Fish, Santa Fe, New Mexico; 3-Dept. of Zoology, Miami University, Hamilton, Ohio).

Amphipod crustaceans comprising the *Gammarus pecos* species complex are endemic to spring systems associated with the Pecos River of New Mexico and Texas. However, identification and monitoring of these amphipods is hindered by their high rate of cryptic morphology, which potentially conceals important biodiversity within this complex. Here we present the results from a rapid, barcoding-based method for the molecular detection of provisional species which likely merit separate species description and consideration for state and/or federal protection. We sequenced mitochondrial DNA regions corresponding to the cytochrome oxidase I (COI) and 16S rRNA genes from amphipods in 12 extant populations of this complex. For COI, we obtained 163 gene sequences and 90 haplotypes. Each New Mexico spring contained on average 12.2 COI haplotypes (range: 4 - 34 haplotypes) and each Texas spring contained on average 3.5 COI haplotypes (range: 1 - 7 haplotypes). Overall for COI, the mean intrapopulation sequence divergence was 1.2% (range: 0.1 - 3.7%) and the mean interpopulation sequence divergence was 14.2% (range: 0.5 - 23.4%). For 16S, we obtained 168 gene sequences and 58 haplotypes. Each New Mexico spring contained on average 7.0 16S haplotypes (range: 2 - 18 haplotypes) and each Texas spring contained on average 3.5 16S haplotypes (range: 2 - 6 haplotypes). Overall for 16S, the mean intrapopulation sequence divergence was 0.3% (range: 0.06 - 0.54%) and the mean interpopulation sequence divergence was 8.7% (range: 0.2 - 17.2%). Our genetic analyses have revealed the presence of at least five provisional species across this spring system. Now with the understanding of how genetic diversity is distributed within and among populations in this system, resource agencies can formulate appropriate management and conservation strategies based on the fauna supported at each spring.

2007-11-16 09:30 Microsatellite loci and population genetics for the Owens pupfish, *Cyprinodon radiosus*

Finger, A. J.*[1]; Parmenter, S.[2]; May, B. P.[1]. (1-Univ. Calif., Genomic Variation Lab; 2-Calif. Dept. Fish and Game).

We report the results of testing microsatellite primers developed in other pupfish species in the Owens pupfish, *Cyprinodon radiosus*. *Cyprinodon radiosus* was once common in the Owens River valley and associated aquatic habitats prior to the 1940s, but nearly went extinct as a result of predatory fish introductions and habitat loss. Five extant populations occur in Inyo and Mono Counties, CA: Well 368, BLM Spring, Pond 'D' near BLM Spring, Mule Spring, and Marvin's Marsh. Mule Spring was founded in 2007 with fish from BLM Spring. All populations are the result of multiple founding events and translocations over the past 37 years, and all descend from a single founder population of 800 fish in 1969. To reduce extinction risk from genetic and stochastic factors, it is important to found new populations of *C. radiosus* - a process warranted by the 1997 multi-species recovery plan for Owens Valley. By discovering which primers are useful in *C. radiosus*, genetic information concerning differentiation between and among populations (He, Fst, allelic richness, inbreeding, etc.) can be analyzed and used to make recommendations for which fish should be used to found new populations.

2007-11-16 09:45 Homeless bugs: Consequences of hydrologic failure in a desert spring

Bogan, Michael T.*[1]. (1-Oregon State University, Zoology Department).

Perennial springs in the arid Southwest often support an incredible diversity of freshwater organisms. From 2003 to 2007, I studied the aquatic insect community of spring-fed French Joe Canyon (Whetstone Mountains, SE Arizona), identifying at least 53 insect taxa. The spring was perennial with a stable temperature regime until April 2005, when it failed completely and went dry for several months. Intense monsoon rainfall caused flooding and recharged the spring in late summer 2005, and by November 2005 more than 29 species had recolonized the spring. Most of the colonists were adult beetles and true bugs, but within months many odonate species had returned as well, via egg oviposition by adults. Since then, however, the spring has been unstable with varying temperatures and water levels, and partly failed again in November 2006 and May 2007. As a result of this shift from perennial to ephemeral conditions 6 species were extirpated, including the population of giant water bugs (*Abedus herberti*) which, from genetic evidence, has likely been isolated at French Joe Spring since at least the Pleistocene. Other taxa exhibited signs of ecological release and were much more abundant after the extirpation of the top predator (*A. herberti*) and interspecific competitor taxa. French Joe Canyon could serve as a model system for understanding changing community and hydrologic dynamics at springs across the Southwest under intensified interannual drought regimes or anthropogenic aquifer depletion.

2007-11-16 10:00 **Spawning and culture of headwater chub (*Gila nigra*)**

Sontz, Erica A*[1]; Bonar, Scott A[1]. (1-University of Arizona).

Headwater chub (*Gila nigra*) is an imperiled desert fish found in mid-elevation streams in Arizona that wasrecently approved as a candidate for Threatened status under the Endangered Species Act. Little is known about culture techniques for this species. We captured adult headwater chub from Fossil Creek, AZ above the Salt River Project diversion dam in 2005 and 2006. Fish were housed at the University of Arizona and spawned by simulating a winter drop in temperature accompanied by decreased photoperiod followed by an increase in temperature and photoperiod. Fish spawned at 18 degrees Celsius (C). We collected and hatched eggs in separate hatching tanks. We cultured fish at three different sizes: newly hatched larvae, small juveniles and large juveniles at multiple temperatures: 17-27 degrees C for larvae and 19-30 degrees C for juveniles; at multiple densities: high, medium and low for larvae and high and medium for juveniles; and with several feeds, including natural and artificial feeds, to test for the effects of hatchery conditions on growth and survival. Preliminary data suggest that larvae show the most growth at 27 degrees C when fed "natural" feed (a mix of decapsulated brine shrimp and plankton). Larvae grew less at water temperatures below 20 degrees C, and growth on artificial feed and supplemented artificial feed types did not differ. The densities tested had no significant effect on growth in larvae. Preliminary analysis of juvenile results indicates trends similar to those of larvae for temperature and density but reversed for feed type. Our research should prove useful if supportive breeding becomes necessary for this species.

2007-11-16 10:15 **Estimating dispersal of spring invertebrates through genetic diversity in threatened habitats of the Great Basin**

Stutz, Heather*[1]; Shiozawa, Dennis[1]; Tanner, Keith[1]; Evans, R. Paul[2]; Rader, Russell[1]. (1-Brigham Young University, Department of Biology; 2-Brigham Young University, Department of Microbiology and Molecular Biology).

The Southern Nevada Water Authority has begun to develop water rights to carbonate aquifers in many isolated basins of eastern Nevada. Springs in pluvial lake beds are at risk of drying if the surface water table is depressed by the pumping. It is unknown how unique the invertebrate communities in these springs are within or between basins. Furthermore, it is unknown which taxa are capable of recolonizing if dried springs are restored through mitigation efforts. Analyses on *Hyallela azteca*, a poor dispersing amphipod, in the Great Basin have revealed a tremendous degree of cryptic diversity and endemism despite morphologically being recognized as a single species (Witt et al. 2006, Mol. Ecol.15:3073-3082). We hypothesize that aquatic invertebrates with low dispersal ability will tend to be more unique, in terms of genetic diversity, within basins than between basins compared to invertebrates with high dispersal ability. Multiple springs from each of six basins were qualitatively sampled. Two of these basins will be directly impacted by the pumping project. Cytochrome c oxidase subunit I, a mitochondrial gene, and the large ribosomal subunit 28S, a nuclear gene, were amplified from isolated *H. azteca* DNA and sequenced. A parsimony phylogeny with well supported bootstrap values showed great divergence between spring populations. Genetic divergence averaged 4% within populations and 15% between. Snake Valley populations were especially different from the other basins and separated out early in the phylogeny. These preliminary results are part of a population genetics study of strong and weak dispersers in these systems.

2007-11-16 10:30 **Comparison of two net-pen designs for the grow-out of juvenile June suckers, *Chasmistes liorus* in Utah Lake**

Billman, Eric J*[1]; Belk, Mark C[1]. (1-Brigham Young University, Department of Biology).

The June sucker, *Chasmistes liorus*, is an endangered species endemic to Utah Lake, a shallow lake in the Bonneville basin. Recovery efforts have focused on producing hatchery-reared fish to bolster the population in the lake. Due to concerns about the fitness of hatchery-reared fish, managers have begun searching for alternative sites to acclimate hatchery-produced suckers prior to stocking them into Utah Lake. Recent studies indicated that larval suckers could be reared in net pens or cages in Provo Bay of Utah Lake during the summer months, before stocking them into the lake, thus providing wild-reared suckers. We tested two designs of large cages (4 x 2.5 x 1 m), one fixed to the substrate and one floating, to examine survival and growth of hatchery produced larval June suckers at two densities (50 and 150 fish/m^2). Survival and growth was determined after 66 d (10 July – 14 September). The mean survival of June sucker in all cages was approximately 50%. Growth rates were higher in the floating cages than in fixed cages, and higher in the low density compared to the high density. Growth rates ranged from 0.44 – 0.67 mm/d. These results demonstrate that cages can be used to raise wild-reared suckers at low cost.

2007-11-16 10:45 **Genetic relationships of moutain sucker and bluehead sucker based on mitochondrial DNA**

Laitinen, Nina J.*[1]; Shiozawa, Dennis K.[1]; Evans, Paul R.[1]. (1-Brigham Young University, Department of Integrative Biology; 2-Brigham Young University, Department of Biology; 3-Brigham Young University, Department of Microbiology and Molecular Biology).

Mountain suckers, *Catostomus platyrhynchus*, are widespread in the western U.S. and co-occur with bluehead suckers, *C. discobolus*, in three separate basins: the Bonneville, Colorado, and the Upper Snake River. Bluehead suckers are thought to have invaded the Upper Snake River and Bonneville basins from the Green River of the Colorado River Basin, and mountain suckers may have invaded in the opposite direction from the upper Snake River. We examined mountain sucker and bluehead sucker mitochondrial DNA from the Colorado River and the Bonneville basins and mountain sucker from the upper Snake River. Based on cytochrome b, bluehead suckers from the Upper Green River Basin had about 0.8% sequence divergence. Approximately 2.6% to 2.8% sequence divergence separates the mountain sucker in the Bonneville Basin from bluehead suckers. However, bluehead suckers in the Weber River of the Bonneville Basin differed from those in the Green River by about 2.2% sequence divergence. In addition, specimens that morphologically appeared to be mountain suckers in the Snake River drainage basin (Raft River of northern Utah) and from the upper Green River (Blacks Fork, UT) contained mitochondrial DNA that was more similar to bluehead sucker than to mountain suckers. Mountain suckers from the Blacks Fork were similar to Green River bluehead suckers and the Raft River mountain suckers were similar to Weber River bluehead sucker.

2007-11-16 11:00 **Behavioral and molecular evidence for hybridization between *Gambusia nobilis* and *Gambusia affinis***

Swenton-Olson, Daniella*[1]; Kodric-Brown, Astrid[1]; Turner, Thomas[1]; Osborne, Megan[1]; Wilson, Wade[1]. (1-University of New Mexico, Department of Biology).

Gambusia nobilis is a federally endangered fish that is now restricted to only four populations in New Mexico and Texas. Its highly invasive sister species, *G. affinis* has been introduced to the habitat of the New Mexico *G. nobilis* populations. It is unclear if the species are readily hybridizing or segregating via behavioral or ecological means, thereby maintaining unique species' identities. In laboratory studies we examined both species' mating preferences in both male and female mate choice trials. Although males of both species had a clear preference for conspecific females, females of both species had a preference for *G. affinis* males, suggesting that hybridization could be facilitated by female *G. nobilis*. This is cause for concern because presumed hybrids have been found in areas where these species co-occur, so the persistence of *G. nobilis* as a genetically distinct species is now in question. To determine if the mate choice trials are an accurate proxy for actual mating behavior we are using microsatellite and mitochondrial DNA data to determine the degree of hybridization and introgression between the two species at Bitter Lake National Wildlife Refuge outside of Roswell, NM. To identify the potential role of hybridization and introgression, we are genetically screening *Gambusia affinis* and *G. nobilis* individuals collected from Bitter Lake NWR, NM in 2006 and 2007 in areas of allopatry as well as areas of presumed hybridization. Individuals were screened for variation at six microsatellite loci and a partial fragment of the CytB gene in the maternally inherited mitochondrial DNA.

2007-11-16 11:15 **Using Geographic Information Systems to delineate native fish and sport fish management areas in the Verde River watershed, Arizona**

Kretschmann, Anne*[1]; Bonar, Scott[1]; Young, Kirk[2]. (1-University of Arizona; 2-Arizona Game and Fish Department).

There is an increasing need in the Southwestern United States for development of watershed-level fisheries management plans that incorporate both native fish conservation and sport fishing opportunities. This project provides a basis for the development of a watershed-level fisheries management plan for the Verde River watershed in Arizona, by utilizing Geographic Information Systems (GIS) to build a landscape-level view of fisheries resources in the watershed.

The current process for developing watershed-level fisheries management plans in Arizona involves dividing the watershed into native and nonnative fish management units and requires substantive discussion, collaboration, and time. GIS offers tools to reduce conflict between native and nonnative fish while streamlining the decision-making process. A GIS data framework can delineate discrete management units with specific management emphasis (e.g. native fish, sport fish, or other aquatic wildlife) by identifying geologic, hydrologic, and biologic isolating mechanisms between management units. Inter-unit and intra-unit conflict, as well as conflict between experts regarding management decisions, can be minimized through the use of GIS techniques.

A more streamlined and efficient decision-support system will expedite the process of developing watershed-level fish management plans by allowing managers to focus on priority units (e.g. those with native and sport fish conflict) while still providing a framework to efficiently address all other management units. Automated decision-making systems could expedite the process of developing management plans by decreasing the amount of discussion needed while increasing efficiency through integration of qualitative and quantitative GIS variables into the decision-making process. Using the Verde River as a model, this project provides an implementation tool for fisheries managers of other watersheds that will reduce conflict between native fish and nonnative fisheries.

2007-11-16 11:30 **Bluehead sucker (*Catostomus discobolus*) of the Weber River, Utah: A population in peril**

Webber, Peter*[1]; Thompson, Paul[1]. (1-Utah Division of Wildlife Resources).

Historically, bluehead sucker (*Catostomus discobolus*) occupied numerous drainages in the Bonneville Basin. Since 1988, extensive survey efforts have documented an absence of bluehead sucker from historical habitat with the exception of the Weber River. Between 2000 and 2005, only 22 individuals were documented in the Weber River and all but three were found within a 1.6 km reach of river near Coalville, Utah. Recent genetic research on the Weber River bluehead sucker indicate that this population has a unique mitochondrial DNA lineage and may be considered a unique species. Based on this information, we considered that this small population had the potential of becoming extinct. Our research during the summer of 2007 was thus intended to obtain baseline information, obtain an adult population estimate, determine movement, and obtain additional tissue samples for genetic analyses. In an attempt to obtain a population estimate we completed a two-pass, mark recapture effort in the entire 11.5 km reach between Rockport and Echo reservoirs. This effort resulted in the capture of 125 individuals, which equated to a population estimate of approximately 215 bluehead suckers. Of the 125 bluehead suckers captured, some had been PIT-tagged during previous years and these had grown only a few millimeters. In addition, only five juveniles (200 mm or less in length) were captured, indicating a senescent population. In August 2007, we installed two stationary flat plate antennas within the 1.6 km occupied reach and we hope to obtain movement results as early as this fall. Considering the genetic background and potential lack of recruitment and/or reproduction, we feel this population is imperiled and warrants additional research and management focus.

2007-11-16 11:45 **Avian predation: habituation, industry perception, and field investigation**

Schooley, Jason D.*[1]; Marsh, Paul C.[1]; Dowling, Thomas E.[1]. (1-Arizona State University, School of Life Sciences).

An aquarium owner knows that pet fish learn when and how they will be fed - the water's surface. It can be argued that our hatchery-reared native fishes are simply aquarium fishes on a larger scale. They too learn that they are fed at particular places and times, adjusting their habits accordingly. Surface habituation, particularly due to surface feeding, can drastically alter the natural foraging behaviors of a demersal species like the razorback sucker. In the context of avian predation, surface habituation may impart a post-stocking survival disadvantage. An online questionnaire was submitted to 473 state, federal, and private fish aquaculture facilities to investigate feeding methodologies, prevalence of avian predation, opinions on habituation and its effects on post-stocking survival. Questionnaire results indicated some concern in regards to habituation, but in general, respondents expressed much uncertainty. To investigate the effects of surface habituation on razorback sucker, pond-reared fish were experimentally fed at 2 m below the surface for several months in an attempt to dehabituate. Post-stocking field observations provided insight into differential proportions of avian predation, depth preference, and overall survival.

12:00 - 13:30 LUNCH

13:30 - 16:00 GENERAL SESSION - 4
Location: Pierpont Hotel, Pavilion.

2007-11-16 13:30 **Native fish conservation, research and management in the upper/middle Rio Grande basin New Mexico, 2006/2007**

Davenport, Stephen R.*[1]; Brooks, James E.[1]; Remshardt, William J.[1]; Coleman, Stephanie M[1]; Propst, David L.[2]; Zymonas, Nik D.[2]; Platania, Steven P.[3]; Brandenburg, William H.[3]. (1-U S Fish and Wildlife Service, New Mexico Fishery Resources Office; 2-New Mexico Department of Game and Fish, Conservation Services Division; 3-American Southwest Icthchyological Researchers).

U. S. Forest Service (USFS), New Mexico Department of Game and Fish (NMDGF) & U.S. Fish & Wildlife Service (USFWS) surveyed Gila trout (*Oncorhynchus gilae*) populations in four streams and carried out two piscicide applications on the West Fork of the Gila River. Gila trout were stocked into Black Canyon and brood stock was collected from South Diamond and relocated to Mora NFH&TC.

American Southwestern Icthyological Researchers (ASIR) continued Rio Grande silvery minnow (*Hybognathus amarus*, RGSM) monitoring in 2006 and conducted RGSM spawning studies. Salvage of RGSM from dry river sections by USFWS continued, as did augmentation of the wild population, and captive propagation at Dexter NFH&TC and Albuquerque Biological Park. Twenty miles of Comanche Creek were treated with piscicide following extensive mechanical removal of non-natives. This treatment is part of a restoration of Rio Costilla watershed. The project will eventually reestablish Rio Grande cutthroat trout (*Oncorhynchus clarki virginalis*, RGCT), Rio Grande sucker (*Catostomus plebeius*) and Rio Grande chub (*Gila pandora*) to the watershed. University of New Mexico carried out genetic research on RGSM and RGCT. Water appropriations maintained surface flows on the Pecos River. Pecos bluntnose shiner (*Notropis simus pecosensis*) population trends are tracked through a long-term monitoring effort. Research at University of New Mexico established baseline genetics for the Pecos bluntnose shiner. A river restoration project by USFWS at Bitter Lake National Wildlife Refuge will reconnect oxbows to river flow, remove salt cedar and reconnect river to flood plain. Bigscale logperch (*Percina macrolepida*) and green throat darter (*Etheostoma lepidum*) monitoring is scheduled to begin by USFWS in 2007. Surveys by NMDGF in lower Pecos River found gray red-horse sucker (*Moxostoma congestum*) locally common, but blue sucker (*Cycleptus elongatus*) rare, and a larval series of gray red-horse sucker was developed.

A fish community monitoring effort by ASIR and NMDGF on the Canadian River of New Mexico continued. Sampling is focused on providing status information for four protected species: Sucker mouth minnow (*Phenacobius mirabilis*), southern redbelly dace (*Phoxinus erythrogaster*), Arkansas River speckled chub (*Macrhybopsis aestivalis tetranemus*) and Arkansas River shiner (*Notropis girardi*). In the Tularosa basin yearly monitoring of White Sands pupfish continued into year twelve, and the status of the fish is stable.

San Juan River fishery work continued with expansion of non-native removal by USFWS and partners. Release of Colorado pike minnow (*Ptychocheilus lucius*) and razorback sucker (*Xyrauchen texanus*) continued, and USFWS began experimental soft release techniques of Colorado pike minnow. Razorback sucker larval surveys by ASIR continued in 2006/07, as did monitoring of small bodied fish by NMDGF.

2007-11-16 13:45 **Developing a range-wide long-term monitoring strategy for Virgin River chub (*Gila seminuda*)**

Golden, Michael E.[1]; Bennion, Melinda R.M.*[1]; Fridell, Richard A.[1]; Rehm, Amos H.[1]; Wheeler, Kevin K.[1]. (1-Utah Division of Wildlife Resources).

The Virgin River Resource Management and Recovery Program (Program) was funded in 2002. In order to measure the effects that Program management activities were having on sensitive and endangered fish populations, effective long-term monitoring programs were necessary. Through 2004, seining was the primary method used in most sampling on the mainstem Virgin River. Since seining is not as effective for large-bodied fish, data on the status and trends of the adult portion of the federally endangered Virgin River chub (*Gila seminuda*) population were felt to be lacking. Therefore, in 2004, the Program funded a collaborative effort between state agencies, academia, and private experts to develop a range-wide monitoring program for Virgin River chub. The collaborative effort clearly defined several sampling techniques that were effective at collecting different size classes of Virgin River chub, however, it also illustrated the difficulties in finding a feasible method to accurately detect population trends.

Since 2004, the Utah Division of Wildlife Resources (UDWR) has been attempting to adapt the methodologies developed in 2004 to provide a feasible monitoring program to track range-wide trends in population abundance and size-structure of Virgin River chub. UDWR personnel have found that using a standard number of hoop nets to sample several small stations throughout a longer geographic area can show differences in abundance for juvenile and adult Virgin River chub. Using these data in conjunction with already existing seining data should provide a range-wide picture of reproduction, recruitment, and adult survival. Multiple years of data collection should be able to determine the status and trends of the Virgin River chub population in the Virgin River.

2007-11-16 14:00 **Renovation of Fresno Canyon for restoration of Gila topminnow**

Kline, S. Jason*[1]; Mitchell, Don[1]. (1-Arizona Game and Fish Department).

Fresno Canyon is a tributary of Sonoita Creek located in the Sonoita Creek State Natural Area of southern Arizona. It is home to a population of endangered Gila topminnow *Poeciliopsis occidentalis occidentalis*, and green sunfish *Lepomis cyanellus*. In June of 2007, members of Arizona Game and Fish Department (AGFD) together with members from Arizona State Parks completed a chemical renovation of Fresno Canyon to provide a refuge population of Gila topminnow by eliminating the green sunfish. Approximately 1200 topminnow were captured prior to the renovation and transplanted to Coal Mine Spring, an AGFD owned property and refuge of topminnow located just up drainage of Fresno Canyon. The following day, two teams treated the 600 m wetted section of Fresno Canyon with the rotenone-based piscicide Prentox Synpren-fish. The following day the treatment was repeated and the fourth day a survey was conducted to confirm a complete removal of fish. The renovation resulted in a surprising number of green sunfish in the limited pools of the canyon and we noted several Sonoran mud turtles, *Kinosternon sonoriense*, feeding upon the dead fish during the renovation. We found several dead turtles, but only in pools of a slot canyon where the turtles were unable to exit the steep sides of the pools. Currently, only a small amount of anecdotal evidence, speculation and casual observation is available to support that rotenone is toxic to turtles; possibly through cloacal respiration, but to our knowledge no research exists for Sonoran mud turtles. However, we realize these impacts may be real, and recommend fishery managers take precautions when planning rotenone treatments in areas occupied by Sonoran mud turtles. A survey conducted one week later did show many mud turtles in Fresno Canyon and no fish present in the system. The monsoon rains have since washed Gila topminnow back into the canyon from Coal Mine Spring. We will continue to monitor the site and manage it for native fish, and expect the population to flourish in the absence of sunfish.

2007-11-16 14:15 **Optimizing control methods for an invasive crayfish**

Rogowski, David L.*[1]; Sitko, Suzanne[2]; Bonar, Scott A.[1]. (1-Arizona Cooperative Fish and Wildlife Research Unit, SNR, University of Arizona; 2-The Nature Conservancy, AZ).

The northern or virile crayfish (*Orconectes virilis*) has been introduced throughout the southwestern United States. These introductions have negatively impacted a variety of native species, including fishes, amphibians, snakes, snails, and vegetation. Additionally, due to their burrowing activities (as well as vegetation removal) erosion, siltation, and suspended sediments have increased. Control methods have been attempted in the past with little thought to the efficiency and effectiveness of particular methods. A popular control method involves trapping, however effectiveness varies due to crayfish activity and temporal susceptibility to traps. We are investigating the life history of four introduced populations of *O. virilis* within Arizona streams using capture-recapture methods. Results of these investigations will be used to construct population models with the goal of determining the most effective and efficient means of crayfish control or eradication. Preliminary results (over the past 6 months) reveal that survival and capture probability varies by site and season. Depending on the site these parameters can also vary by sex. Control methods must be tailored to a particular time of year and technique to be effective at controlling or eradicating crayfish populations. The probability of capture appears to be highest in late summer after the monsoon season. Both male and female crayfish are more active at this time of year (mating season) and abundance is low compared to the previous four months. Future work will investigate the feasibility of control by concentrating trapping activities in certain seasons or areas.

2007-11-16 14:30 **Efficiency of mechanical control of nuisance populations of northern pike in small Arizona lakes**

Kuzmenko, Yuliya[1]; Specivy, Timofy[2]; Bonar, Scott A.*[3]. (1-Zaporizhzha State University; 2-Ukraine Institute of Fisheries; 3-USGS Arizona Cooperative Fish and Wildlife Research Unit).

Mechanical control of nonnative aquatic species has often been difficult; yet in some situations, fish populations have collapsed following mechanical control measures. In the Ukraine, northern pike (*Esox lucius*) are the top predator in many reservoirs of the Dnieper River. Here, mechanical removal methods reduced annual pike catch by an order of magnitude over a ten-year period. Northern pike can develop nuisance populations in Southwestern waters. Here we describe a joint Ukrainian/Arizona effort to research mechanical methods to suppress nuisance northern pike populations in Rainbow and Fool's Hollow Lake, Arizona. Researchers at the Arizona Cooperative Fish and Wildlife Research Unit, Zaporizhzha State University (Ukraine), The Ukrainian Institute of Fisheries, and the Arizona Game and Fish Department jointly selected four mechanical removal techniques. Ukrainian fyke netting with barrier nets to capture spawning fish in the spring, gill netting, electrofishing, and angler reward methods were tested simultaneously in the two lakes over a two-year period. We estimated gear efficiency by season, time of day, and weather conditions using a Jolly-Seber (POPAN) open-population model in program MARK based on capture-recapture methods. Initial data suggest gill netting and fyke netting with barriers fished in early spring were most effective.

2007-11-16 14:45 **Yellow bullhead diet in Aravaipa Creek, Graham and Pinal Counties, Arizona**

Conn, Jeff A*[1]; Blasius, Heidi B[2]; Reinthal, Peter[3]. (1-Bureau of Land Management, Volunteer; 2-Bureau of Land Management; 3-University of Arizona, Ecology and Evolutionary Biology).

Aravaipa Creek, located in southeastern Arizona, is considered one of the premiere native fish streams in Arizona, supporting seven native fishes, roundtail chub, *Gila robusta*, speckled dace, *Rhinichthys osculus*, longfin dace, *Agosia chrysogaster*, loach minnow, *Tiaroga cobitis*, Spikedace, *Meda fulgida*, Sonora sucker, *Catostomus insignis*, and desert sucker, *Pantosteus clarki*. In addition, three nonnative fish species, yellow bullhead, *Ameiurus natalis*, red shiner, *Cyprinella lutrensis*, and green sunfish, *Lepomis cyanellus*, also inhabit the mainstem and overlap with native fishes in the west (lower) end of Aravaipa Creek. Impacts of introduced red shiner and green sunfish on southwestern native faunas have been well documented in the literature, however, documentation of yellow bullhead impacts have not been and so remain uncertain. A diet study to investigate impacts of yellow bullhead on native fish in Aravaipa Creek was conducted from March 2005 through December 2006. A total of 243 yellow bullheads were collected and examined. Fourteen had consumed fishes and one had consumed a lowland leopard frog, *Rana yavapaiensis*. Of fishes consumed, 33% (5/15) were loach minnow, 40% (6/15) were longfin dace, 6.7 % (1/15) were desert and Sonora suckers, and 13.3 (2/15) were unidentified suckers. The majority of yellow bullheads consumed primarily macroinvertebrates.

2007-11-16 15:00 **Restoring a native fish community: Mechanical removal efforts in Bright Angel Creek, Grand Canyon National Park**

Sponholtz, Pamela*[1]. (1-USFWS).

The U.S. Fish and Wildllife Service is working with Grand Canyon National Park on a project to restore native fish populations in Bright Angel Creek, a small tributary to the Colorado River, using mechanical removal of nonnative brown trout (*Salmo trutta*). The purpose of this project is to enhance native fish populations and restore natural ecosystem values. Currently, Bright Angel Creek is home to nonnative brown and rainbow trout (*Oncorhynchus mykiss*) and native species such as speckled dace (*Rhinichthys osculus*) bluehead (*Catostomus discobolus*) and flannelmouth (*Catastomus latipinnus*) suckers. There is some evidence that endangered humpback chub (*Gila cypha*) use the inflow areas during some parts of the year. Nonnative brown trout were removed using two methods. The first method uses a weir placed at the mouth of Bright Angel Creek to intercept fish migrating upstream to spawn. During 2006, only 54 brown trout were captured in the weir, 87% lower than similar efforts in 2003 suggesting that river-wide changes in the mainstem Colorado, such as temperature, may be impacting migrating brown trout. The second method uses multi-pass electrofishing. In fall 2006, 158 brown trout were removed from a 3.35 km sampling reach in Bright Angel Creek. This represents an average of 55% of the estimated number of brown trout present in this reach. Abundance estimates for brown and rainbow trout varied greatly between the two species where rainbow trout densities were 3 and 1.6 times higher than brown trout. Length frequencies of rainbow and brown trout indicate a strong year class for both species from spawning events in spring 2006, yet mean sizes of both species did not exceed 150mm total length. The absence of larger individuals may indicate that summer temperatures exceed the thermal tolerances of trout, causing them to move into the colder mainstem Colorado River during the summer. The lack of larger fish also indicates that the weir was effective in intercepting migrating adults and that the dual approach of operating the weir and incorporating electrofishing as a removal method is effective in targeting different life history stages in Bright Angel Creek.

2007-11-16 15:15 **Recent habitat association and the historical decline of *Notropis simus pecosensis***

Hoagstrom, Christopher*[1]; Brooks, James[1]; Davenport, Stephen[1]. (1-New Mexico Fishery Resources Office).

Small-bodied riverine minnows that historically characterized fish assemblages of Great Plains rivers in North America have declined because of river fragmentation, dewatering, river channel degradation, river salinization, and nonnative species introductions. The Pecos bluntnose shiner *Notropis simus pecosensis*, a member of this guild, persists in one segment of the Pecos River, New Mexico, USA. We characterized habitat associations for the species at two spatial scales. In general, *N. simus pecosensis* associated with fluvial habitats, but velocity association depended on size, with larger individuals using swifter habitats. All *N. simus pecosensis* associated with relatively low depths (3 to 51 cm). Such habitat was most abundant in sites with relatively wide river channels (> 25 m) and during periods with intermediate discharges (0.5 to 4.0 m^3s^{-1}). Correspondingly, *N. simus pecosensis* was most abundant at such sites. Other characteristics that set this river sub-segment apart were relative high median discharge and relatively low salinity. This sub-segment is replenished by uncontrolled tributaries that maintain a wide river channel with a shifting-sand substrate, creating a dynamic habitat mosaic. High river segment length is also a factor because *N. simus pecosensis* eggs and larvae are prone to downstream displacement. Short river segments with narrow river channels facilitate high displacement into downstream reservoirs where they presumably perish. No unoccupied Pecos River segment appears to be suitable for *N. simus pecosensis*. Habitat restoration opportunities exist within the occupied segment via base flow enhancement and river channel restoration and these may be necessary to conserve the species.

2007-11-16 15:30 **Recent observations on the status of the Yaqui catfish (*Ictalurus pricei*) in the United States and northwest Mexico**

Hendrickson, Dean A.[1]; Varela-Romero, Alejandro*[2]; Brooks, James E.[3]; Ulivarri, Manuel[4]. (1-Texas Natural Science Center, University of Texas at Austin; 2-Department of Science and Technology Research, University of Sonora; 3-U.S. Fish and Wildlife Service, Albuquerque; 4-U.S. Fish and Wildlife Service, Dexter National Fish Hatchery and Technology Center).

We review the conservation status of, and conservation actions for, Yaqui catfish, *Ictalurus pricei*, endemic to the Yaqui, Mayo and Fuerte river basins in Sonora, Chihuahua and Sinaloa, Mexico and southeastern Arizona, U.S.A. Examination of specimens collected during an extensive survey of the entire Yaqui river basin's fish fauna in 1978 indicated that the species was hybridizing with introduced channel catfish (*Ictalurus punctatus*). In the late 1980's and 1990's the Arizona Game and Fish Department, U.S. Fish and Wildlife Service, and a number of Mexican and U.S. collaborators invested considerable effort to obtain captive stocks of genetically pure specimens from Mexico for propagation in the U.S. and eventual reintroduction into the species' historic range. Genetic and morphometric studies of the captive stock contracted by USFWS allowed hatchery managers to select a probably "pure" *I. pricei* broodstock and exclude suspected hybrids from propagation attempts. Though propagation of the species was eventually achieved after many failed attempts over nearly a decade, several year classes of offspring were finally obtained, but the captive brood stock and their progeny retained in captivity were lost to a variety of causes by 2005. Some progeny, however, were stocked into earthen ponds on a private ranch and a USFWS Refuge in southeastern Arizona where a few stocked individuals still survive. Monitoring of those localities has been sporadic and generally inadequate to assess the status of those stockings, but it now appears that these few small habitats may harbor potentially the last individuals of the species. In Mexico, wild populations had not been systematically surveyed since 1978, but data from scattered and sporadic more recent samples, starting with those that initiated the captive stock, indicated that genetically pure individuals of Yaqui catfish had become very rare and likely absent throughout most of its range. Our 2004 – 2006 field survey focusing on native catfishes provided the first extensive field data in nearly two decades on the low- to mid-elevation fish fauna of northwestern Mexico. We sampled in the Yaqui, Mayo and Fuerte river basins, and in most of the Pacific drainages of the Sierra Madre Occidental previously considered to harbor the "*I. pricei* complex" - the Sinaloa, Culiacan and San Lorenzo. Our ongoing study of morphometrics, meristics and genetics appears to support earlier suggestions in the literature that *I. pricei* is indeed restricted to the Yaqui, Mayo and Fuerte basins, where it is very rare, with other undescribed species in the more southern rivers. Our data clearly argue that *I. pricei* should be considered critically endangered, but unfortunately a recent conservation status evaluation by the Mexican federal government's biodiversity division (CONABIO) that considers the more southern undescribed species to be *I. pricei* and proposes to retain the species in its current relatively low conservation status of "special protection". Conservation of the Yaqui catfish is a complicated issue with much remaining to be learned, but it is now clear that current levels of protection do not adequately reflect its critical conservation plight and management efforts to date have failed to provide appropriate, long-term conservation strategies and actions, and much-needed research. We propose several activities to improve our knowledge of the species' true conservation status and to better protect and assure its long-term conservation.

2007-11-16 15:45 **The peculiar catfishes of the Modoc Triangle**

Reid, Stewart B.*[1]. (1-Western Fishes).

Blind bullhead catfishes in Dog Lake, Oregon (Goose Lake Basin) were first recognized in the 1960's to represent a significant portion of the population. These specimens were identified as the non-native brown bullhead (*Ameiurus nebulosus*), first introduced into California in 1874 and since widely dispersed about the West. Subsequent collections have encountered six additional populations containing large percentages of the blind phenotype, all in the Goose, Klamath and upper Pit River basins ("Modoc Triangle"). These specimens exhibit coloration distinct from that of sympatric phenotypic brown bullheads. No native bullheads are known from west of the Rockies, however, the Pliocene Lake Idaho fish fauna and other localities with similar fishes in the west did contain *Ameiurus* spp. Furthermore, available vocabularies from pre-1900 tribes in the region record the existence of words for "bullhead", although it is not fully clear whether this applies to sculpin (*Cottus* spp.) or to a catfish. However, native myths include a "bullhead" character with behaviors that suggest a catfish. The ongoing investigation of the puzzling identity and origin of this blind phenotype is part of a broad project including exploration of paleontological, ethnographic, osteological, biogeographic, historical and genetic lines of evidence, as well as continuing field explorations.

16:00 - 17:00 POSTER SESSION and COFFEE BREAK

Location: Pierpont Hotel, Camulos Rooms - Pavilion and Veranda.

POSTER - Effect of exercise and predator acclimation on swimming performance and survival of hatchery-reared razorback suckers

Mueller, Gordon A.[1]; Carpenter, Jeanette*[1]; Krapfel, Robert W.[2]; Figiel, Chester R. Jr.[2]. (1-USGS; 2-FWS).

We conducted experiments to test if physical and behavioral conditioning would improve predator avoidance skills of hatchery-reared razorback suckers, *Xyrauchen texanus*. We exercised razorback suckers (15-29 cm TL) in raceways with current velocities that increased from 7.5 cm/s to 30 cm/s over a 10-week period. We used a velocity chamber to measure swimming performance, and found that 50% more exercised fish than control fish attained critical flow velocities of 2.5 body lengths/s or higher. When razorback suckers and one large (>45 cm) flathead catfish, *Pylodictis olivaris*, were placed in a 4-m diameter tank that included a predator-free zone, the razorback suckers initially appeared curious; they showed no sign of avoidance and used the two zones equally. However, following the first predation event, use of the predator-free zone nearly doubled. In a separate test, we placed equal numbers of exercised and un-exercised razorback suckers together with 5 large flathead catfish (57-84 cm TL) in a 7-m diameter tank. The mean percent mortality of exercised fish (33% ± 6.2 SE) was significantly lower than for un-exercised fish (51% ± 7.3 SE). We then placed equal numbers of exercised razorback suckers that had been previously exposed to a predation event (treatment fish) and predator-naïve, unexercised razorback suckers (control fish) with 5 large flathead catfish. The mean percent mortality of treatment fish (31% ± 4.4 SE) was significantly lower than for control fish (46% ± 4.9 SE). These tests illustrated that hatchery-reared razorback sucker were naïve to flathead catfish as a predator; that predator avoidance was a learned behavior; and that exercised and predator-savvy fish had higher swimming performance and survival rates.

POSTER - Evaluation of handling stress in the bonytail chub *Gila elegans*

Montony, Andrea*[1]; Elekonich, Michelle[2]. (1-Bureau of Reclamation, Lower Colorado Region; 2-University of Nevada, Las Vegas, School of Life Sciences).

Extirpation of the bonytail chub, *Gila elegans*, on the lower Colorado River is being prevented through propagation and rearing in hatcheries for release into the lower Colorado River. In aquaculture, handling of fish is inevitable and disease and mortality are principally related to physiological stress and injury associated with handling. Before the bonytail chub are released they are exposed to substantial handling; fish are crowded, netted, placed in an anesthetic, measured, and finally tagged. To determine the stress response to this handling, cortisol levels, the most common stress indicator measured in telesosts, are being evaluated over a 24 hour period post handling. Cortisol levels are currently being evaluated using an EIA kit (Cayman Chemical) and recovery profiles are being created to evaluate if stress levels will decrease more rapidly during one season rather than another.

POSTER - Swimming performance and morphology of native Utah fishes: Critical information for culvert design in Utah streams

Aedo, John R*[1]; Belk, Mark C[1]. (1-Brigham Young University, Department of Biology).

Historically, migratory salmonids have received the majority of the consideration in fish passage through in-stream culverts. This neglect has, in turn, introduced a number of barriers to movement of non-game, non-salmonid species. To avoid negatively impacting existing populations and thus maintain stream connectivity, it is vital to know the swimming performance of these species in relation to conditions created by culvert placement. We quantify swimming performance in 11 species of Utah fishes, including taxa with both widespread and restricted ranges, in terms of prolonged and burst speed. We also characterize morphometric shape variation in the same species. Fishes were collected from field and hatchery locations in Utah during the summer and fall of 2007 and subjected to two swimming performance tests. Prolonged swimming velocity was quantified using a step endurance test and burst swimming velocity was tested using a simulated predator attack. We report both measures of swimming performance for several size classes and morphological groups. In general, swimming performance increases with body size and is related to morphometric shape variation. Additionally, we identify unique behavioral responses to simulated high flows in a laboratory setting. Further characterization and quantification is ongoing. This information expands the traditional view of culvert passage to non-game, poorly studied species and will aid in future culvert design and mitigation efforts.

POSTER - Seri ethnoichthyology: folk fishers in a desert sea

Torre, Jorge[1]; Findley, Lloyd*[2]. (1-Comunidad y Biodiversidad, A.C., Guaymas, Sonora, Mexico; 2-Centro de Investigación en Alimentación y Desarrollo, A.C.-Unidad Guaymas).

The Seri (Comcáac) Indians and their ancestors have lived on the desert coast of Sonora and on Tiburón and San Esteban islands in the Gulf of California for ca. 2000 years. Traditional subsistence was and continues to be based mainly on fishing and shellfish gathering, and Seri knowledge of coastal environments and the biota inhabiting them is profound. We compiled information pertaining to fishes from 13 experienced Seri fishers during 1970-1972 (LF) and 1999-2002 (JT). During interviews, positive identifications of fishes under discussion were confirmed by reference to freshly caught and preserved specimens as well as accurate drawings and diagnostic photographs. We were aided in interpreting fish names by detailed information compiled by three linguists (Edward and Mary-Beck Moser and Stephen Marlett) working with the Seri since the 1950s. We focused on analyses of traditional fish nomenclature, obtaining information on biology, ecology and behavior of 115 ethnospecies related to 153 traditional names. Seri recognize approximately 69 fishes at the level of ichthyological species and 25 at genus level, in 68 current scientific families. They use conspicuous morphological characteristics (coloration, size, shape, texture, fat content and presence/absence of a physical feature) as well as other traits (food habits, behavior, habitats, gender, reproductive aspects and effects on humans) to classify and identify fishes. Knowledge is more detailed for preferred-eating and commercially important species, especially several sharks (*hacat*), rays (*hacat cmaam*) and bony fishes (*zixcám*), the latter particularly well represented by grunts (Haemulidae), snappers (Lutjanidae), mullets (Mugilidae), croakers/corvinas (Sciaenidae), and sea basses/groupers (Serranidae). Seri traditional biological and ecological knowledge provide important insights to the regional ichthyofauna and other biota. For example, of the ichthyologically defined 265 coastal/epipelagic species in 82 families recorded from Seri territory, 11% and 18%, respectively, are based on Seri reports. Further work should test several folk observations (e.g., seven distinct ethnospecies of mullets, whereas only two ichthyologically defined species are known to commonly occur in the area) and should convert all information into management tools for use by the Seri and other regional fishing communities. Unfortunately, this unique knowledge bank is imperiled due to rapid acculturation and overexploitation of many traditionally targeted species (e.g., totoaba, *Totoaba macdonaldi*, several groupers: *Mycteroperca* spp.; *Epinephelus*; *Stereolepis gigas* which are verging on extinction or regional extirpation.

We dedicate this presentation to the memory of the western world's "Father of Taxonomy," Carolus Linnaeus (unknown to the Seri), on this year's occasion of his 300th birthday.

POSTER - Status of the Pacific lamprey, *Lampetra tridentatus* south of Point Conception, southern coastal California

Swift, Camm C.*[1]; Howard, Steve[2]. (1-ENTRIX, Inc., Ventura, CA; 2-United Water District, Santa Paula, CA).

Since the early 1970s catches of Pacific lamprey have been documented by our directed surveys and other sampling in coastal southern California south of Point Conception and north of the Los Angeles Basin. These collections document a strong decline in numbers of lampreys, particularly after about 2000. This decline may be steeper than documented since directed efforts for this species have increased in this same time period. Counts adjunct to monitoring of migratory steelhead were documented in 1981 at Sespe Creek. Intermittent annual counts were made since 1994 at the Freeman Diversion on the Santa Clara River, and specific sampling for lampreys occurred in Sespe Creek, the major tributary of the Santa Clara River intermittently since the late 1970s. The last lamprey records for Malibu Creek were in March of 1993. Since the late 1990s the numbers in the Santa Clara drainage have dropped to a few individuals, and the last four years of repeated efforts in lower Sespe Creek and other major tributaries have encountered only one specimen (an ammocoete not captured) through both wet and dry rainfall years. Five ammocoetes taken in the lower Ventura River on 08 March 2005 are the only other individuals recorded south of Point Conception in the 2000s. This cannot easily be explained since many conditions have not changed appreciably in that time. Conjectures and possible reasons for this decline will be discussed.

POSTER - New spikedace and loach minnow propagation and research facility at Bubbling Ponds Fish Hatchery, Arizona

Ward, David L.*[1]. (1-Arizona Game and Fish Department, Research Branch).

Construction of a new spikedace, *Meda fulgida*, and loach minnow, *Tiaroga cobitis*, propagation and research facility was completed in June 2007 at Bubbling Ponds Fish Hatchery in Arizona. The goal of this facility is to maintain backup populations of spikedace and loach minnow stocks and to propagate these species for reintroduction and repatriation projects. The new facility contains 24, 6-foot diameter circular fiberglass tanks. Artesian well water at 68°C flows through each tank at 2-3 gallons per minute. Each tank is set up to mimic a natural environment with rock and sand substrates and submerged logs for structure. Overhead lights are controlled by a timer to manipulate photoperiod and induce spawning. Successful reproduction of both species has already occurred in the new facility and methods to produce large numbers of offspring are currently being evaluated.

POSTER - Taxonomic diversity of spring invertebrates in threatened habitats of the Great Basin

Hansen, Christopher A.*[1]; Stutz, Heather L.[1]; Tanner, Keith J.[1]; Barney, Michelle[1]; Rader, Russell B.[1]; Redlin, Emily E.[1]; Keleher, Jane M.[1]; Shiozawa, Dennis K.[1]. (1-Brigham Young University, Department of Integrative Biology).

Las Vegas, Nevada, through the Southern Nevada Water Authority (SNWA) is developing a pipeline to mine deep aquifers in Eastern Nevada. This has the potential to drop the water table and result in drying of springs and wetlands. We collected spring invertebrates from six closed basins of Eastern Nevada and Utah, some of which would be affected by the ground water exploitation. The number of taxa ranged from a high of 35 genera from a spring near Rosenlund Ranch in Spring Valley to a low of ten genera from Indian Spring located in Steptoe Valley. Of the 105 total genera identified, 49% were unique to a single valley and 43% were found in a single spring. We found *Hyalella azteca*, *Gammarus lacustris*, and *Callibaetis* spp. to be among the most common species. This correlates with other research in the neighboring Bonneville Basin. We assessed the extent of taxonomic distinctness using exploratory techniques – cluster analysis, and funnel graphs. The data showed a broad range of taxonomic diversity within individual springs but not between valleys.

POSTER - Mark-recapture monitoring of smallmouth bass in the Green River

Monroe, Leisa D.*[1]; Hedrick, Trina[1]. (1-Utah Division of Wildlife Resources).

A diverse aquatic community that includes many species of exotic fishes currently characterizes the Green River in eastern Utah. Historically, there were only 14 fish species in the Upper Colorado River Basin. Today, the fact that these 14 native species must compete with more than 40 nonnatives has contributed to the listing of four of them as endangered. The range of the smallmouth bass (*Micropterus dolomieu*) has expanded in the river over the past decade, leading the Upper Colorado River Recovery Program to initiate a mark-recapture study to determine the population size of smallmouth bass in the Green River and to examine the possibility of effectively removing enough bass to see a positive reaction by the native fish community.

Initially, one marking and 3 removal passes were implemented in the middle Green River to obtain a population estimate. Based on information from a population model, this level of effort was determined to be insufficient. This determination led to a more focused effort, concentrating on a smaller removal area and increasing the number of removal passes. One marking and 9 removal passes were suggested.

Initial results indicate that a population estimate is feasible, with 127 smallmouth bass tagged on the first pass and five recaptured on the second pass. Data from subsequent passes indicates that a greater percentage of the adult smallmouth bass population is being removed through our effort compared to that of the juvenile smallmouth bass, with a similar trend seen in previous years' data as well. Remaining passes will indicate the percentages of the population estimate of adult and juvenile smallmouth bass removed, as well as the usefulness of this management tool in the recovery of the endangered fish species.

POSTER - Backwater site selection for razorback sucker (*Xyrauchen texanus*), bonytail (*Gila elegans*), and flannelmouth sucker (*Catostomus latipinnis*) habitat creation, in support of the Lower Colorado River Multi-Species Conservation Program

Ulepic, Caireen R.*[1]; Lenon, Nathan[1]. (1-Bureau of Reclamation, Lower Colorado Region).

The Lower Colorado River Multi-Species Conservation Program (LCR MSCP) is a multi-stakeholder Federal and non-Federal partnership responding to the need to balance the use of Lower Colorado River (LCR) water resources and conservation of native species and their habitats to comply with the Endangered Species Act.

As the implementing entity for the LCR MSCP, the U.S. Bureau of Reclamation is tasked with creating 360 acres of backwater habitat along the LCR for razorback sucker (*Xyrauchen texanus*), bonytail (*Gila elegans*), and flannelmouth sucker (*Catostomus latipinnis*). Over 400 backwaters exist within the LCR MSCP planning area, from Davis Dam to the Southerly International Boundary.

To prioritize habitat creation efforts, a systematic and repeatable process was developed to evaluate and screen potential candidate sites for habitat creation. This process is being implemented in two phases, the first being conducted throughout Reaches 5-6 (from Reclamation's Cibola Gauge to the Northerly International Boundary), and the second being conducted throughout Reaches 3-4 (from Davis Dam to Reclamation's Cibola Gauge). The evaluation and screening process is comprised of 5 steps, and was developed with technical input from LCR MSCP stakeholders.

The process starts with an inventory and analysis of existing geographic information system (GIS) data and consideration of potential land use conflicts (Step 1), which is used to perform an initial screening of potential sites to undergo brief site visits. During the site visits (Step 2) a variety of biological and physical data is collected, which is used to rate and select sites for further evaluation (Step 3). Backwater Site Assessments are then performed, following one year of quarterly monitoring (Step 4), after which sites are selected for potential habitat creation (Step 5).

POSTER - Changes in habitat affect the population dynamics of the federally threatened Sana Ana sucker, *Catostomus santaanae* in the Santa Ana River

Baskin, Jonathan N.[1/2]; Even, Thomas J.*[4]; Haglund, Thomas R.[1]; Thompson, Andrew[3]. (1-San Marino Environmental Associates, San Marino, CA; 2-Biol. Sci. Dept., Calif. State Polytechnic Univ. Pomona; 3-U.S. Fish & Wildlife Service, Carlsbad, CA; 4-Dept. of Ecology, Evolution and Marine Biology, Univ. Calif. Santa Barbara).

The federally threatened Santa Ana sucker (*Catostomus santaanae*), in the *Pantosteus* group of mountain catostomid species, now occurs naturally in Southern California in the lowlands of the Los Angeles (LAR) and Santa Ana (SAR) rivers, the mountains of San Gabriel River (SGR), and is thought to be introduced to Santa Clara River. To elucidate forces that influence Santa Ana sucker population dynamics and viability, the Santa Ana Sucker Conservation Team, which is comprised of scientists, regulators and stakeholders, conducted several observational and experimental studies. First, microhabitat selectivity studies in SAR and SGR showed that adult and juvenile sucker primarily select locations that are relatively deep, have a relatively swift current velocity and contain grave/cobble substrate, and avoid areas that are shallow, have low current velocity and are sandy. Greater amounts of the preferred habitats are found in the SGR than the SAR sites. Second, annual population density and habitat evaluation surveys at three fixed sites in the SAR between 2001 and 2007 indicated that density declined significantly through 2006 at the two downstream sites coincident with a significant decline in habitat quality at these sites. During the same time period density at the most upstream site (Riverside Avenue Bridge) increased significantly as suitable habitat was consistently available there. In 2007 habitat recovered dramatically at the two downstream sites, but density increased significantly only at the middle site (60 Freeway). In 2007, no suckers were found at the most downstream site (Mission Bridge). Incidental sampling and field observations in other contexts throughout the SAR show patterns of habitat quality and sucker density consistent with our study findings (i.e., progressively at sites extending downstream from La Cadena Bridge to Prado Basin we find more sand and less gravel/cobble, correlated with fewer or no suckers during the period 2001 to 2006). Third, systematic surveys of habitat composition over a 30-km stretch of river showed that the availability of suitable habitat varies through time. Surveys by C. Swift indicated that there were approximately 12.3 km of suitable habitat in 2000. Subsequently, we documented approximately 4.2 km of cobble/gravel habitat in 2006 and 9.6 km in 2007. Fourth, body condition index (ratio length to weight) studies in the SAR, LAR and SGR, and the SCR (lowlands) in 2006 showed that sucker condition was best in the SGR (mountains). Condition was significantly poorer at all other sites (lowlands) and there was no difference among sites. Overall results stress the importance of cobble/gravel habitat for sucker persistence and suggest that large-scale sedimentation may be degrading sucker habitat. In addition, it appears that the sucker does better in mountain habitats, where the preferred microhabitat is more abundant. Incidental observations suggest that lower temperatures, greater dissolved oxygen and steeper gradients may also contribute to the better sucker body condition in the SGR. In light of these findings, the Team is striving to develop a management strategy that will help conserve the sucker.

POSTER - Northwestern Mexico Area Report: Catalog of the freshwater fishes of the Baja California peninsula: Part I. Baja California Sur

Ruiz-Campos, Gorgonio*[1]. (1-Universidad Autónoma de Baja California, Facultad de Ciencias, Ensenada).

This catalog is one of two compendia on the freshwater fish fauna of the Baja California peninsula, M|e|xico. In this case is referable to the State of Baja California Sur (BCS). Detailed information on historic and current distribution, habitat, ecological and biogeographical aspects, as well as conservation status are provided for 25 species (19 native and 6 exotic) that inhabit permanent or temporally the freshwaters of BCS. The information that supports this catalog was gathered through fish sampling expeditions in 65 localities during a period of 16 years (1991-2007), and complemented with records in literature and specimens deposited in other museums. From the ecological point of view, 53% are sporadic, 26% complementary, 16% vicarious, and 5% diadromous. Biogeographically, most of species have a tropical (panamanian, 63%; tropical amphiamerican, 16%; circumtropical, 5%) and only one species (5%) is from Californian (San Diegan) affinity. Two taxa (11%) are endemic to the oasis of BCS, one of them, *Fundulus lima* is confined to the Pacific drainage, while *Gobiesox junioperoserrai* is only known in Las Pocitas basin. Six exotics have been recorded, of which the guppy, *Poecilia reticulata*, and redbelly tilapia, *Tilapia* cf. *zillii*, are the most invasive; the latter affecting significantly the populations of the endemic killifish. Various peripheral fishes such as *Dormitator latifrons*, *Gobiomorus maculatus* and *Eleotris picta*, invade the freshwater of the Pacific drainage as northern as the R|i|o La Purísima. The main factors affecting the abundance and survival of the native fish fauna in the freshwaters of BCS are the alteration of habitats by anthropogenic impact and the introduction of invasive exotic fishes.

Reporte del Área Noroeste de México: Catálogo de los peces de agualdulce de la peninsula de Baja California: Parte I: Baja California Sur

El presente catálogo es uno de dos compendios sobre la ictiofauna dulceacuícola de la península de Baja California, México. En este caso, se trata de la parte correspondiente al Estado de Baja California Sur (BCS), donde se ofrece información detallada sobre distribución histórica y actual, hábitat, aspectos ecológicos y biogeográficos, como estatus de conservación para un total de 25 especies ícticas (19 nativas y 6 exóticas) que habitan de manera permanente o temporal las aguas dulces de BCS. Los registros que sustentan este catálogo fueron generados a través de expediciones ictiológicas en 65 localidades durante un periodo de 16 años (1991-2007), y complementados con reportes en literatura o de especimenes depositados en otros museos. Desde un punto de vista ecológico, 53% de las especies son esporádicas, 26% complementarias, 16% vicarias y 5% diadromas. Biogeográficamente, la mayoría de las especies son de afinidad tropical (panámica, 63%; anfiamericana tropical, 16%; y circumtropical, 5%) y solo una especie (5%) es de afinidad Californiana (San Dieguina). Dos taxa (11%) son endémicos, *Fundulus lima* (oasis de la vertiente del Pacífico) y *Gobiesox juniperoserrai* (Arroyo Las Pocitas, BCS). Seis especies exóticas han sido registradas, destacando el pecílido neotropical, *Poecilia reticulata*, y el cíclido africano, *Tilapia* cf. *zillii*; este último afectando significativamente a las poblaciones de *F. lima*. Varios peces periféricos como *Dormitator latifrons*, *Gobiomorus maculatus* y *Eleotris picta* incursionan en aguas continentales de la vertiente del Pacífico tan al norte como el Río La Purísima. Los principales factores que atentan la supervivencia de las especies ícticas nativas en las aguas continentales son la alteración de hábitat por la actividad antropogénica y la introducción de especies exóticas invasoras.

POSTER - One-year progress report of telemetry efforts to determine post-stocking survival of razorback sucker in Lake Mohave

Karam, Abraham P.*[1]; Kesner, Brian R.; Marsh, Paul C.. (1-Arizona State University).

Long term monitoring of razorback sucker *Xyrauchen texanus* in Lake Mohave, AZ/NV suggests poor repatriate survival, yet little is known about immediate post-stocking dispersal and mortality. Biotelemetry in combination with SCUBA confirmed poor survival for subadult fish (avg. TL 38 cm) immediately following stocking and remained low (~91% weekly survival) throughout the remainder of the six month study. In addition, we designed a captive fish study to assess the effects of implanting transmitters in razorback sucker. No tags were shed and all fish remained healthy throughout the study. Surgical complications and handling appeared not to contribute to mortality of tagged fish. Presently, we are comparing survival of subadult and adult (~50 cm) razorback sucker to further investigate post-stocking mortality in Lake Mohave.

POSTER - Morphometric comparison of *Ictalurus furcatus* (Teleostei: Ictaluridae) from northern and southern Mexico

Ruiz-Campos, Gorgonio[1]; Lozano-Vilano, Maria De Lourdes*[2]; García-Ramírez, Maria Elena[2]. (1-Universidad Autónomoa de Baja California, Ensenada, B.C., México; 2-Universidad Autónoma de Nuevo León, Monterrey, N.L., México).

The blue catfish (*Ictalurus furcatus* Lesueur 1840) is one of the Nearctic freshwater fish species of the Atlantic slope with a distribution extending to Neotropical localities as far south as the Río Usumacinta and the Río Belize, Belize, where it was originally called *Ameiurus meridionalis* (Günther 1864 = *I. meridionalis*; Miller et al. 2005). This southern form was described on the basis of its lower number of anal rays, its shorter barbels and its smaller eye as compared to the northern form. However, Lundberg (1992) considered the nominal species *I. meridionalis* from the Río Usumacinta as conspecific with *I. furcatus*, a situation that Miller et al. (2005) stressed as an interesting theme for additional study. In this study we compared 28 morphologic characters of specimens of *I. furcatus* from northern and southern Mexico. The discriminant function analysis (forward stepwise) determined three characters to be highly diagnostic to separate the southern group from the northern; a shorter anal fin base, a smaller head width, and a longer distance between the posterior insertion of the adipose fin and the posterior insertion of anal fin. Seventeen additional characters were also different ($p<0.01$) between groups. These character differences support the taxonomic validity of *I. meridionalis* for the southern individuals currently referred to as *I. furcatus*. Studies focused on comparative osteology and molecular genetics of both forms are needed for the clarification of their taxonomic status.

17:00 - 18:00 BUSINESS MEETING

Location: Pierpont Hotel, Pavilion.

Saturday, 17 Nov. 2007

09:00 - 13:00 GENERAL SESSION - 5

Location: Pierpont Hotel, Pavilion.

2007-11-17 09:00 **A study of the endemic icthyofauna and consequences of human impacts in the endorheic Parras de la Fuente basin, Coahuila**

Chavarria Gallegos, Roberto*[1]; Gómez Garza, Miguel Angel[1]; Garza Tobon, Daniel[1]; Valdes Gzz., Arcadio[2]. (1-Consejo Mexicano de Peces del Desierto; 2-Universidad Autónoma Nuevo Leon).

The area of Parras de la Fuente is of special conservation interest due to its wealth of freshwater fishes, the majority of which are endemic. We determined conservation priorities for these populations by means of an integral method. We based our recommendations on genetic diversity and an analysis of ecological (e.g. exotic species), social (e.g. political situation) and environmental (e.g. pollution) information from two sites that historically contained three native species, the Parras chub, *Gila* sp., Parras pupfish, *Cyprinodon latifasciatus*, and stumptooth minnow, *Stypodon signifer*. Distribution patterns and indices of genetic diversity were closely associated with human impacts. Diverse events caused the disappearance of the five endemic species from this region at the beginnings of the 20th century. We identified three refuge areas for three remaining species. These areas must be conserved and require special attention because they contain unique populations.

2007-11-17 09:15 **Bonneville Basin Area Report**

Wilson, Krissy W.*[1]. (1-Utah Division Wildlife Resources).

I present a brief summary of activities for this year associated with native aquatic species in the Bonneville Basin. The June Sucker, *Chasmistes liorus*, Recovery Program continues to be very active. Approximately 90,000 (200 mm TL) June sucker were reintroduced into Utah Lake as part of recovery efforts. June sucker are propagated from brood stock held at Utah Division of Wildlife Resources hatchery facility at the Fisheries Experiment Station (FES), Logan, Utah. Seventy six thousand were reared at FES and the remaining 14,000 were reared in grow out ponds. Recent genetic studies suggest that what has been considered the leatherside chub, *Gila copei*, is actually two distinct species, the northern leatherside chub, *Lepidomeda copei*, and the southern leatherside chub, *Lepidomeda aliciae*. The northern leatherside chub was reintroduced into two locations where they had been extirpated: tributary to Hayden Fork in Northeast Utah and Upper Diamond Fork Creek in Central Utah.

We also introduced and established least chub, *Iotichthys phlegethontis*, in two new refuge locations; Willow Pond in Northwest Utah and Fish Springs National Wildlife Refuge in Western Utah. Least chub are also being held at three new locations: Willow Park Zoo, Logan, Utah; Ogden Nature Center, Ogden, Utah; and the Living Planet Aquarium, Sandy, Utah. In June 2007, the Center for Biological Diversity and others petitioned the Fish and Wildlife Service (FWS) to list the least chub as threatened or endangered under ESA. In July 2007, Forest Guardians petitioned the FWS to list 206 species in the Mountain-Prairie Region, of which 106 species occur in Utah. The quagga mussel, *Dreissena bugensis*, was detected in Lake Powell in May 2007. Utah Division of Wildlife Resources received $1.2 million from the Utah State Legislature to develop and implement an Action Plan to address the invasion of this species.

2007-11-17 09:30 **Update on Lake Mead razorback sucker research, evidence of continued, recent recruitment, and an update of our hypothesis regarding recruitment events of Lake Mead razorback suckers**

Albrecht, Brandon*[1]; Sanderson, Travis[1]; Holden, Paul[1]. (1-BIO-WEST, Inc.).

An ongoing razorback sucker (*Xyrauchen texanus*) research project on Lake Mead, Arizona and Nevada, has been funded by the Southern Nevada Water Authority and the U.S. Bureau of Reclamation for the past 11 years. Major emphasis of this research has been to locate spawning sites and to use aging information to identify patterns of recruitment. Using multiple methodologies (trammel netting for adults and juveniles/subadults, larval sampling, and telemetric data from captive-reared sonic-tagged fish) a new spawning area was located at the Fish Island area in the Overton Arm of Lake Mead, a highlight of the 2005-2007 spawning seasons. This year's data and observations collected to date suggest that the Echo Bay and Fish Island spawning aggregates are one in the same, and that the number of fish in the northernmost end of Lake Mead may be larger than previously thought. In addition, the first known shift in the spawning habitat selection of the Las Vegas Bay population was documented in 2006 and a similar shift was observed again in 2007.

The continued presence of actual, wild recruitment in the form of young, sexually immature individuals makes the Lake Mead razorback sucker population a rarity and an anomaly in terms of razorback sucker persistence throughout the Colorado River drainage, despite non-native fish composition and densities being similar to those at other locations. Since the early years of our research on Lake Mead, fin-ray aging data and back-calculation techniques have indicated that recruitment of razorback sucker on Lake Mead has occurred nearly every year. Furthermore, data collected up to this year have indicated that high lake elevations - those typically associated with maximum amounts of inundated terrestrial vegetation- appear to be responsible for pulses in recruitment. However, during the 2007 spawning period, we captured large numbers of juvenile/subadult, and adult razorback suckers that, based on back-calculation techniques, were spawned under low and declining lake elevations. In fact, the largest number of recruits observed to date now coincides with 2003, a low-water year which has produced 16 recruits thus far and has prompted a need to revisit our hypothesis regarding factors driving recruitment in Lake Mead.

We believe that cover - both vegetative and in the form of turbidity - provides protection and food resources for larval and juvenile razorback sucker, thereby enabling them to avoid predation by nonnative sportfish present in the system. Interestingly, it appears as though turbidity (another form of cover) may be even more important than we have typically considered to date. As time passes and monitoring efforts continue, we would expect to begin capturing individuals spawned during 2005, 2006, and beyond. Continued monitoring efforts on Lake Mead should help ascertain if in fact recruitment events continue, and perhaps begin to help understand more fully how to enable this unique trend in other locations.

2007-11-17 09:45 **Lower Colorado River Area Report, November 2006-2007**

Sponholtz, Pamela*[1]; Mitchell, Don[2]; Richardson, Mary[1]; Paroz, Yvette[3]; Hedwall, Shaula[1]; Benedict, Chuck[2]; Whittier, Joanna[4]; Weiss, Dannette[2]. (1-U.S. Fish and Wildlife Service; 2-Arizona Game and Fish Department; 3-New Mexico Department of Game and Fish; 4-Kansas State University).

Funding for recovery and conservation actions for native fishes got a boost in 2007 as the Central Arizona Project (CAP) biological opinion added $50,000 a year to the Gila River Basin Native Fishes Conservation Fund for an additional five years. This program has provided funding for upgrading the Bubbling Ponds Facility and was developed for captive propagation of spikedace (*Meda fulgida*) and loach minnow (*Tiaroga cobitis*). Fish from the Gila River, Blue River, and Aravaipa Creek have already been collected and placed in the facility. Roundtail chub (*Gila robusta*) collected from the Verde River, Black River and Chevelon Creek are also being held at the facility to use as a brood stock to propagate and utilize F1's as surplus fish for conservation actions. Reintroductions progressed in 2007 including West Chevelon Creek (spinedace, *Lepidomeda vittata*), Hassayampa River (woundfin, *Plagopterus argentissimus*) and Mud Springs (Gila topminnow, *Poeciliopsis o. occidentalis* and desert pupfish, *Cyprinodon m. macularius*). The Rucker Creek population of Mexican stonerollers (*Campostoma ornatum*), the only known permanent U.S. population, was used as a donor site to start a new population at West Turkey Creek. In the Little Colorado River evidence was found that Chute Falls is not an impassible physical barrier to all upriver migrations by humpback chub (*Gila cypha*) and successful spawning and recruitment above Chute Falls was finally found. Planning efforts in 2007 continue as Arizona Game and Fish Department biologists and managers developed a plan to identify and manage native and nonnative fish areas on the Little Colorado River. Researchers at the University of Arizona, in cooperation with Kansas State University, are identifying data gaps for the Verde watershed and updating segments of the plan to be able to apply it in a new location. Plans are underway for barrier construction on the Blue River and cooperative work Is underway with the community of Blue to develop a Native Fish Management Plan that will eventually lead to native fish restoration as well as resolution of resource management concerns of residents of Blue. In Grand Canyon, a long term experimental planning effort was initiated that focuses on the responses of sediment and humpback chub to different flows, water temperatures and differing experimental designs. Chemical renovations of Conklin and Stinky creeks and the South Fork Little Colorado River for Apache trout (*Oncorhynchus apache*) recovery were completed in summer/fall 2007. In the fall of 2006 two new populations of Apache trout were started in Fish Creek and the East Fork Little Colorado River on the Apache-Sitgreaves National Forest. Habitat improvement via creation of refuge ponds was completed for spinedace at Grasslands Wildlife Area and at Winslow High School. By the end of this calendar year refuge ponds for all three known genetic sub-groups of the spinedace will be in operation. The City of Kingman, USFWS Partners for Fish & Wildlife Program, and USGS Native Fish Refuge Program initiated a project to renovate two ponds at Cerbat Cliffs Golf Course to be used as a refuge for razorback sucker (*Xyrauchen texanus*) and bonytail chub (*Gila elegans*). USGS continues to monitor sanctuary habitats created for the big river native fishes along the Colorado River. Ongoing research activities in 2007 included an experimental batch stocking of subadult razorback suckers in Lake Mohave where a small group of those fish were tracked for 6 months using sonic telemetry, remote listening stations, and SCUBA. Monitoring of razorback sucker stockings below Parker Dam in the Colorado River has continued to demonstrate a lack of long-term survival. Other monitoring efforts indicated that Gila chub (*Gila intermedia*) returned to Sabino Canyon in 2005 are doing well with several year classes represented throughout the canyon. However, Gila chub stocked in Bear Canyon, a tributary to Sabino Canyon, did not establish a population, likely due to continued sedimentation following the 2003 Aspen fire and record rainfall. Gila trout (*Oncorhynchus gilae*) was downlisted to threatened in 2006. The New Mexico State Game Commission opened two streams for Gila trout fishing providing the first legal angling for Gila trout in over fifty years. Critical habitat designation for spikedace and loach minnow became effective on March 21, 2007, designating a total of 522 river miles as critical habitat for both species.

Contributors to this report include (in alphabetical order): Chuck Benedict, Scott Bonar, Chris Cantrell, Stephanie Carman, Gregg Cummins, Patricia Delrose, Doug Duncan, Shaula Hedwall, Stewart Jacks, Brian Kesner, Glen Knowles, Julie Meka, Chuck Minckley, Don Mitchell, Yvette Paroz, Mary Richardson, John Rinne, Tony Robinson, Dennis Stone, Marty Underwood, Dannette Weiss, Joanna Whittier.

2007-11-17 10:00 **Status and management of the fishes of the Upper Colorado River Basin**

Hedrick, Trina N*[1]; Cavalli, Pete[2]; Martin, Lori[3]. (1-Utah Division of Wildife Resources; 2-Wyoming Game and Fish Department; 3-Colorado Division of Wildlife).

Activities continue in an effort to improve the status of many of the native fishes of the Upper Colorado River Basin. These activities are guided principally by three programs: the Upper Colorado River Endangered Fish Recovery Program, the range-wide Conservation Agreement for the Colorado River cutthroat trout, *Oncorhynchus clarkii pleuriticus*, and the Range-wide Conservation Agreement and Strategy for the roundtail chub, *Gila robusta*, bluehead sucker, *Catostomus discobolus*, and flannelmouth sucker, *C. latipinnis*. The Recovery Program (this program works specifically towards recovery of the Colorado pikeminnow, *Ptychocheilus lucius*, bonytail, *Gila elegans*, razorback sucker, *Xyrauchen texanus*, and humpback chub, *G. cypha*), uses the protection of instream flow, habitat restoration, nonnative fish control, propagation, life history monitoring, and information and education to bring benefits to the four "big river fishes." Examples of recent efforts include continued research into the use of floodplain habitats by razorback sucker, increased effort towards removal of problematic nonnative species, and the continuation of long-term status assessments. Renovation of rainbow trout streams and reintroduction of the Colorado River cutthroat trout continues in Colorado, Utah, and Wyoming. Additional locations continue to be targeted for barrier placement and cutthroat reintroduction. Research into the movement and life history needs of the roundtail chub, bluehead sucker, and flannelmouth sucker continues in many locations in the upper basin. Fish passage continues to be a problem for these species; however, a few locations (the Duchesne River and the San Rafael River in Utah) have been the target of recent proposals to improve fish passage into potential spawning habitat above migration barriers.

2007-11-17 10:15 **The use of grow-out ponds and hatcheries in the recovery of June sucker, *Chasmistes liorus***

Mellon, Cassie D.*[1]; Wilson, Krissy[1]. (1-Utah Division of Wildlife Resources).

June sucker are endemic to Utah Lake in central Utah and are federally listed as endangered. To aide in June sucker recovery, eggs fertilized during streamside spawning have been raised at a hatchery at the Fisheries Experiments Station (FES). Crosses from these family lots have then been stocked into Utah Lake at a size of 8" that is most likely to avoid predation. Young-of-year fish from FES have also been placed in grow-out ponds where they grow in a more natural setting before reaching stocking size. All fish are marked with passive integrated transponder (PIT) tags or coded wire tags (CWT) pre-stocking so origin is known. Preliminary results from previous stocking events show higher recapture rates in Utah Lake and during spawning runs in the Provo River for individuals from grow-out facilities than for those from FES. Fish reared at FES have greater growth and survival rates during rearing than do those in the grow-out facilities. We compared growth, survivability and health of June suckers raised at FES to those raised at two separate grow-out facilities to determine the most effective method for rearing June sucker.

2007-11-17 10:30 **Development and evaluation of a nonative fish barrier to assist in creating protected backwaters along the lower Colorado River**

Karchesky, Christopher[1]; McDonald, Robert*[1]; Garnett, Gregg[2]. (1-Normandeau Associates Inc.; 2-Bureau of Reclamation).

We evaluated an experimental cylindrical wedge-wire screen system for use in protected backwaters designated for endangered fish habitat along the lower Colorado River. The prototype system was installed at the inlet canal of Beal Lake, a backwater that is currently being renovated to improve habitat conditions for native fishes. To evaluate the screen system, we developed a two-stage evaluation plan: 1) to evaluate the hydraulic performance of the system to determine if sufficient surface flow could be delivered to balance summertime evaporation losses from Beal Lake; and 2) to determine the fish exclusion efficiency of the screen system at various flow velocities. The hydraulic performance of the screen system was evaluated by measuring the volume of flow through the system at various water level differentials, and these results were compared with evaporation losses from Beal Lake. The effectiveness of the screen system at excluding all life stages of nonnative fishes was evaluated in a hydraulic flume. Entrainment of eggs and larvae from three size-classes of nonnative species was quantified. The results of our two year evaluation indicate that the screen system provides sufficient water flow to compensate for evaporative losses and excludes all but the smallest nonnative fish species.

2007-11-17 10:45 **Isotopic analyses of heavy metal contamination in aquatic systems and endangered species**

Reinthal, Peter*[1]; Chesley, John[2]; Blasius, Heidi[3]; Haberstitch, Mark[4]. (1-Department of Ecology and Evolutionary Biology, University of Arizona, Tucson, AZ 85721.; 2-Department of GeoSciences, University of Arizona, Tucson, AZ 85721.; 3-3Bureau of Land Management, Safford Field Office, 711 14th Avenue, Safford, AZ 85546-3337.; 4-The Nature Conservancy, Aravaipa Preserve Manager, 41099 W. Aravaipa Canyon Road, Willcox, AZ 85643.).

Endangered species and ecosystems throughout the southwest are under increasing deleterious pressures from a variety of sources. One threat, often not considered, is the effect of heavy metal contamination. Here we present a brief summary of results from three different case studies where isotopic analyses are used to determine contaminant sources and movements under a variety of conditions. In Aravaipa Creek, stable and radiogenic isotopes are used to determine extent, source and movement of lead contamination into the aquatic food web. Based on lead isotopes, the point source designated as an EPA superfund site, Klondyke Mill, is not the major contributor to lead contamination in the aquatic food web. At Alum Creek, in the Santa Cruz basin, extreme acidification and lead contamination from mine tailings are potentially contaminating both an important refuge for native fish species and an area that is managed as a recreational sport fishery. The efficacy of within-stream remediation efforts is discussed. Also, analyses of lead contamination in endangered California Condors are presented, where sources of lead contamination are determined to be lead bullets. These findings provide the scientific basis for a major shift in endangered species management.

2007-11-17 11:00 **Quantifying generational effects of endocrine disruption in bonytail chub (*Gila elegans*) exposed to secondarily-treated wastewater**

Walker, David[1]; Paretti, Nick[2]; McDonough, Lisa*[1]; Cordy, Gail[2]; Gross, Timothy S.[3]; Furlong, Edward T.[4]; Kolpin, Dana W.[2]; McIntosh, Dennis[5]. (1-University of Arizona, Environmental Research Laboratory; 2-USGS, WRD; 3-USGS, Florida Carribean Science Center; 4-USGS, National Water Quality Laboratory; 5-University of Delaware).

Endocrine disrupting compounds (EDCs) can reduce both fertility and fecundity of aquatic organisms. EDCs are found in effluent-dependent waters (EDWs), most of which contain effluent discharge year-round in arid regions. Following exposure to effluent from the Santa Cruz River, bonytail chub (*Gila elegans*) displayed hormonal impairment. In controlled laboratory studies, males experienced feminization and females experienced androgenization as characterized by the sex hormones 17β;-estradiol and 11-ketotestosterone and the protein vitellogenin.

2007-11-17 11:15 **Biological and water quality monitoring of native fish sanctuaries in the lower Colorado River Basin**

Carpenter, Jeanette*[1]; Mueller, Gordon A[1]; Thullen, Joan S.[1]. (1-USGS).

The conservation plan for native fishes of the lower Colorado River (Minckley et. al., 2003: Bioscience 53:219-234) recommended development of isolated, secure, off-channel habitats to be used in the recovery of native fish populations. We designed a monitoring plan to evaluate conditions of current or potential sanctuaries for razorback sucker, *Xyrauchen texanus*, and bonytail, *Gila elegans*. The objective of our monitoring protocol is to provide information to managers that will enhance success of established and future native fish sanctuaries. We collected baseline data at eight sites. Physiochemical parameters include bathymetric mapping, chlorophyll, nutrients, temperature, pH, dissolved oxygen, conductivity, major ions, and heavy metals. Biological data include: abundance and community composition of zooplankton; population structure, condition, and reproductive success of native fish; possible presence of nonnative fish; and mapping and identification of submerged vegetation. As of July 2007, six sites have razorback sucker, bonytail or both: Cibola High Levee Pond, Davis Cove, Mohave Community College Pond, Office Cove, Parker Dam Pond, and Three Fingers Lake. Two of these sites are compromised by presence of nonnative fishes (Cibola High Levee Pond and Three Fingers Lake) and we recently documented successful spawning and recruitment at Davis Cove and Parker Dam Pond. The range of physiochemical and biological parameters varied considerably among sites that support growing or stable populations of native fishes.

2007-11-17 11:30 **Lower Colorado River Multi-species Conservation Program backwater inventory site visits in Reaches 5 and 6**

Robertson, Mike*[1]; Ulepic, Caireen R.[2]. (1-BIO-WEST; 2-U.S. Bureau of Reclamation, Lower Colorado Region).

As part of the Lower Colorado River Multi-Species Conservation Program to establish 360 acres of backwaters for razorback sucker, *Xyrauchen texanus*, and bonytail, *Gila elegans*, we evaluated 25 existing backwaters in the Lower Colorado River project area as potential habitat creation sites. The evaluation included determining the current habitat condition of each site for razorback sucker and bonytail using a rating system that was developed to prioritize sites. Habitat condition was determined through various water quality parameters, availability of suitable spawning habitat, availability of suitable cover, and the presence/absence of any fish species (excluding *Gambusia* sp. and bullhead, *Ameiurus melas*) as a general indicator of current fish habitat suitability. The existing habitat condition is used as an indicator of which features of a site will require greater effort toward habitat creation. Those sites with numerous deficiencies will presumably require more effort to create habitat to support native fishes. The majority of sites had an existing connection to the river, but if isolation is desired to prevent compromise by non-native fishes, establishment of a barrier and filtration system may be required. As expected, the sites that are currently connected to the river had water quality characteristics that more frequently fell into the 'high suitability' category of the rating system than sites that are currently disconnected from the river. It will be important to consider potential changes in water quality that may be associated with any barrier system and reduced water exchange. There was no variation among sites in presence/absence of fish; all sites had fish present, even the most isolated sites with poor water quality. The greatest variation among sites, connected or disconnected from the river, was in availability of spawning habitat and cover. As a result of this evaluation process, Reclamation will be able to prioritize existing sites by current habitat condition and identify sites with a high probability of successful habitat creation for use by razorback sucker and bonytail.

2007-11-17 11:45 **Richard Gordon Miller (1913 -), ichthyologist, conservationist and educator**

Brittan, Martin R.*[1]. (1-California State University, Sacramento, Department of Biological Sciences).

If Richard (Dick) Miller had never done a single thing more than filing for and receiving the appropriative rights to the waters of Devils Hole in 1948 (via a special use permit), he would still be deserving of thanks from all lovers of nature, conservationists, and the American public, but he has done much more.

Miller was born on a farm in Denison, Iowa. An outdoorsman and small town boy, he had already graduated from Principia College in St. Louis, married a fellow student, Maya Paine (1939), gotten an M.S. degree from Cornell (1940, Maya in 1941), moved to California, spent a summer at the Yosemite Field School, and worked at the Santa Barbara Museum of Natural History. Dick was offered and accepted a job with the Nevada State Museum in 1941, only to find out that the Japanese had bombed Pearl Harbor. The position was postponed, and while he waited to be called to active duty, he spent the summer as a Ranger-Naturalist in Yosemite.

Called to active duty from the U.S. Naval Reserve in 1943, Dick spent the war on picket and minesweeper duty off the California coast and in the islands of the Central Pacific. At anti-mine school in Florida, he met Edward Raney, whom he had known from Cornell days, and they snorkeled in Florida waters. Later Miller continued his diving in the Pacific, thus learning much about tropical marine fishes. In 1946 Miller was discharged in Washington, D.C..

After the war, Miller traveled back to California, stopping to visit Carl L. Hubbs and his students at the University of Michigan. Once again, newly appointed as Director of the Nevada State Museum in the old U.S. Mint building in Carson City, Miller discovered that Nevada was the only state not having a state conservation agency. He was soon instrumental in getting the State Legislature to form such a commission.

Miller wished to pursue a Ph.D. under ichthyologist Ed Raney at Cornell. However, while Raney was agreeable, he pointed out that Carson City was much nearer to Stanford University, which had a long history in the study of western U.S. and Pacific fishes, and so, Miller enrolled there to study under Dr. George S. Myers. As a graduate student, he obtained a position with the California Division of Fish and Game, researching the fishes of Lake Tahoe for his Ph.D. thesis (1951).

In 1948, after a visit with Carl Hubbs and Robert Miller, Dick Miller was moved to file for appropriative rights on the waters of Devils Hole for the purpose of “raising fish” - pupfish. The filing was granted, thus providing legal protection to Devil’s Hole until it became a detached portion of Death Valley National Monument in 1959.

In 1951, the Millers moved to Los Alamitos, California, where Dick held a teaching position until 1958. During this period, he had the opportunity to join the Lady Margaret cruise (1952) as navigator and scientist, making several marine collections in the Gulf of California. Maya served as an instructor at the Chapman (Middle) School. In 1958, Miller had the opportunity to make the first of two visits to Antarctica, the first as a U.S. observer on the New Zealand ship Endeavour and later with the Argentine Antarctic re-supply program. The team of Drs. R. Miller and C. Eklund of the U.S. and Dra. Maria Buchinger were responsible for the conservation content of the original Antarctic Treaty Protocol drafted in Buenos Aires. After years of working on the fishes he collected and on international efforts to protect the Antarctic, Miller eventually published his superb "A History and Atlas of the Fishes of the Antarctic Ocean" in 1993. It was published by the Foresta Institute in Nevada and beautifully illustrated by the line drawings of Josette Gourley, with numerous photographs. The book is a mine of information on the contributions of explorers from Columbus and Vespucci to the early 1990’s, including Miller’s own work on Antarctic and Subantarctic oceanography, and on all fishes known from Antarctic and Subantarctic seas.

When Miller resigned from Long Beach State College, he and Maya returned to Carson City, where they soon acquired property in Washoe Valley. This was the base from which both operated to work on conservation and social problems in the Great Basin and desert southwest. In 1962, Dick and Maya Miller, Ann and Homer Angelo, and John Darling established the Foresta Institute, a small but mighty and pioneering non-governmental organization. Until 1974 the Foresta Institute ran an environmental study program for elementary through high-school students, including boys and girls of all races and socio-economic groups. One of the instructors was James E. Deacon, known to us all; another was William Franklin, later the stoutest proponent of protection for the American camelids. Foresta provided a representative at the IUCN and other international organizations when there was no official U.S. government representation. Miller served on the boards of numerous national organizations and acted as an expert witness in the suit brought by the Pyramid Lake Indians against diversions of Truckee River water. Over the years, Foresta also backed many publications promoting the conservation of Nevada’s springs (by J. Deacon) and other desert resources, and it was instrumental in establishing Great Basin National and Ichthyosaur State parks. Many of the crucial ‘good-guy’ players involved in evicting cattle interests and other developmental threats from Ash Meadows and formation of the federal reserve had direct connections to the Foresta Institute.

In 1974, Maya Miller, who was becoming increasingly involved in women's rights and other social causes, ran for U.S. Senator. She narrowly lost in the primary to now Senator Harry Reid. As the Millers' interest and activities were growing apart, they divorced in 1975, though both remained on the Foresta board. Dick moved off the Washoe Pines Ranch, and soon to Tucson, where he continued his work on international conservation. A few years later, Miller married Mardith K. Scheutz (who became Mardith Scheutz-Miller), an archeologist and historian. Together, they have traveled to many national and international meetings and spent two years on Guam, where Mardith did archeological work and Dick was again able to dive.

In recent years (1990's and 2000's), Miller has continued to participate in world-wide environmentalism, especially in the Antarctic and the Arctic basins, but he has also returned to his involvement with the conservation of desert fishes. He has exhibited on desert cyprinodonts and other fishes at Desert Fishes Council symposia and is working to update and publish his Lake Tahoe work (with Almo Cordone, CF&G, retired). He is also working up and plans to publish on Baja California fishes and is working on an illustrated handbook on the fishes of Cozumel. All of this at age 94!

2007-11-17 12:00 **Early ontogeny of gray redhorse *Moxostoma congestum***

Zymonas, Nik D.*[1]; Altenbach, Chris[2]; Propst, David L.[1]. (1-New Mexico Department of Game and Fish; 2-City of Albuquerque Biological Park).

Collection of larval specimens may provide important insights into the ecology and status of fish populations. We artificially spawned gray redhorse *Moxostoma congestum* from the Black River, New Mexico, and reared the progeny under laboratory conditions to obtain information on early life history and to enable development of an identification key. Fertilized eggs (day 1) were initially adhesive, 3 mm in diameter, and pale yellow in color. Embryos flexed at three-second intervals and hatched tail-first on day 4 (92 h; 88 Celsius temperature units). Newly hatched protolarvae were 8 mm TL with a transparent body, their heads strongly decurved over the yolk sac. Features of the protolarval phase included the appearance of circulating blood, pigmentation of the retina, alignment of the head with the body axis, and progressively stronger swimming bursts along the tank bottom. Attainment of the mesolarval phase at about 13 mm TL (day 11) was associated with development of caudal fin rays, filling of the gas bladder, residence in the water column, complete absorption of yolk, and onset of exogenous feeding by day 14. Mesolarvae exhibited yellowish-tan dorsal pigmentation and increased density of dorsal melanophores. Metalarval phase was reached by 17 mm TL (day 23) with the presence both of pelvic fin buds and all median fin rays. The mouth was distinctly subterminal and individuals were increasingly oriented with the tank bottom. The larval period was complete by 20 mm TL (day 39) as the full complement of fin rays was apparent and finfolds were entirely absorbed. Morphological measurements and character counts from this developmental series provide the means to distinguish gray redhorse larvae from those of sympatric catostomids as well as other Moxostomids. All specimens will be accessioned to the Museum of Southwest Biology at the University of New Mexico.

2007-11-17 12:15 **Consultation and collaboration: Balancing water resource management with conservation of the endangered Moapa dace, *Moapa coriacea***

Syzdek, David J*[1]. (1-Southern Nevada Water Authority).

The Moapa Warm Springs in southern Nevada, a regional spring complex that is the headwaters of the Muddy River, is primarily fed by the White River carbonate flow system. These springs and the associated streams are habitat for an endemic suite of thermophilic aquatic species that includes the federally endangered Moapa dace, *Moapa coriacea*. Currently, the Southern Nevada Water Authority (SNWA) and stakeholders are undertaking recovery actions for the Moapa dace. These include construction of fish barriers, removal of invasive species, riparian habitat restoration, and development of an ecological model for the Moapa dace. To facilitate recovery of the dace and other species, SNWA purchased the approximately 1,200 acre Warm Springs Ranch in September 2007 and designated it the Warm Springs Natural Area.

Evaluation of carbonate groundwater pumping in Coyote Spring Valley will be completed to determine the relationship to discharge rates in the Moapa Warm Springs area. The Nevada State Engineer required an aquifer test to evaluate the relationship between carbonate pumping in Coyote Spring Valley and the Moapa Warm Springs. SNWA applied for rights-of-way (ROW) with the Bureau of Land Management to construct water facilities and to conduct an aquifer test of the SNWA's existing water rights in Coyote Spring Valley. The pipeline will transport water to the Moapa Valley Water District's (MVWD) system. The ROW application triggered a Section 7 Consultation with the U.S. Fish and Wildlife Service (USFWS). Through this consultation, a memorandum of agreement between the Authority, USFWS, Coyote Spring Investment, MVWD and the Moapa Band of Paiutes was developed, and a monitoring and mitigation plan was agreed upon. This plan provides for continuous hydrological and biological monitoring, and aggressive conservation actions toward recovery of the Moapa dace.

2007-11-17 12:30 **Conservation by cooperation: Determining how habitat dynamics influence the federally threatened Santa Ana sucker in a highly urbanized environment**

Baskin, Jonathan N.*[2]; Haglund, Thomas R. [1]; Thompson, Andrew[3]. (1- San Marino Environmental Associates, San Marino, CA; 2- Biological Science Department, California State Polytechnic University Pomona, Pomona, CA; 3- U.S. Fish and Wildlife Service, Carlsbad, CA).

Cooperation among disparate groups is necessary to facilitate species conservation in many urban environments. The Santa Ana Sucker Conservation Team (Team), organized by the Santa Ana Watershed Project Authority and comprised of representatives from the Carlsbad Fish and Wildlife Office, California Department of Fish and Game, U.S. Forest Service, universities, conservation groups, private companies and flood control, wastewater treatment, and water districts, is working to conserve the federally threatened Santa Ana sucker (*Catostomus santaanae*) in the Santa Ana River, California. Research (see related poster) funded and carried out by the Team has identified sedimentation as a primary threat to the sucker as: 1) a habitat selectivity study showed that the sucker primarily selects cobble/gravel substrate and avoids sandy areas, 2) yearly fish density and habitat composition surveys at three sites from 2001 to 2007 demonstrated that sucker densities declined dramatically in sites where substrate concurrently shifted from cobble/gravel to sand, and partly recovered when habitat also recovered, and 3) systematic surveys of habitat composition over a 30-km stretch of river showed that the availability of suitable habitat varies through time as approximately 4.2 km of cobble/gravel habitat was present in 2006 and 9.6 km was documented in 2007. Given the detrimental impact of sedimentation to the sucker, the Team is attempting to formulate a management strategy to ameliorate this threat. Among the actions under consideration are 1) transplanting suckers into parts of their historic range from which they were extirpated and, due to artificial barriers, unable to naturally recolonize, and 2) conducting in-stream habitat restoration. Elucidation of the problems affecting sucker conservation and hence our ability to adequately address these issues would be greatly diminished without the Conservation Team. By working together now and in the future under the common goal of conserving the sucker we hope to establish and maintain a healthy sucker population in the Santa Ana River.

2007-11-17 12:45 **Oregon / Northern California Area Report: surveys, screens and, of course, bad news for bass**

Reid, Stewart B.*[1]; Scheerer, Paul[2]; Heck, Michael[2]; Smith, Roger[3]; Osbon, Shannon[3]; Mauer, Alan[4]; Munhall, Allen[5]; Corning, Max[6]. (1-Western Fishes; 2-Oregon Dept Fish and Wildlife, Corvallis; 3-Oregon Dept Fish and Wildlife, Klamath Falls; 4-U.S. Fish and Wildlife, Bend; 5-U.S. Bureau Land Manaagement, Lakeview; 6-National Resource Conservation Service, Lakeview).

The northwestern extreme of the American deserts includes six interior drainage basins in Oregon and northeastern California (Fort Rock, Chewaucan, Goose, Warner, Catlow, and Alvord), which contain the remnant fish faunas of once extensive pluvial Pleistocene lakes. Species of particular conservation concern in this region include: Alvord Chub, *Siphateles alvordensis*; Borax Lake Tui Chub, *Siphateles boraxobius*; Cow Head Tui Chub, *Siphateles bicolor vaccaceps*; Hutton Springs Tui Chub, *Siphateles obesus* ssp.; Foskett Dace, *Rhinichthys osculus* ssp.; Modoc Sucker, *Catostomus microps*; Warner Sucker, *Catostomus warnerensis*; Lahontan Cutthroat Trout, *Oncorhynchus clarki henshawi*; and Interior Redband trouts, *Oncorhynchus mykiss* sspp..

2007 was a hot, dry year in the region. Oregon Department of Fish and Wildlife (ODFW) completed distribution surveys of fishes in the Warner and Goose basins, with population estimates for Interior Redband trouts and Warner Sucker (see presentations by Scheerer and Heck et al). There were also specific population surveys for Hutton Springs Tui Chub, Foskett Dace and Modoc Sucker (Goose Basin population). In Oregon's peripheral Lahontan drainages, ODFW has initiated a program to clear introduced trout out of potential Lahontan Cutthroat Trout reaches in McDermitt Creek. In the Warner Basin, various fish screening projects benefit the Warner Sucker, Redband Trout and other native fishes. Eradication of a reservoir population of Goldfish (*Carassius auratus*) appears to have been successful, preventing the spread of this exotic species into the Warner Basin. A conservation review for the Modoc Sucker was completed in 2007, and U.S. Fish and Wildlife Service is completing its status review. The active non-native fish management program continues in the Turner Creek drainage, one of three containing Modoc Suckers, and experimental Bullfrog (*Rana catesbeiana*) suppression has been initiated. There are now no bass remaining in the Turner Creek drainage.

13:00 CLOSING REMARKS

CANCELLED - Phylogeographic patterns within the central Australian rainbowfishes

Unmack, Peter J.*[1]; Adams, Mark[2]; Dowling, Thomas[3]. (1-Brigham Young University, Department of Biology; 2-South Australian Museum, Evolutionary Biology Unit; 3-Arizona State University, School of Life Sciences).

Phylogenetic patterns within Australian desert fishes remain relatively poorly known, although considerable research is underway to investigate the systematics and biogeography of this unusual fauna. A phylogeographic study was recently completed on one of the more abundant groups, the rainbowfishes (Melanotaeniidae: *Melanotaenia*) as part of a broader Australia-wide examination of the group. Two species occur in the eastern arid portion of Australia, *Melanotaenia fluviatilis* in the Murray-Darling Basin and *M. splendida tatei* which occurs in western portion of Murray-Darling Basin and the Lake Eyre Basin. We used SSCP to determine variation in a portion of the mitochondrial cytochrome b gene and allozyme electrophoresis on 18 variable loci to examine phylogeographic patterns. Results suggest that central Australian rainbowfishes have a complicated history, with several potential invasions into the Lake Eyre Basin from surrounding drainages. In addition, *M. s. tatei* appears to have recently invaded the Murray-Darling Basin and a hybrid zone now exists where they come into contact with *M. fluviatilis*. The history of *M. fluviatilis* is also complicated by introgression with *M. duboulayi*, a species found in eastern coastal drainages. This work adds to the growing body of evidence that hybridization and introgression in rainbowfishes may be more common than previously thought and has important implications at multiple temporal and spatial scales.

CANCELLED - Conservation genetics of Warm Springs pupfish, *Cyprinodon nevadensis pectoralis*

Martin, Andrew P*[1]. (1-University of Colorado, Dept of Ecology and Evolutionary Biology).

The Warm Springs pupfish, *C. nevadensis pectoralis*, survive in 5 low flow springs in Ash Meadows, Nevada. Comparison of microsatellite allele frequencies sampled ten years apart provided the basis for estimating genetic effective population size (Ne). Assuming a demographic generation time of 1 year, Ne is smaller than historical estimates of census size. Overall, all populations are extremely small except for the School Spring population. Despite the extremely low flow rate of School Spring, the population size is exceptionally large relative to the other populations. This observation most likely reflects the effects of augmentation of the habitat by the artificial pools. Using the genetic and historical data, I will discuss issues related to the conservation of the Warm Springs pupfish.

CANCELLED - Desert fish species under protection of the Mexican environmental legislation - POSTER

Fuentes, Patricia*[1]; Espinosa, Hector[2]. (1-Instituto Nacional de la Pesca, SAGARPA; 2-Inst. de Biología, UNAM).

This paper presents 93 freshwater fishes associated to hydrological basins of desert areas of the country to which the Mexican environmental legislation (NOM-ECOL-059) grants some level of protection. The DFC lists 150 desert fish species (not considering subspecies) that live in strictly freshwater, of which 62% are shared between Mexico and the U.S.A. The Mexican Method of Risk Evaluation (MER) considers range distribution, endemism, intrinsic vulnerability, and habitat deterioration and other criteria to assign species to the categories of extinct, endangered, threatened or under special protection. Examples are presented for selected species. The Neartic families with the large numbera of shared species are: Cyprinidae with 32 of 78, Cyprinodontidae with 16 of 32, Catostomidae with 12 of 37, Ictaluridae with 5 of 9 and Percidae with 5 of 8 species. Other families with two or fewer species are Acipenseridae (not collected in Mexico for a long time), Lepisosteidae, Salmonidae, Gobiesocidae, Fundulidae and Gasterosteidae, with ovreall 14% shared species. For the entire Neartic ictiofauna, 78 species are included in the NOM-059 with a high value (83.8%), largely related to the desert aquatic habitat. The Neotropical families Poecilidae has 11 species of 33 shared between the two countries, Cichlidae has 3 of 8, and Goodeidae has 1 of 6. The majority of biodiversity in these families is associated with fluvial and lacustrine habitats in non-desert regions.