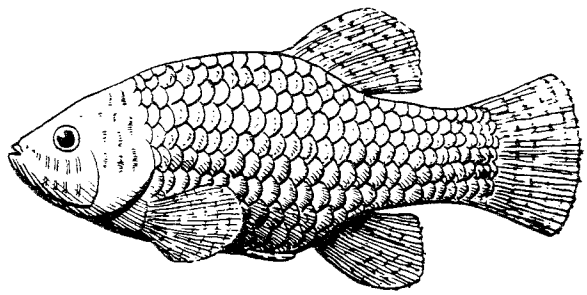
Desert Fishes Council



"Dedicated to the Preservation of America's Desert Fishes"

Proceedings of the Desert Fishes Council

VOLUMES XIII — XV - A

Edited by
Edwin P. Pister

The Thirteenth — Fifteenth Annual Symposia

Produced in cooperation with the University of Nevada, Las Vegas

Desert Fishes Council
407 West Line Street
Bishop, California 93514

October, 1985

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FOREWORD

It remains a fond hope (though no doubt an unrealistic one) that Providence may one day smile upon such individuals as missionaries laboring in the Congo, Salvation Army workers, street urchins in Calcutta, graduate students in the biological sciences, and editors of scientific journals.

Publication of the Council's proceedings, which began with the appearance of Volume 1 in 1970, has proved to be a task nearly as frustrating and time consuming as the activities attending the Devils Hole Supreme Court decision, the acquisition of Ash Meadows, the Fish Slough land exchange, and the preparation of listing packages. However, with the appearance of the 1971-77 Proceedings Compendium, our publication schedule was completed through 1980. The current volume brings us up to date through the Fifteenth Annual Symposium held in Death Valley in November, 1983.

If all goes well, it should henceforth be possible for us to stay on top of our publication schedule. The next volume will usher in a new era for the Proceedings, complete with illustrations, an increase in bilingual publication, a more thorough peer review of full papers, and complete indexing. A separate index for Volumes 1-15 is now being prepared. We hope in this way to make the Proceedings a more attractive, valuable, and prestigious publication medium and one befitting the excellent quality of the papers which are often submitted to us.

Thank you for your patience through all of this. We welcome you to this new era of the Proceedings and look forward to working with you in the future.

Phil Pister
August 15, 1984

IN MEMORIAM

The Desert Fishes Council mourns the passing of three of its members since the 1980 Symposium and dedicates this publication to their memories.

Dale Lockard, of the Nevada Department of Wildlife, was actively affiliated with the Council from its inception. He was the Council's chairman-elect until called from Las Vegas to a promotion in Reno shortly before he would have assumed the chair in the early 1970s. Educated at Colorado State University, Dale was an excellent biologist and was strongly dedicated to the fish and wildlife resources of his state. He possessed enormous leadership potential which was only beginning to be realized when he was taken by a malignancy late in 1981.

Bob Borovicka, of the Oregon State Office of the Bureau of Land Management, was also a charter member of the Council. As with Dale, he was one of the handful of individuals who met in Death Valley in April, 1969, when the decision was made that "something has to be done." Educated at Oregon State University, Bob possessed a wealth of knowledge and experience in fishery science, much of it gained during his long association with the Oregon Department of Fish and Wildlife. He was a valued member of the Council until his death from a heart ailment in 1982.

Katsuo Nishikawa, of the Centro de Investigación Científica y Educacion Superior de Ensenada, México, was one of the Council's newest members. Many will recall the excellent paper he presented in November, 1983 concerning his preliminary studies of the limnology of streams of Baja California's Sierra de San Pedro Mártir. A native of Mexico, Katsuo graduated from la Universidad Autónoma de Baja California Norte at Ensenada and earned his Ph.D. at Oregon State University. Fluent in several languages, his services were invaluable at international conferences. Katsuo was an environmental activist and a man of strong convictions. He possessed enormous talent and potential, a potential that was taken from him and from the world by a drunken driver as he, his wife, and their three children drove from Tijuana toward their home in Ensenada during the evening of August 6, 1984. Although badly injured, his family somehow survived the accident. As with Dale and Bob, Katsuo will be missed by all who knew him, and by future generations that will never benefit from what he might have given them.

Perhaps Carlos Yruretagoyena, of the Centro de Investigación de Quintana Roo, said it best, in their native language. Although he was writing of his friend and colleague Katsuo, his thoughts are most appropriate for all three of our departed friends:

> Tu mano nos deja la semilla del compromiso y de la responsibilidad de seguir adelante y de cumplir con nuestras metas. Por como eras y por lo que aprendí de ti, no siento que haz partido de este mundo, sino que haz de andar por ahí investigando, y cada vez tengo la oportunidad de visitar la Sierra de San Pedro Mártir podre sentir tu espíritu y la gracia del Señor.
>
> Your influence has left us with the seed of commitment and the responsibility to press forward and fulfill our goals. For what you were and for what I learned from you, I feel that you have not departed from this world, but that you will continue to be close, always researching, and every time I have the opportunity to visit the Sierra de San Pedro Mártir, I will be able to feel your spirit and the grace of the Lord.

ACKNOWLEDGMENTS

Once again, the efforts of the staff of the Biology Department at the University of Nevada, Las Vegas, and especially Laurie Vincent, were instrumental in producing this document. Without their help, it would not exist.

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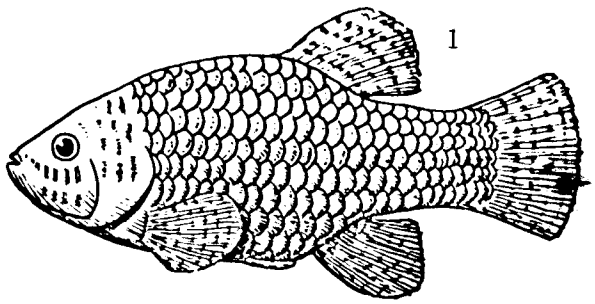

"Dedicated to the Preservation of America's Desert Fishes"

THIRTEENTH ANNUAL SYMPOSIUM

Death Valley National Monument Headquarters

Furnace Creek, California

November 19-21, 1981

Thursday, November 19.

8:00 a.m. until noon - registration.

8:30 a.m. Welcome to Death Valley.

George Von der Lippe, Superintendent, Death Valley National Monument.

Announcements and introductions.

Phil Pister, California Department of Fish and Game, Program Chairman.

SPECIAL ITEM: Current status of the Endangered Species Act.

Jim Williams, Office of Endangered Species, Washington, D.C.

SESSION I - REPORTS FROM AREA COORDINATORS AND RECOVERY TEAM LEADERS.

Chairman: Chuck Minckley, Area Coordinator Supervisor, Flagstaff, Arizona.

Bonneville

Interbasin

Death Valley

Oregon Lakes

Lahontan

Sonoran Desert - Mexico

Sonoran Desert - United States

Chihuahuan Desert - Mexico

Chihuahuan Desert - United States (New Mexico and Texas)

Chihuahuan Desert - Isolated Basins

Upper Colorado

Lower Colorado

SESSION II - RESEARCH. 1:30 p.m.

Chairman: Glenn Clemmer, U.S. Fish and Wildlife Service, Fort Collins, Colorado.

Redescription of Catostomus warnerensis.

Carl E. Bond, Oregon State University, Corvallis.

*

The status of introduced fishes in certain spring systems of southern Nevada.

Walter R. Courtenay, Jr., Florida Atlantic University and James E. Deacon, University of Nevada, Las Vegas.

*

The metabolic cost of aggressive behavior in territorial pupfish.

Robert C. Feldmeth, Joint Science Department, Claremont Colleges, Claremont, California.

*

Niche segregation of the ichthyofauna of the Virgin River.

Thom Hardy, Bio-Consultants of Nevada and University of Nevada, Las Vegas.

The Saga of Devils Hole.

James E. Deacon, University of Nevada, Las Vegas and the U.N.L.V. Audio-Visual Department.

BREAK.

Preliminary morphometric analysis of geographic variation in Agosia chrysogas

Dean Hendrickson, Arizona State University, Tempe.
*
Effects of flooding on population dynamics and interaction of Sonoran topminnow (Poeciliopsis occidentalis) and mosquitofish (Gambusia affinis) in an Arizona spring.

Gary Meffe, Arizona State University, Tempe.
*
Desert spring habitats in the Bolsón de los Muertos, Chihuahua, México, with special reference to their endemic fauna.

Michael L. Smith and Robert R. Miller, University of Michigan, Ann Arbor.
*
The challenge of protecting Nevada's aquatic habitats.

Donald W. Sada, U.S. Fish and Wildlife Service, Reno, Nevada.
*
Replacement of Cyprinodon macularius by Tilapia zillii in an irrigation drain near the Salton Sea, Imperial County, California.

Alan Schoenherr, Fullerton College, Fullerton, California.
*
The biological significance of proposed mining operations in the Death Valley region.

Robert L. Newell, Anaconda Copper Company, Denver, Colorado.

OFFICIAL 1981 DESERT FISHES COUNCIL BARBECUE (location to be announced). 6:30 p.m.

SESSION III - SPECIAL PROGRAM. 8:30 p.m.

The changing fish fauna of the Yangtze River.

James F. LaBounty, U.S. Bureau of Reclamation, Denver, Colorado.

Friday, November 20. 8:00 a.m.

SESSION IV - RESEARCH AND MANAGEMENT: COLORADO RIVER FISHES.

Chairman: Walter R. Courtenay, Jr., Florida Atlantic University, Boca Raton.

Status of the razorback sucker (Xyrauchen texanus) in the lower Colorado River basin.

W.L. Minckley, Arizona State University, Tempe.
*
Aspects of razorback sucker life history which help explain their decline.

Bill Loudermilk, California Department of Fish and Game, Blythe.
*
Spawning behavior and substrate selection in razorback suckers.

Linda Ulmer, California Department of Fish and Game, Blythe.

Reintroducing the natives: razorback sucker.

James E. Johnson, U.S. Fish and Wildlife Service, Albuquerque, N.M.

*

A summary of observations on the humpback chub (Gila cypha) in the Grand Canyon region.

Chuck Minckley, Flagstaff, Arizona.

*

Lordosis in Gila, Yampa River, Colorado.

C.M. Haynes, Colorado Division of Wildlife, Nongame Research Group, Fort Collins; and R.T. Muth, Department of Fishery and Wildlife Biology, Colorado State University, Fort Collins.

*

Recent fish collections in the Green and Yampa Rivers, Dinosaur National Monument.

Randy McNatt, U.S. Fish and Wildlife Service, Vernal, Utah.

*

Spawning migration of Colorado squawfish (Ptychocheilus lucius).

Harold Tyus, U.S. Fish and Wildlife Service, Vernal, Utah.

*

A summary of Colorado squawfish rearing experiments.

Arcadio Valdes-Gonzalez, Utah State University, Logan.

*

BREAK.

*

Whistling into Plato's cave: affecting impact reports and statements.

Mike Busdosh, Woodward-Clyde Consultants, San Diego.

*

Research on the Mojave chub, Gila bicolor mohavensis, at the Desert Research Station.

Mike Havelka, Barstow Unified School District.

*

New Horizons for the Great Basin Naturalist.

James R. Barnes, Brigham Young University, Provo, Utah.

*

Use of cattle watering tanks as pupfish habitats.

Astrid Kodric-Brown, University of Arizona, Tucson.

*

Ecological distribution of fishes in the Amargosa River canyon.

Cindy Williams, Sacramento State University.

SESSION V - REPORTS BY AGENCY AND GOVERNMENTAL REPRESENTATIVES. 1:30 p.m.

Chairman: John N. Rinne, Forestry Sciences Laboratory, Arizona State University.

México

United Kingdom

United States

Bureau of Land Management

National Park Service

Bureau of Reclamation

REPORTS BY AGENCY AND GOVERNMENTAL REPRESENTATIVES (Continued):

- Forest Service
- Fish and Wildlife Service
  - Washington, D.C.
  - Sacramento
  - Albuquerque
  - Boise-Reno
  - Fort Collins
- Soil Conservation Service
- State Fish and Wildlife Agencies
  - Nevada
  - Colorado
  - California
- The Nature Conservancy
- Southeastern Fishes Council

BREAK FOR DINNER.

SESSION VI - SPECIAL PROGRAM. 8:30 p.m. (Visitors Center Auditorium)

Water: California's most sought after resource.

John Turner, California Department of Fish and Game, Sacramento.

*

The Fishes of Iran.

Neil Armantrout, Bureau of Land Management, Portland, Oregon.

Saturday, November 21. 8:00 a.m.

SESSION VII - SPECIAL DISCUSSION ITEMS AND BUSINESS MEETING.

Chairmen: James E. Johnson, Chairman, Desert Fishes Council.
Salvador Contreras-Balderas, Chairman-elect, Desert Fishes Council.

Special items:

a) The Ash Meadows dilemma: a special fund for political action?

b) The Proceedings of the Desert Fishes Council: where do we go from here?

c) Should the DFC [illegible]

Business meeting:

a) Old and new business.

b) Constitution and bylaws.

c) Resolutions.

d) Treasurer's report.

SESSION VIII - FIELD TRIPS. 10:00 a.m.

Field trips are tentatively scheduled for Ash Meadows, Amargosa River Gorge, and Cottonball Marsh (limited to first 20 applicants - only 2 or 3 vehicles may be taken). Further details will be announced early in the symposium.

NOTE TO PARTICIPANTS

We have a very full schedule this year, so it is absolutely mandatory that each participant adhere strictly to his allotted time as follows: research and status reports, 20 minutes (including discussion period); reports by agency representatives, 15 minutes; area coordinator and recovery team leader reports, 15 minutes for each area. If you feel that you cannot make an effective presentation within the designated time, please contact me prior to your session and we will see if an adjustment may be made.

If you are still speaking when your time is up, you run the risk of being abruptly removed from the speaker's stand by your session chairman. Please review your presentation prior to the symposium and limit your slides (if any) to those necessary to illustrate your point. Remember that slides invariably take much longer during a formal presentation than during a brief review. Slides greatly enhance a presentation if prudently used. Conversely, they may just as effectively detract from a presentation if too many are used, or if they are poorly arranged. If possible, bring your slides to the symposium "ready to go" in a Kodak Carousel magazine. The National Park Service will provide Kodak Carousel 35 mm. projectors as the standard projection equipment, with remote controls to enable you to change slides from the speaker's stand.

The manuscript or abstract you submit will be used as the original for reproduction. In the interest of uniformity, please adhere as closely as possible to the following guidelines: Use a typewriter with elite type and a new ribbon; typing to be done on 8½ x 11 bond paper with margins of 1 1/8 inches top and bottom, 1 inch on left side and 7/8 inch on right side; single spacing with double space between paragraphs; paragraphs indented 6 spaces. Please number pages in pencil. The final page numbers will be typed in after all papers are assembled for printing. Photographs are not acceptable, but graphs and drawings in black and white may be used. Perfection of the material you submit is your responsibility, so be sure to check your work carefully. Abstracts and papers are to be submitted in both English and Spanish. If manuscript preparation in a second language poses a problem for you, please let me know. Assistance is available for this purpose.

DEADLINE FOR MANUSCRIPT SUBMISSION IS DECEMBER 31, 1981. Manuscripts submitted after this date will be published in a special section of the 1982 proceedings.

Papers, abstracts, and inquiries concerning the symposium and activities of the Desert Fishes Council should be directed to:

E. P. Pister, Secretary
Desert Fishes Council
407 West Line Street
Bishop, CA 93514

Phone: (714) 872-1171

Area Report for the Interbasin of Nevada
November 19, 1981
Donald W. Sada

The single greatest threat to aquatic habitats in the Interbasin has passed with the decision to deploy MX missles from existing silos in the west and midwest. This does not mean, however, that these aquatic resources are secure. In response to continued habitat degradation resulting from agricultural diversion and oil field development, and the detrimental influence of exotic fishes, the U. S. Fish and Wildlife Service has prepared listing packages to list five fishes in the region as threatened or endangered. These are: the Railroad Valley springfish (Crenichthys nevadae), Hiko White River springfish (Crenichthys baileyi grandis), White River springfish (Crenichthys baileyi baileyi), Big Spring spinedace (Lepidomeda mollispinis pratensis), and the White River spinedace (Lepidomeda albivallis). There is no indication when these listings will occur.

The Nevada Department of Wildlife reorganized their rare and endangered list of fishes during 1981 by designating those species whose status is uncertain as sensitive and those whose livelihood is insecure as protected. Those included on the protected list are further segregated into protected, rare, or endangered categories. Within the Interbasin, the sensitive species list includes the Hot Creek Valley tui chub (Gila bicolor ssp.), Little Fish Lake Valley tui chub (Gila bicolor ssp.), Railroad Valley tui chub (Gila bicolor ssp.), Moapa roundtail chub (Gila robusta ssp.), relict dace (Relictus solitarius), White River speckled dace (Rhinichthys osculus velifer), and the Meadow Valley desert sucker (Catostomus clarki ssp.). The White River spinedace (Lepidomeda albivallis), Big Spring spinedace (Lepidomeda mollispinis pratensis), White River desert sucker (Catostomus clarki intermedius), White River springfish (Crenichthys baileyi), Moapa dace (Moapa coriacea), Nevada pupfish (Cyprinodon nevadensis), and Railroad Valley springfish (Crenichthys nevadae) are each considered rare. The Pahranagat roundtail chub (Gila robusta jordani), Pahrump killifish (Empetrichthys latos latos), and Devils Hole pupfish (Cyprinodon diabolis) are considered as endangered.

Several studies regarding native fishes of the region have been initiated and/or completed since the 1980 Desert Fishes Council Meeting. The most comprehensive was conducted by Jim E. Deacon and concerned the collection of baseline data in representative springs that would be influenced by MX missle system construction and operation. The representative springs in Nevada that were investigated during this study were Big Spring on Locke's Ranch, Nye County; Preston Big Spring and Shoshone Ponds, White Pine County; and the outflow of Ash Spring, Pahranagat Valley, Lincoln County. The information gathered during these studies dealt primarily with the physical and biological characteristics of each spring. This is the first study to provide thorough baseline information describing "typical" spring habitats in the Great Basin.

Other studies in the region included a life history investigation of the Railroad Valley springfish in its native and introduced habitats. Cindy Williams will complete this study in the next several months. Jim Deacon

and Thom Hardy, University of Nevada, Las Vegas, are initiating thorough studies into the habitat preferences of native fishes in the Moapa River system, and completing an investigation funded by the U. S. Fish and Wildlife Service into habitat preferences of the Pahranagat roundtail chub.

The native fishes of the region are presented with ever-increasing activities which threaten their livelihood. The following discussion is offered as a summary of these fishes that are most seriously threatened. Habitats and populations of the Railroad Valley springfish are being influenced by diversion activities for agriculture, water depletion possibly caused by nearby oil field development, and introduced fishes. The largest of the habitats occupied by the species, Big Warm Spring on the Duckwater Indian Reservation, is scheduled for dramatic alteration authorized by the Tribe. The Bureau of Indian Affairs is sponsoring a program to capture the north spring outflow in a concrete pipe to make irrigation delivery to nearby pasture lands more efficient. This pipe will eliminate all but 1,100 feet of springfish habitat in this outflow. Plans have also been approved for David Koch to eliminate most of the habitat in the south outflow by constructing an aquiculture facility to produce catfish (Ictaluris punctatus). These anticipated projects, in addition to recent springfish population declines in this spring that are attributed to the introduction of guppies (Poecilia reticulata), leave little hope for the continued existence of this population. The populations in Little Warm Spring on the Duckwater Indian Reservation and on Locke's Ranch are doing well at this time. The introduced population in Chimney Spring, however, was extripated during a partial failure of the spring which occurred during August. The introduced population at Sodaville is doing well in a habitat that is becoming increasingly stabilized.

Several fishes endemic to the pluvial White River system are doing poorly because of agricultural diversion and competition and predation by exotic fishes. The White River spinedace has not been recently collected in Preston Big Spring and is in low numbers in its remaining habitats. Reasons for its scarcity are obsecure but are attributed to spring outflow capture for diversion, as these activities are the only influences that have altered the habitats from what existed historically. The desert sucker endemic to this drainage is also doing poorly in the habitats occupied by this spinedace; agricultural diversion is again believed to be the cause. The Hiko White River springfish has been extripated from Hiko Springs because of introduced largemouth bass (Micropterus salmoides) and habitat alteration and is now found in low numbers only in Crystal Spring where it is threatened by a variety of introduced fishes. The sole population of White River springfish in Ash Spring is similarily affected by introduced fishes. It is maintaining itself in extremely low numbers.

Recent studies of the Pahranagat roundtail chub by Thom Hardy and Jim Deacon show the species exists as adults only in a 10 meter length of the outflow from Ash Spring. Thirty-seven individuals have been counted in this population, granting this chub the dubious distinction as the Nevada fish presently closest to extinction. Continued studies are necessary to determine how this species can be recovered.

The creation of pristine aquatic habitat on the Moapa National Wildlife Refuge is proceeding with development of an aquatic habitat management plan

which provides direction for maximum habitat development within the refuge. Implementation of the plan will begin shortly. Information quantifying habitat preferences of fishes in the Moapa River being collected by Jim Deacon and Thom Hardy will be integrated into construction of this habitat.

Area Report for the Lahontan Basin
November 19, 1981
Donald W. Sada

Significant new information about the status, distribution, and life history of a number of fishes endemic to the Lahontan basin has been compiled and/or collected since the 1980 Desert Fishes Council meeting. This information, in several instances, provides guidance that will aid in the direction and mechanisms to be employed for recovery of several species included on the U.S. Fish and Wildlife Service list of threatened and endangered animals.

Litigation surrounding the Truckee River and its water users took a turn for the conservation of the cui-ui (Chasmistes cujus) and Lahontan cutthroat trout (Salmo clarki henshawi) when the 9th Circuit Court of Appeals ruled the Pyramid Lake Indian Tribe has a water right superior to that certificated to the Truckee Carson Irrigation District representing the agricultural interests near Fallon, Nevada. This case will continue through appeals; however, the Tribe is confident the ultimate decision will grant increased flow into Pyramid Lake. This Appellate Court decision has also created an atmosphere that encourages the affected parties to negotiate an out-of-court settlement for water appropriations. These negotiations began recently.

Efforts were continued by the U.S. Fish and Wildlife Service and Bureau of Reclamation to reestablish the successful spawning of cui-ui in the Truckee River. The Pyramid Lake Fishway is continually being modified to facilitate migration past the barrier delta and water was released from Stampede Reservoir during the spring to attract cui-ui to their spawning grounds. The 1981 run, however, did not materialize to the extent expected. Approximately 100 fish were observed moving through the fishway; a much smaller run than the 5,000 fish comprising the 1980 run. Reasons for the small run cannot be quantified; however, data indicates that late and inadequate releases from Stampede Reservoir were influential.

The first year of a planned three-year investigation into the life history of cui-ui was conducted by the U.S. Fish and Wildlife Service. This phase of the study focused on riverine spawning characteristics and requirements, and fry movement.

The Nevada Department of Wildlife in cooperation with the Bureau of Land Management and U.S. Forest Service continued habitat and population surveys of northern Nevada streams. To date these surveys and those conducted by California Department of Fish and Game have identified the threatened Lahontan cutthroat trout in 94 streams including 246 stream miles and document that many of these habitats are severely degraded by livestock grazing. In spite of its wider distribution than previously thought, this cutthroat trout currently occupies less than five percent of its historic range. In Nevada approximately 36 percent of the habitats are in poor condition, 30 in fair, 24 in good, and 10 percent in excellent. The U.S. Fish and Wildlife Service has completed a draft status review of this trout and is in the process of discussing how this newly gathered information shall be used in the recovery of the species.

Field surveys have also been conducted for the tui chub (Gila bicolor ssp.) in Dixie Valley, Pershing County. This fish had not been located since the 1930's when Carl Hubbs and Bob Miller were involved in their initial collection of many native fishes in the Great Basin. The security of this fish is tenuous as it is restricted to a single isolated spring on private land that is associated with an extensive spring system occupied by brook trout (Salvelinus fontinalis).

The aquatic habitats of Fish Lake Valley, Esmeralda County, were also surveyed. Tui chubs (Gila bicolor ssp.) were collected from three small, local springs that are tributary to one another and on the McNutt Ranch. This is apparently one of the localities where chubs were collected by Carl Hubbs and Bob Miller during the late 1930's. Additional investigations are needed to determine the absence or presence of chubs in other locations inin the valley. The springs on the McNutt Ranch are immediately adjacent to Bureau of Land Management parcels currently being leased for geothermal exploration. Their security is therefore questionable.

Surveys need to be conducted for a number of fishes, including the Railroad Valley tui chub (Gila bicolor ssp.), Big Smoky Valley tui chub (Gila bicolor ssp.), Independence Valley tui chub (Gila bicolor isolata), Clover Valley speckled dace (Rhinichthys osculus oligoporus), Independence Valley speckled dace (Rhinichthys osculus lethoporus), Big Smoky Valley speckled dace (Rhinichthys osculus lariversi), and the Wall Canyon sucker (Catostomus ssp.).

The U.S. Fish and Wildlife Service has prepared packages to list as threatened or endangered two fishes in the Lahontan basin. These are: the desert dace (Eremichthys acros) and Fish Creek Springs tui chub (Gila bicolor euchila). There is no indication of when these species will be listed.

With the revision of the lists maintained by the Nevada Department of Wildlife (see the discussion under the area report for the Interbasin for a complete review of the changes in the Nevada Department of Wildlife lists), the desert dace is the only species in the Lahontan basin considered as rare and the cui-ui the only species considered as endangered. The Fish Creek Springs tui chub, Independence Valley tui chub, Newark Valley tui chub (Gila bicolor newarkensis), Diamond Valley Lahontan tui chub (Gila bicolor obesa, aberrant form), Big Smoky Valley tui chub, Big Smoky Valley speckled dace, Independence Valley speckled dace, Clover Valley speckled dace, and the Monitor Valley Lahontan speckled dace (Rhinichthys osculus robustus, aberrant form) are recognized as sensitive.

DESERT FISHES COUNCIL

1981 Bonneville Basin Report

Don Duff[1]
Bonneville Basin Coordinator
Salt Lake City, Utah

The following is a brief summary of significant activities taking place in the 34-million acre Bonneville basin situated with the Great Basin of the Western United States in the states of west central and northern Utah, eastern Nevada, southeastern Idaho, and southwestern Wyoming. For a further insight into past Bonneville basin history and activities leading up to this period of time, please refer back to the past basin reports of 1977 through 1980.

Bonneville Cutthroat, Salmo clarki utah

State and Federal agencies continue to cooperate in the management of populations and habitat for this subspecies. The Forest Service and Bureau of Land Management in Nevada, Utah, and Wyoming have implemented stream habitat improvement projects in 1981 to improve pool quality and streambank erosion in selected streams where the subspecies occur. This work has been completed in cooperation with the respective state wildlife agency.

Project and inventory work in Nevada was hampered in 1981 in Nevada by the State Legislature's decision not to allow the Nevada Department of Wildlife (NDOW) to accept Federal monies for fish and wildlife work associated with endangered, threatened, or sensitive species. As a result, the USFS and BLM interagency stream survey crews with NDOW were not operative in 1981. It remains to be seen if this attitude will carry over into 1982, thereby further hindering management opportunities for this subspecies.

The U.S. Fish and Wildlife Service (FWS) in the Salt Lake City Area Office hosted status review meetings in Nevada, Utah, and Wyoming for this subspecies in June 1981 to obtain state and Federal agency views toward possible listing of this subspecies. Generally, all state and Federal agency did not support a listing as a threatened species. All agencies indicated a desire to work within their existing management plans to provide for species survival. Wyoming stated that the subspecies was in a "biologically threatened situation in Wyoming, which may merit listing but for management purposes we prefer to pursue progressive management for this sensitive species." The FWS has suggested each state take the leas in their area to develop an interagency recovery plan for the subspecies. Management plans are now in preparation in Nevada, Wyoming, and Utah, and drafts should be circulated for review in early 1982. The FWS plans followup status review meetings with each state in January 1982.

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In Utah, the Deep Creek Mountain streams of Trout and Birch Creeks are still closed to fishing to provide for population recovery, which is occuring at a very slow rate. The Deep Creek Mountains are still under a 2-year "temporary segregation" from mining activity, but this expires in May 1982, at which time the BLM could reopen the area to mining claims which would jeopardize the continued existence of this subspecies in that range.

The Uinta and Wasatch-Cache National Forests in Utah have implemented memorandums of understanding with the Utah Division of Wildlife Resources (DWR) for the population inventory and analysis of cutthroat populations in over 25 streams which could still harbour remnant pure populations of the Bonneville cutthroat.

Dr. Eric Loundenslager, University of California at Davis, in a report on cutthroat trout biochemical genetic assessment, has suggested separating certain strains of the Bonneville cutthroat with other cutthroat strains outside the basin, i.e., the transfer of the Bear River cutthroat from Salmo clarki utah to Salmo clarki bouvieri. The majority of fisheries management biologists in the basin, as well as Dr. Robert Behnke of Colorado State University, feels this suggestion is not valid and would certainly hinder on-going and future management efforts for the Bonneville cutthroad in the basin and detract emphasis from its unique and rare status.

Terry Hickman, FWS in Salt Lake City, will present in further detail at this meeting more specific information of the FWS status reviews on the Bonneville cutthroat.

Utah Lake

USDI Bureau of Reclamation cooperation studies with Brigham Young University and Utah DWR on Utah Lake have been essentially completed. The FWS is presently contracting to a private consultant for a status review of the Webug sucker, Catastomus fecundus and the June sucker, Chosmistes liorus. This the the only FWS funded project in the basin at this time. Also included in this contract is a review of the least chub, Iotichthys phlegethontis.

Dr. Robert Rush Miller, University of Michigan, published a manuscript on Chasmistes in western North America in 1981 through the University. Dr. Miller states that his data demonstrates that the original population of Chasmistes liorus from Utah Lake is extinct, and that Catostomus fedundus is best regarded as a hybrid between Catostomus ardens and Chasmistes liorus and that the population of Chasmistes of hybrid origin survives in the lake and is given taxonomic recognition as a new subspecies as the June sucker, Chasmistes liorus mictus.

Lahontan cutthroat, Salmo clarki henshawi

The FWS, Utah DWR, and Utah BLM are continuing to cooperate in management efforts to expand the Donner and Bettridge Creek populations in the Pilot Peak Range. Population estimates for 1981 on Bettridge Creek, the transplant area, number 32 fish, while Doner Creek fish range from 75 to 200 fish. The BLM has completed partial streamside fencing on Bettridge Creek and land exchanges on Donner Creek to enhance the survival of this endangered species.

Summary and Recommendations

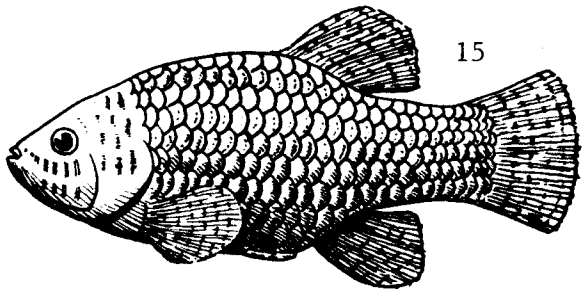
The Desert Fishes Council should continue to emphasize management protection for the Bonneville cutthroat, least chub, June sucker, and the Lahontan cutthroat and their habitats within the Bonneville basin.

The council should stress protection and survival of the Bonneville cutthroat by (1) supporting a continued protective land withdrawal of the 27,000-acre area in the Deep Creek Mountains, Utah; (2) supporting nomination of the Deep Creek Mountains as a National Natural Landmark (USDI-HCRS program) and as a National unique wildlife ecosystem area (USDI-FWS program); and (3) supporting a recommendation to list the species as threatened.

Resolutions submitted at the 1981 annual meeting should be approved to show our concern for the protection of the Bonneville cutthroat and for recommending to all state and Federal agencies in the Bonneville basin to jointly cooperate in finalization of Bonneville cutthroat management plans for each respective state affected.

Even though the MX missle deployment activities in Utah and Nevada appear dead, the need for protection of the Bonneville cutthroat and least chub and other Nevada nongame fish remains from mining and livestock activities, and I would continue to urge the Council, as I have since 1977, to consider holding an annual meeting in the northeast Nevada-western Utah area as soon as possible. By doing this, the aquatic resources of the northern Basin desert can be seen, appreciated, and studied by the Council.

Desert Fishes Council



"Dedicated to the Preservation of America's Desert Fishes"

407 West Line Street
Bishop, California 93514

April 9, 1981

To: All Persons and Agencies Concerned

From: Chairman, Death Valley Area Committee

Subject: **Eighth** Annual Meeting, Death Valley Area Committee

Subject meeting was held at the National Park Service Auditorium, Furnace Creek, on February 27, 1981. A total of 38 were in attendance (list attached). The following items were discussed:

1. Ash Meadows Scenario. Pete Sanchez presented an excellent history and overview of the current problems faced at Ash Meadows, the same basic talk he had presented a month earlier at the annual meeting of the California-Nevada section of the American Fisheries Society at California Polytechnic State University, San Luis Obispo. This provided an excellent background for discussion of the following agenda item.

2. The Ash Meadows dilemma. After considerable discussion, it was decided that the only viable course of action available to us at this time is to support in any way possible S.41, the Ash Meadows National Wildlife Refuge bill. Submitted earlier this year by Senator Alan Cranston of California, this bill would provide the machinery for acquiring necessary private lands in Ash Meadows and protecting the all-important water sources. The support for S.41 is being coordinated by Tasker and Beula Edmiston, who are performing wonders in this respect by rallying public support and maintaining a close liaison with Senator Cranston's office. The first thing that needs to be accomplished is to bring the bill to hearing, and this can only be done if the Senator receives an abundance of support for the bill. The Edmistons are handling mailings and have prepared a petition for distribution among sympathetic groups. Following the meeting the Council forwarded a resolution to Senator Cranston supporting S.41 and urging him to do everything within his power to bring it to hearing. All of this is being done with a full awareness of the lack of sympathy for such endeavors, both among local residents and the incumbent administration in Washington.

3. MX missile review and update. The potential deployment of the MX throughout much of the Great Basin continues to pose perhaps the greatest threat to the nation's environmental integrity yet faced by this country. We continue to hope that an alternative deployment plan will be selected, but is it presumptuous at this stage to assume that this will occur. On the positive side, MX funding has allowed us to acquire a vast amount of environmental data that otherwise would not have been available. The Council is in receipt of a number of documents critical of MX deployment, and in particular the MX Draft Environmental Impact Statement. The Nevada Chapter of The Wildlife Society prepared an excellent document in this respect, and the Council has previously registered its concern to the Air Force and a variety of public agencies and officials in its Resolution 79-16. Similar criticism will be forwarded from the Council as deemed expedient.

4. Observations on Gila bicolor mohavensis at the Desert Research Station. Mike Havelka, field instructor at the Desert Research Station (Barstow Unified School District), working under the general direction of Leon Hunter, described research efforts at the Desert Research Station and emphasized the value of having an endangered fish available for teaching purposes. During the process, much excellent background information on the biology of the Mohave chub is being obtained.

5. Recovery activities involving the Desert National Wildlife Range. Activities at this facility, more commonly known within Council circles as Corn Creek, were described by Bob Yoder, Refuge Manager. The Pahrump killifish (Empetrichthys latos) population is doing very well despite the bullfrog problem. Gambusia have not reappeared following the treatment several years ago. Mr. Yoder also supervises the Amargosa Refugium near School Spring and reported the C. diabolis (15 fish) transplant is doing satisfactorily there. For information on Moapa coriacea, refer to the 1979 Council proceedings, p. 18.

6. Monterrey symposium summary and review of 1980 resolutions. Phil Pister reported briefly on the highly successful Monterrey symposium and reminded everyone of the 1981 symposium, which will be held at Furnace Creek during November 19-21, 1981. Probably the high point of the Monterrey meeting was the obvious involvement of Salvador Contreras' students in some excellent fisheries research. The University of Nuevo Leon and Facultad de Ciéncias Biológicas were superb hosts. The symposium will be reported on more fully in the forthcoming Proceedings.

7. The new Eastern Mojave Desert Fishes Recovery Team. Don Sada reported on the activities of this group, which primarily handles recovery problems of Nevada species. Species in the Owens system will be handled separately. A recent activity of the team involved treatment of Scruggs Spring to remove Gambusia sp.

8. Proceedings publication update. All members should now have their 1978 and 1979 proceedings. Pending receipt of abstracts from several Mexican students, the 1980 proceedings will be published during the summer of 1981. Thom Hardy reported that the acquisition of a word processor by the U.N.L.V. Biology Department will greatly facilitate future publications. Work is progressing on the 1971-77 proceedings compendium.

9. Xyrauchen texanus studies at Senator Wash Reservoir. Louis Courtois' abstract follows: "Two additional suckers were implanted with sonic transmitters last December. These transmitters also have temperature sensing capability. To date, over fourteen months of tracking data have been collected. This covers two spawning seasons. A total of three spawning areas have been located and many hours of behavioral observation have been recorded. Predation by channel catfish and bluegill sunfish upon recently spawned sucker eggs has been confirmed. The X. texanus population produces viable reproductive products as evidenced by a 48% successful hatch of eggs collected from the reservoir.

"Problems facing the X. texanus population include periodic fluctuation of water levels within the reservoir which has resulted in complete exposure of the spawning gravels during the spawning season. Another problem was the accidental introduction of channel catfish by a new Departmental employee. The brood stocks at Willow Beach NFH have been moved out since the species was not officially listed by the FWS within the two year limit.

"Future projects include the development of a 16 mm underwater movie of X. texanus spawning behavior. This will also include aerial shots of the lower river system depicting the causes for decline of the Colorado River species. A contract study funded by the USFWS is currently defining areas within the lower river which contain gravel and rock bars suitable for X. texanus spawning. These areas will be sampled to determine species occurrence and utilization. The recovery plan for X. texanus will be updated and the species reproposed for federal listing as endangered."

10. The introduction of Ictalurus punctatus into the Amargosa River drainage. During the past year, without the knowledge of other agencies, the Soil Conservation Service designed a channel catfish rearing pond adjacent to the Amargosa River in Shoshone, Calif. The pond was subsequently stocked with channel catfish. Several laws, procedures, and policies were overlooked here, and the entire matter is being carefully evaluated. In the meantime, we are faced with the possible introduction of channel catfish into the Amargosa River. However, high summertime water temperatures may prove lethal to the catfish. The pond owner is sympathetic to the cause of native fish preservation and the California Department of Fish and Game is working with him and other agencies toward an acceptable solution of the problem.

11. Status of the San Sebastian Marsh and San Felipe Creek habitat acquisition problem. The Desert Pupfish Advisory Committee met at Furnace Creek on the night of February 26, and this meeting was summarized by Glenn Black of California Fish and Game, Committee Chairman. Much of the preservation problem is tied up in the acquisition and protection of the San Sebastian Marsh and San Felipe Creek habitat areas in Riverside County. Major effort is being devoted to resolution of these problems, and cooperation and understanding by the major agencies involved are being actively sought. As is often the case, "We have met the enemy, and they are us."

12. Status of the Death Valley Area fishes.

    a. Pahrump killifish, Empetrichthys latos.
    Bob Yoder reported the population at Corn Creek to be in good condition, as is the population at Shoshone Ponds near Ely, Nevada. Don Sada reported acquisition of Manse Spring is not showing significant progress. Current plans call for an introduction into Spring Mountain Ranch, located on the east side of the Spring Mountains.

    b. Devils Hole pupfish, Cyprinodon diabolis.
    The population in Devils Hole was reported to be the highest since pumping began over a decade ago, with a high count of 548 on October 16. Amargosa Station was reported to have 15 fish, and Hoover Dam Refugium has about 50. Hoover Dam Refugium may be revamped in the near future.

    c. Ash Meadows speckled dace, Rhinichthys osculus nevadensis. The populations in Big, Jackrabbit, and Bradford springs and Crystal Pool appear to be in good condition. However, as with all Ash Meadows flora and fauna, the spectre of major land development looms ominously over their long term safety.

    d. Ash Meadows pupfish, Cyprinodon nevadensis mionectes. Good populations were reported from Big, Bradford, Rogers, and Longstreet springs and Collins Ranch. Refer to comment under item C.

    e. Warm Springs pupfish, Cyprinodon nevadensis pectoralis. The recovery plan for this fish has been implemented, with the most recent activity being the eradication of Gambusia sp. from Scruggs Spring. Rehabilitation of School and Indian springs was discussed. Invasions of Scirpus pose serious problems in both locations.

    f. Owens chub, Gila bicolor snyderi. Life history studies on the Owens chub are progressing very slowly, and we hope to accelerate them in 1981. Additional transplant attempts into the Owens Valley Native Fish Sanctuary are also planned in 1981. An aquarium rearing project is in operation at facilities of the California Department of Fish and Game.

g. Owens dace, Rhinichthys osculus subsp. Populations appear to be stable. Transplants into the Owens Valley Native Fish Sanctuary are planned for 1981.

h. Rhinichthys osculus subsp., Amargosa R. near Beatty, NV
" " " , Amargosa Gorge below Tecopa, CA.

There is some indication that the Springdale and Beatty populations differ from the Amargosa Gorge. Additional taxonomic work is planned during 1981.

i. Mohave chub, Gila bicolor mohavensis. Naval Weapons Center personnel reported a good population at Lark Seep Lagoon. Studies of the Mojave River drainage by California Fish and Game personnel (East Lake near Victorville, Deep Creek, and the Mojave River in Afton Canyon) indicated nothing but G. orcutti. The Fort Soda population is doing well, and the ponds and reservoir at Camp Cady (California Fish and Game property) show promise as introduction sites.

j. Owens pupfish, Cyprinodon radiosus. The key 202 acre parcel in Fish Slough north of Bishop is in the final exchange process and is before Congress in the form of a bill to remove the water rights withdrawal. If and when Congress passes this legislation, the entirety of Fish Slough will be owned by public agencies, and our refugia will be relatively safe from the problems of land development. The new refugium below the Owens Valley Native Fish Sanctuary was very successful in 1980. BLM plans to rehabilitate the BLM Spring Refugium in 1981. Scirpus is proving to be a problem there, too.

k. Tecopa pupfish, Cyprinodon nevadensis calidae. Should any relict populations exist, they are threatened by drilling in the area around Tecopa. Drilling of an illegal water well in 1980 reduced the flow of the Inyo County Recreation Department hot springs by about 50 percent when it could not be capped. More likely than not, the subspecies is extinct.

l. Cottonball Marsh pupfish, Cyprinodon milleri. A field trip to Cottonball Marsh on February 26 revealed the habitat and population to be in good condition.

m. Saratoga Springs pupfish, Cyprinodon nevadensis nevadensis. This population remains in stable condition, with no known threats other than to the integrity of the Amargosa River watershed and supporting aquifers within Nye County, Nevada.

n. Amargosa pupfish, Cyprinodon nevadensis amargosae. The subspecies remains in stable condition within the Amargosa River near and below Tecopa, as is the transplanted population within River Springs (Adobe Valley, Mono Co., Calif.). See long range jeopardy note under the preceding species.

o. Salt Creek pupfish, Cyprinodon salinus. This species appears to be in stable condition, although apparent unusual fluctuations in recent years caused concern to Park Service personnel. Consequently, Park Service and California Fish and Game personnel are currently devising a means of conducting an accurate annual inventory. An initial meeting and field trip to discuss this procedure was held on March 31.

p. Owens sucker, Catostomus fumeiventris. This species remains abundant and stable, especially in the northern portion of its range in the area of Long Valley Reservoir (Crowley Lake).

q. Desert pupfish, Cyprinodon macularius. This species remains highly endangered for several reasons. See item 11 above.

Do not forget to mark your calendars for Nov. 19-21!!

E. P. Pister, Chairman
Death Valley Area Committee

ATTENDANCE LIST

Name	Affiliation	Address
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Tasker Edmiston	" "	
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Sally Stefferud		1492 Argyle, Bishop, CA. 93514
Jerry Stefferud	Inyo NF	873 N. Main St.,Bishop, CA 93514
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Barbara Sada		11535 Oregon Bl., Reno, NV 89502
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Earl Kisler	USFWS	1500 N. Decatur, Las Vegas, NV 8
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Jim St. Amant	F&G	350 Golden Shore, Long Beach 908
Louis Courtois	"	1701 Nimbus Rd. Sacto.,CA 95670
Glenn Black	"	15378 Bird Farm Rd. Chino,CA 917
Bob Love	Nature Conservancy	POB 1006, Yorba Linda,CA 92686
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Michael Havelka	Des.Res.Sta. Barstow Sch.Dist.,	551 H. Ave. Barstow,CA 92311
Leon Hunter	" "	" "

Sonoran Desert Fishes - Mexico Area Coordinator Report Mag Cards
11/1/82

John N. Rinne
Forestry Sciences Laboratory
Rocky Mountain Forest and Range Experiment Station
Arizona State University Campus
Tempe, Arizona 85287

Notes On Collection and Photographing of Fishes

in the Northern Mexico, June 1981

John N. Rinne
Forestry Sciences Laboratory
Rocky Mountain Forest and Range Experiment Station
Arizona State University Campus
Tempe, Arizona 85287

On 12 June 1981 Dr. John Rinne and Martin D. Jakle entered Mexico at Nogales, Sonora. The permit from the Officina Regulacion Pesquera for photographing fishes was picked up at the Forestry Department in Nogales, Sonora. The objective of the trip was to obtain color photographs of live native fishes of the Sonoran Desert region. In a five-day period almost 2,000 km were traveled (see map), 8 localities were collected by seining, gill netting and electro fishing, and 15 species of fishes photographed (see plates). The trip was an excellent beginning for the overall objective of photographing all native species in Sonoran Desert Region of Mexico.

1. Itinerary

Friday 12 June 1981:

Traveled from Nogales, Sonora (depart 1400 hours) to a campsite near Rancho El Jaquito 30 km east of Imuris. Collected in stream at lower end of marsh (under railroad bridge) which is located between highway markers 229 and 230 on highway 2 to Hermosillo (Locality 1, see map).

Saturday 13 June 1981:

Traveled from Rancho El Jaquito (depart 0645 hrs) via Agua Prieta, Janos and Nuevo Casas Grandes to a campsite along Rio Piedras Verde about 3 km north of Colonia Jurez (arrive 1630 hrs). Collected above bridge, in spring beside channelized stream, apparently a tributary of Rio Guzmon about 16 km west of Janos, Chihuahua (Locality 2).

Sunday 14 June 1981:

After photography work we traveled from Rio Piedras Verde (depart 1000 hrs.) via Nuevo Casas Grande, Galena, Buena Ventura, Gomez Farias and camped at the Rio Sirupa 48 km west of Madera (arrived at 1930 hrs). Collected the Rio Piedras Verde (Locality 3), Ojo del Rey Spring several km south of Galena (Locality 4) and set nets in the Rio Sirupa (Locality 5).

Monday 15 June 1981:

After photography work we traveled from Rio Sirupa (depart 1100 hrs.) to a campsite at Rio Papigochic (Rancho San Pedro) 13 km west of La Junta. Collected and photographed fishes at first bend of river about 200 m above bridge (Locality 6).

Tuesday 16 June 1981:

Collected and photographed fishes at Rancho San Pedro then departed (1100 hrs) for Arroyo Ahumado (tributary of Rio Tomochic) 25 km west of Tomochic. Sampled (1300 hrs) and photographed (Locality 7). Returned to the campsite at Rancho San Pedro (arrived 2100 hrs.) after visiting Cascada de Basaseachi.

Wednesday 17 June 1981:

Departed from Rio Papigochic at 0645 hours for Tempe, Arizona, USA. Collected Rio Santa Maria 32 km south of Nuevo Casas Grande (Locality 8). Then on to Janos and Palomas. Checked through Border at 1430 hours.

2. Photographs And Narrative

The only data collected as prescribed by the Permit were colored photographs of species collected (see Plates 1-11). No measurements or other biological information were taken.

At locality 1 only Sonoran topminnow, Poeciliopsis occidentalis sonoriensis (Plate 1), and longfin dace Agosia chrysogaster were captured (Plate 2), photographed and returned alive to the stream. At locality 2 only two species, the Yaqui shiner, Notropis formosus mearnsi (Plate 3) and an undescribed pupfish, Cyprinodon sp. (Plate 2) were taken and photographed. Three species of fishes, 2 cyprindis and one catostomid, were collected and photographed at locality 3: Mexican stoneroller, Campostoma ornatum (Plate 4), beautiful shiner Notropis formosus mearnsi (Plate 3), and Rio Grande sucker, Pantosteus plebius (Plate 4). A single species, an undescribed species of pupfish (Cypronodon sp; Plate 5), was collected at locality 4. Three species of fishes were collected and photographed at locality 5: roundtail chub, Gila rousta (Plate 6), Yaqui sucker, Catostomus bernardini (Plate 7), and Yaqui catfish, Ictalurus pricei (Plate 6).

Locality 6 contained the most diverse fauna of all localities sampled. Seven taxa were collected and photographed at this site: Yaqui sucker, Catostomus bernardini (Plate 8), an undescribed sucker, Catostomus sp (Plate 8), ornate minnow, Codoma ornata (Plate 9), an undescribed pupfish, Cyprinodon sp (Plate 10), Mesa del Norte chub, Gila pulchra (Plate 7), Mexican stoneroller Campostoma ornatum (Plate 4), and bluegill sunfish, Lepomis macrochirus (Plate 10). At locality 7 only one species of trout was photographed, Salmo sp (Plate 11). At locality 8 fathead minnow, Pimephales promelas (Plate 11) was photographed.

En 12 Junio 1981, Dr. John Rinne y Martin D. Jakle entraron Mexico en Nogales, Sonora y cogeron el permiso de la Officina Regulacion Pesquera (para fotografíar peces) en el Departamento Forestales en Nogales, Sonora. El objectivo del viaje era paro obtener fotografías en color de vivo peces nativos en la regioń del Desierto Sonaran. En cinco dias, viajamos cerca de 2,000 km (mapa) y examinamos 8 localidades por red barrendera, "gill netting", y "electro-fishing". Fotografíamos 15 especies de peces (Noté los fotos). El viaje fue un comencio excelente para complir el objectivo principal de fotofraffíar todos los expecies nativos en el Desierto Sonoran en la region de Mexico.

ITINERARIO

Viernes 12 Junio 1981:

Viajamos de Nogales, Sonora (1400 horas) al campo cerca de Rancho El Jaquito, 30 km este de Imuris. Asimos una colección en el rio al punto más bajo de la cienega (bajo la puente de ferrocarril). La localidad es entre medio de las marca de camino 229 y 230 en camino real 2 para Hermosillo (Noté localidad 1, mapa).

Sabado 13 Junio 1981:

Viajamos (0645 horas) de Rancho El Jaquito via Aqua Prieta, Janos, y Casas Grandes, y acampamos cerca de Rio Piedras Verde, como 3 km al norte de Colonia Jurez (1630 horas). Asimos una coleccioń en un manantial al lado del rio (cerca de la puente), al parecer un tributario del Rio Guzman como 16 km oeste de Janos, Chihuahua (localidad 2).

Domingo 14 Junio 1981

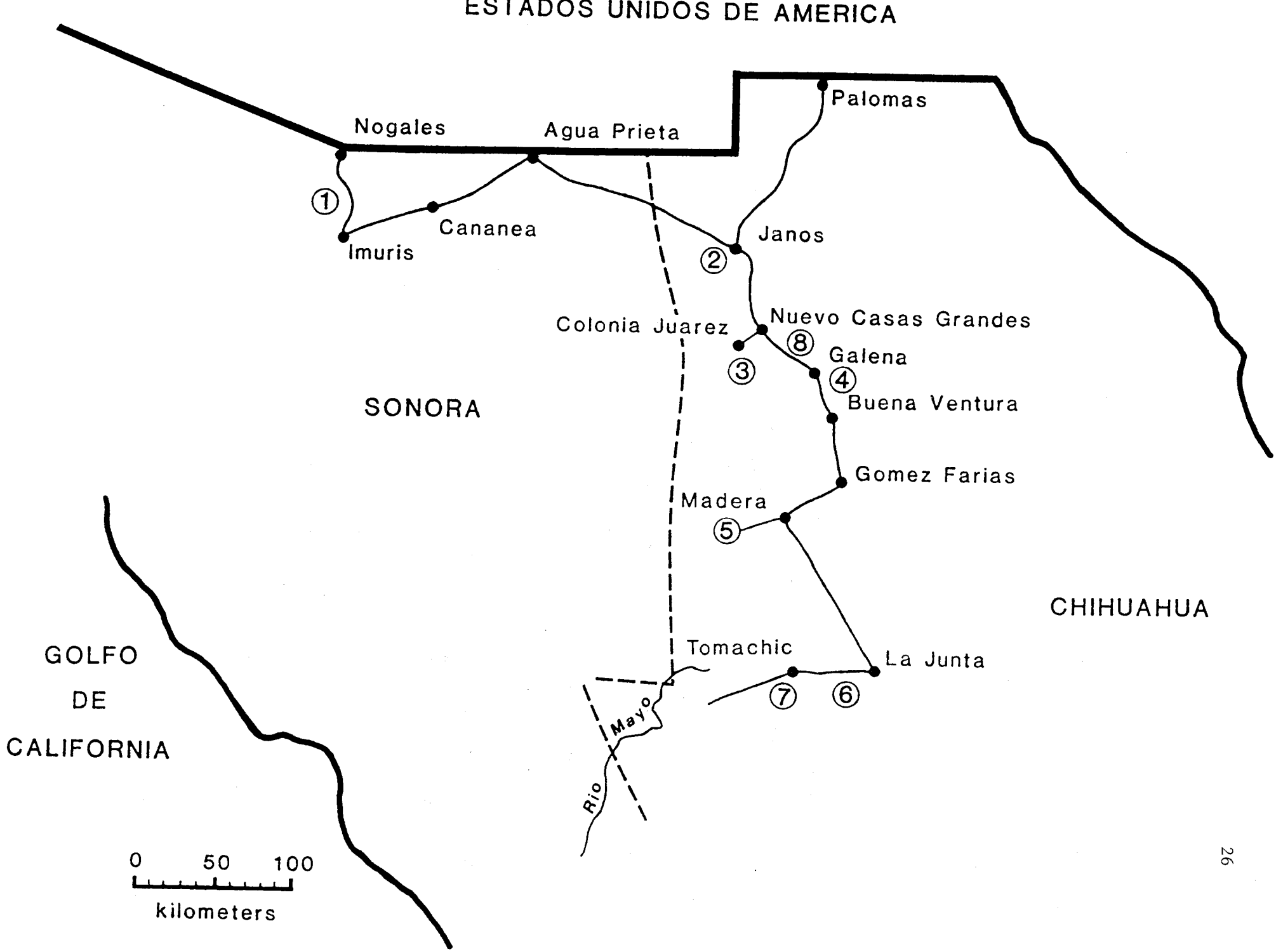
De Rio Piedras Verde viajamos (1000 horas) via Nuevo Casas Grande, Galena, Buena Ventura, Gomez Farias, y acampamos en Rio Sirupa, 48 km oeste de Madera (1930 horas). Asimos colecciońes en el Rio Piedras Verde (localidad 3), Ojo del Rey varios km al sur de Galena (localidad 4) y ponimos redes en el Rio Sirupa (localidad 5).

Lunes 15 Junio 1981:

De Rio Sirupa viajamos (1100 horas) a Rio Papigochic (Rancho San Pedro), 13 km oeste de La Junta. Asimos colecciońes y fotografíamos peces a la primera vuelta del rio, como 200 m antes de la puente (localidad 6).

Martes 16 Junio 1981:

Asimos colecciońes y fotografíamos peces en Rancho San Pedro, y luego viajamos (1100 horas) para Arroyo Ahumado (tributario de Rio Tumochic) 25 km oeste de Tomochic. Allí tomamos pruebas (1300 horas) y fotografías (localidad 7). Regresamos al campo en Rancho San Pedro despues de visitar Cascada de Basaseachi (2100 horas).


ESTADOS UNIDOS DE AMERICA
Nogales
Agua Prieta
Palomas
1
Cananea
Imuris
Janos
2
Colonia Juarez
Nuevo Casas Grandes
8
3
Galena
4
Buena Ventura
SONORA
Gomez Farias
Madera
5
CHIHUAHUA
GOLFO
DE
CALIFORNIA
Tomachic
La Junta
7
6
Mayo
Rio
0 50 100
kilometers

Miercoles 17 Junio 1981:

Viajamos de Rio Papigochic (0645 horas) viajamos y Palomas para Tempe, Arizona, USA. Asimos una colección en Rio Santa Maria, como 32 km al sur de Nuevo Casas Grande (localidad 8). Pasamos la frontera a 1430 horas.

FOTOGRAFÍAS Y NARRATIVO

Al conforme el permiso, la unica información colecciónada eran fotografías en color de especies (Noté placas 1-11). Tomasmos unicamente medidas de lagura pero no otras medidas o otra información biológica.

En localidad #1, pruebamos unicamente "Sonoran topminnow" (Poeciliopsis occidentalis sonoriensis (Placa 1) y "longfin dace" (Agosia chrysogaster. Los fotografíamos y retornamos vivo al rio. En localidad #2 pruebamos unicamente 2 especies, el "Yaqui shiner" (Notropis formosus mearnsii; placa 3) y un desconocido "pupfish" (Cyprinodon spp.; placa 2). Pruebamos y fotografímos trés especies de peces, 2 "cyprindis" y un "catostomid": "mexican stoneroller" (Campostoma ornatum, placa 4), "beautiful shiner" (Notropis formosus mearnsi, placa 3), y "Rio Grande sucker" (Pantosteus plebius, placa 4). Un desconicido especie de "pupfish" (Cyprinodon spp., placa 5) fotografíamos en localidad #4. En localidad #5, pruebamos y fotografíamos trés especies: "roundtail chub" (Gila robusta, placa 6), "Yaqui sucker" (Catostomus bernardini placa 7), y "Yaqui catfish" (Ictalurus pricei, placa 6).

En localidad #6 se contener una fauna mas diverso de todas las otras localidades que pruebamos. Pruebamos y fotografíamos siete especies en esta localidad: "Yaqui sucker" (Catostomus bernardini, placa 8), un desconicido "sucker" (Catostomus sp., placa 8), "ornate minnow" (Codoma ornata, placa 9), un desconicido "pupfish" (Cyprinodon spp., placa 10), "Mesa del Norte chub" (Gila pulchra, placa 7), "Mexican stoneroller" (Campostoma ornatum, placa 4), y "bluegill sunfish" (Lepomis macrochirus, placa 10). Unicamente fotografíamos un especie de "trout" (Salmo sp., placa 11) en localidad 7, y 8 "fathead minnow" (Pimephales promelas, placa 11) en localidad 8.

3. Captions To Plates

Plate I. Sonoran topminnow, Poeciliopsis occidentalis sonoriensis Male, 32 mm (upper), Female, 43 mm (lower).

Plate II. Longfin dace, Agosia chrysogaster 74 mm (upper), Whitefin pupfish, Cyprinodon sp 45 mm (lower).

Plate III. Beautiful shiner, Notropis formosus mearnsi, male, 56 mm (upper), female, 64 mm (lower).

Plate IV. Rio Grande sucker, Pantosteus plebius 52 mm (upper), Mexican stoneroller, Campostoma ornatum 117 mm (lower).

Plate V. Undescribed pupfish, Cyprinodon sp, male, 47 mm (upper), female, 39 mm (lower).

Plate VI. Yaqui catfish, Ictalurus pricei, 155 mm (upper), roundtail chub, Gila robusta 260 mm (lower).

Plate VII. Yaqui sucker, Catostomus bernardini, 310 mm (upper), Mesa del Norte chub, Gila pulchra, 86 mm (lower).

Plate VIII. Yaqui sucker, 107 mm, (upper), undescribed sucker Catostomus sp, 160 mm (lower).

Plate IX. Ornate minnow, Codoma ornata, male, 56 mm (upper), female, 55 mm (lower).

Plate X. Undescribed pupfish, Cyprinodon sp, female, 44 mm (upper), bluegill sunfish, Lepomis macrochirus, 150 mm (lower).

Plate XI. Undescribed trout, Salmo sp. 52 mm (upper), fathead minnow, Pimephales promelas, 55 mm (lower).

Agency Report of The U.S. Fish and Wildlife Service, Sacramento, California

Jack E. Williams and Gail C. Kobetich

Endangered Species Office
U.S. Fish and Wildlife Service
1230 "N" Street, 14th Floor
Sacramento, California 95814

The Sacramento Endangered Species Office will prepare listing packages during 1982 for the Lost River sucker, Catostomus luxatus (with our Olympia, Washington office), and the Owens tui chub, Gila bicolor snyderi. Listing packages prepared by our office during 1980 and 1981 continue to be reviewed in Washington, D.C. These packages include the desert dace, Eremichthys acros, desert pupfish, Cyprinodon macularius, Warner sucker, Catostomus warnerensis, Modoc sucker, C. microps, Hutton Spring tui chub, Gila bicolor subsp., Foskett Springs speckled dace, Rhinichthys osculus subsp., and the Ash Meadows populations of speckled dace, R. osculus nevadensis. Final endangered listing is still pending for the Borax Lake chub, Gila boraxobius. A Memorandum of Understanding, in lieu of listing, will be used for the Warner sucker if local landowners agree to this approach for conservation of the species.

In conjunction with California Department of Fish and Game, our office is developing recovery plans for the Mohave tui chub, Gila bicolor mohavensis, and Owens pupfish, Cyprinodon radiosus. We are also scheduled to update the Unarmored Threespine Stickleback Recovery Plan during 1981. Of primary concern is the maintenance of instream flows in the Santa Clara River system and San Antonio Creek. Our preliminary study of the unarmored threespine stickleback, Gasterosteus aculeatus williamsoni, in San Antonio Creek is nearing completion and we anticipate beginning further studies on Vandenberg Air Force Base involving the endangered stickleback as well as the tidewater goby, Eucyclogobius newberryi. The Fish and Wildlife Service is also involved with prosecuting illegal water diversion activities along important habitat of the unarmored threespine stickleback in the Santa Clara River.

Other activities of the Sacramento Endangered Species Office during the past year include the development and presentation of a management paper for the Amargosa Canyon ecosytem and a recovery plan for the Moapa dace, Moapa coriacea. A habitat management plan was also developed with the aid of the Reno Fisheries Assistance Office, for the Moapa Valley National Wildlife Refuge in Clark County, Nevada.

The perpetuation of the Goose Lake Basin ichthyofauna of Oregon and California is becoming an increasingly important problem. Many of the tributary streams of Goose Lake have been severely degraded by erosion, diversion structures, and overgrazing. Measures that should be taken immediately to maintain the ecosystem include the development and implementation of habitat improvement programs along tributary streams, funding status surveys of the fishes and habitats, and terminating the destructive practice of introducing exotic fishes into the basin.

Reporte de la Agencia de Pesca y Vida Silvestre de los E.U. Sacramento, California

Jack E. Williams y Gail C. Kobetich

Oficina de Especies en Peligro de Extincion
Sercicio de Pesca y Vida Silvestre de los E.U.
1230 Calle "N"
Sacramento, California 95814

La oficina de especies en peligro de extincion de Sacramento preparara listas durante 1982 para el Lost River sucker, Catostomus luxatus (con nuestra Olympia, oficina de Washington), y Owens tui chub, Gila bicolor snyderi. La lista de grupos preparada por nuestra oficina durante 1980 y 1981 continua siendo revisada en Washington, D.C. Estos grupos incluyen el desert dace, Eremichthys acros, desert pupfish, Cyprinodon macularius, Warner sucker, Catostomus warnerensis, Modoc sucker, C. microps, Hutton Spring tui chub, Gila bicolor subsp., Foskett Springs speckled dace, Rhinichthys osculus subsp., y los Ash Meadows populations de speckled dace, R. osculus nevadensis. Todavia esta pendiente por anadir a la lista final Borax Lake chub, Gila boraxobius. Un contrato, en lugar del listado, sera usado para el Warner sucker si los propietarios de las tierras llegan a un acuerdo en la conservacion de la especie.

Nuestra oficina, en conjunto con el Departamento de Pesca y Caza de California esta desarrollando un plan de recobro para el Mohave tui chub, Gila bicolor mohavensis, y Owens pupfish, Cyprinodon radiosus. Tambien se ha estipulado pener al dia el Unarmored Threespine Stickleback Recovery Plan durante 1981. La primera prioridad es el mantenimiento de afluents en el Sistema de el Rio Santa Clara y el riachuelo San Antonio. Nuestros estudios preliminares acerca del unarmored threespine stickleback, Gasterosteus aculeatus williamsoni, en el riachuelo San Antonio esta cerca a completarse y anticipamos el comienzo de futuros estudios en la Base de la Fuerza Aerea Vandenberg relacionado con la especie en peligro de extinicion stickleback como tambien el tidewater goby, Eucyclogobius newberryi. El Servicio de Pesca y Vida Silvestre esta ademas involucrado en procesar actividades ilegales en el desvio de aguas a lo largo de importantes areas del unarmored threespine stickleback en el Rio Santa Clara.

Otias actividades de la Oficina de Especies en Peligro de Extincion de Sacramento durante el pasado ano incluyo el desarrollo y presentacion del plan de manejo para el ecosistema del Canon de Amargosa y el plan de manejo para el area de Moapa Valley National Wildlife Refuge en el Cendado Clark, Nevada que fue desarrollado con la ayuda de la Oficina de Asistencia de Pesca de Reno.

La perpetuacion de la ictiofauna de Goose Lake Basin de Oregon y California esta constituyendo un enorme problema de suma importancia. Muchos de los afluentes de Goose Lake han sido severamente degradados

por erosion, estructuras de desvios, y sobre pastores. Medidas que deben ser tomadas immediatamente para mantener el ecosistema incluyen: el desarrollo he implantacion de programas para el mejoramiento de areas a lo largo de los afluentes, dinero disponible para los estudios de peces y sus areas, y terminar con la practica destructiva de introducir peces exoticos dentro del area.

AGENCY REPORTS - CALIFORNIA DEPARTMENT OF FISH AND GAME

Leonard Fisk, Chief, Inland Fisheries Branch, Sacramento

The California Department of Fish and Game has experienced some cuts in personnel this year, and will continue to lose more over the next couple of years. The loss of Federal Endangered Species funds for 1981-82 resulted in the loss of three biologists in the fisheries function and a like number in wildlife. We have enough funds to continue the program at a reduced level until July 1, 1982. The Department has submitted a Budget Change Proposal to continue our nongame, rare, and endangered program in 1982-83 using State Environmental Protection Program (personalized license plates) funds. This will provide a staff of four people -- a supervisor, and a coordinator for fishes, for amphibians and reptiles, and for invertebrates. Our long-range goal is to have this program supported by General Fund appropriations.

A complicating factor is that the Department is now expending license funds at a rate of about $2 million annually in excess of income. This will exhaust our "bank account" in about two years. We are now in the process of prioritizing our programs, with the intent of eliminating or curtailing certain ones in order to reach a balance of income-outgo. No decisions have been made on which programs will be affected.

INFORME DE AGENCIA - DEPARTAMENTO DE PESCA Y CAZA DEL ESTADO DE CALIFORNIA

Leonard Fisk, Chief, Inland Fisheries Branch, Sacramento

El Departamento de Pesca y Caza ha tenido unos disminuciones en personal este año y continuara perder más en los dos años que viene. El perdido de los fondos federales por especies comprometidos por 1981-82 ha resultado en el perdido de tres biologos en la funcion de pesqueras y al mismo numero en fauna. Tenemos adecuado fondos para continuar el programa a un nivel reducido hasta el primero de Julio, 1982. El Departamento ha presentado un propósito por cambiar el presupuesto para continuar nuestro programa por especies no-cazas, especies raros, y especies comprometidos en 1982-83, empleando fondos del Programa Estado de Ambiente Protección (licencias personales por autos). Este acción pagara por cuatro empleados--un director, y coordenadores por peces, anfibios y reptiles, y invertebrados. Nuestro meta de gran alcance es tener este programa suportada por dinero del fondo general.

Un factor complicador es que el Departamento esta gastando ahora fondos de licencias a razón de más o menos dos millones de dólares cada ano en excess de ingreso. Este agotara nuestro "cuenta de ahorro" en más o menos dos años. Nosotros estamos ahora en el proceso de poniendo nuestros programas por orden de preferencia con el propósito de eliminar o cercenar programas ciertos para obtener un balance de ingreso y egreso. No decisiones han estado hacer de que programas estaran afectado.

AGENCY REPORT
BUREAU OF LAND MANAGEMENT

Neil B. Armantrout

Desert Fishes Council, Death Valley, CA
November 18-20, 1981

GENERAL

As with many other Federal agencies, the Bureau of Land Management has had to reduce spending on wildlife. While the actual cuts will not be known until after passage of the 1982 budget, it is certain that major reductions will occur in habitat improvement work, inventory and monitoring. Concurrent with the budget reduction there is a general reorganization of the Bureau. The purpose is to place more of the personnel and decision-making in the district and area offices. It is anticipated that there will be very few biologists remaining in state offices, but may be an increase in the number of district or area biologists, depending upon final manpower ceilings. While priority fisheries will be taken care of, there will probably be a reduction in the efforts for habitat maintenance and improvement for the fisheries resources overall.

CALIFORNIA

Owens Pupfish. A land exchange agreement has been signed by the BLM and the owner of 202 acres of private lands (the last remaining private inholding) within the proposed Fish Slough Ecological Study area and Owens Pupfish Critical Habitat. The exchange cannot be consumated, however, without passage of H.R. 2475 introduced by Congressman Shumway. This bill would simultaneously withdraw the acquired lands and rescind the withdrawal on the offered lands within Mono County. Hearings were held October 5, 1981 by the Committee on Interior and Insular Affairs on the bill, however to date no action has been taken.

In the meantime, renovation of a predatory fish barrier located at a BLM spring in Fish Slough has been completed as scheduled.

Mohave Chub. Emphasis within the past year has been to maintain the habitats at Fort Soda (Zzyzx Spring) in good condition. Efforts to expand the available habitat by construction of an additional pond at Fort Soda were stopped when an Indian grave site was discovered.

The BLM issued a contract with the California Department of Fish and Game to evaluate the condition of populations in two of the three habitats at Fort Soda. This project will be completed in June of 1982.

Amargosa Canyon Fishes. The BLM entered into an interagency agreement with the U. S. Fish and Wildlife Service to survey the Amargosa River between Tecopa and Dumont Dunes. The objectives of the study are to document the distribution of Amargosa pupfish and speckled dace. The speckled dace are also to be examined in hopes of determining their taxonomic status. Field work on this project has been completed and a final report is expected by February, 1982. BLM also plans to prepare a management plan for the Amargosa Canyon during FY 82 assuming funds are available.

Desert Pupfish. The area around San Sebastian Marsh/San Felipe Creek has been designated as an Area of Critical Environmental Concern (ACEC) in the California Desert Plan. A management plan for this area will be prepared as soon as funding is available and several problems resolved (i.e., scattered ownership pattern and existing reclamation withdrawal on public lands).

IDAHO

Redband trout. A report is due in Copeia on electrophoretic patterns. Inventories are continuing in the Bruneau-Kuma and Jarbridge Planning Units. Protection of habitat in the Owyhee EIS area has started, using fences, barriers, grazing systems, etc.

Shoshone Sculpin. The fish is now a candidate for T/E listing. A contract to study the fish in the Shoshone District (Box Canyon and Blue Heart Springs) by Jack Griffith of Idaho State University is nearly complete. A relatively large population is found in both spring areas, but the range is very restricted. Box Canyon area is especially sensitive due to human activities. BLM management will seek to protect the habitat, and possibly spread the distribution.

Warm Springs Snail. Water levels at Indian Bath Tub (near Bruneau River, Boise District) has dropped to about 10% of former flow due to wells for irrigation. An unnamed endemic snail (about 2 mm in diameter) formerly was found in algae growing in warm water seeps at the Bath Tubs. The water level has dropped, drying up the seeps and algae, and the snails are presently found only in the main creek below the Bath Tub on private lands. The snails are being studied by FWS as candidate T/E species. BLM's role is to determine 1) exact causes of water drop, 2) exact land ownership and management responsibilities, and 3) presence of additional habitat in other warm springs where possible transplants could be made. Remote sensing is being instigated as a tool to monitor spring water levels. The main concern is that high water might sweep snails into the Bruneau River where they will probably die due to cold water. New wells in the area may be restricted; old ones may be modified to pump from other than warm water levels.

UTAH

The main efforts are in maintaining the aquatic program. The habitat improvements were finally completed in Rock Creek in Desolation Canyon. Evaluations will be done on the situation in Trout Creek.

NEVADA

The land exchange for Ash Meadows is underway, although it was delayed by the proposed listing of a group of endangered plants. Part of the Ash Meadows habitat management plan is being implemented. A HMP is also being implemented in Railroad Valley; there is a problem in Railroad Valley from reduced flows due to pumping of wells. The Elko District began fencing for the relict dace, but ran into strong local opposition and is now putting the project on hold. Mahogany Creek shows some improvement, but Summer Creek remains heavily grazed. Goshute Creek is under a protective grazing plan but has been heavily grazed.

WYOMING

Bruce Smith continues his studies in Rock Springs on the native trout. The Rawlins District is developing an HMP on the Snake River trout.

COLORADO

Improvements and renovations are being completed for the Colorado cutthroat trout. These include habitat improvements and removal of Brook trout. Additional post-treatment studies will be done. The final report on habitat requirements in the Yampa River, done in conjunction with the Bureau of Reclamation, is due in January.

ARIZONA

Agreement has been reached with Arizona Game and Fish on the introduction of sensitive fish, such as the Gila topminnow, pupfish, etc. Sites have been selected for some of the introductions. Aravaipa Creek Canyon has been nominated by James Watt as a Wilderness Area.

An aquatic invebtory was completed on the lower Gila River (Phoenix to Yuma, abt. 199 mi). Nineteen plus species were taken with Mugil cephalus (mullet) the only native. An aquatic inventory is to be initiated for the Paria River Primitive Area in Spring, 1982.

A mining plan has been drawn up for Cocio Wash, with participation of state, private and Federal agencies. A habitat management plan is being developed to implement the plan.

BLM, in agreement with Arizona Game and Fish, is placing much of their emphasis in FY 82 on identification of aquatic habitat and fish populations, and development of management plans. A major effort is also being made to cooperate with the management of sport and non-game fish species in the Colorado River.

NEW MEXICO

BLM is cooperating with New Mexico Game and Fish in a planning update on the Gila River. They are also cooperating with the Fish and Wildlife Service on management in the Rio Grande and Red Rivers, including determining minimum flows. A proposal was made by FWS and New Mexico F&G for reintroduction of the Pecos gambusia; this received a tentative approval from the State Director, but the proposal has not been pursued by the initiating agencies. An intensive management plan is being implemented for recreation use on the Rio Grande that could benefit aquatic habitat.

OREGON

The emergency listing of the Borax Lake Chub expired without a permanent listing action being taken. Current management actions are in accordance with the consultation agreement with FWS. A habitat management plan is being written for the Alvord Basin that will consider all aquatic habitat, but the preparation and implementation will depend upon funding availability.

Habitat improvement projects continue in the Whitehorse and Willow Creek drainages for the Whitehorse Trout. Additional areas have been fenced, and stream improvement structures placed in the streams. The land exchange which would give BLM nearly complete control over the Whitehorse and Willow Creeks is nearing completion.

Habitat improvements have been made for the Foskett Springs Dace, and they are functioning. A transplant was made to an adjoining spring on public lands. For a time, it was feared the transplant had not taken, but the last report was that a resident population has become established. The second spring has been fenced to exclude livestock.

Most of the Warner sucker habitat on public lands has been fenced. Local livestock owners have been quite cooperative in the effort. Two land exchanges for Warner sucker habitat are being considered, although implementation is limited because of the lack of funds or personnel to carry out the exchanges.

THE NATURE CONSERVANCY'S REPORT FOR VOLUME XIII OF THE DESERT FISHES COUNCIL PROCEEDINGS

Roughly one year after its inception, the Conservancy's Great Basin program has made progress towards preserving some of Utah and Nevada's important natural areas including several aquatic systems which support unique desert fish species.

Most notably, on December 1, 1981, the Conservancy exercised its option for the purchase of 40 acres at the head of Condor Canyon in Nye County, Nevada; a purchase which will enable The Nature Conservancy to file on the in-stream flow water rights over two and one half miles of important stream habitat on public land below the acquired parcel.

The net effect of this transaction will be the protection of a largely undisturbed free flowing desert aquatic system and three associated endemic desert fish species (a mountain sucker, a speckled dace, and most importantly, the once thought to be extinct Panaca Big Spring spinedace) for the modest cost of a small acquisition together with the processing of proper water rights applications. Because the fee simple acquisition involved makes the protection of a much larger system possible, it can be truely said that a gift to The Nature Conservancy's Condor Canyon project represents "more for your preservation dollar." $14,000 is now needed to fulfill fundraising obligations.

In addition to Condor Canyon, the Conservancy has been working actively on the following projects related to desert fish and aquatic systems: Ash Meadows, Soldier Meadows, Locke's Ranch, Pilot Peak, and the Bobcat and Anderson ranches. A

long term plan has been developed that calls for the expansion of The Nature Conservancy's activities in the Great Basin over the next four years. Those which aim to join the organization or contribute should write to:

Dave Livermore
The Nature Conservancy
Western Regional Office
156 Second Street
San Francisco, CA 94105

CHARACTERISTICS AND LIFE HISTORY OF CATOSTOMUS WARNERENSIS

C. E. Bond and Candia Coombs

The Warner sucker, Catostomus warnerensis, was described by Snyder (1908) from a holotype of 296 mm and 12 paratypes ranging from 54 to 245 mm. Only two of these were over 150 mm. Specimens available to Andreasen (1975) were mostly small as well. We present data on 13 preserved adults, 149 mm to 320 mm, numerous live specimens measured in the field, and many color photographs. Museum material examined is as follows, all specimens are in the fish collection of Oregon State University Department of Fisheries and Wildlife (OS): OS 2710 (1) ♀, 167 mm; OS 2440 (1) ♀, 158 mm; OS 5142 (2) ♀, 280 mm, ♂, 220 mm; OS 5256 (3 ♂) 234, 240, 286 mm; OS 5311 (2) ♀, 149 mm, ♂, 155 mm; OS 6358 (1) ♂, 302 mm; OS 6359 (1) ♂, 267 mm; OS 7032 (1) ♀, 320 mm; OS 7035 (1) ♀, 228 mm. Some of these were used in Andreasen's study.

CHARACTERISTICS OF C. warnerensis

General--The Warner sucker reaches a moderate size; the largest measured to date was 372 mm SL. The heaviest specimen was 354 mm but weighed 1450 grams. This is a relatively slender species with moderately large lower fins. The dorsal fin tends to be smaller than that of other Catostomus species. Figure 2 of Snyder (1908), showing the holotype, is an excellent likeness, accurately depicting the proportions and the limits of pigmentation. The actual pigmentation is more remarkable than presented by Snyder, who mentioned the characteristic sharp demarcation between the dark upper sides and back and the creamy white (in preservation) lower sides and belly. His figure shows the connection of dark pigment of the side with the dark pigment on the upper surface of the pectoral fin. In life, most individuals are

characterized by heavy mottling in the dark pigment, some having a blotchy appearance. Some males in breeding season are so heavily pigmented on the back that the mottling is not evident. These very dark males usually have a brilliant red stripe mixed with the dark pigment of the sides, and this contrasts sharply with the silvery white of the belly. The overall appearance of such males is strikingly beautiful.

Not all breeding fish show bright color. Some have the same mottled back and side pigmentation that is common in late summer and fall. Others have a coppery wash down the sides, but most show a side stripe of pink to red. These stripes vary in width. The paired fins are dusky on the upper surface only, and all lower fins are edged with lighter color. Some males show an intense dark spot at the origin of the pectoral fin.

Distinguishing characteristics--Meristic counts and proportional measurements for the 13 museum specimens are presented in Table 1. These compare reasonably well with those presented by Snyder (1908) and Andreasen (1975) with a few exceptions. Snyder reported on smaller fish so his proportional figure of .045 for eye diameter is greater because of allometry. In addition, his method of counting scales above the lateral line "to the middle of the back" apparently gave higher counts than our counts to the origin of the dorsal fin. Snyder did not obtain counts of lateral line scales over 79, whereas we and Andreasen recorded counts up to 83. Andreasen's reported low count of 68 was taken from a mis-labeled specimen of C. occidentalis, as did dorsal counts of 12 and pelvic counts of 8.

C. warnerensis is distinguishable from other western Catostomus by the following characteristics:

1. Dorsal fin base short, its length usually less than, or equal to, the depth of the head.

Table 1. Meristic counts and proportional measurements (thousandths of SL) for 13 C. warnerensis

Character	Range	Mean Value	Standard Deviation
Standard Length (mm)	149-230	223.5	57.8
Eye Diameter	.027-.034	.031	.003
Head Length	.227-.275	.252	.014
Depth Caudal Peduncle	.077-.104	.089	.008
Snout Length	.102-.131	.119	.010
Snout to Dorsal (n=12)	.437-.536	.498	.030
Head Depth	.136-.178	.157	.011
Mouth Width	.060-.076	.067	.005
Dorsal Base Length	.119-.172	.147	.015
Lateral line scales (n=12)	74-83	78.08	3.390
Scales above lat. line (n=12)	15-17	15.83	.093
Scales anal to lat. line	9-12	11.08	.862
Dorsal fin rays	9-11	10.23	.832
Anal fin rays	7-8	7.23	.438
Pectoral fin rays	14-17	15.61	.960
Pelvic fin rays	9-11	9.69	.630

2. Dorsal with 9 to 11 rays.
3. Pelvic rays 9 to 11.
4. Lateral line scales 73 to 83.
5. Eye small, .035 SL or less in adults.
6. Fronto-parietal fontanelle large, its width more than half the eye diameter in adults.
7. Scales around caudal peduncle usually 25 or more.
8. Dark pigmentation absent from lower 1/3 of body, not reaching pelvics or anal fin; in adults, unpigmented area extends around snout above upper lip.

9. Cleft of lower lip incomplete, 2 or 3 rows of papillae cross midline. Cartilaginous jaw edge not prominent, but noticeable in occasional specimens.

C. warnerensis resembles C. tahoensis, as has been noted by others, but can be distinguished from that species by its distinctive pigmentation, wider fontanelle, smaller eye, and larger scales.

Sexual dimorphism--Most males develop tubercles on the anal fin, caudal fin and caudal peduncle during breeding season. Many show small, granular tuberculation on the head and back. Very few have tubercles on the pectoral and pelvic fins. Others virtually lack tubercles. A few females show weak tuberculation.

The lower fins of males are generally longer that those of females. Table 2 presents results of measurements of fins of live fish in the field.

Table 2. Comparison of fin heights (in thousandths of SL) of mature male and female C. warnerensis. (n = 50 except where noted)

	mean height - (standard deviation)	
fin	male	female
Anal fin	.212(.013) n=43	.194(.013)
Pectoral fin	.187(.013)	.182(.044)
Pelvic fin	.159(.012)	.152(.017)

The anal fin of male fish is broad and rounded on the distal edge, and the ends of the fin rays are well separated. In females the distal edge is angular to pointed, and the ends of adjacent fin rays are very close together. In most adult fish, the skin covering the fin rays is thicker in females than

in males.

Males are often more intensely colored than females, but color is subject to great variation. Usually, the red stripe is wider in females than in males. Females apparently reach a larger size than males.

BIOLOGY

Migrations and Spawning--Suckers apparently spend the fall and winter in lakes or deep portions of canals and creeks, then migrate to gravel-bottomed areas in the spring for spawning as water temperature reaches about 8° C. Ripe or spent fish were found during April and May in Deep Creek, Honey Creek, Snyder Creek and the waterways north of Hart Lake. We suspect that most spawning occurs in late April through May, although actual spawning was not observed. Larvae were first collected on June 4 and the last recently-spawned fish on June 24. Postlarvae were collected as late as July 23 on Snyder Creek. Water temperature during May and June usually ranges between 8 to 15° C.

Growth--Postlarvae ranged from 11 to 17 mm. Metamorphosed juveniles 21 to 28 mm were seen in Honey Creek about 4 weeks following the appearance of postlarvae (June 8). At about 30 mm the juveniles left the stream edges and moved into deeper water.

The average length of one-year-old fish was 40 mm. Average length at two years was 80; at three years, 130; at four years, 160; at five years, 210; at six years, 250; at seven years, 300; and at eight years, 330 mm. The largest fish measured (no scale taken) was 372 mm, so possibly the Warner sucker lives to an age of nine or ten years.

POPULATIONS

Spawning populations are now known from Honey Creek, Snyder Creek, Twenty-mile Creek and Deep Creek (= Warner Creek, the type locality). Ripe and spent individuals were found in the spillway pool at the outlet of Hart Lake. These apparently were on an upstream migration to Hart Lake when the spillway was closed. Because no larvae or juveniles were found in this waterway, the inference is that spawning in that waterway was unsuccessful. The presence of these separate populations leads to the conclusion that the sucker is not endangered but is threatened with endangerment.

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December 15, 1981

Mr. Phil Pister
Secretary, Desert Fishes Council
California Department of Fish and Game
407 West Line Street
Bishop, CA 93514

Dear Phil:

Here is the Spanish version of the C. warnerensis paper. German Pequeño, professor at Universidad Austral, Valdivia, Chile, was kind enough to translate it for me.

In working up the translation, we noted that in the literature cited of the English version I left with you, I had "Snyder, 1980" instead of 1908. Please make the correction for me.

Happy Holidays,

Carl E. Bond
Professor of Fisheries

CEB:ljb

Encl.

Características e Historia Natural de Catostomus warnerensis

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Oregon State University, Corvallis, Oregon

El Warner sucker, Catostomus warnerensis, fue descrito por Snyder (1908) a partir de un holotipo de 295 mm y 12 paratipos desde 54 hasta 245 mm. Sólo dos de estos estuvieron sobre 150 mm. Los especímenes con que contó Andreasen (1975) también fueron mayoritariamente pequeños. Ahora pesentamos data sobre 13 especimenes adultos preservados, de 149 mm a 320 mm, numerosos especímenes vivos medidos en el terreno y varias fotografías en colores. Todos los especímenes examinados están en la colección de peces del Department of Fisheries and Wildlife de la Oregon State University [OS], y son los señalados a continuación: OS 2710 (1) ♀, 167 mm; OS 2440 (1) ♀, 158 mm; OS 5142 (2) ♀, 280 mm, ♂, 220 mm; OS 5256 (3 ♂), 234, 240, 286 mm; OS 5311 (2) ♀, 149 mm, ♂, 155 mm; OS 6358 (1) ♂, 302 mm; OS 6359 (1) ♂, 267 mm; OS 7032 (1) ♀, 320 mm; OS 7035 (1) ♀, 228 mm. Algunos de estos fueron usados en el estudio de Andreasen.

Características de C. warnerensis

Generales. El Warner sucker alcanza un tamaño moderado; el mas largo medido hasta hoy tuvo 372 mm L.S. El especímen de mas peso tuvo 354 mm pero peso 1450 g. Es una especie relativamente delgada con aletas inferiores moderadamente grandes. La aleta dorsal tiende a ser mas pequeña que las de otras especies de Catostomus. La figura 2 de Snyder (1908), que muestra al holotipo, es un excelente retrato vivo, describiendo correctamente las proporciones y los límites de pigmentación. La pigmentación real es mas marcada que la presentada por Snyder, quien menciona la característica precisa de demarcación entre el dorso

y los lados superiores oscuros y el vientre y los sectores inferiores de blanco cremoso (en los preservados). Su figura muestra la conexión de pigmento oscuro del costado con el pigmento oscuro de la superficie superior de la aleta pectoral. En vida, la mayoría de los individuos se caracterizan por un fuerte jaspeado en el pigmento oscuro, algunos llegan a tener apariencia de manchado. Algunos machos durante la época de crianza están tan fuertemente pigmentados sobre el dorso que el jaspeado no es evidente. Aquellos machos oscuros usualmente tienen una banda roja brillante mezclada con el pigmento oscuro de los costados y esto contrasta nítidamente con el blanco plateado del vientre. La apariencia completa da tales machos es llamativamente hermosa.

Todos los peces durante la crianza no muestran color brillante. Algunos tienen el mismo dorso jaspeado y la pigmentación lateral que es común a fines de verano y otoño. Otros tienen un color cobrizo lavado en los costados inferiores, pero la mayoría muestran una banda lateral de rosado a rojo. Estas bandas varian en ancho. Las aletas pares son oscuras sólo en su superficie superior, y todas las aletas inferiores están festoneadas con color mas claro. Algunos machos muestran una intensa mancha oscura en el origen de la aleta pectoral.

Características distintivas. Las cuentas merísticas y las medidas proporcionales para los 13 especímenes de museo se presentan en la Tabla 1. Esta compara razonablemente bien con lo presentado por Snyder (1908) y Andreasen (1975) con unas pocas excepciones. El registro de Snyder fue sobre peces pequeños de modo que su figura en proporción de .045 para diámetro del ojo es mas grande debido a alometría. Además, su método de contar escamas sobre la línea lateral "hasta el centro del dorso" aparentemente dió cuentas mayores que las nuestras tomadas hasta el origen de la aleta dorsal. Snyder no logró contar mas allá

de 79 escamas en la línea lateral, mientras que nosotros y Andreasen contamos hasta 83. El bajo recuento de Andreasen de 68 fue tomado de un ejemplar mal etiquetado de C. occidentalis, así como sus cuentes de 12 en la dorsal y 8 en la pélvica.

Tabla 1. Cuentas merísticas y medidas proporcionales (milésimos de L.S.) en 13 ejemplares de C. warnerensis

Caracter	Rango	Promedio	Desviación Standard
Longitud stantard (mm)	149-230	223.5	57.8
Diámetro ocular	.027-.034	.031	.003
Longitud de la cabeza	.227-.275	.252	.014
Altura pedúnculo caudal	.077-.104	.089	.008
Longitud de la nariz	.102-.131	.119	.010
Nariz a la dorsal (n=12)	.437-.536	.498	.030
Altura de la cabeza	.136-.178	.157	.011
Ancho bucal	.060-.076	.067	.005
Longitud base de la dorsal	.119-.172	.147	.015
Escamas en la línea lateral(n=12)	74-83	78.08	3.390
Escamas sobre línea lat.(n=12)	15-17	15.83	.093
Escamas entre la anal y línea lat.	9-12	11.08	.862
Rayos aleta dorsal	9-11	10.23	.832
Rayos aleta anal	7-8	7.23	.438
Rayos aleta pectoral	14-17	15.61	.960
Rayos aleta pélvica	9-11	9.69	.630

C. warnerensis se distingue de otros Catostomus del oeste por las siguientes características:

1. Base de la aleta dorsal corta, siendo su longitud usualmente menos que, o igual a la altura de la cabeza.
2. Dorsal con 9 a 11 rayos.
3. Rayos pélvicos 9 a 11.
4. Escamas de la línea lateral 73 a 83.
5. Ojo pequeño, .935 L.S. o menos en adultos.
6. Fontanela fronto-parietal grande, siendo su ancho mas que la mitad del diámetro del ojo en adultos.
7. Escamas alrededor del pedúnculo caudal usualmente 25 o mas.
8. Pigmentación oscura ausente del tercio inferior del cuerpo, no alcanzando a las pélvicas o a la anal; en adultos, un área sin pigmentación se extiende alrededor de la nariz sobre el labio superior.
9. Hendidura del labio inferior incompleta, 2 a 3 corridas de papilas cruzan la línea media. Borde cartilaginoso mandibular no destacado, pero perceptible en algunos especímenes.

C. warnerensis se parece a C. tahoensis, como ha sido señalado por otros, pero puede distinguirse de esa especie por su pigmentación distintiva, fontanela mas ancha, ojo mas pequeño y escamas mas grandes.

Dimorfismo sexual. La mayoría de los machos desarrollan tubérculos sobre la aleta anal, aleta caudal y pedúnculo caudal durante la época de crianza. Muchos muestran tuberculización granular pequeña sobre la cabeza y el dorso. Muy pocos tienen tubérculos sobre las aletas pectorales y pélvicas. Otros carecen virtualmente de tubérculos. Unas pocas hembras muestran débil tuberculización.

Las aletas inferiores de los machos generalmente son mas largas que aquellas de las hembras. La Tabla 2 presenta resultados de medidas de aletas de peces vivos tomadas en terreno.

Tabla 2. Comparación de altura de las aletas (en milésimos de L.S.) de machos y hembras maduros de C. warnerensis (n=50, excepto cuando se señala).

Aleta	Altura media - (Desviación standard) machos	hembras
Anal	.212(.013) n=43	.194(.013)
Pectoral	.187(.013)	.182(.044)
Pelvica	.159(.012)	.152(.017)

La aleta anal de los machos es amplia y redondeada en su borde distal y los extremos de los rayos están bien separados. En las hembras el borde distal es angular a puntiagudo, y los extremos de los rayos adyacentes están muy juntos unos a otros. En la mayoría de los peces adultos la piel que cubre los rayos de las aletas es mas gruesa en las hembras que en los machos.

Los machos a menudo están mas intensamente coloreados que las hembras, pero el color esta sujeto a gran variación. Usualmente, la banda roja es mas ancha en las hembras que en los machos. Aparentemente las hembras alcanzan un tamaño mayor que los machos.

Biología

Migraciones y puesta. Aparentemente los suckers pasan el verano e invierno en los lagos o partes profundas de canales y arroyos, entonces migran a areas con fondo pedregoso en la primavera, para poner cuando la temperatura del agua alcanza alrededor de 8° C. Se encontró peces maduros o desovados durante abril y mayo en Deep Creek, Jones Creek, Snyder Creek y en corrientes de agua al norte de Hart Lake. Sospechamos

que la mayoría de la puesta occurre a fines de abril y durante mayo, ya que la puesta real no fue observada. Las primeras larvas se coleccionaron el 4 de junio y los últimos peces recién desovados el 24 de junio. Se colectaron postlarvas después, el 23 de julio en Snyder Creek. La temperatura del agua durante mayo y junio usualmente varía entre 8° y 15° C.

Crecimiento. Las postlarvas tuvieron un rango entre 11 y 17 mm. Juveniles metamorfoseados de 21 a 28 mm fueron vistos en Honey Creek alrededor de 4 semanas después de la aparición de las postlarvas (8 de junio). Alrededor de 30 mm los juveniles dejan los bordes de la corriente y se mueven hacia aguas mas profundas.

La longitud promedio de los peces de un año de edad fue 40 mm. La longitud promedio a 2 años fue 80; a 3 años 130; a cuatro años 160; a cinco años 210; a seis años 250; a siete años 300; y a 8 años, 330 mm. El pez mas largo medido (no se sacó escamas) tuvo 372 mm, así posiblemente el Warner sucker vive hasta una edad de nueve o diez años.

Poblaciones

Ahora se conocen poblaciones capaces de desovar de Honey Creek, Snyder Creek, Twenty-mile Creek and Deep Creek (=Warner Creek, la localidad Tipo). Se encontró individuos maduros y desovados en la laguna del vertedero en el desagüe de Hart Lake. Aparentemente estos estaban en una migración aguas arriba hacia Hart Lake cuando el vertedero fue cerrado. Debido a que no se encontró larvas o juveniles en este riachuelo, la inferencia es que la frezada allí fue sin éxito. La presencia de estas poblaciones separadas conduce a la conclusión de que el Warner sucker no está en peligro pero esta amenazado con riesgo.

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(Traducido por G. Pequeño)

CONSERVATION OF DESERT SPRING HABITATS AND THEIR ENDEMIC FAUNA IN NORTHERN CHIHUAHUA, MEXICO

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ABSTRACT.-- A system of isolated springs west of Villa Ahumada, Chihuahua, Mexico, provides limited aquatic habitat in an arid basin within the Chihuahuan Desert Region. The springs shelter relicts of a Pleistocene lacustrine environment including mollusks, crustaceans, fishes, amphibians and reptiles, many of which are endemic. The aquatic fauna is threatened by reduction and modification of its habitat due to agricultural development.

ABSTRACTO.-- Un sistema de manantiales aislados al oeste de Villa Ahumada, Chihuahua, México, provea una habitación acuática restringida en un bolsón árido del Desierto de Chihuahuá. Los manantiales refugian a las relíquias biológicas de una laguna pluvial del Plestoceno. La fauna acuática, que incluye muchas especies endémicas, consta de moluscos, crustáceos, peces, amphibios y reptiles. La fauna es amenazada por la reducción y la modificación del ambiente acuático que resulta del desarrollo agrícola.

The modification of natural environments to suit human purposes has frequently resulted in the loss of particular species or populations of organisms. As exploitation of natural resources continues, another level of biotic impoverishment is reached; not only do individual taxa continue to disappear, but entire ecosystems or habitat types are lost. One type of habitat which is currently being drastically altered and reduced comprises the isolated springs of desert regions. The purpose of this paper is to make known one of the remaining examples of this habitat type and to discuss recent and impending modifications there.

Ojo de Carbonera and a system of associated springs are located about 35 km west of Villa Ahumada, Chihuahua, Mexico (Fig. 1) in an endorheic basin, the Bolsón de los Muertos. The springs are associated with an alkali flat, the southern lobe of a playa locally known as "El Barreal." They are probably typical of isolated desert springs in the Mexican Basin and Range section, an area that has been subject to a cycle of alternating pluvial and arid climates (Axelrod, 1979; Van Devender and Spaulding, 1979) that have been associated with great fluctuations in the volume of aquatic habitat (Miller, 1981; Smith, 1981). Reconstructions of past climates from paleobotanical data reveal that aridity is more severe now than at any earlier time (Axelrod, 1979); presumably, the volume of aquatic habitat is currently at its most reduced state.

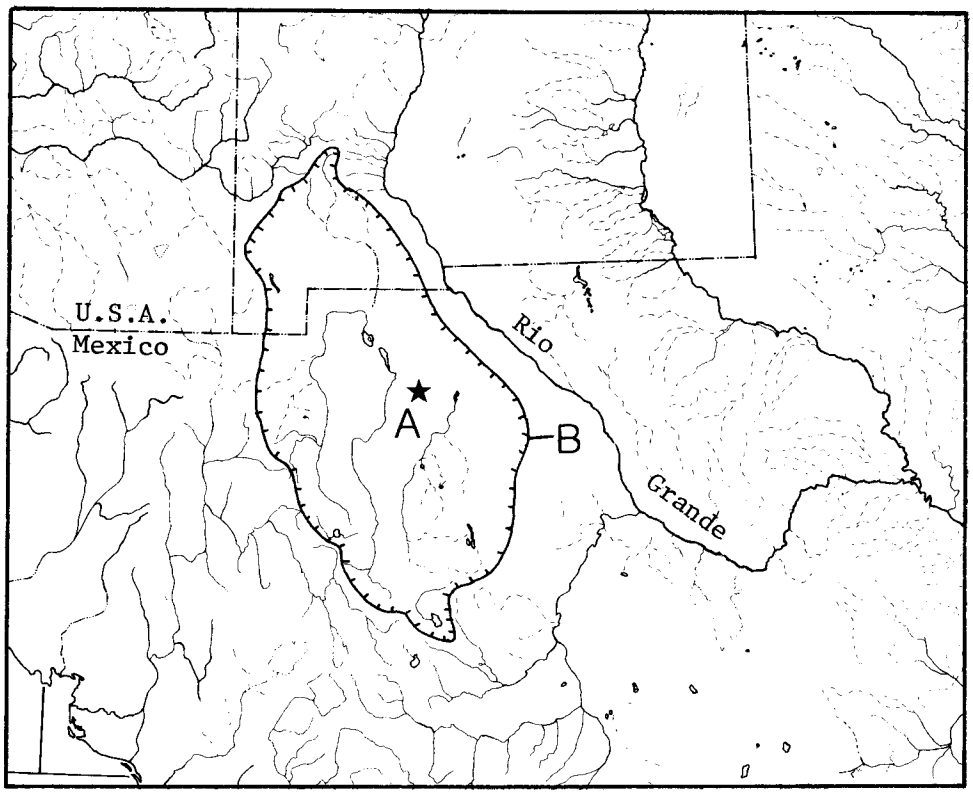

Figure 1. Location of (A) the Carbonera spring system within (B) the hydrographic limits of a region of interior drainage in northern Chihuahua, Mexico.

PALEOHYDROLOGY

The combination of an increasingly arid climate with the basin-and-range topography of northwestern Chihuahua has resulted in a complex of basins that fail to achieve exterior drainage (Fig. 1). This endorheic region includes the Bustillos Basin and the four drainages of the Guzmán Complex: the Río Casas Grandes, Río Santa María, Río del Carmen, and the Mimbres River. Although these streams no longer coalesce, their discharge (plus that of former tributaries) was once sufficient to form an extensive lacustrine environment that united the Guzmán Complex into a single hydrographic system, as inferred from geomorphological data (Strain, 1966; Reeves, 1969) and fish distributions (Smith, Miller and Minckley, in prep.).

Before the close of Kansan time, the Guzmán Complex also received the discharge of the upper Rio Grande. The resulting lacustrine system, named Lake Cabeza de Vaca by Strain (1966), extended throughout much of northern Chihuahua and adjacent Texas and New Mexico (Miller, 1981:Fig. 5). Although sometimes regarded as a single large lake (Strain, 1966; Reeves, 1969), Cabeza de Vaca may have been a complex of interconnected

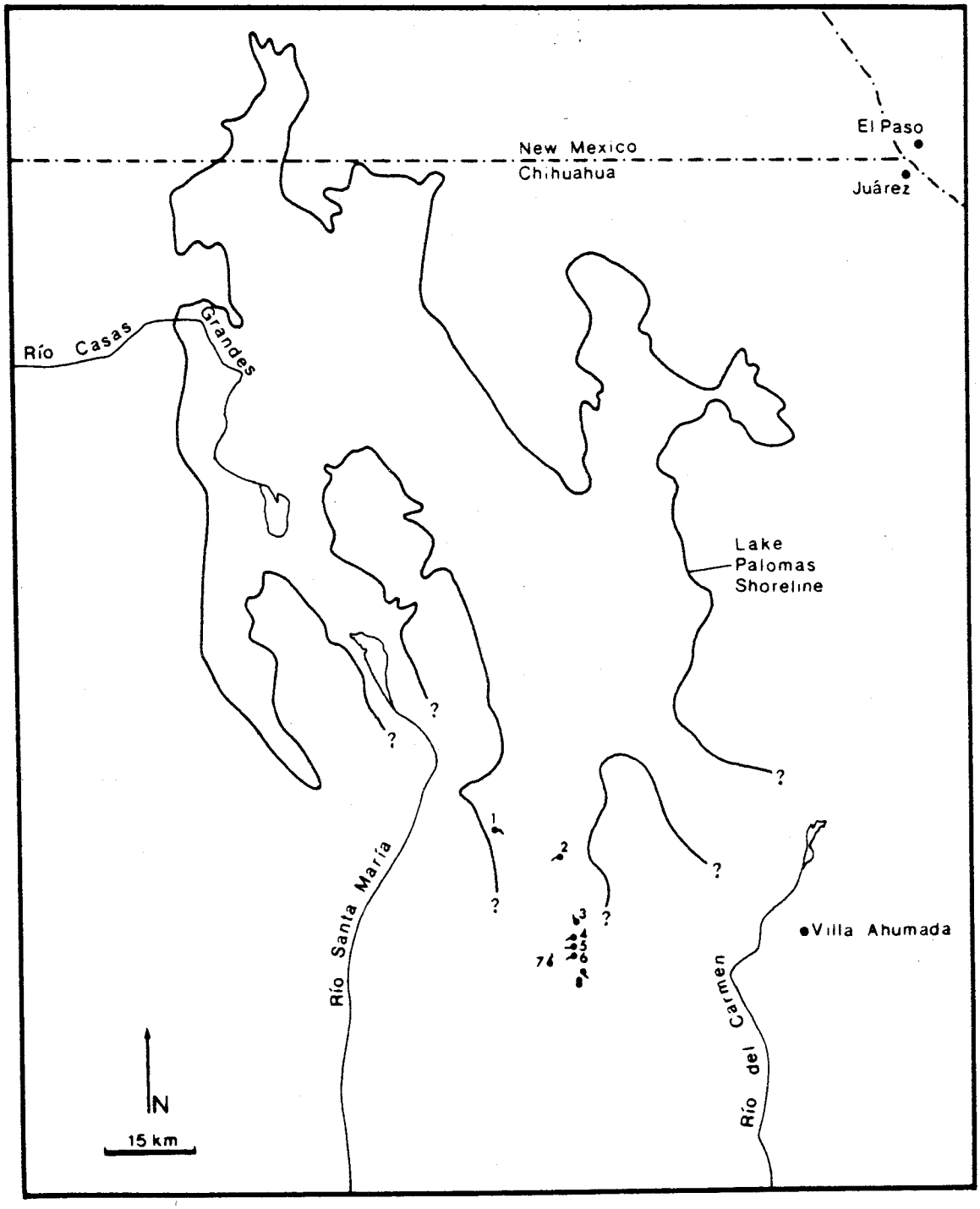

Figure 2. The Carbonera spring system comprising (1) Ojo Sanguijuela, (2) Ojo Caliente, (3) Ojo Solo, (4) Ojo de las Varas, (5) Ojo El Medio, (6) Ojo de Carbonera, (7) Ojo del Apache, and (8) Ojo Santo Domingo. The shoreline shown is the 1225-meter level (after Reeves, 1969).

lakes and streams (Hawley, 1975). By late Kansan time, the complex had been subdivided into isolated impoundments due to basin filling, tectonic activity, and entrenchment of the Rio Grande in the Hueco Bolson (Reeves, 1969).

Following the integration of the upper and lower segments of the Rio Grande during early or middle Pleistocene, much of the Guzmán Basin was inundated by post-Kansan Lake Palomas. This pluvial lake has left lacustrine sediments, abandoned beaches and wave-cut escarpments (Reeves, 1969) which indicate several stable stages at different levels. The highest level which is documented by wave-cut features or abandoned beaches at multiple localities was at 1225 m (Fig. 2). Innumerable other levels are marked by less abundant shoreline features, and a maximum level is presumed to have occurred at 1250 m in late Kansan to possibly late Illinoian time (Reeves, 1969). This high stand would have inundated the Carbonera springs which lie at 1210-1240 m; it therefore marks their maximum age as isolated aquatic habitats.

With the development of a progressively more arid climate during and since the late Pleistocene, lacustrine habitat was further reduced and subdivided. Terminal lakes persisted into historic times at the mouths of the Ríos Casas Grandes, Santa María and del Carmen, but these lakes are in advanced stages of desiccation (Tamayo and West, 1964).

AQUATIC HABITATS

The only surface water in the area between the Santa María and Carmen drainages is provided by Ojo de Carbonera and several other springs nearby (Fig. 2). At Ojo de Carbonera, the only spring which remains in its pristine state, water rises through several solution holes in carbonate rock and flows a short distance over the desert floor before being dispersed through an irrigation system. Spring-heads vary from small seeps through quicksand or crevices to holes as much as a meter in diameter and nearly a meter deep. The discharge from these sources coalesces to form a shallow brook (less than 10 cm deep) that flows nearly 100 m over substrates ranging from fine sand to gravel; this brook is the only natural stream habitat between the Santa María and Carmen Rivers. The temperature of water emerging from the ground is higher than ambient air and apparently constant; it was 27°C on 28 May 1978 and 6 June 1979. Although the natural aquatic habitat at Ojo de Carbonera encompasses an area of less than 200 m^2, it is relatively diverse and supports all but two of the endemic aquatic organisms known from the basin.

The other springs have been modified to provide water for domestic and agricultural use. Three of them (Ojo del Apache, Ojo El Medio, and Ojo de Las Varas) have been impounded to provide a head of water that enters a system of interconnected irrigation ditches. Water from Ojo de Carbonera enters the same irrigation system. The impounded springs provide moderate habitat for native fishes and invertebrates. The ponds are less than 100 m in greatest dimension and do not exceed 1 m in depth. Aquatic vegetation is sparse, but some cover is provided by mats of filamentous algae and emergent reeds. The temperature of water emerging from the ground is 27-28°C at each of these springs.

A fifth spring, Ojo Solo, is not connected with the other springs near Ojo de Carbonera. It has been impounded to serve as a cattle tank which is about 100 m in diameter. The pond is mostly shallow (less than 0.5 m deep), but there is a hole of unknown depth at its center which is surrounded by tules. Fishes, amphibians and reptiles were found in the central hole, but could not be found in the remainder of the impoundment where cover has been eliminated by the trampling of livestock.

Aquatic habitat at Ojo Sanguijuela, 28 km NW of Ojo de Carbonera, consists of marshy ground which drains onto the bed of former Lake Palomas. The marsh supports very dense stands of tules and cattails which provide cover for insect larvae, amphipods (Hyalella sp.), and frogs (Rana berlandieri). The water at Ojo Sanguijuela was very hard (3500 μMHOS/cm) and was 28°C at its source.

Several springs rise at Rancho Ojo Caliente on the alkali flat "El Barreal." These springs are apparently too hot (45-56°C) to support vertebrate life and have not been explored for invertebrates. Introduced bullfrogs (Rana catesbeiana) are present in artificial ponds where temperatures are under meteorological control.

The Carbonera spring system is separated from the basin of the Río del Carmen only by a low, broad ridge. A large spring near the top of this ridge, Ojo Santo Domingo, is of uncertain hydrographic affinity, although its water currently flows toward the Río del Carmen. The spring has been impounded and diverted into concrete sloughs. Its native fish fauna, if there was one, has been replaced by exotic organisms including mosquitofish (Gambusia), predatory bass (Micropterus) and bullfrogs.

NATIVE FAUNA

The first aquatic organisms known from the Carbonera springs were a pupfish (Cyprinodon) and a shiner (Notropis) discovered by aquarists interested in native North American fishes. David Schleser first drew attention to these fishes in a letter to Miller in 1972, and he and Joe Anascavage provided photographs and specimens that established that they were new species. Field work in 1978 and 1979 resulted in exploration of all known springs in the area and investigation of other aquatic animals. Several of these have received detailed taxonomic treatment; others are still under study.

Crustaceans.-- Three species of aquatic crustaceans are known from the Carbonera spring system. An amphipod in the genus Hyalella was collected at Ojo Sanguijuela. Although the material differs from H. azteca (Saussure), its specific status is uncertain due to the variability of allopatric populations of H. azteca, which is widespread in aquatic habitats of the northern Mexican deserts.

An aquatic isopod, Thermosphaeroma milleri Bowman, has been collected at Ojo de Carbonera, Ojo El Medio and Ojo de las Varas where it occurs on sandy substrates and in decaying plant debris. It should also be expected at Ojo del Apache which provides similar habitat and is directly connected to the above-mentioned springs. The genus Thermosphaeroma was recently

erected to receive three unusual species of sphaeromatid isopods (Cole and Bane, 1978) that are restricted to hot springs in the Rio Grande Basin and Mexican Plateau. Bowman (1981) described two additional species (including T. milleri) which are also of restricted occurrence in hot springs. Because the ancestors of Thermosphaeroma were probably marine sphaeromatids, Bowman (1981) hypothesized that the genus is a relict of a middle to late Mesozoic marine transgression in the Rio Grande basin. The restriction of freshwater flabelliferan isopods to warm springs and other unusual habitats such as caves may be a result of limited ability to compete with aquatic insects and their larvae (Bowman, 1981).

A dwarf crayfish, Cambarellus chihuahuae Hobbs (1980), is endemic to Ojo Solo and the springs connected to Ojo de Carbonera. It is abundant at the latter locality where it can be found in all habitats except swift water; in the impounded springs it is found only in vegetation or along banks. Several related species of Cambarellus are distributed across the Chihuahuan Desert and southward into Central Mexico (Hobbs, 1974, 1980). C. chihuahuae is probably most closely related to C. areolatus (Faxon) and C. alvarezi Villalobos, species which are similarly restricted to isolated aquatic habitats in basins formerly drained by the Rio Grande system.

Mollusks.-- Snails collected at Ojo de Carbonera represent a species of Tryonia (D. W. Taylor, pers. comm.). This hydrobiid genus has been collected in many desert springs in northern Mexico, including hot springs. Determination of the specific status of the Carbonera population awaits collection of material from other localities in the region.

Fishes.-- Two fish species are endemic to the Carbonera spring system. A pupfish, Cyprinodon fontinalis Smith and Miller (1980), occurs in Ojo Solo and the springs connected to Ojo de Carbonera. It is particularly abundant in the natural habitat remaining at Ojo de Carbonera where it perfers spring-heads, solution holes and quiet pools. Less dense populations occur in the impounded springs, and individuals can be seen occasionally in irrigation ditches.

The inter-relationships of the species of Cyprinodon are not well understood; however, C. fontinalis does not appear to be closely related to other pupfishes which are widespread in the Guzmán Basin and other nearby drainages. Rather, it resembles C. macrolepis and C. alvarezi which occur in desert spring habitats elsewhere in the Rio Grande region.

The other native fish is the largemouth shiner, Notropis bocagrande Chernoff and Miller (1982). It has been found only around the central spring in the impoundment of Ojo Solo where it is sympatric with C. fontinalis. The largemouth shiner is aligned with the N. lutrensis complex which includes several minnows distributed in present and former tributaries of the Rio Grande. Notropis bocagrande may be closely related to N. formosus, a species found in streams of the Guzmán Complex.

Amphibians and reptiles.-- The semi-aquatic fauna of the Carbonera spring system includes three species of amphibians and reptiles that can be regarded as probable natives to the area. All are known from other localities in the region. Rana berlandieri has been collected at most

of the springs, including the most remote one, Ojo Sanguijuela. A mud turtle, Kinosternon flavescens, has been collected only at Ojo Solo. This species has been found in both permanent and intermittent aquatic habitats in northern Mexico; it appears to be moderately independent of desert bodies of water and able to move about freely during wet weather (Conant, 1978). The checkered garter snake, Thamnophis marcianus, has been collected at Ojo de Carbonera and can be expected at other springs in the area. It is generally distributed along water courses in the northern Chihuahuan Desert.

CONSERVATION

Although the reduction of aquatic habitat in the Bolsón de los Muertos is a secular event related to climatic change, the rate of reduction has been greatly accelerated in historic times. Much of the basin is still a frontier for agricultural development, but the impact of early irrigation was noted by Brand (1937): "The increasing use of spring and river water for irrigation on the haciendas and colonias of the region has contributed markedly to the lessened flow of the rivers in their lower courses." Today, no surface water reaches the lower Río del Carmen below the Presa las Lajas which is situated near the midpoint of the drainage; the only aquatic habitat remaining in the old stream bed is a rheocrene north of the town of Ricardo Flores Magón. In the areas around Villa Ahumada and Palomas, springs which had once been impounded are now dry as a result of groundwater pumping. "The long dry canal which once carried stock water from the Palomas springs into the northern part of the Bolsón de los Muertos is now mute testament to the falling water level" (Reeves, 1969).

The development of irrigation around the Carbonera springs is less advanced than in the adjacent basin of the Río del Carmen. Groundwater pumping, which has eliminated many springs in the lower Carmen basin, has not yet been developed near the Carbonera springs.

Impoundment of the Carbonera springs and the construction of irrigation ditches may benefit the semi-aquatic fauna by providing additional habitat; Thamnophis marcianus has extended its range into irrigated regions, and Kinosternon flavescens often appears in cattle tanks and other artificial habitats (Conant, 1978). The impact of habitat modifications on the strictly aquatic fauna are more likely to be negative, although this is difficult to determine since the habitat had already been altered when field work at the Carbonera springs began. It is reasonable to infer, however, that Cyprinodon fontinalis had suffered a decline in numbers because it is presently more abundant in remnant natural habitat at Ojo de Carbonera than in ditches and impoundments. Population densities were estimated by making instantaneous counts of pupfish visible in meter-square quadrates placed randomly in each habitat. Pupfish are most abundant in springs and pools; strong currents are avoided (Table 1). Although pupfish are present in impounded springs, densities there are too low to be measured meaningfully.

TABLE 1. Density of Cyprinodon fontinalis at Ojo de Carbonera, Chihuahua, Mexico.

Habitat	Number of quadrates	Individuals/m^2 Range	x
Springs, solution holes depth to 80 cm	15	6-57	21.1
Pools, mud flats depth to 15 cm	20	0-32	13.1
Stream, weak current silt or sand substrate depth to 15 cm	20	0-30	9.5
Stream, strong current gravel substrate depth to 15 cm	20	0-26	3.4
Channelized ditch, moderate current sand substrate depth to 15 cm	20	0	0

Habitat modifications may affect native organisms indirectly by providing conditions favorable to exotic species. The impounded springs support introduced mosquitofish (Gambusia affinis), catfish (Ictalurus melas), bass (Micropterus salmoides), and bullfrogs (Rana catesbeiana). Bass and bullfrogs are both predatory species, and the latter is credited with having eliminated several native riparian species in areas where it has been introduced (Conant, 1978). Though itself diminutive, Gambusia affinis can have a controlling effect on populations of larger species through competition and predation of their young; it has been widely introduced in arid regions where it has replaced native fishes (Minckley, 1973).

Conservation efforts should be directed at maintaining Ojo de Carbonera in its pristine state. This spring provides the greatest habitat diversity in the system and shelters most of the known endemic species; others (e.g., Hyalella sp.) may yet be found there. The introduction of additional aquatic organisms should be prevented.

Captive populations of the endemic aquatic organisms should be maintained as a provision against desiccation of the springs due to groundwater pumping. Stocks of a relative of Thermosphaeroma milleri have been successfully cultured (Bowman, 1981) and many species of Cyprinodon have been successfully reared in aquaria.

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EFFECTS OF FLOODING ON POPULATION DYNAMICS AND INTERACTIONS OF SONORAN TOPMINNOWS (POECILIOPSIS OCCIDENTALIS) AND MOSQUITOFISH (GAMBUSIA AFFINIS) IN ARIZONA.

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Population dynamics of native topminnows (Poeciliopsis o. occidentalis) and introduced mosquitofish (Gambusia affinis) were studied before and after 1981 summer flooding in a southern Arizona spring system. Relative population sizes were estimated using a catch per unit effort measure. Before flooding, mosquitofish constituted 11.5% of the fish fauna in the upper 600 m of the system. After two "minor" floods (no scouring observed), mosquitofish were reduced slightly, to 9.0%, and topminnows were unaffected. After a "major" (scouring) flood, mosquitofish were reduced by over 98% (to 0.7% of the fauna), while topminnows were reduced by 75%. Many of these topminnows were washed to a lower section of the system, while most mosquitofish were flushed out entirely.

Since this is an unstable predator-prey system, with the prey (topminnows) subject to local extinction, results are discussed in the context of predator-prey theory. Natural catastrophic events such as flooding may act to stabilize an otherwise unstable interaction (by periodically removing a large fraction of predators), leading to long-term coexistence. Management plans for endangered desert fishes should consider moderate flooding events are desirable, since they may aid in removing deleterious introduced fauna.

LOS EFECTOS DE CRECIENTES SOBRE DINÁMICAS DE POBLACIONES É INTERACCIONES DE SONORAN TOPMINNOWS (POECILIOPSIS OCCIDENTALIS) Y MOSQUITOFISH (GAMBUSIA AFFINIS) EN ARIZONA.

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Las dinamicas de poblaciones de "topminnows" nativos (Poeciliopsis o. occidentalis) y una especie introducia (Gambusia affinis) se estudiaron antes y despues do los crecientes de verano de 1981 en un sistema manantial en la parle sur de Arizona. Se estimaron las poblaciones relativas utilizando método de captura por unidad de esfuerzo. Antes de llegar los crecientes, el mosquitofish formó 11.5% de la fauna ictica en los 600 m mas arriba del sistema. Despues de dos crecientes monores (no se removó sedimento), se redujó poquito (a 9%) el mosquitofish y no el topminnow no fue afectado. Despues de un creciente mayor (se removó sedimento), el mosquitofish fue reducida mas de 98% (a 0.7% de la fauna) mientras la población de topminnow fue reducido 75%. Muchos topminnows se desplazaron a una parte mas bajo del sistema, mientras la mayoria de los mosquitofish fue removida completamente del sistema.

Se discutan resultados en contexto de teoría de rapiña y presa porque se trata de un sistema inestable con la presa (topminnows) sujeto a extincciones locales. Eventos catastróficos naturales, como los crecientes, pueden estabilizar una interaccion de otro modo inestable (par una reducción de nivel de rapiña), asi resultando en coexistencia de las dos especies sobre plazo largo. Los programas de manaje de peces del desierto enpeligrados se deben considerar crecientes moderados como deseables, como pueden asistir en removación de fauna introducida y nocivo.

REPLACEMENT OF *CYPRINODON MACULARIUS* BY *TILAPIA ZILLII* IN AN IRRIGATION DRAIN NEAR THE SALTON SEA

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Abstract

Drying of Lake Cahuilla about A.D. 1500 eliminated from the Salton Basin what was essentially a Colorado River fauna that included the Desert Pupfish, *Cyprinodon macularius*. In 1905, flooding of the irrigation system carrying Colorado River water and subsequent refilling of the present Salton Sea fortuitously reintroduced the pupfish to a portion of its native range. Throughout the early 60s pupfish were considered to be common in shoreline pools of the Salton Sea, but in recent years they appeared in that habitat only during a period of extraordinary spring runoff due to heavy rains. Replacement of pupfish from the shoreline habitat appears associated with two phenomena; continued rising of the water level, and appearance of Sailfin Mollies, *Poecilia latipinna*, in shoreline pools. Perhaps newly inundated soil is hostile to pupfish, but it is more likely that courtship of both male and female pupfish by mail Sailfin Mollies interferes with breeding success.

An apparent sanctuary in irrigation drains continued until the middle 70s. Until that time pupfish were found locally common in shallow, sandy portions of the canals, or in algal mats and roots of cattails (*Typha*). Introduction of the "weed eating" Cichlid, *Tilapia Zillii*, is associated with loss of pupfish from the freshwater drains. Adult *Tilapia* are too large (ca. 12 cm SL) to interfere with *Cyprinodon* in shallow water because pupfish are able to feed and spawn in water approximately 3 cm deep. It appears, therefore, that interaction with juvenile *Tilapia* is the problem. Male pupfish vigorously patrol and protect their spawning sites. When they are busy chasing off intruders such as juvenile *Tilapia* and other male *Cyprinodon*, eggs in the spawning territory are subject to predation by subdominant males that resemble females in coloration, and to other juvenile *Tilapia*. These interactions have been observed in the King Street Canal on the northwestern portion of the Salton Sea.

In the King Street Canal I have been studying niche partitioning in association with habitat changes since 1977. At that time pupfish were most abundant in water only 5 to 10 cm deep at 39° C. The source of the hot water was an artesian well on a nearby ranch. In March of 1978, following flooding and canal reconstruction by the Coachella Valley Water District, I discovered that a small pond had been constructed apparently by residents of the nearby ranch in order to impound the hot water. It was being used for human bathing and washing of clothes. At that time pupfish still inhabited shallow water at the margin of the pond. In July, 1978, I discovered adult *Tilapia* in the pond and pupfish were still in the shallows and among the roots of cattails upstream. In March, 1980, juvenile *Tilapia* were the most common inhabitants of the shallows, and two hours of seining yielded only four adult pupfish taken from among the roots of cattails. Collecting trips in the summer of 1980 and the winter of 1981 yielded no pupfish. The winter visit revealed other changes, however. The pond had been filled by siltation and the amount of water had been reduced to a trickle. Apparently the pump that was the source of hot water had been

turned off. No pupfish and no Tilapia were collected in the winter of 1981. Investigations of the King Street Canal will continue in an attempt to determine if Cyprinodon macularius still occurs there.

This paper documents more than a simple case of replacement of one fish species by another. This paper points out the numerous uncontrollable factors that endanger the only native species of the area. Among the factors I have observed are rising water levels of the Salton Sea, fluctuating flow in the irrigation drains, flooding, reconstruction and stripping of vegetation by the water district, impoundment, bathing and other activities by local residents, and perhaps of greatest significance is the introduction of at least twenty-two non-native fresh water fishes to the irrigation drains. The only vestige of natural habitat for this species lies on BLM land in San Sebastian Marsh, and this area too is threatened by non-native fish species and proposed groundwater pumping.

Aspects of Razorback Sucker (*Xyrauchen texanus*, Abbott) Life History Which Help Explain Their Decline

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ABSTRACT

Efforts to federally list and develop a recovery plan for razorback sucker *(Xyrauchen texanus)* in 1978-1980 failed despite their critical status. Now, their abundance is further reduced, threats have increased, and they are unsuccessfully attempting reproduction only in the Yampa River (northwest Colorado), the Colorado River (near Clifton and Grand Junction, Colorado), in Lake Mohave (Arizona/Nevada) and in Senator Wash Reservoir (California). Federal/State agreements have been enacted to begin reintroduction efforts as a method of recovery in some areas although a substantial portion of their life history is unknown. A review of historic river conditions, and the relationship to the currently known life history of razorback sucker is summarized to indicate possible mechanisms for the population decline. Incorporation of critical early life history requisites into a recovery program is the most likely way to reestablish natural recruitment and recover the species.

INTRODUCTION

Razorback sucker *(X. texanus)* were proposed for a federal "threatened" status in 1978, but listing efforts were dropped in 1980. They are now in serious trouble both in the upper and lower Colorado River Basin. They have been listed as endangered in California since 1974. The only remaining groups known to be attempting natural reproduction are in the Yampa River (northwest Colorado), the upper Colorado River (near Clifton and Grand Junction, Colorado), Lake Mohave (Arizona/Nevada), and Senator Wash Reservoir (California). Two dams proposed on the Yampa River above spawning areas will likely modify the physical habitat conditions along that drainage and both physical and biological changes occurring or planned at Lake Mohave will further jeopardize the existence of the species. All other areas of their historic range contain only remnant individuals or groups making the remaining areas where natural reproduction is now attempted even more valuable to preserve. I'll briefly describe the river conditions that historic populations were exposed to, summarize known and some suspected life history aspects, and present some possible reasons for their decline. Defining the critical reason(s) is the first step to recovery. I believe predation is an important factor now that broodstock abundance is low and spawning is restricted to isolated locations, but there are suggestions that other mortality, associated with egg and larval development, is of equal or greater importance in razorback sucker *(X. texanus)* population declines.

PHYSICAL CONDITIONS

Near the end of the Pliocene or early Pleistocene epoch the area from Parker, Arizona south (River Mile 176) was a brackish arm of the Gulf of California. The desert mountain ranges appeared only as islands. Fossils in strata from this epoch indicate both freshwater and marine species were present. The water receded 1-3 million years ago, the Colorado River entered the area and much of the original substrate in the first channel was washed out. After that, the mountains rose

relative to the basins, slow enough for the river to cut the canyons which still exist today. No evidence of ponding or lakes along the mainstream south of Needles (River Mile 245) exists, but major wash systems draining adjacent mountain ranges and channel braiding in the river valleys were common. A series of two aggradations and degradations have occurred with the last aggradations beginning 10,000-15,000 years ago. During these changes in riverbed elevation, the slope stayed about the same near 1.7 ft drop per linear mile of river. The river character changed dramatically though, from a system moving pebble- to cobble-sized gravel to one moving a median-particle size of 44 microns which is silt (Metzger et al., 1973). High flow events, generally peaking May-July, created new gravel bars and renovated old ones annually. The area of gravel substrate was primarily upstream of Parker, Arizona with the exception of wash fans from lateral drainage areas. Similar bar development occurred in major tributaries, only on a smaller scale.

The literature indicates that razorback sucker once migrated considerable distances and concentrated in large numbers near the mouths and up into the tributaries, presumably to spawn (Jordan, 1891; Hubbs & Miller, 1953; Sigler & Miller, 1963). Recent information indicates specific substrates are selected for spawning (Linda Ulmer pers. comm.) approximating substrates similar to historic bars or wash fans. The confluence areas of major tributaries and the mainstream (wash fans included) may have provided the loose, clean substrate during the late or post runoff periods on the Colorado River. Gravel on newly formed or active bars would have good percolation through interstices and spawning adults could move substrate easily during the deposition of gametes.

During the period 1909-1938, seven dams were built on the lower Colorado River which has resulted in colder, but more uniform water temperatures extending longer into the spring, and the warming trend into the summer (post runoff) is slower. Peak flows are now later into the summer and there is an inverse relationship between flow and temperature. As flows increase to meet irrigation/power demands temperatures are cooler and peak flows are not adequate to renovate or create bars. Migration routes to the majority of tributary streams in the upper and lower basin have been blocked. Reservoirs along the system where remnant sucker populations exist are aging, substrate is silted in and compacted, and temperature regimes are variable. Channelization in river segments between dams has reduced backwaters and potential spawning and rearing habitats. Spawning observations in 1980 and 1981 in Senator Wash Reservoir and Lake Mohave were over lap-zone gravel areas (Linda Ulmer pers. comm.; W. L. Minckley, pers. comm.) which are continually cleaned of silt by wave action. Only in the Yampa River (Colorado) is the channel substrate and temperature near natural conditions and now headwater storage projects in that drainage are proposed (R. Valdez & E. Wicks, pers. comm.). It was estimated that razorback sucker range was limited to elevations near or below 5,000 ft in Colorado (Ellis, 1914), and that only a limited amount of stream habitat there was below that elevation, and the majority of the river downstream has been altered.

LIFE HISTORY REVIEW

Maturity in razorback sucker (*X. texanus*) appears to begin around 5-7 years of age (W. L. Minckley, pers. comm.; L. Courtois, pers. comm.) and spawning occurs at temperatures 12-18°C in January through April depending on the weather, water operations and location along the system. Spawning depths from 0.5-3.0 meters are most common. Dams now block migration and now only specific locations provide spawning substrate in the lower river (Loudermilk, 1982, in press). Only a small percentage of gonad contents are released during each spawning act, and there are

suggestions that multiple spawning may occur to a certain extent, on the same sites (Jones and Sumner 1954; Linda Ulmer, pres. comm.). The same spawning areas were used for 2 consecutive years at SWR. Relative fecundity, based on a small sample size, was estimated at 27,000-144,00 eggs per female with a poor correlation between the number of eggs and the units of female body length (McAda and Wydoski, 1980; Minckley, 1981 in press). There are suggestions that viability decreases in older females, but a good sequence of gonads from aged individuals or a reliable aging technique has not been available. Eggs are mildlyadhesive to the substrate (Moyle, 1976; Minckley, 1973) and range in size from 1.8 to 3.2 mm in diameter (Gustafson, 1975; Calif. Fish and Game, unpublished data). Time to hatching is variable, but appears to decrease as temperatures increase. Culture experiments at Willow Beach National Fish Hatchery indicated poor survival occurs when incubation temperatures are near 12°C (Toney, 1974). At Dexter National Fish Hatchery 14-16°C incubation temperatures resulted in 10-20% survival, but many other factors besides water temperature may explain the low survival (Inslee, 1981). We removed 100 eggs from spawning areas at Senator Wash Reservoir (SWR) and incubated them in aquaria at 20-23.5°C and had 46% survival (Loudermilk et al., 1981, unpublished manuscript). Experiments at Utah State University using sub-adult fish (1974 cohort from Willow Beach NFH stock) in thermal preference chambers indicated preferenda of 25.4°C were chosen (Bulkey, et al. 1981). Within four years after the closure of Flaming Gorge Dam, native fish of all ages, including razorbacks, were displaced for 7 miles downstream, their abundance was reduced for many miles further downstream, and cold hypolimnetic releases were suggested as the major cause (Vanicek, 1967; Vanicek et al. 1970; Holden, 1973).

Very little is known about the larval stage of this species other than identification characters of the post larvae (Winn and Miller, 1954). For 2-3 days after swim-up, post larvae in aquaria used the upper 1/3 of the water column and displayed little tendency to seek shelter. If in a mild current, they would have been carried downstream. After this period they began moving to the bottom and gradually began feeding on or near the substrate and began using the vegetation and rock provided as cover when disturbed. They rarely entered the upper half of the water column beyond 15 days after hatching (Loudermilk et al., 1981, unpublished manuscript). At SWR, larvae were collected from both the surface and by disturbing the substrate. Dead or mortibund larvae were observed in relatively high numbers (Linda Ulmer, pers. comm.) there.

It has been suggested (Hubbs and Miller, 1953) that young razorbacks followed adults back out of streams to the main river. The young have been reported to travel in large schools along stream or reservoir margins. The terminal mouth migrates to the sub-terminal position within 6 months of hatching and the nuchal keel ~~generally develops~~ is discernable when the young are ~~12 to 18 cm~~ 180-200 mm in total length. Adults reach 5 to 6 kg in weight and feed on algae, dipteran larvae and zooplankton. They have long digestive tracts, poorly differentiated stomachs, no pyloric caecae and well-developed hearing.

Based on very limited information, egg survival may be best between 16-25°C and spawning occurs between 12-18°C. Tributary water temperatures in that range historically would have occurred March - July, depending on the water year, but generally during the later part of the runoff period. Before dams, gravel bars or wash fans were likely available for spawning and water temperatures were rising with ambient temperature increases as runoff subsided. In the river below Parker, Arizona most of the substrate was and is sand, mud or silt. The only likely spawning gravels, with a few exceptions, were alluvial fans created by flood events down tributary washes or up the Gila River drainage into southwest Arizona.

Razorback suckers now spawn in lap-zone gravel substrates of reservoirs in the lower basin, but eggs are subjected to longer incubation times, wave action disturbance, greater predation and dessication with water level fluctuations. As you move downstream to the Gulf, the water temperatures come closer to the suspected desirable range for egg maturation, but spawning substrates are not available there. Not enough information exists to discuss problems involving the larval stage.

HYBRIDIZATION

Another aspect to consider is hybridization with other suckers of the genus *Catostomus*. Hubbs and Miller (1953) clarified the identification of a specimen, collected in the Uncompahgre River near Delta, Colorado in 1889, as a flannelmouth x razorback sucker hybrid (*C. latipinnis* x *X. texanus*). They theorized that the abundance of flannelmouths relative to that of razorbacks and the close similarities in spawning requirements explained the natural hybridization occurring. Almost half of the razorbacks sampled in the Green River below Flaming Gorge Reservoir in 1967-1973 were flannelmouth x razorback hybrids (Vanicek, 1970; Vanicek et al., 1970; Holden 1973; Holden and Stalnaker, 1975; Behnke and Benson, 1980). Razorback sucker crosses with white suckers (*X. texanus* x *C. commersoni*) and bluehead suckers crossed with white sucker (*C. discobolus* x *C. commersoni*) were collected from the Yamp River, a tributary to the Green River below Flaming Gorge Dam, during the same time period (Holden, 1973), and flannelmouths were the dominant species there at the time. Flannelmouth sucker were reported downstream in the last major tributary to the lower Colorado River, the Gila River, near the confluence at Yuma in the late 1800's and have more recently been collected in Lake Mohave (W. L. Minckley, pers. comm.). Gustafson (1973) reported that a minimum of 10% hybridization between *X. texanus* and an undetermined species of *Catostomus* was indicated from data collected at Lake Mohave.

Razorback x Gila sucker (*X. texanus* x *C. insignis*) hybrids were collected from Tonto Creek, Arizona in 1926 (Hubbs & Miller, 1953). This creek is a tributary to the Salt River, the Gila River and eventually the lower Colorado River.

Flannelmouth (*C. latipinnis*) a western white sucker (*C. commersoni suckleyi*), the dusky mountain sucker (*Pantosteus sp.*), Bonneville mountain sucker (*P. platyrhunchus*), Utah bluehead sucker (*P. delphinus*), northern bluehead sucker (*P. d. delphinus*) and the Rio Grande mountain sucker (*P. plebeius*) were all used as bait fish in the lower Colorado River during the late 1940's and early 1950's (Miller, 1952). In 1976, approximately 600 adult flannelmouth sucker were transplanted into the mainstream of the lower river below Davis Dam (River Mile 276) near Bullhead City, Arizona (Minckley, 1973).

What I have just described is that in mainstream tributaries of both the upper and lower basins where razorback range overlapped with abundant populations of flannelmouth (*C. latipinnis*) or Gila sucker (*C. insignis*) some degree of hybridization resulted. Hybrid introgression may help explain the gradual decline of razorback populations.

RECOVERY

So how do we get them back? Reintroduction without defining and satisfying egg and larval survival requirements and not considering habitat maintenance will

not result in natural recruitment. Populations established with successive year-class representatives by reintroduction will still lack the capability to perpetuate themselves. We will eventually need the culture techniques and the broodstock currently being developed at Dexter National Fish Hatchery, but right now, if we are ever to regain natural recruitment, egg and larval requirements are crucial. Equally important, an electrophoretic comparison of Yampa River, Lake Mohave and Senator Wash Reservoir stock should be evaluated before a broodstock is selected for the hatchery program because of the hybridization suggested.

Memorandums of Understanding (M.O.U.'s), involving interstate waters, which infer that adequate protection is provided by the current reintroduction program jeopardize the capability to maintain or upgrade habitat quality for this species through the Fish and Wildlife Coordination Act, NEPA or other related legislation. Considering the apparent need for relatively warm egg incubation temperatures, somewhere along the lower Colorado River will be the most feasible location to attempt recovery on the mainstream. The lack of spawning substrate may be solved through modification of proposed projects, but only if we define and build-in the early development requisites, will these projects result in the maintenance of a razorback sucker population.

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REINTRODUCING THE NATIVES: RAZORBACK SUCKER

by

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ABSTRACT

Over 15,000 young razorback suckers were reintroduced into historic localities within the Gila River basin in Arizona in 1981. Within the next 10 years, up to 1,000,000 fish will be stocked in a joint State/Service project to recover the razorback in lieu of listing it under the Endangered Species Act. Localities of the stockings, criteria for site selection and size of the stocked fish are discussed. Future reintroductions of other native fish species may be simpler because of the precedent set by this action.

ABSTRACTO

Durante 1981, mas de 15,000 juveniles de Xyrauchen texanus fueron liberados en localidades historicamente de habitacion natural adentro de la cuenca del Rio Gila en Arizona. Un proyecto cooperativo Estado-Servicio tiene la meta de liberar alrededor de 1,000,000 ejemplares de la especie durante la decada entrante en vez de incluir Xyrauchen texanus en la lista Federal de especies amenazadas. Localidades de liberacion, criterios para seleccion de localidades y tamano de juveniles liberados se discuten. Precedentes establecidos atravez de esta reintroduccion quiza simplificaran liberaciones futuras.

Introduction

The Fish and Wildlife Service has been trying to coordinate and encourage the reintroduction of endangered fish species back into historic habitats for several years (Johnson, 1980a). Earlier attempts have met with failures and frustrations because of political opposition to the actions. Apprehension over curtailment of user actions (fishing, hunting, etc.) as well as the potential of Service "take over" of areas through critical habitat designation has led to this opposition (Johnson, 1979; 1980b). Although the Service considers the basis of this opposition groundless, its influence has stopped nearly all reintroduction efforts and recovery (via reintroduction) of nonlisted species has become easier than those protected under the Endangered Species Act.

Earlier this year, the Service signed a Memorandum of Understanding (MOU) with the Arizona Game and Fish Commission that added a new direction to reintroducing native fish species. The Service agreed to produce up to 100,000 razorback suckers (Xyrauchen texanus) a year for a 10-year period, if Arizona would agree to stock them into historic habitats and to monitor the success of that stocking. This proposal succeeded where past proposals

failed because the MOU requires the Service not to list the razorback suckers as long as the reintroduction effort continues and appears successful. This "in lieu of listing" approach appears to have broken the previous deadlock and may clear the way for reintroducing listed fish species.

This paper discusses the first year of the reintroduction process for razorback suckers, some of the reasoning for site selections, and future actions for other native fish species.

Discussion

Two alternatives for the reintroduction of razorback suckers were considered: (1) stock adult fish or (2) move adult fish into a hatchery situation, spawn them there and stock their offspring. Each approach has specific advantages, but also demands certain conditions. Although stocking adults would partially eliminate the major problem of predation by the numerous non-native fish species, it is dependent upon a large source of healthy adult fish and their ability to spawn successfully in the reinhabited waters. As the first of these conditions cannot be met for razorback suckers and the second is questionable at this time, the hatchery alternative was chosen. On January 15, 1981, 136 adult razorback suckers were collected from Lake Mohave (Arizona) and shipped to Dexter National Fish Hatchery (New Mexico) for spawning. Mean length of the adult fish was 57.7 cm (range 50.0 - 69.0 cm) and mean weight was 2.6 kg (range 1.4 - 4.2 kg). Many of the fish were ripe and expressing gametes at the time of collection. Spawning procedures at Dexter generally followed Toney (1974), who partially determined the methods of artificial propagation for razorback suckers 7 years earlier. Because of the handling of the adults during their spawning period and their general poor health (80% were blind in one or both eyes), many adults and eggs were lost. Approximately 20,000 young were eventually produced for the 1981 year class from Dexter (Inslee, 1981).

The next decision involved where, when, and how many fish to reintroduce. Historic habitat of the razorback sucker in Arizona is the Colorado, Gila, Salt, Verde, and San Pedro rivers and Tonto Creek (Minckley and Deacon 1968; Minckley 1973). The species is extant in Lake Mohave where the population consists of large, old adults apparently unable to reproduce successfully. Razorback suckers disappeared from the Gila River basin in the mid-1950's where their distribution was generally below 4,000 feet elevation (Minckley, 1973).

Reintroduction sites in the upper Colorado River basin (Utah and Colorado) were not considered at this time because specific status information on the species in the upper basin was lacking and MOUs were not available with the States involved. However, preliminary data indicate loss of razorback suckers from the upper basin may have been

at least as extensive as the loss from the lower basin. More than 2 years of intensive field work by the Service's Colorado River Fish Project produced fewer than 40 specimens, all old fish (William Miller, pers. comm).

Recently (October 20, 1981), the State of New Mexico signed a MOU to stock razorback suckers into the San Juan River. Utah and Colorado have declined to sign similar agreements choosing instead to consider razorback suckers in their portions of the San Juan River as native species, whether they come from wild parents or are downstream migrants of fish reintroduced in New Mexico.

Habitat alteration was the principle reason for the decline of razorback suckers throughout the Colorado River basin, especially in lower basin areas like the lower Gila and Salt rivers that are now totally dry. However, habitat alterations may only partially explain the extirpation of this species above the uppermost dams on the Salt, Gila, and Verde rivers. An estimated 60 miles of stream above Horseshoe Reservoir on the Verde River, 40 miles above Lake Roosevelt on the Salt, and at least 20 miles of possible habitat above San Carlos Reservoir on the Gila River in Arizona appears capable of supporting razorback suckers (Fig. 1). No data are available to explain the disappearance of razorback suckers from the upper reaches of these rivers (Minckley, 1973). However, their disappearance indicates that the habitat was unsuitable for them. Numerous scenarios can be developed theorizing how unusual environmental conditions may have caused essential habitats to become temporarily unsuitable, or how recent changes in watershed vegetative cover have caused downstream habitats in desert rivers to migrate upstream, converting once unsuitable habitats into suitable ones. However, little data is available to substantiate or to refute each scenario, and the real reason razorback suckers disappeared from these streams may never be known. In fact, specific habitat requirement information is not necessary to reestablish the species. The easiest and least expensive method to determine if razorback suckers can now survive under the present environmental conditions of these streams is to stock them and let the fish sort out suitable habitats. Johnson (1980a) called this the "Johnny Applefish" approach to reintroducing native species--allowing the organism itself to become the testing mechanism. The method appears possible only if potential habitat still remains and if a large number of offspring can be readily obtained. Environmental effects of the "Johnny Applefish" approach of reintroducing native species are few to nonexistent because only historic habitats are considered.

Using the above reasoning and data that the species normally moved upstream into smaller waters to spawn (Hubbs and Miller, 1952), the first reintroduction localities were tributary streams to the Salt, Gila, and Verde rivers. These tributary localities probably simulate natural nursery habitats for the young razorbacks, and harbor fewer large predatory fish species, deemed an important potential sink for the newly stocked fish. Eventually, Eagle Creek on the Gila River, Cherry Creek on the Salt River, and West Clear and Oak creeks on the Verde River were chosen as reintroduction sites (Fig. 1).

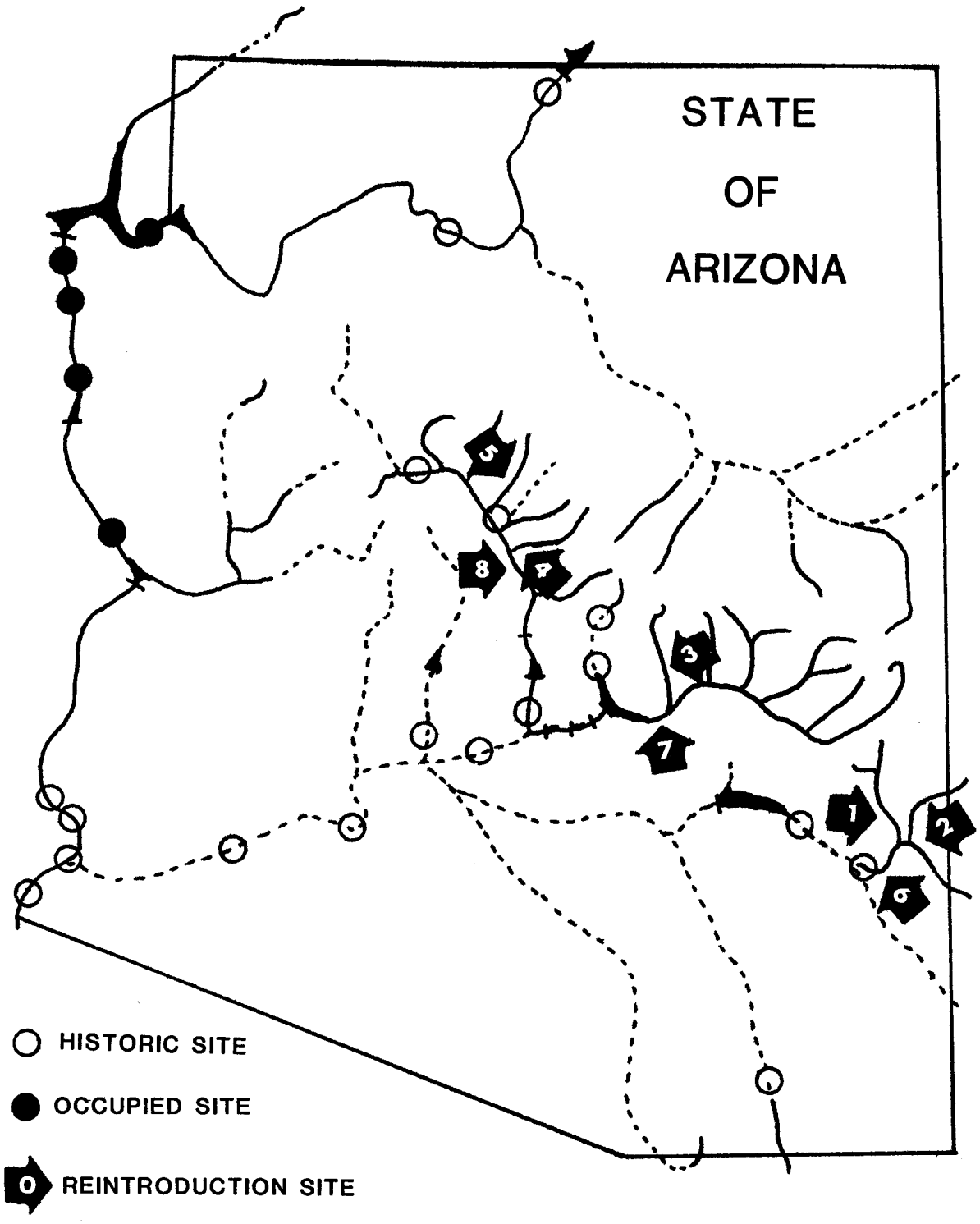

Figure 1. Distribution of the razorback sucker (Xyrauchen texanus) in Arizona (modified from Minckley, 1973). Localities: 1- Eagle Creek, 2- Gila River at Guthrie, 3- Cherry Creek, 4- West Clear Creek, 5- Oak Creek, 6- Gila River below Bonita Creek, 7- Salt River, 8- Verde River.

On June 30 and July 1, 1981, the first stockings of razorback suckers took place. The fish ranged between 5.9 and 11.3 cm in length, with a mean length of 8.1 cm and a mean weight of 6 grams. The following distribution was made (Table 1).

Table 1. Numbers of young razorback suckers stocked in Arizona on June 30, July 1, 1981 (locality numbers relate to Figure 1).

Locality	Tributary of	Legal Description	Number of Fish Stocked
1. Eagle Creek	Gila River	T.4 S., R.28 E.	1,000
2. Gila River (Guthrie)	------	T.6 S., R.30 E.	1,000
3. Cherry Creek	Salt River	T.4 N., R.15 E.	2,000
4. West Clear Creek	Verde River	T.13 N., R.6 E.	1,000
5. Oak Creek	Verde River	T.16 N., R.4 E.	2,000
			7,000

The Gila River mainstream site (locality 2) was selected because flow in a previously selected nursery stream of the Gila River, Bonita Creek was too low. Extensive sampling prior to the stocking was made to provide future baseline data on species abundance. All suckers observed after stocking moved downstream, individually or in small schools. Predation on the young razorbacks by green sunfish (Lepomis cyanellus). was observed almost immediately.

An additional 8,100 razorback suckers were stocked on September 8-9, 1981. These fish were appreciably larger than the first stocking (mean length 12.6 cm; range 7.9 - 17.7 cm, mean weight 19.5 g; range 4.5 - 60.7 g) and were stocked into mainstream localities on the Gila, Salt and Verde rivers (Table 2).

Table 2. Numbers of young razorback suckers stocked in Arizona on September 9 - 10, 1981 (locality numbers relate to Figure 1).

Locality	River	Legal Description	Number of Fish Stocked
2. Guthrie	Gila	T.6 S., R.28 E.	1,500
6. Below Bonita Creek Confluence	Gila	T.3 N., R.23 E.	1,500
7. Horseshoe Bend	Salt	T.4 N., R.15 E.	1,500
7. Highway 288 Bridge	Salt	T.3 N., R.14 E.	1,500
8. Childs, Arizona	Verde	T.11 N., R.6 E.	2,100
			8,100

Perhaps the most controversial razorback sucker stocking of the 1981 year class is yet to be made. Sometime within the first quarter of 1982, 4,000 young razorback suckers will be stocked into Lake Mohave. Whereas all of the other stockings are attempts to establish reproducing populations in historic localities, the Lake Mohave plan is an attempt to maintain a genetic stock of razorback suckers for future recovery efforts. The present Lake Mohave razorback suckers resemble a classic senescent population; one that contains only large individuals, many of them diseased and with fatty material replacing the gonads. Whereas McAda and Wydowski (1980) estimated the maximum age of upper basin razorback suckers to be 9 years, they question their findings because of the difficulty of identifying annuli. Minckley (1973) has suggested Lake Mohave fish may be 30-45 years old. Assuming the latter estimate more closely describes the age span of Lake Mohave razorback suckers, a successful stocking program through 1990 may provide investigators with genetic stock through at least 2020, a pretty good hedge on extinction of the species if the Gila River basin stockings do not succeed.

The razorback sucker reintroduction program will be evaluated annually for the next 15 years. The 1981 fish were marked with tetracycline (Weber and Ridgway, 1962). The fish stocked in Lake Mohave will have one pelvic fin clipped and a liquid nitrogen cold brand placed on the clip wound to prevent regeneration. All future razorback stockings will be marked with a coded metal wire nose tag commonly used for salmonids. To date, only one of the 15,100 fish stocked in 1981 has been recaptured, a 17.1 cm individual captured in an irrigation ditch near Salomon, Arizona, on November 11, 1981.

Conclusion

Hopefully, the MOU between the Service and Arizona will lead to the eventual reestablishment of razorback suckers in the Gila River drainage. But more than that, the reintroduction action will demonstrate to both parties, and to other private, State, and Federal entities, that reintroduction of native fish species need not bring an end to sport fishing or other ongoing activities. It may also point out that native fish species are a valuable resource--one that interests the public and is well worth conserving.

Some spin-off benefits from the razorback stocking may have already been realized. Close on the heels of the razorback reintroduction, the Service, Arizona, and the U.S. Forest Service signed a similar agreement to reintroduce the endangered Gila topminnow (Poeciliopsis occidentalis) into a number of localities within its historic drainage. This planting should start early in 1982. And even more recently (October 19 and November 3, 1981), 41,500 young bonytail chubs (Gila elegans) were stocked into Lake Mohave in an effort to perpetuate that endangered Colorado River endemic. Hopefully, these stockings will continue and increase--the first steps toward the perpetuation of the southwestern fish fauna in the wild.

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A SUMMARY OF OBSERVATIONS ON THE HUMPBACK CHUB (Gila cypha) IN THE GRAND CANYON REGION.

by

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ABSTRACT

The humpback chub, Gila cypha, was described from the Grand Canyon in 1946. The description was based on an angler caught fish taken from Bright Angel Creek in 1942. Historically this species was distributed throughout the Colorado River Basin, where isolated populations remain today. Farly records from the Grand Canyon region include localities from Stantons Cave dated at 4000 years B.P. and from an archeological site at Catclaw Cave. Both of these localities are adjacent to the mainstream Colorado River, although Catclaw Cave is now covered by Lake Mead. Current distribution of this species within this region is from Lake Powell to R.M. 194 in Grand Canyon. In all probability, this species also occurs in Lake Mead. It also is found 5 km upstream in the Little Colorado River.

In the Little Colorado River, smaller fish (10 cm) are found in water less than one meter deep. Larger fish occur in deeper water, while all size classes were found in slow to moderately moving water over mud-silt bottoms. In the Colorado River, adults were taken in slow to moderate current in deeper water (3-5 m) over sand bottoms. The only small fish taken was in an isolated pool with no current, over a silt bottom. In both rivers larger fish undoubtedly occur in swifter areas, but were not collected there due to the collecting methods used.

Based on the examination of a small number of stomachs, humpback chubs were found to eat Dipterans. Additional observations on this species illustrated that it readily takes floating Cladophora and actively inspects possible food items on the surface and in midwater areas. However, as inferred by the inferior mouth of this species, and by observations, most feeding activity is directed towards the bottom where it feeds extensively.

Actual growth of young-of-the-year humpback chubs was from 1.5 cm in June to 9 cm in October. Calculated growth was found to be similar, with fish reaching 8.6-9 cm their first year of life. It was also found that humpback chubs live at least nine years, with the oldest fish examined being 38 cm in total length. As fish this size and larger are common in

Grand Canyon, it appears that this species may be long lived, similar to the other big river fishes of the Southwestern United States.

Additionally, there are several problems affecting this species and include the presence of the ectoparasite Learnea in the humpback chub population of Grand Canyon. This situation currently is not a major problem, but easily could become one. The impact of predation by the channel catfish and possibly striped bass, is a continuing problem, as is the impact of commercial river traffic on this species, especially at the Little Colorado River. Perhaps the major problem is the water fluctuation of the Colorado River due to the operation of Glen Canyon Dam. This fluctuation has become "stabilized" in the last several years, but is now in the process of being changed to a peaking power operation, the impacts of which are unknown.

UN RESUMEN DE OBSERVACIONES DE EL HUMPBACK CHUB (Gila cypha) EN LA REGIÓN DE EL GRAN CANON.

por

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ABSTRACTO

El humpback chub, Gila cypha, que describe del Gran Cañón en 1946. La descripción que tomo un pescador que atrapo un pez en el año de 1942. Historicamente esta especie se distribuyo por toda la cuenca del río Colorado, donde las poblaciones se quedan aisladas hoy en día. Los primeros archivos de la región del Gran Canón inclulle localidades de la cueva de Stantons con fecha del año 4000 B.P. y de un sitio arqueologico en la cueva de Catclaw. Estas dos localidades están adyentes a la corriente principal del río Colorado aunque la cueva de Catclaw está ahora cubierta por el lago Mead.

Distribuciones corrientes de estas especies de entre esta región es de Lago Powell a R.M. 194 en el Gran Cañón. En toda población, estas especies tambien se encuentran en Lago Mead. Tambien estos se encuentran a 5 km río arriva en el pequeno río Colorado.

En el pequeno río Colorado, se encuentran tambien los peses pequenos (< 10 cm) en aguas menos profundas que un metro. Los peses grandes se encuentran en aguas profundas, mientras clases de todos tamanos se encontraton en aguas moderadamente tranquilas y el fondo es de sedimento de lodo. En el río Colorado a los adultos los tomaron en corrientes lentas y moderadas y en aguas de 3-5 m de profundidan y estas aguas trenen su fondo de arena. Los peses pequenos se encuentran aislados en lagos sin corrientes, y sobre un fondo de lodo. En los dos ríos los peses mas grandes sin duda se encuentran en areas de corrientes rapidas, pero no se colectaron allí devido a los metodos de colectar que usaron.

Bajo una examinación de un reducida numero de estomagos de humpback chubs encontraron que comem Dipterans. Adicionales observaciones en estas especies ilustraron que facilmente toman Cladophora flotante y activamente inspeccionan cosas que puedenser posibles comidas para ellas en la superficie y enmedio del agua. Sin embargo, como supone por la boca inferior de estas especies, y por observaciones, la major parte del activamiento de comer es dirigido hacia el fondo donde comen extensivamente.

Actualmente los humpback chubs jovens de el año crecen de 1.5 cm in Junio a 9 cm in Octubre. Calculando el erecimiento similar que se iso, con peses que alcanzaron 8.6-9 cm éste primer ano de vida. Este calculo tambien dise que el humpback chubs vive por lo menos nueve años, con la exmainación del pez grande existe que mi de 38 cm en total de largo. Pero este pescado es comun de tamaño y de largo en el Gran Canyon, parece que exta especie es de larga vida, es parecide a el otro río grande de pescados de el Southwestern de Los Estados Unidos.

Adicionalmente hay varios problemas afectando éstas espécies y incluye la precencia de el ectoparasito Learnea en la población del humpback chub de el Gran Cañon. Esta situación corrientemente no es un problema major, pero facilmente podria hacerse uno. El impacto de predador por el bagre de canal y posiblemente róbalo rayado es un problema continuo como es el impacto del trafico comercial del río en estas especies, especialmente en el pequeno rio Colorado devido a la operación de la presa del Glen Canon. Estas fluctuacions de agua se han estabilizado en los ultimos anos, pero ahora estan en el proseso de ser combiadas a una operacion de una potencia extrema, los impactos de cuales están descanocidos.

Lordosis in Gila, Yampa River, Colorado

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As part of an ongoing study of the fishes of the Upper Colorado River system, we conducted surveys of YOY fishes in the Yampa River, Moffat Co., Colorado during 1980 and 1981. Fishes were collected from backwaters and other low-velocity habitats along a 97 km reach from the confluence with the Green River (Dinosaur National Monument) upriver to the upper end of Cross Mountain Canyon. Collections were made with a dip-net (1/32 in) and sein (1/16 in). In August 1980, 106 samples were collected and processed, and 127 samples were collected in 1981. Lordosis (dorsoventral curvature of the spine) was observed in YOY roundtail chubs (Gila robusta) from the August Yampa surveys during both years. A preliminary analysis of July, 1981 YOY roundtails from a 40 km reach of the mainstem Colorado River (Mesa Co., Colorado) revealed lordosis at <2%. Counts are imcomplete.

In 1980, deformed chubs were found in 68 of the 106 samples (64.1%). A total of 3497 YOY chubs were examined of which 360 (10.3%) were deformed. In 1981, 101 of 127 samples (79.5%) contained deformed specimens. A total of 4032 specimens were examined of which 667 (16.5%) were deformed. For 1981, YOY roundtails ranged from 14.5 mm - 48.0 mm in length (T.L.) and were probably 17-84 days old. Deformed specimens were 23.0 mm - 41.0 mm T.L. suggesting that spinal curvature appeared at 34-70 days. A number of yearling roundtails (>48 mm T.L.) were collected, but lordosis was not observed in this group. Examination of cleared and stained whole specimens indicates a gradual spinal curvature beginning around the 10th trunk vertebra through the 11th caudal. Maximum ventral depression is at the 3rd and 4th caudal. Vertebral rupture, separation, or compression are not evident. Preliminary microscopic examination has not revealed any readily noticable gross differences in vertebral structure between normal and deformed fish. Examinations for two parasites known to be associated with fish spinal deformities (Myxosoma cerebralis and Ichthyosporidium hoferi) were negative.

We know of few reports of lordosis in wild fish populations; however, it has been frequently observed in hatchery and laboratory conditions. A number of factors have been implicated in both lordosis and scoliosis (lateral curvature) including disease, heavy metals, nutritional deficiencies, pesticides, electroshock, fluctuations in oxygen and temperature, radiation, and genetic abberations. Necropsy

results suggest that neither disease nor lead or zinc were the causative factors in this situation. Further, organophosphate pesticides have been shown to act as actetylcholinesterase inhibitors and often result in traumatic vertebral damage which is not evident in these specimens. Based on our preliminary examinations, we can only speculate that the cause of lordosis in these fish is one of the other factors. We assume that, since curvature occurs in the same area in each specimen, the condition can probably be attributed to one type of factor. Hopefully, ongoing analysis of possible pesticide and metal content in addition to bone composition, amino acids, and vitamin C levels (USFWS Fish - Pesticide Research Laboratory, Columbia, Mo.) will provide additional insight into this condition.

Lordosis en Gila, Río Yampa, Colorado

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Como parte de una investigación que se está realizando sobre los peces del sistema superior del Río Colorado, llevamos a cabo un estudio con crías del año (YOY) en el Río Yampa, Moffat Co., Colorado durante 1980 y 1981. Los peces fueron recogidos de los remansos y corrientes poco veloces a lo largo de 97 (noventa y siete) kilómetros desde las confluencias de la parte superior del Río Green (Monumento Nacional al Dinosaurio) hasta la parte superior del Cañón Cross Mountain. El recogido de las muestras se hizo con un copo (de una tri-gésimo-segunda parte de pulgada) y una red de barredera (de una décimosexta parte de pulgada). En agosto de 1980 se recogieron y procesaron 106 (ciento seis) muestras; 127 (ceinto veintisiete) en 1981. Se observó la curvatura dorsoventral del espinazo (lordosis) en YOY Gila robusta de las muestras tomadas en agosto en el Río Yampa durante los dos años. Un análisis preliminar hecho a YOY Gila robusta a lo largo de 40 (cuarenta) kilómetros de la corriente principal del Río Colorado (Mesa, Colorado), en julio de 1981, reveló lordosis en menos de un dos por ciento (<2%). Los estudios aún no han finalizado.

En 1980 se encontraron cotos deformes en 68 (sesenta y ocho) de las 106 muestras (64.1 por ciento). De un total de 3497 cotos YOY examinados 360 (10.3 por ciento) eran deformes. En 1981, 101 de 127 (79.5 por ciento) muestras contenían especímenes deformes. De un total de 4032 especímenes examinados 667 (16.5 pos ciento) eran deformes. Para 1981 el largo de los cotos, que tendrían entre 17 y 84 días de nacidos, fluctuaba entre los 14.5 y 48.0 milímetros. El largo de los especímenes deformes fluctuaba entre los 23.0 y 41 milímetros, lo que segiere que la curvatura espinal (lordosis) apareció entre los 34 y 70 días de nacidos. Se recogieron varios cotos YOY cuyo largo era menor a los 48 milímetros (48 mm.), pero no se observó lordosis en este grupo. El examen de especímenes enteros, que habían sido limpiados y teñidos, indica una curvatura espinal gradual comenzado cerca de la décima vértebra troncal hasta la undécima vértebra caudal. La depresión ventral máxima se encuentra en la tercera y cuarta vértebra caudal. La rotura, separación o compresión vertebrales no es evidente. El examen micróscopico preliminar no ha revelado ninguna diferencia notable en crecimiento entre la estructura vertebral de los peces normales y los deformes. El examen de dos parásitos asociados con las deformaciones espinales en los peces (Myxosoma cerebralis e Ichthyosporidium hoferi).

Tenemos conocimiento de algunos informes sobre lordosis en poblaciones de peces silvestres sin embargo se ha observado frecuentemente en viveros y en condiciones de laboratorio. Varios factores han sido implicados tanto a la lardosis como a la scoliosis (curvatura lateral). Entre estos factores se incluyen; enfermedad, metales densos, deficiencias nutricionales, pesticidas, choques eléctricos, fluctuaciones en los niveles de oxígeno y en la temperatura, radiación y aberraciones genéticas. Los resultados de disecciones realizadas sugieren que ni la enfermedad ni el plomo, ni el cinc fueron los factores causantes de esta situación. Además, se ha probado que los pesticidas organofosfatados actúan como inhibidores de actetylcolinesterasa y a menudo resultan en daño vertebral traumático, el cual no es evidente en estos especímenes. Basándonos en nuestros estudios preliminares sólo podemos especular que la causa de lordosis en estos peces es uno de los otros factores. Asumimos que, dada la condición de que la curvatura ocurre en la misma área en cada espécimen, probablemente la condición puede atribuirse a un solo tipo de factor. Esperamos que los análisis que lleva a cabo el Laboratorio de Pesca y Pesticidas USFWS, Columbia, Mo., sobre el posible contenido de metales y pesticidas en la composición ósea, aminoácidos y niveles de vitamina C, provea un mayor discernimiento sobre esta situación.

Lordosis in Gila, Yampa River, Colorado

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As part of an ongoing study of the fishes of the Upper Colorado River system, we conducted surveys of YOY fishes in the Yampa River, Moffat Co., Colorado during 1980 and 1981. Fishes were collected from backwaters and other low-velocity habitats along a 97 km reach from the confluence with the Green River (Dinosaur National Monument) upriver to the upper end of Cross Mountain Canyon. Collections were made with a dip-net (1/32 in) and sein (1/16 in). In August 1980, 106 samples were collected and processed, and 127 samples were collected in 1981. Lordosis (dorsoventral curvature of the spine) was observed in YOY roundtail chubs (Gila robusta) from the August Yampa surveys during both years. A preliminary analysis of July, 1981 YOY roundtails from a 40 km reach of the mainstem Colorado River (Mesa Co., Colorado) revealed lordosis at <2%. Counts are imcomplete.

In 1980, deformed chubs were found in 68 of the 106 samples (64.1%). A total of 3497 YOY chubs were examined of which 360 (10.3%) were deformed. In 1981, 101 of 127 samples (79.5%) contained deformed specimens. A total of 4032 specimens were examined of which 667 (16.5%) were deformed. For 1981, YOY roundtails ranged from 14.5 mm - 48.0 mm in length (T.L.) and were probably 17-84 days old. Deformed specimens were 23.0 mm - 41.0 mm T.L. suggesting that spinal curvature appeared at 34-70 days. A number of yearling roundtails (>48 mm T.L.) were collected, but lordosis was not observed in this group. Examination of cleared and stained whole specimens indicates a gradual spinal curvature beginning around the 10th trunk vertebra through the 11th caudal. Maximum ventral depression is at the 3rd and 4th caudal. Vertebral rupture, separation, or compression are not evident. Preliminary microscopic examination has not revealed any readily noticable gross differences in vertebral structure between normal and deformed fish. Examinations for two parasites known to be associated with fish spinal deformities (Myxosoma cerebralis and Ichthyosporidium hoferi) were negative.

We know of few reports of lordosis in wild fish populations; however, it has been frequently observed in hatchery and laboratory conditions. A number of factors have been implicated in both lordosis and scoliosis (lateral curvature) including disease, heavy metals, nutritional deficiencies, pesticides, electroshock, fluctuations in oxygen and temperature, radiation, and genetic abberations. Necropsy

results suggest that neither disease nor lead or zinc were the causative factors in this situation. Further, organophosphate pesticides have been shown to act as actetylcholinesterase inhibitors and often result in traumatic vertebral damage which is not evident in these specimens. Based on our preliminary examinations, we can only speculate that the cause of lordosis in these fish is one of the other factors. We assume that, since curvature occurs in the same area in each specimen, the condition can probably be attributed to one type of factor. Hopefully, ongoing analysis of possible pesticide and metal content in addition to bone composition, amino acids, and vitamin C levels (USFWS Fish - Pesticide Research Laboratory, Columbia, Mo.) will provide additional insight into this condition.

Lordosis en Gila, Río Yampa, Colorado

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Fishery Investigation of the Yampa and Green Rivers, Dinosaur National Monument, Colorado and Utah, 1981

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Abstract--The whitewater canyons of the Yampa and Green rivers within Dinosaur National Monument, Colorado and Utah, have been reported as important habitat for endangered fishes. The U. S. Fish and Wildlife Service initiated a cooperative fishery study in Dinosaur National Monument, in March, 1981, as part of a larger study of the fishes of the Green River Basin. Results from a standardized sampling program indicated eight native species (Catostomus discobolus, Catostomus latipinnis, Xyrauchen texanus, Ptychocheilus lucius, Gila robusta, Gila cypha, Rhinichthys osculus, and Cottus bairdi) were present in both the Yampa and Green rivers within the monument. Ptychocheilus lucius was found throughout the monument, but was uncommon in abundance. Xyrauchen texanus was found only in small numbers at the Yampa/Green confluence during May and June. G. cypha was extremely rare; a total of 5 individuals was found at one sample site on the Green and two sites on the Yampa. Cyprinus carpio, Ictalurus punctatus, Notropis lutrensis, Notropis stramineus, and Richardsonius balteatus were the most abundant and widely distributed of the twelve introduced species collected.

Investigaciónes Pesqueras en los Ríos Yampa y Verde, Monumento Nacional de "Dinosaur", Estados de Colorado y Utah, 1981

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Abstracto--Los cañones de corrientes ligeras en los Ríos Yampa y Verde entre el Monumento Nacional de "Dinosaur", estados de Colorado y Utah, han sido exponidos como habitat importante para los peces empeligrados. El Servicio de Peces y Animales Silvestres de los Estados Unidos inició un estudio cooperativo de peces en el Monumento Nacional de "Dinosaur", en Marzo, 1981, como parte de un estudio mayor de los peces de la Cuenca del Rio Verde, Resultados de un programa clásico de muestra indicaron que ocho especies nativas (Catostomus discobolus, Catostomus latipinnis, Xyrauchen texanus, Ptychocheilus lucius, Gila robusta, Gila cypha, Rhinichthys osculus, y Cottus bairdi) fueron presente en los Ríos Yampa y Verde entre el monumento. Ptychocheilus lucius se encontró por todo el monumento, pero sin ser comum en abundancia. Xyrauchen texanus se halló solamente en numeros escasos en la confluencis de los Ríos Yampa y Verde durante Mayo y Junio. G. cypha fue estremamente raro; un total de 5 individos se hallaron en un sitio de muestra en el Río Verde y en dos sitios en el Río Yampa. Cyprinus carpio, Ictalurus punctatus, Notropis lutrensis, Notropis stramineus, y Richardsonius balteatus fueron las mas abundantes y mejor destribuidas de las doce especies introducidas que se colectaron.

The Yampa River, largest tributary of the Green River, arises on the western slope of the Rocky Mountains near Steamboat Springs, Colorado. It flows westerly and joins the Green River in Dinosaur National Monument (Fig. 1). Within the monument, the lower 72 km of the Yampa River are contained within a steep-walled canyon with near-vertical walls rising to 400 m above river level. The upper canyon, from km 72 to km 32 is characterized by long flatwater sections interrupted by whitewater produced by boulder fields carried in from tributaries. The Yampa enters the Weber sandstone at km 32, where the substrate changes from boulder/cobble to sand. With the exception of Warm Springs rapid at km 6.7, the lower Yampa is relatively deep and slow-moving, with many meanders cut through the soft sandstone cliffs.

The Green River receives the Yampa River at km 552 and abruptly enters Whirlpool Canyon, a section with deep eddies and steep, boulderstrewn cliffs. At km 534, the Green River leaves Whirlpool Canyon and meanders through cottonwood-lined sand/cobble shorelines in Island Park and Rainbow Park until entering Split Mountain Canyon at km 523. During its passage through Split Mountain the Green River passes through several large boulder fields creating four major rapids. The Green River exits Split Mountain Canyon at km 510 and enters a broad, flat agricultural valley.

Homogeneous river sections, or strata, were delineated from topographic and geologic maps, aerial surveys, and on-ground reconnaissance. Eight strata on the Yampa River (two strata within DNM) and four on the Green River were identified (Fig. 1). Sample sites consisted of randomly selected 0.8 km - long sections of river. All habitat types within a sample site were intensively sampled with trammel nets, seines, and electrofishing gear during prerunoff (April), runoff (May), and postrunoff (June through October) for a total of five sampling rotations. In addition, electrofishing was continued downstream for 4 km. Sampling and tagging procedures followed those of Archer et al. (1980). Total effort for the three gear types for each stratum was comparable during the study (Table 1).

A total of 20 fish species was found in the Yampa and Green rivers within DNM (Table 2). Seventeen species were common to both rivers. Incidental species included one Ictalurus melas from the Yampa and one Micropterus dolomieui and one Catostomus commersoni from the Green. Seventeen adult Colorado squawfish (432 mm TL to 680 mm TL) were collected from the Green and Yampa rivers within the monument. Although collected from each stratum, squawfish were uncommon. Only five individuals were collected in the lower Yampa canyon (stratum Y_1) during standardized sampling; however, an additional 32 were collected and tagged during special spawning studies between 3 July and 10 July. The four Xyrauchen texanus collected in the Yampa River were obtained by electrofishing from a riffle 0.8 km upstream from the Yampa/Green River confluence where several others were observed but not caught. The only X. texanus found in the Green River was collected with electrofishing gear in May, approximately 1.6 km downstream from the confluence. Five humpback chubs were collected in this study. Two were collected with floating trammel nets at km 29 on the Yampa during Colorado squawfish studies in July. One humpback chub was caught in a stationary trammel net at km 26 in September. Two individuals were also taken in August with stationary trammel nets in Whirlpool Canyon.

Two native suckers, Catostomus discobolus and Catostomus latipinnis were abundant throughout both rivers in the Monument (Tables 2 and 3). Numbers of these two species were approximately equal in the Yampa and Green rivers downstream to Echo Park, but Catostomus discobolus was noticeably more abundant further downstream (Table 3). Gila spp. (including G. robusta) occurred throughout the monument, but were uncommon in the Green River below Whirlpool Canyon. Rhinichthys osculus and Gila robusta were abundant in seine hauls throughout both rivers in the monuments.

Two introduced species, Cyprinus carpio and Ictalurus punctatus, were common in trammel net and electrofishing samples throughout the monument (Table 3). Both these species reached weights in excess of 5 kg. Rhinichthys osculus and Notropis lutrensis were abundant in seine hauls throughout both rivers. Pimephales promelas was widespread in both rivers, but was abundant only in occasional seine samples from backwaters. Notropis stramineus and Richardsonius balteatus were common in the Green River, but were uncommon-to-rare in the Yampa.

Occurrence of fishes found in the present study was generally similar to that reported by Holden and Stalnaker (1975a, 1975b), Seethaler et al. (1979), and Tyus et al. (1981a). Gila elegans was reported abundant in the Green River at Echo Park in 1964-66 (Vanicek et al. 1970), but Holden and Stalnaker (1975b) found the species to be rare. No G. elegans were found in 1981, and the species appears to be extirpated in DNM. G. cypha were rare in 1981, as was reported by Holden and Stalnaker (1975b) from 1968-71. The five G. cypha collected in 1981 were found in deep pools or eddies adjacent to boulders where water velocity was $<$ 0.5 ft/sec. Xyrauchen texanus was found in spawning condition in May 1981 from the identical riffle where found by McAda in 1975 (McAda and Wydoski 1980). Ptychocheilus lucius was rare; however, a radiotelemetry study (Tyus et al. 1981b) discovered spawning Colorado squawfish in the lower 32 km of Yampa canyon in early July 1981 at which time the species was locally common.

Results of the Yampa River Study are preliminary since data analysis has just begun. The final report is due in January 1982 and will include information for all fish species, with emphasis on endangered fishes. Information from radiotelemetry and larval collections will be used to explore spawning of Colorado squawfish. The largest task has yet to be addressed: combining all FWS studies so that the upper Colorado River Basin can be placed in perspective regarding the most important habitats for endangered fishes. When this is done it appears the Yampa River may be proven a critical link.

The U.S. Fish and Wildlife Service (FWS) began a fishery study (Colorado River Fishery Project) on the upper Colorado River Basin in July 1979. This study included the mainstream Colorado River from Lake Powell to Palisade, Colorado and the Green River from its confluence with the Colorado upstream to Split Mountain Canyon in Dinosaur National Monument. In fall 1980 the study was expanded to include the Yampa River and that portion of the Green River from Split Mountain to the mouth of the Yampa. Previous workers (Holden 1973; Holden and Stalnaker 1975a, 1975b; Seethaler et al. 1979; Vanicek and Kramer 1969) have indicated the importance of the monument for endangered fishes. In addition, the endangered Colorado squawfish (Ptychocheilus lucius) has been collected throughout the lower 208 km of the Yampa River (Seethaler 1978). Colorado squawfish have also been observed moving between the Yampa and Green rivers, since a fish tagged by FWS in the Green River in 1979 was found 83 km up the Yampa River by Colorado Division of Wildlife (CDOW) biologists in 1980.

The Yampa River is the only major tributary of the Green River whose historic flows have not been altered by dams. The Yampa may not remain in its wild state for long, however, since several water development projects are planned. These include the proposed Juniper-Cross Mountain Project (consisting of two reservoirs at km 90 and km 142), and the Cheyenne Water Project (diverting water from the headwaters of the Little Snake River, a major tributary of the Yampa). Because of potential conflicts between such projects and the survival of endangered fishes, the FWS and the National Park Service (NPS) proposed a study of the Yampa River in 1980. This study was to supply the FWS with needed information for Biological Opinions under Section 7 of the Endangered Species Act. In addition, NPS needed information within Dinosaur National Monument (DNM) to plan for the conflicting congressional mandates of maintaining the area in a natural state and providing for the enjoyment of present and future generations.

The USFWS and NPS entered into a cooperative agreement in spring 1981 to study the Yampa and upper Green rivers within DNM. The Colorado Division of Wildlife also cooperated in this study because of their ongoing monitoring program on fishes in the Yampa River. Funds to study the upper Yampa were also provided by Congress.

A primary objective of the Yampa River Fishes Study is to evaluate the importance of the study area for maintenance of endangered Colorado River fishes and to characterize fishery habitat. Studies include (1) a standardized sampling program for all fishes, (2) a radiotelemetry program for Colorado squawfish, and (3) a program to determine distribution and abundance of larval and young-of-year Colorado squawfish. This paper presents preliminary data from the standardized fish sampling program in Dinosaur National Monument, Colorado and Utah.

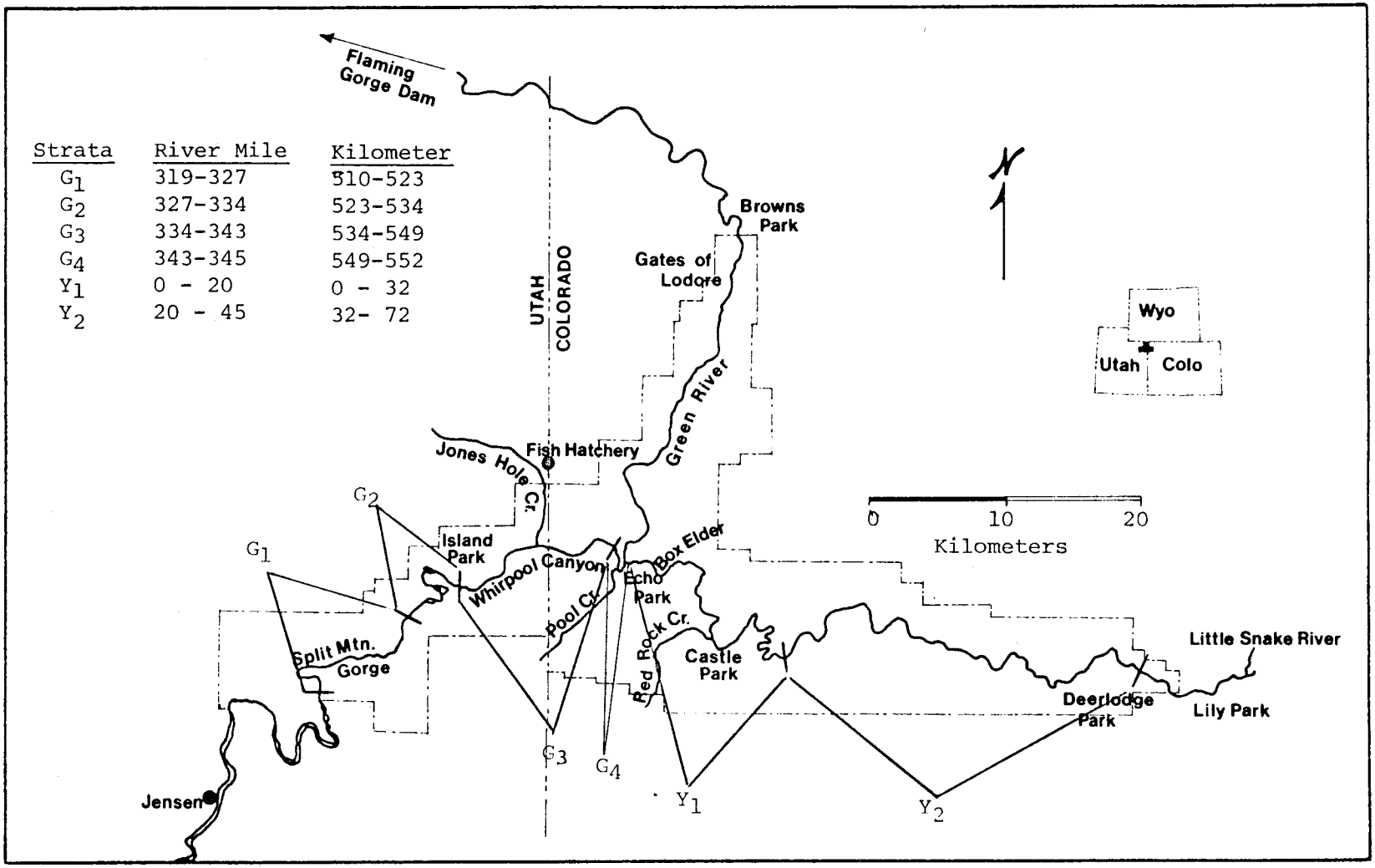

Figure 1. Dinosaur National Monument including study area.
(From Seethaler, 1978.)

Table 1. Total effort for three sampling techniques, Green and Yampa rivers, Dinosaur National Monument, April - October, 1981.

Strata	Electrofishing (hrs)	Trammel Net* (net hrs)	Seine (m^2)
G_1	9.6	49.1	2159
G_2	9.8	48.0	3303
G_3	12.0	41.8	3650
G_4	9.5	47.5	4863
Y_1	12.0	46.6	2509
Y_2	8.1	49.2	1696

*150' X 6' Net

Table 2. Occurrence of fishes by strata in the Green and Yampa rivers, Dinosaur National Monument, April - October 1981. Abundant=A; Common=C; Rare=R; Incidental=I.

Species	G_1	G_2	G_3	G_4	Y_1	Y_2
Ptychocheilus lucius	R	R	R	R	R	R
Xyrauchen texanus				R	R	
Gila cypha			R		R	R
Salmo gairdneri	R		R	R	R	
Salmo trutta			R	R		R
Catostomus commersoni				I		
Catostomus latipinnis	A	A	A	A	A	A
Catostomus discobolus	A	A	A	A	A	A
Gila spp.	R	R	C	A	A	A
Cyprinus carpio	C	C	C	C	C	R
Rhinichthys osculus	A	A	A	A	A	A
Notropis lutrensis	A	A	A	A	A	C
Notropis stramineus	C	C	C	C	R	C
Richardsonius balteatus	C	C	C	C	R	R
Semotilus atromaculatus		R	R	R	R	
Pimephales promelas	C	C	C	C	C	R
Ictalurus punctatus	C	C	C	C	C	C
Ictalurus melas						I
Micropterus dolomieui			I			
Cottus bairdi		R	R	C	R	R

Table 3. Total fishes > 150 mm collected by strata, all gear types combined, from the Green and Yampa rivers, Dinosaur National Monument, April - October 1981

Species	Strata					
	G_1	G_2	G_3	G_4	Y_1	Y_2
Ptychocheilus lucius	5	2	2	5	37	1
Xyrauchen texanus				1	4	
Gila cypha			2		2	1
Salmo gairdneri	1		4	1	1	
Salmo trutta			1	1		1
Catostomus commersoni				1		
Catostomus latipinnis	43	62	125	89	89	97
Catostomus discobolus	136	129	170	93	68	122
Gila spp.	3	1	25	25	41	59
Cyprinus carpio	24	23	46	42	23	4
Micropterus dolomieui			1			
Ictalurus punctatus	32	22	82	20	37	33
Ictalurus melas						1

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A Summary of the Proposed Listing Activities for the Bonneville Cutthroat Trout

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U.S. Fish and Wildlife Service
Salt Lake City, Utah

During the fall of 1979 the Desert Fishes Council (November 1979) and the Bonneville Chapter of the American Fisheries Society (October 1979) sent petitions to the Director of the U.S. Fish and Wildlife Service (FWS) asking for a status review of the Bonneville cutthroat trout (Salmo clarki utah). After examination of the data submitted by these organizations, the Director determined that a substantial amount of information had been presented to warrant a review of the status of the Bonneville cutthroat trout. Subsequently, a notice of review was published in the Federal Register on March 26, 1980.

The public and other state and Federal agencies were given 60 days to comment on this notice of review. Letters requesting comments were sent to the Governors of Nevada, Wyoming, and Utah. The following agencies stated opposition to the proposal to list the Bonneville cutthroat trout: U.S. Bureau of Land Management (BLM), U.S. Forest Service (FS), and the states of Nevada, Utah, and Wyoming. Several organizations, institutions and private individuals responded in favor of the proposal to list.

During the last half of 1980 and the first half of 1981 the FWS was in the process of determining if a proposal was warranted to list this species as endangered or threatened. Several meetings were held during this time period with the states of Nevada, Utah, and Wyoming and the BLM and FS. The purpose of these meetings were to familiarize the participants with the listing process and to gather information to determine if a proposal to list was warranted. The information collected included: locations of pure populations; type and condition of habitat, an economic analysis of the habitat; and a review of existing management plans and goals for the trout.

As a result of the information obtained during the past two years, the FWS decided to pursue entering into a memorandum of understanding (MOU) with the states of Nevada, Utah, and Wyoming, and the BLM and FS. This action if successful would be in lieu of listing. The FWS has suggested that each state take the lead in their area in developing a cooperative management agreement for this subspecies. It is hopeful that a signed MOU for the Bonneville cutthroat trout with the individual states and the BLM and FS, could be developed by June of 1982. The FWS would act as a liaison between the various agencies and monitor their activities. If the MOU fails to accomplish the stated goals and objectives and the Bonneville cutthroat trout populations continue to decline, the listing process would be reinitiated.

A Spawning Migration of Colorado squawfish (Ptychocheilus lucius) in the Yampa and Green Rivers, Colorado and Utah, 1981.

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Abstract--Spawning migration of Colorado squawfish has been hypothesized but never documented until late June and early July, 1981 when eight Colorado squawfish were radiotracked from the upper Yampa and lower Green Rivers to spawning grounds in the lower 32 km of the Yampa River. Seven Colorado squawfish migrated from 80 to 160 km downstream in the Yampa River and one migrated 154 km upstream from the Green River to enter the spawning grounds. Radiotagged fish remained in the lower Yampa from June 26 to July 10 and contact was reestablished with seven fish near their premigratory location about two weeks after this period. Three Colorado squawfish originally tagged with dangler tags on the upper Yampa River in 1978 and 1980 and on the upper Green River in 1981 were recaptured on the spawning grounds from June 18 to July 9. Collection of larval Colorado squawfish in the lower 20 km of the Yampa River confirmed that successful spawning occurred.

Una Migracion Para la Reproduccion del Squawfish del Colorado (Ptychocheilus lucius) en los Rios Yampa y Green, en los Estados de Colorado y Utah, 1981.

Abstracto--Mucho se ha teorizado, pero nunca antes documentado, hacerca de la migracion con propositos de reproduccion de el Squawfish del Colorado hasta a finales de Junio y principios de Julio de 1981 cuando ocho ejemplares fueron observados mediante el uso de radiotelemetria en movimiento migratorio desde la cabezera del Rio Yampa y desde la region mas inferior del Rio Verde (Green River), hacia la zona de reproduccion: 32 kms en la parte mas inferior del Rio Yampa. Siete ejemplares migraron 80 - 160 kms con la corriente rio abajo en Rio Yampa; y uno fue observado en el Rio Green migrando 160 kms contra la corriente y entrar en la zona de reproduccion en la parte mas inferior del Rio Yampa. Estos peces permanecieron en dicha zona desde Junio 26 hasta Julio 10 y posteriormente, dos semanas mas tarde, siete de ellos fueron detectados aproximadamaente en la zona original previa adicho movimiento migratorio. Tres Squawfish del Colorado fueron marcados previmente con etiquetas dangler y liberados en las cabezeras de los Rios Yampa y Green en 1978 y en 1980; estos peces fueron recapturados en la zona de reproduccion en la parte mas inferior del Rio Yampa en la epoca de Junio 18 a Julio 9 de 1981. Se confirma la reproduccion exitosa del Squawfish mediante la colecta de larvas en la region de 20 kms de la zona mas inferior del Rio Yampa.

The U. S. Fish and Wildlife Service began a comprehensive study of the fishes of the Yampa River in March, 1981. Included as part of that study was a study of the movement and habitat preferences of Colorado squawfish(Ptychocheilus lucius), using conventional dangler tags and radiotelemetry. During this study investigators were able to document the first recorded spawning migration of Colorado squawfish. This paper presents general observations about that spawning migration. More detailed information about the Yampa study can be obtained from Miller, et al (1982). Work is continuing to analyze the results of this study and relate them to other Fish and Wildlife Service studies in progress in the upper Colorado River Basin.

Field collections on the Yampa River began in April, 1981. By May 14, seven Colorado squawfish were surgically implanted with AVM Radiotransmitters. In late June the radiotagged fish began moving downstream from their original points of capture and in early July were relocated in the lower 32 km of Yampa Canyon. By late July all the radiotagged fish had left the lower Yampa Canyon and when relocated, were generally found at the same area of initial capture. Found in association with these fish was one Colorado squawfish radiotagged in the lower Green River (km 397) near Ouray, Utah, which also returned to its initial location in late July.

Radiotelemetry of Colorado squawfish in the Green River in 1980, suggested that such long distance movement at that time of year was associated with spawning (Tyus et al 1981). Although study objectives of the Yampa study did not permit disturbance of the radiotagged squawfish, extensive collecting with floating trammel nets was conducted near them. Collections made from July 1 to July 9, 1981 produced 34 Colorado squawfish in spawning condition. These fish were either ripe males or spent females and catches reflected a very high catch per effort of ripe Colorado squawfish from short pool-riffle-pool habitat sections in the lower Yampa Canyon.

The spectacular change in movement patterns of the eight radiotagged Colorado squawfish migrating into the lower Yampa River is indicated in Figure 1, which displays the movement during June and July. Distances traveled during spawning migration were calculated for those fish that returned to the initial point of capture and remained at that location. Table 1 provides movement information for the eight radiotagged Colorado squawfish. One of these fish (No. 1) moved past the initial capture point and relocated 93 km upstream. Contact with Fish No. 2 was lost on the spawning grounds; however, since the fish was originally tagged in October at km 85 by Colorado DOW and recaptured two years later at this same location, the assumption is made that this fish returned there (with an inoperable radiotag). The remaining six fish (Nos. 3-8; Table 1) exhibited a spawning migration that accounted for 96% of the total movement during the study period.

Data from conventional tag recaptures substantiate the movement exhibited by the radiotelemetered fish. Three Colorado squawfish were recaptured on the spawning grounds. Two of these (Table 2) were tagged on the upper Yampa in August 1978 and 1980, and the other was tagged in the upper Green in May 1981.

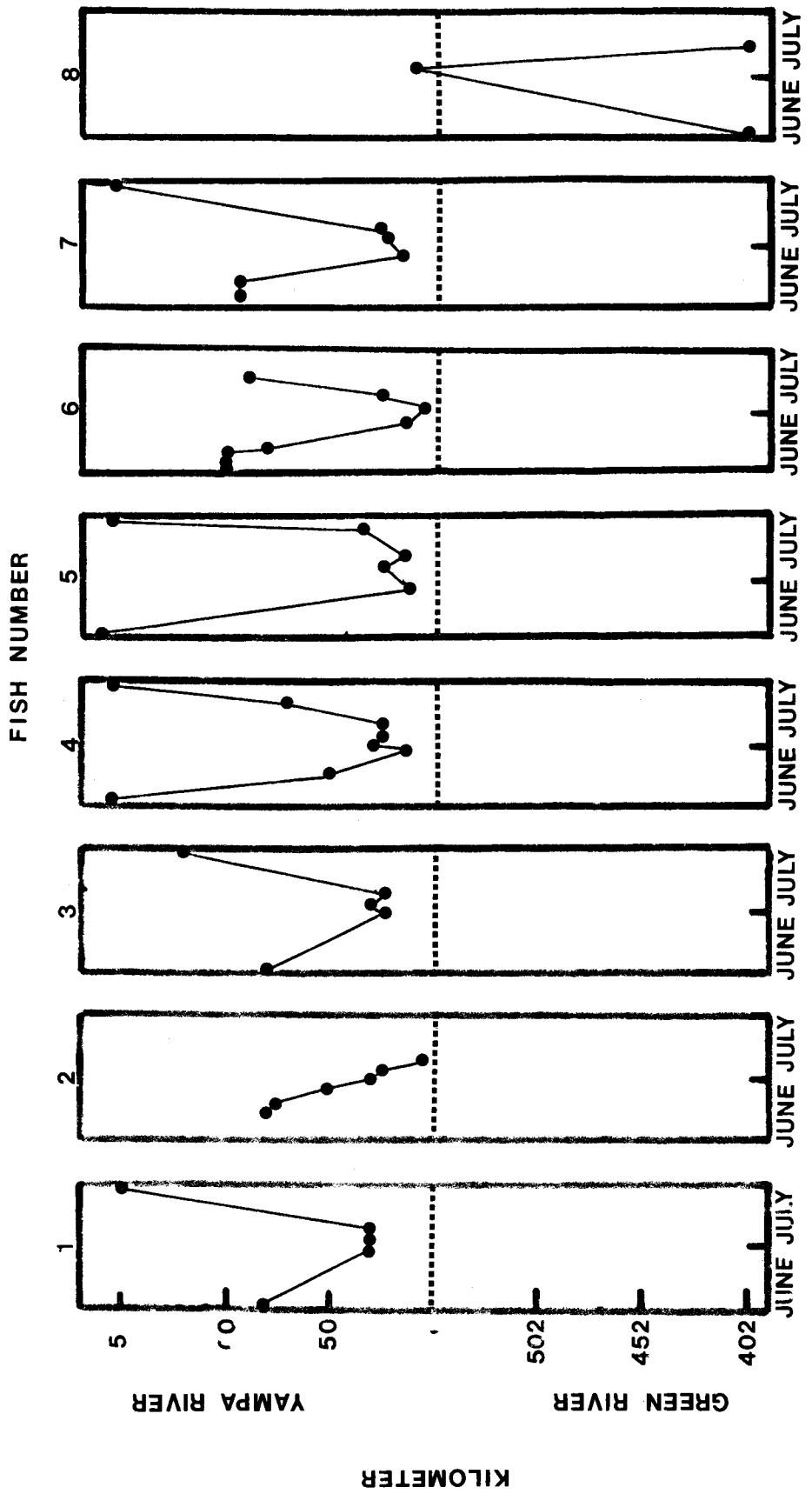

Figure 1. [illegible] Colorado squawfish, Yampa and Green River, 1981. (Mouth of the Yampa River enters the Green River at km 552.)

Table 1. Movement of radiotelemetered Colorado squawfish, Yampa and Green Rivers 1981

Fish	TL[2]	Initial Capture			At Spawning Grounds[1]		Last Contact		Movement		
		Date	River	Location[3]	Dates	Location	Date	Location	Spawning	Total	%[4]
1	533	4-22-81	Yampa	83	7-1 to 7-8	29-30	8-18-81	174	-[5]	237	-
2	528	4-22-81[6]	Yampa	88	7-1 to 7-11	2-29	7-11-81	-[7]	-	88	-
3	520	4-22-81	Yampa	88	7-1 to 7-24	26-29	8-05-81	120	157	157	100
4	624	5-06-81	Yampa	157	6-26 to 7-10	14-30	9-03-81	163	291	336	86
5	542	5-07-81	Yampa	157	6-26 to 7-10	6-26	8-27-81	158	288	306	94
6	601	5-08-81	Yampa	157	6-26 to 7-8	16-29	9-09-81	106	230	230	100
7	657	5-14-81	Yampa	142	6-26 to 7-5	13-26	8-05-81	154	270	270	100
8	614	4-28-81	Green	397	7-2 to 7-5	8-10	9-01-81	394	327	350	93

1 lower 32 km of Yampa River

2 km, rounded

3 km, rounded, river mouth = 0

4 % = spawning movement ÷ total

5 fish did not establish pre and post spawning territory

6 originally tagged by Colorado DOW 10/11/79 at km 85.

7 contact was lost on this date.

Long distance (over 100 km) spawning migrations in freshwater fish species is generally uncommon in North America although Nikolsky (1961) cites examples in Asia of Cyprinid fishes that migrate over 1,000 km. Other fishes of the genus Ptychocheilus include the northern squawfish P. oregonensis and the Sacramento squawfish (P. grandis). These two squawfishes, the only living congeners of the Colorado squawfish, also make freshwater spawning migrations (Reid, 1971; Moyle 1976).

Other workers have postulated spawning migrations in Colorado squawfish and there are many reports of spring spawning migrations by early settlers who called the Colorado squawfish "salmon" (Sigler and Miller 1963). Joseph et al (1977) provides a review of known information concerning movement and spawning and concluded that large individuals possibly migrate long distances and smaller ones may move shorter distances. It is likely that the observed spawning migration is historic since Holden and Stalnaker (1975) reported increased numbers of ripe Colorado squawfish in the lower Yampa River in July 1968-1970. Collections made by Seethaler (1978) also indicated increased numbers of Colorado squawfish in the lower Yampa River in July 1974-75.

Although in general agreement with hypotheses of others regarding spawning, the findings of this study disagree with the hypothesis (Joseph et al 1977) that Colorado squawfish spawn in the same area in which they live all year.

The presence of ripe fish does not necessarily reflect a spawning area. This appears to be particularly true for Colorado squawfish since ripe males can be stripped of milt for an extended period. Therefore, it is important to consider the results of larval fish collections in Dinosaur National Monument conducted by the Colorado Division of Wildlife in August 1980, and the more intensive sampling by the Colorado Division of Wildlife and Fish and Wildlife Service in July - August 1981. The 1980 collections produced larval Colorado squawfish in the lower 16 km of the Yampa River. Although the lower 190 km of the Yampa River was intensively sampled in 1981, larval Colorado squawfish (9-13 mm) were collected only in the lower 20 km. This is conclusive proof that spawning occurred in the Yampa River both years and indicates that spawning may be restricted to the lower 32 km as suggested by radiotelemetry.

Indentification and protection of long distance spawning migrations of Colorado squawfish may be the most significant factor for the preservation of this endangered fish. The loss of fish passage may offer an explanation for its disappearance from the lower Colorado River Basin. Blockage of such spawning migrations by the construction of dams may result in its loss from the upper basin as well; however, it is possible that passageways might be utilized by Colorado squawfish since northern squawfish have been reported to use them (Park and Farr 1972).

Table 2. Recapture of Colorado squawfish tagged with dangler tags on spawning grounds, Yampa River, 1981.

Fish No.	Capture				Recapture				Distance [3]
	Date	River	Location [1]	TL [2]	Date	River	Location	TL	
9	5-27-81	Green	491	560	6-18-81	Yampa	5	560	66
10	10-8-80	Yampa	147	593	7-9-81	Yampa	27	607	120
11 [4]	8-21-78	Yampa	88	452	7-5-81	Yampa	26	506	62

1 km, mouth of river = 0

2 mm

3 given from point of capture to point of recapture

4 tagged by Biowest, Inc.

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WHISTLING INTO PLATO'S CAVE: AFFECTING THE ENVIRONMENTAL IMPACT STATEMENT

by

M. Busdosh[1]

ABSTRACT -- Environmental Impact Statements (EIS) and associated environmental reports and assessments are part of the decision process in the acquisition of permits. EIS'a are as thorough as the lead agency requires. Over a period of time the caliber of the works adjusts to the level the regulatory agencies demand. The best way, biologically, politically, and finally realistically, to deal with serious potential impacts is to avoid them. Many projects have linear components, as pipelines, roads, or transmission lines. Larger area developments usually have alternative sites. Identification of potential impacts very early in the impacting process can affect siting decisions and exact location of linear components. The more advanced a project, the more difficult it is to effect changes.

Input from concerned groups and agencies is essential, and must be timely. People concerned over environmental issues are considered as one group. Resource agencies must work toward a consensus in identifying resource impacts, with concerned groups or individuals. Organizations concerned about a resource must communicate with each other, coordinate their input, and contribute to the process via the scoping process, the lead agency, and the review process.

ABSTRACTO -- Las declaraciones de impacto ambiental, los reportes asociados y sus evaluaciones son parte del proceso de decisión en la consecución de los permisos de operación. Las declaraciones de impacto ambientales provienen de los requisitos de las agencias que los exigen. Por un período de tiempo la calidad de los trabajos se ha ajustado al nivel de las exigencias de las agencias reguladosas. La mejor manera de tratar los problemas biólogica, politica, y finalmente realisticamente es evitándolos. Muchos proyectos tienen una serie de componentes como lineas de conducción, carretera, y linea de transmisión. Grandes áreas de desarrollo usualmente presentan varios sitios de alternativas. La identificación de los impactos potenciales con la debida anticipación, pueden afectar las decisiones a cerca del lugar escogido, la exacta localización de los componentes ya mencionados. Mientras más avanza de esté el proyecto, más dificil será efectuar cambios.

Es necesaria la información que pueden aportar los grupos involucrados en el proyecto. La gente que tiene que ver con los asuntos ambientales se consideran como un grupo. Las agencias deben trabajar hacia un concenso en identificar las recursos de los impactos, con los grupos relacionados o con los individuos. Las organizaciones relacionadas con los recursos deben estar en comunicación entre si, coordinar sus contribuciones y contribuir a mirar y revisar todo el proceso.

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GROWTH & POPULATION STRUCTURE OF THE MOJAVE CHUB

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Karen G. Whitney and Charles E. Whitney

(Desert Research Station, Barstow, CA 92311)

ABSTRACT. In an attempt to establish a refugium for the Mojave Chub (Gila bicolor mohavensis), sixteen chubs were transplanted from their site at the Fort Soda pond near Baker, California to a 30-square meter pond at the Desert Research Station, 26 km. west of Barstow, California. This initial parent stock rapidly established a sizable population within the first year of its introduction.

From February, 1981 to January, 1982 the chub population was monitored weekly. A Lincoln-Peterson Index was used to estimate the population of chubs from 4 to 11 cm. in size. Two hundred fish were tagged and their lengths and weights were monitored from May, 1981 to January, 1982.

The data indicated that the Mojave Chub population ranged from a high of 2516 fish during late summer to a low of 880 during late winter. Chubs gained weight in May, but from June to October lost up to 35% of their body weight. During November the fish again started to gain weight. Possible reasons for summer weight loss are reviewed.

INTRODUCTION

Sixteen Mojave Chubs (Gila bicolor mohavensis) were introduced

into the pond at the Desert Research Station on December 12, 1978. By May, 1979 fry appeared and in September, 1979 research work began on the chub population and growth rates.

Very little research has been conducted on this endangered species. Snyder (1918) examined the external morphology of the fish. Hubbs and Miller (1942) examined the theory that Mojave chubs once occurred in the Mojave River and subsequently hybridized with the Arroyo chub (Gila orcuttii). Vicker (1973) researched some of the aspects of the Mojave chub's life history. The only complete habitat evaluation of the Fort Soda (Zzyzx Springs) area was done by Soltz (1978).

Vicker (1973) examined 113 specimens taken from Fort Soda and assigned them to age classes based on annuli development. His research has been the only work done on the growth rates of Mojave chubs.

Soltz (1978) made four population estimates of the Fort Soda population. Karner (1980) examined the Mojave chub population at Lark Seep Lagoon on a one time basis.

ACKNOWLEDGEMENTS

This project would not have been possible without the help of a great many people. We would like to extend a special thanks to Dr. Louis Courtois, Mr. Tom Taylor, and Mr. Frank Hoover of the California Department of Fish and Game for their helpful advice and cooperation during the course of this study. For work on

the chub population at the Desert Research Station we thank Jeff Bittman, Kelly Weis, David Bautisata, Richard Carlson, Mike Kleiber, John Lilley, Bernice Morgan, Steve Rodriguez, Brian Simmons, Chris Soppeland, Leanne Whitney, and Ronnie Willard. A special thanks goes to Mr. Leon Hunter for his aid and advise during the course of the study. Finally, we would also like to thank the numerous people who helped with all the various tasks required to complete this project.

STUDY AREA

The Desert Research Station is located approximately 26 km. northwest of Barstow, San Bernardino County. California. The Station is located on a 48 hectare site leased from the Bureau of Land Management and operated by the Barstow Unified School District. The station serves academically talented students, providing advanced training in the sciences.

The site contains a small pond that is approximately thirty meters square and 80 centimeters deep. Approximately half the pond surface is covered with cattails (Typha dominguez). Ditch grass (Ruppia maritama) also occurs in the pond. The pond community contains few potential predators to the chubs. Dragon fly nymphs occur and may take chub fry. In addition a small population of bullfrogs (Rana castesbeiana) live in the pond. Occasional piscivorous birds occur as transients.

Pond temperatures range from 28^{o} C to 2^{o} C. The pond salinity

is 1.7 parts per thousand and dissolved oxygen ranges from 14 to 2.6 parts per million approximately 2 cm. from the surface. Pond pH is approximately 7.2. The Mojave Chub is the only fish species in the pond.

METHODS

The first attempt at examining growth rates was done by placing fin-clipped chubs in forty liter aquariums and feeding them tropical fish foods. Later, fin-clipped chubs were placed in a 75 square centimeter cage in the pond, so the fish could take advantage of natural food sources. To provide a larger sample size for study, an attempt was made to freeze brand the chubs using a mixture of dry ice and acetone. This technique was not successful on this size fish.

To permit long range studies on population size and growth rates tags were inserted into two hundred chubs. The tags were approximately one-half centimeter long and sequentially numbered. Fish were randomly selected and ranged from 4.5 to 17.0 centimeters in length. The fish's standard length was measured to the nearest millimeter. An Ohaus Model 300 electronic balance measured weight to the nearest 0.01 gram. Captured fish were tranquilized with Alka-Seltzer, after which a hypodermic needle was passed through the musculature just anterior to the dorsal fin. A small piece of stainless steel surgical wire with a tag attached was passed back through the needle and the needle was removed. The

needle was again passed through the musculature anterior to the previous puncture, the wire again passed through and the two ends were twisted tight with hemostats. The fish were placed in an aquarium containing Wide Spectrum Tonic, an anti-infection agent, and Shieldex, a compound designed to help restore the fish's natural mucous coating. After three days to one week the fish were returned to the pond.

A weekly monitoring of the chub population was started during the first week in February, 1981. At least once a week ten minnow traps were set in the pond using bread for bait. Population estimates were made using the standard Lincoln-Peterson Index. Captured chubs were fin-clipped on different parts of the caudal fin approximately every three months and released back into the pond. The standard length of the fin-clipped fish ranged from 3.0 to 12.5 centimeters and at least 25 percent of the population was fin-clipped.

The population indices and confidence limits were calculated using a Radio Shack TRS-80 Model 1 microcomputer.

RESULTS AND DISCUSSION

Figure 1 shows the length distribution of Mojave chubs at the Fort Soda Lake and Pond (Soltz, 1978) and at the Desert Research Station for September, 1979 through May, 1980 and from February, 1981 through October, 1981. The mode size class for the Fort Soda Lake is 8.0-8.9 centimeters, while the mode for the Fort Soda pond is 4.0-4.9 centimeters. The mode for the Desert Research

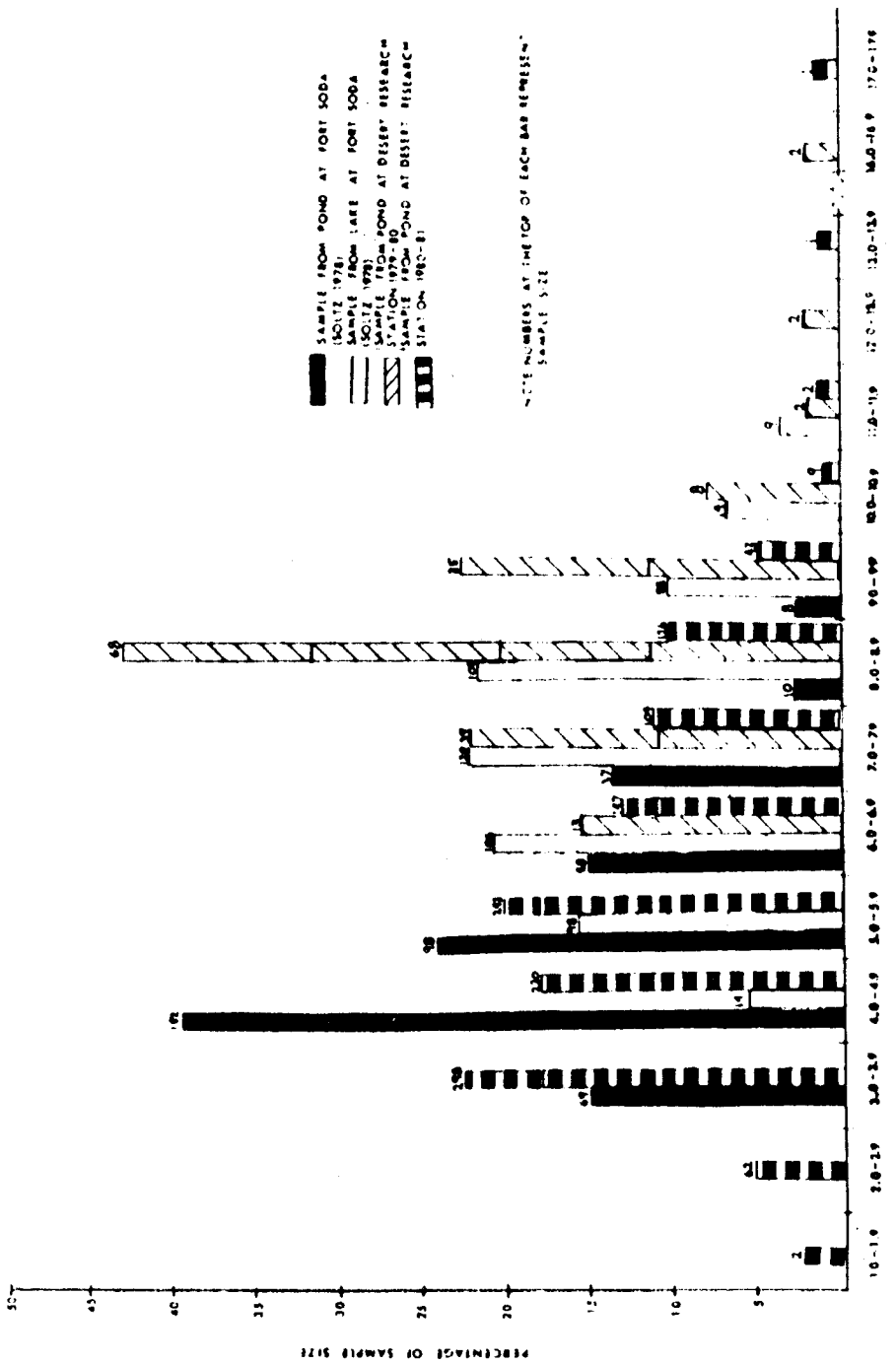

FIG. 1. Length distribution of four populations of Mojave Chubs.

Station pond during 1979 to 1980 period was 8.0-8.9 but during the 1981 sampling period the mode had dropped to 6.0-6.9. This might be a response to overcrowding. Of the three bodies of water the Fort Soda Lake is the largest and has the largest size class mode. During the 1979-1980 sampling period the Desert Research Station size class mode was the same as that at the Fort Soda Lake, even though this is the smallest of the three bodies of water. At that point in time the chub population had been in the pond for only about one year and it may not have reached an equilibrium. The figure also shows an increase in the number of fish in the 8.0-8.9 size class from the 7.0-7.9 size class for the Desert Research Station pond for the 1981 smapling period indicating a residual population of fish in that size class from the previous year. Kimsey (1954) reported catching Tui chubs (Gila bicolor) in Eagle Lake, a 15,000 acre body of water, that were 35 centimeters in length.

Figure 2 shows a weight-length distribution of the Desert Research Station chub population. It appears to compare well with the weight-length distribution of the Eagle Lake Tui chubs even through they are separate subspecies (Kimsey 1954). Except for a current study by the California Department of Fish and Game on the Fort Soda chub population that will include length-weight distributions no other length-weight distributions for the Mojave chub could be found in the literature.

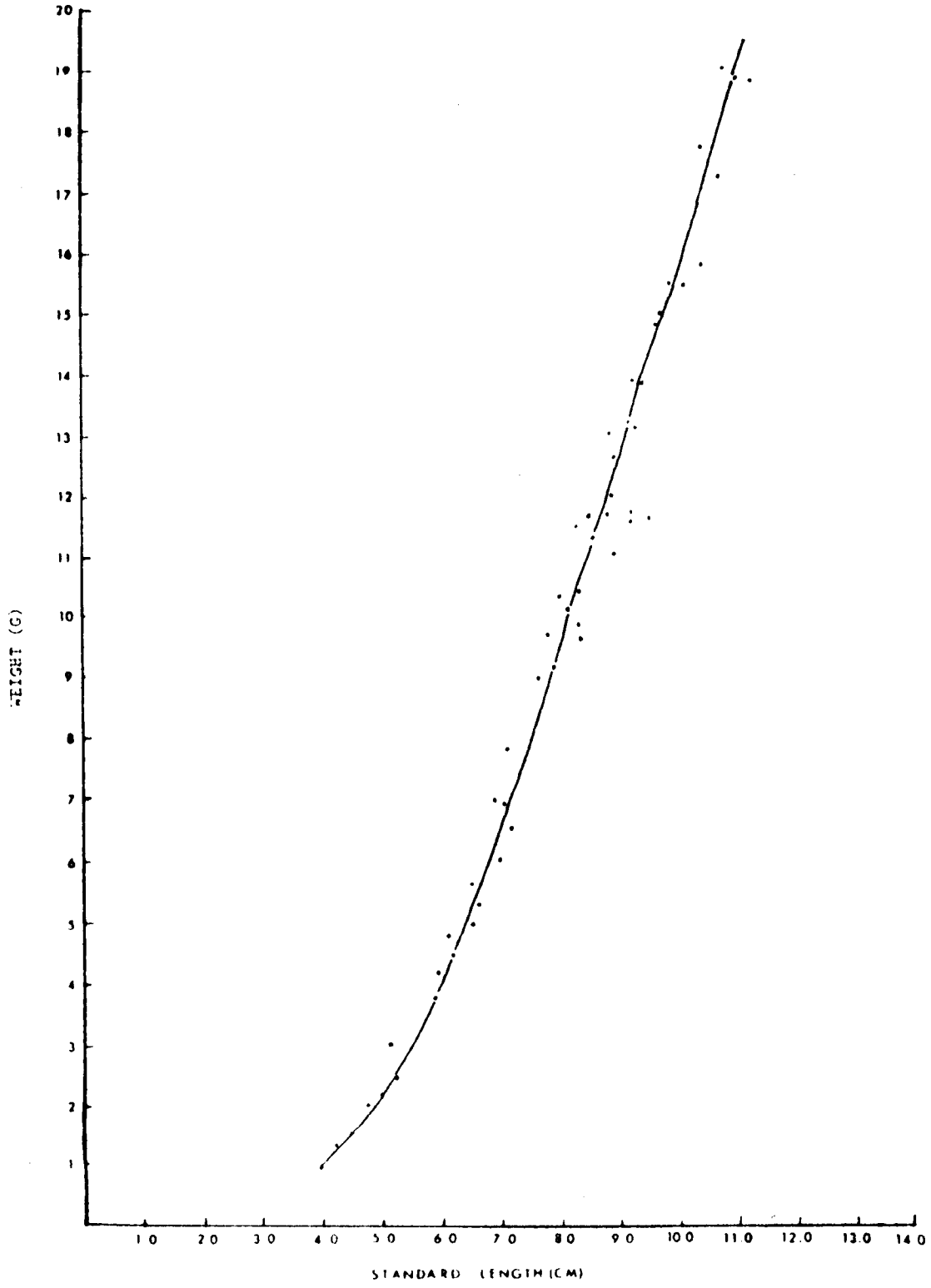

FIG. 2. Weight-length distribution of Mojave Chubs.

Figure 3 deals with the growth of the Mojave chub. During May the chubs were gaining weight at the rate of 0.03 percent of their body weight per day. However, during June the fish lost 0.7 percent of their body weight per day. The rate of loss decreased during the months of July and August with the rate of loss increasing slightly during September. By October the chubs were gaining weight at the rate of 0.006 percent of their body weight per day. This increase continued during November and in December again decreased to 0.14 percent of their body weight lost per day.

Table 1 shows the weight data for some selected fish. Some individuals lost as much as 35 percent of their body weight during this period. Only two tagged fish gained any weight during the summer months.

It is possible that the loss of weight is due to higher metabolic rates during the summer combined with a possible reduction in planktonic biomass. Normally it would be expected that plankton biomass would increase during the summer months, however, it is possible that high water temperatures might effect plankton production adversely. During the entire sampling period there was no significant length gain by the tagged population.

Figure 4 shows the weekly population estimates for the Mojave chub along with the confidence limits. The population seems to increase from February through the beginning of April. This might be a function of recruitment into the size class that was being sampled. A slow decrease occurred from April through the middle of May and

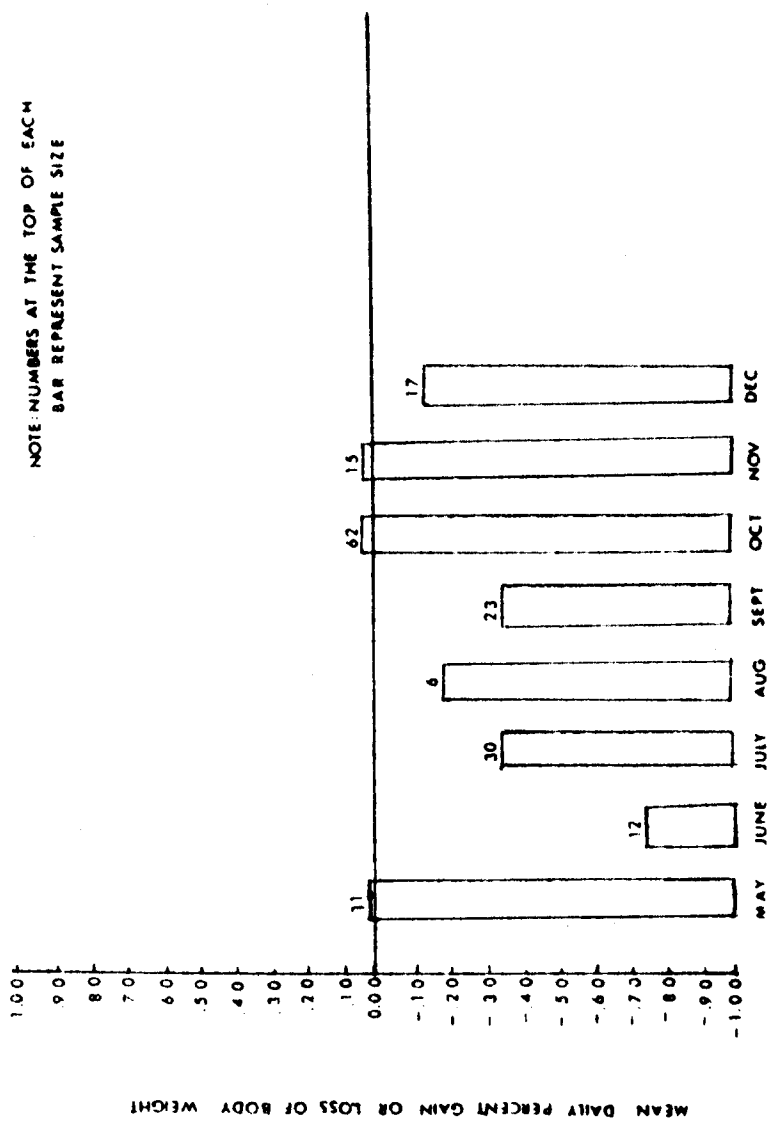

FIG. 3. Mean daily percent gain or loss of body weight of Mojave Chubs over an eight month period.

TABLE 1. Growth data on four selected Mojave Chubs.

TAG NUMBER	BEGINNING DATE	ENDING DATE	NUMBER OF DAYS BE-TWEEN DATES	WEIGHT (G)	STANDARD LENGTH (CM)	MEAN WEIGHT GAIN OR LOSS PER DAY (G)	PERCENT GAIN OR LOSS OF BODY WEIGHT
3400	6/8	6/29	21	11.48	8.4	+.0067	+1.2%
3400	6/29	7/6	7	11.62	8.4	-.0129	-0.8%
3400	7/6	7/27	21	11.53		-.0605	-1.0%
3400	7/27	10/14	79	10.26	9.4	-.0047	-3.6%
3400	10/14	10/20	6	9.89	9.4	+.0300	+4.8%
3400	10/20	10/26	6	10.07	9.4	+.0033	+0.2%
3400	10/26	11/1	6	10.09	9.4	+.1450	+8.6%
3400	11/1	11/25	24	10.96	9.4	-.0221	-4.8%
3400	11/25	12/16	21	10.43	9.4	-.0371	-7.5%
3395	5/1	5/12	11	13.52	9.6	-.0173	-1.4%
3395	5/12	7/13	62	13.33	9.6	-.0382	-17.8%
3395	7/13	7/20	7	10.96	9.6	-.0343	-2.2%
3395	7/20	10/6	78	10.72	9.6	-.0122	-8.9%
3395	10/6	10/14	8	9.77	9.6	-.0912	-7.5%
3395	10/14	10/26	12	9.04	9.6	+.0150	+2.0%
3395	7/13	7/20	7	17.01	9.3	-.1500	-6.2%
3399	7/20	9/16	58	15.96	9.3	-.0143	-5.2%
3399	9/16	10/3	17	15.13	9.3	-.0335	-3.8%
3493	7/20	9/13	55	9.41	7.7	-.0166	-9.0%
3493	9/13	10/3	20	8.56	7.7	-.0165	-3.9%
3493	10/3	10/13	10	9.23	7.8	+.0433	+5.2%
3493	10/13	11/2	20	8.66	7.8	-.0156	-3.6%
3493	11/2	11/10	8	8.35	7.8	+.0425	+4.1%
3493	11/10	11/25	15	8.69	7.8	+.0073	+1.3%
3493	11/25	12/9	14	8.50	7.8	+.0029	+0.5%
3493	12/9	12/16	7	8.84	7.8	-.0271	-2.1%

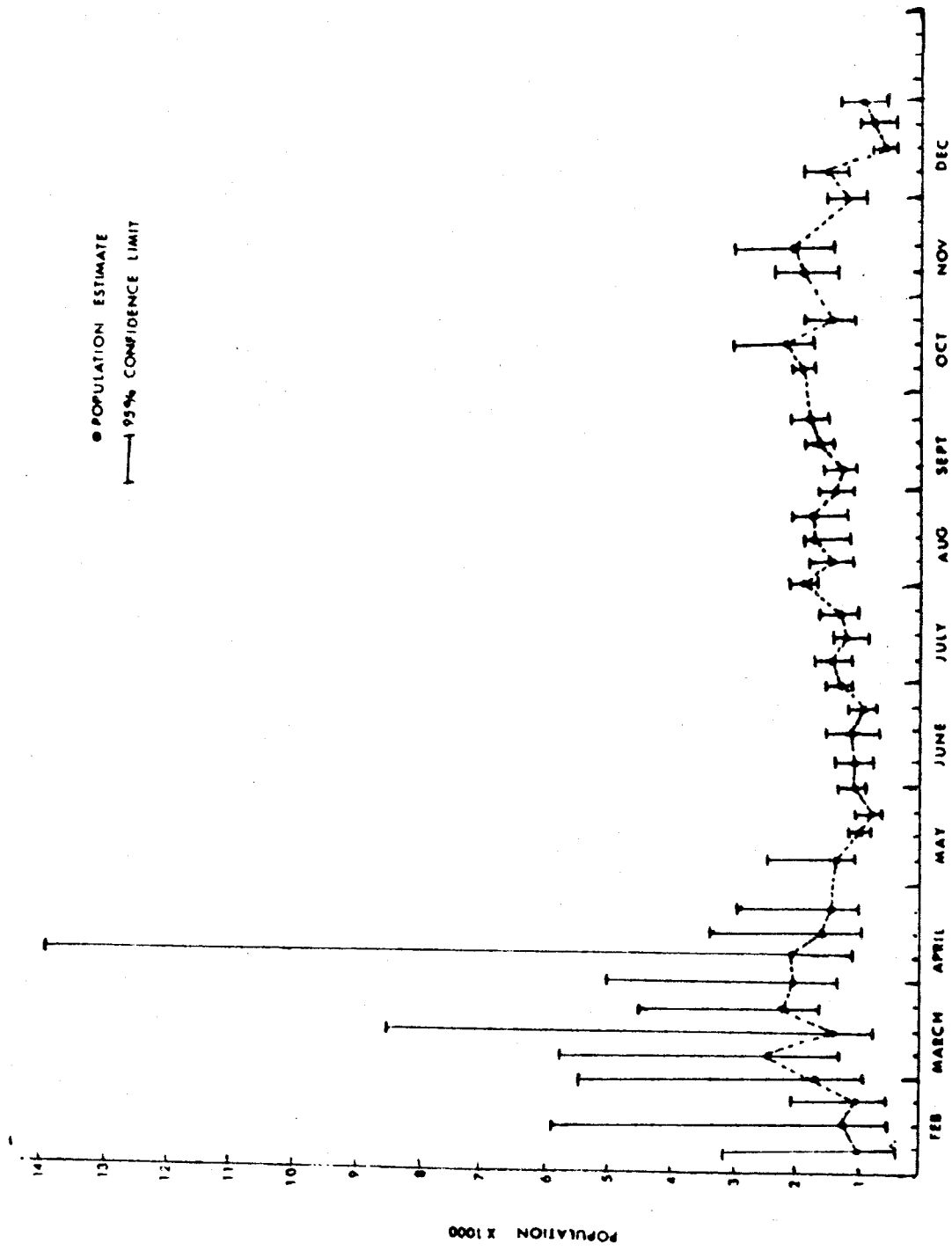

FIG. 4. Weekly population estimates of Mojave Chubs over an eleven month period.

then the population stablized around 1100 individuals. In July the population again started to increase through October. This may also be a function of recruitment of the previous spring's hatch. By early December the population decreased through the first part of January.

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Snyder, J.O. 1918 The fishes of Mohave River, California Proc. U.S. Nat. Museum. 54:297-299.

Vicker, C.E. 1973 Aspects of the life history of the Mohave chub, Gila bicolor mohavensis (Snyder), from Soda Lake, California Unpublished Master's thesis. 27p.

407 West Line Street
Bishop, California 93514
March 24, 1981

RESOLUTION 81-1

RELATIVE TO S. 41 AND THE PRESERVATION OF ASH MEADOWS

WHEREAS the Ash Meadows area of Nye County, Nevada has long been recognized by scientists world-wide as an area unique in the North American continent for its scientific values, and

WHEREAS Ash Meadows contains a number of federal and state listed endangered fish and plant species and subspecies, and

WHEREAS many of the habitats occupied by these endemic life forms will be dramatically altered or destroyed by planned residential development in Ash Meadows, and

WHEREAS this habitat destruction and alteration will inevitably destroy the flora and fauna associated with and dependent thereon for their continued existence, and

WHEREAS this Council has repeatedly during the past decade expressed its concern over the protection of Ash Meadows, and

WHEREAS Senator Alan Cranston has submitted before the Congress S. 41, the Desert Pupfish National Wildlife Refuge Bill, and

WHEREAS such legislation offers the best hope for the long term preservation of Ash Meadows and its associated zoological and botanical treasures, now therefore be it

RESOLVED that the Desert Fishes Council, an organization numbering in excess of 300 persons and comprising a nationwide and international representation of federal, state, and university scientists and resource specialists, members of conservation organizations, and individuals concerned with long-term environmental values, meeting at Death Valley, California on February 27, 1981, does hereby encourage Senator Alan Cranston to actively undertake every reasonable effort to secure hearings on S. 41 as a step toward effecting the passage of this vitally needed legislation.

PASSED WITHOUT DISSENTING VOTE

ATTEST:

Edwin P. Pister, Chairman
Death Valley Area Committe

407 West Line Street
Bishop, California 93514
April 9, 1981

RESOLUTION 81-2

RELATIVE TO THE PROTECTION OF THE ASH MEADOWS ECOSYSTEM

WHEREAS Ash Meadows (Nye County, Nevada) is the habitat of a number of endemic species, and

WHEREAS several of these species are included on federal and state endangered species lists, and

WHEREAS many of the habitats occupied by these species will be dramatically altered or destroyed by residential development planned for Ash Meadows, and

WHEREAS such alteration and destruction will increase the jeopardy in which these species now exist, now therefore be it

RESOLVED that the Desert Fishes Council, an organization numbering in excess of 300 persons and comprising a nationwide and international representation of federal, state, and university scientists and resource specialists, members of conservation organizations, and individuals concerned with long-term environmental values, meeting at Death Valley, California on February 27, 1981, does hereby strongly urge the Nevada Department of Wildlife, Nevada Department of Conservation and Natural Resources, U.S. Bureau of Land Management, and U.S. Fish and Wildlife Service to undertake whatever programs may be necessary to provide for the protection of the Ash Meadows ecosystem and the biological treasures dependent thereon, and be it further

RESOLVED that copies of this resolution be forwarded to the Nevada State Director of the Bureau of Land Management; to the Director of the Bureau of Land Management in Washington, D.C.; to the Director of the Nevada Department of Wildlife; to the Director of the U.S. Fish and Wildlife Service in Washington, D.C.; to the Regional Director of the U.S. Fish and Wildlife Service in Portland, Oregon; and to the Director of the Nevada Department of Conservation and Natural Resources.

PASSED WITHOUT DISSENTING VOTE

ATTEST:

Edwin P. Pister
Executive Secretary

DESERT FISHES COUNCIL
407 West Line Street
Bishop, California 93514

RESOLUTION 81-3

RELATIVE TO LAND WITHDRAWAL FOR THE WARM SPRINGS PUPFISH

WHEREAS the Warm Springs Pupfish Recovery Plan identifies the essential habitat, the majority of which falls under Bureau of Land Management jurisdiction, and

WHEREAS BLM and cooperating agencies have within the past year accomplished major components of the Recovery Plan to improve the habitat, and

WHEREAS the Recovery Plan identifies the extreme need for a withdrawal of public lands within the essential habitat for retention in public land status, and

WHEREAS BLM has initiated a temporary two-year land withdrawal to complete administrative procedures preliminary to a permanent withdrawal, and one year remains to complete these procedures, now therefore be it

RESOLVED that the Desert Fishes Council, meeting in Death Valley, California on February 27, 1981, does hereby urge BLM to move with all haste to complete this permanent land withdrawal, thereby providing a major accomplishment toward upgrading the status of this fish, and be it further

RESOLVED that the Desert Fishes Council requests the BLM to present a progress report on the completion of the permanent land withdrawal at the Council's next annual meeting to be held on November 19-20 at Death Valley National Monument, and be it further

RESOLVED that copies of this resolution be forwarded to the Nevada State Director of the Bureau of Land Management; to the Director of the Bureau of Land Management in Washington, DC; and to the Director of the Nevada Department of Wildlife.

PASSED WITHOUT DISSENTING VOTE

ATTEST:

Edwin P. Pister
Executive Secretary

407 West Line Street
Bishop, California 93514
April 9, 1981

RESOLUTION 81-4

RELATIVE TO THE PROCUREMENT OF PRIVATE LANDS
WITHIN THE WARM SPRINGS PUPFISH ESSENTIAL HABITAT

WHEREAS the entire world population of the Warm Springs pupfish inhabits an area of approximately one square mile in the Ash Meadows area of southern Nevada, and

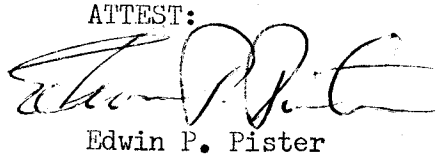
WHEREAS this subspecies is presently listed on the federal and state endangered species lists because of the jeopardy of its essential habitat, and

WHEREAS the Recovery Plan for this subspecies identifies the need to acquire and retain in public ownership and administration the lands and waters in the essential habitat to assure species perpetuation, now therefore be it

RESOLVED that the Desert Fishes Council, meeting in Death Valley, California on February 27, 1981, does hereby encourage the Nature Conservancy to consummate at the earliest possible date the acquisition of the key private inholdings within this essential habitat, thereby adding materially to the long-term preservation of the Warm Springs pupfish.

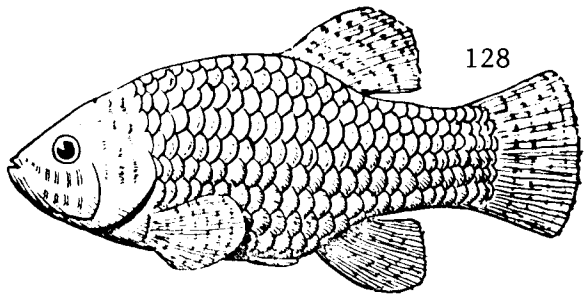
PASSED WITHOUT DISSENTING VOTE

ATTEST:



Edwin P. Pister
Executive Secretary

Desert Fishes Council



"Dedicated to the Preservation of America's Desert Fishes"

407 West Line Street
Bishop, California 93514
December 30, 1981

RESOLUTION 81-7

RELATIVE TO THE ENCOURAGEMENT OF A MEMORANDUM OF UNDERSTANDING BETWEEN THE BUREAU OF LAND MANAGEMENT, U.S. FISH AND WILDLIFE SERVICE AND ARIZONA GAME AND FISH DEPARTMENT

WHEREAS a Memorandum of Understanding has been a successful vehicle for the reintroduction of native fishes within their historic range, i.e. razorback sucker (Xyrauchen texanus) on Forest Service lands, and

WHEREAS reintroduction is considered essential to the recovery of threatened and endangered species in certain circumstances, now therefore be it

RESOLVED that the Desert Fishes Council, an organization numbering in excess of 300 persons and comprising a nationwide and international representation of federal, state, and university scientists and resource specialists, members of conservation organizations, and individuals concerned with long-term environmental values, meeting at Death Valley, California on November 21, 1981, does hereby urge that the Arizona State Office of the Bureau of Land Management, U.S. Fish and Wildlife Service (Region 2), and Arizona Game and Fish Department enter into a Memorandum of Understanding designed to reintroduce the Gila topminnow (Poeciliopsis occidentalis occidentalis) and desert pupfish (Cyprinodon macularius macularius) into suitable habitats on public lands.

PASSED WITHOUT DISSENTING VOTE

ATTEST:

Edwin P. Pister
Executive Secretary

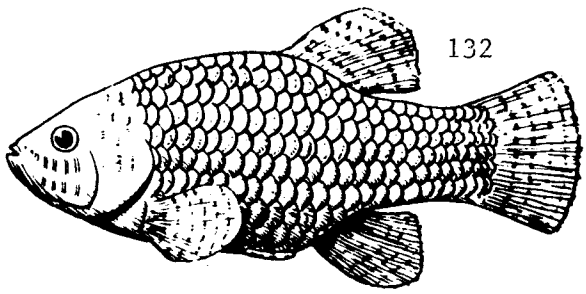
Thirteenth Annual Symposium Attendance List

Name	Affiliation	Address
Cal Allen	Nev. Dept. of Wildlife	St. Mail Rm. Complex, Las Vegas, NV
Don Archer	USFWS	P.O. Box 11568, Salt Lake City, UT
Neil Armantrout	BLM	Box 12052, Portland, OR
Michael Baltzly	ASU	4520 E. Pepper Tree, Scottsdale, AZ
Jim Barnes	BYU	Zoology, BYU, Provo, UT
Paul Barrett	ASU	1010 W 17th St., Tempe, AZ
Robert Behnke	Colo. St. U.	Dept. Fish and Wildlife, Fort Collins, CO
Gary Bell	USFS	Coconino National Forest, Flagstaff, AZ
Jim Bennett	Colo. Div. of Wildlife	6060 Broadway, Denver, CO
Glenn Black	CDFG	15378 Bird Farm Rd., Chino, CA
Carl Bond	Oregon St. U.	OSU, Corvallis, OR
Peter Bowles	UCI	Dept. of Eco. & Evo. Bio., UCI, CA
David Bowman	USFWS	1317 Wilmoore, SE, Albuquerque, NM
Martin Brittan	CSU	Bio, 6000 J St, Sacramento, CA
Jim Brooks	AZ Game and Fish	2222 W. Greenway, Phoenix, AZ
Jack Brotherson	BYU	Provo, UT
John Burd	USFS	4638 B 52nd St, Lubbock, TX
Tom Burke	Bureau Rec	1316 Gloria Ln, Boulder City, NV
James Burton	AZ Game and Fish	4423 W. Groswold, Glendale, AZ
Mike Busdosh	Woodward-Clyde	3489 Kurtz St., San Diego, CA
Gerald Burton	USFWS	2953 W. Indian Sch. Rd, Phoenix, AZ
Glenn Clemmer	USFWS	1300 Blue Spruce Dr, Ft. Collins, CO
Gary Combes	Cal Poly SLO	357 S. Gordon Way, Los Altos, CA
Salvador Contreras/Balderas	UANL	Lomas Anahuac, San Nicolas NL, MEX
Jim Cooper	USFS	Bishop, CA
Walter Courtenay, JR	Florida Atlantic U.	1040 SW 3rd St, Boca Raton, FL
Larry Crist	BIO/West Inc.	P.O. 3226, Logan, UT
Jim Deacon	UNLV	Biology, UNLV, Las Vegas, NV
Nick Dye	AZ Sonora Des. Mus.	1141 N. Norton, Tucson, AZ
Tasker/Beula Edmiston		814 W. Markland Dr, Monterey Park, CA
Larry Eng	CF & G	1701 Nimbus Rd. C, Rancho Cordova, CA
Diana Evans	IUCN, Con. Mon. Ct.	219 C Huntington Rd, Cambridge, UK
Robert Feldmeth	Claremeont Colleges	Jt. Science Dept, CC Claremont, CA
Leonard Fisk	CDFG	IFB, 1416 9th St, Sacto, CA
Bob Furtek	UNLV	Las Vegas, NV
Bill Gallagher	SF Bay Reg. Water Qual.	1600 Begen Ave, Mountain View, CA
Dale Gaskill	Nat. Wildlife Fed.	1156 S. Nevada #504, Carson City, NV
Cheryl Gast	ASU	1045 E. Campus Dr, Tempe AZ
Eric Gerstung	CDF & G	1701 Nimbus Rd, C, Rancho Cordova, CA
Ellen Gleason	CDF & G	6513 Blanche Dell Dr, Sacramento, CA
Phil Hartwick	CDF & G	8112 Treecrest Ave, Fair Oaks, CA
Phil Hastings	Univ. of AZ	Ecology, UA, Tucson, AZ
Charles Haynes	Colo. Div. of Wildlife	317 W. Prospect St, Ft. Collins, CO
Kevin Herbinson	SCE	P.O. Box 800, Rosemead, CA
Terry Hickman	USFWS	9473 S. Hunts End Rd, Sandy, Utah
Frank Hoover	CDF & G	CFWB, 1822 Miramar, Pomona, CA
Laura Hubbs		2405 Ellentown Rd, La Jolla, CA
John Irwin	Cal. St. Univ., LA	5151 St. University Dr, Los Angeles, CA
Jim Johnson	USFWS	P.O. Box 1306, Albuquerque, NM
Nadine Kanim	CF & G	407 W. Kine St, Bishop, CA
William Kepner	BLM	10613 N 33rd Ave, Phoenix, AZ
Ed Kinney		807 17th St SW, Massillon, Ohio

Gail Kobetich	USFWS	1230 "N" St, 14th Fl, Sacto, CA
Astrid Kodric-Brown	U of AZ	Tucson, AZ
Milton Kolipinski	NPS	West. Reg. Off, 450 Golden Gate, SF, CA
Jeannine Koshear	Mono Lk. Comm.	Lee Vining
Dean Hendrickson	ASU	Zoology, ASU, Tempe, AZ
Clark Hubbs	U of Texas	Zoology, U of Tex, Austin, TX
James LaBounty	Bureau of Rec.	P.O. Box 25007, Denver, CO
Jerry/Sandra Landyw	BIO-GEO So W Inc	3465 N Jamison Blvd, Flagstaff, AZ
Ray Lee	ASU	P.O. Box 26469, Tempe, AZ
Dave Livermore	Nature Conservancy	West, Reg. Off, 156 2nd St, SF, CA
Ed Lorentzen	USFWS	508 Greenwood Dr, Woodland, CA
Bill Loudermilk	CF & G	P.O. Box BD, Blythe, CA
Bob Love	Nature Conservancy	P.O. Box 1006, Yorba Linda, CA
Tom Lytle	Colo. Div. of Wildlife	711 Independent Ave, Grand Junction, CO
M. Maley	BLM	2000 N. Winwood, Las Vegas, NV
Paul Marsh	ASU	Center for Envir. Studies, Tempe, AZ
Mark Martin	BYU	Provo, UT
Gary Meffe	ASU	Zoology, ASU, Tempe, AZ
Tom McMahon	U of AZ	210 Bio Sci E, Tucson, AZ
Randy McNatt	USFWS	447 E. Main, Vernal, UT
Dick Miller	Foresta Institute	9750 E Tanque, Tucson, AZ
Robert Rush Miller	U of Mich.	Zoology, U of M, Ann Arbor, MI
Chuck Minckley		2820 N 1st St, Flagstaff, AZ
WL/Pat Minckley	ASU	3332 S. Ventura, Tempe, AZ
Sue Morgensen		P.O. Box 3, Headview, AZ
Gordon Mueller	Bureau of Rec	1332 Pinto, Boulder City, NV
Robert Newell	Anaconda Minerals Co	555 17th St, Denver, CO
David Ng	BYU	Provo, UT
Larry Norris	USDA SCS	621 J St. #2, Sacto, CA
Butch Padilla	Nev. Dept. Wildlife	6359 W. Woodbury, Las Vegas, NV
Ronald Piette	ASU	2211 N 202nd Ave, Buckeye, AZ
Phil Pister	CF & G	407 W. Line St, Bishop, CA
Carl Richards	BIO/West Inc.	Box 3226, Logan, UT
Bill Rinne	Bureau of Rec	708 Ave. A, Boulder City, NV
John Rinne	USFS	Forest Sci Lab, ASU Campus, Tempe, AZ
Sam Rushforth	BYU	Botany, BYU, Provo, UT
Don Sada	USFWS	4600 Kietzke Blvd, Reno, NV
Pete Sanchez	Nat. Park Serv.	Death Valley Nat. Mon, Death Valley, CA
Ganise Satterwhite	UNLV	6000 Bromley #6, Las Vegas, NV
Karl Seethaler		98 E 500 So, Providence, UT
James Schuler	CDFG	428 Tenaya Ave, Sacto, CA
Valerie Sheppe	UNLV	5010 S. Maryland Pkwy. #3, Las Vegas, N
Dennis Shiozawa	BYU	Provo, UT
Allan Schoenherr	Fullerton Jr. College	321 E. Chapman Ave, Fullerton, CA
Gary Smith	CDFG	3009 Roman Ct., Sacto, CA
Stan Smith	FWS Ret.	924 Northwood St, Ann Arbor, MI
Dave Soltz	Cal St, LA	Biology, Los Angeles, CA
Jim/Evelyn St. Amant	CDFG	350 Golden Shore, Long Beach, CA
Jerry/Sally Stefferud	USFS	1109 Calle Del Sol, Albuquerque, NM
Royal Suttkus	Tulane U.	Mus. of Natl. Hist, Belle Chasse, LA
Tom Taylor	CDF & G	1701 Numbus Rd. #C, Rancho Cordova, CA
Rosie Thompson	HDR Sciences	804 Anacapa St, Santa Barbara, CA

John Turner	CDFG	28 Covered Bridge Rd, Carmichael, CA
Harold Tyus	USFWS	447 E. Main St, Vernal, UT
Virginia Ullman	Phoenix Zoo	4642 N 56 St, Phoenix, CA
Linda Ulmer	CDFG	362 Coronado Ave, Long Beach, CA
Gary Vinyard	UNR	Biology, UNR, Reno, NV
Arcadio Valdez	Utah S.U.	1465 W 2nd N, Fish Exp. Sta, Logan, UT
Richard Valdez	USFWS	764 Horizon Dr, Grand Junction, CO
JH Wales	OSU Ret.	4390 Crescent Valley, Corvallis, OR
Johnson C.S. Wane	Ecolo. Analysts, Inc.	2150 John Glenn Dr, Concord, CA
Edmund Wick	Colo. State U.	1232 Juniper Ct, Ft. Collins, CO
Gene Wilde	UNLV	Biology, UNLV, Las Vegas, NV
Jack/Cindy Williams	USFWS-Sac St.	6821 Barbara Lee Circle, Sacramento, CA
Jim Williams	USFWS	2318 Hildarose Dr, Silver Spring, MD
Jeff Woodbury	ASU	1308 S. Polly Ann Dr, Tempe, AZ
Charlton Woodruff	ASU	2258 E. Downing Circle, Mesa, AZ
Darrell Wong	CDFG	407 W. Line St, Bishop, CA

Desert Fishes Council



"Dedicated to the Preservation of America's Desert Fishes"

FOURTEENTH ANNUAL SYMPOSIUM

Hosted by the
Arizona State University Department of Zoology
and held at the
Granada Royale Hometel - Tempe, Arizona

November 18-20, 1982

Thursday, November 18.

7:00 a.m. until noon - registration.

8:00 a.m. - announcements and introductions.

SESSION I - REPORTS FROM AREA COORDINATORS, RECOVERY TEAM LEADERS, AND AGENCIES.

Chairman: Don Sada, U.S. Fish and Wildlife Service, Reno, Nevada.

AREAS	GOVERNMENTAL AGENCIES, ET AL.
Bonneville	México
Interbasin	United States
Death Valley	Bureau of Land Management
Oregon Lakes	National Park Service
Lahontan	Bureau of Reclamation
Sonoran Desert - Mexico	Forest Service
Sonoran Desert - United States	Fish and Wildlife Service
Chihuahuan Desert - México	State Fish and Wildlife Agencies
Chihuahuan Desert - United States	Nevada Utah
Chihuahuan Desert - Isolated Basins	Colorado Arizona
Upper Colorado	California New Mexico
Lower Colorado	The Nature Conservancy
Baja California	Southeastern Fishes Council

SESSION II - THE RAZORBACK SUCKER (XYRAUCHEN TEXANUS). 1:00 p.m.

Chairman: W.L. Minckley, Arizona State University.

- 1982 Video observations of razorback suckers in a spawning area of Lake Mohave, Arizona-Nevada.

  B. Rinne, G. Mueller and T. Burke, U.S. Bureau of Reclamation, Lower Colorado River Regional Office, Boulder City, Nevada.

- Preliminary findings on razorback sucker spawning success in Lake Mohave.

  M. Bozek, Lake Mead Limnological Research Center, University of Nevada, Las Vegas.

- Habitat selection of spawning razorback suckers observed in Arizona Bay, Lake Mohave, Arizona-Nevada.

  G. Mueller, B. Rinne, T. Burke and M. Delamore, U.S. Bureau of Reclamation, Lower Colorado River Regional Office, Boulder City, Nevada.

- Morphological variation in Lake Mohave razorback suckers.

  Gene R. Wilde, Lake Mead Limnological Research Center, University of Nevada, Las Vegas.

- Distribution and relative abundance of razorback suckers in Lake Mohave during winter and spring of 1982.

  L.J. Paulson, Lake Mead Limnological Research Center, University of Nevada, Las Vegas.

SESSION III - THE CUATROCIENEGAS OF COAHUILA, MEXICO.** 2:30 p.m.

Chairman: W.L. Minckley, Arizona State University.

- Crustaceans.

  G.R. Cole, Flagstaff, Arizona.

- Fishes.

  W.L. Minckley, Arizona State University.

- Flora.

  Donald J. Pinkava, Arizona State University.

- Herpetology.

  C.J. McCoy, Carnegie Museum of Natural History, Pittsburgh, Pennsylvania.

- Gastropods.

  Robert Hershler, Roselle, New Jersey.

- Environmental impacts.

  Salvador Contreras-Balderas, Director, Escuela de Graduados, Facultad de Ciencias Biológicas, Universidad Autónoma de Nuevo Leon, Monterrey, México.

- Summary.

  James E. Johnson, U.S. Fish and Wildlife Service, Albuquerque, New Mexico.

** Note: The above symposium was arranged and coordinated by Paul C. Marsh, Center for Environmental Studies, Arizona State University.

SESSION IV - BARBECUE, ET AL., AND INFORMAL CONTINUATION OF DISCUSSIONS.

Friday, November 19. 8:00 a.m.

SESSION V - RESEARCH AND MANAGEMENT PAPERS.

Chairman: Phil Pister, California Department of Fish and Game, Bishop.

- Reproductive biology of longfin dace (Agosia chrysogaster) in a Sonoran Desert stream, Arizona.

  W.G. Kepner and W.L. Minckley, Arizona State University, Tempe.

- Evolutionary ecology of three Mexican pupfishes (Cyprinodon eximius complex): preliminary studies of life histories and thermal tolerances.

  D.L. Soltz, California State University, Los Angeles; and C.R. Feldmeth, Joint Science Department, Claremont Colleges, Claremont, California.

- The role of predation in desert aquatic communities: problems and perspectives.

  Gary Meffe, Arizona State University, Tempe.

- Movement of energy by predation in spatially intermittent streams.

  M. Busdosh and R. Freeman, Woodward-Clyde Consultants, San Diego.

- Ecology of the Nevadan relict dace, Relictus solitarius (Hubbs and Miller).

  Steven Vigg, Desert Research Institute, University of Nevada System, Reno.

- Reseña sobre los estudios de los peces de aguas continentales en Baja California, con especial referencia en la trucha de San Pedro Mártir.

  Carlos Yruretagoyena U., Dirección de Pesca, Ensenada, Baja California, México.

- Estudio preliminar de la Pesquería de la Laguna Salada, Baja California.

  G. Compeán J. y O. Baylón G., Secretaria de Pesca, Recursos Pesqueros, Ensenada, Baja California.

- Threatened and endangered freshwater mollusks of western North America that are associated with threatened and endangered fish.

  J.J. Landye, Bio-Geo Southwest, Inc., Flagstaff, Arizona.

- Sexual dimorphism in the Utah chub, Gila atraria (Girard).

  Arcadio Valdes G. and Rex Herron, Utah State University, Logan.

SESSION VI - MISCELLANEOUS ITEMS. 10:45 a.m.

Chairman: James E. Johnson, U.S. Fish and Wildlife Service, Albuquerque, N.M.

- The Desert Fishes Council's endangered species committee.

  Jack Williams, U.S. Fish and Wildlife Service, Sacramento, California.

- "Exotic Species"

  W.R. Courtenay, Jr., Florida Atlantic University, Boca Raton.

- Ash Meadows update.

  Cindy Williams, Barbara Kelley, Tasker & Beula Edmiston, Ash Meadows Task Force; Don Sada, U.S. Fish and Wildlife Service, Reno, Nevada.

SESSION VII - RESEARCH AND MANAGEMENT PAPERS (CONTINUED). 1:00 p.m.

- The life history and recovery of the Cui-ui (Chasmistes cujus).

  Gary Scoppettone, U.S. Fish and Wildlife Service, Reno, Nevada.

- Phototaxis in the Devils Hole pupfish, Cyprinodon diabolis Wales.

  T.M. Baugh, University of Nevada, Las Vegas.

- Gila topminnow introductions on four Arizona national forests.

  Kenneth Byford and Gary Bell, Tonto National Forest, Phoenix, Arizona.

- Livestock and riparian habitat management - why not?

  Jerry W. Davis, Tonto National Forest, Phoenix, Arizona.

- Evolutionary genetics of the Gambusia nobilis species group, including G. longispinis, a Cuatrociénegas endemic.

  Anthony A. Echelle and Alice F. Echelle, Oklahoma State University, Stillwater.

- Fish fauna of the Rio Sonoyta, Sonora, Mexico.

  Thomas E. McMahon, University of Arizona, Tucson; and Robert Rush Miller, Museum of Zoology, University of Michigan, Ann Arbor.

- Cyprinodon diabolis at the Hoover Dam Refugium: facultative or genetic change?

  Astrid Kodric-Brown, Department of Ecology and Evolutionary Biology, the University of Arizona, Tucson.

- Relationships between recruitment of woundfin and stream flow in the Virgin River, 1977-82.

  James E. Deacon, University of Nevada, Las Vegas.

- Application of a physical habitat usability model to the fish community in a spring-fed desert stream.

  T.B. Hardy, C.G. Prewitt and K.A. Voos, University of Nevada, Las Vegas.

- The status of Lahontan cutthroat trout (Salmo clarki henshawi).

  Don Sada, U.S. Fish and Wildlife Service, Reno, Nevada.

- Area cladograms for western North American fish faunas.

  D.A. Hendrickson and W.L. Minckley, Arizona State University.

- Ciénegas - endangered habitats of the Southwest.

  W.L. Minckley and D.A. Hendrickson, Arizona State University.

- The first U.S. Fish and Wildlife Service National Fish Refuge: the San Bernardino Ranch.

  Gerald L. Burton, U.S. Fish and Wildlife Service, Phoenix, Arizona.

- Records for native southwestern fishes transplanted in Arizona.

  W.L. Minckley, Arizona State University; and J.E. Brooks, Arizona Game and Fish Department, Phoenix.

- Thermal ecology of the native and introduced fishes of the Virgin River (Utah, Arizona, Nevada).

  P.B. Schumann, Office of Environmental Science and Engineering, U.C.L.A.; E.L. Stuenkel, Pacific Biomedical Research Center, University of Hawaii, Manoa; J.E. Deacon, Department of Biological Sciences, University of Nevada, Las Vegas.

SESSION VIII - BUSINESS MEETING. 7:30 p.m.

Chairmen: James E. Johnson, Chairman, Desert Fishes Council; and Salvador Contreras-Balderas, Chairman-elect, Desert Fishes Council.

- Old and new business.
- Constitution and bylaws.
- Resolutions.
- Treasurer's report.
- Announcement of nominating committee.
- Installation of new Chairman.

Saturday, November 20. Several field trips will be conducted. Details will be announced.

Papers, abstracts, and inquiries concerning the symposium and activities of the Desert Fishes Council should be directed to:

E.P. Pister, Executive Secretary
Desert Fishes Council
407 West Line Street
Bishop, CA 93514

Phone: (619) 872-1171

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Sonoran Desert Fishes - Mexico Area Coordinator Report

John N. Rinne and Scott C. Belfit
Rocky Mountain Forest and Range Experiment Station
Forestry Sciences Laboratory
Arizona State University Campus
Tempe, Arizona 85287

Notes on Collection and Photographing of Fishes in Sonora and Chihuahua, Mexico, June 1982

John N. Rinne and Scott C. Belfit
Forestry Sciences Laboratory
Rocky Mountain Forest and Range Experiment Station
Arizona State University Campus
Tempe, Arizona 85287

Betweeen 15 June and 30 June 1982, Dr. John Rinne and Scott Belfit captured and photographed fishes in the States of Sonora, Sinaloa, and Chihuahua, Mexico. During this trip 2,500 miles were traveled and 12 localities visited. The purpose of the trip was to complete a photo file on fishes of the Sonoran Desert region in Mexico which was started in 1981 (see 1981 Mexico Area Coordinator Report by John Rinne). These photos will be used in a regional publication "Native Fishes in the Sonoran Desert Region" and represent a major improvement over currently available photographs of Mexican fishes.

As prescribed in the permit (#932) from the Officina Regulacion Pesquera, the only data collected were colored photographs of fish species (see plates #1 -7). All fishes were collected in seine nets, dip nets, gill nets or fishing poles and returned alive to the water. Though not all species were photographed at each locality, a list was kept of species observed at each locality and is included (Section B).

During the trip, 17 fish species were photographed which includes 7 additions to our file. Also photographs of several species taken in 1981 were improved upon. In order to avoid repetition, only plates of fish not included in the 1981 report are presented here.

The trip was very successful and upon publication will provide a greater appreciation of this unique aquatic fauna.

A. Itinerary

Tuesday 15 June 1982:

Crossed U.S.-Mexico border at Nogales (1300 hours). Traveled to locality 1 via Imuris and Cananea arriving at 1830 hours. Camped just below low water bridge (2 km East of Arizpe) on the Rio Bacanouchi.

Wednesday 16 June 1982:

Photographed fish at locality 1 and departed by 1100 hours. Traveled to the Rio Yaqui just west of Tonichi via Ures, Hermosillo, and Tecoripa. Camped at this location and attemped to collect fish with gill nets.

Thursday 17 June 1982:

Attempted again to collect fish from Rio Yaqui just below bridge. Water level was too high and no specimens were captured. Departed at 1100 hours and traveled to locality 2 via Onabas, Rosario, and Nuri arriving in Movas at 1600

hours. Sampled and photographed fish from the Rio Chico (locality 2). Camped just south of Movas at junction of Nuri and Rosario roads by 1830 hours.

Friday 18 June 1982:

Departed camp (0630 hours) and traveled to locality 3. Finished photographing fish (1200 hours) and drove to locality 4 via Nuri, Rosario, and Hornos. Arriving by 1700 hours, nets were set and fish collected that evening.

Saturday 19 June 1982:

Photographed fish collected the previous evening and departed by 0600 hours. Traveled to Alamos via Cuidad Obregon and Navajoa (arrived by 1200 hours). Took a side trip to locality 5 but didn't find desired species so returned to Alamos by 1600 hours. Camped this evening just northwest of El Tábelo off the road to San Bernardo.

Sunday 20 June 1982:

Departed camp by 0600 hours and drove to locality 6 at which fish were collected and photographed until 1200 hours. Next, traveled to Navohoa and rented rooms at the Del Rio Hotel by 1530 hours.

Monday 21 June 1982:

Left Navohoa by 0730 hours and traveled to locality 7 near Choix (1430 hours) via Mexican Highway 15 and Sin. 23. Fish photography was hampered on this date by high afternoon algae production. Camped 3 km north Choix bridge on road to Tasajeras.

Tuesday 22 June 1982:

Returned to locality 7 (0600 hours) and finished photographic work by 1100 hours. Traveled to Guaymas via Navohoa and rented rooms near the Playa del Cortez (1900 hours).

Wednesday 23 June 1982:

Departed Guaymas (1245 hours) and returned to El Potrero (locality 4) to camp and replenish water supply.

Thursday 24 June 1982:

Departed (0740 hours) for locality 8 in the State of Chihuahua. Traveled route including San Rosario, Nuri, San Nicholas, Santa Rosa, and passed through Yecora at 1400 hours. Arrived at locality 8 (Rio Concheño road crossing) by 1800 hours and set up camp.

Friday 25 June 1982:

Photographed fish collected the previous evening and left the site by 0700 hours. After visiting the Cascada de Basaseachi, collected and photographed at locality 9 (1300 hours) and locality 10 (1800 hours). Continued east and camped 10 km east of Tomachic.

Saturday 26 June 1982:

Departed (0800 hours) for locality 11 via Chihuahua highway 16 to Madera (1100 hours) and La Norteña. No photographs taken.

Sunday 27 June 1982:

Work completed (1000 hours) and departed for Rio Sirupa (locality 12) via La Mesa and Madera. Camped here and unsuccessfully attempted to collect with fishing poles.

Monday 28 June 1982:

Captured and photographed (1300 hours) fish and remained in the same camp.

Tuesday 29 June 1982:

Left Rio Sirupa (locality 12) by 0700 hours and traveled to Nuevo Casas Grandes via Madera. Stopped at a motel for the night due to mechanical problems.

Wednesday 30 June 1982:

Cross U.S.-Mexico border (1200 hours) at Aqua Prieta.

B. Localities and Photographs

The following is a list of the localities referred to in the itinerary. Included are references to the Mexican topographic maps 1:250,000 (Secretaria Programación Y Presupuesto), and a list of fish species observed (O) and/or photographed (P) at each locality.

Locality 1: Sonora. Junction of Rio Bacanouchi and the Arizpe-Buenvista Roads, 2 km east of Arizpe. Cananea, H12-5.

a.	Catostomus wigginsi (Opata sucker)	Plate 1.
b.	Poeciliopsis occidentalis (Sonoran topminnow)	P
c.	Campostoma ornatum (Mexican stoneroller)	P
d.	Agosia chrysogaster (Longfin dace)	O

Locality 2: Sonora. Rio Chico at Movas. Tecoripa, H12-12.

a.	Catostomus ornatum	P
b.	Cichlasoma beani (Sinaloan cichlid)	P
c.	Poeciliopsis occidentalis	O

Locality 3: Sonora. 5 km north of Movas on the Rio Chico. Tecoripa, H12-12.

a.	C. beani	Plate 2.
b.	P. occidentalis	P

Locality 4: Sonora. 3 km south of Marina del Ray Presa Alvaro Obregon at El Potrero canal entrance. Cuidad Obregón, G12-3.

a. Dorosoma smithii (Pacific shad) Plate 3.

Locality 5: Sinaloa. Rio Ranchito + 50 km southeast of Alamos on San Vicinte road. Huatabampo, G12-6.

a. P. occidentalis O

Locality 6: Sonora. Arroyo San Bernardo at San Bernardo. Cuidad Obregón, G12-3.

a. P. occidentalis P
b. C. ornatum P
c. Catostomus spp. P
d. C. beani P
e. Ictalurus spp. P

Locality 7: Sonora. Rio Choise 3 km north of Choix at bridge on Tasajeras road. Huatabampo, G12-6.

a. Gila robusta (Roundtail chub) P
b. A. chrysogaster P
c. P. occidentalis P
d Tilapia spp. P
e. C. beani P

Locality 8: Chihuahua. Rio Concheño at junction with road to Basaseachic, 22 km north of Basaseachic. Tecoripa, H12-12.

a. Catostomus spp. Plate 5.

Locality 9: Chihuahua. Rio Casita in the vicinity of Riito and + 6 km east of Basaseachic. Tecoripa, H12-12.

a. Salmo spp. (Rio mayo trout) Plate 6.

Locality 10: Chihuahua. Arroyo Ahumado (tributary of Rio Tomochic) 25 km west of Tomochic. Chihuahua, H13-10.

a. Salmo spp. (Yaqui trout) P
b. Gila spp. (Mesa del norte chub) P

Locality 11: Chihuahua. Rio Negro + 12 km west of La Norteña. Madera, H12-9.

a. Salmo gairdneri (Rainbow trout) P
b. Catostomus spp. Plate 7.
c. Gila robusta P
d. Notropis spp. P
e. A. chrysogaster P

Locality 12: Chihuahua. Rio Sirupa + 14 km west of Madera. Madera, H12-9.

a. Ictalurus pricei (Yaqui catfish) P

Species List

Catostomus wigginsi
* P. occidentalis
* Campostoma ornatum
* Agosia chrysogaster
Cichlosoma beani
Dorosoma smithi
Ictalurus spp. (San Bernardo)
Tilapia spp. (Rio Choix)
Catostomus (Rio Concheño) spp.
* Salmo spp.
Salmo spp.
* Gila (Arroyo ahumado) spp.
Salmo gairdneri
Catostomus spp. (Rio negro)
* Gila robusta
Notropis formosus (Rio negro)
* Ictalurus pricei

* = species photographed in 1981.

Peces del desierto de Sonora - Relato del Coordinator del área de México

John N. Rinne y Scott C. Belfit
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Notas sobre la recolección y fotografía de peces en Sonora y Chihuahua, México, junio de 1982

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Entre el 15 y el 30 de junio de 1982, el Dr. John Rinne y Scott Belfit capturaron y fotografiaron peces de los estados de Sonora, Sinaloa y Chihuahua de México. Durante el viaje se recorrieron 2,500 millas y se visitaron 12 localidades. El objetivo del viaje era completar un archivo fotográfico de peces de la región del desierto de Sonora de México, que se había empezado en 1981 (véase el relato del Coordinator del área de México, 1981, de John Rinne). Estas fotografías se usarán en una publicación regional "Peces naturales de la región del desierto de Sonora" y representan una gran mejora sobre las fotografías que hoy en día se puede disponer de los peces de México.

Como se prescribe en la licencia número 932 de la Oficina de Regulación Pesquera, los únicos datos recogidos fueron fotografías en colores de especies de peces (véanse láminas 1-7) Todos los peces se pescaron en red de jábega, "dip nets", "gill nets" o can˜as de pescar y fueron devueltos vivos al agua. Aunque en cada localidad no fueron fotografiadas todas las especies, se mantuvo una lista de los ejemplares observados en cada localidad la cual se incluye en la sección B.

Durante este viaje se fotografiaron diecisiete (17) especies, lo que supone siete (7) adiciones a nuestro archivo. Además se mejoraron las fotografías de varias especies tomadas en 1981. Con objeto de evitar la repetición, aquí se incluyen sólo las láminas de peces que no formaban parte en el relato de 1981.

El viaje fue exitoso y con la publicación de las fotografías se proporcionará una mayor apreciación de esta única fauna acuática.

A. Itinerario

Martes 15 de junio, 1982:

Se cruzó la frontera de México y Estados Unidos en Nogales (1300 horas). Se viajó a la localidad 1 vía Imuris y Cananea llegando a las 1830 horas. Se acampó debajo del puente de aguas profundas (2 km al este de Arizpe) del rio Bacanouchi.

Miércoles 16 de junio, 1982:

Se hicieron fotografías de los peces en la localidad 1 y se partió a las 1100 horas. Se viajó al río Yacqui al oeste de Tonichi, vía Ures, Hermosillo y Tecoripa. Se acampó en este lugar y se intentó capturar peces con "fill nets."

ueves 17 de junio, 1982:

Se intentó de nuevo capturar peces del río Yaqui devajo del puente. El nivel del agua era demasiado alto y no se capturó ningún ejemplar. Se partió a las 1100 horas y se viajó a la localidad 2 vía Onabas, Rosario y Nuri llegando a Movas a las 1600 horas. Se tomaron muestras y se fotografiaron peces del río Chico (localidad 2). Se acampó al sur de Movas en la intersección de las carreteras de Nuri y Rosario a las 1830 horas.

Viernes 18 de junio, 1982:

Se partió del campamento (0630 horas) y se viajó a la localidad 3. Se terminó de fotografiar los peces (1200 horas) y se manejó a la localidad 4 vía Nuri, Rosario y Hornos. Habiendo llegado a las 1700 horas, se echaron las redes y se recogieron peces esa tarde.

Sábado 19 de junio, 1982:

Se fotografiaron los peces recogidos la tarde anterio y se partió a las 0600 horas. Se viajó a Alamos vía Cuidad Obregón y Navajoa (llegada a las 1200 horas). Se hizo un viaje secundario a la localidad 5, pero no se encontraron las muestras buscadas y se volvió a Alamos a las 1600 horas. Se acampó esa tarde al noroeste de El Tábelo, algo apartados de la carretera de San Bernardo.

Domingo 20 de junio, 1982:

Se partió del campamento a las 0600 horas y se manejó a la localidad 6 en donde se capturaron y fotografiaron peces hasta las 1200 horas. Después se viajó a Navohoa y se tomaron habitaciones en el Hotel Del Rio a las 1530 horas.

Lunes 21 de junio, 1982:

Se salió de Navohoa a las 0730 horas y se viajó a la localidad 7, cerca de Choix (1430 horas) vía Mexican Highway 15 y Sin. 23. La fotografía de peces no se llevó a cabo en este día debido a la producción de algas al mediodía. Se acampó 3 km al norte del puente Choix en la carretera a Tasajeras.

Martes 22 de junio, 1982:

Se volvió a la localidad 7 (0600 horas) y se terminó el trabajo de fotografía a las 1100 horas. Se viajó a Guaymas vía Navohoa y se alquilaron habitaciones cerca de la Playa de Cortez (1900 horas).

Miércoles 23 de junio, 1982:

Se partió de Guaymas (1245 horas) y se volvió a El Potrero (localidad 4) para acampar y repostar agua.

Jueves 24 de junio, 1982:

Se partió (0740 horas) para la localidad 8 en el estado de Chihuahua. Se tomó la ruta que incluye San Rosario, Nuri, San Nicolás, Santa Rosa y se pasó por Yecora a las 1400 horas. Se llegó a la localidad 8 (donde la carretera cruza el río Concheño) a las 1800 horas y se estableció el campamento.

Viernes 25 de junio, 1982:

Se fotografiaron los peces capturados la tarde anterior y se dejó el lugar a las 0700 horas. Después de visitar la Cascada de Basaseachi, se capturaron y fotografiaron peces en la localidad 9 (1300 horas) y en la 10 (1800 horas). Se continuó al este y se acampó 10 km al este de Tomachic.

Sábado 26 de junio, 1982:

Se partió (0800 horas) para la localidad 11 vía Carretera de Chihuahua 16 a Madera (1100 horas) y La Norteña. No se tomaron fotografías.

Domingo 27 de junio, 1982:

Se terminó el trabajo y se partió para el río Sirupa (localidad 12) vía La Mesa y Madera. Se acampó aquí y se trató de capturar peces con cañas de pescar sin tener éxito.

Lunes 28 de junio, 1982:

Se capturaron y fotografiaron peces (1300 horas) y se permaneció en el mismo campamento.

Martes 29 de junio, 1982:

Se dejó el río Sirupa (localidad 12) a las 1700 horas y se viajó a Nuevo Casas Grandes vía Madera. Se paró en un motel durante la noche a causa de unos problemas mecánicos.

Miércoles 30 de junio, 1982:

Se cruzó la frontera de Estados Unidos-México (1200 horas) por Agua Prieta.

B. Localidades y fotografías

Lo siguiente es una lista de las localidades a las que se hizo referencia en el itinerario. Están incluídas las referencias a los mapas topográficos de México, 1:250,000 (Secretaría programación y Presupuesto), y una lista de las especies observadas (O) y/o fotografiadas (F) en cada localidad.

Localidad 1: Sonora. Intersección de las carreteras de Río Bacansuchi y Arizpe-Buenavista, 2 km al este de Arizpe. Cananea, H12-5.

a.	Catostomus wigginsi (Opata sucker)	Lámina 1.
b.	Poeciliopsis occidentalis (Sonora topminnow)	F
c.	Campostoma ornatum (Mexican stoneroller)	F
d.	Agosia chrysogaster (Lonfin dace)	O

Localidad 2: Sonora. Río Chico en Movas. Tecoripa, H12-12.

a.	Catostomus ornatum	F
b.	Cichlasoma beani (Sinaloan cichlid)	F
c.	Poeciliopsis occidentalis	O

Localidad 3: Sonora. 5 km al norte de Movas en el río Chico. Tecoripa H12-12.

a.	C. beani	Lámina 2.
b.	P. occidentalis	F

Localidad 4: Sonora. 3 km al sur de Marina del Ray Presa Alvaro Obregón en la entrada del canal El Potrero. Ciudad Obregón, G12-3.

a.	Dorosoma smithii (Pacific shad)	Lámina 3.

Localidad 5: Sinaloa. Río Ranchito ± 50 km al sudeste de Alamos en la carretera de San Vicente. Huatabampo, G12-6.

a.	P. occidentalis	O

Localidad 6: Sonora. Arroyo de San Bernardo en San Bernardo. Ciudad Obregón. G12-3.

a.	P. occidentalis	F
b.	C. ornatum	F
c.	Catostomus spp.	F
d.	C. beani	F
e.	Ictalurus spp.	F

Localidad 7: Sonora. Río Choise, 3 km al norte de Choix en el puente de la carretera de Tasajeras. Huatabampo, G12-6.

a.	Gila robusta (Roundtail chub)	F
b.	A. chrysogaster	F
c.	P. occidentalis	F
d.	Tilapia spp.	F
e.	C. beani	F

Localidad 8: Chihuahua. Río Concheño en la intersección de la carretera a Basaseachi, 22 km al norte de Basaseachi. Tecoripa, H12-12.

a.	Catostomus spp.	Lámina 5.

Localidad 9: Chihuahua. Río Casita en la vecindad de Riíto y a ± 6 km al este de Basaseachi. Tecoripa, H12-12.

a.	Salmo spp. (Rio Mayo trout)	Lámina 6.

Localidad 10: Chihuahua. Arroyo ahumado (afluente del río Tomochic) 25 km al oeste de Tomochic. Chihuahua, H13-10.

a.	Salmo spp. (Yaqui trout)	F
b.	Gila spp. (Mesa del Norte chub)	F

Localidad 11: Chihuahua. Río Negro ± 12 km al este de la Norteña. Madera, H12-9.

a.	Salmo gairdneri (rainbow trout)	F
b.	Catostomus spp.	Lámina 7.

c. Gila robusta F
d. Notropis spp. F
e. A. chrysogaster F

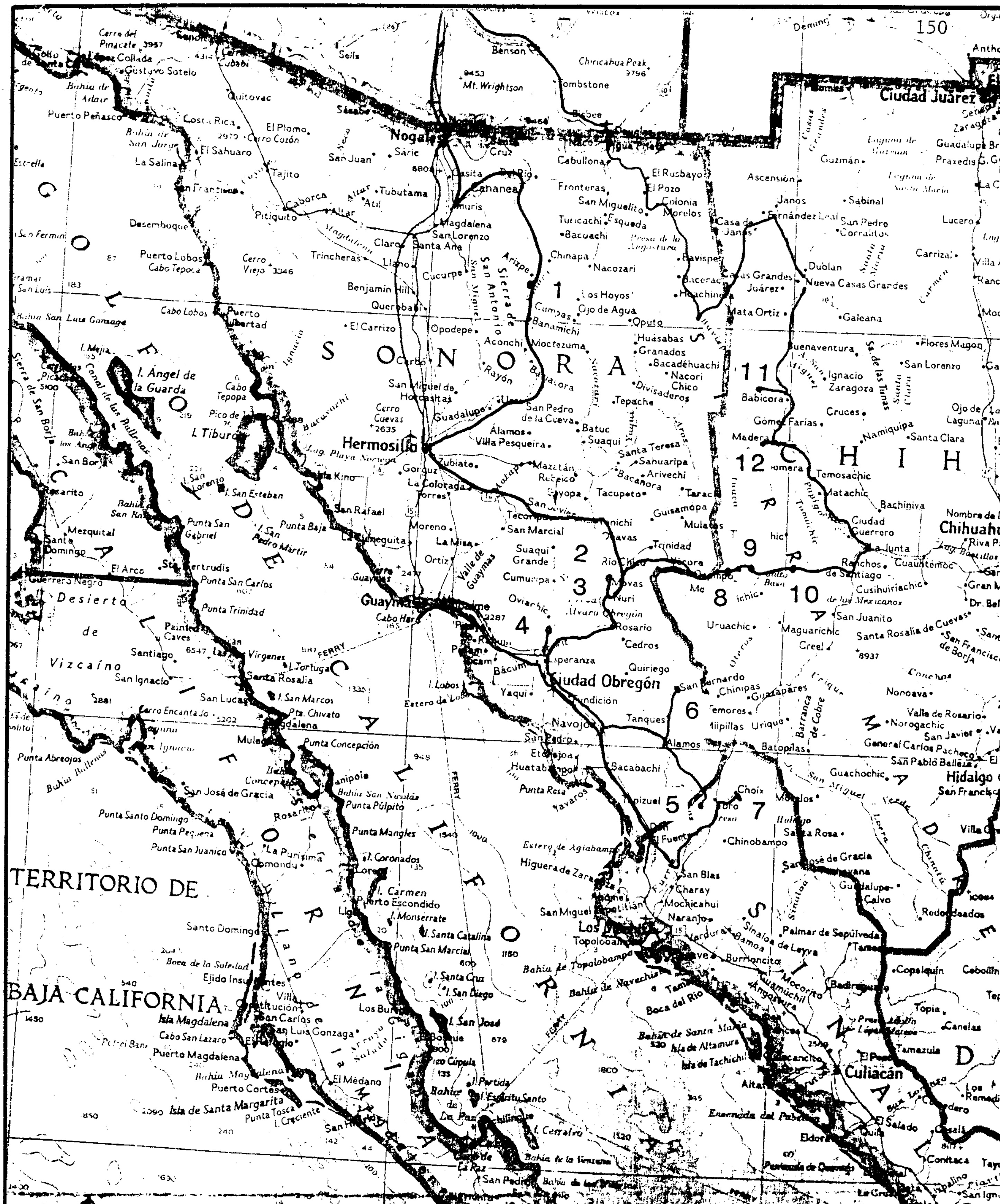
Localidad 12: Chihuahua. Río Sirupa ± 14 km al oeste de Madera. Madera, H12-9.

a. Ictalurus pricei (Yaqui catfish) F

Lista de especies

Catostomus wigginsi
* P. occidentalis
* Campostoma ornatum
* Agosia chrysogaster
Cichlosoma beani
Dorosoma smithii
Ictalurus spp. (San Bernardo)
Tilapia spp. (Río Choix)
Catostomus (Río Concheño) spp.
* Salmo spp.
Salmo spp.
* Gila (Arroyo ahumado) spp.
Salmo gairdneri
Catostomus spp. (Río Negro)
* Gila robusta
Notropis formosus (Río Negro)
* Ictalurus pricei

* = especies fotografiadas en 1981.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Benson
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El Sahuaro
La Salina
Caborca
Pitiquito
Altar
Tubutama
Magdalena
San Lorenzo
Santa Ana
Trincheras
Cucurpe
Benjamin Hill
Desemboque
Puerto Lobos
Cabo Tepoca
Puerto Libertad
El Carrizo
S O N O R A
Hermosillo
Guaymas
Ciudad Obregón
Navojoa
Álamos
Huatabampo
Yavaros
Fronteras
Nacozari
Chinapa
Arizpe
Los Hoyos
Ojo de Agua
Banamichi
Moctezuma
Huásabas
Granados
Bacadéhuachi
Nacori Chico
Divisaderos
Tepache
San Pedro de la Cueva
Batuc
Suaqui
Villa Pesqueira
Ures
Rayón
Aconchi
Opodepe
Carbó
San Miguel de Horcasitas
Cerro Cuevas
Guadalupe
Zubiate
La Colorada
Torres
San Marcial
Suaqui Grande
Cumuripa
Rosario
Cedros
Quiriego
Sahuaripa
Arivechi
Bacanora
Tacupeto
Santa Teresa
Mazatán
Tecoripa
San Javier
Onavas
Movas
Nuri
Rio Chico
Trinidad
Yécora
Tarachi
Guisamopa
Mulatos
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Casas Grandes
Nuevo Casas Grandes
Janos
Ascensión
Sabinal
Lucero
Carrizal
Dublan
Galeana
Mata Ortiz
Buenaventura
Flores Magon
San Lorenzo
Ignacio Zaragoza
Babicora
Cruces
Gómez Farías
Madera
Namiquipa
Santa Clara
Temosachic
Matachic
Bachiniva
Ciudad Guerrero
Chihuahua
Cuauhtémoc
La Junta
Ranchos de Santiago
Cusihuiriachic
San Juanito
Uruachic
Maguarichic
Creel
Santa Rosalía de Cuevas
San Francisco de Borja
Nonoava
Valle de Rosario
Norogachic
San Javier
General Carlos Pacheco
San Pablo Balleza
Guachochic
Hidalgo
Batopilas
Chinipas
Guazapares
Temores
Milpillas
Urique
Barranca de Cobre
San Bernardo
Tanques
Sacabachi
Choix
Chinobampo
El Fuerte
Tepizuel
San Blas
Charay
Mochicahui
Naranjo
San Miguel Zapotitlán
Los Mochis
Topolobampo
Bahía de Topolobampo
Higuera de Zaragoza
Estero de Agiabampo
Sinaloa de Leyva
Bamoa
Guamúchil
Angostura
Mocorito
Burrioncito
Palmar de Sepúlveda
Badiraguato
Tamazula
Culiacán
Eldorado
Quila
El Salado
Cosalá
Mazatlán
Villa Unión
El Walamo
Santa Rosa
San José de Gracia
Guadalupe y Calvo
Redondeados
Topia
Canelas
Boca del Rio
Bahía de Santa María
Isla de Altamura
Isla de Tachichilte
Ensenada del Pabellón
Península de Quevedo
TERRITORIO DE
BAJA CALIFORNIA
G O L F O D E C A L I F O R N I A
I. Ángel de la Guarda
I. Tiburón
I. San Esteban
I. San Lorenzo
I. San Pedro Mártir
I. Tortuga
I. San Marcos
I. Coronados
I. Carmen
I. Monserrate
I. Santa Catalina
I. Santa Cruz
I. San Diego
I. San José
I. Partida
I. Espíritu Santo
I. Cerralvo
Isla Magdalena
Isla de Santa Margarita
I. Creciente
Canal de las Ballenas
Bahía de San Luis Gonzaga
Bahía de los Ángeles
San Borja
Rosarito
Mezquital
Santa Domingo
El Arco
Santa Gertrudis
Punta San Carlos
Punta Trinidad
Desierto de Vizcaíno
Painted Caves
Santiago
San Ignacio
San Lucas
Santa Rosalía
Mulegé
Punta Concepción
Bahía Concepción
San José de Gracia
Rosarito
Punta Pulpito
Punta Mangles
La Purísima
Comondú
Loreto
Puerto Escondido
Ligüí
Punta San Marcial
Santo Domingo
Ejido Insurgentes
Villa Constitución
San Carlos
San Luis Gonzaga
Puerto Magdalena
Bahía Magdalena
Puerto Cortés
Punta Tosca
El Médano
San Hilario
Los Burros
Bahía de La Paz
La Paz
San Pedro
El Triunfo
San Bartolo
Todos Santos
Santiago
San José del Cabo
Cabo San Lucas
Punta Abreojos
Bahía Ballenas
Punta Santo Domingo
Punta Pequeña
Punta San Juanico
Boca de la Soledad
Cabo San Lázaro
Punta San Gabriel
Punta Baja
San Rafael
Kino
Lag. Playa Noriega
Pta. Chivato
Cerro Encantado
Cabo Haro
Empalme
Bácum
Cócorit
Yaqui
Esperanza
Fundición
Etchojoa
Punta Rosa
Estero de Lobos
I. Lobos
FERRY
Guadalupe Bravos
Praxedis G. Guerrero
Guzmán
Fernández Leal
San Pedro Corralitos
Villa Ahumada
Colonia Morelos
El Pozo
El Rusbayo
Cabullona
Agua Prieta
Douglas
Esqueda
Turicachi
Bacoachi
San Miguelito
Bavispe
Bacerac
Huachinera
Sáric
San Juan
El Plomo
Cerro Cozón
Costa Rica
Sásabe
Sells
Cerro del Pinacate
Bahía de Adair
Llano
Claro
Querobabi
Sierra de San Antonio
Valle de Guaymas
Ortiz
La Misa
Moreno
La Pintada
San Francisco
Cerro Viejo
Cabo Lobos
Cabo Tepopa
Pico de Tepopa
Sierra de San Borja
Punta San Gabriel
Las Vírgenes
Deming
Anthony
El Paso
Ojo de Laguna
Nombre de Dios
Gran Morelos
Dr. Belisario Domínguez
Conchos
Villa Coronado
Los Remedios
Conitaca
San Ignacio
Dimas
Coyotitan
Concordia
Siqueros

OREGON LAKES BASIN REPORT
Desert Fishes Council
November 1982

Neil B. Armantrout

During the past year there have been no changes in the populations of desert fishes in Oregon. As a result of budget reductions, activities in the Oregon Lakes Basin have declined, with all agencies being affected.

The Borax Lake Chub was listed as an endangered species in October 1982 wit critical habitat designated that includes Borax Lake, Lower Borax Lake and the immediately adjoining hot springs. Drilling has begun on the geothermal testing program, with the companies involved closely following the prescribed monitoring plan. The Nature Conservancy has been talking with the owners of Borax Lake about a conservation easement on their holdings, and there is optimism that an agreement can be reached.

In 1980, the Lakeview District of BLM initiated habitat management plans for the Foskett Springs Dace and the Warner Sucker. Both are progressing well. A second spring a half mile south of Foskett Spring was developed and fenced, with dace being transplanted. The dace has survived and reproduced, providing a second population. Efforts were initiated to either buy or trade for Foskett Spring but no action has occurred recently.

The HMP for the Warner Sucker included fencing of several miles of habitat. These areas were recovering well. However, major storms hit the area last spring and summer, resulting in some flood damage. Suckers were flushed out of the streams into some of the valley floor areas, but populations remain in the streams.

Populations of the Whitehorse trout continue in good condition. Stream improvements were continued in the Whitehorse Basin, with the fencing of additional stream miles. The Whitehorse land exchange is still on hold as a result of a disagreement over taxes; all other work on the exchange has been completed.

The Vale District, BLM, conducted inventories in the upper Malheur River for Redband Trout. Samples were sent to Dr. Robert Behnke for analysis. He confirmed that 10 of the populations sampled showed the Redband characteristics. A habitat management plan is being developed for these streams. Oregon Department of Fish and Wildlife is participating in the efforts. ODFW is also doing work on the Redband in the Blitzen River.

The Fish and Wildlife Service is planning a survey on the Klamath suckers; this is a high priority in the Service. A basin-wide survey may also be conducted in the Goose Lake Basin.

Of the three springs containing the Shoshone scuplin in Idaho, two are administered by BLM, and one of these may be lost. The Idaho Fish and Game is thinking of developing a Redband trout hatchery for use in a stocking program.

BUREAU OF LAND MANAGEMENT
AGENCY REPORT
Desert Fishes Council
November 1982

Neil B. Armantrout

SUMMARY

The Bureau of Land Management has had major reductions in programs for desert fishes. As a result of reductions in personnel and in funding for both field programs and projects, efforts in all parts of the west have been reduced or halted. This trend is expected to continue into the near future. Proposals are being considered that would transfer much of the Bureau program, particularly habitat development and maintenance to the States, but without providing any financial support to the states for this effort. BLM is seeking to initiate a study on the potential impacts of energy development on desert fishes, but few other new initiatives are planned. The Asset Management, or land disposal program, includes desert fish habitat. The program is already responsible from holding up previously proposed land exchanges.

REPORT BY STATES

Oregon - Habitat management plans for the Foskett Springs Dace, Warner Sucker and Whitehorse trout continue to function well, with the transplanted population of Foskett Springs Dace doing well. No new efforts for desert fishes were initiated this year. Inventories identified populations of Redband trout in the Malheur River with an HMP planned for this habitat. Monitoring continues on geothermal exploration in the Alvord Basin.

California - The Amargosa report by Cindy Williams has been received and an HMP is being prepared. The San Sebastian land exchange is on hold. An ACEC management plan will be developed for the Mohave chub, based on the HMP. California Department of Fish and Game prepared a report on the Ft. Soda area, giving general population estimates and habitat descriptions; an HMP is now functioning in the area, but will be revised based on the Cal F&G report, and an attempt will be made to have the area designated as an ACEC. The Owens Valley pupfish legislation is in conference committee.

Nevada - Plans are being developed for management of the Lahontan cutthroat in the Marys River drainage. Fencing was planned for some Lahontan cutthroat trout and relic dace habitat but protest from some livestock people - not those directly involved - stopped the program. Ash Meadows efforts are on hold as some of the public lands involved are included in the asset management program.

Utah - The Lahontan cutthroat in Bettridge Creek on Pilot Peek are surviving. The White Riv er study was completed, and a cooperative management plan involving State and Federal agencies developed for management of the dam. However, due to financial difficulties, the dam is now on hold. Low head hydro projects are proposed in the Deep Creeks, but the developer is willing to move the location downstream away from trout habitat.

Idaho - Stream improvements were made for Redband trout, primarily in the Owyhee drainage. Efforts to protect the Shoshone sculpin are on hold; of the three springs, it lives in two managed by BLM and one of these may be lost. A number of riparian studies are underway, with fenced areas in a number of locations, and using remote sensing to detect changes.

Arizone - BLM has entered into two interagency agreements on the introduction of desert fishes. The Gila top minnow has been introduced into 22 areas, with 24 more being considered. The pupfish (C. macularius), will be introduced into locations, with the transplants already begun. The Posey Well area, an artesian oil wellhole, is being developed for desert fishes and waterfowl. BLM has also participated in transplants of razorback suckers on public lands. Other introduction habitat management plans have been written, but concerns about possible conflicts with other uses have delayed implementation.

Colorado - A plan is being implemented to eliminate non-native fishes in some streams in the Montrose District and Naval Shale area of Grand Junction to protect habitat for the Colorado cutthroat trout.

Wyoming - Bone draw, in the Big Sandy River system, was developed as a nursery area, with hatching boxes for fish such as Kokanee placed in the spring. It has been quite successful in producing fish. HMP's for the Colorado cutthroat have been written and partially implemented. Populations of the trout are stable. In the Beaver Creek system, blocks have been placed in the headwaters to protect the fish from contamination from non-native populations downstream. In Rock Creek, four exclosures were built, with 100% improvement in bank conditions. A major problem is overfishing. Even though the area is closed to fishing, many people fish the area, and have removed a high percentage of the population. Extensive exploration throughout the Overthrust Belt area has led to heavy fishing pressure on isolated fish populatinos. The Bear River cutthroat HMP has been implemented with protection in several areas. Exclosure studies are underway, looking at the impacts of several grazing systems. In the Sand Dune belt, there are a series of lakes with trout populations. Freezing in the winter has been a problem. The Rawlins office has been working with windmill aeration of these lakes to improve winter survival. In another study on the Muddy River, beaver are being introduced to attempt to reduce erosion and to create sediment traps that can be used to produce woody vegetation to stabilize the stream system.

WYOMING

BLM in Wyoming has cooperated with the Wyoming Game and Fish Department on a number of habitat improvement projects. Bone Draw, in the Big Sandy River system, was developed as a nursery area, with hatching boxes for fish such as kokanee, brown and rainbow trout. It has been quite successful in producing fish. A Sike's Act HMP for the Colorado cutthroat has been written and partially implemented. Populations of the trout are stable. In the Beaver Creek system, two blocks have been placed in the headwaters to protect the fish from contamination from non-native populations dowstream. Barriers were also placed in Rock Creek and Rod Castle Creek. Four exclosures were built on Rock Creek, with 100% improvement in bank condition. Some early season grazing deferrement and beaver management have also been used to improve bank condition. A major problem was overfishing. The area is now closed to fishing. People fishing the area had removed a high percentage of the native population. Extensive oil and gas exploration throughout the Overthrust Belt has led to increased fishing pressure on isolated fish populations. The Bear River cutthroat Sikes Act HMP has been implemented with protection of several areas. Riparian pasture studies are underway on Muddy Creek, looking at the potential of several grazing systems. In the San Dune belt, there are a series of lakes with trout populations. Freezing in the winter has been a problem. The Rawlins office has been working with windmill aeration of these lakes to improve winter survival. In another study on Current and Sage Creeks south of Rock Springs, beaver have been introduced to reduce erosion and to create sediment traps that can be used to produce woody vegetation to stabilize the stream system. Rock Creek and Raymond Creek have been designated as ACEC's to protect native trout, with no surface occupany in Rock Creek valley proper. Drilling for oil and gas is still permitted from adjacent ridges along the valley.

Memorandum

TO: Bob Love

FROM: Dave Livermore

RE: Information for upcoming Desert Fishes Council Meeting

DATE: November 12, 1982

CC: Dick Armstrong and Terry Johnson

Per our conversation this morning, I hope you will be able to combine with Dick Armstrong or Terry Johnson when it comes time to bring the DFC folks up to date on Conservancy projects in the Great Basin. The following notes may be helpful:

Condor Canyon

Please thank all on hand for their help with raising funds for this project. It is now completely paid for. TNC is keeping current on Union Pacific's plans to abandon the railroad in the area. So far, Union Pacific has been cooperative in promising to be extra careful of the spinedace habitat if and when they engage in any structure removal.

Locke' Ranch

Livermore will not be on hand for this year's DFC meeting because of a Valient Farms bankruptcy sale in Reno on Friday which includes Locke's Ranch. TNC is still very interested in acquiring this property. A letter of intent has been received from Roger McCormick, the BLM Assistant State Director in Reno, committing the Bureau to assisting with this project as is necessary.

Soldier Meadows

Ken and Dorothy Earp's divorce proceeding is coming close to completion. The courts are now entertaining serious offers on both Soldier Meadows and Piaute Meadows ranches. TNC is trying to put together a limited partnership of interested buyers in Reno who would be willing to purchase the ranch and donate back a series of easements to protect the desert dace habitat and Lahonton cutthroat spawning regions on Mahogany Creek.

Ash Meadows

Livermore met with Jack Soules and Ace Reed from Senator Laxalt's office last Friday. Soules is still very anxious to complete the large scale exchange and has secured a verbal promise from Chic Hecht, the new Senator from Nevada, to assist in this process as well.

Barring a large scale exchange, Soules reiterated his commitment to work with small areas like the Collins Ranch. He is now also willing to consider offers on individual holdings such as the northern springs. (Rogers, Fairbanks, and Longstreet)

TNC will be working with Soules in the coming weeks to identify individual parcels he may wish to sell.

The Conservancy continues to view Ash Meadows as a high national priority. Our president Bill Blair wrote to Bob Burford, Director of the BLM on behalf of the exchange in late August.

Amargosa Toad

Information is wanted on the exact location of the Amargosa Toad occurance along the highway northeast of Beatty, Nevada. TNC wants to act on this project but cannot until this information is obtained.

For more information - or for suggestions - contact Dave Livermore at the San Francisco Regional office (415)777-0541.

HABITAT SELECTION OF SPAWNING RAZORBACK SUCKERS OBSERVED IN ARIZONA BAY, LAKE MOHAVE, ARIZONA-NEVADA

Gordon Muller, William Rinne,
Tom Burke, and Mike Delamore

Bureau of Reclamation
Boulder City, Nevada

Since the closing of Davis Dam in the early 1950's, razorback suckers (Xyrauchen texanus) have been observed spawning along the shoreline of Lake Mohave. Although a river oriented fish, this endemic Colorado River Basin sucker has apparently been able to adapt to a reservoir habitat.

Very little is known concerning the spawning habitat requirements of this species. On February 16-17, 1982 an attempt was made to identify some of the physical habitat parameters being utilized by spawning razorbacks in Lake Mohave.

A portion (690 sq/m) of a razorback spawning area located in Arizona Bay, Lake Mohave was mapped using survey techniques and underwater SCUBA divers. The paper discusses the location of spawning sites, their depth, densities, size, substrate composition and occurrence of eggs.

Observations indicate that substrate size may be a critical factor in spawning site selection. All observed spawning sites were characterized by a lack of fines in the substrate. With the absence of flushing river currents, wave action coupled with fluctuating lake elevations may be a critical factor which maintains substrate suitability in a reservoir situation.

REPRODUCTIVE BIOLOGY OF LONGFIN DACE (AGOSIA CHRYSOGASTER) IN A SONORAN DESERT STREAM, ARIZONA

by W. G. Kepner and W. L. Minckley (Arizona State University, Tempe)

ABSTRACT

The longfin dace, Agosia chrysogaster Girard, is the most abundant native minnow of low elevation (< 1,500 m) streams in Arizona, parts of southwestern New Mexico, and northern Mexico. Reproductive life history of longfin dace was examined over a 12-month period (1977-78) in Aravaipa Creek, Graham and Pinal counties, Arizona. Adult males and females are sexually dimorphic, clearly distinguishable by differences in size of fins. Gravid females and tuberculate males persisted throughout the year and spawned in shallow saucer-shaped depressions in sand-bottomed backwaters and runs. Although individual spawning activity was asynchronous, populations reached peak spawning condition at least twice within the year. Peak reproductive activity was during increased discharge in spring and late summer. Fecundity was primarily a function of size. Ovary weight was highly correlated with fecundity and was the most reliable indicator of total mature ova produced.

THE ROLE OF PREDATION IN DESERT AQUATIC COMMUNITIES: PROBLEMS AND PERSPECTIVES [159]

Gary K. Meffe (Department of Zoology, Arizona State University, Tempe, AZ 85287)

Severe declines in distribution and abundance of native southwestern fishes have been noted for decades, but underlying causalities are frequently ambiguous. A variety of abiotic and biotic mechanisms have been implicated in loss of desert fishes, often with little supportive data. Predation has not been well investigated in this context, even though theoretical and empirical studies demonstrate its potentially powerful role in community structure. Since nearly 50% of introduced southwestern fishes are piscivorous, desert aquatic communities have probably shifted from being only slightly influenced by predaceous fishes, to being strongly controlled by them.

To examine the role of one introduced predator in the decline of a native desert fish, studies were conducted on Sonoran topminnows (Poeciliopsis occidentalis) and introduced mosquitofish (Gambusia affinis) in Arizona, with the following conclusions: 1) competition between these fishes is unimportant, since they largely eat different foods which are not limiting, and have different trophic morphologies; 2) several lines of evidence, including laboratory and field experiments and observations, demonstrate heavy predation rates on juvenile, and perhaps adult topminnows by mosquitofish, which can locally eliminate the native species; 3) when sympatric with mosquitofish in the laboratory, topminnows may incur stress that results in lower fertilities, but this has not been demonstrated in natural populations. Experimental evidence thus indicates that predation by G. affinis is a major factor in the decline of P. occidentalis. A similar hypothesis-testing, experimental approach is strongly encouraged in study of loss of other native southwestern fishes, in order to remove the ambiguity often present regarding mechanisms of species' decline.

MOVEMENT OF ENERGY BY PREDATION IN SPATIALLY INTERMITTENT STREAMS

M. Busdosh and R. Freeman
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ABSTRACT

A common aquatic habitat in the southwest is created in streams where underground flow is forced to the surface by shallow bedrock. A study of two of these wetlands was done in the Santa Maria River drainage of western Arizona. The water and its associated riparian area create habitat very different from the surrounding Sonoran desert. The large amount of energy fixed in these areas by algae moves through the food web via aquatic insects and fish. Predation by small mammals, bats, and especially birds allows movement of this energy from the aquatic to the terrestrial ecosystem.

Killdeer, several flycatchers, Says phoebe, summer tanager, and Brewers sparrow were observed feeding on aquatic insects. These species were also noted feeding on terrestrial insects found near the water. Killdeer, kingfishers, and herons were observed preying upon fish.

The single fish found in the area was the longfin dace, Agosia chrysogaster, a native cyprinid. Of itself the longfin dace may not generate sufficiently widespread interest to allow protection of its habitat. These stream segments, with associated riparian areas, are essential for the birds and mammals noted, as both habitat and a food source. Efforts to preserve native fishes' habitat may be enhanced by promoting the "ecosystem" rather than the fish. Mammals and birds elicit more protectionist feelings than do minnows when all are presented to the public. While preservation of a native minnow because birds use its habitat may seem less noble than preservation for its own sake, there are no indications the fish prefers one mode over the other.

MOVEMENT OF ENERGY BY PREDATION IN SPATIALLY INTERMITTENT STREAMS

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RESUMEN (ABSTRACTO)

Un comun habitat acuatico en el suroeste es producido en arroyos donde el flujo subterenio es forzado al superficie por el lecho de roca. Un estudio en dos de estes tierras humedas fue hecho en el cuenca del Rio Santa Maria en el oeste de Arizona.. El agua y su area ripereno asociado producen habitat muy diferente del Disierto Sonoran del Alrededor. Un gran contidad de energia fijado po elga en estats areas es transpotado en la candenda alimenticia por insectos acuaticos y peces. Predacion por los mamiferos pequenos, murcielagos y especialmente los pajaros se permitaron movemiento de este energia del habitat acuatico al ecosystema terrestre.

Killdeer, algunos flycatchers, Says phoebe, summer tanager, and Brewers sparrow fueron observado alimentando de insectos acuaticos, y tambien insectos terrestres encontrado cerca al agua. Killdeer, kingfishers y herons fueron observados alimentando de peces.

El unico pez econtrado en la area eria el longfin dace, Agosia chyrysogaster, un cyprinid nativo. Por su mismo el longfin dace no se produzca interest suficiente a permitir el protecion de su habitat. Estes segmentos de arroyos, con su areas riperenos asociados, son esencial para los pajaros y mamiferos notados, como habitat y un fuente alimental. Esfuerzos de preseuar el habitat nativo de los peces son aumentado por la promocion del ecosistema en viz de los peces. Mamiferos y pajaros se obtene mas sentimientos de protecion que peces pequenos cuando el total es presentado al publico. Preservacion de un pez porque los pajaros se usan su habitat es talvej menos noble que el preservacion de el mismo, pero no hay indicaciones que el pez se prefiere un modo mas que el otro.

Ecology of the Nevadan Relict Dace

by

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SYNOPSIS

Relict dace, Relictus solitarius (Hubbs and Miller), live in various aquatic habitats in Ruby, Butte, Goshute, Steptoe, and Spring Valleys in northeastern Nevada. The springs, creeks, sloughs, and ponds in which relict dace exist are remnants of Pluvial Lakes which periodically inundated the valleys during cyclic climatic changes. The monotypic genus is believed to have evolved during the past 1.5 to 2.0 million years in the contiguous drainage basins of Pleistocene Lakes Franklin, Gale, Waring, and Steptoe just south of the conjoining parts of the Lahontan and Bonneville systems (Hubbs et al. 1974; R.R. Miller, University of Michigan, personal communication). As these lakes desiccated over the last 10,000 years, R. solitarius was the only fish to survive.

Historically relict dace was the most abundant of four fish species native to the north-central Great Basin. However, predation and competition by exotic fish species, modification of natural habitats, and groundwater mining have all caused detrimental impacts on the species.

Relict dace habitats can be grouped into four categories: 1) thermal springs 2) non-thermal springs and creeks 3) intermittant and/or saline ponds 4) large marsh complexes. Thermal springs have a stable temperature regime (generally ranging 15-21 C), moderate salinity (200-350 mg/ℓ TDS), with DO and pH dynamics assoicated with diel primary productivity. Non-thermal springs and creeks exhibit intermediate winter temperature regimes (8-12 C) with more seasonal variation, somewhat lower salinity (≤200 mg/ℓ TDS), with DO relatively high and pH relatively neutral. Franklin Lake and Alkali Pond are examples of the third category - they experience cold winter temperatures, and maximum seasonal variation, high salinity (450-1150 mg/ℓ TDS) with a high proportion of bicarbonate alkalinity, variable DO, and high pH. The large marsh complexes (e.g., Ruby Marshes and Duck Creek Slough) originally represented diverse and relatively stable habitats, however, are probably the most impacted by man's activities.

Life history patterns of relict dace correspond to habitat type. In stable thermal springs spawning is probably protracted (perhaps year-long) while it is seasonal in the more dynamic habitats. Size structures of various populations indicated that stable environments were conducive to a mature age compostion with minimal recruitment **("K-strategy")** while fluctuating

environments dictated a large reproductive effort and a youthful population ("r-strategy").

One gravid female weighing 12.3 grams had an ovary weight of 3.7 grams and a fecundity of 4,368 eggs. The mean egg diameter was 1.035 mm.

Relict dace habitats contain a diversity of food organisms-amphipods and gastropods were the prevalent forms. Insects, amphipods, ostracods, and leeches were found in the stomach contents of relict dace. In aquaria they readily feed on commerical dry fish food and live zooplankton-midwater.

Natural causes of mortality include various forms of predation, paricitism and disease, adverse environmental conditions and desiccation of habitats. Modification of habitats and introduction of exotic fish species (predation and competition) are two major causes of artificial mortality. I observed two interesting causes of mortality: a large predaceous bug, Lethocerus angustipes in Quilici Spring; and black spot disease caused by the encapsulated metacercariae of the worm known as Neascus cuticola von Nordmann in the Atwood Ranch Spring.

Via laboratory bioassays, the upper median thermal tolerance limit (96-hr TL50) of Butte Valley relict dace was determined to be 30.6 C when acclimated at 18-20 C. Relict dace tolerated TDS of 11,043 mg/ℓ with no mortality during 96-hr exposures, but experienced 100% mortality at concentations of 15,759 mg/ℓ with a mean resistance time of 23 hours. A synergistic relationship was demonstrated between temperature and salinity tolerance. An apparent difference existed in the tolerance of different dace populations to both temperature and salinity.

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