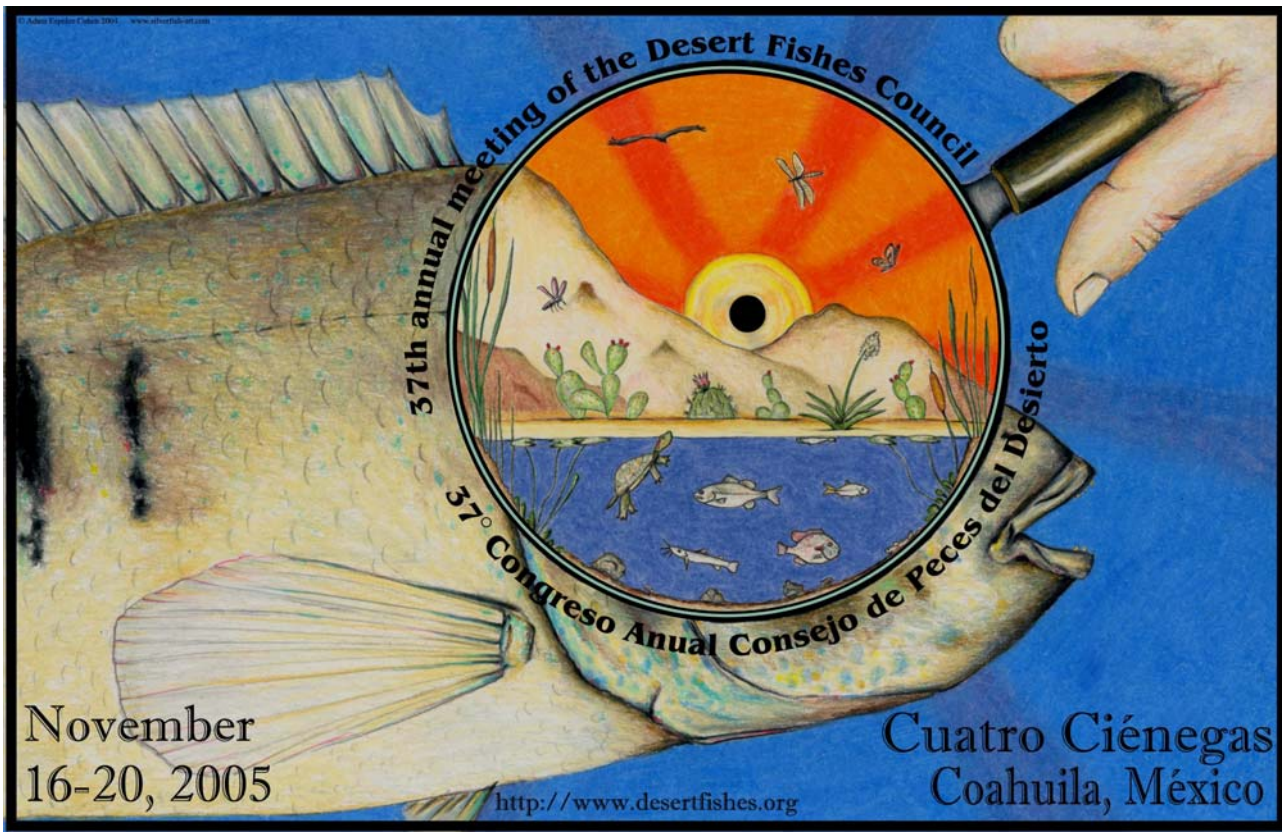

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General Meeting Program

Wednesday (miercoles) November 16, 2005

Registration and "ice-breaker social"/ Inscripción y rompehielos (19:00 - 22:00)

Light refreshments and drinks and an opportunity to socialize and relax. For van passengers, someone will wait for your arrival at the Casa de Cultura after 10:00 PM if necessary.

Thursday (jueves) November 17, 2005

Inaugural Session / Presidium (08:30 - 10:00)

Technical Session 1 / Sesión Técnico 1 (10:00 – 12:00)

2005-11-17 10:00:00 - García de León, Francisco J.[*1]

(1-Genética de la Conservación, Planeación Ambiental y Conservación, Centro de Investigaciones Biológicas del Noroeste (CIBNOR), La Paz, BCS, México.)

Microsatellite markers for study of three fishes in northeast Mexico: Mexican tetra (*Astyanax mexicanus*), Amazon molly (*Poecilia formosa*) and Cuatro Ciénegas cichlid (*Herichthys minckleyi*)

Three species representative of the Mexico's Northeast icthyofauna were analyzed with microsatellite markers. Mexican tetra (*Astyanax mexicanus*) is considered a successful species that has invaded almost every freshwater habitat; nevertheless, due to hydrological separation among basins, it is predicted that the species would have genetically differentiated populations. The data of two microsatellite loci indicated distance isolation, and three different populations have been distinguished: a very distinct northern population (Cuatro Ciénegas), an intermediate population (San Fernando and Soto la Marina System), and a southern population (Panuco and some from Tuxpan). Amazon molly (*Poecilia formosa*) is considered a case study for sexual evolution and skin cancer research, it is a gynogenetic species, and was the first vertebrate discovered to have clonal reproduction. For the most part, the genetic material of the males has no contribution to the genome of the progeny, but in rare occasions, the exclusion mechanisms failed, leaving small traces or microsomes within the genome of the oocyte and furthermore, they can produce triploid organisms. Microsatellites obtained from *Xiphophorus* sp were used in the analysis of the genetic variability of Amazon molly, shortfin molly (*P. mexicana*), and sailfin molly (*P. latipinna*). As expected, the clone species had lower levels of genetic variability and sixteen primers allowed species identification and eight primers allowed a diagnosis of different ploidy levels in Amazon molly. The cichlid (*Herichthys minckley*) is an endemic species of the region of Cuatro Ciénegas Coahuila that exhibits trophic polymorphism. Two loci were obtained from the genome of *Herichthys minckleyi* and allowed amplification of DNA amplification from congenital species: *H. cyanoguttatus, H. bartoni, H. tamasopoensis, H. steindachneri, H. labridens, and H. carpintis* , as well as some of the genus *Tilapia* sp. In a sample of 260 individuals, the heterozygocity observed was 0.85 for the Hmick8 locus, and 0.67 for the Hmink14 locus. Two trophic morphs were compared (molluscivorous and papilliform), the genetic differential value between them was low but significantly different (Fst = 0.013, $p<0.05$).

Marcadores microsatelites para el estudio de tres especies de peces en el noreste de Mexico: sardinita mexicana (*Astyanax mexicanus*), topote amazona (*Poecilia formosa*) y cíclido de Cuatro Ciénegas (*Herichthys minckleyi*)

Se analiza a especies de los generos más representativos de la ictiofauna del Noreste de Mexico mediante marcadores del tipo microsatelites. La sardinita mexicana (*Astyanax mexicanus*) es una especie exitosa y ha invadido casi cualquier ambiente dulceacuícola, no obstante, dado la separación de las diferentes cuencas hidrológicas, se predice que *A. mexicanus* se encuentra genéticamente diferenciada. Los datos de dos loci microsatélites indican un aislamiento por distancia, y reconocen tres poblaciones: una norteña y muy diferente (Cuatrocienegas), una intermedia (sistemas del San Fernando y Soto la Marina) y una sureña (Pánuco y algunas del Tuxpan). El Topote amazona (*Poecilia formosa*) es un modelo de estudio para la evolución del sexo y el cáncer de piel, es considerada una especie ginogenética y fué el primer vertebrado descubierto con reproducción clonal. En general, el material genético de los machos no contribuye al genoma de la descendencia, pero en casos raros, los mecanismos de exclusión fallan, dejando pequeñas partes o microcromosomas dentro del genoma en el oocito, o incluso se producen organismos triploides. Los microsatelites fueron obtenidos en *Xiphophorus* sp. para analizar la variabilidad genética de *P. formosa, P. mexicana y P. latipinna*. Como se esperaba los niveles de variabilidad genética fueron menores en la especie clonal, 16 primers permitieron la identificación de especies y 8 permiteron diagnosticar los diferentes niveles de ploidia en *P. formosa. Herichthys minckleyi* es una especie endémica en Cuatro Ciénegas Coahuila, que muestra un polimorfismo trófico, se analizaron dos loci en el genoma de *H. minckley* que pudieron amplificar ADN de especies congenéricas *H. cyanoguttatus, H. bartoni, H. tamasopoensis, H. steindachneri, H. labridens y H. carpintis*, asi como del género *Tilapia* sp. En una muestra de 260 individuos la heterocigosidad observada fue de 0.85 para locus Hmink8 y 0.67 para el locus Hmink14. Se compararon dos morfos tróficos (molusquivoros y papiliformes) y el valor de diferenciación genética entre ellos fue bajo pero significativo (Fst = 0.013, $P < 0.05$).

2005-11-17 10:15:00 - Hendrickson, Dean A.[1]; McEachron, Lucas[*2]

(1-Texas Natural History Collection, PRC176/R4000, 10100 Burnet, University of Texas, Austin, TX 78758; 2-Dept. Geography, Florida State University, Tallahassee, FL 32306-2190)

Mark-recapture monitoring, population modeling, and laboratory observations of Cuatro Ciénegas cichlids

Mark-recapture projects on Cuatro Ciénegas cichlid, Herichthys minckleyi, and studies of a lab stock are contributing toward development of a life table for the species. In Poza Mojarral Oeste (now also called "Poza Azul" near the Visitor Center) 35 separate, variable size samples taken between June 18, 1999 and March 17, 2005 (6 in 1999, 10 in each 2000 & 2001, 3 in each 2002 and 2003, 1 in each 2004 and 2005) resulted in marking and release of 1,798 marked individuals > 50 mm SL. Over half (58%, n=1,038) of all tagged individuals have been recaptured. Numbers of individuals recaptured one, two, three to 10 times in the 35 variable-size samples are respectively 681, 176, 87, 37, 26,

19, 6, 4, 1, and 1. Times between first and last recaptures varied from one to the maximum possible 2099 days (2 individuals). For several years now, the proportion of marked individuals in samples has ranged from about 50 – 70%, even despite long intervals (9-11 months) between each of the last 3 samples.

Mojarral Oeste discharges via both surface and subterranean flows to the much larger Mojarral Este, which in turn discharges to the Río Mesquites. Little more than 100 m separates the two pozas. Fish from Oeste have been observed to enter and move at least 10s of meters downstream in the surface channel and cichlids commonly enter the much greater discharge that flows through the subterranean outlet. Twenty one samples in Mojarral Este between June 1999 and July 2002 allowed us to tag and release 860 individuals there, but we obtained only 28 (3%) recaptures and have yet to capture any individual tagged in one poza in the other. Obviously the population of Mojarral Este is very large and probably open, and we tentatively conclude that movements between these two pozas must be very limited.

Population modeling using Program Mark under Pollock's robust design yielded population size estimates for Mojarral Oeste that range from 367 to 802 individuals, and survival rates from 0.45 to 0.76. Additional details of the model and influences of the sampling regime on modeling results will be discussed.

The lab stock has allowed us to compile data on aspects of the species' life history that are difficult to obtain in the field, such as fecundity, complement field mark/recapture data (tag shedding is essentially non-existent), and also make some interesting observations regarding breeding coloration and social behavior.

Further refinements of life table and movements data will be useful for future management of this endangered, endemic and polymorphic species.

2005-11-17 10:30:00 - Hulsey, C Darrin[*1]; García de León, Francisco J.[2]

(1-Georgia Tech, Department of Biology; 2-CIBNOR, La Paz, Baja California Sur, México)

Molecular Divergence in the polymorphic Cuatro Ciénegas cichlid *Herichthys minckleyi*

The tempo of evolutionary divergence in *Herichthys minckleyi*, the polymorphic Cuatro Ciénegas cichlid, was examined using two molecular markers. Both the mitochondrial gene cytochrome *b* and the nuclear intron S7 were examined in the clade of Northeastern Mexican cichlids in the genus Herichthys and among populations of the Cuatro Ciénegas valley. *Herichthys cyanoguttatus*, the Texas cichlid, was found to be the sister species to *H. minckleyi*. The percentage of molecular divergence in both genes support a molecular clock based coalescent time between the two species of approximately two million years. We interpret the molecular divergence recovered as evidence *H. minckleyi* may have been evolving in isolation from all other cichlids for several million years within the Cuatro Ciénegas valley. Within the valley, *H. minckleyi* sequences show small but structured genetic subdivision related to geographic distance among pools sampled. However, haplotypes that are invariable in over an 800 kilometer range of *H. cyanoguttatus* were recovered from the populations of *H. minckleyi* sampled in Cuatro Ciénegas. The implications of the *H. cyanoguttatus* invasion for the *H. minckleyi* polymorphism and conservation of this unique polymorphic species will be discussed.

2005-11-17 10:45:00 - Piller, Kyle R[*1]

(1-Southeastern Louisiana University, Dept. of Biological Sciences)

Resource partitioning and morphometric diversity among silverside fishes (Atherinopsidae: *Chirostoma*), Lake Chapala

Adaptive radiations represent one the most interesting evolutionary phenomena and in recent years, have received much study due to its perceived importance in diversification and speciation. Members of the genus *Chirostoma*(Actinopterygii: Atherinopsidae), a morphologically diverse genus of silverside fishes, are believed to be the result of an adaptive radiation. Lake Chapala, Mexico, the center of *Chirostoma* diversity, harbors eight sympatric species that have diversified in body shape and size and trophic specialization. This study was undertaken to assess whether trophically similar species of *Chirostoma* in Lake Chapala have converged on similar body morphometries. Landmark data for geometric morphometrics were gathered from 155 museum specimens from eight sympatric species of *Chirostoma* to determine if body shape and trophic position are linked and therefore likely important in the diversification of this group. The results indicate that there are significant differences in body shape among all Lake Chapala species of *Chirostoma*(MANOVA Wilks' λ =0.1504, F=30.578, p<0.0001). Canonical variates analysis indicates that piscivorous species (*C. lucius, C. sphyraena*, and *C. promelas*) and non-piscivorous species (*C. jordani, C. labarcae, C. consocium, C. chapalae*, and *C. contrerasi*) are completely separated in morphospace along canonical variates axis 1. However, there is a large degree of overlap among the piscivorous species, which all possess elongate jaws and bodies relative to all other species. Canonical variates axis 2 discriminates among some species within the non-piscivorous trophic guild, however there is some overlap in body morphometries of *C. chapalae* and *C. consocium*, likely associated with similarities in resource acquisition.

2005-11-17 11:00:00 - Winsborough, Barbara M.[*1]

(1-Winsborough Consulting)

A preliminary account of the diatom flora of the Cuatro Ciénegas basin, including "Lazarus species" (evolutionary relicts) and marine disjuncts

The aquatic habitats of the Cuatro Ciénegas Basin contain an abundant, diverse and remarkable diatom flora (single-celled algae with a silica cell wall) that includes roughly 300 species and varieties. In addition to freshwater diatoms there are many species found typically in either brackish or marine environments. Many of the diatoms are cosmopolitan species but there is a significant number of undescribed forms, some of which may be endemic to the basin. One of the most common diatoms living in the spring lakes was known previously only from fossil deposits of Plio-Pleistocene age. A few species appear to demonstrate adaptive radiation, producing several distinct morphologies. Biological, meteorological and hydrochemical factors influence species distribution within the basin and, in spite of ample mechanisms for dispersal, individual diatom taxa are often constrained to particular lakes. Many diatoms are sensitive to habitat alteration or changes in nutrient or salinity concentrations and their response is a rapid shift or adjustment in their community composition. This characteristic makes diatoms particularly useful for monitoring water quality.

2005-11-17 11:15:00 - Karam, Abraham P.[*1]; Lyons, Lindsey T.; Parker, Michael S.

(1-Southern Oregon University, Department of Biology; 2-Southern Oregon University, Department of Biology; 3-Southern Oregon University, Department of Biology)

Comparison of ecological characteristics of three Devils Hole pupfish refuges

Attempts to maintain refuge populations of Devils Hole pupfish (*Cyprinodon diabolis*) in artificial tanks have achieved limited success. Changes in morphological, behavioral and genetic characteristics of refuge populations suggest that environmental conditions, and thus selective pressures, are much different than in Devils Hole. Yet, to date, there have been no attempts to quantify differences among refuges or between

refuges and Devils Hole. Over the past year, we compared physical, chemical and biological characteristics of the three existing pupfish refuges (Hoover Dam, School Springs and Point of Rocks). Temperature monitoring revealed large differences in mean temperatures and diel and seasonal fluctuations among the three refuges and between all three refuges and Devils Hole. On two occasions we recorded extreme temperature fluctuations due to water supply malfunctions at Hoover Dam (8 C temperature drop) and School Springs (20+ C drop). Similar malfunctions have caused large declines in, or losses of entire refuge populations in the past. Substrate composition is very different in refuges than in Devils Hole. Because they are closed systems, thick layers of organic-rich, anoxic sediment have accumulated, particularly in School Springs (mean depth 19.1 cm; range 1-30 cm) and Point of Rocks (mean depth 8.9 cm; range 5-39 cm) refuges, burying the rocky substrate designed to replicate the spawning shelf in Devils Hole. Algal standing crops differed several-fold among the three refuges and in two of three refuges were consistently greater than peak standing crops reported in Devils Hole. In addition, algal biomass showed much less seasonal variation within all three refuges than has been reported for Devils Hole. Dissolved oxygen concentrations were much less variable in the refuges than in Devils Hole, particularly during the spring and summer when there are short periods of direct sunlight on the upper shelf. Benthic invertebrate abundances and taxonomic diversity also differed considerably among the three refuges and taxa abundant in Devils Hole were consistently rare or absent. Our results show that existing refuge environments deviate considerably from natural conditions in Devils Hole and further illustrate the challenges faced in trying to establish and maintain refuge populations of *C. diabolis*.

2005-11-17 11:30:00 - Clements, M.D.[*1]

(1-Tulane Univeristy Museum of Natural History)

Phylogenetic relationships and biogeography of the Moxostomatini (Cypriniformes: Catostomidae) with special reference to species in Texas and Mexico

The tribe Moxostomatini (Catostomidae, Cypriniformes) is comprised of 6-7 genera and about 30 species. Within this tribe, the genus *Scartomyzon* has been recognized as a monophyletic assemblage of small bodied, rheophillic fishes that usually have high scale counts, low dorsal ray counts, small fins, and striped coloration. The group has an extremely disjunct distribution with 4-5 eastern species that inhabit major river drainages of the South Atlantic slope and the Appalachicola drainage and 3-5 species western species that inhabit western Gulf Slope rivers of Texas and Mexico and Pacific slope drainages of east-central Mexico. This disjunct distribution suggests that *Scartomyzon* is not monophyletic, thus phylogenetic analysis of cytochrome-b sequences of all extant Moxostomatin suckers was employed to test this hypothesis. Although phylogenetic analysis of cytochrome-b sequences was unable to resolve some deeper nodes among the Moxostomatini, the analysis suggests that *Scartomyzon* is indeed non-monophyletic. Similarities in morphology and ecology among disjunct groups could be due to convergence as consequence of adaptive evolution to similar, upland habitats. In addition, phylogenetic relationships among western *Scartomyzon* based on cytochrome-b sequences are incongruent with current taxonomy and proposed evolutionary relationships. Phylogenetic relationships of these western forms are similar to speciation patterns of other, similarly distributed freshwater fishes suggesting that similar historical events have shaped genetic divergence and ultimately speciation patterns of these fishes in this region of the desert southwest.

2005-11-17 11:45:00 - Martínez-Tristán, Alejandra, M. T. Srita.[*1]; Lozano-Vilano, Ma de Lourdes L. V. Sra.[1]; García-Ramírez, M. Elena G. R. Sra.[1]; Contreras-Balderas, Armando Jesus C. B. Sr.[1]

(1-Lab. Ictiología, Facultad de Ciencias Biológicas, UANL.)

Diet of the jewel cichlid *Hemichromis guttatus*, and exotic species in selected areas of the valley of Cuatrociénegas, Coahuila, México

Dieta del ciclido joya *Hemichromis guttatus*, una especie exóica en areas selectas del valle de Cuatrociénegas, Coahuila, México

Este estudio examina la dieta del *Hemichromis guttatus* o "cíclido joya", una especie exótica; con respecto a cambios estacionales y la talla del pez en dos localidades: Poza Churince y Poza San José el Anteojo, dentro del Área de Protección de Flora y Fauna Cuatro Ciénegas, Coahuila, México. Se realizaron en total 8 colectas en 2 localidades, en las cuales se obtuvieron 120 ejemplares de San José el Anteojo y 120 ejemplares de la Poza Churince, sumando un total de 240 ejemplares para revisar los contenidos estomacales y determinar la dieta. El Hemicrhormis guttatus presentó para la Poza San José el Anteojo un peso promedio de 6.2 gr y una talla promedio de 52.7 mm, mientras que para la Poza Churince el peso promedio fue de 4.4 gr y 49.4 mm de longitud patrón promedio. Se registraron para la dieta un total de 26 taxa presa, pertenecientes a 1 familia de origen vegetal: algas y 18 familias de origen animal crustáceos (6), moluscos (3), insectos (7) y peces (2). Con el método de Frecuencia de Ocurrencia se determinó que en la dieta existe mayor preferencia por consumir algas, crustáceos e insectos, sobresaliendo las familias Zygnemataceae, Cypridae (ostracoda) y Chironomidae (Diptera), respectivamente. Se estableció que para el cíclido joya existen tendencias de variación en la dieta, para las diferentes estaciones, como resultado de la combinación de la disponibilidad de alimento en el hábitat.

Lunch / Almuerzo (12:00 - 14:00)

Technical Session 2/ Sesión Técnica 2 (14:00 – 15:45)

2005-11-17 14:00:00 - Ruiz-Campos, Gorgonio[1]; Camarena-Rosales, F.[1]; Varela-Romero, Alejandro[*2]

(1-Universidad Autónoma de Baja California, Facultad de Ciencias, Ensenada; 2-Universidad de Sonora, DICTUS, Hermosillo)

Northwestern Mexico Area Report: fish evaluation of the Río San Luis and Río Las Pocitas basins, Baja California Sur, Mexico

The San Luis and Las Pocitas drainage basins were surveyed for fishes during two expeditions in 2005. Sampling was done in the known distribution sites of the endangered Baja California killifish (*Fundulus lima*) and other sites within these same basins. Nine fish species were recorded for the entire study area: one vicarious (the native killifish), six peripherals (mountain mullet *Agonsotomus monticola*, striped mullet *Mugil cephalus*, Pacific sleeper *Gobiomorus. maculatus*, Pacific fat sleeper *Dormitator latifrons*, spotted sleeper *Eleotris picta*, and river goby *Awaous banana*) and two exotics (guppy *Poecilia reticulata* and redbelly tilapia *Tilapia cf. zillii*). In two sites of the Río San Luis (Mission San Luis Gonzaga and Rancho Las Cuedas) we confirmed the extirpation of the killifish due to competitive exclusion by exotic tilapia. At the Río Las Pocitas, the southernmost drainage in the distribution of the killifish, eight species were recorded (all but tilapia), including one individual of

the killifish (at Rancho El Caracol) and a gravid female of mountain mullet. The record for mullet establishes the reproduction of this species in inland waters of the Baja California peninsula. The endemic peninsular clingfish (*Gobiesox juniperoserrai*) was not found at the type locality.

2005-11-17 14:15:00 - Parker, Michael S.[*1]; Lyons, Lindsey T.; Wullschleger, John; Manning, Linda; Webber, Grant; Goodchild, Shawn; Hobbs, Brian; Scoppettone, G. Gary

(1-Southern Oregon University, Department of Biology; 2-Southern Oregon University, Department of Biology; 3-National Park Service, Water Resources Division; 4-National Park Service, Death Valley National Park; 5-U.S. Fish and Wildlife Service, Southern Nevada Field Office; 6-U.S. Fish and Wildlife Service, Southern Nevada Field Office; 7-Nevada Division of Wildlife; 8-U.S. Geological Survey, Biological Resources Division, Reno Field Station)

Restoration of habitat conditions on the upper shelf of Devils Hole improves pupfish reproduction

On 15 August and 11 September 2004, localized thunder storms produced flash floods that introduced substantial volumes of sediment and organic debris into Devils Hole. Much of this material was deposited onto the shallow, upper shelf drastically reducing the quantity and quality of primary spawning and larval rearing habitat for the Devil's Hole pupfish, *Cyprinodon diabolis*. Structures installed within the hole to allow access by divers and researchers played a large role in the pattern of sediment deposition, and thus alteration of habitat conditions on the shelf. In addition, during the 11 September event, sampling equipment being used in our larval pupfish study, including 36 larval fish traps, was washed into the hole. Since, these traps were not discovered and removed from the hole for 10-12 days, a large number of pupfish were captured and died within them, a loss of approximately 37% of the total population (based on 10 July pupfish census). Highly altered habitat conditions and reduced population size limited the ability of the pupfish population to recover from disturbances and substantially increased the risk of extinction. Although increased spawning activity was observed, larval surveys revealed an absence of reproductive success after the September flood.

On 07 February 2005, we undertook a large-scale restoration effort to improve habitat conditions on the shelf prior to peak spawning activity. Our goals were to (1) increase average water depth, and thus habitat volume, across the shelf by removing the large quantity of deposited sediment, and (2) change substrate particle size to increase interstitial habitat for larval fish. Prior to sediment removal, we collected and retained all pebble–cobble size particles and algal mats from the substrate surface for to re-inoculate the shelf with algae and invertebrates. Sediment was shoveled into buckets and hauled, bucket-brigade style, out of the Devils Hole cavern. We removed 2.7m³ of sediment, increasing habitat volume by 22.3% over pre-flood conditions, and increased average water depth across the shelf by 22 cm (range 5.1-48.0 cm). By hand-sorting substrate particles during the sediment removal process, we were able to shift the size distribution from coarse gravel filled with interstitial fines to a complex mixture of unembedded pebble-cobble across the shelf surface. This substantially increased interstitial habitat available to larval and juvenile pupfish. Results of monthly larval censuses from April through August showed that pupfish began spawning shortly after the habitat restoration and successfully spawned throughout the spring and summer. Shifts in size-frequency distributions provide evidence of larval survival, growth and recruitment into reproductively mature age classes. Results of the Autumn dive count will determine if this apparent increase in reproductive success has translated into a more robust adult population.

2005-11-17 14:30:00 - Varela-Romero, Alejandro[*1]; Yepiz-Plascencia, Gloria; Peregrino-Uriarte, Alma; Hendrickson, Dean A.

(1-Department of Science and Technology Research, University of Sonora; 2-Aquatic Molecular Biology Laboratory, CIAD; 3-Aquatic Molecular Biology Laboratory, CIAD; 4-Texas Memorial Museum, University of Texas)

Genetic variability of the Yaqui catfish, *Ictalurus pricei* (Pisces: Ictaluridae), in northwest Mexico

Species of the genus *Ictalurus* are among the most abundant and commonly encountered species of the family Ictaluridae, which ranges from southern Canada to southern Mexico and Central America. The genus is comprised of two clades; the *furcatus* clade containing the species *furcatus*, *meridionalis* and *balsanus*, while the *punctatus* clade includes *punctatus*, *lupus*, *australis*, *dugesi*, *mexicanus* and *pricei*, all known from, and and all but the first endemic (or very nearly so) to México. In general, information about Mexican species of the genus is very scant and further studies are necessary. Since perhaps four or five more Mexican forms remain to be described, the majority of the diversity in the genus clearly resides in Mexico. At least some of those taxa still undescribed are members of what has previously been referred to as the poorly known "*Ictalurus pricei* complex" that inhabits Mexico's northern Pacific drainages. At least two distinct, undescribed forms were found in the Fuerte and San Lorenzo river basins. Phylogentic relationships of members of this complex from the Yaqui and Fuerte basins were estimated by analysis of complete sequences of the mitochondrial genes *12SrRNA* (954 bp) and *Cytb* (1138 bp) obtained from recently collected material. Published sequences of selected other members of the "punctatus" clade and "furcatus" to represent the clade of the same name, completed the input data set. Both mitochondrial gene sequences have fixed inter-specific differences; and high levels of intra-specific variation was found among individuals from the Yaqui basin. Maximum likelihood analysis of each gene separately and both genes together support the *punctatus* clade and exclude the *furcatus* from it. Relationships derived from only *Cytb* sequence exclude specimens from the Fuerte River from the *price* clade, grouping them instead with other native catfishes of Northwest Mexico and with *lupus* from Northeastern Mexico.

Variabilidad genética del bagre Yaqui *Ictalurus pricei* (Pisces: Ictaluridae), en el Noroeste México

Las especies del género *Ictalurus* son las especies de la familia Ictaluridae más abubndantes y comunmente encontradas que se distribuyen del Sur de Canada hasta el sur de México y Centroamérica. El género comprende dos clados, el clado *furcatus* contiene a las especies *furcatus*, *meridionalis* y *balsanus*, y el clado *punctatus* incluye a *punctatus*, *lupus*, *australis*, *dugesi*, *mexicanus* y *pricei*, todas presentes en México y la mayoría endémicas a nuestro país. En general, la información sobre las especies Mexicanas del género es muy escasa, por lo que se necesario estudiarlas. Además, de permanecer cuatro o cinco formas aún sin describirse para la ciencia, la mayoría de la diversidad del género reside en México. Algunos de estos taxa no descritos son miembros de lo que previamente ha sido referido como el escasamente conocido complejo "*Ictalurus pricei* complex" que habita las cuencas del Pacífico del Norte de México. Al menos dos formas distintas no descritas han sido encontradas en las cuencas de los ríos Fuerte y San Lorenzo. Se estimaron las relaciones filogenéticas de este complejo de las cuencas de los ríos Yaqui y Fuerte por medio del análisis de las secuencias completas de los genes mitocondriales *12SrRNA* (954 bp) y *Cytb* (1138 bp) obtenidos de material recientemente recolectado. El grupo de genes para el análisis fue completado con secuencias publicadas de otros miembros de los clados *furcatus* y *punctatus*. El análisis de Máxima Verosimilitud de las secuencias de ambos genes mitocondriales definen diferencias interespecíficas y revelan altos niveles de variación intraespecífica entre individuos de la cuenca del Yaqui. Las secuencias de cada gen por separado y de ambos genes juntos soporta el clado *punctatus* y excluye a *furcatus* de el. Las relaciones derivadas del análisis de la secuencia de *Cytb* excluye a los especímenes del Río Fuerte del clado *price*, y los agrupa con los otros bagres nativos del Noroeste de México y con *lupus* del Noreste de México.

2005-11-17 14:45:00 - Valdés, Arcadio Dr.[1]; Angeles, María E. Mc.[*1]; Reséndiz, Alejandro Sr.[1]; García, Sergio Dr.[2]

(1-Laboratorio de Acuacultura, Facultad de Ciencias Biológicas, Universidad Autónoma de Nuevo León. San Nicolás de los Garza, Nuevo León.; 2-Laboratorio de Acuacultura, Unidad Académica de Ecología Marina. Universidad Autónoma de Guerrero. Acapulco Guerrero.)

Advances in conservation and laboratory reproduction of *Megupsilon aporus* (Miller y Walters 1972) a species extinct in the wild in Nuevo León, México

Avances en la conservación y reproducción en condiciones de laboratorio de *Megupsilon aporus* (Miller y Walters 1972) especie extinta en el medio silvestre de Nuevo León, México

Megupsilon aporus (Miller y Walters, 1972), es una especie endémica cuya localidad de origen era el manantial (actualmente seco) del ejido El Potosí en Galeana, NL. Esta especie según el anexo II de la Norma Oficial Mexicana NOM-059-ECOL-2001, publicada en el Diario Oficial de la Federación el 6 de Marzo del 2002, se encuentra en la categoría de riesgo: "Probablemente extinta en el medio silvestre". Por lo que actualmente se hacen esfuerzos para su conservación y reproducción en cautiverio. Desde 1985, se ha tratado de mantener a esta especie en acuarios en el interior del Laboratorio de Acuacultura de la FCB, UANL. En el año 2002 se han retomado las observaciones hechas por Valdés y Sotelo en 1987 en el manejo de la alimentación y temperatura en Cyprinodon alvarezi, para mantener y reproducir en cautiverio a esta especie, concluyendo que se pueden aplicar los mismos manejos en Megupsilon. Desde el 2002 a la fecha se han probado: 1) acuarios para los padres con medidas de 18 x 26 x 18, 30 x 40 x 20, 40 x 60 x 30 cm.; 2) desde una pareja hasta diferentes proporciones de hembras y machos en los acuarios; 3) como material de ovipostura se han utilizado motitas de estambre, variando en cantidad, combinación de colores, así como su posición dentro del acuario; 4) los adultos se han alimentado con: mezcla preparada con mariscos de 47% de proteína, hojuela Tetramin, larvas de culícidos, ralladura de corazón de res tanto separado cada tipo de alimento como combinaciones de algunas de ellas; 5) temperaturas del agua de 24, 26 y 28 C; 5) los intervalos de colecta de huevecillos a diario, cada 2 y 4 días. Los huevecillos colectados, se colocan en cajas petri plásticas de 60 x 15 mm, con un poco de azul de metileno para evitar la proliferación de hongos y cerca de una lámpara que les suministra calor. Para las crías en fase de larva se ha probado el alimento de a) cultivo de paramecio con hojuela Tetramin molida, b) cultivo de paramecio con camarón seco molido, y ya en su estadio juvenil se les ha administrado c) larvas de culícidos de primer instar. Después, los juveniles se pasan a piletas de concreto en el exterior del Laboratorio (cubiertas con malla plástica, para evitar depredadores) y se alimentan con ralladura de corazón de res alternando con larvas de culícidos. Como resultados y conclusiones hasta el momento, podemos decir que se han obtenido mejores resultados cuando se ha utilizado: 1) una hembra y un macho por acuario 2) un tamaño de 30 x 40 x 20 cm. en los acuarios para los padres; 3) material de ovipostura 1 motita de estambre, en combinación de colores de azul oscuro y verde claro, y colocada en el fondo del acuario; 4) alimento de larvas de culícidos; 5) temperatura de 26 C; 5) y la colecta diaria de huevecillos ya que se ha observado que las hembras se comen los huevecillos, no así los machos. Como resultado de estos experimentos, se ha observado porcentajes de fertilidad de los huevecillos que va desde un 40 hasta el 100% en relación directa con la dieta, demostrando con ello que la alimentación es un factor importante en la fertilidad y no la endogamia como se ha manejado. En el laboratorio de Acuacultura, de la F.C.B., U.A.N.L., actualmente se cuenta con una población estable de Megupsilon aporus en condiciones de cautiverio desde 1985.

2005-11-17 15:00:00 - Koike, Haruko[*1]; Echelle, Anthony A.[1]; Loftis, Dustin G.[1]; Van Den Bussche, Ronald A.[1]

(1-Oklahoma State University, Department of Zoology; 2-Oklahoma State University, Department of Zoology; 3-Oklahoma State University, Department of Zoology; 4-Oklahoma State University, Department of Zoology)

Changes in genetic structure of captive stocks of desert pupfish

A captive stock of desert pupfish has been maintained at Dexter National Fish Hatchery and Technology Center (DNFH) since April 1983. The parent population was from Santa Clara Slough, Sonora, Mexico. Since its initiation, the DNFH stock has served as the source population for establishment of a number of refuge populations in Arizona. In this paper we use microsatellite DNA variation to compare captive and wild populations of the species. Two DNFH collections, one in 1998 and one in 2005, and various descendant populations showed marked reductions in allele diversity and large differences in allele frequencies compared with a 1998 collection of the population in Santa Clara Slough and other wild populations nearby. Implications for captive management of the species will be discussed.

2005-11-17 15:15:00 - Davenport, Stephen R. Mr.[*1]; Propst, David L. Dr.[2]

(1-U.S. Fish and Wildlife Service, New Mexico Fishery Resources Office; 2-New Department of Game and Fish, Conservation Services Division)

Drought and persistence of an arid-land stream fish assemblage

Native fishes of arid-land streams have evolved strategies to cope with effects of drought and extensive drying of riverine habitats. However, stressors imposed by flow manipulation during drought present these fishes with challenges for which some are ill-prepared. Fish assemblages in the regulated Pecos River in southeast New Mexico were sampled weekly in midst of drought at 2 locations during summer 2002 and 2003. For extended periods in both summers, habitats at each site were limited to isolated pools. Water quality was variable, but dissolved oxygen was usually >4.0 mg/L and water temperature <30.0ºC. Collectively, 9 species (7 native and 2 nonnative), of 26 found, numerically dominated (>90%) all collections. Overall, there was no change in abundance of red shiner, speckled chub, and Arkansas River shiner; plains minnow, Rio Grande shiner, Pecos bluntnose shiner, and sand shiner decreased; and plains killifish and western mosquitofish increased. Impacts of channel drying were ameliorated by persistence of deep pools that maintained comparatively high water quality and summer storm induced flow spikes. Presumably, movement of fishes from upstream reaches that remained wetted helped maintain fish assemblages in study area. Although no common species was eliminated from Pecos River reaches prone to drying in 2002 and 2003, our data suggest that persistence of several species has been compromised.

2005-11-17 15:30:00 - Contreras-Balderas, Salvador[1]

(1-Bioconservación, A.C./UANL, Monterrey)

Book project update: Exotic Freshwater Fishes in México: summary and worst cases

Exotic (= alien) freshwater fishes are a source of worries on their role in native species damages worldwide. México is one of the best analyzed countries in this matters. Any species out of original place is included in this paper. Starting with trout in 1884, up to 2004 they have increased to 114 species are recorded, plus 8 hybrids. The main groups are food (42), sports (30), ornamental (18), forage (8), biocontrol (6), bait (4), conservation (3), all aquacultural, plus accidentals (17), and invasives after any of the former (62). By origin, they are nearctic (57), palearctic (9), neotropical (34), ethiopic (7), and oriental (2). By countries they are from USA (27), shared US/Mex (22), Guatemalan (3), shared Guatemala/Mexico (3), and strictly Mexican (26). Important families are cyprinids (21), cichlids (16), poeciliids (15), and atherinopsids (10), with 14 more families contributing. Increments in exotic fishes are strongly parallel to Mexican native species at risk. Misunderstanding of the niche concept and application of the mythical "empty niche" result in many purposeful introductions, to supplement food resources, or for recreation. There are some worst cases. The African jewel fish in 4 springs in Cuatro Ciénegas, that is harming stromatolites, cichlids, and gambusia, now invading creeks, and is nearly impossible to control. The plecos are invading Río Balsas (4 species), Río Usumacinta (3), Río

Grijalva (2), and Río Bravo (1); in Río Balsas they have impacted the Tilapia fisheries 80%, damaging nets and habitats. Local fishermen lost US 3.6 million/year income plus damages in 1998.

Poster Session 1/ Sesión de Carteles 1 (15:45 - 16:15)

2005-11-17 15:45:00 - Coleman, Stephanie M.[*1]; Brooks, James E.[2]; Caldwell, Colleen A.[3]

(1-New Mexico Fishery Resources Office; 2-New Mexico Fishery Resources Office; 3-U.S. Geological Service, NMSU Cooperative Unit)

Post-wildfire effects on Gila trout streams

Gila trout (Oncorhynchus gilae) is an endangered native trout found in the Gila River drainage on the Gila National Forest/Aldo Leopold Wilderness, New Mexico. Recent wildfires have hindered Gila trout recovery by impacting stream morphology, water quality, and habitat availability. Viability and persistence of Gila trout populations are driven by environmental factors affecting quality and quantity of stream discharge. High severity fires can alter hydrologic and erosional processes causing erratic changes in discharge and extreme channel modification. Recent population viability analyses have shown the probability and severity of fires was a larger influence on persistence of Gila trout than population size, fecundity or population structure. The extent of the relationship between fire severity and its effect on aquatic systems is not fully understood. This project will focus on that relationship and correlate a range burn severity effects within the same stream on fish population structure, habitat complexity, water quality and riparian vegetation. By correlating a range of fire severity effects on these variables, it may be possible to predict future effects to Gila trout streams given a certain level of fire severity.

2005-11-17 15:45:00 - Gloss, Steven P[*1]; Dahm, Clifford[2]; Follstad Shah, Jennifer[2]

(1-USGS Southwest Biological Science Center, University of Arizona; 2-University of New Mexico, Dept. of Biology)

River restoration: Is it making ecological and conservation sense?

Increasingly, river managers are turning from hard engineering solutions to ecologically-based restoration activities in order to improve degraded waterways. There is growing interest in applying river restoration techniques to solve environmental problems, yet little agreement exists on what constitutes a successful river restoration effort. We propose five criteria for measuring success, with emphasis on an ecological perspective. First, the design of an ecological river restoration project should be based on a specified guiding image of a more dynamic, healthy river that could exist at the site. Secondly, the river's ecological condition must be measurably improved. Thirdly, the river system must be more self-sustaining and resilient to external perturbations so that only minimal follow-up maintenance is needed. Fourthly, during the construction phase, no lasting harm is inflicted on the ecosystem. Fifthly, both pre- and post-assessment must be completed and data made publicly available. Despite spending over $1 billion per year nationally on these efforts for more than a decade there is no watershed, regional, or national means to prioritize restoration efforts. Using various governmental classification programs such as critical habitat designations under the Endangered Species Act or listings of impaired waterways under the Clean Water Act may be a way to initially prioritize restoration efforts. We examine relationships between previous assessments and previous restoration projects.

2005-11-17 15:45:00 - Snyder, Darrel E.[1]; Bestgen, Kevin R.[*1]; Seal, Sean C.[1]

(1-Larval Fish Laboratory, Dept. of Fishery and WIldlife Biology, Colorado State University)

Native cypriniform fish larvae of the Gila River basin

Use of collections of fish larvae and young-of-the-year juveniles to help document fish spawning sites and seasons or assess larval production, transport, distribution, nursery habitat, survival, and other aspects of early life history, requires diagnostic criteria to accurately distinguish target species from all similar appearing taxa in the waters sampled. To facilitate identification of the larvae and early juveniles of most native cypriniform fishes in the Gila River Basin, developmental series of reared and collected desert sucker (*Catostomus clarkii*), Sonora sucker (*C. insignis*), longfin dace (*Agosia chrysogaster*), spikedace (*Meda fugida*), and loach minnow (*Rhinichthys cobitis*) were illustrated and described to detail differences in morphology, meristics, pigmentation, and size relative to developmental state. Comparable illustrations and data were extracted mostly from existing descriptions of flannelmouth sucker (*C. latipinnis*), razorback sucker (*Xyrauchen texanus*), bonytail (*Gila elegans*), roundtail chub (*G. robusta*), Colorado pikeminnow (*Ptychocheilus lucius*), speckled dace (*R. osculus*), and non-native cyprinids common carp (*Cyprinus carpio*), red shiner (*Cyprinella lutrensis*), and fathead minnow (*Pimephales promelas*). The results are documented in a 2005 report to the U. S. Bureau of Reclamation, Phoenix, AZ. This work expands on the earlier work of Winn and Miller (1954) and provides detailed descriptive species accounts, comparative summaries, and computer-interactive keys to the covered cyprinids and catostomids and all species at the family level. Such keys are flexible and are much easier to prepare, update, and expand than traditional keys. Among other features, users can limit consideration to only likely candidate species, have available characters listed in the most diagnostic order for remaining candidates, and select from that list of characters in any desired sequence–bypassing those that are unfamiliar, difficult to assess, or based on structures that are damaged or missing. This is the second such application to fish larvae and the first for most of the native fish assemblage in a major drainage basin.

2005-11-17 15:45:00 - Schonhuth, Susana I.[*1]; Doadrio, Ignacio[2]; Mayden, Richard L.[1]

(1-Saint Louis University, Department of Biology, Missouri, USA; 2-Museo Nacional de Ciencias Naturales, Departamento de Biodiversidad y Biologia Evolutiva, Madrid, SPAIN)

Evolution and biogeographic approach to central and south Mexican cyprinids

Phylogenetic relationships among southern and central Mexican cyprinids of the genera *Notropis, Algansea, Dionda* and *Cyprinella* were inferred from cytochrome b gene. These collections cover the Atlantic and the Pacific slopes. Phylogenetic trees were recovered using maximum parsimony (MP), minimum evolution (ME) and Bayesian inference (BI). According to cytb data, 5 clades were resolved, showing species of the genus *Dionda* as not monophyletic. One clade includes south and central Mexican *Notropis* (plus *Yuriria*). A second clade includes Southern species of the genus *Dionda* plus *Codoma*. A third clade includes specimens of the genus *Cyprinella*. A fourth clade includes species of the genus *Algansea* closely related to the monotypic genus *Agosia*. The fifth clade includes Northern species of the genus *Dionda*.

Understanding the phylogenetic relationships of primary freshwater fishes such as cyprinids may lend support to the geological hypotheses proposed for southern and central regions of Mexico that have a complex geological history. Our findings of a monophyletic clade including central and southern Mexican *Notropis* suggest a single colonization event in time of Central and South Mexico of this group. The age of the major lineages of this clade has been tentatively estimated with a molecular clock (1.52% per my), and geological datings. The evolution of Mexican *Notropis* was deeply marked by the complex geology and diverse configuration of this region. Molecular data support speciation events during the middle Miocene, contemporaneous with the built up of the Mesa Central in Mexico. These uplift events caused the detachment of two pacific drainages (Balsas and Atoyac) from the Mexican Plateau. There is also evidence for river capture events, one in the Pliocene involving

the Atoyac and Balsas drainages, and others in the Pleistocene, affecting Atoyac-Balsas-Papaloapan headwaters in the Mixteca region and Pánuco-Lerma headwaters in central Mexico.

2005-11-17 15:45:00 - Karam, Abraham P.[*1]; Parker, Michael S.; Lyons, Lindsey T.

(1-Southern Oregon University, Department of Biology; 2-Southern Oregon University, Department of Biology; 3-Southern Oregon University, Department of Biology)

Artificial refuges and Devils Hole pupfish conservation: an historical perspective

Single species refuges are a conservation tool often used as a "last resort" to sustain declining desert fish populations. Though some species have been successfully maintained in refuges over the short term, environmental conditions, and thus selective pressures, often differ considerably from natural habitats which calls into question the use of artificial refuges over the long term. In this poster, we present an historical account of the development and management of artificial refuges used in an attempt to establish additional, secure populations of Devils Hole Pupfish *Cyprinodon diabolis.*

Over the past 35 years, there have been numerous attempts to establish "back-up" populations of *C. diabolis* in both natural and man-made environments, with limited success. Prior to gaining protection under the federal ESA, numerous attempts were made to transplant *C. diabolis* into existing spring systems and aquaria. All such attempts failed, though, due to environmental conditions vastly different than conditions in Devils Hole and negative interactions with resident and exotic species. In 1972, a reproducing population was established in an artificial refuge near Hoover Dam, constructed to superficially mimic Devils Hole. Within 5 years, however, it was evident that morphological and behavioral characteristics of the refuge population had changed dramatically. Despite these obvious phenotypic shifts in response to the refuge environment, two virtually identical refuges were constructed in an attempt to establish additional populations. Over the 30+ years that artificial refuges have been in use, maintaining breeding populations has proven difficult. Water delivery failures and fluctuating environmental conditions have resulted in frequent, drastic declines within and extinctions of refuge populations. Infrequent additions of fish from Devils Hole in combination with population reductions to 10 or fewer individuals has resulted in genetic bottlenecks in all refuge populations. This historical account illustrates how difficult it will be in the future to achieve the goal of establishing and maintaining "back-up" populations of this species.

2005-11-17 15:45:00 - Kline, S. Jason[*1]; Bonar, Scott[1]; Francis, Andrea[1]

(1-University of Arizona Fish and *Wildlife Cooperative Unit)*

Propagation of Yaqui chub (*Gila purpurea*), and Yaqui topminnow (*Poeciliopsis occidentalis sonoriensis*) in a controlled environment

Yaqui chub (*Gila purpurea*), and Yaqui topminnow (*Poeciliopsis occidentalis sonoriensis*) are native to the Río Yaqui basin. Found in the U.S. only in San Bernadino National Wildlife Refuge, Leslie Canyon National Wildlife Refuge and Turkey Creek on the Austin Ranch in the Chiracaua Mountains, these fishes are federally endangered due to livestock overgrazing, erosion, water diversion, aquifer pumping, non-indigenous species, destruction or alteration of most natural fish habitats and drought (USFWS 1994). We developed methods to captively breed the Yaqui chub and Yaqui topminnow for the Río Yaqui fish/Asian Tapeworm study. We incorporated the technique developed by Schultz and Bonar (unpublished data) to propagate the Yaqui chub on a 12 hr light cycle, with a water temperature of 21 degrees C. We propagated the topminnow in plastic pools, 20-gallon aquaria and 1,098-L fiberglass tanks. The topminnow reproduced best in non-glass tanks with a large volume of water and cover for the young. Both the chub and topminnow were fed a combination of frozen food and pellets to maintain a high protein diet necessary for reproduction. Our success in propagating these species is the first recorded in a laboratory setting and will be beneficial to researchers trying to produce these and similar endangered species.

2005-11-17 15:45:00 - Heinrich, Jim[*1]; Hutchings, John[2]

(1-Nevada Department of Wildlife; 2-Nevada Department of Wildlife)

Virgin spinedace recovery efforts in Nevada

Historically, the Virgin spinedace, *Lepidomeda mollispinis mollispinis*, was endemic to the Virgin River drainage, covering the states of Utah, Arizona, and Nevada. Within the State of Nevada, spinedace were extirpated from Beaver Dam Creek sometime during the late 1960's, most likely due to the construction of Schroeder Reservoir reducing their available habitat dramatically, and competition, due to the abundance of rainbow trout in the system.

Efforts by the Nevada Department of Wildlife to repatriate these fish into historic habitat began in 1997, initially with a tributary stream, and later into the main stem Beaver Dam Creek in 2004. Although only small numbers of the stocked spinedace remained by the 2004 Fall season, surveys in 2005 have shown recruitment for the first time since the repatriation effort began. This recruitment follows a year of massive winter flooding, a January storm potentially equivalent to a 100-year flood event, within the Beaver Dam Creek system, ultimately requiring the breeching of the Schroeder Reservoir Dam to protect downstream residents. With most steam reaches stripped of overstory, pool depths dramatically reduced, and much of the large boulder substrates removed, this has produced limited habitat for adult rainbow trout resulting in somewhat depressed numbers, and an advantage to the smaller spinedace adults, which have responded positively. The future of Virgin spinedace recovery looks rosy, with favored habitats, additional repatriations of spinedace scheduled for late 2005 and 2006, and the potential decommissioning of Schroeder Reservoir, adding much needed stream miles to spinedace distribution within Nevada.

2005-11-17 15:45:00 - Minckley, Thomas[*1]; Jackson, Stephen[1]

(1-University of Wyoming, Department of Botany)

Reassessment of the environmental history of the Cuatro Cienegas basin

The paleoenvironmental history of Cuatro Cienegas has long been considered stable relative to other regions of North America. The pioneering work into the prehistory of Cuatro Cienegas by Meyer (Ecol. 54, 982-995, 1973) suggests little to no vegetation change in the valley during the past ca. 30,000 years. This despite significant changes in climate and vegetation in other parts of North America related to continental ice sheets covering present-day Canada and evidence of coniferous forests expansion in the American southwest and northern Mexican deserts. We reexamine the data presented by Meyer and agree that the grasses and herbaceous taxa of the valley floor may have been stable. However missing in his analysis is evidence for regional vegetation responses to the cooler temperatures and greater effective moisture during the last glacial period. A 17,000-year-old fossil packrat midden from near the base of Sierra San Marcos indicates late Pleistocene woodlands dominated by *Pinus remota*, *Juniperus* sp., *Quercus* sp., *Yucca* sp., and *Celtis reticulata*. Similar woodlands are found 1000 to 1500 m above the site today. Recalculation of the pollen data from the valley floor suggests Pleistocene woodlands were near the valley floor between 24,000 to 13,000 C^{14}

years BP. These results reveal that the environmental history of Cuatro Cienegas is still largely unknown and systematic studies of the prehistory of the basin are needed.

2005-11-17 15:45:00 - Doyle, Robert D.[1]; Mullins, Melissa L.[*1]; Cantu, Valentino[2]; Power, Paula[2]

(1-Center for Reservoir and Aquatic Systems Research,Baylor University; 2-USFWS, National Fish Hatchery, San Marcos TX)

A Central Texas restoration project-- removal of an exotic aquatic macrophyte in a spring-fed system

The spring-fed San Marcos River in Texas is characterized by a diverse aquatic community which includes many species of exotic or invasive plants and animals. Among the natives, several are threatened or endangered at the state or federal level. Asian water trumpet (*Cryptocoryne beckettii*), a "pretty aquarium plant", has expanded rapidly in some portions of the river during the last decade since it was initially found. Between spring 1998 and fall 2002, the number of *C. becketti* colonies increased from 11 to 110, and total areal coverage increased from 171 to 1750 m^2. Recently, the USFWS has obtained funds for a large-scale dredge removal operation which will begin this fall. These efforts will be followed by more extensive plantings of beneficial native plant species. We also discuss expansion of non-native aquatic macrophytes following a flood disturbance.

2005-11-17 15:45:00 - Valera, Aldo[*1]; Bonilla, German[1]; Eguiarte, Luis[1]; Souza, Valeria[1]

(1-Dept. Ecologia Evolutiva, Instituto de Ecologia UNAM, CU, Mexico DF)

Genética de poblaciones, clonalidad y manejo del carrizo gigante (*Arundo donax*)

Arundo donax es una de las plantas invasoras de humedales más agresivas y dificiles de erradicar y en California ha sido muy costoso y poco eficiente su control. Es una planta originaria de Asia central y aparentemente fue introducida en América durante la colonia. Se propaga fundamentalmente de forma asexual. En México es posible observar pequeños manchones de carrizo en los jardines y poblaciones bien desarrolladas en humedales o bordeando cuerpos de agua, donde se sabe que ha ocasionado problemas relacionados con la agricultura y la ganadería. Sin embargo, muchas comunidades en México explotan a esta especie (usos artesanal, construcción, medicinal, industrial, estético, etc.) debido a que históricamente las comunidades usaban plantas nativas similares morfológica y ecológicamente (como al género *Phragmintes*). Estamos usando ISSR (Inter Simple Sequence Repeats) como marcadores moleculares para reconstruir su historia en México, conocer sus niveles de clonalidad y describir la estructura genética de sus poblaciones. Actualmente tenemos 42 sitios provenientes de nueve estados de México, dando un total de 1005 individuos colectados. Hemos detectado 39 loci polimórficos con tres primers: 14 loci con el primer 827, 12 loci con el primer 846 y 13 loci con el primer 850. La diversidad genética y genotípica (número de linajes clonales por sito) es baja. Además se han logrado identificar algunos perfiles (linajes clonales) únicos por región.

Asimismo hemos realizando experimentos para desarrollar métodos de control eficientes y que minimicen el impacto a otros organismos en las comunidades acuáticas y estromatoliticas donde crece. Estos experimentos incluyen crecer de manera clonal 50 linajes de cianobacterias tanto filamentosas como unicelulares para llevar a cabo experimentos de toxicidad con el herbicida Aquamaster (Monsanto) a concentraciones sugeridas en campo 100x, 10x, 1x, 01x y control negativo y positivo de exposición tanto al herbicida con y sin surfactante (sulfato de amonio). La toxicidad se evaluara tanto a nivel morfológico (tipo de daño) al microscopio de fluorescencia como demográfico (que proporción de células afectadas del cultivo). Además de la toxicidad inmediata se esta evaluando la resilencia de los microorganismos expuestos a este herbicida al mantener las observaciones al microscopio por un mes. si la toxicidad a nivel 1X no es extrema se aplicara en campo el aquamaster como lo sugerido por los fabricantes y se evaluará el imparto en la comunidad microbiana por medio de TRFLP antes de la aplicación, a las 24 horas y a la semana de la aplicación

Estos datos experimentales y las observaciones sobre su estructura genética permitirán llegar a implementar prácticas de manejo y control de *Arund*o adecuadas a la condiciones y necesidades de las comunidades humanas donde crece *Arundo* en México, y en particular nos permitirán elaborar planes de manejo de la especie en la región de Cuatrociénegas, Coahuila.

Technical Session 3 / Sesión Técnica 3 (16:15-18:00)

2005-11-17 16:15:00 - Hendrickson, Dean A.[*1]; Brooks, James E.[2]; Camarena Rosales, Faustino[3]; Espinosa-Pérez, Héctor[4]; Findley, Lloyd T.[5]; García de León, Francisco[6]; George, Anna L.[7]; and 11 more as listed in the abstract, [8]

(1-Univ. Texas, Texas Nat. Hist. Coll. R4000/PRC 176, 10100 Burnet, Austin, TX 78758-4445 U.S.A.; 2-U.S. Fish & Wildlife, 3800 Commons Ave. NE, Albuquerque, NM 87109 U.S.A.; 3-Univ. Autónoma Baja California, A.P. 1653, Ensenada, BC 22800 México; 4-Inst. Biología, Univ. Nacional Autónoma de México, A. P. 70-153, México, D.F. 04510 México; 5-Centro Invest. Alimentación y Desarrollo, Guaymas, Sonora México; 6-CIBNOR, A.P. 128, La Paz, Baja California Sur México; 7-Dept. Biology, 3507 Laclede Ave., Saint Louis Univ., St. Louis, MO 63103-2010 U.S.A.; 8-see abstract)

Truchas Mexicanas: new discoveries and insights into diversity and conservation status of Mexico's native trouts

Our growing bi-national 'Truchas Mexicanas' team continues exploring northwest Mexico's Sierra Madre Occidental (SMO). Undescribed native trouts have long been known from the northern rios Yaqui and Mayo, and the only formally described mainland Mexico trout (*Oncorhynchus chrysogaster*) occurs in the next Pacific drainages to the south; rios Fuerte, Sinaloa and Culiacán. Further southward, specimens from rios Presidio and San Lorenzo, previously considered non-native or of uncertain status, are native according to our preliminary genetic and morphological work, and new native forms were discovered even further south in the Baluarte and Acaponeta basins. We also recently collected the first vouchered specimens of a native trout from the Rio Conchos (Rio Grande) drainage. Desktop GARP modeling of native trout habitats based on known localities and remotely sensed data focused searches for new localities, and indicated potential trout habitat extending well beyond areas sampled to date. Preliminary analyses of mitochondrial and nuclear DNA sequence data support several recently derived but distinct Mexican lineages conflated with *O. mykiss*, and a phylogenetic placement of *O. chrysogaster* that renders *O. mykiss* paraphyletic. Morphology and microsatellite DNA reveal introgression with non-native Rainbow Trout (O. mykiss) in many areas, but also existence of pure stocks of each native form. All Mexican trout species are endangered by escape of hatchery rainbows from rapidly expanding aquaculture, and IPN-exposed rainbows were recently shipped to hatcheries within ranges of native trouts. Habitat degradation is common throughout the SMO,

and all Mexican trouts are susceptible to climate change. Team members continue to work with Mexican government officials and local residents promoting native trout conservation by increasing awareness, pointing out risks posed by many human activities, and researching adaptability of native stocks to aquaculture. Our fieldwork and genetic and morphological analyses continue focusing on describing new taxa, evolutionary histories and conservation status.

All authors after first are listed alphabetically. Additional authors: Kuhajda, Bernard R.; Mayden, Richard L.; Neely, David A.; Propst, David L.; Ruiz-Campos, Gorgonio; Santos Camarillo, Ana Belia de los; St. Clair, Eric; Tomelleri, Joseph R.; Varela Romero, Alejandro; Zamora Balbuena, Gerardo. Additional affiliations: (RLM, DAN, EstC) Same as ALG; (BRK) Univ. Alabama, Dept. Biological Sciences, Tuscaloosa, AL 35487-0345 U.S.A.; (DLP) New Mexico Dept. Fish and Game, P.O. Box 25112, Santa Fe, NM 87504 U.S.A.; (ABdlSC) Inst. Tec. Cd. Victoria, Cd. Victoria, Tamaulipas, México; (JRT) 8436 Meadow Ln., Leawood, KS 66206 U.S.A.; (AVR) Univ. Sonora, DICTUS, A.P. 1819, Hermosillo, Sonora 83000 México; (GZB) Centro Acuícola del Zarco, SAGARPA, México, D.F., México

2005-11-17 16:30:00 - Knowles, Glen W.*[1]; Duncan, Doug[1]; Hedwall, Shaula[1]; Sponholtz, Pam J.[1]; Sillas, Albert U.[2]; Voeltz, Jeremy B.[3]

(1-U.S. Fish and Wildlife Service; 2-U.S. Forest Service; 3-Arizona Department of Game and Fish)

Fishes and fire – Salvage of native fishes during the 2005 fire season in Arizona

The arid American southwest has experienced a deep drought during the last 5-7 years. Following this period of historically low precipitation, snowpack, and runoff, the winter of 2004/2005 was unusually wet with a number of significant storm and flooding events. This scenario led to a situation where native fish populations across Arizona were at risk. The high winter moisture led to a flush of both native and nonnative annual grasses, a tremendous buildup of fuel for the 2005 wildland fire season. Numerous lighting and man-caused fires resulted in threats to a number of isolated native fish populations. The largest of these fires, the Cave Creek Complex Fire, (the second largest fire in Arizona history) burned over 248,000 acres and threatened numerous native fish populations. The primary risks were from both the direct effects of the wildfires and from subsequent high silt and ash laden runoff resulting from seasonal "monsoonal" storms. During and immediately following these wildfires, a number of coordinated fish salvage operations were undertaken to retain valuable populations of native fish. Salvage efforts were necessary during or shortly following the fires. The efforts resulted in several populations being protected via salvage. Salvage efforts included Sycamore Creek, Indian Creek, and Silver Creek in the Agua Fria drainage; in Camp Creek and Lime Creek in the Verde River drainage; and Gardner Canyon in the Santa Cruz River drainage. Salvaged species included speckled dace (*Rhinichthys osculus*), longfin dace (*Agosia chrysogaster*), Gila chub (*Gila intermedia*), desert sucker (*Catostomus clarkii*), and Gila topminnow (*Poeciliopsis occidentalis*). Populations will be, and some cases, have been, repatriated when post-fire monitoring indicates conditions will support these species. These actions would not have occurred without the efforts of numerous individuals from cooperating agencies including the Arizona Game and Fish Department, the U.S. Forest Service, and the U.S. Fish and Wildlife Service. We summarize these activities and discuss considerations for fire season fish salvage planning for future fire seasons.

2005-11-17 16:45:00 - Andress, Robert J.*[1]; Gourley, Chad R.[1]

(1-Otis Bay Ecological Consulting)

Restoration of spring complexes throughout the Great Basin: design and implementation

Due to the isolation of many spring complexes associated with climatic changes following the Pleistocene, many endemic plants, insects, and fish are found within and surrounding spring riparian habitats. Numerous spring complexes throughout the Western United States have been developed and de-watered for recreational, municipal, and agricultural use. Increased recognition of the value of these unique habitats within the last 20 years has resulted in an interest for restoration of spring riparian habitat. Federal agencies, non-governmental organizations, environmental groups, and consultants are working together to develop spring restoration, assessment, design, construction, and monitoring practices throughout the West. Implementation of spring restoration involves the assessment and recognition of many factors including but not limited to legal protection, connection to landscape features, and restored hydrologic and geomorphic processes. Examples of spring restoration at several locations will be discussed including Ash Meadows National Wildlife Refuge (USFWS), Moapa Valley National Wildlife Refuge (USFWS), Reese River (USFS), and Parker Ranch (TNC).

2005-11-17 17:00:00 - Reinthal, Peter*[1]; Chesley, John[2]; Corley, Tim[3]; Ruiz, Joaquin[2]

(1-Dept Ecology and Evolutionary Biology, University of Arizona; 2-Dept of Geosciences, University of Arizona; 3-Department of Hydrology and Water Resources, University of Arizona)

Food webs and heavy metals in a desert fish assemblage: A radiogenic and stable isotopic analysis of Aravipa Creek, Arizona

The fish community of Aravaipa Creek, Graham and Pinal Counties, Arizona, with seven native species, including threatened species *Meda fulgida* and *Tiaroga cobitis*, and relatively few well established exotic species, is considered to be the foremost remnant assemblage of the imperiled Gila River basin fauna. This study presents an update of results from (1) high-precision isotopic analyses of lead (208Pb, 207Pb, and 206Pb) to determine levels of contamination in fishes and invertebrates and (2)stable isotopes of carbon (δ13C‰) and nitrogen (δ15N‰) to determine trophic interactions among community members and mechanisms of bioaccumulation. We find that the major source of heavy metal accumulation and transport mechanism of contamination is different than previously reported. Furthermore, we present distinct trophic interactions and mechanisms of accumulation within the Aravaipa food web. Specifically, invertebrates like odonates and hellgrammites show much higher levels of lead contamination than those found in fishes. Furthermore, fish species show variation in their lead contamination levels indicating alternative mechanisms of deposition into the food web.

2005-11-17 17:15:00 - Taylor, Kathie A.*[1]; Gourley, Chad R.[1]; McKelvey, Sharon[2]; Baldino, Christi R.[2]

(1-Otis Bay Ecological Consulting; 2-U.S. Fish and Wildlife Service)

Restoration of Kings Spring and Point of Rocks Spring Complex at Ash Meadows National Fish and Wildlife Refuge, Nevada

Island biogeographical effects associated with post Pleistocene climatic change resulted in a site of world-wide importance at Ash Meadows National Wildlife Refuge. The Point of Rocks Spring Complex is part of an extensive wetland system supporting 24 endemic plants and animals and the largest concentration of endemic species in the United States. Some of these species are species-of-concern, or are federally listed as threatened or endangered. Over the past century, water extraction and storage, spring development, agricultural ventures, and attempts at development have degraded most of the spring complexes and the oasis environment. In 1997, the U.S. Fish and Wildlife Service initiated a restoration program focusing specifically on these environments. Beginning with restoration of the Kings Spring, federal agencies working with

private consultants worked to restore the spring pool and outflow channel. In 2001, the Point of Rocks spring and outflow channel was restored. Post construction monitoring has shown that the primary target species, Ash Meadows Amargosa pupfish *(Cyprinodon nevadensis mionectes)* and Ash Meadow pebble snail *(Pyrgulopsis erythropoma)* have responded positively to the restoration project. In addition, native trees, shrubs, and wetland plants are re-colonizing areas previously disturbed around the Kings Spring pool and outflow channel. Presentation will address process, design, and implementation of Kings Spring and Point of Rocks restoration projects.

2005-11-17 17:30:00 - Wilson, Kristine W.[*1]

(1-Utah Division Wildlife Resources)

Status of least chub, *Iotichthys phlegethontis*, in Utah

Least chub, Iotichthys phlegethontis, is a small minnow endemic to the Bonneville Basin of Utah where it was historically widely distributed. In the eastern portion of the basin, least chub occurred historically in streams, freshwater ponds, and wetlands. In the western portion of the basin, least chub occurred historically in desert spring systems. By 1996, the known distribution of least chub had been reduced to two spring complexes in the eastern portion of the basin and three spring complexes in the western portion of the basin. The decline has been attributed to urbanization, water development projects, livestock impacts, and the introduction and proliferation of nonnative species. Due to persistent threats and the limited current distribution, least chub is classified as a Sensitive Species in Utah. A Conservation Agreement and Strategy for Least Chub was developed in 1998 as a collaborative and cooperative effort among resource agencies to expedite the implementation of conservation actions for least chub. The goal of the Agreement and Strategy is to ensure the long-term persistence of the species by eliminating or significantly reducing threats and restoring populations throughout the historic range. This paper reports status information and summarizes current conservation actions conducted for least chub in Utah.

2005-11-17 17:45:00 - Sheller, Francis J.[1]; Fagan, William F.[1]; Unmack, Peter J.[*2]

(1-Department of Biology, University of Maryland; 2-University of Oklahoma Biological Station)

Analyzing translocation success from sporadic monitoring data using survival analysis: lessons from the Gila topminnow (*Poeciliopsis occidentalis*)

Translocation, the intentional release of captive-propagated and/or wild-caught animals into the wild in an attempt to establish, reestablish, or augment a population, is one of the most commonly used approaches to species conservation. Despite their frequent use and prominence in many species recovery plans, translocations have demonstrated limited success in the creation of sustainable populations. To improve the effectiveness of translocation efforts, it is essential to identify what differentiates translocations that succeed from those that fail. This study analyzed a unique database consisting of records for 148 translocations of the endangered Gila topminnow (*Poeciliopsis occidentalis*) to identify characteristics associated with the translocated populations and stocking environments that have significantly influenced translocation success. Using records from the United States Fish and Wildlife Service and the Arizona Game and Fish Department, we quantified translocation success as the "persistence time" of the translocated populations and analyzed the resulting dataset using survival analysis. We found that several factors, including the season in which the fish were translocated, the habitat type of the translocation site, and the genetic origin of the fish stocked significantly affected persistence times of translocated populations. For the Gila topminnow, our findings suggest that future translocations should 1) be undertaken in late summer or fall (not early summer), 2) occur into pond like habitats (not streams, wells, or tanks), and 3) should utilize individuals from genetic lineages other than Monkey Spring. With regard to the general practice of translocation as a conservation technique, our results imply that particular factors associated with stocking, the population stocked, and the site of translocation can significantly affect the persistence of translocated populations and thus increase the probability of translocation success.

Evening Social/Poster Session 2 – Hotel El Nogalito / Evento Social/Sesión de Carteles 2– Hotel El Nogalito (19:30 – 22:30)

Outdoors in the pool area (with a contingency plan to be announced earlier this day if we have bad weather). Snacks, sodas and beer free to start, with a cash bar for beer available once the freebies are gone. Local artesans will be present to sell their crafts for souvenirs, and one of the local wineries will be selling their products. **All poster authors (from either of the poster sessions held in the Casa de Cultura) are invited to exhibit their posters in the conference room adjoining the pool.**

Friday (viernes) November 18, 2005

Technical Session 4 / Sesión Técnica 4 (08:00 – 12:00)

2005-11-18 08:00:00 - Reid, Stewart B[*1]; Allen, Chris[2]; Munhall, Allen[3]; Chappell, Paul[4]; Smith, Roger[5]; Tinniswood, Bill[5]; Bowersox, Brett[5]; Gunckel, Stephanie[6]

(1-Western Fishes; 2-USFWS, Portland OR; 3-BLM, Lakeview OR; 4-CDFG, Susanville CA; 5-ODFW, Klamath Falls OR; 6-ODFW, Corvallis OR)

Oregon / Northern California Area Report and the Pit River Native Fishes Stewardship Program

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*), Cowhead Lake 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.).

Principal conservation actions in 2004/2005 have focused on population and habitat surveys of Hutton Springs Tui Chub, Foskett Dace, and Lahontan Cutthroat Trout; genetic studies of regional dace and tui chubs populations to better understand the Foskett Dace and Cow Head Lake Tui Chub populations; fish passage projects on the Chewaucan River to benefit the native redband trout population; and exotic fish

survey/removal in the Turner Creek drainage containing Modoc Suckers. In northern California we have initiated the Pit River Native Fishes Stewardship Program to promote private land stewardship. The program seeks to involve private landowners in the stewardship of native fishes and their habitat, while maintaining the flexibility necessary to accommodate a broad spectrum of land management goals. It is entirely supported by non-governmental funds and local landowners.

2005-11-18 08:15:00 - Stevens, Lawrence E.[*1]; Gourley, Chad[2]; Andress, Robert[2]; Taylor, Kathie[2]; Turner, Lee[2]

(1-Stevens Ecological Consulting, LLC; 2-Otis Bay Consultants, Inc; 3-Otis Bay Consultants, Inc; 4-Otis Bay Consultants, Inc; 5-Otis Bay Consultants, Inc)

A Restoration, Research, and Long-term Management Plan for Ash Meadows National Wildlife Refuge, southern Nevada, USA.

Ash Meadows (AM) occupies 88 km^2 in the Amargosa Valley, Nye County, southern Nevada. AM has the highest concentration of endemic species in the United States, including: at least 10 plants, more than a dozen invertebrates, and five fish species (of which the AM poolfish, Empetrichthys merriami, is extinct). Prior to 1984, AM was subjected to intensive agricultural, livestock grazing, and surface and ground water use and diversion. Since 1984, AM has been managed by the U.S. Fish and Wildlife Service as a National Wildlife Refuge to conserve endangered and endemic species. As part of a long-term Refuge management and restoration planning project, we coordinated a land cover inventory, mapped springs vegetation at a fine scale, and overall Refuge vegetation at a coarse scale, and surveyed for additional invertebrate taxa. Endangered, endemic, and non-native species distributions were compiled and those data were used in a Geographic Information Systems mapping analysis. Long-term management of the AM Refuge requires establishing management priorities and actions, monitoring, and research on: non-native species impacts; fire frequency and intensity; flooding; reservoir management; removal and restoration of ditched and diked areas; and wetland and old-field succession. We used a springs ecosystem assessment protocol (SEAP) to quantify existing conditions and recommend springs restoration priorities. Springs that support AM speckled dace (Rhinichthys osculus nevadensis) emerge as the highest priority for individual site restoration projects, particularly the Warm Springs complex and Bradford Springs. Although many springs are hydrologically isolated from the overall drainage network, that isolation may confer an advantage in retarding crayfish invasion. Old-field succession analyses reveal that research is warranted into combined treatments using fire, flooding, and mechanical control to reduce invasive non-native plant species on old agricultural fields. We use this presentation to solicit review comments on the draft AM Refuge Management Plan from the Desert Fishes Council membership.

2005-11-18 08:30:00 - Andersen, Matthew E.[1]; Miller, Peggy A.[*1]

(1-Utah Division of Wildlife Resources)

Taxonomy of and conservation efforts for leatherside chub

This year's Bonneville Basin report presents a case study in the interrelationship of species concepts, taxonomy, and conservation. Leatherside chub are presented as a single species *Snyderichthys copei* in the most recent American Fisheries Society Names of Fishes publication. However, multiple lines of evidence, testing multiple species concepts, indicate that the single species should be divided into two species that are closely related to the plagopterin fishes. Testing of phylogenetic, similarity, and ecological species concepts all support this finding. The three species concepts were tested with molecular, phenotypic, and growth and feeding data, respectively. Supporting species descriptions with multiple lines of evidence is consistent with Templeton's cohesion species concept, which establishes null two null hypotheses to be tested. Both of Templeton's proposed null hypotheses could be rejected by the data in this case. The proximal relationship of the northern and southern leatherside chub to the spinedaces suggests that the genus *Lepidomeda* is a more appropriate name for the two leatherside chub species. If the single species is divided into a northern and a southern population, as multiple authors now suggest, then the need for conservation efforts is increased. The southern leatherside chub occurs entirely within Utah, while the northern leatherside chub is distributed in Utah, Wyoming, and Idaho. Draft Conservation Agreements and Strategies have now been prepared for both the northern and southern leatherside chub and are currently being reviewed for signature by responsible agencies in all three states. Some of the conservation actions suggested by researchers have been incorporated into the Agreements and Strategies. Despite the unfortunate disagreement with the AFS Names of Fishes publication, the preferred names for these species should be *Lepidomeda copei* for the northern leatherside chub and *Lepidomeda aliciae* for the southern leatherside chub.

2005-11-18 08:45:00 - Kosa, Jarrad[*1]

(1-Bureau of Land Management, Fisheries Program)

The National Fish Habitat Initiative and the Potential for Development of a Desert Fish Habitat Partnership

The Desert Fishes Council has the opportunity to focus resources on desert fish habitat issues by developing a fish habitat partnership under the National Fish Habitat Initiative (NFHI). The NFHI began in 2001 when an ad hoc group explored the concept of developing a partnership effort for fish habitat on the scale of what was done for waterfowl in the 1980's via the North American Waterfowl Management Plan. Since its creation, the Waterfowl Plan has successfully forged partnerships and developed funding that has protected millions of acres of waterfowl habitat. Although focused on fish habitat, the NFHI is modeled on key characteristics that contributed to the success of the Waterfowl Plan: it is partnership-driven, non-regulatory, science-based, and national in scope. Since then, momentum has surged for developing a National Fish Habitat Action Plan. The International Association of Fish and Wildlife Agencies (IAFWA) has the lead role in developing the NFHI and the Action Plan, with the U.S. Fish and Wildlife Service providing much of the administrative and technical support. In 2005, five Multistate Conservation Grants totaling $1.8 million were awarded for on-the-ground projects and continued development of the Action Plan. Congress appropriated $1 million in FY 2006 to the U.S. Fish and Wildlife Service for pilot NFHI habitat projects and further Action Plan development. With the NFHI serving as an umbrella initiative, three regional fish habitat partnerships have emerged as pilot Fish Habitat Partnerships: the Eastern Brook Trout Joint Venture, the Western Native Trout Initiative, and the Southeastern Aquatic Resources Partnership. The Desert Fishes Council may offer an ideal platform for the development of a fourth partnership. Establishment of such a partnership within or in association with the Council could result in increased collaboration and the infusion of funding for priority desert fish habitat projects. If such a partnership were successfully established, the Desert Fishes Council would move from being a catalyst for change to an instrument of change, bringing immediate, positive impacts to the desert aquatic ecosystems the Council seeks to protect.

2005-11-18 09:00:00 - Bestgen, Kevin R.[1]; Zelasko, Koreen A.[*1]; Compton, Robert I.[1]

(1-Larval Fish Laboratory, Colorado State University)

Distribution and ecology of suckermouth minnow, *Phenacobius mirabilis*, in Colorado

We conducted research to determine historic and present distribution and abundance patterns, habitat use, and reproductive ecology of suckermouth minnow, *Phenacobius mirabilis*, in arid eastern plains streams of Colorado. Suckermouth minnow was historically widespread in

foothills and plains stream reaches of the South Platte River Basin. It is now present only in the lower South Platte River and Lodgepole Creek. Historical distribution and abundance of suckermouth minnow in the Republican and Arkansas River basins was difficult to infer from the few collections available. The species may be extirpated from the Republican River Basin but remains relatively widespread in the Arkansas River downstream of John Martin Dam and sporadically upstream of the dam. It is also present in Arkansas River tributaries including the Purgatoire River, and Big Sandy, Cheyenne, and Horse creeks. Abundance and habitat use of suckermouth minnow varied by river basin and seasonally in response to drought. This was particularly evident in the drought-affected South Platte River, where the few suckermouth minnows captured occupied mostly deep pools and runs found only below diversion dams in summer. Suckermouth minnows were more common and widespread in the higher flow Arkansas River and occupied deeper riffles, runs, and pools. Sand dominated the substrate in both systems, but suckermouth minnows were typically captured over gravel. Impassable diversion dams and low flows may be limiting distribution and abundance of suckermouth minnows in the South Platte River system and portions of the Arkansas River upstream of John Martin Dam. Maintaining connected mainstem and tributary habitat and providing stream flow of sufficient quality and quantity to promote survival of suckermouth minnows, even in drought, seem critical to long-term persistence of the species in Colorado.

2005-11-18 09:15:00 - Gloss, Steven P[*1]; Dahm, Clifford[2]; Follstad Shah, Jennifer[2]

(1-USGS Southwest Biological Science Center, University of Arizona; 2-University of New Mexico, Dept. of Biology)

Restoring rivers and streams: What is being done and where?

This paper summarizes findings of the National River Restoration Science Synthesis Project (NRRSS) with regard to temporal, geographic, and project purpose trends with particular emphasis on the southwestern United States. Ecological restoration of rivers and streams is an increasingly common approach to managing U.S. freshwaters, a trend that reflects societal desires for waterways that provide beneficial human uses while sustaining biodiversity and ecosystem goods and services. Through the construction of a national database synthesizing records of more than 38,000 river restoration projects, we document a dramatic increase in river restoration activity over the past decade and an uneven distribution in the extent and types of efforts regionally. Project information derived from previously existing national coverage databases made up less than 7% of the total projects in our database and 14% of all project records we obtained made mention of assessment or project outcome monitoring. The majority of projects encountered were intended to enhance water quality, manage riparian zones, and improve instream habitat. We conservatively estimate cumulative expenditures of $15-$17 billion for U.S. river restoration to date. Aside from a few high profile and well-studied restorations, our ability to evaluate the effectiveness of restoration actions was hindered by a lack of available data. Overall, only 14% of all project records made mention of assessment or project outcome monitoring.

2005-11-18 09:30:00 - Shaul, Anita E.[*1]

(1-Nevada Department of Wildlife)

Freshwater mussels in western North America and their close ties to desert fishes

Freshwater mussels, Order Unionoida, are one of the most endangered groups of animals on Earth, and have become a symbol of the diversity and conservation of North America's rivers. Of the nearly 300 North American species, 35 have gone extinct in the last 100 years. Nearly 25% are listed as endangered or threatened under the United States Endangered Species Act and 75% are listed as endangered, threatened, or special concern at the state level. The conservation predicament of mussels is a result of continent-wide degradation of aquatic ecosystems and is a symbol of the loss of our native freshwater fauna. The West has a very low diversity compared to the 290 species that occur in the eastern two-thirds of North America. Only seven native freshwater mussel species are known to occur west of the Continental Divide; little information is available on their distributions, life histories and status. One thing that <U>is</U> known is that they are dependent on a host, the vast majority of which are fishes. Western North-American freshwater mussels species will be discussed, including habitats, ecosystem role, known host species, and conservation concerns. A recently published Western American guide will be provided as a resource for DFC members and others to facilitate contribution of sighting and host information.

2005-11-18 09:45:00 - Bart, Henry L. Jr.[*1]; Suttkus, Royal D.[1]

(1-Tulane University Museum of Natural History, Belle Chasse, LA 70037)

Taxonomic status of *Carpiodes* populations on the western Gulf slope

Populations of *Carpiodes* west of the Mississippi River are currently recognized as *Carpiodes carpio* Rafinesque. However, mtDNA sequence analysis indicates that populations in the Rio Grande Basin and the upper Colorado River systems of Texas show very close genetic affinities to Mississippi River populations of *Carpiodes cyprinus* LeSueur. In this paper, we present morphological evidence for the distinctiveness of Rio Grande and upper Colorado River populations of *Carpiodes*, and that these populations show morphological affinities to *Carpiodes cyprinus*. *Carpiodes carpio* ranges from the Mississippi River system to the San Antonio River system and occurs sympatrically with the *Carpiodes cyprinus*-like form in the Colorado River system. Meek (1904) applied two names to *Carpiodes* forms in the Rio Grande system and lesser rivers of the northeastern Gulf of Mexico: *Carpiodes elongatus* and *Carpiodes microstomus*. We discuss the complexities and unresolved issues involved in applying these names to the two *Carpiodes cyprinus*-like forms.

2005-11-18 10:00:00 - Loftis, Dustin G.[*1]; Echelle, Anthony A.[1]; Van Den Bussche, Ronald A.[1]

(1-Oklahoma State University, Department of Zoology)

Genetic structure of the desert pupfish complex (*Cyprinodon macularius* and *C. eremus*)

Genetic variation at seven microsatellite DNA loci was assessed for wild populations of two endangered fishes from throughout their existing range, the desert pupfish, *Cyprinodon macularius*, and the Sonoyta pupfish, *C. eremus*. Ten populations of *C. macularius* and two populations of *C. eremus* were assayed. More than 15% of the total genetic diversity is attributable to differences between the two species. AMOVA indicated that the average local population contains 84% and 88% of the total diversity in, respectively, *C. macularius*, and *C. eremus*. With *C. macularius* populations grouped by geographic region, differences between Salton Sea and Colorado River Delta populations explain 4% of the total diversity. The results correspond closely with a previous mitochondrial DNA analysis (Echelle, et al., 2000, Copeia), except that, for microsatellites, the amount of variation attributable to differences between species was much lower (15% vs 70%) and there were statistically significant differences between the two populations of *C. eremus*. These results will be discussed from the perspective of the long-term conservation of the two species.

2005-11-18 10:15:00 - Bonar, Scott[1]; Hubert, Wayne[2]; Willis, Dave[3]; Brouder, Mark[4]; Iles, Alison[*1]

(1-Arizona Cooperative Fish and Wildlife Research Unit; 2-Wyoming Cooperative Fish and Wildlife Research Unit; 3-South Dakota State University, Department of Wildlife and Fisheries Sciences; 4-US Fish and Wildlife Service, Pinetop, Arizona)

Standard sampling methods for North American freshwater fishes: Averages and standards for commonly used fisheries indices

Many federal and state/provincial fisheries agencies in North America recognize and benefit from the scientific and practical advantages to standardizing sampling procedures within their jurisdictions. Sampling of inland fish populations across North America, however, remains unstandardized. Our objective is to edit a text that will provide standard methods for sampling fish populations in various types of freshwater environments in an effort to standardize across political boundaries in North America. This text will provide standard ways to obtain the most commonly used indices of fish population structure and abundance: presence, length frequency, relative weight, relative growth, and catch per unit effort. The greatest advantage to standardizing sampling procedures is to be able to compare data. Thus, we will also provide national and regional averages for measures of size structure, catch per unit effort, growth and condition indices for common species collected using the standard techniques. Biologists using the same standard techniques will be able to compare their data to these averages to determine if fish in their waterbodies are average, below average or above average for the index in question. The present challenge is to gain the cooperation of fisheries biologists and managers from across the United States, Mexico and Canada so that we can obtain the appropriate data sets to calculate these averages.

2005-11-18 10:30:00 - Bestgen, Kevin R.[*1]; Mefford, Brent[2]; Bundy, Jay[1]; Walford, Cameron[1]; Compton, Robert I.[1]; Seal, Sean[1]

(1-Larval Fish Laboratory, Colorado State University; 2-U. S. Bureau of Reclalmation, Denver, Colorado)

Swimming performance of Rio Grande silvery minnow

Disruption of river reaches by dams often has negative impacts on biota that require relatively long and contiguous stream reaches to complete their life history. The reach of the middle Rio Grande, New Mexico, that supports the only remaining population of the endangered cyprinid Rio Grande silvery minnow *Hybognathus amarus* is dissected by numerous low-head diversion dams that prevent their upstream movement. Adult Rio Grande silvery minnows need to re-populate upstream reaches because semi-buoyant eggs and larvae drift downstream. To assist with determining optimal upstream passage designs, we assessed aspects of swimming performance and behavior of the Rio Grande silvery minnow in a variety of laboratory experimental settings. Wild Rio Grande silvery minnow were capable swimmers achieving speeds up to 118 cm/sec for short periods in a swimming chamber at water temperatures of 15, 19, and 23 C. Swimming endurance increased as water velocity declined; a threshold for an exponential increase in swimming performance was noted at water velocities less than 45 to 60 cm/sec. The threshold may represent a transition from anaerobic sprint swimming to more sustained aerobic swimming. Water temperature and fish length were positively correlated with swimming endurance. Rio Grande silvery minnows routinely swam the equivalent of 50 km or more (up to 125 km) in a swim-chamber in 72 hr or less. Rio Grande silvery minnows in a flume completed trials swam over sand to cobble-sized particles in a range of flow velocity conditions and used velocity breaks near the boundary layer and behind cobble particles to proceed upstream in an energetically efficient manner. Passage experiments showed that Rio Grande silvery minnow did not ascend Denil and single vertical slot fishway models presumably because of high water velocities and complex, turbulent flow fields. Up to 50% passage was observed in a lower turbulence dual vertical slot fishway at a relatively low 70-cm/sec; passage was only 8% at a higher 100-cm/sec water velocity. About 75% of wild and hatchery fish successfully ascended a large-scale model of a rock-channel fishway with a 1% hydraulic gradient in both low and high-velocity flows. Underwater cameras showed that silvery minnow used the lower velocity boundary layer and breaks adjacent to high velocity zones to swim upstream. The mosaic of water velocities present in the rock channel fishway was likely the reason for relatively high passage success. We integrated time to fatigue relationships with hypothetical passage attributes including fishway length and flow velocity, water temperature, and fish length, that should assist with design of structures appropriate for successful passage of Rio Grande silvery minnow.

2005-11-18 10:45:00 - Osborne, Megan J.[*1]; Benavides, Melissa A.[1]; Turner, Thomas F.[1]

(1-University of New Mexico, Department of Biology and Museum of Southwestern Biology)

Genetic heterogeneity among pelagic egg samples and variance in reproductive success in an endangered freshwater fish, the Rio Grande silvery minnow (*Hybognathus amarus*)

A sweepstakes-mismatch process in which reproduction is poorly coordinated with appropriate resources for larval development and recruitment may result in large variance in reproductive success among individuals and spawning aggregations. This process has been proposed to explain the very low ratio of genetic effective population size (Ne) to adult census size (N) in marine species with high fecundity, pelagic spawning and extensive mortality in the early life stages. The federally endangered Rio Grande silvery minnow, *Hybognathus amarus*, shares these life history traits and as such, a sweepstakes mismatch process has been suggested to account for very low Ne to N ratios observed in this species. We tested two key predictions of the sweepstakes mismatch process using molecular data: (i) that temporally distinct samples of eggs differ in genetic composition and (ii) that egg samples do not comprise a random subset of the potential adult breeders. Genetic data is presented that supports both of these predictions. Data supports the hypothesis that the interaction of key life-history traits and river fragmentation results in high variance in reproductive success which has lowered the ratio of Ne to N in the Rio Grande silvery minnow. This study highlights the importance of understanding the interaction of early life-history and fragmentation in devising conservation plans for endangered freshwater species.

2005-11-18 11:00:00 - Remington, Rachael K.[*1]

(1-University of Oklahoma, Zoology Department)

Are minnows muddled in murky waters? Evaluating the effects of turbidity on growth of three *Notropis* species

Anthropogenic disturbances, such as agriculture and dams, have influenced aquatic systems by changing the amount of suspended sediment (i.e., turbidity) in streams and rivers. Turbidity may have different short-term and long-term impacts on fishes, including altering spawning behavior, foraging success, predator vulnerability and growth rate. Although many aquatic habitats have relatively low levels of turbidity, several river systems have historically experienced extreme turbidity levels (e.g., Colorado River Basin, Great Plains rivers). Hence, anthropogenic reductions in turbidity levels (e.g., via dams acting as sediment traps) may have negative effects on fishes adapted to naturally turbid environments. I investigated the effects of turbidity on the growth of three minnow species (*Notropis bairdi, N. stramineus* and *N. boops*) that occur in environments with contrasting turbidity levels. Experiments were conducted over 60 days in outdoor artificial stream mesocosms at the University of Oklahoma Biological Station, Kingston, OK. Each species was tested in 6 clear and 6 turbid (50-100 NTU) treatments. Fishes were individually marked with acrylic paint, measured and weighed. *Notropis bairdi* (turbid-water species) and *N. stramineus* (clear to intermediate turbid-water species) exhibited significantly higher levels of growth in turbid treatments than in clear treatments. However, *Notropis boops* (clear-water species) did not grow well in either environment. Additionally, benthic invertebrates, zooplankton and algal growth were measured to quantify food availability. Levels of zooplankton were significantly higher in *N. bairdi* and *N. stramineus* turbid treatments than in clear water treatments. These results suggest that turbidity can enhance the growth of certain species through alteration of food

resources, however, more research is necessary to uncover other potential mechanisms underlying this enhancement (e.g., alteration of feeding behaviors). Understanding how fishes perform in turbid environments will help us uncover what influence, if any, changes in turbidity have in the decline of turbid river faunas.

2005-11-18 11:15:00 - Bloom, Devin D[*1]; Piller, Kyle R[1]

(1-Southeastern Louisiana Univeristy, Dept. of Biological Sciences)

Molecular systematics of the Tribe Menidiini, with emphasis on the silverside genus *Chirostoma*) (Atherinopsidae)

The tribe Menidiini consists of four genera including *Poblano, Chirostoma, Menidia*), and *Labidesthes*). *Chirostoma* and *Poblano* are endemic to the mesa central of Mexico and account for the 23 of the 30 species in the tribe, and is the apparent product of an adaptive radiation and represent an immense amount of diversity in an area that is otherwise characterized by a depauperate ichthyofauna. In particular, *Chirostoma* is of significant interest to conservationists and evolutionary biologists alike due to its unique evolutionary history as well as its importance to local commercial fisheries. Morphological similarity and high degree of sympatry among the species of *Chirostoma* has confounded the taxonomic validity of the taxa within Menidiini. The purpose of this study is to generate a hypothesis of the phylogenetic relationships within the tribe Menidiini, with emphasis on *Chirostoma*, using mitochondrial ND2 sequence data. We generated partial sequence data (536bp) from four species of *Menidia, Labidesthes sicculus*, and eight species of *Chirostoma*, including several that are represented by multiple populations. Preliminary analyses support the monophyly of Chirostoma. However, we deem these results tentative until more taxa and characters are included in the analysis. There is a relatively low degree of sequence divergence among *Chirostoma* (0.3-8%), as has been observed in other adaptively radiated groups, but a moderate degree (10-13%) between *Chirostoma* and *Menidia*.

2005-11-18 11:30:00 - Tech, Cynthia[*1]; Kodric-Brown, Astrid[1]

(1-University of New Mexico, Department of Biology)

Sex ratio bias and loss of male fertility in hybrids of Comanche Springs pupfish and sheepshead minnow

Introgressive hybridization is major threat to native fishes; thus, understanding the mechanisms that limit genetic introgression is of great importance for conservationists and academics alike. In this paper, we examine the postzygotic incompatibilities between two species of hybridizing pupfish, the Comanche Springs pupfish, *Cyprindon elegans*, and the sheepshead minnow, *C. variegatus*. We bred and reared both species, their hybrids, and their backcrosses under standardized conditions within the laboratory, recording (1) the number of breeding attempts that failed to produce offspring, (2) the number of offspring produced in each breeding attempt, (3) the sex ratio of the resulting offspring, and (4) the survival of offspring to 35 weeks past spawning. We found that hybrids and backcrosses have greatly reduced fitness relative to the parental species. The survival of backcrosses into *C. elegans* was greatly reduced relative to all other crosses. In addition, breeding attempts involving male hybrids nearly always failed, suggesting that male hybrids have greatly reduced fertility. Finally, we found female-biased sex ratio in several crosses. Hybrid crosses involving *C. elegans* females and *C. variegatus* produced only females, and backcrosses involving hybrid females and *C. elegans* males produced offspring with a sex ratio (number of males divided by the total number of offspring) of approximately 0.25. All other crosses produced offspring with a sex ratio of approximately 0.5. Since female biased sex ratios and male sterility are known to occur in other pupfish hybrids, it has been suggested previously that pupfish have XY chromosomal sex determination; these results give further support to this hypothesis. Our results further suggest that there may be an incompatibility between the "Y" chromosome of *C. elegans* and either a dominant gene on an autosomal chromosome or a gene on the X chromosome of *C. variegatus*. Postzygotic incompatibilities between *C. elegans* and *C. variegatus* may be a major force limiting genetic introgression between these species.

2005-11-18 11:45:00 - Gesundheit, Pablo[*1]; Macias-Garcia, Constantino[1]

(1-Instituto de Ecología UNAM, Laboratotio de Conducta Animal)

Historical biogeography of the Goodeidae (Cyprinodontiformes)

The fish family Goodeidae is a monophyletic group made up by approximately 37 living species and 3 extinct; distributed mainly on the highlands of Central Mexico. The minimum age for the family is given by the fossil species Tapatia occidentalis, found in Late Miocene-Early Pliocene deposits located within the group's present-day distribution. The group's distribution area is centered on the Mexican Neovolcanic Axis, which is known for its highly complex relief and geologic history. We used Brooks' Parsimony Analysis (BPA) to test whether the individual distributions of the species in the family are a consequence of vicariance-promoted speciation events; given the geologic and geographic dynamism in the area of distribution. We used a recent molecular phylogeny of the Goodeidae and known distribution of the species in the family to this end, and included the partially sympatric fish genera Algansea and Notropis in the analysis. Additionally, we used dates of divergence between lineages, estimated using a molecular clock, to search for relatable events of geographic change. We partially reconstructed the hydrographic history of the area of distribution.

The resultant area cladogram contains a considerable amount of homoplasy, which, in a biogeographical context, is suggestive of extinction and dispersion events as well as non-response to vicariance. Our results confirm the importance of both vicariance and stream piracy-driven dispersal in the history of the family reported in previous studies. The biogeographic history of the Goodeidae conforms only partially to the dichotomic scheme represented on an area cladogram. The allopatric mode of speciation seems to have been the predominant form in the family, but the geographic history of the clade can be reconstructed only to a certain degree.

Lunch / Almuerzo (12:00 - 14:00)

Technical Session 5 / Sesión Técnica 5 (14:00 – 16:15)

2005-11-18 14:00:00 - Robinson, Anthony[*1]; Cordy, Gail[2]

(1-Arizona Game and Fish Department; 2-U.S. Geological Services)

Ecological condition of Arizona's streams

Arizona Game and Fish Department in cooperation with U.S. Geological Services and University of Arizona conducted stream surveys as part of the U.S. Environmental Protection Agency's (EPA) Environmental Monitoring and Assessment Program—Western Pilot Surface Waters Project. The EPA used a probabilistic design to select sites throughout the West, and to develop biological indicators and to conduct a large-scale assessment of the biological condition of Western streams. Sites were probabilistically selected from a GIS coverage of mapped streams (River Reach File 3, 1:1,000,000 scale digital line graph). Although this design worked well for most states, it worked poorly in Arizona, where

approximately 81% of the sites were found to be non-target (most were not perennial, but some were canals or permission to sample was not granted). At each target site, numerous measurements were made of response indicators (habitat, water chemistry, periphyton assemblages, macroinvertebrate assemblages, and vertebrate assemblages), and stressor indicators (e.g., land use, habitat degradation).

In Arizona, 10% of the sites did not have any fishes. Nonnative fish species were more prevalent than native fish species; i.e., nonnatives were found in 75% of the streams whereas native fishes were found in 65% of the streams. Species composition of fishes was dominated (>50%) by nonnative fish species in 43.6% of the streams, and by native species in 46.2% of the streams. With respect to the number of individuals, nonnative fish dominated at 53.8% of the streams and native fish dominated at 51.3% of the streams. Neither the abundance of nonnative fish nor the proportion of individuals that are nonnative fish, nor the proportion of species that are nonnative fish, nor native fish richness were related to overall human-caused riparian disturbance, or to grazing related disturbance. Native fish richness was also not correlated with nonnative fish species richness ($P = 0.955$, $n = 39$) nor was native fish abundance correlated with nonnative fish abundance ($P = 0.227$, $n = 39$). The EPA developed aquatic vertebrate indexes of biological integrity (IBI) for three major aggregated ecoregions in the West: Mountains, Xeric, and Plains (the latter is not presented). Metrics included in the Mountain IBI included: 1) proportion of aquatic vertebrate individuals that are alien, 2) proportion of aquatic vertebrate abundance in family Cyprinidae, 3) proportion of individuals that are sensitive and invertivore/piscivores, 4) proportion of species that are lithophilic, 5) proportion of species that are native, sensitive, and long lived, 6) proportion of individuals that are sensitive and rheophilic, and 7) proportion of all species that are super-tolerant. Metrics included in the Xeric IBI included: 1) alien vertebrate species richness, 2) proportion of vertebrate abundance in family Cyprinidae, 3) proportion of species that are nontolerant and invertevore/piscivores, 4) proportion of all individuals that are sensitive and rheophilic, 5) proportion of individuals that are sensitive spawners, 6) proportion of individuals that are tolerant, and 7) proportion of individuals that are native and migrators. Metrics were scaled and added together to create a multimetric score, which was then scaled to range from 0 – 100 (the IBI). The distribution of IBI scores for reference sites (minimally disturbed sites sampled in addition to the probability sites) were used to establish threshold criteria to divide scores into good, fair, and poor categories. Based on the aquatic vertebrate IBI and thresholds set, 70% of Arizona's stream miles were in poor condition, 14% were in fair condition, and only 9% were in good condition; for 7% there was no data, because they were fishless or not sampled. As expected, a greater proportion of Xeric streams were in poor condition than Mountain streams.

2005-11-18 14:15:00 - Albrecht, Brandon[*1]; Holden, Paul B.[1]

(1-BIO-WEST, Inc.)

Documentation of a new razorback sucker spawning area in Lake Mead and insights to recent razorback recruitment using a multiplicity of methodologies

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 9 years. Two primary populations at Echo Bay and Las Vegas Bay were followed during the first 8 years. A major emphasis of this research has been to locate spawning sites at these two areas and to use aging information to identify patterns of recruitment for both populations. Using multiple methodologies (trammel netting for adults, 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 2004-2005 field season. Ages calculated nonlethally for more than 70 individual razorback sucker (4 to 35 years of age) indicated that these were young populations that potentially recruited under specific reservoir conditions. An additional 6 razorback sucker were aged during the 2004-2005 study year, including one six year old fish from the new Fish Island spawning area. This fish was found to be ripe and participating in spawning activities. Previously, fish from this cohort were found to be immature, providing information on age at sexual maturity for Lake Mead razorback suckers. Using back-calculation techniques to compare the years all aged razorback sucker were spawned with historical Lake Mead water elevations provides some evidence that a combination of small, annual lake-level fluctuations and larger, multi-year changes in lake elevation may influence razorback sucker recruitment. The long-term lake-level changes apparently serve to promote growth of terrestrial vegetation that may provide increased protective cover for larval and juvenile razorback sucker, resulting in the limited recruitment documented in Lake Mead. This theory is generally supported by the fact that the 11 sub-adult fish aged during past study years were apparently spawned in 1997 and 1998, at a time when large amounts of protective cover were inundated at Las Vegas Bay.

The precipitous drop in Lake Mead's elevation over the last 5 years has affected razorback sucker spawning sites. The spawning area used by the Las Vegas Bay population at Blackbird Point appeared to be affected by the declining lake elevation when the presumptive spawning area was inundated with sediment from Las Vegas Wash and desiccated, a condition attributable to declining lake levels during early 2004. For example, during the 2003-2004 field season, only 4 razorback larvae were captured near this location. However, rapid increases in lake elevation during the course of this study year (approximately 20 ft overall and on average increases were 4 ft/month) allowed Blackbird Point to become re-inundated. Subsequently, larval razorback sucker were documented in much greater abundance (96 razorback larvae were captured during the 2004-2005 field season) suggesting that the Las Vegas Bay population continued to utilize the Blackbird Point spawning area and highlighting the importance of maintaining lake elevations sufficient to allow access to this historical spawning area. These findings provide hope for recovery as it appears that the razorback population in Lake Mead is successfully able to persist despite multiple years of perturbation.

2005-11-18 14:30:00 - Voeltz, Jeremy B.[*1]

(1-Arizona Game and Fish Department)

Drought, floods, and fires – challenges and opportunities for native fish management in Arizona

The last year has certainly been interesting. Faced with a 9-year drought, the winter of 2004-2005 turned out to be the wettest in Arizona in a decade. Reservoirs across the state went from near empty to near capacity, vegetation in the Sonoran Desert responded, and streams and springs were recharged from the wet winter. Native fishes that had survived the drought found themselves in constricted habitats that were blown out by winter/spring flooding. And unfortunately, after the wet winter followed the 2005 wildlife season. The second largest wildfire in modern Arizona history burned much of the Tonto and Prescott National Forests, threatening several populations of native fish. Several other large fires threatened many other native aquatic resources. We will look at nature's impacts over the past year; as well as some of challenges and opportunities provided by the unique conditions in Arizona over the last year.

2005-11-18 14:45:00 - Clark, Brian[*1]; Rogers, Scott[1]

(1-Arizona Game and Fish, Research Branch)

Effects of increased water temperature on Colorado River fishes in Grand Canyon

The temperature of water being released from Glen Canyon Dam (15 C) is significantly warmer than normal for this time of year because of low water level in Lake Powell. This warmer water may impact both native and nonnative fish populations downstream. Mechanical removal of predators from the Little Colorado River inflow has also been underway for three years. The combination of warmer water and fewer predators sets the stage for big changes to occur in native fish populations. Preliminary catch results indicate humpback chub *Gila cypha*, flannelmouth sucker *Catostomus latipinnis*, and bluehead sucker *Catostomus discobolus* populations are already expanding. Higher water temperatures may

also increase the number and distribution of warm water nonnative fishes. Whether overall changes to native fish populations will be positive or negative remains to be seen.

2005-11-18 15:00:00 - Cantrell, Christopher J.[*1]

(1-Arizona Game and Fish Department)

Arizona statewide conservation agreement and strategy for roundtail chub (*Gila robusta*), headwater chub (*Gila nigra*), flannelmouth sucker (*Catostomus latipinnis*), Little Colorado River sucker (*Catostomus* spp.), bluehead sucker (*Catostomus discobolus*), and Zuni bluehead sucker (*Catostomus discobolus yarrowi*)

In 2001, the Colorado River Fish and Wildlife Council began discussions of a range-wide conservation effort for three native southwest species (roundtail chub (*Gila robusta*), flannelmouth sucker (*Catostomus latipinnis*), and bluehead sucker (*Catostomus discobolus*)). Representatives from the 6 states that comprise the range of these three fishes were brought into discussions and after 3 years, these discussions resulted in the completion of a Range-wide Conservation Agreement and Strategy (RCAS), which the states of Arizona, Colorado, Nevada, New Mexico, Utah, and Wyoming signed. By signing the RCAS, these 6 states have committed to developing conservation plans for any of the three species found within their political boundaries. Within Arizona, there is need to address concerns for other species and subspecies concurrently. Therefore, for conservation purposes the Department saw value in including headwater chub (Gila nigra), Little Colorado River sucker (*Catostomus* spp.), and Zuni bluehead sucker (*Catostomus discobolus yarrowi*) in this effort. The Arizona Game and Fish Department is nearing completion of their Statewide Conservation Agreement and Strategy, which provides a framework for the long-term conservation of roundtail chub, headwater chub, bluehead sucker, flannelmouth sucker, Zuni bluehead sucker, and Little Colorado sucker throughout their respective ranges in Arizona as a collaborative and cooperative effort among resource agencies. We will take a look at the development of this document over the past year and the future implementation in store for its involved parties.

2005-11-18 15:15:00 - Modde, Tim[*1]; Haines, Bruce[1]

(1-U.S. Fish and Wildlife Service)

Survival and growth of stocked razorback sucker and bonytail larvae in multiple floodplain wetlands in the middle Green River under reset conditions

The concept of initializing floodplain wetlands to remove residual nonnative fishes was tested in the middle Green River to determine if larval razorback sucker and bonytail could grow and survive in newly flooded floodplains. Five different floodplains were stocked with razorback sucker and bonytail larvae during two growing seasons (five one year and three the second year). Following flooding and colonization of nonnative fishes, survival and growth of stocked fish was monitored during each growing season. Survival among sites and between years ranged between 0.0%-0.7% and 0% to 13.6% for razorback sucker and bonytail, respectively. Age-0 growth rates ranged between 0.4 - 0.8 mm/d for razorback sucker and 0.4 - 0.7 mm/d for bonytail. Given the small sample size, it was difficult to correlate environmental factors with survival of razorback sucker and bonytail. No correlation of age-0 razorback sucker survival was observed with nonnative biomass (within the range observed) or submerged aquatic vegetation. Conversely, survival of bonytail may be related to nonnative fish biomass and submerged vegetation. The differing relationship may be the result from predator-prey interactions. Based on body depth and predator gape relationships, razorback sucker were not vulnerable to predation to any age-0 predators in floodplains, whereas a portion of age-0 bonytail were vulnerable to predation by some young-of-the-year predators.

2005-11-18 15:30:00 - Schooley, Jason D.[*1]

(1-Arizona State University, School of Life Sciences)

Survival of razorback sucker stocked to the lower Colorado River (Parker-Laguna): perspective on historic and present recovery efforts

Razorback sucker *Xyrauchen texanus* has been actively stocked by the millions to the lower Colorado River basin since the 1970's with low to undetectable long-term survival. A small repatriate population exists between Parker and Laguna dams which is maintained by regular stockings to this reach of river, backwaters, and impoundments. Recent stockings have resulted in higher concentrations of razorback suckers near the stocking site, but older, adult fish remain absent from the catch. This may be due to dispersal, mortality, or both; rendering them undetectable approximately 2 years post-stocking. This is contrary to data from Lake Mohave where fish stocked as early as 1992 are captured annually. It is possible that the lower river presents a different suite of mortality threats and is therefore a less hospitable place for repatriated razorback suckers resulting in a considerably lower survival rate. The 30 year lower basin stocking history for razorback sucker is reviewed, and status of Parker-Laguna monitoring surveys 2003 to present is updated, with hypotheses on mortality factors.

2005-11-18 15:30:00 - Schooley, Jason D.[*1]; Marsh, Paul C.[1]; Kesner, Brian R.[1]; Lee, James C.[1]; Thornbrugh, Darren J.[1]

(1-Arizona State University, School of Life Sciences)

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2005-11-18 15:45:00 - Hedrick, Trina[*1]; Andersen, Matthew[1]

(1-Utah Diviision of Wildlife Resources)

A conservation action prioritization method for roundtail chub, *Gila robusta*, flannelmouth sucker, *Catostomus latipinnis*, and bluehead sucker, *Catostomus discobolus*, in Utah

The Colorado River Fish and Wildlife Council has identified the roundtail chub, flannelmouth sucker, and bluehead sucker (the three species) as species that are in need of and would likely benefit from proactive conservation efforts. The Council's concern for the three species resulted in the 2004 signing of a range-wide agreement and strategy. The range-wide documents identify real and potential threats to the species and provide a conceptual framework for development of individual state plans. The general objectives of the state plans likely vary; however, through the development and implementation of Utah's conservation plan, participants intend to describe the current scenario, identify the range of potential conservation actions that will likely benefit the three species in Utah and in which management units these actions are most suitable, illustrate a process whereby projects are prioritized, and define the criteria that must be met in order to be successful in this effort.

The Utah Division of Wildlife Resources (Division) is currently identifying locations where the three species remain, conducting initial population estimates where appropriate, and ascertaining the immediate threats to each of these populations. In addition to this fieldwork, the Division is continuing to make progress on the completion of its state plan. The plan currently provides a method for managers and scientists to employ as they work towards conservation through on-the-ground efforts. This method offers an objective means for identifying and prioritizing projects for incorporation into annual work plans. Each potential project will be analyzed through a filter describing the level of knowledge of the particular location where the project will occur, the magnitude of the threats present in the location, and the availability of opportunity (including resources) present to complete the project. In addition to the prioritization process, the plan presents the initial criteria for the number of populations per management unit necessary for recovery.

2005-11-18 16:00:00 - Osmundson, Douglas B.[*1]
(1-U. S. Fish and Wildlife Service, Colorado River Fishery Project)

Estimates of Colorado pikeminnow abundance in the upper Colorado River: a 2005 update

During 1992-1994, the first systematic mark-recapture study of the endangered Colorado pikeminnow, Ptychocheilus lucius, was conducted in the upper Colorado River mainstem. Two similar three-year studies have since been completed providing estimates for the years 1998-2000 and 2003-2005. Together, results of these three separate studies have been used to monitor the status and trend of this population over a 14-year period. However, individual point estimates have increased and decreased from year-to-year, perhaps as a result of annual variation in environmental conditions that affect capture probabilities. For instance, the 1992 estimate of 324 individuals (> 500 mm total length) was followed by a 1993 estimate of 255 individuals and a 1994 estimate of 507 individuals. Similarly, the 1998 estimate of 507 individuals was followed by a 1999 estimate of 398 individuals and a 2000 estimate of 544 individuals. Estimates from the most recent three-year effort again exhibited high between-year variation: the 2003 effort resulted in a point estimate of 718 individuals; the 2004 effort, 370 individuals; the 2005 effort, 703 individuals. Some of the estimates are clearly better than others based on the associated confidence intervals, and in some cases, increases or decreases might have real biological explanations. Despite this, it is becoming clear that individual annual estimates for the mainstem Colorado River population may not be precise enough to reliably monitor population trend on a year-by-year or short-term basis. An alternative method by which to assess trend is to average the annual estimates of each three-year effort in an attempt to reduce the variation apparently inherent in individual annual estimates. Such averaging might allow a more accurate assessment of the long-term trend and discourage investigators and managers from reading too much into apparent short-term fluctuations in estimates. Using this method, the trend in abundance for the mainstem Colorado River population appears to have been upward over the past 14 years. The first three-year effort resulted in an averaged estimate of 362 (95% CI = 309-697) individuals > 500 mm TL; the averaged estimate for the second three-year effort was 483 individuals (no 95% CI available). Preliminary results from the most recent three-year effort, ending in 2005, indicate an average of 597 individuals > 500 mm TL (no 95% CI yet available). Although confidence intervals likely overlap, this trend in estimates is encouraging because it strongly suggests this population, though still small, is recovering rather than continuing to decline as is currently the case with many populations of endangered fish species.

Poster Session 3 / Sesión de Carteles 3 (16:15 - 17:00)

2005-11-18 16:15:00 - Fuentes, Patricia MC[*1]; Espinosa, Hector MC[2]
(1-Instituto Nacional de la Pesca, SAGARPA; 2-Instituto de Biología, UNAM)

Presence in Mexico of exotic fishes via the aquarium hobby industry

A remarkable increment of the international trade of fish exists in the entire world, for use in exhibition aquariums and domestic; it was found that via the imports, they enter Mexico 393 exotic freshwater species in their majority; according to their origin, they come from the basin of the Amazons and from different regions of Center-South America, 49%; from Africa 25%, Asia 22%, and Australia a little more than 1% and from both regions 3%. This work presents a revised list of fishes and upgraded systematically the ornament fresh water species that were cared in Mexico with legal authorization during 2001; an analysis is presented on the impact that can cause the presence of exotic species in short term in some basins. The possibility of processes of displacement of native species is documented in different grades, competition for of the habitat, food, space and propagation of illnesses for species invasive. Cichlidae and Characiidae families have the high number of species (171) and Anabantidae, Pimelodidae, Aplocheilidae, Cobitidae, Callychthyidae, Loricariidae and Cyprinidae are the other 122 species. The imports of organisms supply 80% of the national market of ornament fish and in minimum scale they produce it in hatcheries of the country. The main countries that provide Mexico of ornamental fish are United States, Colombia, Peru, Czech Republic, Philippines, Thailand and Singapore. It is recognized that they are necessary stricter measures to control the problem of accidental introduction of species and to reinforce the application of the effective rules.

Presencia en México de peces exóticos por medio de la industria acuarista

Existe un incremento notable del comercio internacional de peces en todo el mundo, para uso en acuarios de exhibición y domésticos; se encontró que vía las importaciones, ingresan a México 393 especies dulceacuícolas en su mayoría exóticas; de acuerdo a su origen proceden de la cuenca del Amazonas y de diferentes regiones de centro y Sudamérica en un 49%; de África el 25%, de Asia el 22%, de Australia poco más del 1% y de mas de dos regiones el 3%. Este trabajo presenta una lista ictiofaunística revisada y actualizada sistemáticamente de las especies de ornato de agua dulce que fueron importadas por México con autorización legal durante 2001; se presenta un análisis sobre el impacto que puede causar la presencia de especies exóticas a corto plazo en algunas cuencas. Se documenta la posibilidad de procesos de desplazamiento de especies nativas en diferentes grados, competencia por del hábitat, alimento, espacio y propagación de enfermedades por especies invasoras. Las importaciones de organismos abastecen el 80 % del mercado nacional de peces de ornato y en mínima escala, lo hacen las granjas de productores del país. Los principales países que proveen a México de peces ornamentales son Estados Unidos, Colombia, Perú, República Checa, Filipinas, Tailandia y Singapur. Se reconoce que son necesarias medidas más estrictas para controlar el problema de introducción accidental de especies y reforzar la aplicación de la normatividad vigente.

2005-11-18 16:15:00 - Hobbs, Brian[*1]; Goodchild, Shawn C.[*2]
(1-Nevada Department of Wildlife; 2-U.S. Fish and Wildlife Service, Southern Nevada Field Office)

The perilous persistence of the Pahrump poolfish

The Pahrump poolfish, *Empetrichthys latos latos*, has a complex history of management activities to preserve the species; however, much still needs to be done to prevent its extinction. This poolfish originally occurred in Manse Spring, which issues within the Pahrump Valley, Nye County, Nevada, which lies between Las Vegas and Death Valley. This poolfish was extirpated in 1975 as the spring output decreased, but fortunately in 1971, biologists transferred poolfish to several ponds fed by two springs at Corn Creek in the Las Vegas Valley. Two other subspecies of this fish, *E. m. concavus* and *E. m. pahrump*, were extirpated, as well as the Ash Meadows killifish *Empetrichthys merriami*, leaving the Pahrump poolfish the only representative of its genus. In 1972 poolfish were moved from Corn Creek to Shoshone Ponds, in Spring Valley, White Pine County, Nevada, which lies about 40 miles east of Ely. In 1983, poolfish were moved from Corn Creek, to a large reservoir at Spring Mountain Ranch, just 20 miles west of Las Vegas, Clark County, Nevada. Although the Corn Creek population survived for many years it succumbed to crayfish in 1999, and a new refuge was built at Corn Creek that would guarantee seclusion from noxious species. Red swamp crayfish, *Procambarus clarkii*, were first detected in 1993 at a time when poolfish numbered in the thousands, and by 1998 only 3 fish were captured in 76.25 trap hours. The new refuge now has a viewable population of about 200 individuals and appears to be effective at maintaining a population. Current estimates of poolfish at Shoshone Ponds total nearly 3,000 fish which is stable. This site, a series of modified spring pools administered by the Bureau of Land Management, is set to be expanded to provide even more habitat in 2006. The Spring Mountain Ranch population is also stable and well into the thousands of fish and the habitat has remained nearly unchanged over the past 5 years. The poolfish persists in three populations, each which are radically different habitats, however attempts are planned to work with landowners to re-establish this species within its historic habitat.

2005-11-18 16:15:00 - Brandenburg, Howard[*1]; Dudley, R.[1]; Platania, S.[1]; Brooks, J.[2]; Probst, D.[3]; Farrington, M.[1]; Davenport, S.[2]; Remshardt, J.[2]

(1-University of New Mexico; 2-U.S. Fish and Wildlife; 3-New Mexico Department of Game and Fish)

Native fish research and management in the upper/middle Rio Grande basin New Mexico during 2005

Severe drought conditions in New Mexico since 2001, coupled with over-allocated human water demands, have left rivers in New Mexico dry or intermittent and have jeopardized already threatened and endangered fish species. Fortunately, a wet winter in 2004 and a wet, cool spring in 2005 gave a short reprieve from the drought and produced a substantial and prolonged spring run-off in most of New Mexico's rivers. The effects of the high spring run-off replenished depleted reservoirs, flooded rivers and sustained inundated riparian floodplains.

The endangered Rio Grande silvery minnow (*Hybognathus amarus*; RGSM) responded favorably to the high spring flows in 2005. The increased discharge not only acted as a strong cue for spawning but also created longstanding inundated floodplains that provided nursery habitat for larval fishes. Spring and summer monitoring indicated that abundance of RGSM was markedly higher in 2005 than in the previous five years. However, survival of 2005 RGSM cohort depends upon maintaining a wetted river channel. Sections of the Rio Grande began drying in the late summer months which initiated salvage operations by agency personnel as well as a change in the USFWS biological opinion (BO) that was drafted in 2003. Change to the BO included an increase in the take of RGSM from 775 to over 10,000 individuals and well as decreasing the size classification of age 0 fish, thereby minimizing risk of exceeding the take.

The Pecos River was one of the few rivers in New Mexico that did not benefit from effects of high spring run-off in 2005. Severely depleted upstream reservoirs absorbed much of the spring run off. Truncation of spring runoff contributed to low reproductive success and recruitment of Pecos bluntnose shiner (*Notropis simus pecosensis*; PBNS) in 2005. Long term monitoring of PBNS by U.S. Fish and Wildlife Service and New Mexico Game and Fish continues, including population observations of bigscale logperch (*Percina macrolepida*) and longnose gar (*Lepisosteus osseus*). Continued threats to PBNS are surface flow intermittence, block releases from reservoirs for irrigation purposes, as well as inadequately low-base flow.

New Mexico Game and Fish signed the range-wide conservation agreement for roundtail chub (*Gila robusta*), bluehead sucker (*Catostomus discobolus*) and flannelmouth sucker (*Catostomus latippinis*) in early 2004. As part of its commitment, NMGF has developed a draft recovery plan for roundtail chub and Gila chub (*Gila intermedia*). The recovery plan is aimed at recognizing and improving current populations and associated habitat of these two species. The debate over use of piscicides continues in New Mexico yet its use was approved in the reclamation of thirteen miles of the West Fork of the Gila River for Gila trout (*Oncorhyncus gilae*). Prohibited use of piscicides still curtails the recovery of Rio Grande cutthroat trout (*Oncorhyncus clarki virginalis*; RGCT). however the use of antimycin may be permitted by the State Game Commission in restoring RGCT in the Costilla watershed. Lastly, a system wide ichthyofaunal survey is currently being conducted in the South Canadian River of Northeastern New Mexico. The survey conducted by American Southwest Ichthyological Research (ASIR) includes sampling of main stem South Canadian River, as well as its major tributaries. The South Canadian is the least studied of the eight major river basins in New Mexico and its ichthyofauna includes four taxa listed by NMDGF as threatened or endangered.

2005-11-18 16:15:00 - McGaugh, Suzanne[*1]

(1-Iowa State University)

Trachemys scripta: a global threat to genetic swamping in Cuatro Ciénegas

A ubiquitously sold turtle of the pet trade and food market, *Trachemys scripta*, poses a threat to genetic swamping by congeners throughout is sale distribution. *T. taylori* is endemic to Cuatro Ciénegas and is a distinct species from *T. scripta. T. scripta* has been located in the Cuatro Ciénegas system. Although hybrids have not been found and hybridization has not been examined genetically, proper identification of the two species and public awareness of the issue is important.

2005-11-18 16:15:00 - Barriga-Sosa, Irene de los Angeles.[*1]; Pérez-Ramírez, Mónica Yanelli[1]; Soto-Aguirre, Fernando[2]; Castillo-Rivera, Manuel[3]; Arredondo-Figueroa, José Luis[1]

(1-Planta Experimental de Producción Acuícola, Departamento de Hidrobiología, Universidad Autónoma Metropolitana-Iztapalapa. Av. San Rafael Atlixco 186. Col. Vicentina. Del. Iztapalapa. A. P. 55-535. C. P. 09340. México. D. F.; 2-Instituto Nacional de la Pesca. Pitágoras No. 1320, 8vo. Piso, Colonia Santa Cruz Atoyac, Del. Benito Juárez, C. P. 03310. México, D. F.; 3-Departamento de Biología. División Ciencias Biológicas y de la Salud. Universidad Autónoma Metropolitana-Iztapalapa. Av. San Rafael Atlixco 186. Col. Vicentina. Del. Iztapalapa. A. P. 55-535. C. P. 09340. México. D. F.)

Inter-specific variation of the mitochondrial r16S gene among silversides "Peces Blancos" (Atherinopsidae: Menidiinae) and its utilization for species identification

Analysis of 570 nucleotide sequences of the mitochondrial r16S gene of four species of silversides "peces blancos" (Chirostoma) and of two euryhaline related species Membras martinica and Menidia menidia indicate levels of variation that aid in the development of a DNA-based method for species identification. The nucleotide sequence data show levels of inter-generic genetic variation that range from 3.3 – 7.9% and from 1.06 to 1.8% at the inter-specific level. The variation observed allowed the identification of 18 diagnostic restriction enzymes that in any

combination of two or three could aid in the diagnosis of species of "peces blancos"; six of these enzymes could also discriminate between the genera Membras and Menidia; the enzymes Ase I, Cvi AII and Fat I might discriminate the genus Membras from Chirostoma; and the combination of any of the enzymes Bsa AI, Cvi AII, Fat I or Hpy CH4IV can allow to discriminate Menidia from the "peces blancos". PCR-RFLP analysis of amplified mitochondrial r16S fragments of 90 un-identified "peces blancos" from lake Patzcuaro and utilizing the restriction enzymes Hpy CH41V, Taq I, Bsm F1 and Bbv I, allowed us to diagnosed unambiguously cultivated Chirostoma estor and C. humboldtianum in juvenile and adult stages. The use of a non-invasive method to PCR amplified specific DNA from live reproductive stocks, allow us to suggest the use of this tool as a potential for identification of endangered or threatened species.

2005-11-18 16:15:00 - Blasius, Heidi B[*1]

(1-Bureau of Land Management)

Establishment of Gila topminnow (*Poeciliopsis occidentalis occidentalis*) and desert pupfish (*Cyprinodon macularius macularius*) into multiple springs and streams within the watershed of the South Rim of Aravaipa Creek

The Bureau of Land Management, Safford Field Office, in cooperation and coordination with the Arizona Chapter of the Nature Conservancy, Aravaipa Canyon Preserve, initiated a native fish conservation project with United States Fish and Wildlife Service and Arizona Game and Fish Department to establish two endangered fish species, Gila topminnow and desert pupfish into multiple springs and streams within the watershed of the South Rim of Aravaipa Creek. The project will assist in securing reproductive, self-sustaining populations of Gila topminnow and desert pupfish within their historic range. This is vital since fishes of the Gila River system are all biologically imperiled to various degrees and are found on Federal, State, and BLM sensitive species lists.

2005-11-18 16:15:00 - Miskow, Eric[*1]; Clemmer, Glenn[1]; Goodchild, Shawn[2]; Heinrich, Jim[3]; Hobbs, Brian[3]; Sjoberg, Jon[3]; Tisdale, Kim[3]; Webber, Grant[2]

(1-Nevada Natural Heritage Program; 2-U.S. Fish and Wildlife Service, Southern Nevada Field Office; 3-Nevada Department of Wildlife)

Nevada Area Report

The winter of 2004-2005 was one of record precipitation in both northern and southern Nevada. Stream systems affected substantially were the Virgin River, Lower Muddy River and Meadow Valley Wash. Fires in the summer of 2005 also heavily impacted the Meadow Valley Wash watershed particularly the uppermost reaches, as well as portions of Ash Meadows. At this time surveys have yet to be conducted to assess the full impact of these events on fish populations. We will report on these events and findings after submission of this abstract.

Ash Meadows: On 29 July 2005 a wild fire consumed some 370 acres of the Tubbs Ranch area and the Jackrabbit Springs outflow, severely impacting the population of the endangered Ash Meadows speckled dace, Rhinichthys osculus nevadensis. After the fire no speckled dace were seen during visual surveys; nor Ash Meadows Amargosa pupfish, Cyprinodon nevadensis mionectes. Initial impressions are that 95 percent of the fish may be extirpated from the spring. This is the last remaining population of the original 12 populations of the Ash Meadows speckled dace. However, two other introduced populations of Ash Meadows speckled dace persist in Bradford and Point of Rocks springs. Since March of 2004 Point of Rocks Spring has received three separate introductions of Ash Meadows speckled dace including 130 in September of 2005.

In 2004 population surveys of six springs for the Ash Meadows Amargosa pupfish and the Warm Springs Amargosa pupfish, C. n. pectoralis were within long-term averages. Pupfish were surveyed in, School, North and South Indian, Roger's , Fairbanks, and Longstreet springs, exotic crayfish, bullfrogs, mosquitofish, mollies, and convict cichlids were widespread in the system and removed when encountered.

Pahranagat roundtail chub Refuge: The Pahranagat roundtail chub, Gila robusta jordani, has been in serious decline in the Pahranagat Valley because of habitat loss primarily from channelization and water diversions. Only 14 fish were found during the survey in November 2001, when access to this site on private lands was last allowed. In December of 2004, with the combined efforts of the Nevada Department of Wildlife, U.S. Fish and Wildlife Service, and Dexter National Fish Hatchery (Dexter), 1,000 Pahranagat roundtail chubs obtained from Dexter were introduced into a pond at the Key Pittman Wildlife Management Area. In May 2005 another 1,400 were introduced. The effort to establish a rufuge population in Nevada helps insure the persistence of a species that may otherwise be extirpated in the wild. Plans to create an additional pond from a spring source on the Pahranagat NWR are being developed.

Railroad Valley: The Nevada Department of Wildlife's (NDOW) acquired Locke Ranch in November 2004 securing additional Railroad Valley springfish (Crenichthys nevadae) habitat. This purchase was obtained with U.S. Fish and Wildlife Recovery Land Acquisition grant and state matching funds. The site will be managed by the NDOW as a state Wildlife Management Area. The Trust for Public Land and the FWS were instrumental in negotiating this purchase. Access to monitor springfish on the Duckwater Tribal land in 2003 was also granted for the first time since the early 1990's. Restoration of Big Warm Spring on the Duckwater Reservation is scheduled for this fall and 2006, including removal of the catfish farm and repatriating Railroad Valley springfish to this spring system.

Shoshone Ponds: Surveys in June 2005 for Pahrump poolfish, Empetrichthys latos latos, and relict dace, Relictus solitarius, revealed that the populations were stable. Planning is underway to expand habitat for the Pahrump poolfish.

Beaver Dam Wash: Winter flows on upper Beaver DamWash were the highest on record, resulting in the potential decommissioning of Schroeder Reservoir. Spring 2005 surveys within Nevada found small numbers of reintroduced adult Virgin River spinedace, Lepidomeda mollispinis mollispinis, persistent after the flood events and, for the first time, limited recruitment.

Wall Canyon: Surveys for the Wall Canyon sucker, Catostomus sp., in the spring and fall of 2004 continue to monitor the population and to track the brown trout expansion upstream. The upper reaches continue to hold Wall Canyon suckers, while the lower portions above the reservoir contain brown trout and speckled dace. The high water year will enable NDOW personnel to sample the reservoir for the first time in three years in October 2005. Construction of a fish barrier in the middle section of the canyon to prevent brown trout expansion upstream is slated for October 2005.

Amargosa toad: In 2004 surveys marked the seventh consecutive year for toad surveys. A total of 833 toads were tagged. Of those 557 were new captures. The surveys continue to be a useful tool for gauging population health of the Amargosa toad, Bufo nelsoni.

Columbia spotted frog: The Toiyabe distinct population segment of the Columbia spotted frog, Rana luteiventris, was surveyed in July with over 550 frogs captured representing approximately 200 new captures. Large numbers of tadpoles were observed at many sites indicating a positive impact from the past wet winter. This spring 22 new open water features were created and many existing features were augmented to provide additional breeding habitat and increase the persistence of key habitats during drought periods.

Devil's Hole: Winter storm events deposited large amounts of substrate on the Devil's Hole shelf, eliminating an estimated 30 percent of pupfish spawning habitat. In February a multi-agency effort removed the metal framing thought to be a contributor to substrate deposition, and

excess material from the shelf. Recent monitoring indicates that adults are using the "new" substrate for successful reproduction. Adult population counts are currently suspended pending the construction of a new access platform that will not block natural flows into the Hole.

Moapa: Moapa dace, Moapa coriacea numbers from the February 2005 dive count increased slightly at 1,296 fish, but continue to be depressed overall since blue tilapia became established in Moapa Valley in the mid-90's. Virgin River chub, Gila Seminuda, in the Muddy River were sampled in good numbers, even with heavy winter flooding in the lower river. This Muddy River fish, identical to the endangered Virgin River fish, still remains to be federally listed.

2005-11-18 16:15:00 - Christopherson, Kevin D.[*1]; Brunson, Ronald[1]; Bestgen, Kevin[2]

(1-Utah Division of Wildlife Resources; 2-Colorado State Univesity)

Larval Razorback Sucker Drift and Floodplain Entrainment Studies in the Green River, Utah.

Preliminary results are presented on an effort to identify important nursery habitats for razorback sucker larvae in the Green River, Utah. Neutrally buoyant beads, and marked hatchery produced razorback sucker larvae, were released at two known spawning locations during peak spring flow in 2005. Beads and larvae were released at three different river flows, and were sampled at five different floodplain sites along 83 kilometers of the river. Beads were collected in all floodplains that had river connection including the Leota site 83 kilometers down stream.

DFC Business Meeting / Junta de Negocios CPD (17:00 - 18:00)

Banquet / Banquete (El Marengo) – 19:00 – 22:00

Saturday (sábado) November 19, 2005

Special Symposium – Invasive Species in Aquatic Habitats / Simposio Especial – Especies Invasoras en Habitats Acuáticas (09:00 – 12:00)

2005-11-19 09:00:00 - Chapman, John W[*1]

(1-Dept. Fisheries & Wildlife, Oregon State University, Oregon)

The Greenland Norse, Rapa Nui, Natural Resources and Nonindigenous Species

Nearly all nonindigenous aquatic species (NAS) transfers result from commerce. Commerce is the source of most global wealth. Species introductions are among the major causes of biodiversity losses but became an international concern only within the last few decades. A common assumption has therefore been that regulating commerce to reduce species introductions is of little consequence because few economic effects of diversity losses have been apparent, because societies readily adapt and because global wealth depends on commerce. Similar assumptions by past societies appear unfounded. Permeable international borders create, financial, cultural and environmental incentives to cooperatively manage introduced species and the value of such conservations efforts may be increasing.

2005-11-19 09:15:00 - Schade, Charles[1]; Bonar, Scott A.[*]

(1-Arizona Cooperative Fish and Wildlife Research Unit, University of Arizona)

Presence and abundance of nonnative fish species in streams of the American West

Understanding the role of nonnative species in an ecosystem is based on both the distribution and the impact of those species. We used Environmental Protection Agency (EPA) Environmental Monitoring and Assesment Program (EMAP) data from 689 sites in 12 western states to evaluate environmental, anthropogenic, and biological factors related to distribution and relative abundance of introduced fishes in streams of the American West. This represents one of the largest standardized fish and habitat data collection efforts ever in the western United States. Nonnative fish were found in 50.1% kilometers of fish-bearing streams in the West. The most widely distributed species in the West were salmonids, common carp *Cyprinus carpio* and centrachids. Distribution of nonnative fishes was highest in the interior states, including Colorado, Montana, Arizona and Utah; and lowest in streams of the Pacific Northwest. We found no clear relationship between anthropogenic disturbance of habitat and the distribution and relative abundance of nonnative species. Nonnative fishes have significant impact on aquatic communities and were much more widespread across the American West than stream habitat degredation. Without deemphisizing the effects of habitat degredation on native aquatic communities, our data suggests that reducing the effects of nonnative fishes should be of equal if not greater importance.

2005-11-19 09:30:00 - Finney, Sam[*1]; Haines, Bruce[1]; Fuller, Mark[1]

(1-United States Fish and Wildlife Service, Colorado River Fishery Project, Vernal)

Removal effectiveness of northern pike in the Upper Yampa River, Colorado, 2003-2005

Northern pike (Esox lucius) were removed from a 38-mile stretch of the Yampa River in the spring on 2003, 2004, and 2005. Methods employed included fyke nets set in localized areas and DC electrofishing reach wide in 2003 and 2004 and solely DC electrofishing in 2005. Sampling design in 2003 featured a control/treatment reach approach wherein pike were removed from treatment reaches and released in control reaches. In 2004 and 2005 we removed pike from all reaches and an initial marking pass was added to estimate pre-removal population size and structure. Movement of fish between control and treatment reaches made assessment of removal effectiveness difficult in 2003. High capture probabilities allowed for quality estimates of population size and high removal rates in 2004 and 2005. In 2003, 611 pike were captured and removed from treatment reaches and 273 pike were captured and released in control reaches. In 2004, 1132 of 1883 (95% C.I. 1273-2370) pike were removed from the river. In 2005, 813 of 2024 (95% C.I 494-3553) adult pike were removed from the river as well as 295 juvenile pike. We found statistically significant reductions in mean length of northern pike in the population both within and between years. We identified and effectively targeted concentrations of pike within the study site.

2005-11-19 09:45:00 - Hobbs, Brian[*1]; Ehret, Suzanne[1]; Beckstrand, Mark[1]; Cotrell, Shauna[2]

(1-Nevada Department of Wildlife; 2-Peace Corps)

Trapping and removal of nonnative species from Crystal Spring, Nevada yields surprising results

Crystal Spring, a group of several springs that discharge into two, adjacent headwater pools, is located 100 miles north of Las Vegas in Pahranagat Valley, Nevada. It is one of three springs that are home to the federally endangered, Hiko White River springfish, *Crenichthys baileyi grandis*. Unfortunately, the springfish must share this habitat with convict cichlids, *Cichlosoma nigrofasciatum*; Mexican mollies, *Poecilia mexicana*; red swamp crayfish, *Procambarus clarki*; and American bullfrogs, *Rana catesbeiana*. In October 2002, the Nevada Department of Wildlife, with permission from the landowner, began intensively trapping and removing these nonnative species at Crystal Spring. After 3 years of monthly trapping, over 7,000 cichlids, 31,000 mollies, 10,000 crayfish, and over 3,000 bullfrog tadpoles have been removed. To our surprise, periodic springfish population estimates have only slightly increased. Although catch rates for cichlids, mollies, and tadpoles have decreased over this period, the catch rate for crayfish has gone up slightly. Another population of *C. b. grandis* at nearby Hiko Spring, where the species composition and environmental conditions are nearly identical, was negatively impacted after the introduction of crayfish in the 1990s. In addition to removing nonnative animals at Crystal Spring, we will also begin removing large stands of Red Ludwigia, an introduced aquarium plant. We believe that this plant is preventing us from effectively trapping the crayfish by providing day-time refuge. Finally, although slow reproductive rates coupled with intense predation and competition are viable explanations for the slow recovery of the springfish, highly modified habitat and water level fluctuations may also be to blame and are the focus of long-term goals.

2005-11-19 10:00:00 - Kesner, Brian R.[*1]; Marsh, Paul C.[1]; Pacey, Carol A.[1]

(1-Arizona State University, Native Fish Lab, SOLS)

Striped bass predation reducing survival of razorback sucker in Lake Mohave

Since 1992 the Native Fishes Workgroup (NFWG) has repatriated more than 100,000 razorback suckers, *Xyrauchen texanus*, in an effort to establish population of 50,000 razorback suckers in Lake Mohave, Arizona-Nevada. Increasing population estimates in the late 1990s were encouraging. However, increases in size and number of released fish for the last five years did not result in a predicted increase in population abundance over the same period. Based on mark-recapture data, annual survival is 75% for repatriates 450 mm or longer in total length, which is much lower than apparent 100% survival of wild adults in the 1970s and early 1980s when the population appeared stable even without detectable recruitment. Estimates of wild adult survivorship from 1992 to present, about 73% annually, were thought to reflect mortality due to old age. However, the appearance of large striped bass, *Morone saxatilis*, in Lake Mohave was coincident with markedly declining wild adult abundance. These occurrences in combination with an analysis of striped bass gape-limitation strongly support a hypothesis that reduced survivorship for both wild and repatriate adults is due to striped bass predation. Unless these large non-native predators can be controlled, or other conservation strategies are identified and implemented to increase razorback sucker survival, likelihood is nil under current protocols for obtaining the goal of establishing 50,000 new fish in Lake Mohave.

2005-11-19 10:15:00 - Coggins, Lew[1]; Gwinn, Dan[*1]

(1-Grand Canyon Monitoring and Research Center, USGS)

Mechanical removal of non-native fishes in the Colorado River within Grand Canyon: An update on 2004 operations and results

In response to declining trends in both sediment resources and native fish stocks, the Grand Canyon Adaptive Management Program recommended to the Secretary of Interior that a set of experimental treatments be conducted to better understand mechanisms to conserve sediment and factors contributing to native fish recruitment dynamics. As part of this experiment, non-native fishes were removed from humpback chub habitat near the confluence of the Little Colorado River. This effort focuses primarily on three objectives: (1) evaluating the relationship between non-native abundance and humpback chub population dynamics; (2) efficacy of non-native fish mechanical removal in a distinct segment of the Colorado River; and (3) diet and predatory habits of non-native fishes in the Colorado River. During twelve trips conducted in winter and summer of 2003 and 2004, a total of 19,096 non-native fishes were removed from the primary and secondary removal reaches (River Mile 56.2 – 72.7). The majority of the removed fish were rainbow trout (93%, 17,774 fish) with brown trout (2%, 493 fish) and common carp (2%, 389 fish) contributing the majority of the remainder. Depletion abundance estimates indicated removal efficiencies ranging between 9% and 17% per pass for rainbow trout. Removal efficiencies for brown trout and common carp were difficult to determine because of highly variable low catch per unit efforts. Removal efficiencies for brown trout and common carp appeared to be between 15% and 23% and between 13% and 21% per pass, respectively. Rainbow trout immigration to the removal reach from proximal areas of the river was estimated to be approximately 38 fish/day in 2003 and 14 fish/day in 2004 under a depleted condition. Relative abundance of humpback chub juveniles as indexed using hoopnet catch rate increased through the course of 2003. This atypical pattern may indicate increased survival or near-shore habitat utilization as a result of lower non-native fish density.

2005-11-19 10:30:00 - Reid, Stewart B[*1]

(1-Western Fishes, Ashland OR)

Exotic fishes and the Modoc sucker

The Modoc Sucker (*Catostomus microps*) occupies small streams in the upper Pit River drainage of northern California and southern Oregon (including Goose Lake Basin). Due to its small size and restricted habitat, exotic predatory fishes pose a potential threat to localized populations. However, many populations have maintained themselves for decades in sympatry with introduced populations of various centrarchids, Brown Trout (*Salmo trutta*), and Brown Bullheads (*Ameiurus nebulosus*). Ecological interactions between the native and exotic taxa are poorly understood. In the Turner Creek drainage a barrier was installed in lower Turner Creek, in part to prevent entry of exotic fishes into upper drainages containing Modoc Suckers. However, in May of 2005 heavy rains caused extensive reservoir overflow and sheet flow across the Devil's Garden Plateau, which drains down into the otherwise isolated streams, and a surge of exotic fishes from the reservoirs entered the Turner Creek drainage from above. The principal exotic species in this event were Largemouth Bass (*Micropterus salmoides*), Green Sunfish (*Lepomis cyanellus*), and Bluegill (*Lepomis macrochirus*). Survey and manual removal of centrarchids was initiated in June 2005 and is continuing. This situation and the eradication program provide an opportunity to evaluate the effectiveness of manual, targeted removal of exotic fishes in a small stream system without adverse impacts to the native fish fauna.

2005-11-19 10:45:00 - Goodchild, Shawn C.[*1]

(1-U.S. Fish and Wildlife Service, Southern Nevada Field Office)

Piscivory and other impacts by non-native blue Tilapia, *Oreochromis aureus,* in southern Nevada

During 1992, blue tilapia were first discovered in the Muddy River of southern Nevada, which were a result of an illegal introduction that initiated a basin-wide range expansion. Blue tilapia, and the genus *Oreochromis* in general, are typically considered planktivorous and detritivorous by most many researchers, however they are able to control vegetation. Surveys in the Muddy River correlated the presence of blue tilapia to a drastic decline in the number of the endangered Moapa dace *Moapa coriacea*, Virgin River chub *Gila seminuda*, and Moapa White River springfish *Crenichthys baileyi moapae*. The decreased numbers of native fish suggests that tilapia in some way had decreased the fecundity of native fish, either through predation or other factors. Non-native species present a serious threat to native ecosystems, and are able

to radically alter habitats and their associated communities. Non-native fish have been introduced into novel habitats for several reasons, including for sport fishing, research, the aquarium hobby, aquaculture, and accidentally or unintentionally. Although a wide range of potential impacts with varying severity may occur given introductions of exotic species, successful introductions present the probability of severe impacts to native fishes from the non-native competitive and predatory species. The literature suggests that introduced species could rapidly evolve within novel habitats to maximize fitness. Tilapia have been demonstrated to phenotypically change in introduced habitats. One evolutionary path that could change is diet. It is possible that blue tilapia have developed fish eating behavior, or at least a propensity to satisfy nutrient requirements with a slightly higher degree of piscivory, in the relatively few generations since the 1992 introduction. However, tilapia have been demonstrated to have some degree of piscivory in introduced habitats worldwide, and piscivory is likely a latent behavior. Regardless, it is apparent that the tilapia have some effect on native fish and there is a behavioral tendency to prey on fish. This presentation shall summarize impacts of blue tilapia and discuss piscivory in this species. It will also present provisional data obtained during the pilot study of tilapia diet from the Muddy River.

2005-11-19 11:00:00 - Lyons, John[*1]; Mercado Silva, Norman[2]

(1-University of Wisconsin Zoological Museum; 2-University of Wisconsin Center for Limnology)

Have tilapias influenced Mexico's native fish fauna?

Tilapias (*Oreochromis* and *Tilapia* species; Cichlidae), native to Africa, were first introduced into Mexico in the 1960's for aquaculture purposes. Tilapias continue to be stocked into many Mexican waters today, and they are established and locally abundant across much of the country. *Oreochromis* species, especially *O. aureus*, are much more widespread and common than *Tilapia* species. There is a general perception among ichthyologists and conservation biologists that tilapias are a threat to native fishes, but unequivocal evidence for tilapia impacts is lacking. Although native fishes have declined in many habitats as tilapias have increased, population changes are usually associated with environmental degradation that favors the highly tolerant tilapias over more sensitive native species, so the direct role of tilapias in native fish declines is unclear. Most tilapias are omnivorous, eating mainly zooplankton as small juveniles and algae as larger juveniles and adults. The most likely ways they would affect native fishes would be through competition for food or through a trophic cascade mediated by their influence on primary production via selective feeding and nutrient recycling. Habitat modifications and aggressive behavior during tilapia spawning might also displace some native species. Long term monitoring of fish populations coupled with field studies of tilapia feeding and spawning are necessary if effects of tilapia on Mexico's native fishes are to be distinguished from other types of environmental impact.

2005-11-19 11:15:00 - De Los Santos Camarillo, Anna B.[*1]; Garcia de León, Francisco J.[1]; Zamora Balbuena, Gerardo[2]; Mayden, Richard L.[3]; George, Anna L[3]; Neely, David A.[3]; Hendrickson, Dean A[4]; Espinosa-Pérez, Héctor[5]

(1-Genética de la Conservación, Programa de Planeación Ambiental y Conservación, Centro de Investigaciones Biológicas del Noroeste (CIBNOR)

La Paz, BCS, México.; 2-Centro Acuícola del Zarco, SAGARPA, México, D.F., México; 3-Dept. Biology, 3507 Laclede Ave., Saint Louis Univ., St. Louis, MO 63103-2010 U.S.A.; 4-Univ. Texas, Texas Nat. Hist. Coll. R4000/PRC 176, 10100 Burnet, Austin, TX 78758-4445 U.S.A.; 5-Inst. Biología, Univ. Nacional Autónoma de México, A. P. 70-153, México, D.F. 04510 México)

Evaluation of the genetic diversity of native Mexican trouts using microsatellite markers

In the montane creeks and rivers of the northern part of the Sierra Madre Occidental in Mexico, there is a high diversity of native salmonids, all commonly recognized as Mexican trout and practically unknown by science. For many years, the inaccessibility of the montane areas has made very difficult to carry on studies for these species of trout, and in many cases their presence has been acknowledged only in isolated places for no more than 100 years. The only two Mexican trout formally described are: the golden trout (*Onchorynchus chrysogaster*) from the southern tributaries of the Pacific, and a subspecies of the rainbow trout (Nelson), recognized as *O. mykiss nelsoni* from the rivers of San Pedro Martir in Baja California. Using two microsatellite loci, we analyzed 545 individuals from the rivers of Durango and Chihuahua. None of these loci exhibited linkage disequilibrium, and trout populations did not deviate from the Hardy-Weinberg expectations with the exception of the hatchery trout populations and the ones found in rivers near hatcheries. Three genetically homogeneous but distinct groups were found, a northern group (Yaqui-Mayo-Guzmán), a golden trout area group (Fuerte-Sinaloa-Culiacán) and a southern group (Piaxtla-Acaponeta-Baluarte-San Lorenzo). The genetic analysis showed two contrasting results, one showing evidence of different degrees of genetic introgression in the genome of the native populations due to the introduction of a non-native species (rainbow trout = *O. mykiss*), and the other suggesting persistence of pure stocks of native forms. These analyses confirmed that Mexican trout populations are threatened by several factors such as: hatchery trout escaping from their breeding grounds and habitat degradation.

Diversidad genética mediante marcadores microsatelites en truchas nativas mexicanas

En los ríos y arroyos de montaña del norte de la Sierra Madre Occidental existe una diversidad de salmónidos nativos llamados comúnmente truchas mexicanas que son prácticamente desconocidos para la ciencia. Lo inaccesible de la zona montañosa evitó durante mucho tiempo el estudio de estas especies y sólo se había mencionado su presencia en algunos lugares aislados hace más de 100 años. Las únicas truchas mexicanas formalmente descritas son; la trucha dorada (*Onchorynchus chrysogaster*) de los ríos de la vertiente Pacífico hacia el sur (ríos Fuerte, Sinaloa y Culiacán) y una subespecie la trucha arcoiris Nelson reconocida como *O. mykiss nelsoni* de los ríos de San Pedro Mártir en Baja California. Empleando dos loci microsatélites se analizaron 545 individuos procedentes de ríos de Durango y Chihuahua, no se encontró desequilibrio de ligamiento en estos loci y todas las poblaciones estuvieron en equilibrio de Hardy- Weinberg, excepto poblaciones de cultivo o en ríos cercanos a centros de cultivo. Se encontraron tres grupos genéticamente homogéneos pero diferentes entre si, uno norteño (Yaqui-Mayo-Guzmán), uno en el área de la trucha dorada (Fuerte-Sinaloa-Culiacan) y otro sureño (Piaxtla-Acaponeta-Baluarte-San Lorenzo). Los análisis genéticos muestran también dos resultados contrastantes, por una lado, la evidencia de diversos grados de introgresión genética en el genoma de los nativos por una especie introducida (trucha arcoiris = *O. mykiss*), y por el otro la persistencia de stock puros de formas nativas. Estos análisis confirman la idea que las truchas mexicanas están siendo amenazadas por diversos factores, entre ellos: el escape de la trucha arco-iris cultivada y la degradación del hábitat.

2005-11-19 11:30:00 - Osborne-Gowey, Jeremiah[*1]; Jenne, Alan[2]; Heppell, Scott[3]; Li, Hiram[1]; Pereira, Cliff[4]; Varner, Matt[5]

(1-Oregon Cooperative Fisheries Research Unit (USGS-BRD), Department of Fisheries and Wildlife, Oregon State University, 104 Nash Hall, Corvallis, OR 97331; 2-Nevada Department of Wildlife, 815 East Fourth Street, Winnemucca, NV 89445; 3-Department of Fisheries and Wildlife, Oregon State University, 104 Nash Hall, Corvallis, OR 97331; 4-Department of Statistics, Oregon State University, 44 Kidder Hall, Corvallis, OR 97331; 5-Winnemucca Field Office, Bureau of Land Management, 5100 Winnemucca Boulevard, Winnemucca, NV 89445)

Responses of a threatened cutthroat trout to an exotic invading charr: ecological implications for growth, stress, and behavior

Recent studies suggest that competition from Eastern brook charr (EBC; *Salvelinus fontinalis*) may have a negative effect on Lahontan cutthroat trout (LCT; *Oncorhynchus clarki henshawi*). Results from these studies, however, are equivocal and have failed to elucidate the responsible mechanisms. The primary objectives of this study were 1) to determine if Lahontan cutthroat and Eastern brook trout compete for resources in streams in which they co-occur, and 2) to determine the mechanisms responsible for the competition. A field study was designed to examine how LCT and EBC interact in a colonization situation typical of many LCT reintroductions, and to provide insight into how LCT respond, under natural conditions, to EBC under various *habitat* conditions. A laboratory study was designed to investigate the mechanisms responsible for competition through forcing competitive interactions and quantifying the behavioral and physiological responses of LCT under varying *habitat* and *environmental* conditions. Results from the field manipulation revealed that EBC recolonized a section of stream further and faster than LCT and that about 25% of the individuals of both species stayed in the relocation pool. When in sympatry, LCT lost five times as much weight as EBC during the three week trial (-2.5g to -0.5g, respectively). Additionally, LCT almost always had empty stomachs whereas EBC usually had at least some food present in their stomachs. Under laboratory conditions where density, species proportions, and temperature were manipulated, LCT typically lost considerable weight during the 9 day trials whereas EBC typically gained weight (-8% to +1%, respectively). When temperature remained cool (13 degrees C) and constant, EBC were clearly the dominant competitors gaining an average of 5% of their body weight whereas LCT lost an average of 6%. As temperatures increased to 23 degrees C, both species lost weight but LCT lost over twice as much weight (-5% to -11%, respectively). As the proportion of EBC increased, LCT lost increasingly more weight. Collectively, these results suggest that EBC are the dominant competitor and that the mechanisms responsible for the competition may be both physiological and behavioral in nature.

2005-11-19 11:45:00 - Mercado - Silva, Norman[*1]; Vander Zanden, M. Jake[1]; Helmus, Matthew R.[2]; Diaz-Pardo, Edmundo[3]; Lyons, John[4]

(1-Center for Limnology, UW-Madison; 2-Department of Zoology, UW-Madison; 3-Facultad de Ciencias Naturales, Universidad Autónoma de Querétaro; 4-State of Wisconsin Department of Natural Resources)

Food-web relations among fishes in a modified semi-desert river system in central Mexico

Most streams in Mexico's central plateau share a common suite of anthropogenic impacts including channel desiccation, invasive fishes, and pollution, all which may affect food web structure. Using N and C stable isotope analysis from museum fish specimens and our own samples from the Laja River (Lerma System, Guanajuato, Mexico), we examined food web structure at 10 sites and investigate food web changes since the 1960's. Food web structure was highly variable among-sites, but the exotic largemouth bass (*Micropterus salmoides*) and a native atherinid (*Chirostoma jordani*) were consistently top predators in the system. Another exotic, the platyfish *Xiphophorus variatus* was found occupying a trophic niche similar to that of most native livebearers and cyprinids, suggesting potential competitive interactions. As native top predators (i.e. *Ictalurus dugesi* and *Scartomyzon austrinus*) have disappeared from the system, tolerant exotic species have become dominant in the Laja system's food webs. Given similar impacts and fish introductions elsewhere in central Mexico, our results are relevant to understanding foodweb changes in this region, which could aid in guiding future restoration and rehabilitation of native fish communities.

Lunch / Almuerzo (12:00 - 14:00)

Special Symposium – Invasive Species in Aquatic Habitats (continued) / Simposio Especial – Especies Invasoras en Habitats Acuáticas (continuado) (14:00 – 18:00)

2005-11-19 14:00:00 - Chapman, John W[*1]; Chi-Chang, Liu[1]; Hang-Kwang, Luh[2]; Heppell, Selina[1]

(1-Dept. Fisheries & Wildlife, Oregon State University, Oregon; 2-Integrated Plant Protection Center, Oregon State University, Oregon)

Finding the New Zealand mud snail (*Potomopyrgus antipodarum*, NZMS) its vectors in western North America

The New Zealand Mudsnail *Potamopyrgus antipodarum* (NZMS) (Gray, 1843) (Family: Hydrobiidae) is a small aquatic snail native to freshwater lakes and streams of New Zealand that has been introduced to Australia, Japan, Europe, and both coasts of North America. At the ultra high densities this snail attains, it may stress native fish and invertebrates where ever it is introduced. Slowing the NZMS invasion requires greater knowledge of the vectors that connect its isolated populations but the vectors and routes of dispersal and the most vulnerable types of water bodies to NZMS invasion remain poorly defined. Nearly all fresh or low salinity aquatic habitats seem vulnerable to invasion and the complicated, leap-frog geographical patterns of discoveries could occur with either a broad array of dispersal mechanisms or with incomplete collecting or reporting. Interpreting the NZMS distribution to find its dispersal mechanisms or to reveal where it is most likely to invade next complicates any efforts to slow its spread. Spatially integrated analyses (models) of the data are needed to reveal which NZMS dispersal vectors and pathways are most likely to be operating.

2005-11-19 14:15:00 - Tobler, Michael[*1]; Schlupp, Ingo[1]

(1-University of Oklahoma, Department of Zoology)

Parasites in a gynogenetic complex of poeciliid fish (*Poecilia formosa* and *P. latipinna*)

The maintenance of sexual reproduction in face of its supposed costs is a major paradox in evolutionary biology. The Red Queen hypothesis, which states that sex is an adaptation to fast evolving parasites, is currently one of the most recognized explanations for the ubiquity of sex and predicts that asexual lineages should suffer from a higher parasite load if they coexist with closely related sexuals. *Poecilia formosa*, the Amazon molly, is one of the few clonal vertebrates and always coexists with a closely related sexual species due to its gynogenetic mode of reproduction. All-female, gynogenetic lineages require sperm from closely related species to trigger embryogenesis, but inheritance is clonal. We tested the prediction of the Red Queen using four Texan populations of *P. formosa*. In these populations, the Sailfin molly, *P. latipinna* serves as sperm donor. Both species harbor a diverse parasite fauna, but contrary to expectation, no differences in parasite load could be detected between the two species, neither if individual parasitization indices nor if single parasite prevalences were compared. Future studies need to confirm, if and how differences in genetics, life history strategies, ecology and behavior between asexuals and sexuals contribute to this result.

2005-11-19 14:30:00 - Ward, David L.[*1]

(1-Arizona Game and Fish, Research Branch)

Removal and quantification of Asian tapeworm from endangered cyprinid fishes using Praziquantel

Asian tapeworm, *Bothriocephalus acheilognathi*, is potentially fatal to multiple age classes of fish, and can cause high mortality when infecting new host species. The spread of Asian tapeworm has been identified as a potential threat to endangered cyprinid fish such as humpback chub, *Gila cypha*. Field investigations to quantify tapeworm loads previously required fish to be killed and dissected so sample sizes were small and few adult fish were examined. The advantage of using Praziquantel to evaluate parasite loads is that it does not require killing fish, allowing monitoring of tapeworms in rare fish species that cannot be sacrificed. We used bonytail, *Gila elegans*, as a surrogate for humpback chub and performed laboratory experiments to evaluate the dosage and time needed to effectively remove 100% of Asian tapeworm using Praziquantel. Treatments less than 24 hours were not effective at removing all tapeworms even at high doses (36 mg/L). Commonly used dosages (< 0.7 mg/L) were ineffective at removing 100 % of tapeworms. No mortality or side effects of Praziquantel treatment were observed. Tapeworm loads in rare fish can be accurately quantified in the field without dissection, provided that adequate water quality can be maintained in a treatment container for a 24-hour period. We used this method to evaluate tapeworm loads in 30 humpback chub from the Little Colorado River in May of 2005. Tapeworm infestation was highly variable (0-183 per fish) and likely linked to river hydrology. Continued monitoring is needed to evaluate tapeworm infestation and impacts on humpback chub in the Little Colorado River.

2005-11-19 14:45:00 - Greene, Lacey[*1]; Parmenter, Steve[1]

(1-California Department of Fish and Game)

Owens basin exotic salamander removal

The California Department of Fish and Game (CDFG) has received an Endangered Species Act grant to control non native tiger salamanders, Ambystoma tigrinum, because they threaten several populations of native endangered or sensitive species, including Owens tui chub, Gila bicolor snyderi, Owens pupfish, Cyprinodon radiosus, speckled dace, Rhinichthys osculus, mountain yellow-legged frog, Rana muscosa, and Yosemite toad, Bufo canorus. CDFG surveys found two tiger salamander breeding sites. In the last year extensive trapping efforts have eradicated the salamander from one site. The other site is Laurel Pond, an 85 acre effluent sewage enhance pond containing 10-100,000 larval salamanders. Because of the large size of Laurel Pond and the huge population of salamanders, CDFG plans to introduce a biocontrol agent to the pond. Preliminary studies regarding the movement of terrestrial salamanders and the palatability of salamander larvae are in currently ongoing. This poster will describe the successful trap eradication and our future plans with Laurel Pond.

2005-11-19 15:00:00 - Minckley, C.O.[*1]; Barnett, Joseph[1]; Thorson, Mitch[1]

(1-U. S. Fish and Wildlife Service, Arizona Fishery Resources Office)

Status of giant salvinia in the lower Colorado River in Arizona ,California, and northern Sonora, Mexico

This presentation reports on the status of Giant Salvinia (*Salvinia molesta*) in the lower Colorado River. First discovered in early August 1999, near Blythe, CA it was soon found at Imperial and Cibola National Wildlife Refuges and in the All American and Cochella Canals. It has invaded northern Sonora, México near Mexicali occuring in canals and the Colorado River. Control efforts have included mechanical removal, biological control, and chemical spraying. The results of these control measures are presented as are the current distribution, observed impacts, and future control efforts.

2005-11-19 15:15:00 - Robinson, Anthony T.[*1]; Fulmer, James

(1-Arizona Game and Fish Department; 2-Arizona Game and Fish Department)

Aquatic vegetation surveys of Arizona's lakes and ponds

Invasive aquatic plant species can out-compete native vegetation and form large continuous monocultures which can obstruct angler and recreational use, stunt fish growth, and negatively impact water quality. Several invasive aquatic plant species have been identified in Arizona, but no overall state survey of their distributions has been conducted. Our study was initiated, in part, to address this information gap. We are surveying aquatic plants in a subset of the 363 lakes and ponds in Arizona. At a minimum, we will sample at least one lake or pond from each U. S. Geological Survey watershed (8-digit Hydrologic Unit Code; HUC) that has a lake or pond with sport fish present on non-tribal lands; 48 of the 84 HUCs in Arizona contain lakes or ponds with sport fish, and 41 of the 48 are on non-tribal lands. Surveys were conducted in 2004, 2005, and the final year of surveys will be conducted in 2006. At each lake plants are sampled at 100 points along either 5 (shallow lakes) or 10 (deep lakes) transects. A rake with a 3-m long extendable handle is lowered to the bottom, spun 360 degrees and pulled to the surface. All plants tangled in the rake head are identified to species; specimens of each species are collected for species confirmation by a university botanist. So far, the vast majority of species identified have been native; few invasive plant species have been identified. Eurasian water milfoil (*Myriophyllum spicatum*) is the most widespread invasive aquatic plant species in Arizona, although identification of this species is problematic because of overlap in characteristics with northern water milfoil (*Myriophyllum sibiricum*), which it can hybridizes with. Another nonindigenous species with more a limited distribution was curly pondweed (*Potamogeton crispus*). Several other invasive plant species (e.g., giant salvinia, *Salvinia molesta*; Hydrilla, *Hydrilla verticillata*; water Hyacinth *Eichhornia crassipes*) reported in the state have not yet turned up in our surveys.

2005-11-19 15:30:00 - McGaugh, Suzanne[*1]; Hendrickson, Dean[2]; Bell, Gary[5]; McEachron, Luke[3]; Lyons, Kelly[6]; Souza, Valeria[4]

(1-Iowa State University; 2-University of Texas; 3-Florida State University; 4-Instituto de Ecología de la UNAM (IE/UNAM); 5-The Nature Conservancy; 6-Trinity University)

Arundo: threats posed to the valley of Cuatro cienegas and control approaches

Recently, a number of wetlands and rivers in Cuatro Ciénegas, Coahuila, Mexico have become infested with an alien weed species known as Giant Reed (Arundo donax). Public and private agencies with ownership and/or management responsibilities share a common concern in dealing with the immediate threats of excessive transpiration of water, wild fires, and loss of habitat that are commonly associated with this species. In June of 2005, a workshop was held in Cuatro Ciénegas to discuss the invasion of Arundo in the region. Funding from The Nature Conservancy and Pronatura allowed us to invite experts familiar with Arundo control in the United States, as well as other interested persons from diverse parts of Mexico, to participate in the workshop. We first took visiting experts to see the Arundo stands that we had documented within the Reserve, as well as the well-established stand between El Cariño and Celemania. We then held a public discussion, at which experts provided basic information and recommendations, and the group began the process of developing the outline of a draft Cuatro Ciénegas Arundo Control Plan.

2005-11-19 16:15:00 - Kapuscinski, Anne R.[1]; Patronski, Timothy[1]; Barrett, Paul J.[*2]

(1-Institute for Social, Economic, and Sustainability, University of Minnesota; 2-U. S. Fish and Wildlife Service, Tucson, Arizona)

Genetic methods for biological control of non-native fishes in the Gila River basin -technical, environmental, regulatory, and other considerations

Recent advances in genetic engineering for biological control, such as "daughterless gene" technology, and ecosystem modeling suggest that the development and introduction of certain transgenic lines of fish may offer an effective tool for controlling invasive fish populations. While these new tools offer the potential for invasive species reduction or eradication, it is critically important to carefully identify, assess and manage the ecological risks they may pose. This requires robust ecological risk assessment, population and ecosystem modeling, secure laboratory and field trials and inclusive community awareness and involvement activities. This research explores the feasibility of using various genetic-based methods to control non-native fish in the Gila River system in the U.S. Desert Southwest. Specifically, we: 1) compare genetic methods including gene transfer and chromosome set manipulations in light of differences in the status of their development; 2) describe important considerations for addressing potential ecological and human health risks; 3) highlight the relevant policy, legal and regulatory framework, 4) present community awareness and involvement considerations; and 5) develop a preliminary roadmap, timeline and general costs estimates necessary to develop and assess a genetically modified fish as a biological control agent in the Gila River Basin.

2005-11-19 16:30:00 - Allan, Nathan L.[*1]; Garrett, Gary P.[2]; Edwards, Robert J.[3]; Hubbs, Clark[4]

(1-U.S. Fish and Wildlife Service, Austin, Texas; 2-Texas Parks and Wildlife Department, Ingram, Texas; 3-University of Texas - Pan American, Edinburg, Texas; 4-University of Texas at Austin, Austin, Texas)

Desert fishes research and management in Texas during 2005

Several habitat restoration and maintenance projects are being planned for spring environments in west Texas. Big Bend National Park is completing plans for a new pond at Rio Grande Village to serve as a refuge for the endangered Big Bend gambusia (*Gambusia gaigei*). Reconstruction of the emergency pumping system is planned for Phantom Lake Spring, which experienced high flows in 2004 and 2005 for the first time in 5 years. Phantom Lake Spring is habitat for the endangered Comanche Springs pupfish (*Cyprinodon elegans*), Pecos gambusia (*Gambusia nobilis*), and three species of aquatic invertebrates that are candidates for Federal listing. Initial discussions with local officials in Fort Stockton have begun regarding the possibility of restoring natural habitats at Comanche Springs.

Plans are being pursued for possible future reintroductions of Rio Grande silvery minnow (*Hybognathus amarus*) into the Rio Grande in Big Bend National Park and the Wild and Scenic River segment downstream.

Local governments and landowners in Kinney and Val Verde counties have begun an effort to develop a voluntary watershed management plan to provide long-term protections for habitats of the threatened Devils River minnow (*Dionda diaboli*) and associated rare species. This fish continues to be threatened by the introduced suckermouth catfish (*Hypostomus* sp.) in San Felipe Creek. A final recovery plan for Devils River minnow has been completed.

The U.S. Fish and Wildlife Service was petitioned to list the San Felipe gambusia (*Gambusia clarkhubbsi*) as endangered, a newly described fish known only from San Felipe Creek in Del Rio, Val Verde County, Texas.

Expeditions into the Jeff Davis Mountains of The Nature Conservancy's Madera Canyon Preserve confirmed the persistence of Rio Grande chub (*Gila pandora*) in Little Aguja Creek. Only a few individuals were collected. The only other fish present was green sunfish (*Lepomis cyanellus*)—estimated to outnumber chubs 1,000 to 1.

Preliminary results of range-wide phylogenetic studies of blue suckers (*Cycleptus elongatus*) from across the United States suggest that the populations in the Rio Grande Basin are markedly distinct from populations along the coastal basins of the Gulf of Mexico and the Mississippi River Basin.

2005-11-19 16:45:00 - Sponholtz, Pamela[*1]; Voeltz, Jeremy[2]; Mitchell, Don[2]; Simms, Jeff[3]; Knowles, Glen[1]; Carter, Codey[4]; Propst, David[5]; Bonar, Scott[6]

(1-U.S. Fish and Wildlife Service; 2-Arizona Game and Fish Department; 3-Bureau of Land Management; 4-U.S. Forest Service, Rocky Mountain Research Station; 5-New Mexico Department of Game and Fish; 6-University of Arizona Cooperative Fish and Wildlife Research Unit)

Lower Colorado River Area Report, November 2004-2005

Despite regional challenges brought on by climatic events such as drought, fire, and flooding, native fish conservation activities progressed this past year within an environment of cooperation between agencies and individuals. However, these efforts have not appeared to forestall the range wide declines of many aquatic species. The U.S. Fish and Wildlife Service published a positive 90-day finding on a petition to list a distinct population segment of roundtail chub, *Gila robusta* in the Lower Colorado River drainage, and to list the headwater chub, *Gila nigra*, as endangered in July 2005. Building on a conservation agreement signed by Arizona, Colorado, Nevada, New Mexico, Utah, and Wyoming for the two chubs, flannelmouth, *Catostomus latipinnus* and bluehead suckers, *Catastomus discobolus*, a draft conservation rangewide conservation strategy was completed in 2005. The Arizona Game and Fish Department also continued work on a statewide conservation agreement and strategy that includes roundtail and headwater chub, as well as flannelmouth, bluehead, Zuni bluehead, *Pantosteus d. jarrowi*, and Little Colorado River suckers, *Catostomus sp*. Invasive species management focused on Salvinia removal in the Lower Colorado River, which was initially discovered in Palo Verde drain in 1999, and has moved throughout the river system on both National Wildlife refuges and into Mexico where it has started to impact water delivery. Flow regimes in the Colorado River in Grand Canyon, aimed at reducing numbers of nonnative trout, resulted in little detectable mortality of trout eggs and fry, however mechanical removal of nonnative fishes at the mouth of the Little Colorado River, predominantly salmonids, continued to be successful, and although results are not yet conclusive as to the benefit to native species such as humpback chub, *Gila cypha*. Apache trout, *Oncorhynchus apache*, recovery efforts have resulted in renovation of four streams this year (Bear Wallow, East Fork of the Little Colorado River, Hayground, and Fish Creek) and a total of over 46 miles ready for Apache trout stocking this fall. In New Mexico, 20 miles of the upper West Fork Gila River drainage was treated with antimycin A to remove nonnative salmonids for Gila trout, *Oncorhynchus gilae*, recovery. Previously, use of piscicides was banned by NM State Game Commission but work by groups such as Trout Unlimited contributed to "lifting" of the ban by the Commission. Reintroduction efforts for native species include re-establishment of the Office Cove backwater and ponds on the Emerald Canyon Golf course near Parker for razorback suckers, *Xyrauchen texanus*, spinedace, *Lepidomeda vittata*, stockings into Dane and Bear Canyons in the East Clear Creek drainage, Gila chub, *Gila intermedia*, into Sabino, Bear and Romero Canyons and pikeminnow, *Ptychocheilus lucius*, and razorback stockings into the Verde River. Interestingly, seven razorbacks were found in Horesehoe Lake, approximately 53 miles downstream of stocking sites in the Verde River during a routine sportfish survey. In addition, Gila topminnow, *Poeciliopsis o. occidentalis* were introduced into a New Mexico Wildlife Area and pupfish, *Cyprinodon m. macularius*, were stocked into the TNC San Pedro Preserve. A cooperative effort is proceeding to reestablish native fish species and augment lowland leopard frog *Rana pipiens* into multiple springs and streams within the watersheds of the Muleshoe ecosystem. Effects of

ongoing drought were felt in several mainstem rivers including the San Pedro where water temperatures in excess of 30^ºC contributed to local extinction of desert sucker, *Pantosteus clarki*. Cienega Creek, which has the largest remaining Gila topminnow population in Arizona and supports Gila chub, lost 42%; of its surface flows and dried for 2.5 miles before monsoon season started. The middle Santa Cruz has also been hit hard by drought and recent surveys have found only small numbers of longfin dace, *Agosia chrysogaster*. In response to reductions in fish populations due to fire, water withdrawals and invasive species, propagation techniques for several native fishes including Yaqui chub, *Gila purpurea*, and Yaqui topminnow, *Poeciliopsis o. sonoriensis*, are being refined and developed at the Cooperative Research Unit at the University of Arizona. Other research activities initiated in the Lower Colorado River region this past year have included initiation of telemetry surveys using bonytail chub, *Gila elegans*, to identify habitat use in the lower Colorado River, the effects of fire on fish habitat, investigation of mechanical removal methods for northern pike, *Esox lucius*, and food web dynamics at Aravaipa Creek using stable carbon and nitrogen isotopes. In addition, Asian fish tapeworm was documented in nonnative fishes above Grand Falls in the Little Colorado River and has implications for downstream management of humpback chub. Research has also found that drug concentrations used in standard protocols to de-worm fish before translocations are less than 100%; effective at tapeworm removal. Finally, surveys on the Upper Verde River have found a resurgence of native species such as roundtail chub, desert and Sonora suckers, *Catostomus insignis*, and a reduction in nonnative species and is attributed to high flow events from this past fall and spring. However, as the summer progressed, nonnatives such as red shiner, *Cyprinella lutrensis*, and crayfish appear to have quickly recovered to pre-flow conditions. Renovation of Fossil Creek, highlighted in the report in 2004, is finally complete with a functional barrier, removal of nonnative fishes, and repatriation of native species. Restoration of full flows in to Fossil Creek occurred in June 2005.

Contributors to this report include (in alphabetical order): Chuck Benedict, Heidi Blasius, Scott Bonar, Codey Carter, Andy Clark, Dean Foster, Shaula Hedwall, Stewart Jacks, Glen Knowles, Chuck Minckley, Don Mitchell, David Propst, Peter Reinthal, John Rinne, Tony Robinson, Jeff Simms, Dennis Stone, Roger Sorensen, Jeremy Voeltz, David Ward, David Weedman.

2005-11-19 17:00:00 - Ramírez-Martínez, Carlos[*1]; Mendoza-Alfaro, Roberto[1]
(1-Univ. Autónoma de Nuevo León, Facultad de Ciencias Biológicas)

Production and commercialization of freshwater aquarium fishes as a vector for introduction of aquatic invasive species in Mexico

At the present, more than 20 million ornamental fish are sold every year in Mexico. Approximately 60% imported, while the remaining 40% are raised in more than 100 aquarium fish production facilities located in several states of the nation. Production and commercialization of these fish have augmented more 100% during the last 10 years (Fig.1) due to the continuous increasing demand, particularly on the big cities. However as a consequence of the rapid growth of this industry, risks have also increased. Indeed, unfortunately a large amount of those organisms accidentally and/or intentionally released to the natural environment are exotic. At the international level, the aquarium industry has been continuously recognized as a traditional pathway of introduction of alien aquatic species into new environments (Taylor et al., 1984; Welcomme, 1992) and tends to become the main source of introductions of exotic species in North America (Courtnay, 1995; Courtnay and Williams, 1992). The results of the present research show that the risk of establishment depends on the biogeographic origin of the organisms. Thus, many fish imported from the US are actually fish coming from Asia that are “americanized” and then exported to Mexico. The risk associated to the introduction of these organisms is mainly diseases and parasites. In contrast, most of those organisms imported from South America, particularly from the Amazons, are capture in the wild and are more prone to establish in a similar environment, as has been the case with some cichlids and fish from the Loricariidae family. At the national level, most of the ornamental fish farms lack of adequate biosecurity systems which implies the risk of disease propagation and escapes of native and non-native species.

La producción y comercialización de peces de ornato de agua dulce, como vector de introducción de especies acuáticas invasivas en México

Actualmente, en México se comercializan más de 20 millones de peces de ornato de agua dulce cada año, de los cuales aproximadamente el 60% son importados y el 40% restante se producen en más de 100 granjas localizadas en diferentes estados de la República. En los últimos 10 años la producción y comercialización de este tipo de peces en nuestro país a crecido más del 100%, gracias al crecimiento que ha tenido el acuarismo, especialmente en las grandes ciudades. Sin embargo, con el crecimiento de esta industria, se ha elevado la incidencia (accidental o intencional) de estos organismos en el ambiente lo que implica riesgos ecológicos potenciales, considerando que estos animales son en su mayoría exóticos o transfaunados. A nivel mundial, la acuacultura y el acuarismo, han sido históricamente dos de las vías más importantes de introducción de especies exóticas acuáticas y debido al rápido crecimiento de estos sectores se ha considerado que tienen el potencial de convertirse en la mayor fuente de introducciones de especies exóticas en las aguas Norteamérica. Los resultados de la presente investigación muestran que existen diferentes tipos de riesgos en función del origen biogeográfico de los peces y del hecho que estos sean o no cultivados, en el caso de los organismos importados. Presumiblemente, la mayor parte de individuos que son importados a través de los Estados Unidos de América, provienen en realidad de Asía, donde son producidos en unidades de producción acuícola y el principal riesgo que presentan es la introducción de enfermedades exóticas. En contraste con lo anterior, los organismos que son importados de Sudamérica, principalmente de la Cuenca Amazónica, son producto de capturas del medio natural y son aquellos que tienen una mayor posibilidad de establecerse en los ambientes acuáticos de nuestro país, especialmente algunas especies de la familia Cichlidae y Loricariidae. En lo que se refiere a las granjas que producen este tipo de peces en nuestro país, la mayor parte no cuenta con sistemas adecuados de bioseguridad, lo que provoca que sean focos potenciales de la propagación de enfermedades y/o la introducción de especies acuáticas invasivas a través de la fuga de organismos.

2005-11-19 17:15:00 - Rodríguez Romero, Faustino Dr.[*1]
(1-Universidad Nacional Autónoma de México (Instituto de Ciencias del Mar y Limnología))

The genus *Ictalurus* in México and its biotechnology potential
El género *Ictalurus* en México y su potencial biotecnológico

La Familia Ictaluridae se encuentra formada por 7 géneros y 47 especies. El Género *Ictalurus* en México está representado por especies muy poco estudiadas que pueden ser reservorios genéticos de interés para el mejor aprovechamiento de este recurso. La dispersión en Norteamérica de estos organismos está estrechamente vinculada a la hidrografía. Las principal especie que se explota con fines comerciales es, I. punctatus, cuyas poblaciones naturales parecen estar caracterizadas por una alta variabilidad genética posiblemente por el intercambio de genes que propician las redes hidrológicas en donde se le encuentra en forma silvestre. Aún cuando, *I, punctatus*, es el bagre mas explotado por sus características de resistencia adaptabilidad y conversión del alimento altamente positivas para la piscicultura, se ha demostrado que es posible obtener un híbrido estable por la cruza de, *I. punctatus*, con, *I. furcatus*, el cual ofrece aún mayores ventajas. En el territorio mexicano existen otras posibilidades de hibridación con especies como, *I. pricei*, e *Ictalurus* sp., bagre de Chihuahua, y otras especies del centro y sur del país que es recomendable evaluar en beneficio de la piscicultura mexicana y de la conservación de este género dado que estas especies pueden presentar características atractivas para el mercado y para la conservación de la biodiversidad y de la riqueza genética de este grupo.

2005-11-19 17:30:00 - Christopherson, Kevin D.[*1]
(1-Utah Division of Wildlife Resources)

Area Report for the Upper Colorado River Basin

Despite funding challenges, progress is moving forward on many fronts in the Upper Colorado River Basin. Non-native fish control continues to be a challenge for many of the recovery efforts. The results of these efforts are preliminary, and the results are mixed. The most significant step forward is the implementation of the Flaming George Flow recommendations on the Green River.

2005-11-19 17:45:00 - Contreras-Balderas, Salvador[*1]
(1-Bioconservación, A.C.; 2-Universidad A. de Nuevo León, Monterrey, Mexico)

NE Mexico Coordinator Report 2005

Surveys have been carried out in the region to look for fish species, like percids and other species at risk in localities of known occurrence. Several of them are in very poor condition or even probably extinct. *Etheostoma grahami* was not found in 10 localities in both Coahuila and Nuevo León. *E. pottsi* apparently has disappeared from 3 localities in Rio Conchos, and none turned out in a recent survey of Río Nazas. *E. segrex* has not been found since long ago as already reported. Other species that are now very scarce are those in *Xiphophorus*, like *X. couchianus* restricted now to a barely surviving population in Apodaca, in only one spring. *X. meyeri* is also very scarce. Another survey of Río Conchos for an Index of Biological Integrity was completed this year, recording interesting changes in the fish communities, as well as in the river characteristics to be reported elsewhere On another line of activities, the Mexican Norma Oficial Mexicana 059 for species at risk is being reviewed: also Carta Nacional Pesquera, the fishing regulatory instrument, is being updated, mostly of mistakes in fish faunas for administrative regions.

Closing / Clausura (18:00)

Community Cultural Event in the Plaza / Evento Cultural del Pueblo en la Plaza Principal (20:00 – 22:00)

In the Explanada Presidencial (the area between the chuch and the Presidencia) in the main plaza. Folk dances and other events organized by the local community. Free to both the community and visitors.

Sunday (domingo) November 20, 2005

Field Trips / Salidas al Campo – details to be announced at meeting / detalles por anunciar en el congreso

Everyone wishing to participate in the field trips should sign-up at the registration desk on arrival and pay the fee which will cover cold water and sodas during the trip as well as lunch. All details will be explained at the meeting, but the tour will cover a large part of the valley, visiting a diversity of habitats and providing opportunities for snorkeling. English-speaking guides who know the valley well will be with each group, and trips can to some extent be customized for those with particular interests and varied time restrictions. We hope all fieldtrip participants will help with trapping of the non-native *Hemichromis* during the field trips.