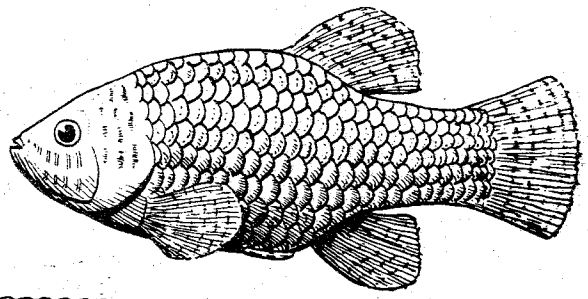
Desert Fishes Council



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

Proceedings of the Desert Fishes Council

VOLUME XII

Edited by
Edwin P. Pister

The Twelfth Annual Symposium

Held at
The University of Nuevo Leon
Monterrey, Mexico
November 5-7, 1980

FOREWARD

En 1.980 el Consejo tomó un valuoso paso iniciador al reunir por primera vez en su historia fuera de los Estados Unidos. Gracias a la bondad del Dr. Salvador Contreras B. y La Facultad de Ciencias Biológicas de le Universidad Autónoma de Nuevo León, gozamos de una reunion de la cual pocos jamás se olvidarán. Detalles de la reunión se hallan en un artículo que salio el 13 de noviembre de 1.980 en el periodico "Inyo Register" que se publicó en Bishop, estado de California. Este artículo sigue este prefacio.

Aunque la reunión de Monterrey fuera la primera asamblea del Consejo que se congregó fuera de los Estados Unidos, aquellos que asistieron fueron unanimos con los sentimientos que por seguro no sería la última.

Quedamos enormamente agradecidos a nuestros anfitriónes mexicanos por la gran bondad que nos mostraron.

In 1980 the Council took a valuable pioneering step by meeting for the first time in its history outside of the United States. Thanks to the hospitality of Dr. Salvador Contreras B. and La Facultad de Ciencias Biologicas at the University of Nuevo Leon, we experienced a meeting that few will ever forget. Details of the meeting follow in an article appearing in the November 13, 1980 edition of the Inyo Register, published in Bishop, California. Although the Monterrey meeting may have been the first Council function held outside of the United States, those in attendance were unanimous in their feeling that it surely would not be the last.

We remain enormously grateful for the superb hospitality shown us by our Mexican hosts.

Inyo Register 20¢

est 1885, Bishop, CA (USPS 268-340) Thursday, November 13, 1980—No. 46

Desert fishes council meets in Monterrey, Mex.

To promote the exchange of ideas and programs with Mexican biologists, the Desert Fishes Council met during November 5-7 under the sponsorship of the Department of Biological Sciences at the University of Nuevo Leon, Monterrey, Mexico.

Meeting for the first time outside of the United States since the council was established in 1969, the Twelfth Annual Symposium brought together over 100 scientists, resource managers, and students representing both nations.

Preservation of the aquatic biological resources of the North American deserts is the council's primary goal, and toward this end 32 technical papers were presented by researchers from Mexico and the United States, status reports were given concerning the integrity of the 12 major hydrologic areas comprising the North American deserts, current plans and activities of government resource managers were described by representatives of U.S. federal and state resource management agencies and the Mexican Departmento de Pesca within the state of Nuevo Leon. A broader overview of Mexican fishery science was presented by Dr. Antonio Mario Rios, Vice Director of Operations for the Departmento de Pesca in Mexico City.

Following the organized sessions held at the University, the group travelled approximately 300 kilometers to the Cuatrocienegas (Four Marshes) area of Coahuila, an area of enormous biological significance because of its unique and diversified flora and fauna. The only comparable area on the North American continent is found in the Ash Meadows area of southwestern Nye County, Nev. near Death Valley. Efforts are currently being exerted to keep threatened real estate development from destroying the biological values within Ash Meadows.

Of special interest to participants from the United States were a series of 12 excellent presentations of current research efforts by Mexican graduate students under the direction of Dr. Salvador Contreras-Balderas, Dean of the University's Graduate School of Biological Sciences. Language barriers were successfuly overcome through the preparation of bilingual abstracts by conference participants and the oral presentation of bilingual summaries by council members from both nations.

At the business session held November 6, Dr. Contreras was unanimously elected to serve as the council's chairman-elect. He will assume the duties of chairman at the 1982 meeting. Dr. Contreras, who received his graduate degree from Tulane University, is a recognized authority on North American desert fishes, serves as a member of the Endangered Species Committee of the American Fisheries Society, has published numerous technical papers in both English and Spanish, and has gained wide respect and acclaim for his efforts in establishing a highly regarded curriculum in fishery and aquatic sciences at this very modern university of 97,000 students. Retiring chairman is Peter G. Sanchez, a resource specialist at Death Valley National Monument, and current chairman is Dr. James E. Johnson, a biologist with the Office of Endangered Species in Albuquerque, N.M.

The Desert Fishes Council was formed in 1969 to lead in the preservation of aquatic resources in the Death Valley hydrologic area (which includes the Owens River). Local efforts of the council (through the Department of Fish and Game) include preservation of native fishes (including the Owens pupfish) in Fish Slough north of Bishop and in other areas of the eastern Sierra. The council currently comprises a nationwide and international representation of over 300 university and government scientists and resource specialists, and private citizens sharing a common concern for the preservation of long-term environmental values. Phil Pister, a Department of Fish and Game biologist from Bishop, served as the council's first chairman and now functions in the position of executive secretary.

Represented at last week's meeting were 15 universities within the U.S. and Mexico, ranging from Nuevo Leon to Ann Arbor, Mich. and Orono, Maine; two branches of Mexico's Departmento de Pesca; four agencies within the U.S. Department of the Interior; U.S. Forest Service; the Fish and Game Departments of Colorado and California; the Environmental Protection Agency; the California Academy of Sciences; the Nature Conservancy; private consulting firms; and private citizens. Travel and lodging were at the personal expense of the participants.

EL CONSEJO DE LOS PECES DEL DESIERTO SE REUNE EN MONTERREY, MEXICO

Para promover el intercambio de ideas y programas con los biólogos mexicanos, el Consejo de los Peces del Desierto se reunieron el 5 hasta el 7 de noviembre bajo el patrocinio del Departamento de Ciencias Biológicas en la Universidad de Nuevo Leon, Monterrey, México.

Reuniéndose por primera vez fuera de los Estados Unidos desde el comienzo del consejo en 1.969, el duodécimo simposio anual se unió más de 100 científicos, directores de recursos y estudiantes representando ambas naciones.

Preservando los recursos acuáticos-biológicos de los desiertos de Norte America es la meta principal del consejo, y para este fin se presentó 32 trabajos técnicos por investigadores de México y los Estados Unidos, informes de posición relativa concerniente a la integridad de los 12 áreas hidrológicos principales que abarcan los desiertos de Norte America, planes y actividades corrientes de los directores de recursos del gobierno fueron descrito por representantes del gobierno de los Estados Unidos y varios agencias del manejo de recursos del estado y del Departamento de Pesca dentro del estado de Nuevo Leon. Una panorama de la ciéncia pesquera de México fue presentado por el Dr. Antonio Mario Rios, vice-director de obras del Departamento de Pesca en la Ciudad de México.

Después de las sesiones organizadas en la universidad, el grupo viajó aproximadamente 300 kilómetros al área de los Cuatrociénegas de Coahuila, un área de gran significado biológico a causa de la flora y la fauna diversificada y singular. El único área comparable sobre el continente de las américas se halla en Los Prados de Cenizas, situado en la parte sur-este del condado de Nye, estado de Nevada, cerca de la Valle de la Muerte. Se están esforzando a guardar el área de Los Prados de Cenizas contra la explotación comercial que destruirán los meritos biológicos dentro de dicha área.

De interés especial a los participantes estadounidenses fue una seria de presentaciones excelentes acerca de los esfuerzos investigatorios por los estudiantes graduados mexicanos, bajo la dirección del Dr. Salvador Contreras-Balderas, rector de la Escuela de Graduados de Ciencias Biológicas de la Universidad. Problemas con el idioma se vencieron con buen éxito por medio de la preparación de resúmenes bilingües por los participantes de la conferencia, y los presentaciones orales de los resúmenes por los miembres del consejo de ambos naciones.

En la sesión de negocios que se reunió el 6 de noviembre, el Dr. Contreras fue elegido unanimamente a servir como el presidente electo. Tomará el sillero en la reunión de 1.982. El Dr. Contreras, quien se graduó de la Universidad de Tulane, es un autoridad reconocido sobre los peces del desierto de Norte America, es miembro del comité de especies empeligradas de la Asociación de Pesquera Americana, ha escrito numerosos trabajos técnicos en español y en inglés, además, ha recibido fama por sus esfuerzos en establecer un plan de estudios sobresaliente de ciencias acuáticas y pesquera en este universidad de 97.000 mil estudiantes. Peter Sanchez, especialista de recursos en el Monumento Nacional de la Valle de la Muerte, se jubiló como presidente. El presidente actual para el año que viene es el Dr. James E. Johnson, biólogo con la Oficina de Especies Empeligradas en Albuquerque, N.M.

El Consejo de los Peces del Desierto se formó en 1.969 para adelantar la preservación de los recursos acuáticos del área hidrológico de la Valle de la Muerte, lo que incluye la Valle de Owens. Esfuerzos locales del Consejo (por medio del Departamento de Pesca y Caza) incluye la preservación de los peces nativos (incluyendo el Owens pupfish) en el Lodazal de Peces al norte de Bishop y en otras áreas al este de la Sierra Nevada. El Consejo se compone de una representación nacional y internacional de más que 300 científicos y especialistas de recursos de universidades y agencias del gobierno y ciudadanos privados que se comparten una preocupación por la preservación de méritos biológicos de largo plazo. Phil Pister, biólogo del Departamento de Pesca y Caza aquí en Bishop sirvió en la capacidad de primer presidente del Consejo y ahora sirve en la posición de secretario ejecutivo.

Representados en la reunión de la semana pasada fueron 15 universidades dentro de México y los Estados Unidos, de Nuevo Leon hasta Ann Arbor, estado de Michigan y Orono, estado de Maine; dos agencias del Departamento de Pesca de México; cuatro agencias dentro del Departamento del Ambiente de los Estados Unidos; el Departamento de la Silvicultura de los Estados Unidos; los Departamentos de Pesca y Caza de los estados de California y Colorado; la Agencia de Protección del Ambiente; la Academia de Ciéncias de California; y la Junta para la Conservación de la Naturaleza; y ciudadanos privados.

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REPORTS FROM AREA COORDINATORS

DESERT FISHES COUNCIL

1980 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 1979.

Bonneville Cutthroat, Salmo clarki Utah

While all state and Federal agencies have become involved in the management of this species and its habitat, the overall condition and trend of populations and habitats are continued poor and declining.

At the request of the Desert Fishes Council and the Bonneville Chapter (American Fisheries Society in October 1979) and the U.S. Fish and Wildlife Service (FWS) initiated a status review of the species in the spring of 1980. As a result of the status review, the FWS has directed its Salt Lake City Area Office to prepare a proposal for listing the species officially. The proposal will probably be completed in the spring of 1981 with a recommended threatened status designation.

In the meantime, some positive accomplishments have occurred. The Utah Division of Wildlife Resources (DWR) Southern Region has cooperated with the Forest Service (FS) Fishlake National Forest in transplanting a second stream on the Forest. Pine Creek was eradicated and transplanted with about 150 Bonneville cutthroat from the Dixie National Forest's Water Canyon Creek population. The Fishlake National Forest and the BLM's Cedar City District have cooperated on improvements to aid the Birch Creek population. The FS has fenced 19 acres of riparian stream habitat while the BLM has maintained its 1/2 mile of stream fence and constructed about 50 single log plunge pool structures.

The DWR shocked its transplanted population (from Birch Creek) in San Stowe Creek on the Fishlake National Forest and has noticed some evidence of reproduction this year.

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[1] Present Address: Wildlife Management Staff, Forest Service, Intermountain Region, 324 25th Street, Ogden, UT 84401.

In fiscal year 1981, the FS plans to do a minimum of $20,000 stream habitat improvements and fencing work on the Fishlake, Dixie, and Humboldt National Forests for this sensitive species.

In the Deep Creek Mountains, Juab County, Utah, the DWR Central Region has taken some 500 eggs from the Trout Creek population and put them into Birch Creek using vibert boxes. This effort is still under evaluation, but both Creeks' transplants are still very shaky, survival-wise. Efforts to take some eggs, in the past, to the DWR Springville, Utah, hatchery met with failure as none survived. The DWR and the Uinta National Forests are exploring project alternatives for stream improvement and propogation reservoir siting.

The BLM acted on May 2, 1980, to extend protection to the 27,000-acre area of critical environmental concern in the Deep Creek Mountains which was due to expire on May 3, 1980, after a 3-year emergency withdrawal from mineral entry. The BLM has temporarily segregated from mining claims this area for another 2 years. However, the BLM is presently developing an interim management plan for the area in which they tentatively plan to manage the area under existing regulations and not the permanent withdrawal. If this plan is completed with no opposition and/or modification, the temporary segregation order will be lifted prior to its 2-year expiration term, and the area once again will be subject to demise from mineral exploration and mining claim activity. The 27,000-acre area encompasses the most significant quality aquatic habitats for the Bonneville cutthroat and the giant stonefly and should be completely protected by a continued permanent withdrawal. This would amount to only a small amount of the total mountain area and the total area under a current Wilderness study proposal.

The DWR completed its 3-year species inventory of the Deep Creek Mountain flora and fauna and their two volume report has been turned over to the BLM. The report is available to the public.

The Nevada Department of Wildlife (DOW), BLM, and FS are continuing joint efforts to inventory and manage streams for the Bonneville cutthroat.

Least Chub, Iotichthys phlegethontis

The DWR has completed its 3-year inventory contract in Utah's west-central desert area for the least chub. This report entitled "Studies on the Least Chub in Geothermal Active Areas of Western Utah," 1979, is available from the BLM or the DWR. It documents the only known existence of the least chub in Utah's desert areas, all of which could be eliminated if the MX missile project occurs in their areas.

The MX missile system is still a viable project in Utah and Nevada desert areas, and a watchful eye on missile siting locations is needed to assure any further elimination of desert spring pothole habitats. At present, the upper Snake Valley missile siting area proposal has been removed from siting consideration, which will help protect Utah's least chub areas.

The Wyoming Game and Fish Department, Idaho Department of Fish and Game, Wyoming BLM, and the FS (Caribou National Forest, Idaho, and Bridger-Teton National Forest, Wyoming) are continuing cooperative efforts for the Bonneville cutthroat in upper Bear River tributaries. Stream riparian fencing, plunge pool structures, and vegetative plantings are being planned on various stream segments in 1981.

The Utah DWR's proposed management plan for the Bonneville cutthroat is still not in a draft report stage after 2 years of commitment to do so. The lack of a cooperative interagency plan for this species in Utah has hindered all agency (state and Federal) initiatives to help in habitat and population recovery for this species. With a listing package by the FWS on the near horizon, it is certainly the time now for state and Federal agencies to cooperate in the development of this much needed management plan.

Lahontan Cutthroat, Salmo clarki henshawi

The FWS, DWR, and Utah BLM have cooperated to expand the Donner Creek population. Bettridge Creek, to the north, eradicated of hybrid populations in 1979, has had 15 fish introduced into it from the very limited Donner Creek population. The BLM has constructed about 25 single log plunge pool structures in Bettridge Creek to enhance the very limited pool quality for the fish. In 1981, the BLM will also fence about 1/2 mile of Bettridge Creek from livestock grazing impact.

The Utah BLM has acquired one section of land on Donner Creek in an exchange project with private landowners. The BLM land on Donner Creek now probably assures protection of the population from headwater spring and stream diversions, although legal actions for water rights could occur in the future. The DWR Northern Region, FWS, and BLM cooperated in trapping Donner Creek fish in the spring of 1980 for egg-taking operations. On May 23, 1980, a total of 12 fish, ranging between 70-169mm (most <117mm) were collected. About 200 eggs were transported immediately to Hotchkiss National Fish Hatchery near Delta, Colorado, for propagation. Some 50 percent of the eggs eyed out but quickly died.

Egg mortality has been attributed to shock and water temperature variances. More preliminary testing is needed to assure proper water temperatures from collection sites to propogation sites. The Fort Morgan, Colorado, Federal Disease Hatchery is performing an autopsy on the eggs, but no results are as yet known. Due to the low numbers of Donner Creek fish, future efforts to remove additional fish and/or handle eggs should be planned carefully by all agencies. The Donner and Bettridge Creek populations should receive high management priority by the DWR, BLM, and FWS.

The Nevada DOW and Nevada BLM (Elko District) did conduct inventories of upper Donner Creek in Nevada, under Pilot Peak, in 1980, but found no additional upstream populations. The steepness of the mountain has limited the population to only about 1 stream mile in Utah.

Other Studies

The USDI Water and Power Resources Service, Utah Division of Wildlife Resources, and Brigham Young University have completed field inventory investigations of Utah Lake. The studies centered around fisheries, water quality, and invertebrates in connection with management planning and impacts of the proposed Central Utah Project. The rare fish, June sucker, has been found in hybrid form only.

Summary and Recommendations

The Desert Fishes Council should continue to emphasize management protection for the Bonneville cutthroat, least chub, 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 prepared at the 1980 annual meeting should address the above three items for the Bonneville cutthroat, as well as for least chub protection from MX missile deployment and for recommending to all state and Federal agencies in the Bonneville basin to jointly, as applicable, cooperate in finalization of Bonneville cutthroat management plans for each respective state affected.

With the increase in MX missile deployment activities in Utah and Nevada, the needs for protection of the Bonneville cutthroat and least chub, and other Nevada nongame fish, I would 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 Great Basin desert can be seen, appreciated, and studied by the Council.

The Interbasin Area Report-1980

by

Thom Hardy

The Interbasin Area encompasses the area of internal drainage in Nevada. I also include in this report certain Colorado River tributaries in Nevada as well as the portion of the Death Valley tributaries. The native fish fauna is distributed within twenty-one (21) valleys and is represented by three (3) Families and eleven (11) Genera containing fourteen (14) species. There are over fifteen (15) described subspecies and several more recognized as distinct forms. Currently, the Nevada Department of Wildlife recognizes over five (5) species as sensitive and six (6) are listed as federally endangered. There are currently over ten (10) species of exotic fish that have been introduced into waters within the interbasin area. This report is intended to provide an introduction to the interbasin area. A list is presented giving the status of the native species. Specific information on each species and subspecies within their various habitats may be obtained by contacting the author at the addresses below.

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EL INFORME SOBRE EL AREA DE LA CUENCA. 1980

Por Thom Hardy

El "área de la cuenca" comprende el área de drenaje interno en Nevada. Incluyo tambien en este informe ciertos afluentes del río Colorado y la porción de afluentes del Valle de la Muerte correspondientes a Nevada.

La fauna de peces de esta area se haya distribuída en 21 valles y está representada por tres (3) familias y once (11) géneros que contienen catorce (14) especies. Hay más de quince (15) subespecies descritas y algunas más reconocidas como formas distintas. Actualmente, el Nevada Department of Wildlife reconoce como susceptibles de peligro a especies y 6 estan consideradas por el gobierno federal como especies en peligro. Hay actualmente más de 10 especies de peces exóticos que han sido introducidos en las aguas del área de la cuenca. Este informe intenta servir de introducción al área de la cuenca. Se presenta una lista dando el estatus de las especies nativas. Información mas específica sobre cada especie y subespecie dentro de sus hábitats se puede obtener contactando al autor en esta dirección:

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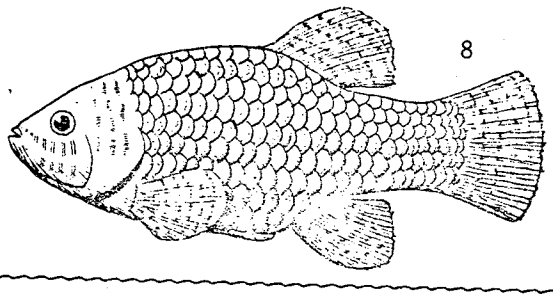
Desert Fishes Council



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

407 West Line Street
Bishop, California 93514

April 9, 1980

To: All Persons and Agencies Concerned

From: Chairman, Death Valley System Committee

Subject: Seventh Annual Meeting, Death Valley System Committee

Subject meeting was held at the National Park Service Auditorium, Furnace Creek, on February 22, 1980. A total of 24 were in attendance, the unusually low number reflecting recent travel budget cuts within federal agencies. A list of those in attendance is attached. The following items were discussed:

1. The Ash Meadows land acquisition dilemma: status of real estate development and implications of the Supreme Court Devils Hole decision. Steve McCormick of the Nature Conservancy is in contact with Preferred Equities (the major land developer) in an effort to negotiate a purchase of at least some of the land in Ash Meadows, and indications are that Indian Ranch might be a possibility in this respect. The current overall asking price for Preferred Equities' holdings is not known, but $3.2 million was the original price when the Nevada Department of Wildlife was first working with the Fish and Wildlife Service to acquire the land. A very recent development is that, in a letter to Beula Edmiston dated March 27, Senator Alan Cranston stated that the General Accounting Office has formally accepted responsibility for a Desert Pupfish study to provide a comprehensive analysis of actions the federal government might take to protect the desert fish resource. This project will be carried out by the GAO Los Angeles office and will begin on or about May 1.

2. The MX Missile System. There is little question that the greatest threat ever faced by the environment of the Great Basin, or of the entire nation, exists in the proposed MX Missile deployment system. The Council protested this proposal by means of a resolution passed at the November symposium and continues to stay informed on this matter. HDR Sciences Division is scheduled to begin its analysis of aquatic resource impacts very shortly, with initial reports due in July. Requests for assistance in site selection, etc., were made to a number of individuals within the Council, and response will be made directly to HDR. In recent weeks mounting protests have been noted in the news media, and hopefully the system will be rejected in favor of several superior alternatives when its many obvious flaws become apparent to the Congress. It is indeed ironic that while one segment of government is striving to acquire $3-4 million to protect a small portion of the Great Basin (Ash Meadows), another is attempting to achieve full funding for the MX Missile program which would essentially spend (as of this writing) over $60,000 million to wreak unprecedented environmental destruction there.

3. 1979 Resolutions review. The 17 resolutions passed by the Council during 1979 were briefly reviewed. Copies of individual resolutions are available from the Secretary by request.

4. Proceedings publication update. As of this writing (April 8) the 1978 Proceedings are in press, and the 1979 Proceedings draft is nearing completion. We hope to have the 1978 Proceedings in the mail during May and the 1979 Proceedings in the mail by mid-summer.

5. Discussion of delisting procedures. After some discussion of this matter, it was decided that the best applicable term is "complicated." Anyone wishing more detailed information in this respect should contact a representative of the Endangered Species Office.

6. Proposed 1980 symposium in Monterrey. Salvador has responded favorably to our suggestion that we meet in Monterrey for the regular symposium and suggested an early November date, which has been set tentatively as November 12-14, with a field trip to the Cuatro Ciénegas to follow immediately thereafter. Council members are encouraged to start their planning now so as not to miss this highly important event. Housing costs are reasonable in Monterrey, and the only real problem lies in transportation. We are investigating various alternatives in this respect and will send out an informational letter at an early date.

7. Status of Death Valley System recovery team formation. Don Sada reported that a more favorable attitude is being shown now by the Portland Office, U.S.F.W.S. Its eventual formation appears likely.

8. Proposed National Fisheries Recognition System, U.S.F.W.S. This system is proposed by the Assistant Secretary for Fish and Wildlife and Parks as a means of affording a degree of protection for our fishery resources without infringing on States' rights. The proposed system does not involve Federal ownership, but is one that identifies red flags, and encourages protection from adverse development. It is similar, in many respects, to the Natural Landmarks Program. A letter of support for the program is being drafted for Assistant Secretary Herbst.

9. Status of Death Valley System fishes.
(Prepared with the assistance of Thom Hardy's Inter-Basin Area Report, 1979).

   a. Pahrump killifish, Empetrichthys latos.

      Although the species no longer exists in its native habitat at Manse Spring, the transplanted Corn Creek population is maintaining about 2,500 individuals after peak reproduction. October, 1979 estimates at Shoshone Ponds also were in the range of 2,500 individuals. However, numbers are less important here than habitat vulnerability. The Corn Creek population is threatened by large numbers of bull frogs (Rana catesbeiana), and proposed MX Missile development near Shoshone Ponds threatens not only the killifish, but also the environmental integrity of the entire central Great Basin. The Pahrump killifish recovery team is making a strong effort to acquire Manse Spring and to reestablish the killifish therein.

b. Devils Hole pupfish, Cyprinodon diabolis.

The Devils Hole pupfish appears to be responding slowly to rising water levels and is maintaining winter populations of over 200 individuals. A total of 253 were counted on February 21. The population should remain above 200 during the next 30 days, then begin to rise. Proposed transplants into the Amargosa pupfish station are progressing, and plans are being laid to establish monthly monitoring there. The Hoover Dam population is currently about 60 fish.

c. Ash Meadows speckled dace, Rhinichthys osculus nevadensis.

The dace populations at Springdale and Beatty continue to survive in the intermittent portions of the Amargosa River, although population numbers fluctuate widely, and studies on these and other Death Valley System dace are continuing, to determine taxonomic differentiation. Dace also occur in several springs in Ash Meadows.

d. Ash Meadows pupfish, Cyprinodon nevadensis mionectes.

Comprehensive surveys and population estimates were conducted over the entire range of the subspecies in May 1979 and form the basis for this report. The subspecies is established in ten springs throughout the Ash Meadows area, although the various populations are threatened by a variety of exotics, primarily Gambusia and mollies. However, the subspecies does not appear to be imminently threatened, other than to share with the other Ash Meadows fishes the general long term problem of decreasing groundwater levels.

e. Warm Springs pupfish, (Cyprinodon nevadensis pectoralis).

Kenny Detweiler, of the Las Vegas BLM Office, reported a population of approximately 500 at School Spring, with an estimated 5,400 in all habitats; including Scruggs Springs. Rehabilitation of the Scruggs Springs habitats, primarily through the eradication of Gambusia, remains a high priority of the Warm Springs pupfish recovery team.

f. Owens chub, Gila bicolor snyderi.

A comprehensive study of the only known population of the subspecies, located below Long Valley (Crowley Lake) Dam, is currently being conducted by Dr. Tom Jenkins of the California Department of Fish and Game. Hopefully, we shall learn enough about the biology of the fish to devise a more concerted recovery program. Our current knowledge is minimal, and we do not even have a reasonable estimate of population numbers. This could easily be the most endangered fish in the Death Valley system.

g. Owens dace, Rhinichthys osculus subsp.

Small populations exist in the lower Bishop Creek drainage tributaries of the Owens River. We have noted no change during the past year. Inventories are conducted on a yearly basis.

h. Rhinichthys osculus subsp., Amargosa River near Beatty, Nevada; and Rhinichthys osculus subsp., Amargosa Gorge, below Tecopa.

Stable populations of both groups exist and are being studied to determine taxonomic differentiation, as described under item c. above.

i. Mohave chub, Gila bicolor mohavensis.

In general, the subspecies is doing well, especially so at Fort Soda, a B.L.M. facility which has been enlarged by 50 percent to serve as a refugium. It is also thriving at Lark Seep Lagoon at the China Lake Naval Weapons Center, where artificial shelters have been helpful in increasing the population. Populations also exist at the Barstow Way Station, at Barstow School District property at Hinckley, and at other, isolated locations.

j. Owens pupfish, Cyprinodon radiosus.

The Owens Valley Native Fish Sanctuary was enlarged during early 1980 to provide ideal pupfish habitat. Treatment to remove exotic fishes was completed on April 4, and restocking will occur during mid-April using fish from BLM Spring at Fish Slough and from the Warm Springs refugium near Big Pine. Plans call for the rehabilitation and expansion of the BLM Spring refugium during ear 1980. However, the future of the Owens pupfish and chub, and to a lesser exten the Owens dace, depends upon the habitat integrity within Fish Slough which continues to be clouded by the 202 acres of private land lying with the heart of the slough area. Preliminary negotiations are underway to effect an exchange, and assistance is being provided to BLM to make this a reality. Although many pitfalls yet exist relative to the exchange, we remain optimistic that it will be completed during 1980. Should this fail, our only alternative would be purchase or condemnation.

k. Tecopa pupfish, Cyprinodon nevadensis calidae.

Although the subspecies is probably extinct, we remain hopeful that it may be found in some isolated habitat near Tecopa. Future plans call for the collecti of breeding stock from a few selected springs for rearing of sufficient numbers to allow accurate taxonomic analysis. Geothermal prospecting in the Tecopa area adds to the jeopardy of the fish, should it still exist.

l. Cottonball Marsh pupfish, Cyprinodon milleri.

A recent check by Park Service personnel reveals that the species is in stable condition in its isolated location in Death Valley. The Cottonball Marsh portic of Death Valley is currently being managed as wilderness, increasing the safety of the species.

m. Saratoga Springs pupfish, Cyprinodon nevadensis nevadensis.

This population remains in stable condition. A potential problem of a talc mine in the area probably will not occur. Potential impacts from the opening of Fort Irwin will be carefully watched.

n. Amargosa pupfish, Cyprinodon nevadensis amargosae.

This subspecies remains in stable condition within the Amargosa River near and below Tecopa. In addition, another population exists within River Springs, Adobe Valley, Mono County, California, originating from an introduction made by Robert R. Miller on August 31, 1940.

o. Salt Creek pupfish, Cyprinodon salinus.

This species remains in stable condition. The interpretive facility at Salt Creek is considered to be highly successful.

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.

The desert pupfish remains highly endangered by reason of the usual habitat loss and introduction of exotic fishes. It is in the current listing plans for both State and Federal programs and should be taken soon to the California Fish and Game Commission for approval. The possible increase in jojoba bean culture in the area around the Salton Sea might reduce water demands.

10. Other items discussed.

a. Louis Courtois of California Fish and Game described the current radio telemetry studies in progress in Senator Wash Reservoir near Yuma, AZ in an effort to learn more about the behavior of the razorback sucker, Xyrauchen texanus.

b. Phil Pister outlined tentative plans for the use of recently acquired properties at Little Lake, Inyo County as a native fish refugium. Located in the Pleistocene outlet of Owens Lake, with abundant artesian water, Little Lake appears ideally suited for this purpose.

c. The California Desert Plan draft E.I.S. is now available for review and comment. Any member wishing to have his comments included in the Council's presentation should make them known to Phil Pister as soon as possible.

d. The next meeting of the Death Valley System Committee will be held at Furnace Creek in late February, 1981.

E. P. Pister, Chairman
Death Valley System Committee

ATTENDANCE LIST, DEATH VALLEY COMMITTEE MEETING, DESERT FISHES COUNCIL
FURNACE CREEK, FEBRUARY 22, 1980

NAME	AFFILIATION	ADDRESS
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Jerry Landye	Bio-Geo Southwest	3465 N. Jamison Blvd. Flagstaff, AZ 86001
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Don Sada	USFWS, Sacramento	2800 Cottage Way, W-2527 Sacramento, CA 95825
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Basin Report
Oregon Lakes

Neil B. Armantrout and Carl E. Bond

Desert Fishes Council
November, 1980

Studies have continued in southwest Idaho on the Redband trout and the Shoshone sculpin. The latter has been proposed for listing under the Endangered Species Act.

The Borax Lake Chub has received considerable attention. It was described by Drs. Jack Williams and Carl Bond as a separate species, Gila boraxobius. In January, the area around Borax Lake was proposed for leasing for geothermal development. As a result of the inadvertent early opening of the sealed bids, the offering was postponed until April. The lease offering was held in April, and the high bid by Anadarko accepted. Subsequently, an emergency listing as an endangered species by the Fish and Wildlife Service postponed the lease offering until completion of formal Section 7 consultation.

The Borax Lake Chub is also discussed extensively, along with other Gila, in the doctoral dissertation completed by Jack Williams. Other populations of Gila he discusses are doing well with the exception of the population in Serrano Spring. As a result of alterations in the spring, the habitat was seriously altered and the fish are doing very poorly, with only a limited population remaining on the last visit.

Two populations of introduced Lahontan cutthroat trout are doing well. The one in Mann Lake is being maintained through hatchery reproduction, and serves as a brood stock for other areas. In a sampling of fish in the Malheur River between Riverside and Juntura, trout made up 13% of the catch, 34% of these were Lahontan cutthroat. Of the rainbow, 17% were produced naturally; previously the rainbow were maintained only by plants. The rainbow fed mostly on caddis larvae, snails and freshwater shrimp, while the cutthroat were mostly using terrestrial insects (grasshoppers and beetles).

Crump Lake was sampled by the Oregon Department of Fish and Wildlife by trapnet. White and black crappie together comprised over half the catch, while brown bullheads made up 47% of the total. Both species of crappie were larger than last year as a result of the strong 1978 year class, and were 5-8 inches. Brown bullhead reached 7-9 inches. In Hart Lake, white and black crappie made up 78% of the catch with brown bullheads most of the rest. No Warner suckers were taken in either test.

Warner suckers were found in Deep Creek this summer. They have now been found in Snyder Creek, Honey Creek, Deep Creek, 12-mile Creek, 20-mile Creek and the slough below Hart Lake. Because of the interconnecting canals, the suckers are probably able to move between stream systems, and to reach some spawning areas. The sucker probably should be listed as a threatened rather than an endangered species.

BLM is implementing a Habitat Management Plan for the Foskett Spring Dace and the Warner Sucker. The dace project involves developing Dace Spring to the south, in the same basin, to duplicate the habitat in Foskett Spring. The area has already been fenced to exclude livestock. When ready, some dace from Foskett Spring will be introduced to try to establish a second population. With the Warner Sucker, several areas of sucker habitat will be fenced to exclude livestock. Some work may be done also on private land when the land owner is willing. Portions of 12-mile creek are available for exchange and will be acquired if funding can be obtained for the exchange processing.

Sonoran Desert Fishes-Mexico, Area Coordinator Report

John N. Rinne
Forestry Sciences Laboratory
Arizona State University Campus
Tempe, Arizona 85281

The coordinator wishes to captilize on the opportunity of this years meeting of the Desert Fishes Council to make a plea for fisheries contacts in the Sonoran Desert Region of Mexico. If anyone falls into this category or knows of another who could provide information annually on 1) any special problems in fisheries in Mexico, 2) status of rare or threatened species, 3) any item of business (resolutions, etc) to be brought before the Council at its annual meeting please see me at these meetings or write to the above address.

At last years meeting it was recorded that the report on the survey of the fishes of the Yaqui River would be published by the USFWS. It will instead appear as a monograph in the J. Arizona-Nevada Academy of Sciences in spring 1981. Contact Dean Hendrickson or Dr. W. I. Minckley regarding publication dates and reprint distribution.

The Tempe Wildlife Research Unit of the Rocky Mountain Station, has been given the charge to coordinate and cooperate more fully with agencies and individuals in Mexico on mutual fish and wildlife problems. One of these efforts involves publication within the next year of a general technical report including color photos on the native fishes of the Sonoran Desert region.

John N. Rinne
Forestry Sciences Laboratory
Arizona State University Campus
Tempe, Arizona 85281

El coordinador quiere aprovechar la oportunidad de la reunión de este año del Desert Fish Council para hacer un llamado de cooperación de los de la región del Desierto de Sonora de México. Cualquier persona que pueda dar información anualmente en cuanto a 1) los problemas de las pesqueras mexicanas, 2) el estado de especies raras o amenazadas, 3) o cualquier asunto que sea de interés para la reunión anual des este concilio, puede conmunicarse conmigo durante la reunión o escribirme a la dirección arriba.

Durante la reunión del año pasado nos informó que la investigación del estudio de las pesqueras del Río Yaquí sería publicada por el USFWS. En vez de ser publicada por el USFWS, aparecerá como un estudio monográfico en la Journal Arizona-Nevada Academy of Sciences durante la primavera de 1981. Comuníquese con el decano Hendrickson o con el Dr. W.I. Minckley para más información sobre la fecha de publicación y la distribucion de tiradas aparte.

La Tempe Wildlife Research Unit de la Rocky Mountain Station se encarga de cooperar completamente con las agencias e individuos de México en cuanto a los problemas comunes del pez y la fauna silvestre. Uno de los proyectos cooperativos trata de la publicación dentro del año que viene de una investigación técnica—con fotos a colores—del los peces nativos de la región del Desierto de Sonora.

LOWER COLORADO RIVER AREA COORDINATOR REPORT

Presented at the Twelfth Annual
Desert Fishes Council Symposium
Monterrey, N. L., Mexico
November 5-7, 1980

by

William E. Rinne
Water and Power Resources Service
Lower Colorado Region
Boulder City, Nevada

LOWER COLORADO RIVER AREA COORDINATOR REPORT

William E. Rinne
Water and Power Resources Service
Lower Colorado Region
Boulder City, Nevada

Research and review of status of several species of native fishes continues to receive emphasis in the lower Colorado area this year.

The status of the razorback sucker (Xyrauchen texanus) is of major concern in this area. The time limit to list the razorback as threatened on the Federal list expired on April 24, 1980. An Ad Hoc Committee of biologists with state, university, and Federal agencies recently began reviewing and updating the 1975 razorback management plan, developing a plan to insure the survival of this species in the immediate future, and considering the need for reproposing razorbacks for listing on the Federal list.

The first year of the cooperative study on razorbacks in Senator Wash Reservoir near Yuma, Arizona nears completion. This study is under the direction of the California Department of Fish and Game and significant data has been gathered on movements, spawning behavior, spawning requirements and population density of razorbacks in Senator Wash. The Water and Power Resources Service (Water and Power) is one of the participating agencies. Some work is planned for the mainstream of the Colorado River this year.

Water and Power, Boulder City, Nevada is in the process of negotiating procurement of a 2½-year study on the razorback sucker and the bonytail chub (Gila elegans) in Lake Mohave, Nevada/Arizona. This study will be designed to determine: the present status, biology and distribution of these fish in Lake Mohave, Nevada/Arizona; and the effect of construction and operation of proposed Water and Power projects in this area.

The bonytail chub (Gila Elegans) was listed as endangered (May 23, 1980). Recent surveys indicate that it is presently found only in Lake Mohave (Federal Register, Vol. 45, No. 80, April 23, 1980). Intensive sampling was conducted in Lake Mohave in the spring of this year in an attempt to collect brood stock for artificial propagation studies at Willow Beach Fish Hatchery. A total of 5 bonytails, all females, were captured and transported to Willow Beach, Arizona. Water and Power, Boulder City, is preparing to contract a study to further investigate the biology and status of bonytails in Lake Mohave. This study may be initiated as early as February 1981.

Spring and fall surveys of woundfin (Plagopterus argentissumus) have been completed by the members of the Recovery Team in the

Virgin River. The spring survey demonstrated a low adult population in the upper Virgin River. The fall survey demonstrated excellent reproduction throughout the river. A study funded by the Bureau of Land Management and conducted by the Fish and Wildlife Service and Environmental Consultants was completed this summer. This study used the Instream Flow Methodology to develop flow requirements for woundfin in the Virgin River during different seasons of the year. The recovery team is presently considering the potential for reintroduction of this species in areas of its historical range. Dr. James E. Deacon, Professor of Biology, University of Nevada, Las Vegas, will give a paper on the effects of low flows on woundfin later in this symposium.

Research by the Fish and Wildlife Service continues on the endangered humpback chub (Gila cypha) in the Little Colorado River. Funding for this study has been provided by the upper and lower regions of Water and Power and by the Fish and Wildlife Service. This effort is part of a study under direction of the Fish and Wildlife Service in the upper Colorado River basin.

The desert pupfish (Cyprinodon macularius) was listed as endangered by the state of California in July of this year. A contract has recently been awarded by the California Department of Fish and Game to complete electrophoretic work on selected populations of pupfish presently recognized as C. macularius. Work is progressing on preparing a listing package for proposing the desert pupfish as endangered on the Federal list. Observations of the desert pupfish in the Santa Clara Slough, Sonora Mexico during Clapper Rail Surveys this spring suggest that this population remains stable. Several exotics (e.g. Tilapia sp, Poecilia latipinna) are firmly established in the slough. Desert pupfish were also observed in the El Doctor Seep during these surveys.

Water and Power biologists completed a population census in October on the Devil's Hole pupfish (Cyprinodon diabolis) in the Hoover Dam Refugium. The last census was completed by biologists from the University of Nevada, Las Vegas in October of 1979. Results of this years census indicate that the population is up. Estimates of the total population were 80. This is the highest population level recorded during a census since 1974. The male to female ratio was 1.6:1.

Surveys by the Arizona Game and Fish Department and reports from anglers indicate that Machete (Elops affinis) are quite common in the Colorado River in an area above Morelos Dam near Yuma, Arizona. It appears that the increased flows because of water from the Gila River has allowed Machete to migrate from the Gulf of California.

Reporte del Coordinador de la Regiòn Lower Colorado River

Presentado en el Duodècimo
Desert Fishes Council Cologuio
Monterrey, N. L., Mexico
November 5-7, 1980

por

William E. Rinne
Water and Power Resources Service
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Lower Colorado River
Reporte del Coordinador de la Regiòn

William E. Rinne
Water and Power Resources Service
Boulder City, Nevada 89005

Investigaciòn y reviso del estado de varias especies de pezes nativos sigue recibiendo énfasis en la region del bajo Rio Colorado este año.

El estado del razorback sucker (Xyrauchen texanus) es de mayor preocupaciòn en esta region. La fecha para registrar el razorback en la lista Federal de "amenazco con extincion" se vencio el 24 de abril, 1980. Un Ad Hoc Comitè de biòlogos empleados de agencias de estados, el govierno Federal, y universidades recientemente empesaron a revisar y fechar el plan de manejo de 1975 de los razorback, desarrollondo un plan para asegurar la salvaciòn de esta especie en el futuro immediato, y consiliderar la necesidad de proponer otra vez registrar el razorback en la lista Federal.

El primer año de la investigaciòn cooperativa del razorback en el reservorio Senator Wash cerca de Yuma, Arizona està casi completo. Esta investigaciòn està bajo la direcsiòn del Departamento de Fish and Game del estado de California y gran contida de datos sobre el movimiento, comportamiento en reproducir, necesidades para reproducir y populaciòn del razorback en el Senator Wash se han consegido. Otra agencia que participa en esta investigaciòn es Water and Power Resources Service (antes Bureau of Reclamation). Algunas investigaciones en la coriente principal del Rio Colorado estàn propuestas para este año.

Water and Power Resources Service, Boulder City, Nevada està en el proceso de negociar un contracto de 2 años y medio para investigar el razorback sucker y el bonytail chub (Gila elegans) en Lake Mohave, Nevada, Arizona. Esta investigaciòn sera desiñada para determinar: el presente estado, biològio y distribuciòn de estos pezes en Lake Mohave, Nevada, Arizona; el effecto de construciòn y operaciòn de projectos propuestos por Water and Power en esta regiòn.

El bonytail chub (Gila elegans) fue registrado como "en peligro de extinciòn" (23 mayo, 1980). Reciente investigaciones indican que presentemente este pez se encuentran solamente en Lake Mohave (Federal Register, Vol. 45, No. 80, 23 abril, 1980). Intensas muestras fueron tomadas en Lake Mohave en la primavera del año presente con la intenciòn de collectar polladas para estudiar la propagaciòn artificial en el Willow Beach Fish Hatchery. Cinco bonytails, todas embras, fueron capturadas y llevadas a Willow Beach. Water and Power, Boulder City, està preparando un contracto para investigar la biologia y estado del bonytail en Lake Mohave. Esta investigaciòn se iniciara tan proximo como en febrero 1981.

Estudios, hechos en la primavera y el otoño, del woundfish (Plagopterus argentissumus) fueron terminados por miembros del Recovery Team en el

Virgin River. Los estudios hechos en la primavera demonstraron una población baja de adultos de estos pezes en la alta parte del Virgin River. Los estudios hechos en el otoño demostraron una reproduciòn excelent sobre todo el rio. Una investigaciòn fondada por Bureau of Land Management y llevada a cabo por Fish and Wildlife Service y Environmental Consultants fue terminada en este verano. En esta investigaciòn se hiso uso del Instream Flow Methodology para desarrollar requerimientos para el woundfin en el Virgin River durante las estaciones del año. El recovery team està presentemente considerando la potencial de reintroducir esta especie en regiones de su històrico pasado. Dr. James E. Deacon presentarà un discurso de los effectos de corrientes bajas en el woundfin mas tarde en este coloquio.

Estudios por Fish and Wildlife Service continuan tocante a el amenazado humpback chub (Gila cypha) en el Little Colorado River. Fundos para esta investigaciòn fueron proveidos por Water and Power y Fish and Wildlife Service. Este esfuerzo forma parte de la investigaciòn bajo la dirreciòn de Fish and Wildlife Service en la alta region en la cuenca del Colorado River.

El desert pupfish (Cyprinod macularius) fue registrado como amenazado en el estado de California en julio de este año. Un contrato recientemente ejecutado por California Department of Fish and Game para completar estudios electrofòresis en populaciones selectadas de pupfish presentemente reconocidas como C. maculanus. El trabajo progresa en preparando una lista proponiendo el desert pupfish como amenazado en la lista federal. Observaciones del desert pupfish en Santa Clara Slough, Sonora, Mexico durante estudios del Clapper Rail esta primavera indican que esta populaciòn esta establecida. Varias exòticas (e.g. Tilapia sp) estàn firmemente establecidas en el lodazal. Desert pupfish tambien fueron observados en El Doctor Seep durante estos estudios.

Water and Power biòlogos finalizaron un censo de populaciòn en octubre, del devil's hole pupfish (Cyprinodon diabolis) en el Hoover Dam Refugium. El último censo hecho por biologos del University of Nevada, Las Vegas fue en octubre 1979. Resultados del censo de este año indican que esta populaciòn es la mas grande desde 1974. La proporcion de hembras a machos es 1.6.1.

Estudios por Arizona Game and Fish Department y reportes de pescadores indican que Machete (Elops affinis) son muy comùn en el Colorado River en la regiòn ariba de Morelos Dam cerca de Yuma, Arizona. Parece que el aumento de corriente por las aguas del Gila River permiten que Machetes se emigre del Gulfo de California.

RESEARCH PAPERS AND ABSTRACTS (alphabetically, by author)

Whitehorse Cutthroat Trout

Neil B. Armantrout
Michael Crouse

Abstract

The Whitehorse trout is an undescribed subspecies of cutthroat trout (Salmo clarki Richardson) related to the Snake River cutthroat, native to the Whitehorse Basin of SE Oregon. Limited access has helped preserve the species from extinction through hybridization. The Bureau of Land Management, with close cooperation of the Oregon Department of Fish and Wildlife and the Whitehorse Ranch, is implementing a habitat management plan to protect the habitat of the trout. The trout has been successfully introduced into the adjoining Alvord Basin.

Introduction

The Whitehorse Basin is a small, enclosed basin in Malheur and Harney Counties of SE Oregon. It contains only one native fish species, a unique form of cutthroat trout (Salmo clarki ssp.) endemic to the basin. Habitat is limited to 40 miles of stream in three stream systems, Willow Creek, Antelope Creek and Whitehorse Creek with its major tributaries, Little Whitehorse, Fifteenmile, Cottonwood and Doolittle Creeks.

These streams are typical coldwater habitat, originating on the upper slopes of the north face of the Trout Creek Mountains. The slope of the mountain begins moderately steep, then becomes gradually less steep, blending into the floor of the Whitehorse Basin. At the bottom of the basin is Coyote Lake, a large, flat, shallow playa. Elevations range from 2700 meters at the top of Trout Creek Mountains to 1250 meters at the valley floor. As they flow down the slopes, the streams cut narrow canyons into the slopes, gradually opening up on the lower slopes. Once onto the valley floor, the streams meander in shallow washes until being lost. Most of the water is diverted from the streams at the edge of the valley floor to irrigate the fields of the Whitehorse Ranch.

The cutthroat trout are found primarily in the canyons and the streams on the upper slopes. Warm summer temperatures and dessication restrict its use of the lower portions of the stream, while ice and snow make the upper headwaters unusable in winter. Removal of vegetation and increased siltation have caused a decline in the available habitat and have made the streams more susceptible to damage from the periodic droughts and floods. These trout, like many of the isolated desert trout populations in the western U. S., show a remarkable resistance to poor habitat conditions.

No historical population estimates are available, so no population trends can be given, although statements from long-term residents suggest the range

and numbers have declined as the habitat quality has diminished. The fish have escaped the threat of extinction through hybridization, a process that led to the extinction of the neighboring Trout Creek cutthroat, largely due to the protection provided by the Whitehorse Ranch and the policies of the Oregon Department of Fish and Wildlife.

Systematic Relationships

Previous discussions of the Whitehorse trout have combined them with the Alvord trout in the neighboring basin. The two are distinct and separate. Dr. Robert J. Behnke (1979) suggests the two populations, the Alvord trout and the Whitehorse trout, shared a common origin from the Lahontan Basin, with the Whitehorse trout possibly entering from the Alvord Basin via stream headwater capture. Other routes of invasion were also open to trout from adjoining basins.

The Trout Creek Mountains are not very large, but are strategically located. Streams arising on these mountains flow into three separate basins. Those originating on the northern slopes flow into the enclosed Whitehorse Basin. Trout Creek and Cottonwood Creek, both arising on the western slopes, flow into the enclosed Alvord Basin. The third group of streams, including McDermitt, Oregon Canyon and Kings River Creeks, arise on the eastern and southern slopes and flow into the Quinn River and Humboldt River, part of the Lahontan Basin.

Streams in each of these basins at one time contained unique subspecies of cutthroat trout. As mentioned previously, the Trout Creek subspecies, in the Alvord Basin, was lost to hybridization with rainbow trout. A similar fate befell the Lahontan cutthroat trout that once occupied the McDermitt, Oregon Canyon and Kings River drainages. Of the three, only the Whitehorse subspecies still remains.

Transfer of cutthroat trout into the Whitehorse Basin may have occurred from either the Trout Creek or Lahontan Basin streams through headwater transfer. Of the two, the headwaters of the Lahontan Basin are the more closely associated with the Whitehorse drainage. On the lower slopes, the heads of washes of the Antelope Creek in the Whitehorse Drainage are closely associated with the heads of washes in the Oregon Canyon Creek drainage, offering another possible route of transfer. No similar option is present between the Alvord and Whitehorse Basins; while they are separated by a relatively low divide, there is no indication of past connections.

While discussions on the origin of the Whitehorse trout center on routes from the Lahontan or Alvord Basins, the current drainage patterns suggest a third, possibly more likely route. Coyote Lake, at the floor of the Whitehorse Basin, is enclosed by only a very low divide to the east. An increase in water level of only 20-30 meters would cause an outflow to the east into a series of washes that are part of the Crooked Creek system. In general, the pattern of flow out of the basin is to the east. Crooked Creek is part of the Owyhee River system, in the Snake River Basin.

The Whitehorse, Alvord and Lahontan cutthroat trout all probably arose from a common stock. Current speculation suggests the Alvord and Whitehorse populations

came from the Lahontan Basin cutthroat, which was, in turn, derived from the Snake River cutthroat. Based on the patterns of flow in the Whitehorse Basin, it is possible to suggest that the movements were in the opposite direction, with the Snake Valley cutthroat first entering the Whitehorse Basin and from there moving into the Lahontan Basin and the Alvord Basin. Or, the Lahontan and Alvord trouts may have had a separate origin from the Whitehorse trout, the former being associated with Gila, absent from the Whitehorse Basin. Elsewhere in the Owyhee drainage, Redband trout have replaced the cutthroat; any movements into the Whitehorse Basin would have had to precede the colonization of the Redband trout.

Habitat Management

Settlements began in southeastern Oregon in the mid-1800s. A military fort was built at nearby Ft. McDermitt. Other settlements and ranches were built during the latter part of the 1800s, with livestock grazing the principal activity. Extensive mineral exploration and some mining occurred. Beginning during this period grazing activities were initiated within the Whitehorse Basin, activities that continue until the present. The Whitehorse Ranch, located on the lower slopes of Whitehorse and Willow Creeks, is the principal livestock operation in the basin today.

Interest in mining has recently increased as a result of the discovery of uranium to the south and east, near McDermitt. Exploration has extended into the upper Whitehorse Basin, but to date no activity has been initiated for production or mining.

In 1971, BLM, in cooperation with the Oregon Department of Fish and Wildlife (ODFW) and the Whitehorse Ranch, initiated a Habitat Management Plan (HMP) for the Whitehorse trout. Two problems were identified. The principal problem was extensive removal of vegetation by livestock, resulting in increased erosion and siltation. The second problem was excessive beaver activity that removed most of the willow and aspen. Livestock grazed off young shoots and resprouts preventing regrowth of the woody species. Beaver dams did create good pool areas but these were often quickly silted in by erosion.

To improve riparian vegetation along seven miles of stream, approximately 40,000 willow cuttings were planted. Forty-nine trash catcher dams were built to create pool habitat for trout. Rim and gap fences were built to exclude access by cattle along several miles of Whitehorse and Little Whitehorse Creeks. Trout were also transplanted into other stream sections and tributaries above natural barriers and into Antelope Creek. Work was completed in 1973.

An aerial inspection was made in the spring of 1980 to assess the situation with the habitat improvements. Although willow plantings are reported to have a take rate over 75% after one year, those planted in 1973 were nearly gone, either replaced by other vegetation or removed by continued livestock use. Sixty percent of the trash catchers were lost in 1976 due to flooding. By 1980, most of the trash catchers that survived the 1976 flood still remained in place, but less than half were functioning to produce trout habitat, a result of erosion around the ends or heavy siltation. Vegetation improvement was good inside the exclosures. Beavers still remained a problem, particularly in Little Whitehorse Creek.

Transplants into Antelope Creek were successful, although it is also possible some fish were already present. Of the transplants above barriers, some took and some didn't. Low flows during the recent drought contributed to loss of habitat in marginal areas. Recently, ODFW also initiated a transfer of Whitehorse trout into the Alvord Basin where they have been introduced into several streams. Populations have become established in Van Horn and Mosquito Creeks.

In 1980, the Vale District revised and updated the HMP for the Whitehorse trout. Some additional fencing, covering about 8 miles, was completed. Future work will include additional fencing. Habitat improvement, using primarily native materials because of wilderness constraints, will be built to reduce erosion and create pool area. Additional measures such as control of beaver populations and protection during mineral activity will be developed.

A land exchange is currently underway that would give BLM management responsibility for near 36 miles of the available habitat, including much of lower Willow Creek. The HMP includes provisions for habitat work in these exchange areas. If the exchange is finalized, the Whitehorse Ranch proposes to build a reservoir on Whitehorse Creek to provide irrigation water. Upstream barriers will be built in Whitehorse Creek to prevent upstream contamination should rainbow or other trout be introduced into the reservoir. Spawning area for reservoir fish will be provided. It will be interesting to see the response of Whitehorse trout in a reservoir, since many other isolated populations of western trouts, when introduced into caves and reservoirs, achieved weights of several kilograms.

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Proposed Methodology for Determining Road Construction and Population Center Growth Impacts and their Significance on Desert Fishes and Aquatic Invertebrates

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Abstract

In the sparsely populated, arid southwest U.S., the potential for impact upon desert fishes and aquatic invertebrates from a large dispersed project involving linear road construction and population growth centers is great. A proposed procedure for predicting and interpreting such impact levels is presented, along with possible mitigations to alleviate those impacts. Locations of protected and recommended protected aquatic biota are compared to known habitat requirements and physical processes resulting from project construction and operation. Critical input into developing this methodology is requested.

Introduction

A large, dispersed project constructed in the water-limited southwest U.S. may impinge upon habitats of endemic and sometimes rare fishes and invertebrates. Their habitats will be subject to project related impacts, both direct and indirect, not only during construction, but also operation. The primary method for estimating direct impact of the project upon this resource is to overlay project structures on a map with known locations of the resource. Impacts will then be extrapolated from known processes, including erosion, surface and groundwater transport and habitat requirements of species of concern. With the exception of groundwater withdrawal impacts, a critical radius of direct impact on aquatic habitats by a project feature has been established at 1-5 mi. The significance of such impacts is a value judgement determined by considering the following questions regarding the magnitude of the impact: what is the effect of the disturbance on the viability of the resource; to what extent will the effect be masked by normal variation expressed by the resource; how rapidly will the resource recover from the disturbance if it is temporary; what is the scientific or intrinsic value of the resource; to what extent is the resource limited by the impacts threatening its carrying capacity, by a process which has already been set in motion for some historic period of time; are the consequences such that the ecosystem will not recover at all; are the consequences such that the impact may be large but the recovery process will overcome the damage in a reasonable period of time; are the deleterious effects measurable; and, to what extent will funding be required to mitigate the effects on the resource? Impact and significance assessment at this time cannot be statistically quantified because of a present scarcity of site-specific information on baseline conditions and fluctuations of sensitive populations, in situ field observations of potential impact scenarios, and hydrological information detailing potential for water table drawdown of nearby and distant springs as a result of heavy groundwater withdrawal. It is expected that a more definitive assessment of impacts will be conducted as more site-specific field information is gathered. It is possible, however, to estimate the potential for impact of the proposed action and its alternatives through careful intuitive analysis of the present knowledge of existing conditions.

Proposed Methodology for Impact Analysis of a Project Alternative

The distribution and status of federally and state protected aquatic species for Nevada and Utah is shown on Figure 1. On this figure can be overlain the proposed configuration of Alternative 1. Construction and operation of a large, dispersed project in the Great Basin desert may impact this resource directly through: 1) habitat disturbance, 2)

altered rainfall runoff patterns, 3) addition of pollutants, and 4) groundwater withdrawal. The last is most difficult to assess, yet most likely to cause adverse impacts. Indirect impacts relate to recreation of people drawn to the area as a result of the project. Recreational activities of concern include fishing, camping, swimming and use of off-road vehicles. The introduction of exotic aquatic species may occur, also. Basically, it is construction of the various projects features and the off-hours activities of the people associated with the construction and operation of the project that cause the major potential impacts.

Fishing pressure, enhanced by project-related personnel (e.g., from nearby construction camps and population growth centers) may require mitigation to prevent significant losses (Walstrom, 1973). Populations of the federally protected Lahontan cutthroat trout in the upper Reese River Valley and the state protected Utah cutthroat trout in the Spring and Deep Creek Mountains are of primary concern. Special fishing restrictions such as reduced access or catch may be required to mitigate potential impacts for these areas.

Direct effects from project structures may originate within 1 - 5 mi of aquatic habitats containing imperilled species. These include habitat disturbance, altered rainfall runoff patterns, and addition of pollutants (Pister, 1974; Deacon et al., 1979; Minckley and Deacon, 1968). Potential mitigations include habitat avoidance (by design), erosion control (e.g., revegetation), wastewater effluent removal and petrochemical spill prevention, containment and clean-up.

Although groundwater withdrawal impacts cannot be easily quantified at this stage, the prospects for impact can be estimated based on known hydrological conditions and expected project requirements. The effects of groundwater withdrawal may occur in valleys distant as well as nearby the withdrawal site, and the impacts may occur much later during the development of the project rather than when the water withdrawal initially takes place (Fiero and Maxey, 1970; Bateman et al., 1974., Dudley and Larson, 1976). The latter depends upon various hydrological features, such as substrate transmissivity, slope and fault structure (Eakin, 1966). Thus, the effects of water withdrawal on springs in certain valleys will probably occur on the order of months or years after the initiation of the action. The magnitude of the effect is not calculable at this time, but hydrological models are presently being developed to answer this and other related questions. It is expected, however, that the potential for significant loss of downslope aquatic habitat is especially likely in certain locations. Although the magnitude of this effect may be large, its duration is not expected to exceed the duration of the action causing the depletion of groundwater. Since the habitat requirements for the species of concern are incompletely known at this time, the magnitude of the biological impact is not presently discernible. This would be the case even if site-specific water quantity reductions were known.

Endangerment of existing federally protected species appears to have resulted, in some instances, from stresses such as water diversion for irrigation purposes or indiscriminant use of the water source for livestock. For instance, in the Ash Spring outflow in Pahranagat Valley, the federally protected Pahranagat roundtail chub has dwindled to less than 45 adults. This has probably resulted primarily from loss of spawning and feeding habitat related to periodic reductions in water level by approximately 50 percent for irrigation purposes. Irrigation diversion may have also caused extirpation of the White River spinedace from Preston Big Spring in White River Valley and the virtual loss of the White River desert sucker from the same habitat. The condition of these fish populations was discovered by field surveys conducted during the late summer of 1980 (Hardy, 1980; Deacon et al., 1980). It can not be determined at this time how the project would change the population levels of individual species of the resource, since baseline

conditions including seasonal fluctuations, are presently not well known. The few data that are available, indicate that population numbers remain fairly constant in some habitats, but fluctuate widely in others (Deacon et al., 1980; Holden and Crist, 1980); apparently a case-by-case evaluation of baseline conditions and potential project impacts will be required to answer these questions.

It is obvious that if an aquatic habitat is even temporarily desiccated, recovery will not be possible for some species such as fish. On the other hand, a catastrophic reduction in population numbers as a result of habitat loss or degradation does not necessarily spell extinction if the nuclear population is not reduced below a certain minimum level and density dependent compensation is allowed to proceed unhindered along its course of rebuilding population structure and optimum density for the carrying capacity of each unique habitat (Ricker, 1977; Everhart et al., 1975, pp. 165-178). Most aquatic species of concern produce at least one new generation per year (Deacon et al., 1979) and thus recovery would be fairly rapid if the impact were sufficiently mitigated and subsequent conditions permitted.

Complete avoidance of groundwater withdrawal impacts upon sensitive aquatic habitats is not possible since the vagaries of groundwater movement are not presently well understood. The most promising potential mitigation for the effects of groundwater withdrawal upon sensitive aquatic habitats would be to change well pumping rates and locations as soon as effects are noted on target aquatic habitats (Dudley and Larsen, 1976). However, since the natural groundwater flow recovery may be slow as the result of delayed movement of water through the aquifer, additional potential mitigations may be desirable. This may involve supplementing water supply in affected aquatic habitat by piping in additional supplies from distant wells. Such actions however, may complicate the groundwater drawdown picture in the area and actually potentiate negative impacts on the habitat of concern. In this case, the only remaining potential mitigation would be temporary transplantation of the affected population to another aquatic habitat unaffected by the project. This procedure would be difficult because of the variable water quality and habitat conditions between isolated aquatic habitats near and distant from the affected aquatic habitat (Deacon et al., 1979). The USFWS discourages transplantation (Rose and Jacobson, 1980); it should be used only as a last resort to prevent extinction.

Loss of the last remaining individuals of a unique and imperilled aquatic species, because of their intrinsic scientific value, would be highly significant. Once the genotype is lost, it cannot be recreated through hybridization or other short-term experimental manipulations. Each unique species required tens of thousands of years to attain its individual characteristics (Hubbs and Miller, 1948; Deevy, in Berwick, 1966). Although most are not of commercial or sport fishing value, threatened or endangered aquatic species provide living evidence for evolutionary processes and clues to the geo-hydrological history of the area (Hubbs, Miller and Hubbs, 1974). Extinctions of threatened or endangered aquatic species should be prevented in order to maintain the ecological diversity of the environment and to help man understand the adaptive capabilities and limitations of isolated populations (Pister, 1974; Williams and Finnley, 1977).

Details of Methodology (Appendix)

Impacts to sensitive aquatic habitats are divided into direct and indirect, consisting of short-term (during construction) and long-term (during operation) time periods. Direct impact levels are calculated by averaging values for the following: index of abundance and status; percent habitat loss from groundwater withdrawal; and, percent habitat loss from direct impact (Step 1). All values range from 1 - 5, with low values indicating low abundance/status or impact and high values, high abundance/status or significant impact. The index of abundance and status is determined for each valley (hydrologic subunit or watershed) by rating both legal status and number of occurrences of aquatic species: a low (1) index value means that no listed species and no more than one recommended protected species occurs in the valley; a moderate (3) level was assigned if 1 listed species and 2

recommended listed species occur therein; and a high (5) value can be assigned only if 2 or more federally and/or state protected, or 3 recommended protected species reside in the valley (Step 2). Percent loss of habitat from groundwater withdrawal is estimated by determining the per cent of the ratio of project and nonproject water use to perennial yield plus any losses from interbasin transfer resulting from distant project water use (Step 3). Ten per cent loss (1) is low and 40% (4) is considered high. Potential per cent habitat loss from direct effects in calculated by dividing total number of sensitive aquatic habitats in a valley into the number approached within 1 - 5 mi by linear road construction (Step 4). Again, ten percent loss (1) is low, whereas 50% (5) is high.

Indirect impacts result from population center growth (e.g. support communities and construction camps) involving persons either directly or indirectly employed by the project, or anticipating such employment. Indirect impacts are calculated by averaging the index of abundance/status of aquatic species in each valley with the index of combined indirect effects (Table 5). The combined indirect effects index is calculated based upon population of each growth center, distances from habitats and their "appeal". Highly attractive recreational areas situated fairly near large population growth centers will probably draw large numbers of people. Conversely, distant and unappealing locations will probably be ignored. Appeal of a habitat will be largely independent of the legal status or abundance of an imperilled species occuring therein. Details of this analysis are presented in Reed (In Press).

Acknowledgements

Several persons provided assistance in the preparation of this material. Dr. Ken Reed formulated the approach to analysis of indirect effects, whereas Drs. Rosemary Thompson, Thomas Mulroy and Mssrs. Robert Dague, Robert Van Tassel and David Vomacka extensively reviewed the manuscript. This study has been funded by the U.S. Air Force and many of its staff have provided considerable time and effort, both directly and indirectly, to its development. My wife, Barbara, played no small part in encouraging this work. Thanks go finally to her.

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Appendix: Details of Methodology

Step 1: Formula for calculation of direct impacts from linear road construction.

$$\text{DIRECT IMPACTS} = \frac{\text{INDEX OF ABUNDANCE} \quad \text{\% HABITAT LOSS FROM GROUNDWATER WITHDRAWAL} \quad \text{\% HABITAT LOSS FROM DIRECT IMPACT}}{3}$$

1 - 2.5 = LOW IMPACT
2.6 - 3.7 = MODERATE IMPACT
3.8 - 5.0 = SIGNIFICANT IMPACT

Step 2: Criteria for assignment of index of abundance and status of protected and recommended protected aquatic species to hydrologic subunits.

INDEX OF ABUNDANCE AND STATUS

HIGH(5) = 2 FEDERAL AND/OR STATE PROTECTED SPECIES
OR, 3 RECOMMENDED PROTECTED SPECIES

MODERATE (3) = 1 LISTED SPECIES OR 2 RECOMMENDED PROTECTED SPECIES

LOW(1) = NO LISTED SPECIES AND NO MORE THAN ONE RECOMMENDED PROTECTED SPECIES

Step 3: Formula for calculation of per cent habitat loss from groundwater withdrawal in hydrologic subunits

$$\text{\% HABITAT LOSS FROM GROUNDWATER WITHDRAWAL} = \left(\frac{\text{MOST PROBABLE QUANTITY}}{\text{PERENNIAL YIELD}} + \frac{\text{NON-PROJECT FUTURE USE}}{\text{PERENNIAL YIELD}} + \frac{\text{INTERBASIN TRANSFER LOSS}}{\text{INTERBASIN TRANSFER}} \right) \times 100$$

10% = 1
20% = 2
30% = 3
40% = 4

Step 4: Formula for calculation of percent habitat loss from direct impact in hydrologic subunits.

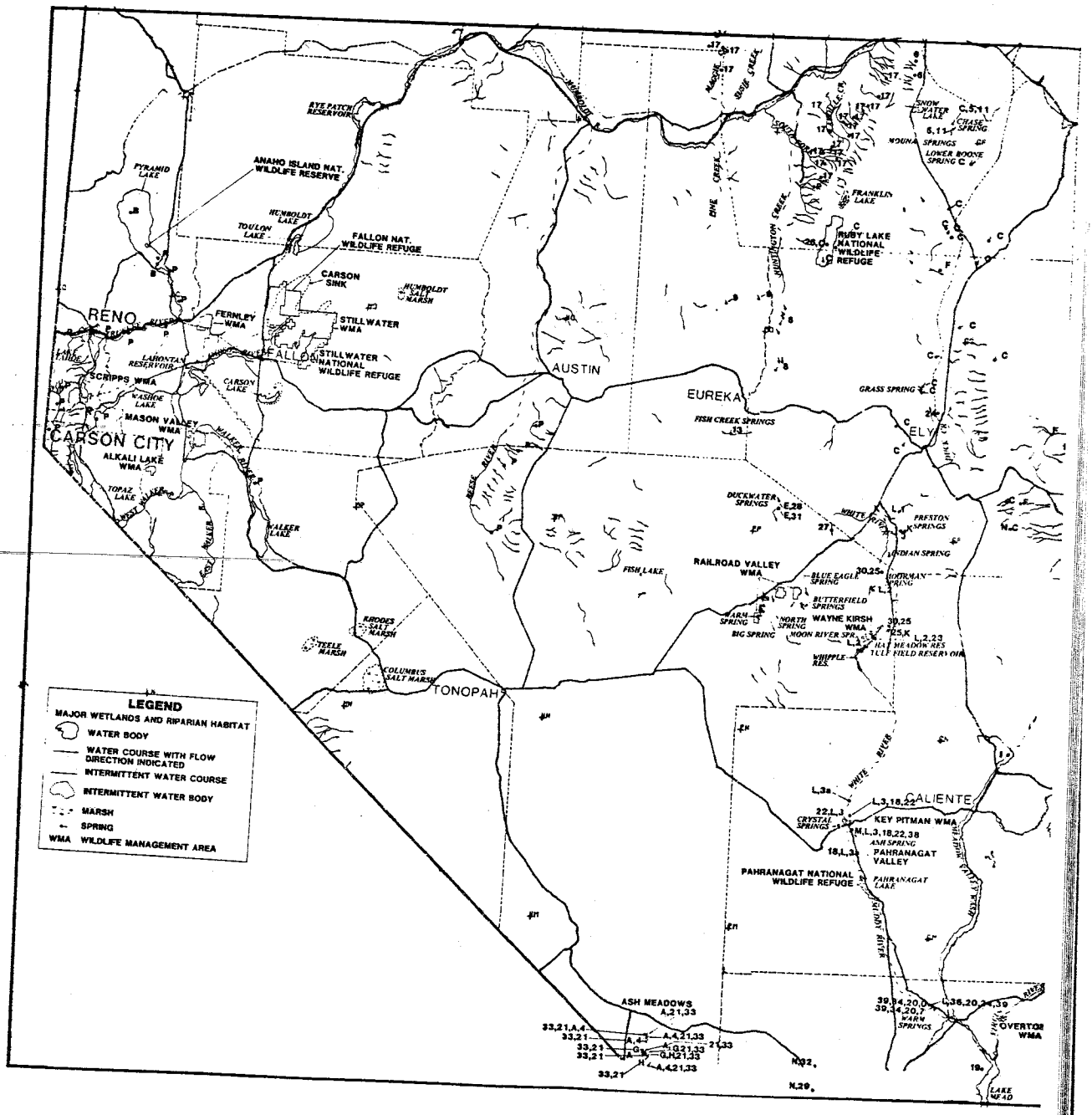
$$\text{\% HABITAT LOSS FROM DIRECT IMPACT} = \frac{\text{NO. HABITATS APPROACHED WITHIN 1-5 MI}}{\text{NO. HABITATS}} \times 100$$

10% = 1
30% = 3
50% = 5

Step 5: Formula for calculation of indirect impacts from population center growth.

$$\text{INDIRECT IMPACTS} = \frac{\text{INDEX OF ABUNDANCE AND STATUS} + \text{COMBINED AVERAGE INDIRECT EFFECTS INDEX}}{2}$$

List of Figures



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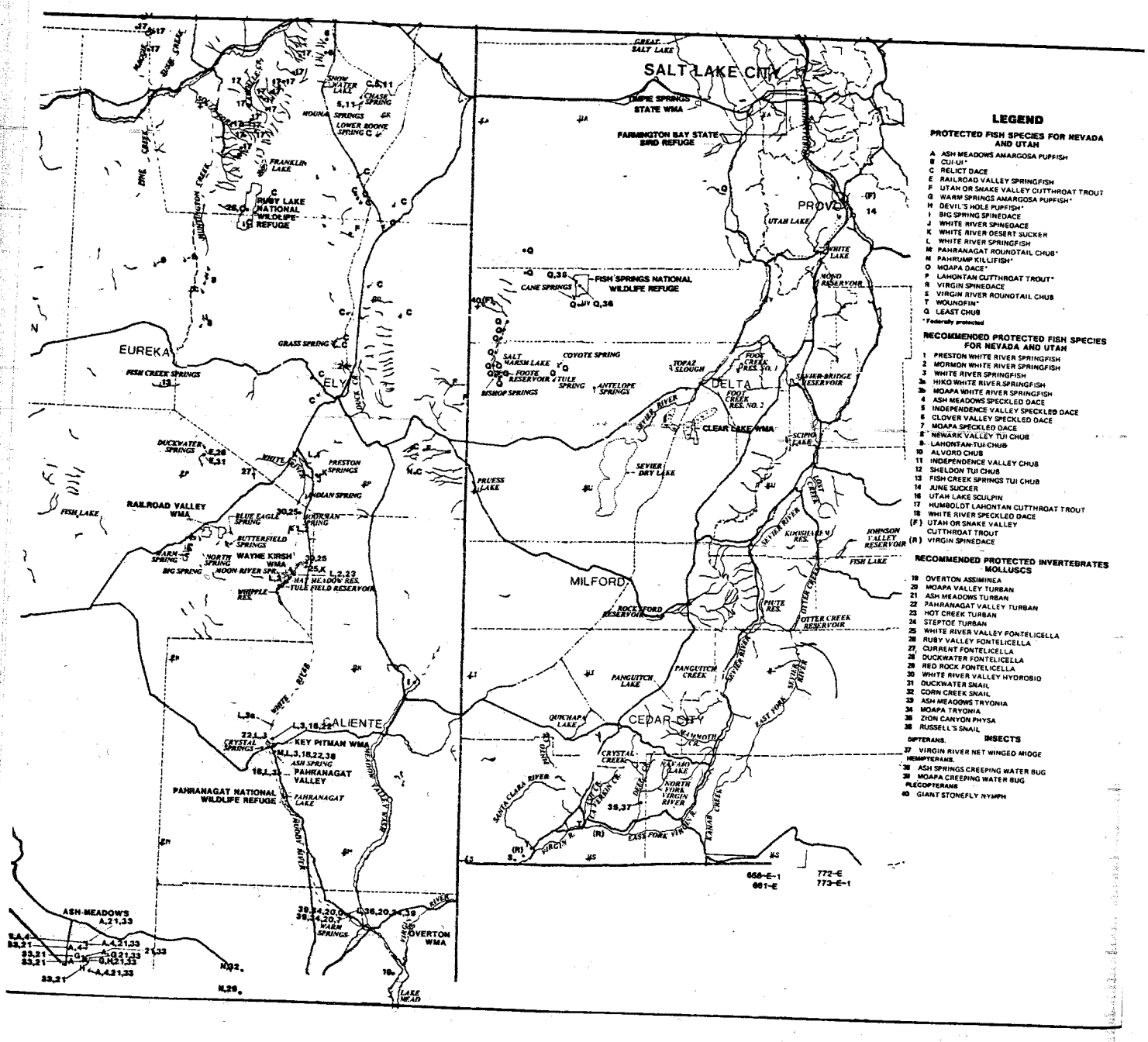

LEGEND

PROTECTED FISH SPECIES FOR NEVADA AND UTAH

- A ASH MEADOWS AMARGOSA PUPFISH
- B CUI-UI*
- C RELICT DACE
- E RAILROAD VALLEY SPRINGFISH
- F UTAH OR SNAKE VALLEY CUTTHROAT TROUT
- G WARM SPRINGS AMARGOSA PUPFISH*
- H DEVIL'S HOLE PUPFISH*
- I BIG SPRING SPINEDACE
- J WHITE RIVER SPINEDACE
- K WHITE RIVER DESERT SUCKER
- L WHITE RIVER SPRINGFISH
- M PAHRANAGAT ROUNDTAIL CHUB*
- N PAHRUMP KILLIFISH*
- O MOAPA DACE*
- P LAHONTAN CUTTHROAT TROUT*
- R VIRGIN SPINEDACE
- S VIRGIN RIVER ROUNDTAIL CHUB
- T WOUNDFIN*
- Q LEAST CHUB

*Federally protected

RECOMMENDED PROTECTED FISH SPECIES FOR NEVADA AND UTAH

1. PRESTON WHITE RIVER SPRINGFISH
2. MORMON WHITE RIVER SPRINGFISH
3. WHITE RIVER SPRINGFISH
- 3a HIKO WHITE RIVER SPRINGFISH
- 3b MOAPA WHITE RIVER SPRINGFISH
4. ASH MEADOWS SPECKLED DACE
5. INDEPENDENCE VALLEY SPECKLED DACE
6. CLOVER VALLEY SPECKLED DACE
7. MOAPA SPECKLED DACE
- 8* NEWARK VALLEY TUI CHUB
- 9- LAHONTAN TUI CHUB
10. ALVORD CHUB
11. INDEPENDENCE VALLEY CHUB
12. SHELDON TUI CHUB
13. FISH CREEK SPRINGS TUI CHUB
14. JUNE SUCKER
16. UTAH LAKE SCULPIN
17. HUMBOLDT LAHONTAN CUTTHROAT TROUT
18. WHITE RIVER SPECKLED DACE
- (F) UTAH OR SNAKE VALLEY CUTTHROAT TROUT
- (R) VIRGIN SPINEDACE

RECOMMENDED PROTECTED INVERTEBRATES

MOLLUSCS

19. OVERTON ASSIMINEA
20. MOAPA VALLEY TURBAN
21. ASH MEADOWS TURBAN
22. PAHRANAGAT VALLEY TURBAN
23. HOT CREEK TURBAN
24. STEPTOE TURBAN
25. WHITE RIVER VALLEY FONTELICELLA
26. RUBY VALLEY FONTELICELLA
27. CURRENT FONTELICELLA
28. DUCKWATER FONTELICELLA
29. RED ROCK FONTELICELLA
30. WHITE RIVER VALLEY HYDROBID
31. DUCKWATER SNAIL
32. CORN CREEK SNAIL
33. ASH MEADOWS TRYONIA
34. MOAPA TRYONIA
35. ZION CANYON PHYSA
36. RUSSELL'S SNAIL

INSECTS

DIPTERANS.

37. VIRGIN RIVER NET WINGED MIDGE

HEMIPTERANS.

38. ASH SPRINGS CREEPING WATER BUG
39. MOAPA CREEPING WATER BUG

PLECOPTERANS

40. GIANT STONEFLY NYMPH

UNUSUAL SECONDARY SEX CHARACTERISTICS IN CYPRINODON OR PUZZLING PUPFISH PATTERNS

Gary P. Garrett

Reproduction in most species of the genus Cyprinodon is intimately related to the male's territorial behavior. Typically, the males defend an area in shallow water which is probably chosen for appropriate substrate (Kodric-Brown, 1978), defensibility while mating and for after eggs are fertilized. Males are very aggressive towards other fish in their territory, especially conspecific, adult males. This aggression towards other adult males is probably to keep them from fertilizing the eggs of females they have attracted into their territory and to keep them from eating previously fertilized eggs. Aggression towards other species may also be to prevent egg eating.

The females spend most of their time in deeper waters offshore and enter the male's territory only long enough to mate. They often school and tend to be much less aggressive.

Such a system requires that the players be able to tell each other apart. This is accomplished, for the most part, by different color patterns and behavior.

JUVENILE COLOR PATTERN

Juvenile pupfish (particularly Cyprinodon variegatus) have been described as having the same color patterns as adult females (e.g. Hildebrand, 1917; Miller and Miller, 1942; Echelle, 1973). Although there are some species specific patterns, in general they have distinct vertical bands or blotches on the body and a prominent spot or ocellus on the posterior portion of the dorsal fin. As juveniles, both sexes have nearly identical external appearances.

The probable reason for this is that the female pattern does not elicit the same aggressive response as the adult male pattern. Thus, the immature males will not be confused as rivals by the adults.

This color pattern system can be seen in young C. variegatus from the South Texas coast (Fig. 1). A few of the juvenile males were lacking the ocellus but the majority had it and all had the characteristic vertical banding pattern.

While working with various aspects of the life history of C. pecosensis, from the Bitter Lake National Wildlife Refuge near Roswell, New Mexico, it was noted that these fish do not follow this system (Fig. 2). Apparently, for a short time after hatching, both sexes do have the female pattern. However, well before the onset of sexual maturity the males begin losing the dorsal ocellus. The sex of all fish was determined by the shape and location of the gonadal tissue. These fish were assumed to be sexually immature because: a) the smallest Hole 10 female with recognizable ova was one of 24 mm in length, b) the smallest Unit 16 female with recognizable ova was one of 20 mm in length and one of 24 mm in length, c) none of these males had the caudal bar and blue nape which is typical of the adult male and d) males under 20 mm consistantly had small, thread like testes as did the majority of those under 24 mm.

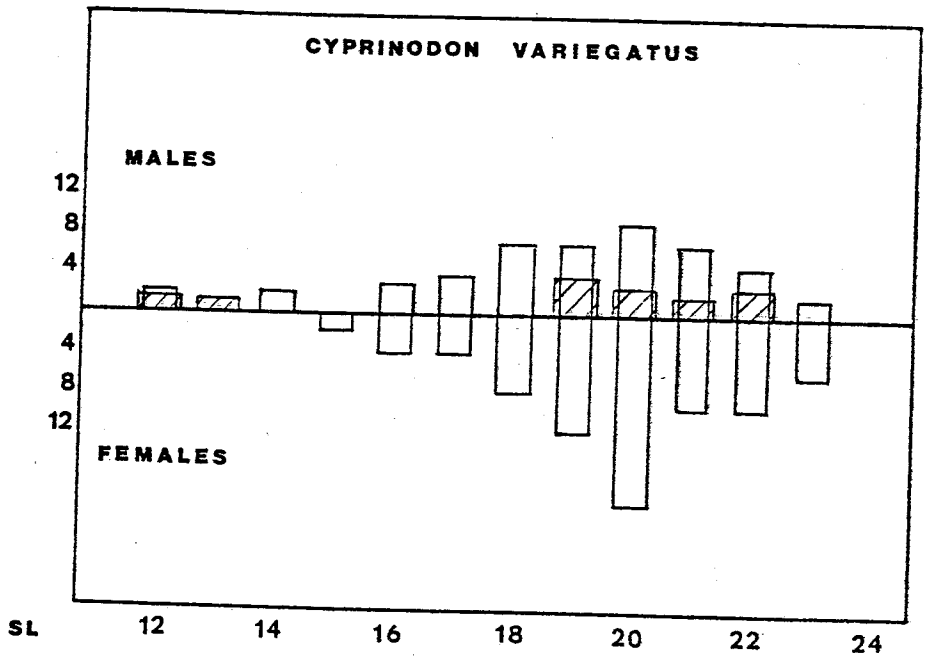

Fig. 1 Hatched boxes indicate number of individuals without dorsal ocelli, open boxes for those with a dorsal ocellus.

It may be noted in Fig. 2 that there is a populational difference in the size at which the ocellus is lost in the young males. This may be somehow associated with the different life histories of the two populations. Unit 16 is a large artificial impoundment where pupfish mature at a smaller size and the adult females have many small eggs. Hole 10 is a small sinkhole where the fish mature at a larger size and the females have fewer, larger eggs.

This phenomenon has also been noted in other populations of C. pecosensis (Fig. 3). Why this occurs is presently unknown, but, apparently there is some advantage for immature males to look like neither adult females or males.

ADULT COLOR PATTERN

Adult pupfish are sexually dimorphic with the mature males generally having a black caudal bar and an iridescent, bluish nape. In addition, breeding male C. variegatus usually have orange-yellow anal and pectoral fins edged in black (Seligmann, 1951). Males also differ from females in body shape and fin size (Figs. 4 and 5). This sexual dimorphism probably serves as a means of advertising that a male is in a reproductive state and is maintaining a territory for that purpose. This message would, of course, elicit different reactions dependant upon the reproductive state and sex of the individual on the receiving end.

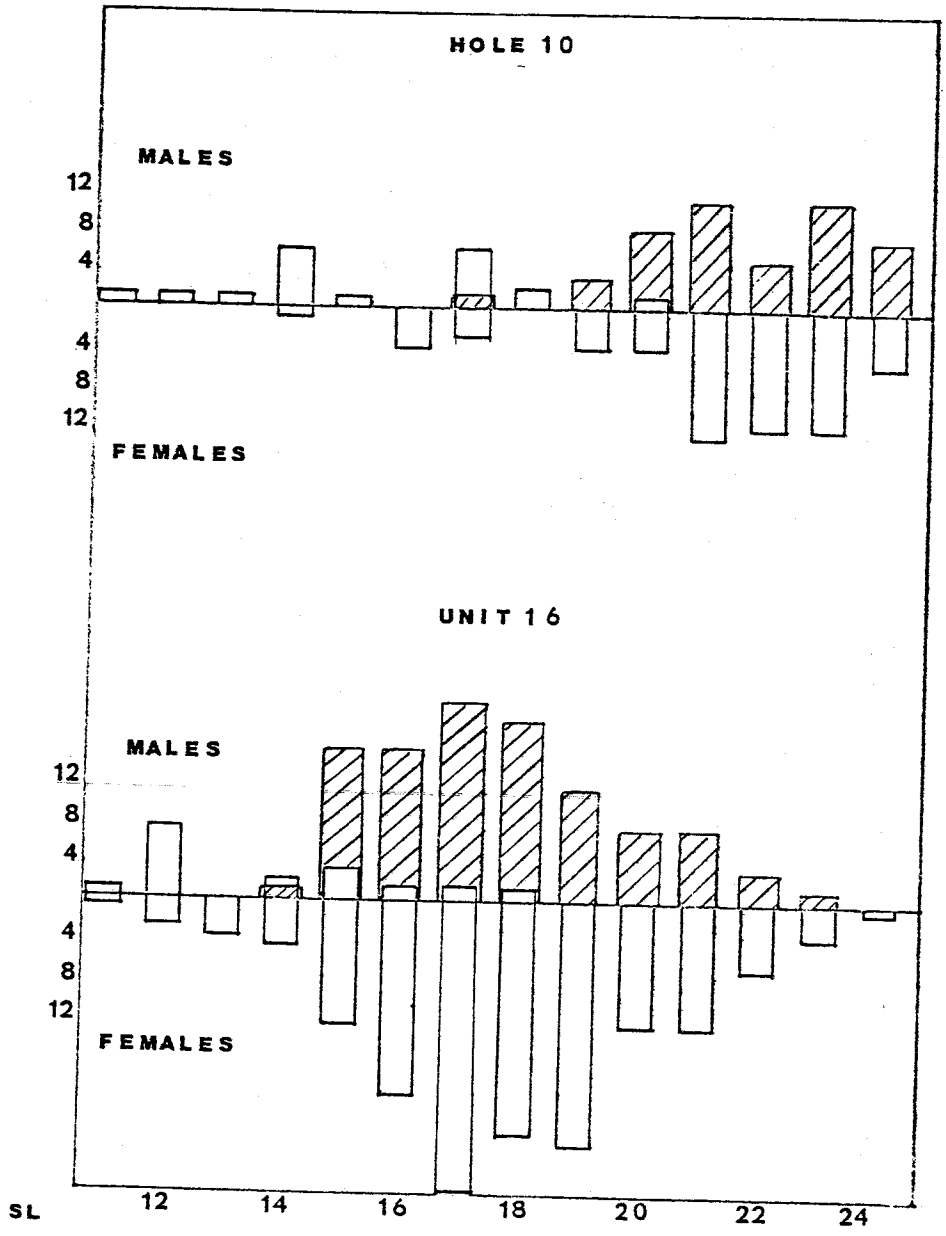

Fig. 2 Dorsal occelus state for C. pecosensis from study populations on the Bitter Lake Refuge. Hatched = absent, open = present.

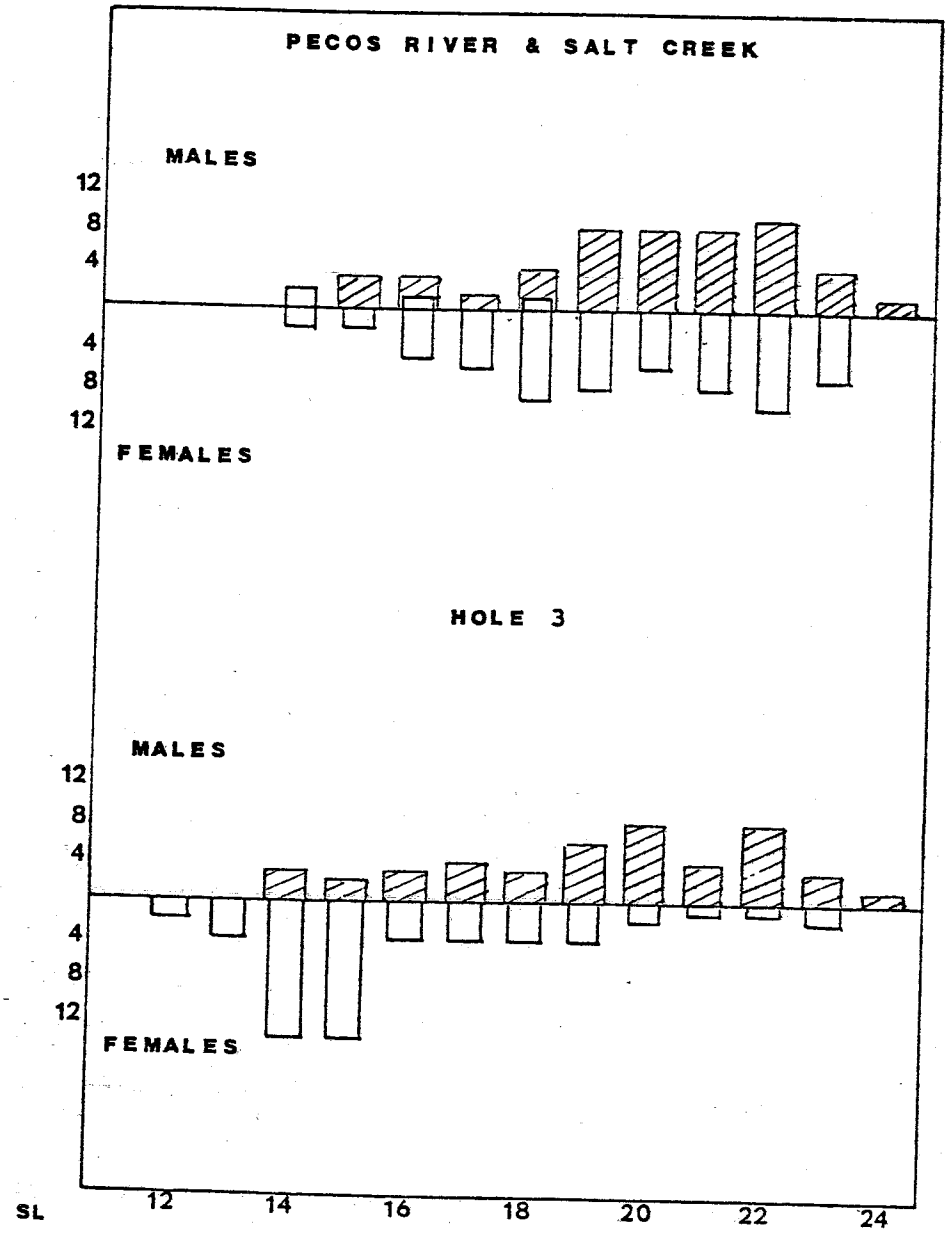

Fig. 3 Dorsal ocellus state for C. pecosensis from other populations in Texas and New Mexico. Hatched = absent, open = present.

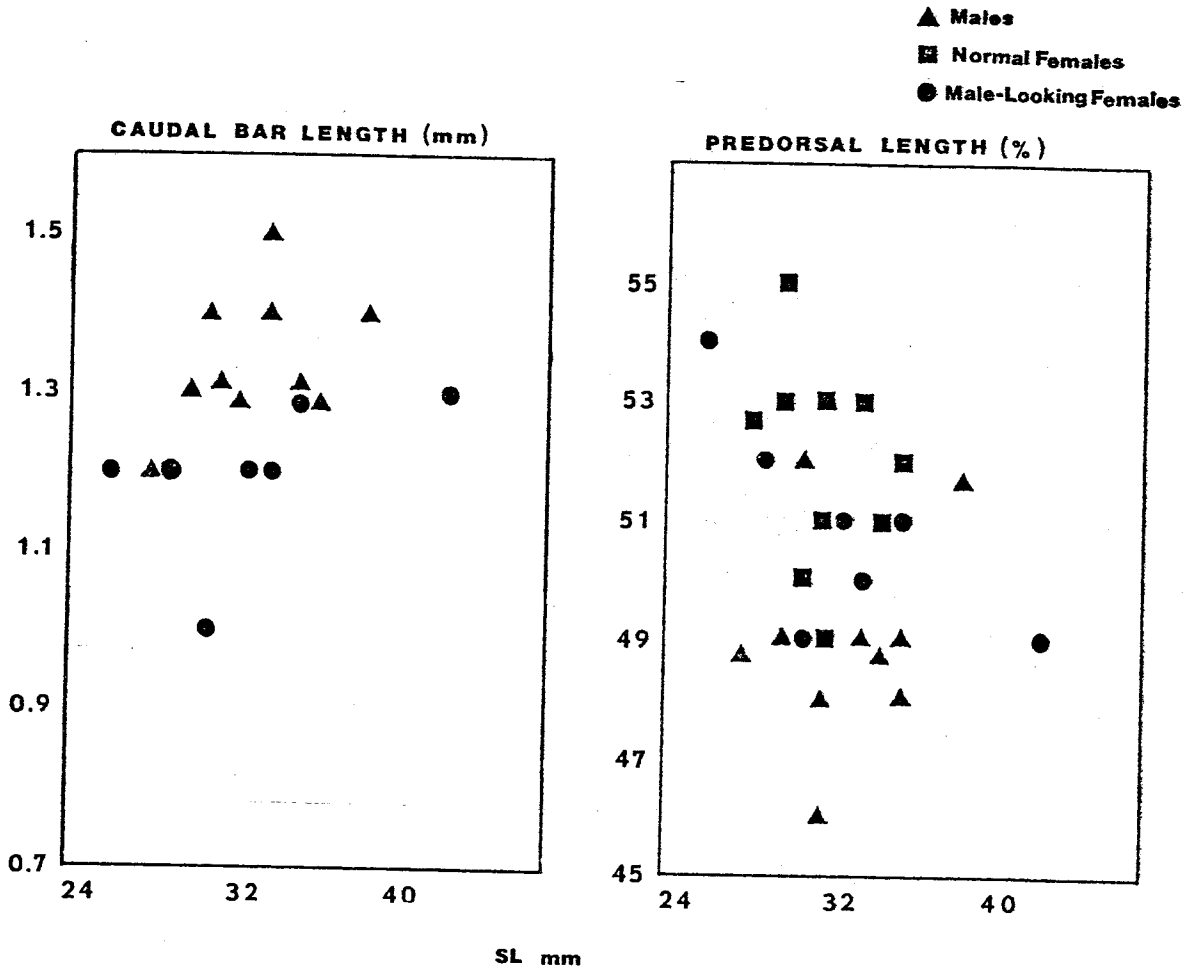

Fig. 4 Morphometrics for C. variegatus from south Texas.

The female's color pattern with the darker banding and prominent ocellus is probably very important to her reproductive success. This color pattern, along with her behavior, tells the male she is ready to spawn which usually results in his actions changing from aggressive to reproductive behavior.

It would seem that there would be no advantage for a female to look like a male (especially during the breeding season). Nevertheless, it does happen. Female C. variegatus have been found recently in nature with caudal bars, bright blue napes and yellow fins with black tips. The caudal bar width is similar to that of males and some of the morphometric characters seem to be nearly intermediate between males and "normal" females obtained nearby. These male-looking females came from south Texas in an isolated side pool off of Packery Channel which connects the Laguna Madre to the Gulf of Mexico. They were collected in August 1979 as the breeding season was nearing an end and the water level of the pool was very low. None from this population were preserved in the field but a collection from nearby showed females with small ovaries, apparently at the first stages of regression. However, many ovaries did contain a few ripe eggs.

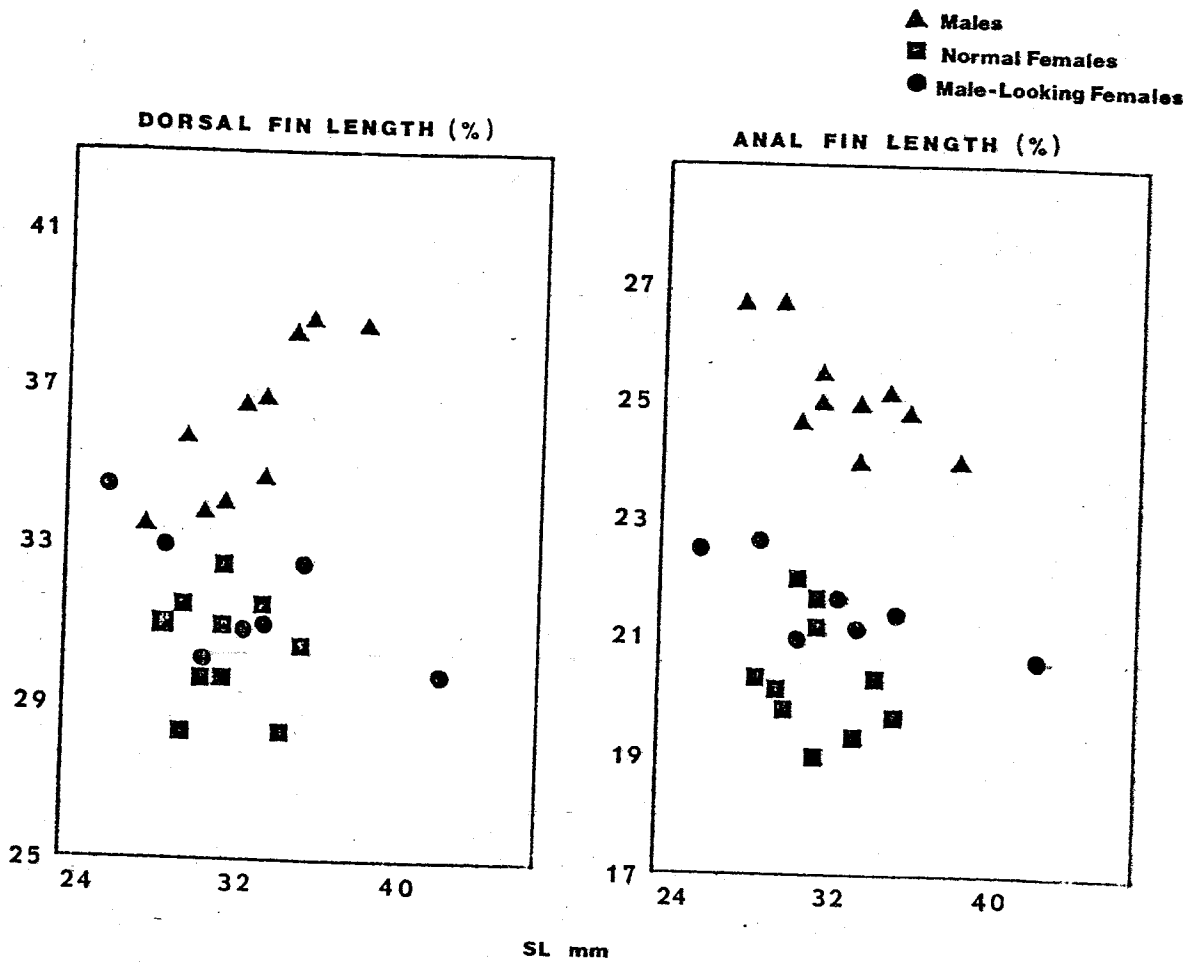

Fig. 5 Morphometrics for C. variegatus from south Texas.

None from the isolated pool population were preserved in the field because they were to be used in a behavior experiment. It was originally thought that there were only males in this population as they all had the male color pattern. After six months in the lab some of these "males" were noted to have an ocellus. These were sacrificed and found to be females with large ovaries full of ripe eggs. When the remaining fish were put under less crowded conditions with abundant food, the females slowly (approximately three months) returned to the normal female color pattern.

Upon re-examining a collection from August 1978 from the same location, one female with male secondary sex characteristics was found. All others had the normal female appearance. Collections at other times of the year (from January 1978 through November 1980) showed normal sexual dimorphism. A hurricane precluded an equivalent August 1980 collection.

There have been occurances in the lab of young adult male C. pecosensis and C. variegatus maintaining the female color pattern when in small tanks with large males. Astrid Kodric-Brown (1977) and others have noted a similar occurance in the field where non-breeding adult males will have the female color pattern, be non-aggressive and even school. The advantage here is obvious, but what a female gains by looking like a male is unclear. The male color pattern seems to advertise and stimulate aggression.

One possibility is that in very crowded conditions a female is constantly "getting the attentions" of the resident males. In an aquarium this often results in the female eventually getting killed. Perhaps in a crowded environment, late in the season, if a female is bred out and wants to avoid the remaining breeding males, it would behoove her to look like one of the males and maintain a territory. This would, of course, lead to aggressive encounters with males but would usually be one on one, rather than having several individuals after her at once.

Another possibility is that as habitat grows smaller, food is becoming sparse and breeding is coming to an end, both males and females become territorial in terms of food supply and this pattern is meant to communicate that the individual is guarding a feeding territory. Raney et al. (1953) noted a female C. variegatus in southern Florida exhibiting territorial behavior and Barlow (1961) found that female C. macularius will defend territories in aquaria.

Admittedly, neither of these explanations is totally satisfactory, but no easy answers come to mind. Laboratory experiments are currently underway with populations under super crowded conditions in the hopes of artificially inducing this condition and perhaps getting a better idea as to what strategies are involved.

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Características Sexuales Secundarias No Usuales en *Cyprinodon*

Resumen

El dibujo de color es un componente importante en la conducta sexual de *Cyprinodon* y este dibujo es semejante en todos las especies. Sin embargo, encontré algunas variaciones del dibujo característica en poblaciones naturales. Los miembros mas jovenes de este grupo tienen, generalemente, el dibujo como las hembras que reflejan una conducta pacifica (liñeas conspicuas del cuerpo y un punto dorsal prominente), pero en algunos poblaciones de *Cyprinodon pecosensis* machos inmaduro pierden este diseño cuando toda via son pequeños, pero la medida es diferente en diferentes poblaciones. El diseño del macho es una raya negra en la cola, el lomo es azul y las aletas son coloradas. Esto es probablemente una atracción sexual para las hembras y una señal agresiva para los otros machos. En una población de la costa de *C. variegatus* en el sud de Tejas en agosto 1979 encontré hembras con el diseño de los machos. Algunos explicaciones han sido dadas pero ninguna es completamente satisfactoria.

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General Characteristics of Springs in Nevada and Utah

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Abstract. Water chemistry and aquatic biota were sampled in numerous valley bottom aquatic habitats in central Nevada and western Utah. The springs show a wide range in physical, chemical, and biological characteristics. Based on temperature, the springs may be grouped into two general categories, cold and warm springs, with 20 degree C the dividing temperature. The waters are fairly hard with moderate to high concentrations of dissolved solids (specific conductivity ranged from 175 to 2600 mhos/cm). Physically, the springs varied from small seeps to large pools and streams. Riparian vegetation was not well developed at most, but emergent macrophytes were generally present. The faunal composition varied considerably among springs as a result of natural characteristics and man-induced changes. Phytoplankton and zooplankton communities were sparse while algae were often abundant. Aquatic insects were well represented, and snails were common. Fish, both native and exotic, were present in some.

INTRODUCTION

Many of the surface waters in the Great Basin are spring-fed. These provide habitat for a variety of aquatic organisms and water sources for terrestrial animals. They have also played a key role in settlement of the area as evidenced by the number of ranches built adjacent to springs. As a result of this development, many of the springs have been modified through impoundment or diversion. The groundwater hydrology of this area is very complex with individual valleys often being hydrologically isolated from each other. In some areas, however, valleys may be interconnected, as in the Pluvial White River system (Eakin, 1966). The geologic, hydrologic, and physiographic characteristics of the Great Basin have resulted in a great diversity of aquatic habitats. The following is a presentation of water quality and biological data for a limited number of spring-fed surface waters in the Great Basin.

METHODS

Numerous aquatic habitats were sampled for water chemistry and biota in all trophic levels. Notes on morphometry, riparian vegetation, and level of disturbance were recorded, and photographs were taken. Water quality parameters measured were temperature, conductivity, dissolved oxygen, pH, alkalinity, hardness, nitrate nitrogen, sulfate, and turbidity. A Yellow Springs Instruments S-C-T meter was used to measure temperature and conductivity while the other parameters were measured using a Hach DR-EL/1 kit. The water samples were collected in conjunction with biological sampling and were sometimes taken in the spring outflow rather than at the spring head. Phytoplankton were collected in whole water samples, and algae were hand picked. Zooplankton were sampled with a 10 cm diameter conical net (76 m mesh) that was hand towed or held in flowing water, while invertebrates were collected using a dip net, by hand picking, or in the towed net. Fish were collected by siene or dip net. Representatives of all organisms not identified in the field were preserved for later identification: Lugol's for phytoplankton and algae, 70% ethanol for invertebrates, and 10% formalin for fish. Sampling took place from October 1979 through August 1980.

RESULTS AND DISCUSSION

The results of the water chemistry field sampling are presented in Table 1. These data show a wide range of values for most parameters. Even within a single valley, the water chemistry of individual springs may be quite different. This suggests different aquifer sources or the presence of geological features, such as faults or different rock outcrops, that are altering chemical characteristics. Temperatures varied from 6 degree C in mid November at Green Spring to over 50 degree C at Diana's Punchbowl. The springs can generally be grouped into cold and warm categories using 20 degree C as the dividing temperature. These two types of springs may occur within a few kilometers of each other within a valley (e.g., in Railroad and White River valleys). Waters in the springs are hard and contain moderate to high concentrations of dissolved solids. Specific conductivity measurements ranged from 175 mhos/cm at Goecoechia Ranch in Newark Valley to 2600 mhos/cm in Coyote Spring, Tule Valley. Most warm springs had conductivity values greater than 500 mhos/cm. Nitrate nitrogen varied between 1 and 4 mg/l, except at Barrel Spring (Newark Valley) where high turbidity interferred with the measurement, while pH ranged from 7.1 to 11.4. Dissolved oxygen concentration showed a wide range, depending upon temperature, primary productivity, and proximity of sample location to the spring head. Sulfate concentrations also varied greatly, ranging from 5 mg/l to more than 150 mg/l. Turbidity was generally very low, except where disturbances were evident in or near the water body.

Physically, the springs were very different. Some consisted of one or more small seeps with little open water while others formed large pools and/or marshes. Flow rate varied considerably. Bottom substrate was soft floc, mud, sand, gravel, or rock. Riparian vegetation was generally absent or very sparse, but emergent macrophytes were usually present in varying amounts. Submerged macrophytes and filamentous algae were also abundant in some springs. Phytoplankton and zooplankton communities were poorly developed as would be expected in flowing systems. Aquatic insects, however, were well represented and often very abundant. Several species of snails were present, several of which are exotics. Fish inhabited only some of the springs. Low natural flow or habitat alteration was often the apparent reason for lack of fish. Exotic species had been introduced in several localities.

Water quality data routinely collected during biological sampling (if taken at the spring head) can also be used in assessing the potential for effects of groundwater use on nearby springs since they are one indicator of aquifers. Thus, if the water chemistry of the spring in question and that at the proposed use site are very similar, the potential for effects is relatively high. It will also depend upon distance separating the spring from the use site and withdrawal rate. On the other hand, if the chemistries are markedly different, the potential for effect is much lower. In this case the hydrology and geology of the area would need further investigation to determine if the sources are actually different (e.g., semiperched vs. valley aquifer) or if geological features are causing the differences. With increasing demands for water, this type of information would be very helpful in predicting the potential for effects of water use on springs and their resident native aquatic organisms, many of which are currently experiencing declines in numbers.

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Table 1. Water chemistry data for selected aquatic habitats in Nevada and western Utah. (Page 1 of 2)

LOCATION	TEMP. (C)	DO (mg/l)	pH	CONDUCTIVITY (µmhos/cm)	TOTAL ALKALINITY (mg/l)	HARDNESS (mg/l)	NITRATE-N (mg/l)	SULFATE (mg/l)	TURBIDITY (FTU)	DATE
Snake Valley										
Foote Res. Outflow	19.0	7.0	9.0	650	236	282	0.7	65	5	8-80
Tule Valley										
Coyote Spring	28.0			2,600					low[1]	8-80
Rush Valley										
Spring N. of St. John Jct.	11.0			395					low[1]	11-79
Escalante Desert										
Beaver River	6.3			418						11-79
Black Rock Jct. Spring - Head	15.0			435						11-79
- Pool	14.0	12.1	8.5	320	107	156	1.8	>150	0	11-79
Steptoe Valley										
Bird Creek	13.8	8.0	9.1	250	158	192	1.3	5	5	8-80
Comins Lake	22.0	14.9	10.9	600	290	273	1.9	45	15	8-80
Lindley Ranch Spring	19.8	7.0	9.0	335	203	165	2.3	18	7	8-80
Newark Valley										
Barrel Spring	16.5	4.3	9.1	590	267	265	18.0[2]	22.5	395	8-80
Cook Ranch - N. outflow	24.0	8.0	9.2	430	212	209	1.7	30	10	8-80
- S. Outflow	24.5	8.5		315						8-80
- N. Pool	25.0			450						8-80
Warm Springs	25.0			590						8-80
Cold Springs - Upper Pool	17.0			190					low[1]	8-80
- Valley Pool	20.2			330					low[1]	8-80
Unnamed Spring 1	12.0			230						8-80
Unnamed Spring 2	13.0			225						8-80
Goecoechia Ranch - Upper Pool	14.0			265						8-80
- Lower Pool	18.0	9.8	11.4	175	88	108	1.7	14	10	8-80
Monitor Valley										
Potts Ranch Spring - Head		0.4								8-80
- 16 M	42.5	0.8	7.4	780	211	175	1.8	49	0	8-80
- Ranch	25.0	10.3		500						8-80
Diana's Punchbowl - Pool	>50			1,090						8-80
- Spring	39.5	5.6	9.3	690	217	122	2.0	59	0	8-80
	35.5			700						8-80
	35.0			520						8-80
	33.0			570						8-80
	30.5			570						8-80
Hot Creek Valley										
Butte Spring	17.0			1,000					high[1]	8-80
Railroad Valley										
Green Spring	5.7	11.0	7.8	283	211	249	1.5	22	8	11-79
Bull Creek Spring	12.0		7.4	266	155	168	4.2	22	0	10-79
Duckwater Big Spring	31.5		7.2	715	270	270	1.6	46	0	10-79
Blue Eagle Spring	28.0		7.1	540	283	211	2.1	34	0	10-79
Butterfield Spring	16.1		7.2	470	309	279	2.6	29	3	10-79
Lockes Ranch Spring	36.5		7.4	650	313	261	1.5	68	0	10-79

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Table 1. Water chemistry data for selected aquatic habitats in Nevada and western Utah. (Page 2 of 2)

LOCATION	TEMP. (C)	DO (mg/l)	pH	CONDUCTIVITY (µmhos/cm)	TOTAL ALKALINITY (mg/l)	HARDNESS (mg/l)	NITRATE-N (mg/l)	SULFATE (mg/l)	TURBIDITY (FTU)	DATE
Meadow Valley Wash										
Meadow V. Creek - N. Caliente	13.0	10.7	8.4	850	354	260	1.0	95	42	4-80
- Rainbow Canyon	11.5	7.9	8.3	700	305	268	1.5	90	25	4-80
Panaca Spring	27.5	8.8	7.7	410	157	117	2.2	23	3	11-79
	29.0	7.8	7.7	425	154	115	2.3	26	2	4-80
Moapa Valley										
Moapa River - below Recreation Area	29.0	8.1	8.0	1,150	230	246	1.5	>150	11	4-80
- Power Plant	25.2	8.3	8.2	1,120	270	279	1.2	150	275	4-80
White River Valley										
Preston Big Spring	18.5		6.9	350	161	215	2.0	33	5	10-79
Lund Town Spring	18.5		6.8	365	232	278	2.5	11	0	10-79
Mormon Spring	35.0		6.9	760	241	245	1.8	47	8	10-79
Hot Creek Spring	23.6		7.2	650	254	260	1.0	45	0	10-79
Moon Ranch Spring	32.0		6.9	650	234	240	1.4	39	0	10-79
Adams McGill Reservoir	12.2		8.3	800	301	320	1.0	135	15	10-79

[1]Observation

[2]Turbidity interfered with measurement

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STATUS OF THE DISTRIBUTION AND TAXONOMY OF *Gila cypha* IN THE UPPER COLORADO RIVER

by

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ABSTRACT

New populations of the endangered humpback chub, *Gila cypha*, were encountered in habitat assessment studies by the Colorado River Fisheries Project of the U.S. Fish and Wildlife Service in 1979-80. These are located in Westwater Canyon and Cataract Canyon, Utah. A third new population is indicated in Debeque Canyon, but since the individuals of this population lack some of the pronounced features of the species, taxonomic verification is still pending. A fourth population, encountered by other investigators in 1977 in Black Rocks, Colorado, was also studied. No estimates of population abundances are presented. Taxonomic studies on individuals of each population continue in order to more clearly distinguish *G. cypha*, *G. robusta*, and *G. elegans*, and to subsequently facilitate their identification afield.

INTRODUCTION

The humpback chub (*Gila cypha* Miller) is one of the most bizzare riverine fishes in North America. Having evolved in the turbulent, silt-laden waters of the Colorado River, it is North America's most recently described large fish species (Miller 1946). *Gila cypha* is closely allied to and sympatric with the roundtail chub (*G. robusta*) and the bonytail chub (*G. elegans*). These three species make up the *Gila* complex, a group of Colorado River fishes with such species variation and overlap that systematic studies continue in order to more clearly delineate the species. *Gila cypha*, and *G. elegans* were designated endangered in 1967 and 1980, respectively, and are protected by The Endangered Species Act of 1973. The conflict between the well-being of these fishes and water uses is a significant environmental issue in the United States today.

This presentation is a product of the Colorado River Fisheries Project (CRFP) of the U.S. Fish and Wildife Service. The investigation is an assessment of the habitat of endangered native Colorado River fishes; Colorado squawfish (*Ptychocheilus lucius*), humpback chub, and bonytail chub. The project is funded by the U.S. Water and Power Resources Service, Bureau of Land Management, and Fish and Wildlife Service. The study is concentrated in (1) the Little Colorado River of the Grand Canyon, Arizona, (2) the Green River between Split Mountain and Turk's Head, Utah, and (3) the Upper Colorado River between Debeque,

Colorado, and Lake Powell, Utah. This presentation encompasses that portion of the investigation conducted on the 450 km of the Upper Colorado River.

DISTRIBUTION

The Humpback Chub Recovery Plan (Colorado River Fishes Recovery Team 1979) identifies five areas in the Colorado River in which G. cypha is presently distributed (Figure 1). Included in the Upper Colorado River is an 80-km stretch of river between Palisade and Black Rocks, Colorado. That area includes one distinct population in Black Rocks, Colorado (Kidd 1977) about 6 km upstream from the Utah line, and a suspected population near Palisade, Colorado (Kidd, personal communication), 94 km further upstream.

The CRFP has continued to monitor the Black Rocks population, and specifically located the population near Palisade in an area of Debeque Canyon (Figure 1). However these individual lack the pronounced morphological features of the species and systematic studies are being conducted to verify their identity. A second new population was discovered October 9, 1979, in Westwater Canyon, Utah, about 11 km downstream from the Colorado state line. Individual catches of G. cypha in Cataract Canyon, Utah, 210 km further downstream, indicate the existence of a third new population in the Upper Colorado River. Verifying the Cataract population may be difficult because of severe rapids and swift water. The few individuals caught in Cataract Canyon (1 adult and several juveniles) may be remnants of a population reported from Lake Powell shortly after impoundment in the 1960's (Colorado River Fishes Recovery Team 1979).

The size and extension of each population has not been ascertained but tagging studies indicate that individuals of the Black Rocks population remain within a 2-3 km section of river. Similar ranges are predicted for the other three populations. This apparent lack of extensive movement may be a function of unique habitat, as discussed in the following section.

GENERAL HABITAT PREFERENCES

The four recognized populations of G. cypha in the Upper Colorado River are distinctly associated with the deeper and swifter riverine areas. In Debeque Canyon, for example, G. cypha are concentrated in an area with an average river depth of 2.2 m and a maximum of 4.9 m (Table 1). The Black Rocks and Westwater populations inhabit areas surprisingly similar in average (5.6 m) and maximum depth (18 m). The deepest area encountered in the Upper Colorado River is below Brown Betty Rapid in Cataract Canyon, with a maximum depth of 28.1 m and an average of 15.2 m. Humpback chubs were captured near this area.

Figure 1. Distribution of Gila cypha (1–5) within the Colorado River drainage (Colorado River Fishes Recovery Team 1979) and specific locations of four populations (①–④) in the Upper Colorado River encountered by the Colorado River Fisheries Project.

Table 1. Average and maximum river depths* associated with four populations of Gila cypha in the Upper Colorado River.

Locale (river mile)	Average Depth (meters)	Maximum Depth (meters)
Debeque Canyon (195)	2.2	4.9
Black Rocks (136)	5.6	18.9
Westwater Canyon (122)	5.6	18.3
Cataract Canyon (212)**	15.2	28.1

* measurements taken in August-September during moderate post-runoff flows; depth may vary with flow stage.
** miles above Lee's Ferry; all others are miles above Green-Colorado confluence.

The maximum depths of Black Rocks, Westwater, and Cataract represent the deepest areas encountered in the Upper Colorado River. By comparison, maximum river depths in August and September rarely exceed 4-5 m.

Gila cypha also appear to associate with specific substrates; large irregular boulders or steep, sheer cliffs. The populations in Debeque and Cataract Canyons, and partially in Black Rocks are associated with large boulders. The boulders near Black Rocks and in Debeque Canyon are part of a railroad or highway foundation. In Black Rocks and Westwater Canyon, the substrate is typically a dark hardened gneiss rock with pockets of gravel and sand. Gila cypha are commonly associated with the steep gneiss walls, expecially where depressions and cutaways forms rooms, eddies, and pockets.

Detailed measures of depth, velocity, and substrate type are being taken by CRFP in order to quantify habitat parameters selected by G. cypha. These data will be incorporated into the instream flow methodology of the Western Energy and Land Use Team of the U.S. Fish and Wildlife Service for determining flow requirements of the species.

SYSTEMATICS

There presently remain many questions as to what constitutes the species G. cypha, G. elegans, and G. robusta. Although systematic ichthyologists generally agree that the three are separate forms, a clear delineation of the extent of variation and hybridization requires further analyses. Such variations as sexual dimorphism, geographic and allometric differences, and habitat requirements are not clearly distinct for each species. (Suttkus and Clemmer 1977).

Although the majority of Gila captured in the Upper Colorado River are clearly robusta, elegans, or cypha, some individuals exhibit overlapping

features. This systematic and taxonomic dilemma represents a frustrating problem to the CRFP field studies particularly since the fish are uncommon to rare (prevents sacrifice of sufficient numbers for appropriate taxonomic studies) and since an identification must be made eventually to document species distribution and habitat requirements.

The more abundant and nonendangered G. robusta appears to be a distinct species in nearly all reaches of the Upper Colorado River (Figure 2), except where it occurs sympatrically with G. cypha. Although G. robusta rarely exceeds 300 mm total length (TL), one individual of 486 mm TL was captured in the upper reaches. This species usually exhibits a terminal mouth, scaled back, robust caudal peduncle, no nuchal hump, and generally 9 dorsal and 9 anal fin rays. Coloration varies but usually the belly is white, the sides silver-gray, and the back, green. This coloration is accented by an orange belly during spawning in June and July.

The rare G. cypha is also usually distinct (Figure 3). Individuals rarely exceed 370 mm TL, but maximum size was 392 mm TL. The species exhibits an abrupt, scaleless nuchal hump, flattened head, overhanging fleshy snout, subterminal mouth, small eye, relatively long fins, and usually 9 dorsal and 10 anal fin rays. Coloration is fairly consistent; creamy white belly and sides, with tints of yellow and green on the sides, and a dull green-silver back. Spawning individuals in early June have light orange bellies.

Gila elegans was not found in the Upper Colorado River during this study either as pure strains, suspected variants, or integrades. The species in characterized by a terminal mouth, a slender body, pencil-thin caudal peduncle, the absence of a nuchal hump, and usually 10 dorsal and 10 anal fin rays (Figure 4). The color is silver-gray and darker dorsally.

Field identification is sometimes difficult for adult Gila that exhibit features intermediate between G. cypha and G. robusta, e.g. a moderate, partially scaled nuchal hump; a slightly inferior mouth; varied coloration and fin ray counts. This problem is intensified when identifying young-of-the-year and juveniles.

Thus, several methodologies are being employed by CRFP to aid identification afield:

1. examination of general morphology
2. enumeration of dorsal and anal fin rays
3. measurement of nuchal depth
4. intensive taxonomic analyses

General Morphology

Since detailed anatomic and meristic measurements are impossible to secure afield from live fish, examination of general and relative anatomic features becomes a vital criterion for identification at capture or at a later date when compared with data of other fishes. Morphology of G. cypha and G. robusta, as described earlier, was examined closely to assess the similarity of individuals with the described holotype (Miller 1946).

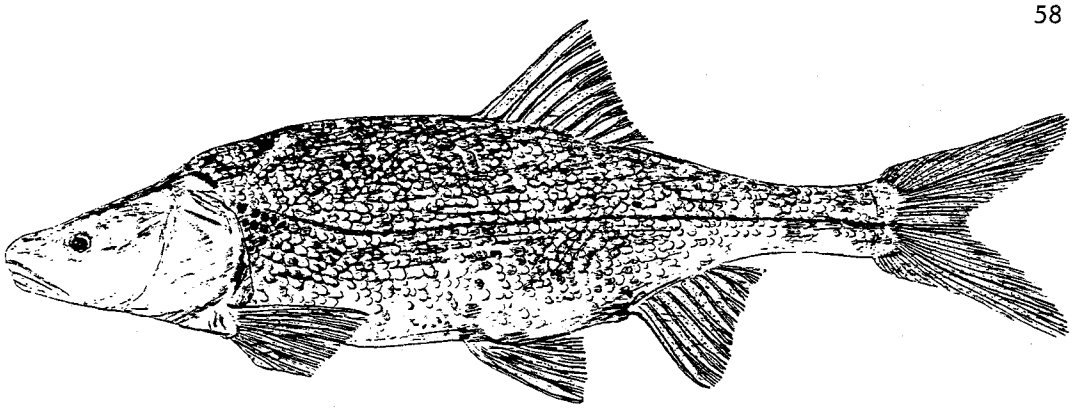

Figure 2. Gila robusta captured October 9, 1979 in Westwater Canyon, river mile 120.5, of the Upper Colorado River. Male, 274mm, 218g.

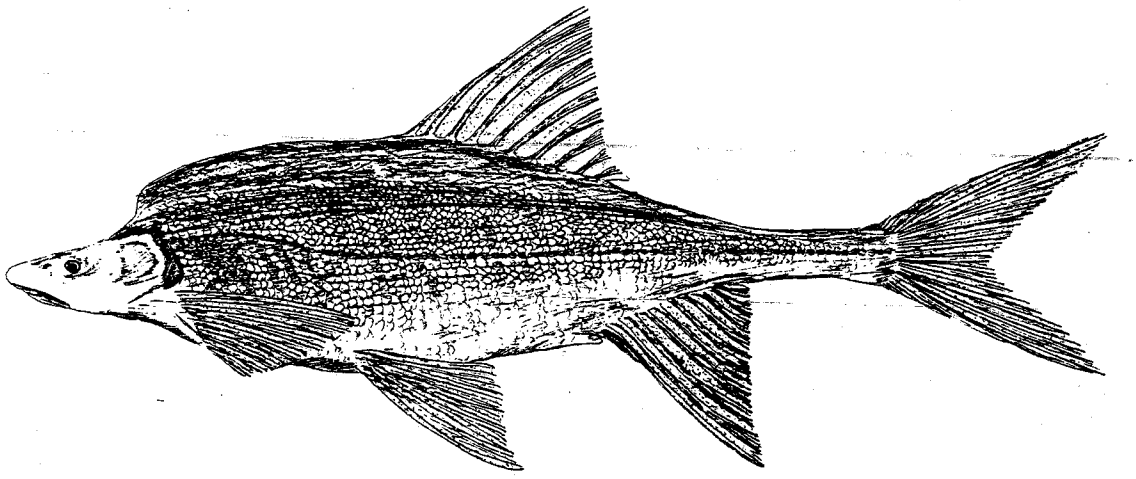

Figure 3. Gila cypha captured October 9, 1979 in Westwater Canyon, river mile 120.5, of the Upper Colorado River. Female, 366mm, 384g.

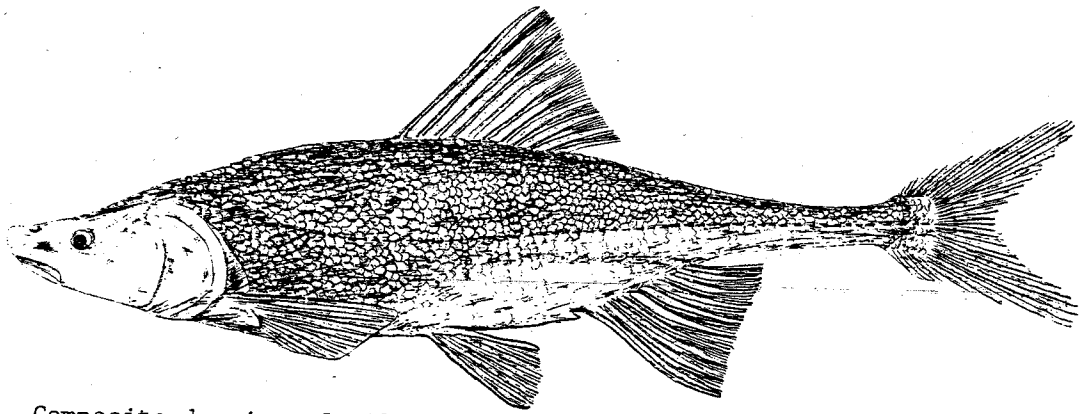

Figure 4. Composite drawing of Gila elegans, based on photographs and sketches (all 3 drawings by Jean Bramsteadt).

Dorsal - Anal Fin Ray Counts

A key character often used to distinguish G. cypha from G. robusta is the presence of 9 dorsal and 10 anal fin rays in the former and 9 dorsal and 9 anal fin rays in the later (Holden and Stalnaker 1970, Minkley 1973). These studies and others (Suttkus and Clemmer 1977) since have revealed great variation in this character among fish distinctly G. cypha. Preliminary results of the CRFP data confirm this variation in fin rays. Variation among individuals from the same area and between individuals from separated areas indicate that dorsal and anal fin ray counts do not appear to be a reliable single meristic character for separation between G. cypha and G. robusta.

Nuchal Depth

Nuchal depth development has been suggested as an effective means of distinguishing adults of the three Colorado River chubs (Smith, Miller, and Sable 1979). The methodology provides a direct repeatable measurement, accurate to 0.1 mm, of the development of the nuchal hump in association with the depressed (often concave) dorsal surface of the skull.

A ratio is employed that is derived by measuring the depth of the frontal depression (maximum distance between a straight line from highest part of nuchal hump and dorsal tip of snout, and dorsal surface of skull) and dividing this figure into the distance between the insertion of the pectoral and pelvic fins.

This method is being used by CRFP on individuals distinctly G. cypha or G. robusta as well as the apparent variants or integrades. There is general agreement between the nuchal hump ratios presented by Smith, Miller and Sable (1979) and those preliminarily computed for individuals from three of the four populations of the Upper Colorado River (Black Rocks, Westwater, and Cataract). Measurements on individuals from the Debeque population generally lie outside of the nuchal hump ratios established for G. cypha.

Taxonomic Analyses

Taxonomic and systematic studies are being conducted on young, juveniles, and adults of G. cypha, robusta, and elegans. Analyses of young and juveniles are being conducted by Dr. Daryll Snyder at the Larval Fishes Laboratory in Fort Collins, Colorado. A guide to the larval fishes of the Colorado River will be the product of this work. Adults are being examined by Drs. Royal Suttkus and Glenn Clemmer in affiliation with the Denver Wildlife Research Center of the U.S. Fish and Wildlife Service. Drs. Suttkus and Clemmer are examining specimens from past and present collections to establish the breadth of variability exhibited by each of the three Gila forms.

SUMMARY

The humpback chub of the Upper Colorado River is distributed in four areas (1) Debeque Canyon, Colorado (verification of identity pending) (2) Black Rocks, Colorado (3) Westwater Canyon, Utah and (4) Cataract Canyon, Utah. Ongoing studies by the Colorado River Fisheries Project indicate that deep, swift, rock canyons are critical to the survival of the species.

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STATUS DE LA DISTRIBUCIÓN Y TAXONOMIA DE *Gila cypha* EN LA REGIÓN ALTA DEL RÍO COLORADO

por

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ABSTRACTO

Poblaciones nuevas del pez "humpback chub", *Gila cypha*, (en peligro de extinción) se han encontrado en estudios de habitat conducidos por el Proyecto de Estudios Pesqueros del Río Colorado bajo del Servicio de Pesca y Vida Silvestre de los Estados Unidos en 1979-80. Estas poblaciones estan localizadas en los Cañones de Westwater y Cataract, Utah. La tercer población nueva fue indicada en el Cañon de Debeque, Colorado, pero como los individos de esta población les faltan algunas de las facciones pronunciadas del especie, verificación taxonómica siempre delata. La cuarta población se encontró durante otras investigaciones en el año 1977 en Black Rocks, Colorado. No se presenta la cantidad de peces de ningunas poblaciones en este reporte. Estudios taxonómicos en individos de cada población continuan para destinguir claramente *G. cypha*, *G. robusta*, y *G. elegans*; asi mismo facilita identificación en el campo.

INTRODUCCIÓN

El "humpback chub" (*Gila cypha* Miller) es uno de los peces mas raros de los ríos Norte Americanos. Es un pez que ha desplegado en las aquas turbulentes y fangosas del Río Colorado y es uno de los peces Norte Americanos descrito recientemente (Miller 1946). *Gila cypha* es relacionado y cohabitante con el "roundtail chub" (*G. robusta*) y el "bonytail chub" (*G. elegans*). Estos tres peces hacen el complexo *Gila*, un grupo de peces del Río Colorado con tanta variación que estudios sistemáticos continuan para delinear claramente los especies. En 1967 y 1980, *G. cypha* y *G. elegans*, respectivamente, fueron designados en peligro de extinción bajo del Acto de Especies que Peligran de 1973. Hoy día, en los Estadios Unidos, el conflicto de la sobrevivencia de estos peces y el uso de las aquas del Río Colorado es un asunto de mayor significancia con respecto a problemas ambientales.

Esta presentación es producto del Proyecto de Estudios Pesqueros del Río Colorado del Servicio de Pesca y Vida Silvestre de los Estados Unidos. La investigación es una evaluación del habitat de los peces nativos en peligro de extinción del Río Colorado; "Colorado squawfish" (Ptychocheilus lucius), "humpback chub", y "bonytail chub". El proyecto es consolidado por El Servicio de Recursos de Aqua y Fuerza, El Cuerpo de Manejo de Terrenos, y El Servicio de Pesca y Vida Silvestre de los Estados Unidos. El estudio es concentrado en (1) el Río Colorado Pequeño del Grand Canyon, Arizona, (2) el Río Verde entre Split

Mountain y Turk's Head, Utah, y (3) la Región Alta del Río Colorado entre Debeque, Colorado y el Lago Empresado de Powell, Utah. Esta presentación es sobre la porción de la investigación en los 450 km de la Región Alta del Río Colorado.

DISTRIBUCIÓN

El Plan de Recobro del "Humpback Chub" (Colorado River Fishes Recovery Team 1979) identifica cinco áreas en el Río Colorado en que se uncuentra G. cypha (Fig. 1). Incluido en la Región Alta del Río Colorado son 80 km entre Palisade y Black Rocks, Colorado. El área encluye una población distincta en Black Rocks, Colorado (Kidd 1977) aproximadamente 6 km río arriba de la frontera de Utah, y se crée que otra población se encuentra acerca de Palisade, Colorado (Kidd, comunicación personal), 94 km mas al río arriba.

El CRFP ha continuado la vigilancia de la población de Black Rocks, y especificamente se la localisado la población acerca de Palisade en el área del Cañon de Debeque (Fig. 1). Pero, les faltan a estos individos de Debeque las facciones pronunciadas del especies, y estudios sistemáticos continuan para verificar la taxonomía. La segunda población nueva fue descubrida el 9 de Octubre, 1979 en el Cañon de Westwater, aproximadamente 11 km río abajo de la frontera de Colorado. Captura de individos de G. cypha en el Cañon de Cataract Utah, 210 km mas al río abajo, indican la posible existencia de l. tercer población nueva en la Región Alta del Colorado. Es deficil verificar la población de Cataract debido a las corrientes ligeras e impetuosas. De los cuantos individos capturados en el Cañon de Cataract (1 adulto y varios juveniles) posiblemente serán remanentes de una población reportada del Lago Powell despues del apresamiento en 1960 (Colorado River Fishes Recovery Team 1979)

Los tamaños y las extensiones de cada población no se han confirmado, sin embargo, estudios con marcas indican que los individos de la población de Black Rocks restan dentro de 2-3 km del río. Extensiones similares se predecen para las otras tres poblaciones. Esta falta de movimiento extensivo puede ser funció de la habitat que parece ser unico, y se discutira en la sección siguiente.

PREFERENCIA GENERAL DE HABITAT

Las cuatro poblaciones reconocidas de G. cypha en la Región Alta del Río Colorado son distinctivamente asociadas con las áreas mas profundas y ligeras del río. En el Cañon de Debeque, por ejemplo, G. cypha se encuentra en área con profundidad promedia de 2.2 m y máxima de 4.9 m (Cuadro 1). Las poblaciones de Black Rocks y Westwater ocupan áreas muy similares en promedia (5.6 m) y máxima profundidad (18 m). La profundidad máxima encontrada es debajo del Rapid "Brown Betty" en el Cañon de Cataract, con profundidad máxima de 28.1 m y promedia de 15.2 m. Se capturaron "humpback chub" cerca de este área.

Figura 1. Distribución de Gila cypha (1-5 ⁘) dentro de la cuenca del Río Colorado (Colorado River Fishes Recovery Team 1979) y localidades especificas de cuatro poblaciones (①-④ ▨) en la Region Alta del Río Colorado encontradas por el Proyecto de Estudios Pesqueros del Río Colorado.

Cuadro 1. Profundidad* promedia y máxima asociada con cuatro poblaciones de Gila cypha en el Río Colorado Superior

Localidad (milla)	Profundidad Promedia (metros)	Profundidad Máxima (metros)
Cañon de Debeque (195)	2.2	4.9
Black Rocks (136)	5.6	18.9
Cañon de Westwater (122)	5.6	18.3
Cañon de Cataract (212)**	15.2	28.1

* medidas en Agosto y Septiembre despues del desaque; profundidad puede variar con estado de corriente

** millas río arriba de Lees Ferry; todas otras son millas rió arriba de la confluencia de los Ríos Verde y Colorado

Las profundidades máximas en Black Rocks, Westwater y Cataract representan las áreas mas profundas de la Región Alta del Río Colorado. Comparativamente, profundidad máxima en otras áreas del río en Agosto y Septiembre raramente exceden 4 o 5 m.

Gila cypha tambien parece que se encuentra en fondos especificos; rocas grandes y de forma iregular, y en áreas con peñascos precipicios. Las poblaciones en los Cañones de Debeque y Cataract, y parcialmente en Black Rocks son asociadas con rocas grandes. Este subsuelo en Black Rocks y Debeque es parte de la fundación del ferrocarril o la carretera que sique el rió. En Black Rocks y Westwater, el fondo es tipicamente de piedra negra y dura de "gneiss" con bolsas de cascajo y arena. G. cypha se asocia comunmente con las paredes precipicias de gneiss, especialmente donde depresiones forman cuartillos remolinos, y bolsillas.

Medidas de profundidad, velocidad y typo de fondo siempre son tomadas por este proyecto para cantificar los parámetros de habitat de G. cypha. Estos datos serán incorporados en los métodos del Grupo Occidental De Usos De Energía Y Terreno (Western Energy and Land Use Team) para determinar el flujo de aquas que requieren los peces de este especie.

SISTEMÁTICA

Actualmente, hay muchas preguntas sobre las características de los especies G. cypha, G. elegans y G. robusta. Aunque los ictiólogos de sistemática, generalmente, estan de acuerdo en que las tres son formas separadas, una delineación clara de la extensión de variación requiere mas análises. Variaciones de dimorfísmo de sexo, diferencias geográficas y alométricas, y requerimientos de habitat no son distincas par cada especie (Suttkus and Clemmer, 1977).

Aunque las mayoría de Gila capturada en la Región Alta del Río Colorado son claramente robusta, elegans, o cypha, algunos individos exhiben facciones inmediatas. Este dilema sistemático y taxonómico representa mayor problema para los estudios campeños de este proyecto, particularmente desde que los peces no son comun (se prevene sacrificio de numeros suficientes par apropiados estudios taxonómicos) y desde que la identificación requiere documentación de la distribución de los especies y de los requerimientos de habitat.

Gila robusta, que es mas abundante y no está en peligro de extinción parece ser distincto especie en casi todas las áreas de la Región Alta del Río Colorado (Fig. 2), excepto donde vive en cohabitación con G. cypha. Aunque G. robusta raramente excede 300 mm longitud total (LT), un indivíduo de 486 mm LT se capturó en las áreas altas. Este especie, normalmente, exhibe boca terminal, espalda escamada, sin joroba, pedúnculo robusto, y generalmente 9 radios en la aleta dorsal y 9 en la aleta anal. Coloración es diverso, pero comunmente el vientre es blanca, los lados de color gris en plata, y la espalda verde. Esta coloración es acentada por el vientre color de naranja durante el desove en Junio y Julio.

El pez G. cypha, que está en peligro de extinción, es normalmente distincto (Fig. 3). Indivídos raramente exceden 370 mm LT, pero tamaño máximo era 392 mm LT. Este especie exhibe joraba precipitada en una espalda sin escamas, la cabeza achatada, el hocico grueso y sobresalido, la boca inferior, ojos pequeños aletas relativemente largas, y normalmente 9 radios en la aleta dorsal y 10 en la aleta anal. Coloración es constante; el vientre es blanco como de crema, los lados con rayas de amarillo y verde, y la espalda de color plata en verde. Indivídos en el desova en Junio tienen el vientre de color naranja.

No se encontró G. elegans, ni de cepa pura, variante parecido, o híbrido, en la Región Alta del Río Colorado durante este estudio. Este especie se caracteriza por la boca terminal, un pedúnculo caudal muy delgado, la ausencia de joroba, y normalmente 10 radios en la aleta dorsal y 10 en la aleta anal. (Fig. 4). El color es gris en plata y mas oscuro dorsalmente.

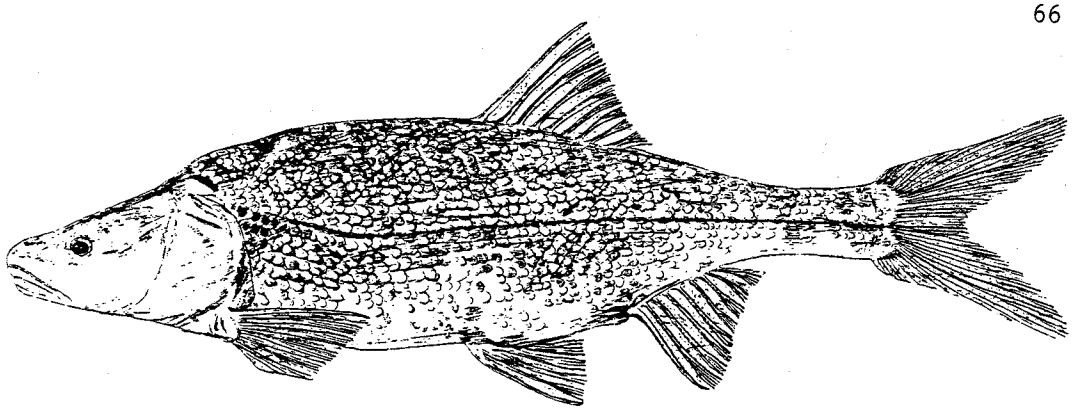

Figura 2. Gila robusta capturada el 9 de Octubre, 1979, en el Cañon de Westwater, milla 120.5, del Río Colorado Alto. Macho, 274 mm, 218 g.

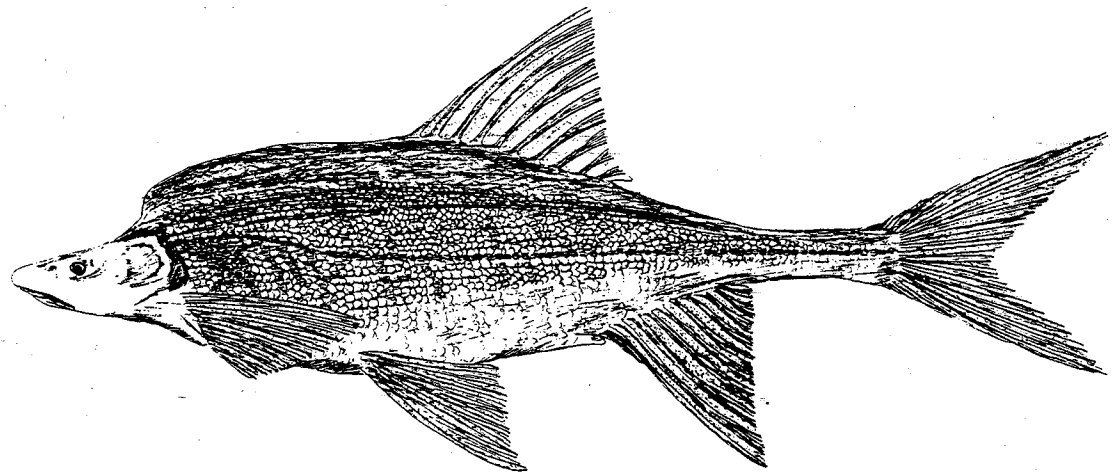

Figura 3. Gila cypha capturada el 9 de Octurbre, 1979, en el Cañon de Westwater, milla 120.5, del Río Colorado Alto. Embra, 366 mm, 384 g.

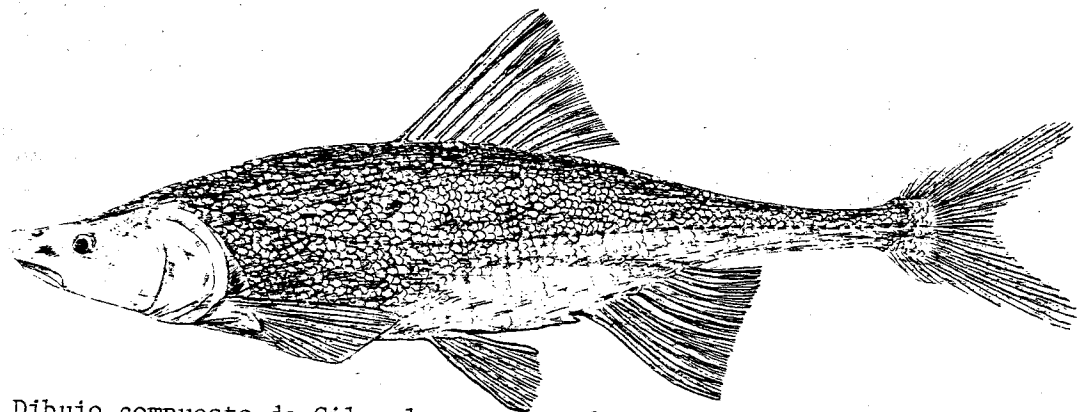

Figura 4. Dibujo compuesto de Gila elegans, basado en photographias y otros dibujos (Dibujos por Jean Bramsteadt).

A veces, es dificil identificar en el campo los adultos de Gila que exhiben facciones intermedias entre G. cypha y G. robusta: por ejemplo: una joroba moderada con esparcido de escamas, la boca entre terminal y inferior, el color y cuenta de radios en las aletas variados. Este problema se intensifica con la identificación de larvas y juveniles.

Así, es que varios metodos se emplean en este proyecto para facilitar la identificación en el campo.

1. examinar la morfología general
2. enumerar los radios en las aletas dorsal y anal
3. medir la profundidad de la joroba
4. analises intensivos de taxonomía

Morfología General

Debido a que las medidas especificas anotómicas y merísticas en peces vivos son imposible en el campo, una examinación de facciones generales es esencial para la identificación a tiempo de captura o despues cuando comparado con datos de otros peces. La morfología de G. cypha y G. robusta, como se describió antes, fue examinada para aclarar la semejanze de los individos y los tipos morfológicos.

Enumeración de Radios de Las Aletas Dorsal y Anal

Una característica empleada frequentemente par distinguir G. cypha de G. robusta es la presencia de 9 radios en la aleta dorsal y 10 en la aleta anal en el interior, y 9 radios en la aleta dorsal 9 en la aleta anal en el posterior (Holden and Stalnaker 1970, Minkley 1973). Estos estudios y otros (Suttkus and Clemmer 1977) han revelado gran variación en esta característica entre peces distinctamente G. cypha. Los primeros resultados de los datos de este proyecto confirman esta variación en radios de las aletas. Variaciones entre individos del mismo área y entre individos de áreas separadas indican que cuentas de los radios de las aletas dorsal y anal no parecen ser característico seguro y correcto para distinguir G. cypha de G. robusta.

Profundidad de la Joroba

Se ha sugerido que el desarollo de la joroba es manera efectiva para destinguir adultos de los tres peces Gila del Río Colorado (Smith, Miller, and Sable 1979). Este método provee una medida - directa y repetible, con exactitud a 0.1 mm - del desarollo de la joroba en asociación con la superficie dorsal diprimida del cráneo.

Se emplea la relación que se derive de la medida de la profundidad de la depresion frontal sobre la parte dorsal del cráneo (distancia máxima entre una linea directa del plano del punto superior de la joroba y el punto dorsal del hocico; y la superficie dorsal del cráneo) dividida la distancia entre la inserción de las aletas pectorales y pélvicas.

Este método se usa por este proyecto en individos distinctivamente G. cypha y G. robusta, y tambien en los individos con variación y los híbridos. Generalmente, las relaciones medidas por Smith, Miller, y Sable (1979) concordan con esas computadas preliminarmente para individos de tres de las cuatro poblaciones del Río Colorado Superior (Black Rocks, Westwater, y Cataract). Medidas en los individos de la población de Debeque, generalmente, quedan fuera de las relaciones establecidas para G. cypha.

Analises Taxonómicos

Estudios de taxomonía y sistemática continuan en los jovenes, juveniles, y adultos de G. cypha, robusta, y elegans. Analises de los jovenes y juveniles se dirigen por el Dr. Daryll Snyder en el Labratorio de Larvas de Peces (Larval Fishes Laboratory) en Fort Collins, Colorado. El producto de su trabajo será un guía para las larvas de los peces del Río Colorado. Los adultos son examinados por los Drs. Royal Suttkus y Glenn Clemmer en asociación con el Centro de Investigaciones de Vida Silvestre (Denver Wildlife Research Center) del Servicio de Pesca y Vida Silvestre de los Estados Unidos. Drs. Suttkus y Clemmer estan examinando ejemplares de colecciones encontradas tanto en lo pasado como en lo presente para establecer la variación exhibida por cada de las tres formas de Gila.

SUMARIO

El "humpback chub" de la Región Alta del Río Colorado se halla en cuatro areas (1) Cañon de Debeque, Colorado (falta verificar la identidad) (2) Black Rocks, Colorado (3) Cañon de Westwater, Utah, y (4) Cañon de Cataract, Utah. Los estudios presentes del Proyecto de Estudios Pesqueros del Río Colorado estan planeados para declarar los requerimientos de habitat del especie y eventualmente el flujo de aqua necesario para su existencia en el Río Colorado.

Borax Lake Chub:
Review of Recent Events

Neil B. Armantrout

Desert Fishes Council
November, 1980

Borax Lake is a 10.2 acre lake located in the Alvord Basin, Harney County, of southeastern Oregon. The lake is fed by a combination of hot and cool springs. Mineral deposits from the spring waters have formed a cone, containing the lake, that rises nearly 30 feet above the surrounding valley floor. As a result of the hot springs feeding the lake, the water in the lake remains warm year-round, with water temperatures in the lake commonly approaching 90°F. Historically the flow from the lake ran southwest into a large depression called Lower Borax Lake, and from there into a marshy area running northward towards Alvord Lake.

The Borax Lake Chub was recently described (Williams and Bond, 1980) as a new species, Gila boraxobius. It is a dwarf relative of Gila alvordensis, the Alvord chub, found at other locations in the Alvord Basin. The Borax Lake Chub is restricted presently to Borax Lake, although it also lived historically in Lower Borax Lake. The biology of the Borax Lake Chub and its habitat have been discussed extensively by Jack Williams (1980) in his doctoral dissertation.

Borax Lake is located in the Alvord Known Geothermal Resources Areas (KGRA). Portions of the Alvord KGRA have been leased for geothermal exploration in recent years. The portion containing Borax Lake was offered for bids in January, 1980, but the offer was withdrawn when sealed bids were inadvertently opened too early. The Borax Lake parcel was again offered for bids in April, 1980. High bidder was Anadarko Company; bids were accepted by May 16, 1980. An emergency listing of the Borax Lake Chub on May 28th delayed issuance of the leases.

The emergency listing of the Borax Lake Chub as an endangered species was based upon the proposed geothermal leasing and the threat of lake drawdown resulting from holes chipped around the edge of the lake that were draining water through 10 to 15 holes along the northern, eastern and southern edge (FR, 1980).

The lake itself is not actually on public lands. The 80 acres on which Borax Lake sits is private land already under lease to Getty Oil Corporation. Lower Borax Lake and other lands around the private parcel are administered by BLM. The emergency listing included these lands, in a mile buffer around the lake, as critical habitat.

On July 3 the BLM requested formal consultation under Section 7 of the Endangered Species Act. A meeting was held on September 23, attended by BLM and FWS personnel, plus personnel from several state agencies, other federal agencies, interested private corporations, and university personnel. General agreement was reached on measures that would protect the habitat of the Borax

Lake Chub and still permit evaluation of the geothermal resources on lands adjacent to Borax Lake. This information, which would define the size, extent and type of aquifers in the area, would be of interest also to biologists in future management recommendations for the area.

On October 10, a formal, jeopardy opinion was issued by the FWS. The opinion requested several stipulations be included in the leases before issuance. Basically, the three stipulations are:

1). Provide for a monitoring program on the quantity and quality of water in Borax Lake;
2). Maintain a half-mile buffer around Borax Lake and the hot springs just to the north on which no surface occupancy or disturbance will be permitted;
3). Provide for an emergency cessation of drilling activity in an area three miles around Borax Lake.

At this time, Anadarko and BLM have agreed to including these stipulations.

On October 21, Art Oakley and myself of the Oregon State Office visited Borax Lake. At that time most of the holes that had been chipped around the edge were not flowing; either they had been plugged or vegetative growth had nearly stopped outflow. Two channels, one to the east and one to the north, continued to flow out of the lake; both had flows in excess of 1-2 cfs. A small amount of flow ran out the natural channel to the southwest but was quickly lost in the vegetation.

We found abundant populations of small fish, but very few larger fish. The small fish were in schools of a few individuals to a hundred or more, and were concentrated on the shelf area close to shore on the west edge of the lake. This area has a good vegetative cover and is protected from the winds that were blowing. We also found some fish that had left the lake via the two outflow channels to the north and east, but were not more than 15 meters from the lake. They did not go any further than the point where the water began to spread through the vegetation. We had received a report of fish in the valley floor to the east but found no water reaching that area and no fish.

The interest in the area was evident from the extensive vehicle and foot traffic that has been in the area.

The final consultation was received in mid-November, with leases issued containing the requested stipulations. Monitoring of the area will continue during the exploratory phase by FWS and USGS.

Williams, J. E. 1980. Systematics and Ecology of Chubs (Gila: Cyprinidae) of the Alvord Basin, Oregon and Nevada. PhD Thesis, OSU, 175pp.

Williams, J. E. and C. E. Bond, 1980. Gila boraxobius, a New Species of Cyprinid Fish from Southeastern Oregon with a Comparison to G. alvordensis Hubbs and Miller. Proc. Biol. Soc. Wash. 93(2):291-298.

BIOLOGIA PESQUERA DEL ROBALO MICROPTERUS SALMOIDES EN LA PRESA VENUSTIANO CARRANZA, N DE COAHUILA, MEXICO.

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El presente trabajo se realiza en la Presa Venustiano Carranza, conocida también como "Don Martín". Se localiza en el Municipio de Juárez, al N del Estado de Coahuila, México.

Es de vital importancia la realización de éste estudio, dado que ésta especie forma parte de la dieta alimenticia del hombre, y además es apreciada gandemente por los deportistas, haciendose necesario el estudio de su biologia.

Se pretende encontrar lo siguiente:

1).- Distribución Local
2).- Determinación del Habitat
3).- Factores Fisico-Químico que Afectan su Distribución
4).- Preferencia en su Alimentación
5).- Establecer el Nivel Trófico de las Especies Utilizadas Como Alimento
6).- Determinar Período del Crecimiento
7).- Epoca de Reproducción

Una vez determinado lo anterior podrán diseñarse las medidas para un adecuado y mejor aprovechamiento de éste recurso, considerando que la economía de los habitantes del pueblo de Don Martín, se basa principalmente en la pesca comercial efectuada en la Presa Venustiano Carranza.

BIOLOGY OF THE LARGEMOUTH BLACK BASS (MICROPTERUS SALMOIDES) IN THE VENUSTIANO CARRANZA RESERVOIR, NORTH OF COAHUILA, MEXICO.

This study will take place in the Venustiano Carranza Reservoir, known also as "Don Martin." It is located in the municipality of Juarez, to the north of the state of Coahuila, Mexico.

It is of vital importance that this study be fulfilled, given that this species forms part of the diet of the people, and moreover is widely popular as a game fish, necessitating a study of its biology.

The following are expected from this study:

1) Local distribution
2) Determination of habitat
3) Physico-chemical factors that affect its distribution
4) Feeding preference
5) Establish the trophic levels of the species used as food
6) Determine the growth period
7) Reproductive season

Once the above are determined, it will be possible to design parameters for an adequate and better use of this resource, considering that the economy of the inhabitants of the town of Don Martin is based principally in the commercial fishery of the Venustiano Carranza Reservoir.

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REINTERPRETATION OF *NOTROPIS SIMUS* FROM THE RIO GRANDE DRAINAGE IN MEXICO, NEW MEXICO AND TEXAS

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and

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Abstract

Notropis simus was described in 1875 from the Rio Grande at San Ildefonso (ca. 40 km NW Santa Fe), New Mexico. *Notropis orca* was described in 1894 from the Rio Grande at El Paso, Texas. Despite the former distributions and abundances of these nominal taxa, they were not studied critically until recently. Our investigations have led to the conclusions that: (1) both species are valid; (2) *N. simus* and *N. orca* were sympatric in the Rio Grande above El Paso/ Cd. Juarez; (3) hybrids between these species have been identified from three locations (the oldest collection dating 1891); (4) *N. simus* is not known below El Paso/Cd. Juarez, but *N. orca* has been collected downstream as far as the mouth of the Rio Grande at Boca Chica, Texas; (5) the "Pecos shiner" is a new subspecies of *N. simus*; (6) *N. simus* was last collected by R.D. Suttkus in 1964 near Peña Blanca, New Mexico; and (7) *N. orca* was last collected by S. Contreras-Balderas in 1975 near Ciudad Díaz Ordaz, Tamaulipas.

In the Rio Grande, proper, these species can be distinguished by the following characters: *N. orca* usually has 8 anal-fin rays versus usually 9 or more in *N. simus*; usually 38 total vertebrae versus 36-37 vertebrae; 15 or more precaudal vertebrae versus 14 or less; 33-38 gill rakers (sum of three arches) versus 25-30. The formula for pharyngeal teeth is 2,4-4,2 in *N. orca* versus 0,4-4,0, 1,4-4,1 or 2,4-4,2 in *N. simus*. *N. orca* and *N. simus* are endangered species.

REINTERPRETACION DE *NOTROPIS SIMUS* DE LA CUENCA DEL RIO BRAVO EN MEXICO, NUEVO MEXICO, Y TEXAS

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y

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Resumen

Notropis simus se describió en 1875 del Río Bravo (Rio Grande) cerca de Santa Fe, Nuevo México. *Notropis orca* se describió en 1894 del Río Bravo en El Paso, Texas. A pesar de la distribución extensa y la anterior abundancia de estas especies nominales, no he habido ningún estudio crítico de su taxonomía hasta agosto, 1980. Durante dos semanas de trabajo intenso, determinamos que: (1) las dos especies son válidas; (2) son simpátricas al norte de Ciudad Juárez, Chihuahua; (3) hibridos se encuentran de tres localidades del alto Río Bravo (desde la colección de 1891); (4) no hay ningunas colecciones de *N. simus* abajo de Ciudad Juárez, pero *N. orca* se distribue hasta la desembocadura del Río Bravo; (5) el "Pecos shiner" es una nueva subespecie de *N. simus*; (6) *N. simus* fue coleccionado por última vez por R. D. Suttkus y sus estudiantes en 1964 cerca de la localidad típica; y (7) *N. orca* fue coleccionado por última vez por Salvador Contreras B. y otros en 1975 del Río Bravo, 4 kilómetros abajo de Ciudad Díaz Ordaz, Tamaulipas.

In el Río Bravo mismo, las dos especies se separan por los caracteres merísticos y morfométricos: *N. orca* tiene usualmente 38 vértebras (total) contra 36-37 vértebras por *N. simus*; 15 or más vértebras precaudales contra 14 or menos; 33-38 branquispinas (total de tres arcos branquiales) contra 25-30. La fórmula de dientes faríngicos es 2,4-4,2 en *N. orca* contra 0,4-4,0, 1,4-4,1 or 2,4-4,2 en *N. simus*. *N. orca* y *N. simus* son especies amenazadas.

ELIMINATION OF A GILA TOPMINNOW (*Poeciliopsis o. occidentalis*, Poeciliidae) POPULATION AND OTHER IMPACTS OF FLOODING IN A SONORAN DESERT STREAM

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ABSTRACT. Tule Creek is an intermittent stream draining Sonoran desertscrub in Yavapai Co., Arizona. An 800 m segment has perennial surface discharge, and was the site of a ciénaga community dominated by *Scirpus olneyi* and *Anemopsis californica*. Extensive flooding in winter 1978 had the following immediate impacts on the system: 1) an introduced population of Gila topminnow (*Poeciliopsis o. occidentalis*) was destroyed; 2) substrate erosion and entrainment removed vegetation, reduced number of pools, straightened and deepened the channel; and 3) canyon treefrog (*Hyla arenicolor*) and saltcedar (*Tamerix chinensis*) were introduced.

LA ELIMINACION DE UNA POBLACION DE GILA TOPMINNOW (*Poeciliopsis o. occidentalis*) Y OTROS IMPACTOS DE INUNDACION EN UN ARROYO DEL DESIERTO SONORIENSE

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Resumen: 'Tule Creek' es un arroyo intermitente que desagua matorral desertico en el condado Yavapai en Arizona. Una sección de 800 m tiene agua superficial perenne y era sitio de una ciénega dominada por *Scirpus olneyi* y *Anemopsis californica*. Inundación extensiva en invierno de 1978 causó los siguientes impactos: 1) Se destruyó una población introducida de 'Gila Topminnow'; 2) La erosión del substrato y la atrincheramiento removaron la vegetación, redujaron el numero de charcos, enderezaron y profundizaron el canal; y 3) 'Canyon Treefrog' (*Hyla arenicolor*) y 'saltcedar' (*Tamerix chinensis*) invadieron la sistema.

ABSTRACT: STATUS OF THE WARNER SUCKER
(Catostomus warnerensis)

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The Warner sucker, once abundant in the Warner Valley, was reduced to remnant populations following development of irrigation systems in the valley. Diversion dams and ditches disrupted natural waterways, preventing access to spawning grounds and diverting fish down irrigation ditches. Although rare 20 years ago and not numerous now the species retains a wide distribution in the valley and at least 4 separate spawning populations so that single deleterious events should not wipe out all spawners. The life span is at least 9 years and maturity is reached in 3 years so that each year class has a long reproductive life. The greatest threat to the species is irrigation structures and artificial waterways, but the introduction of centrarchids and ictalurids constitutes a threat. We recommend that the species be listed as threatened, that additional study on distribution be done, that critical habitat be identified and protected, and that laws and regulations governing water use and fish life be enforced.

DISTRIBUTION AND FOOD HABITS OF LEAST CHUB (*Iotichthys phlegethontis*) IN A SPRING-MARSH COMPLEX IN WESTERN UTAH

Distribution and food habits of least and Utah chubs were examined in Leland Harris Springs monthly from June through September. Fish utilized marsh areas but concentrated in springheads during periods of environmental extremes. Stomach analysis indicated zooplankton to be at least seasonally important dietary component.

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Distribucion y habitos alimenticios del cacho menor (Iotichthys phlegethontis) en un complejo de manantial-cienaga

Distribucion y habitos alimenticios del cacho menor y del cacho de Utah fueron examinados mensualmente en el manantial Leland Harris de Junio a Septiembre. Los peces utilizaron las areas cenagosas pero se concentraban en las fuentes durante periodos de extremos ambientales. Analisis estomacales indicaron que zooplankton es un componente importante, por lo menos estacionalmente.

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EFFECTS OF THE LOW FLOW ON WOUNDFIN IN THE VIRGIN RIVER

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The record low flow in Virgin River of Utah, Arizona and Nevada adversely affected reproduction and survival of woundfin throughout the river. The adverse effects differed in different sections of the river, but were evident through 1980. Most severly affected were woundfin living in the more heavily impacted sections below major irrigation diversions at Washington, Utah and Mesquite, Nevada. Spawning was not successful here in 1977 and adult mortality was high. Good reproduction with reestablishment of normal population densities did not occur until the summer of 1980 in spite of a return of normal to above normal flows in 1978, '79 and '80. Next most heavily impacted was the population in the upper mainstream between La Verkin Springs and Washington Diversion. Here reproduction was very poor in 1977, but adult mortality was less severe. The poor 1977 year class produced a poor hatch in 1979 which in combination with the normal mortality of older fish resulted in an unusually low population of woundfin in winter 1979-80. The woundfin population living in the section of Virgin River from Mesquite Diversion upstream to the Virgin River Gorge was affected the least by the low flows of 1977. A reduced reproductive success here in 1977 also produced a smaller brood stock for 1979. While reproduction in 1979 was somewhat less affected, an analysis of population structure demonstrated that young-of-the-year woundfin failed to dominate the population in fall 1979 as would normally be expected. These data demonstrated that mean flows in Virgin River during, April, May and June of 90-94 cfs coincided with poor reproduction of woundfin. Reproductive success however, differed in different segments of the river. On the other hand, mean flows in April-June in excess of 450 cfs coincide with good reproductive success, provided an adequate brood stock is available in the population. The differential reproductive success at 90-94 cfs suggests that conditions may be generally favorable for reproduction at only slightly higher flows. Undoubtedly, factors other than flow can also influence reproductive success. Critical flow requirements however, clearly appear to fall somewhere between 90 and 450 cfs.

EFFECTOS DEL BAJO CAUDAL SOBRE EL WOUNDFIN EN EL VIRGIN RIVER

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El bajísimo caudal del Virgin River en Utah, Arizona y Nevada ha afectado de una manera adversa a la reproducción del "Woundin" y a su supervivencia a lo largo del río. Los efectos adversos fueron diferentes en las diferentes secciones del río pero fueron evidentes a lo largode 1980. Los mas severamente afectados fueron los woundfin que viven en las zonas mas impactadas por las grandes desviaciones de riegoe en Washington, Utah y Mesquite, Nevada. La fecundación no tuvo éxito allí en 1977 y la mortalidad adulta fue alta. A pesar de la vuelta a caudales normales e incluso por encima de lo normal en 1978, 79 y 80, el restablecimiento de unas densidades nor ales de población y una buena reproducción no ocurrieron nasta el verano de 1980. La siguiente población más afectada fue la de la parte alta del curso del río entre La Verkin Springs y Washington Diversion. Aquí la reproducción fue muy pobre en el 77 pero la mortalidad adulta fue menos severa. El año 1977 que fue muy pobre, tuvo como consecuencia un desove también muy pobre en el 79 que, combinado con la mortalidad normal de los peces más viejos, dió como resultado una anoemal baja de población de woundfin en el invierno de 1979-80. La población de woundfin que vive en la sección del Virgin River que abarca desde Mesquite Diversion río arriba hasta la Virgin River Gorge fue menos afectada por los bajos caucales del 77. Aquí, un reducido éxito reproductivo en 1977 produjo una reducción de las crías en 1979. Mientras que la reproducción se vio, en cierto modo, menos afectada en 1979, un análisis de la estructura de la población demostró que los nacidos ese año no dominaron la población en el otoño de 1979 como podría esperarse en casos normales. Estos datos demostraron que los bajos caudales en el Virgin River durante los meses de abril, mayo y junio, de 90 a 94 pies cúbicos por segundo, coincidiero con una pobre reproducción de woundfin. Sinembargo el éxito en la reproducción difiere en los diferentes segmentos del río. Por otra parte, el reducido caudal de abril a junio cuando sobre asa los 450 pies cúbicos por segundo coincide con buenos éxitos reproductivos cado que la población dispone de una adecuada reserva de crías. Otros factores diferentes al caudal pueden afectar al éxito de la reproducción. Sin embargo, el caudal crítico necesario parece caer claramente entre los 90 y los 450 pies cúbicos por segundo.

BIOLOGIA PESQUERA DE LOS ICTALURIDOS EN LA PRESA VICENTE GUERRERO (LAS ADJUNTAS), TAMAULIPAS, MEXICO.

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Resúmen de Proyecto

Este trabajo se está realizando en la Presa Vicente Gue--- rrero, embalse situado en la cuenca del río Soto La Marina, a unos 60 kilómetros al noreste de Cd. Victoria, Tamaulipas, - México. Dada la importancia comercial y deportiva que tienen - los bagres de la localidad, se ve la necesidad de realizar un trabajo de tipo biológico pesquero para que su explotación - sea racional.

Los objetivos que se persiguen son conocer por medio de - un ciclo anual de colectas, la taxonomía, alimentación, edad, parámetros de crecimiento, reproducción y mortalidad por pesca, de tres especies de ictalúridos existentes. Además, se tratará de evaluar el efecto de los siguientes parámetros físico-químicos sobre estos peces: temperatura, penetrancia de luz, pH, oxígeno disuelto, bióxido de carbono disuelto, alcalinidad y salinidad. El material biólogico se obtiene por medio de redes agalleras experimentales, trasmallos y palangres. Las muestras de agua - para el análisis físico-químico se obtendrán con una botella - Kemmerer y procesados según los métodos estándard para análisis de aguas y métodos recomendados por Lagler (1978). La penetrancia de luz se evaluará con un disco Secchi. El análisis sobre alimentación, edad, reproducción, parámetros de crecimiento y mortalidad por pesca se hará en base a métodos reseñados por - Lagler (1978), Jearld y Brown (1971), Jenkins (1956), Torres (1975) y otros.

BIOLOGY OF THE ICTALURIDS IN THE VICENTE GUERRERO RESERVOIR (LAS ADJUNTAS), TAMAULIPAS, MEXICO.

This study is being made in the Vicente Guerrero Reservoir, situated in the basin of the Soto La Marina River 60 kilometers northeast of Victoria, Tamaulipas, Mexico. Given the commercial and sporting value that the fishes of the area have, one sees the necessity of a biological fish study in order that their exploitation be a rational one.

The objectives that the study will pursue are to find, by means of an annual schedule of collections, the taxonomy, feeding, age, growth parameters, reproduction and fishing mortality of three existing species of ictalurids. Moreover, an evaluation of the effect of the following physico-chemical parameters upon these fishes will be attempted: temperature, light penetration, pH, dissolved oxygen, dissolved CO_2, alkalinity, and salinity. The biological material will be obtained by way of experimental gill nets, trammel nets and drop lines. The water samples for the physico-chemical analysis will be obtained with a Kemmerer bottle and processed according to standard water analysis methods along with methods recommended by Lagler (1978). The light penetration will be evaluated with a Secchi disc. The analysis of food, age, reproduction, growth parameters, and fishing mortality will be based on methods described by Lagler (1978), Jearld and Brown (1971), Jenkins (1956), Torres (1975), and others.

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Datos Biológico-Pesqueros de la "Cuchilla", Dorosoma cepedianum (Le Sueur) Clupeiformes, en la Presa Vicente Guerrero, Tamaulipas, México (Pisces:Clupeidae).

RESUMEN:

La "Cuchilla", Dorosoma cepedianum (Le Sueur) es un pez abundante en la Presa Vicente Guerrero, localizada en el Municipio de Padilla a 60 km. al NE. de Ciudad Victoria, Tamaulipas, México, teniendo como coordenadas: 24°00' latitud Norte 98°13' de longitud Este.

En México no se conocen trabajos publicados sobre la biología pesquera de Dorosoma cepedianum, a pesar de su abundancia en todo el NE. del País. Otro aspecto dentro de su importancia es el lugar que ocupa la especie en el segundo nivel trófico, considerando que es de tipo - filtrador.

Los objetivos que se pretenden en éste estudio son los siguientes: 1) Taxonomía , 2) Distribución, 3) Alimentación, 4) Crecimiento, 5) Reproducción, 6) Determinar algunos parámetros que determinen la composición de la Población.

Se efectuarán como mínimo 15 colectas, con una frecuencia aproximada de cada 30 días y con una duración de 3 días cada colecta.

Las características taxonómicas se basarán en Hubbs y Lagler (1964), Trautman (1957) y Miller (1966). Para análisis alimenticio y crecimiento se usarán métodos y fórmulas recomendadas por Lagler (1978), y para etapa reproductiva por Solórzano (1961) y Lagler (1978).

BIOLOGICAL FISHERY DATA OF THE CUCHILLA, DOROSOMA CEPEDIANUM (LE SUEUR) CLUPEIFORMES, IN THE VICENTE GUERRERO RESERVOIR, TAMAULIPAS, MEXICO. (PISCES: CLUPEIDAE)

The "Cuchilla," Dorosoma cepedianum (Le Sueur) is a common fish in the Vicente Guerrero Reservoir located in the municipality of Padilla, 60 kilometers (40 miles) to the northeast of Ciudad Victoria, Tamaulipas, Mexico, having as coordinates 24°00' north latitude, and 98°13' east longitude.

In Mexico there are no known published works on the fishery biology of Dorosoma cepedianum in spite of its abundance in all of the northeastern section of the country. Another aspect of its importance is the place the species occupies in the second trophic level, considering that it is of a filtrator type.

The objectives of the study follow: 1) Taxonomy, 2) Distribution, 3) Feeding, 4) Growth, 5) Reproduction, and 6) To determine the composition of the population.

There will be a minimum of 15 collections with a monthly frequency, each collection lasting 3 days.

The taxonomic characteristics will be based on Hubbs and Lagler (1964), Trautman (1957), and Miller (1966). For feeding and growth analysis, the methods and formulas recommended by Lagler (1978) will be used, and for the reproductive stage, Salorzano (1961) and Lagler (1978).

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CONTRIBUCION AL CONOCIMIENTO DE LA BIOLOGIA DE LA CUCHILLA, *Dorosoma cepedianum* (LeSueur), EN LA PRESA DE AGUALEGUAS, MUNICIPIO DE AGUALEGUAS N.L., MEXICO.

Es de importancia administrativa pesquera, inferir sobre la posición que ocupa *D. cepedianum* en la presa, puesto que a está especie se la ha conciderade como usurpadora de nutrientes y espacio de algunos centrarchidos. En el presente plan se estudiará la bionómia y desarrolle, así como también se mediran algunos parámetros fisicoquímicos (pH, temp. del agua y del aire, O_2 disuelto y salinidad). Tales mediciones se analizarán por medio de modelos estadísticos de correlación y regresión. También se observarán relaciones recíprocas entre especies.

El material se colectará durante el ciclo de Feb. de 1981 a Feb. de 1982, utilizandose redes experimentales de 1", 2", 3" y 4", y chinchorros manuales.

No existe ningún antecedente biológico en la presa, por lo que éste estudio representará el primer trabajo sobre éste tópico.

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CONTRIBUTION TO THE KNOWLEDGE OF THE BIOLOGY OF THE CUCHILLA (DOROSOMA CEPEDIANUM LE SUEUR) IN THE AGUALEGUAS RESERVOIR, MUNICIPALITY OF AGUALEGUAS, NUEVO LEON, MEXICO.

It is important to fishery administration to study the role that D. cepedianum occupies in the reservoir, in view of the fact that this species has been considered an usurper of nutrients and living space of various centrarchids. In this project the bionomics and development will be studied along with the measurement of various physico-chemical parameters (pH, temperature of water and air, dissolved oxygen, and salinity). These measurements will be analyzed by way of statistical models of correlation and regression. Interspecific reciprocal relationships will also be studied.

The material will be collected between February of 1981 and February of 1982, utilizing experimental nets of 1, 2, 3, and 4 inches and manual dragnets.

There is no existing biological antecedent in the reservoir. Therefore, this study will represent the first work on the subject.

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CICLO VITAL Y ECOLOGIA DE PECES ENDEMICOS DE POTOSI N.L.

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RESUMEN DE PROYECTO

Actualmente se realizan estudios con dos Cyprinodóntidos Megupsilon aporus y Cyprinodon alvarezi endemicos y simpatricos -- en el manantial del ejido el Potosi, Galeana, N. L., especies que- se encuentran en la lista de especies en peligro y amenazadas de - extinción según varias Organizaciones Nacionales e Internacionales.

La situación actual de estos peces es crítica debido a - las condiciones de sequia y uso del agua para la agricultura. Las- especies están fuertemente amenazadas por la predacion de Robalo-- Micropterus salmoides.

En el presente trabajo se están investigando aspectos -- biologicos y datos ecológicos los cuales son básicos para intentar conservar y proteger a estas especies.

Los estudios que se están realizando son:

1) Ciclo del macho y de la hembra
2) Dimorfismo sexual
3) Dieta
4) Demografia
5) Parasitologia
6) Aspectos ecologicos

VITAL CYCLE AND ECOLOGY OF ENDEMIC FISHES OF POTOSI, NUEVO LEON.

At the present time there are studies of two cyprinodonts being carried on: Megupsilon aporus and Cyprinodon alvarezi, endemic and sympatric in the springs on public lands of Potosi, Galena, Nuevo Leon, species that are found on the endangered and threatened species lists of various national and international organizations.

The situation of these fishes is critical due to the conditions of drought and water use for agriculture. The species are strongly threatened by the predation of black bass, Micropterus salmoides.

In the present work, biological aspects and ecological data are being investigated, which are basic to the effort of trying to conserve and protect these species.

These studies are:

1) Male and female cycles.
2) Sexual dimorphism.
3) Diet.
4) Demography.
5) Parasitology.
6) Ecological aspects.

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Notes on the Distribution of Introduced Fishes in Pacific Drainages of Northwestern México

Recent fish collections have demonstrated that many exotic species have become established in the Pacific drainages of Northwestern México. Distributions of introduced species are discussed with comments relative to possible interactions with native faunas.

Notas Sobre la Distribución de Peces Introducidos en las Cuencas Pacíficas del Noroeste de México

Recientes colecciones de peces han destacado el hecho que muchas especies foráneas se han establecido en las cuencas pacíficas del Noroeste de México. Se discuten las distribuciones de las especies introducidas con comentario relativo a las interacciones posibles con faunas nativas.

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Discovery and Management of the Original Pyramid Lake Cutthroat Trout

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Abstract

In 1977, a pure population of the original strain of Pyramid Lake cutthroat trout, Salmo clarki henshawi (a federally threatened species), was discovered by the senior author in a small unnamed stream on the Pilot Peak range, Utah-Nevada. The Pyramid Lake cutthroat trout was the largest trout native to Western North America. The original strain of Pyramid Lake cutthroat trout were presumed extinct after the 1940's.

During the spring of 1980, 200 eggs were collected and transported from this unnamed stream to a federal fish hatchery, but no fish hatched successfully. Also during the spring of 1980, 18 trout were transplanted to a nearby creek, Bettridge Creek. Thus far the transplant is believed to have been a success.

Future management plans involve developing a broodstock of this Pyramid Lake strain and establishing new populations within its native range. Developing a broodstock will be difficult because of the low numbers of trout in this population. It is hopeful that the introduced population in Bettridge Creek will provide additional fish to work with.

Descubrimiento y Manejo de la Trucha Cutthroat original del Lago Pyramid

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Abstracto

En 1977 una poblacion pura de trucha cutthroat original, Salmo clarki henshawi (un especie federal amenazado) fué descubri por el autor mayor en un arroyo pequeño sin nombre en una cadena de montañas llamado Pilot Peak, en Utah-Nevada. La trucha cutthroat original del Lago Pyramid fué la trucha mas grande, nativo in Norte America del oeste. Se presumieron esta trucha extinto despues de 1940.

Durante la primavera de 1980, 200 huevos fueron recogidas y transportidos desde este arroyo sin nombre hasta un criar de pescado federal, pero ni un pescado se crió. Tambien durante esta misma primavera, 18 trucha fueron trasplantidos en un riachuelo cerca, llamado Bettridge Creek. Hasta ahora creen que la trasplantación tiene buen éxito.

Manejo futuro se envuelva el desenvolvimiento de un surtido-pollada de esta población del Lago Pyramid y el establecimiento de poblaciones nuevas dentro de ciertos limites nativos. El desenvolvimiento de un surtido-pollada estará dificile por esta poblacion. Está esperanzado que la población introducido en Bettridge Creek se suplira pescado adicional con que trabajar.

ABSTRACT

THE RESURRECTION OF SAN BERNARDINO

San Bernardino is a 2,432 acre ranch in southeastern Arizona. Several springs on the ranch once flowed into large cienegas and eventually into Black Draw, providing habitats for numerous aquatic and riparian species. Groundwater pumping for agriculture and the introduction of exotic fish species has nearly eliminated the Rio Yaqui fauna in the United States, and is jeopardizing several fish species in Mexico. Only two of six fish species native to San Bernardino still remain on the ranch.

In 1979, The Nature Conservancy purchased San Bernardino under an agreement with the U.S. Fish and Wildlife Service that will turn over control of the ranch to the Service in 1982. Specific plans are now being written for the spring, stream and cienega habitats in an attempt to restore these unique ecosystems. If successful, populations of Gila purpurea and Poeciliopsis occidentalis sonoriensis will be supplemented, and Catostomus bernardini, Ictalurus pricei, Notropis formosus mearnsi, and Campostoma ornatum will be returned to the ranch.

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ABSTRACTO

LA RESURRECCION DE SAN BERNARDINO

La hacienda de San Bernardino es una hacienda de aproximadamente 984 ha situado en el sureste del estado de Arizona (EE.UU. de America) en la frontera con los EE.UU. Mexicanos. Anteriormente varios ojos de agua desembocaron en cienegas grandes y, mas abajo, el flujo entraba al Barranca Negra. Este sistema aquatico proveia habitacion para especies aquaticas y riberenas numerosas. El uso del aqua subterraneo para riego y, ademas, la introduccion de peces exoticos casi han eliminado la fauna nativa de la parte norteamericana del Rio Yaqui. Semejantemente, varias especies estan amenazados en Mexico. Solamente dos de los seis especies de peces nativos ya permanecen en San Bernardino.

En 1979, The Nature Conservancy compro la hacienda en acuerdo con el Fish and Wildlife Service. En 1982, el Fish and Wildlife Service asumira control de la hacienda, y mientras tanto se estan preparando un plan para la restoracion y conservacion de los fuentes, rios y cienegas unicos. Si esos fuerzos tengan exito, se suplementara las poblaciones de Gila purpurea y Poeciliopsis occidentalis sonoriensis y, ademas, se revolvera las especies siguientes: Catostomus bernardini, Ictalurus pricei, Notropis formosus mearnsi, y Campostoma ornatum.

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Effect of Population Density on the Breeding System of Cyprinodon pecosensis

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ABSTRACT

Preliminary results of manipulations of population density and size of the habitat on the breeding system of pupfish (Cyprinodon pecosensis) indicate that male behavior changes significantly both quantitatively, and qualitatively.

At relatively high population densities and large population sizes males defend breeding territories, display a high frequency of agonstic behaviors and engage in an abbriviated courtship.

At relatively low population densities the pupfish breeding system consists in part of a dominance hierarchy and in part of lengthy male-female associations which could be described as consort pairs. At low densities courtship is prolonged, and is the most prominent male activity, while agonstic behavior is drastically reduced.

In an environment of small physical dimensions and high population density, but small population size, the breeding system is a dominance hierarchy, where one or two males defend most of the suitable breeding substrate and perform almost all of the spawnings.

The breeding systems of the experimental populations closely resemble those of natural populations in the springs of the Death Valley region of Nevada and California. Competitive pressures interact with environmental constraints to influence male behavior and determine the nature of the breeding system.

El Efecto de la Población Sobre el Sistema Matrimoniál de *Cyprinodon pecosensis*

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RESUMEN

Resultos preliminarios del efecto de manipulaciones sobre la densidad y la dimensión del medio ambiente de *Cyprinodon pecosensis* sobre su comportamiento matrimonial indican que el comportamiento de los machos cambia cualitivamente y cuantitativamente.

En altas densidades y en ambientes grandes los machos defienden territorios matrimoniales, muestran mucho antagonismo y cortejan poco.

En bajas densidades su sistema de comportamiento matrimoniál consiste de una jerarquía sociál en la cual machos y hembras se cortejan prolongadamente. El comportamiento principál de estos machos consiste en cortejar a las hembras y demuestran mucho menos antagonismo.

En medios pequeños con altas poblaciones los machos exhiben una jerarquía sociál en la cuál solamente uno o dos machos controlan la mayoría del substrato apto a la oviposición y efectuan la mayoría de las crianzas.

Los comportamientos matrimoniales de estas poblaciones experimentales son muy parecidas a los de poblaciones naturales en manantiales de la región de Death Valley en los estados de Nevada y California. El ambiente y la competición entre los machos constrenan al comportamiento de los machos y determinan al sistema matrimoniál de estas poblaciones.

BIOLOGICAL STATUS OF THE CICHLID FISHES OF CUATRO CIENEGAS

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Endemic populations of cichlid fishes in Cuatro Cienegas, Mexico occur in two discrete morphological forms. One form possesses slender papilliform pharyngeal teeth, relatively long intestine, and feeds predominantly on plants. The other form possesses massive pharyngeal teeth, a relatively short gut, and feeds primarily on snails. Experimentation and field observations of ecology and reproductive behavior completed in July 1980 unequivocably suggest that these fish are both forms of a single polymorphic species, Cichlasoma minckleyi. A sample of 20 reproductively active pairs exhibited random mating in situ. Progeny reared from in vitro fertilizations between and within tooth forms showed no differential post-zygotic mortality. Electrophoretic examination revealed crossfostering of alien fry in mother-offspring combinations and equal allele frequencies for polymorphic loci between tooth forms. Since field observations of feeding specificity and laboratory analyses of physiology, gut contents, and body morphology all emphasize major differences between morphs, the organization of genetic differences is of considerable interest. Genetic studies currently underway should provide insight into this general problem. The limited geographic distribution and small population sizes at most localities within the Cuatra Cienegas Basin warrant formal recognition of endangered status for this unique new species.

Supported by NSF DEB78-24074, Earthwatch, and The Center for Field Research of Belmont, Massachusetts.

ESTADO BIOLOGICO DE LOS PECES CICHLIDA DE CUATRO CIENEGAS

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Las poblaciones endémicas de los peces cichlida en Cuatro Cienegas, México, occurren en dos discretas formas morfológicas. Una forma posee los delgados dientes papilliforma y faraneales, un intestino bastante largo, y se alimenta mayormente de las plantas. La otra forma posee los dientes masivos y faraneales, un intestino bastante corto y se alimenta principalmente en caracoles. La experimentación y las observaciones en el campo de ecología y la conducta en la reproducción completados en julio, 1980, sugieren sin equivoco que ambos los peces son formas de un sólo especie polimorfológico, Cichlasoma minckleyi. Un ejemplo de veinte pares activos en la reproducción demostraron al azar el reproducirse in situ. La prole criada de fertilizaciones in vitro entre y dentro las formas dentales no demostraron ninguna mortalidad diferencial pos-zygótico. Una investigación electroforética reveló el compartir de la crianza de la prole de otros en las combinaciones de madre-prole y frecuencias iguales allele para loci polimórfico entre formas dentales. Desde que las observaciones en el campo de la especificidad de alimentación y los analises de laboratorio de la fisología, el contento de intestino y la morfología del cuerpo todas dan énfasis de las diferencias mayores entre morfos, la organización de las diferencias genésicas tiene interés. Los estudios genésicos adelantándose actualmente deben proveer conocimiento en este problema general. La limitada distribución geográfica y los tamanos de una población pequena a casi todas las localidades dentro del Valle de Cuatro Cienegas justifica el reconocimiento formal del estado comprometido de este nuevo especie singular.

Servicio de apoyo de NSF DEB78-24074, Guardia de la Tierra, y El Centro para Investigación en el Campo de Belmont, Massachusetts.

The Conservation of Mollusks in Mexico and the U.S.A.

By
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In the U.S.A. many conservation problems regarding freshwater mollusks have arisen due to lack of environmental planning of water projects. Extremely unique species have become extinct due to the lack of planning at both the national and local levels. Mexico has many unique aquatic ecosystems that will need protection during water development projects. Primary among these would be the Cuatro Cienegas Basin, Coahuila, Mexico. Preservation of molluscan species is necessary for at least three reasons:

1. As part of a total aquatic ecosystem, mollusks are an integral part.
2. Investigations by G.M. Davis have demonstrated the value of these living fossils in reconstructing plate tectonic movements and rates of speciation.
3. To protect these species for their own value.

Short-term preservation of these living fossils can be accomplished prior and during construction phases of these water projects through complete environmental planning. Long term goals are best accomplished through educational programs in schools and to the general public.

La Conservación de Moluscos en México y los Estados Unidos

por

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En los Estados Unidos muchos problemas de conservación sobre moluscos de agua dulce han surgido debido a la falta de planificación en el desarallo de proyectos de aqua. En casos extremos especies unicos se han extinguido debido a la falta de planeacion a los niveles, nacional y local. México tiene muchas sistemas aquáticas únicas que necesitarán protección durante proyectos de desarollo de aqua. Principal entre estas seria la Cuenca de Cuatro Cienegas, Coahuila, México. La preservación de especies de moluscos es necesaria por lo menos tres razones:

1. Moluscos forman una parte importante de la ecosistema acúatica completa.

2. Investigaciones por G. M. Davis han demostrado el valor de estos fósiles vivos en reconstrucción de movimientos tectonicos y epocas de evolución de las especies.

3. La conservación de estas especies es importante por su mismo valor y el valor de sus ambientes. Por falta de estudio, aun no sabemos el valor de la informacion que contienen estas especies y sus habitatos.

La meta inmediata debe ser la preservación de estos fósiles vivos la cual se puede cumplir a menudo facilmente con planificación antes y durante construcción en proyectos de desarrollo de aqua. La meta a largo plazo es fomento de programas educativos en la escuela y para el pueblo general.

BIOLOGIA PESQUERA DE Aplodinotus grunniens RAFINESQUE, EN LA PRESA VENUSTIANO CARRANZA, MUNICIPIO DE JUAREZ, COAHUILA, MEXICO.

RUBEN MARIO LOZANO-ESCAMILLA.
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El Besugo, Aplodinotus grunniens, es un pez de importancia comercial y deportiva, por lo que es necesario un estudio que pueda ayudar a su aprovechamiento racional, en la Presa Venustiano Carranza, Noreste de Coahuila, que tiene una capacidad de Un Millon Trescientos Ochenta y Cinco Mil Metros cúbicos.

Se realizarán un minimo de doce colectas, una cada mes, durante 1981, para conocer la distribución local, habitat, especies asociadas, contenido estomacal, variación estacional de la población, edad, relación longitud-peso, coeficiente de condición, maduréz y ciclo gonádico de Aplodinotus grunniens. En el lugar de captura se medirán algunos factores ambientales como: pH, Concentración de sales, Oxígeno disuelto, Bióxido de Carbono disuelto, temperatura, turbidéz, etc.

BIOLOGY OF APLODINOTUS GRUNNIENS RAFINESQUE, IN THE VENUSTIANO CARRANZA RESERVOIR, MUNICIPALITY OF JUAREZ, COAHUILA, MEXICO.

The red gilthead, Aplodinotus grunniens, is an important commercial and game fish. Therefore, a study is necessary that can help its rational development in the Venustiano Carranza Reservoir, northeast of Coahuila. The reservoir has a capacity of 1,385,000 cubic meters.

There will be a minimum of 12 collections, one each month during 1981, in order to find the local distribution, habitat, associated species, stomach contents, seasonal variation of the population, age, length-weight relationsip, condition factor, maturity and gonad cycle of Aplodinotus grunniens. At the sample site various environmental factors will be measured, such as pH, salt concentration, dissolved oxygen and carbon dioxide, temperatures, and turbidity.

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BIOLOGIA PESQUERA DE DOS ESPECIES EXOTICAS (Cyprinus carpio y Tilapia spp.) EN LA PRESA VENUSTIANO CARRANZA, JUAREZ, COAHUILA; MEXICO.

La Presa Venustiano Carranza tiene una capacidad de 1;385,000mt^3. Este estudio será de gran importancia para un mejor aprovechamiento de las especies, así como el conocer la relación que existe con el resto de las especies que habitan en la presa.

En el presente trabajo se estudiarán los siguientes aspectos:

Taxonomía.- En especial el género introducido Tilapia, ya que hay dudas sobre-la ó las especies que existen en la localidad.

Distribución Local.- Esta se obtendrá colectando en diferentes áreas de muestreo.

Hábitat.- Apreciar si tiene preferencia por uno, o si es de distribución general dentro de la presa.

Factores que Afectan su Distribución.- Se determinarán algunos factores físico-químicos del agua, de acuerdo a los métodos Stándar para análisis de agua.

Alimentación.- Se evaluará su dieta alimenticia, variación estacional cualitativa y cuantitativa, y ecología de la alimentación para generalizar si existe-interrelación con otras especies de peces.

Crecimiento.- Se tomarán en cuenta los siguientes aspectos: edad, longitud, peso, relación longitud-peso, coeficiente de condición para establecer las épocas de máximo aprovechamiento de las especies.

Reproducción.- Tomando en cuenta maduréz, ciclo gonádico y conteo ovárico, con el fin de conocer sus épocas de reproducción y desove, y poder preveer las vedas correctamente, si fuesen necesarias .

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Jorege Fernando Lozano Morales.

BIOLOGY OF TWO EXOTIC SPECIES (*Cyprinus carpio* and *Tilapia* spp.) IN THE VENUSTIANO CARRANZA RESERVOIR, JUAREZ, COAHUILA, MEXICO.

The Venustiano Carranza Reservoir has a capacity of 1,385,000 $m.^3$. This study will be of great importance in gaining better utilization of the species being studied, along with a better understanding of the relationships that exist among the remainder of the species inhabiting the reservoir.

In this study the following items will be examined:

Taxonomy - Especially the introduced genus *Tilapia*, now that there are doubts about the species that exist in the locality.

Local distribution - This information will be obtained by sampling different areas.

Habitat - Determine if the fish have a preference for one habitat, or if their distribution is general in the reservoir.

Factors that affect distribution - Various physico-chemical factors of the water will be measured, according to standard analytical methods.

Feeding - An evaluation will be made of the feeding habits, qualitative and quantitative seasonal variations, and feeding ecology to determine generally if there exists any interrelationship with other species of fish.

Growth - The following factors will be considered: age, length, weight, weight-length relationship, and condition factor to establish the times of maximum utilization of the species.

Reproduction - Taking into account maturity, gonad cycle and ovarian count, with the purpose of finding the time of reproduction and spawning, and to be able to implement correct fishing regulations if deemed necessary.

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ESTUDIO TAXONOMICO DISTRIBUCIONAL DE LOS PECES DEL ESTADO DE CHIAPAS, MEXICO.

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Se está realizando un trabajo de investigación sobre los Peces del Estado de Chiapas. Se inició en 1979 y su avance es del 50 %. Se tratará de obtener una lista de los peces existentes en el Estado y su distribución, así como establecer su posición taxonómica.

Considerando que actualmente el impacto ambiental causado por refinerías petroleras, construcción de presas, zonas ganaderas y de cultivo, puede ocasionar que gran cantidad de especies desaparezcan en el Estado de Chiapas, es necesario un inventario de la ictiofauna en general; además, tomando en cuenta que son pocos e incompletos los trabajos realizados en la región, éste estudio será una ayuda para trabajos posteriores y para fundamentar el uso de los recursos pesqueros.

Se han realizado 5 viajes en los que se ha colectado aproximadamente en 60 localidades diferentes, se tiene planeado llevar a cabo un viaje más en el mes de abril de 1981.

Se han revisado 11,790 ejemplares, los que corresponden a 3 expediciones y faltan por revisar 2. Se encontraron 42 especies ya descritas y además 3 posibles nuevas especies en: Astyanax, Cichlasoma y Gobionellus.

STUDY OF THE DISTRIBUTIONAL TAXONOMY OF THE FISHES OF THE STATE OF CHIAPAS, MEXICO

An investigation is being conducted of the fishes of the state of Chiapas. It began in 1979 and is at the present time half way completed. A list of the existing fishes and their distribution in the state, along with their taxonomic position, will be obtained.

Considering that the environmental impact caused by oil refineries, dam construction, grazing and agricultural zones can cause a great number of species to disappear in the state of Chiapas, it is necessary to make an inventory of the ichthyofauna in general. Also, taking into account that the previous studies made in the region are few and incomplete, this study will be of help for later research and to form a base for the use of the fishery resources.

Five trips have already been made, in which collections have been taken at approximately 60 different locations. One more trip is planned for the month of April, 1981.

A total of 11,790 samples, taken in the first three trips, have been examined. The samples of the last two trips have yet to be examined. We encountered 42 previously described species, along with three possible new species in: Astyanax, Cichlasoma and Gobionellus.

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MOVEMENT AND REPRODUCTION OF THE RAZORBACK SUCKER (XYRAUCHEN TEXANUS) INHABITING SENATOR WASH RESERVOIR, IMPERIAL COUNTY, CALIFORNIA

The movements of five adult razorback suckers within a reservoir of the Colorado River were monitored through two spawning periods from January to April, 1980 and 1981, using ultrasonic transmitters. Telemetry data indicated that razorback suckers congregated and spawned over two gravel areas in the littoral zone of the reservoir in 2-18 feet of water. Substrate samples analyzed from spawning sites at Senator Wash Reservoir and a third location on the Colorado River revealed similar geological and petrological composition. Observations of spawning behavior and inter-specific predation on eggs were made both from shore and underwater using SCUBA. Underwater photography was employed to document spawning habitat and behavioral observations. Eggs and larvae from both spawning areas at Senator Wash Reservoir were collected and photographed at various stages of development. One-hundred eggs were artificially reared to the larval stage and data were obtained on feeding and behavior. Possible reasons for lack of recruitment for this species in the lower Colorado River and the requirements necessary for successful reproduction to the larval stage are discussed.

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Current Status of Endangered Topminnows (Poeciliidae: *Poeciliopsis*) in Arizona

Populations of endangered topminnow (*Poeciliopsis occidentalis*) in Arizona were surveyed several times during 1979-1980. Previous data, and recent surveillance indicate further declines in topminnow distribution and abundance, resulting primarily from new introductions and expansion of already established populations of mosquitofish (*Gambusia affinis*). In December 1979, *Gambusia* were discovered for the first time on the San Bernardino Ranch (Rio Yaqui drainage), sympatric with *P. o. sonoriensis*. Mosquitofish were also found in northern Sonora in 1978 through 1980, the first known occurrences there. A similar invasion of the Bylas Springs populations of *P. o. occidentalis* was discovered in June 1980, and one of three populations in that system is essentially extirpated. Mosquitofish entered Sheehy Spring between March 1977 and December 1979, and those topminnow are now near extinction. Preliminary evidence strongly suggests that direct predation by *Gambusia* on juvenile and adult *Poeciliopsis* is the major mechanism of extirpation.

P. o. occidentalis at Cocio Wash are also nearly extinct, after invasion by green sunfish (*Lepomis cyanellus*). Other populations of topminnow have remained stable during the past year, but are constantly vulnerable to introduction of exotics, and its status in the United States, and perhaps eventually in Mexico, remains precarious at best.

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El Estado Actual de 'Topminnows' Amenazados (Poeciliidae: Poeciliopsis) en Arizona

Se examinaron varias veces durante 1979 - 1980 las poblaciones amenazadas de "topminnow" (Poeciliopsis occidentalis) en Arizona. Datos previos y recentes indican decrementos adicionales en la distribución y abundanza de "topminnow", como resulta principal de nuevos introducciones de "mosquitofish" (Gambusia affinis). En Diciembre 1979 se descubrió Gambusia por primera vez en Rancho San Bernardino (cuenca del río Yaqui), simpatrico con P. o. sonoriensis. Se halló "mosquitofish" tambien en el norte de Sonora en 1978 a 1980, los primeros hallazgos alla. Una invasión parecida de las poblaciones de P. o. occidentalis en el ojo de Bylas se descubrió en Junio 1980 y una de las tres poblaciones en esa sistema se ha extinguida esencialmente. "Mosquitofish" eutraron al ojo Sheehy entre Marzo 1977 y Diciembre 1979, y el "topminnow" alli y se acerca la extinción. Evidencia preliminar sugere fuertemente que la predación directa por Gambusia en adultos y juveniles de Poeciliopsis es el mecanismo mayor de la extinción.

Despues de la invasión de Arroyo Cocio por "Green sunfish" (Lepomis cyanellus), P. o. occidentalis alli esta tambien casi extinguido. Otras poblaciones de "topminnow" han permanecido estables durante el año pasado, pero estan constantamente vulnerable a la introducción de especies exóticas, y su estado en los Estado Unidos, y tal vez eventualmente en Mexico, queda precario a lo mejor.

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CHANGES IN THE CUATRO CIENEGAS BASIN, COAHUILA, MEXICO, 1958-79

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The Cuatro Cienegas basin, Coahuila, Mexico, has long been stable as evidenced by studies of fossil pollens and by a long list of special, endemic taxa of plants and animals. Man's activities in the last few centuries elicited major changes, especially in drainage relations, but observations over more than 20 years indicate maintenance of a remarkably high degree of continuity in certain habitats despite his modifications. Changes in selected habitats and stability of others are to be documented by paired photographs.

El bolsón de Cuatro Ciénegas, Coahuila, México, ha estado estable por muchos años como testificado por estudios de polen fosilífero y por una lista larga de taxa especiales de plantas y animales. Las actividades humanas durante pocos siglos pasados han producido cambios mayores, especialmente en las relaciones de las cuencas, pero observaciones por mas de 20 años indican mantenimiento marcado de un alto grado de continuidad en ciertos habitatos a pesar de estas modificaciones. Ambios en habitatos escojidos y estabilidad de otros se documentan por fotografías pareadas.

BIOLOGIA PESQUERA DE LOS ICTALURIDOS EN LA PRESA VENUSTIANA CARRANZA, JUAREZ, COAHUILA, MEXICO.

La Presa Venustiano Carranza se localiza entre los 27°24' y 27°38' de Latitud Norte, y los 100°35' y 100°48' de Longitud Oeste aproximadamente, en el municipio de Juárez, Coahuila, límites con el Estado de Nuevo León, México.

Las especies de Ictaluridos encontradas mediante colectas previas - en el lugar son: Ictalurus punctatus, Ictalurus furcatus y Pylodictis olivaris.

Anteriormente no se han realizado trabajos de éste tipo en la Presa Don Martín, por lo cual adquiere gran importancia estudiarla.

Estos peces son considerados como una de las más populares especies deportivas y comerciales. El estudio de éstas especies servirá para un mejor aprovechamiento de las mismas, evitando la pesca excesiva en cualquier época, principalmente durante los meses reproductivos de las especies.

Se determinará su distribución local, tomando en cuenta la preferencia de las especies por determinado habitat.

De acuerdo a la influencia de diversos factores, tanto biológicos como físico-químicos, se determinará el grado en que afectan la distribución, empleando para ésto métodos Stándard para análisis de agua. Dentro de los factores físico-químicos están: oxígeno disuelto, cloruros, CO_2, dureza, alkalinidad y pH.

Se analizarán los diversos artículos alimenticios, variación estacional cualitativa y cuantitativa, y ecología alimenticia.

Tomando en cuenta la edad, longitud, peso, relación longitud-peso, coeficiente de condición, se establecerá el crecimiento de las especies, así como las épocas de mayor aprovechamiento de las mismas.

Determinando el grádo de maduréz, ciclo gonádico y conteo ovárico, se establecerán las épocas de reproducción y desove.

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BIOLOGY OF THE ICTALURIDS IN THE VENUSTIANO CARRANZA RESERVOIR, JUAREZ, COAHUILA, MEXICO.

The Venustiano Carranza Reservoir is located approximately 27°24' and 27°38' north latitude and 100°35' and 100°48' west longitude in the municipality of Juarez, Coahuila, bordering with the state of Nuevo Leon, Mexico.

The species of ictalurids collected previously in the area are: Ictalurus punctatus, Ictalurus furcatus, and Pylodictis olivaris.

There have been no previous investigations of this type in the Don Martin Reservoir. Therefore, it is of great importance that it be studied.

These fish (ictalurids) are considered among the more popular game and commercial species. The study of these species will provide a basis for a better utilization of the same, averting excessive fishing in whichever season, but especially during the reproductive months.

Their local distribution will be determined, taking into account the preference of the species for a determined habitat.

In accordance with the influence of diverse factors, biological as well as physico-chemical, the amount that these affect distribution will be determined, employing for this standard methods for water analysis. Among the physico-chemical factors are: dissolved oxygen, chlorides, CO_2, hardness, alkalinity and pH.

The diverse feeding sources, qualitative and quantitative seasonal variation, and ecological feeding aspects will be analyzed.

Taking into account the age, length, weight, weight-length relationship, and condition factor, the growth of the species will be established, along with the seasons of best use.

Ascertaining the degree of maturity, gonadic cycle and ovarian count, the times of reproduction and spawning will be established.

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Research on Two Native Southwestern Trouts and Its Management Implications

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Abstract

Recent research on habitat, distribution, spawning, competitive interactions, temperature tolerances, movements, and experimental sport fishing for the threatened Arizona (Salmo apache Miller) and endangered Gila (S. gilae Miller) trouts has management implications both for their recovery in range and numbers and their development into sports fisheries.

Las investigaciones sobre las dos truchas nativas del sudoeste y las implicaciones para la administración del planeamiento pesquera de las mismas.

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SUMARIO

Las investigaciones recientes sobre la trucha arizona(Salmo apache, Miller) y la trucha gila(S. gilae, Miller) en cuanto a su habitat, a su freza, a sus interacciones con peces rivales, a su tolerancia de temperaturas, a su migración y a los efectos de la pesca deportiva de truchas sobre las mismas sugieren métodos de planeamiento para ambas truchas y las posibilidades de aumentar su habitat natural y su población y de integrarlas en el programa de pesquera deportiva.

Notas relativo a las investigaciónes del Dr. Rinne.

SUMARIO

Tres pasos de electropesca de 100 m. obstruyeron el arroyo 50% del tiempo para colecionar todas las truchas gila(S. gilae). Los peces no capturados representaron menos de 10% del número total de los peces en los rápidos de poca altura y en las pozas que tenían más de 10 peces. La información sobre la trucha arizona(S. apache), la gila, la morena (S. trutta) y la de arroyo(Salvelinus fontinalis) indicó que se puede hacer presupuestos exactas(± 10% de error) de la población del arroyo cuando se base el presupuesto en el número de peces colecionados en los tres pasos de electropesca de 100 m. Se determinan la posición y el número relativos de las secciones de electropesca según el largo del arroyo y según la diversidad y complejidad de la habitat.

Seis factores físico-hydromorfológicos explicaron casi la mitad de las variaciones en los peces(S. gilae) del arroyo McKnight. A pesar de que el número de peces fue controlado con factores espaciales, el tamaño del pez se relacionó con la profundidad del agua y en menor grado con la protección de la habitat. La S.gilae habitó eficazmente el espacio de las cabecera de un pequeño arroyo. Esta característica, junto con la relación del tamaño del pez y la profundidad del agua, sugieron la viabilidad de tener pesqueras deportivas de calidad en el futuro para la S. gilae en las aguas de río abajo.

SUMARIO

La temporada de freza de la trucha gila(Salmo gilae, Miller) en tres arroyos del Bosque National Gila(The Gila National Forest) empezó al principios de abril en las elevaciones más bajas y continuó hasta junio en las elevaciones más altas. La temperatura y la corriente del arroyo obraron recíprocamente para efectuar la freza, sin embargo la temperatura tomó un papel más importante que la corriente. La freza empezó en agua de 8° C. Normalmente se encontraron los depósitos de freza a 6-15 cm. de profundidad en el agua, en el centro del arroyo con un margen a eso de la cuarta parte de la anchura del arroyo. El substrato eraprincipalmente de arena y cascajo(.02-3.8 cm.). Los peces buscaron sitios para depositar los huevos según la profundidad del agua y el substrato en vez de la corriente rápida. Normalmente un pez o una pareja de peces ocuparon un sitio de depósito, pero la cohabitación de 3 a 4 peces era común. La mayor parte de la actividad de la freza ocurrió desde la una hasta las cuarto de la tarde. La cría de la freza (15-20 mm. de largo) salió del huevo a las 8 a 10 semanas y vivieron en las areas del rápido de poca altura. La falta de cría en las pozas ocupadas por peces maduros indica la posibilidad del canibalismo.

SUMARIO

Los presupuestos de la población de peces del tamaño legal(746 ± 116), de la taza de explotación(0.45), del éxito del pescador deportivo (0.25 peces por hora) y de la reducción en el número de los peces del tamaño legal antes y después de la temporada pesquera(de 70% a 15%) indican que la nativa trucha arizona(Salmo apache, Miller) del lago Christmas Tree no se mantendrá como una pesquera deportiva de calidad bajo las condiciones de una pesca intensa.

SUMARIO

Los resultados de la máxima térmica (CTM—Critical Thermal Maxima) y las reacciones a los cambios térmicos de la trucha arco iris (Salmo gairdneri), la trucha morena (Salmo trutta) y la trucha de arroyo (Salvelinus fontinalis)—todas recien introducidas al sudoeste de los Estados Unidos—comprueban que estas truchas se adaptan a temperaturas elevadas tan bien como las truchas nativas del sudoeste: la trucha gila (Salmo gilae) y la trucha arizona (Salmo apache).

SUMARIO

El nuevo pececillo gila (Atheriniformes: Poeciliidae) cuya habitat fue descubierta en un arroyo intermitente del Bosque Nacional de Colorado (Colorado National Forest), debe ser protegido de la minería del futuro, de los vehículos recreacionales, del apacentamiento y de la introducción de especies de peces no nativos. Hay que proteger el nuevo pececillo gila si va a continuar creciendo en la habitat del desierto.

Palabras claves: especie amenazada, Poeciliopsis occidentalis occidentalis.

ASPECTS OF THE LIFE HISTORY AND DISTRIBUTION OF THE VIRGIN SPINEDACE (*LEPIDOMEDA MOLLISPINIS*)

Presented at the Twelfth Annual
Desert Fishes Council Symposium
Monterrey, N. L., Mexico
November 5-7, 1980

by

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Aspects of the Life History and Distribution of the Virgin Spinedace (Lepidomeda mollispinis)

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The Virgin Spinedace (Lepidomeda mollispinis) is a member of a unique, endemic tribe, the Plagopterini, of the western cyprinids. Prior to 1960 little was written on the classification, distribution or biology of this species (Miller and Hubbs, 1960).

This paper reports the results of field and laboratory investigations on the Virgin Spinedace from October 1969 through March 1971. Discussion is also presented on changes in distribution and relative abundance as determined by this study when compared to results of a study by Cross (1975) from June 1973 through March 1975.

Spinedace prefer clean, cool, moderately swift streams of relatively shallow depth. Insect material is the preferred food and plant material is utilized only when insect availability is low. Spawning occurs once each year, lasting from spring through early summer. The majority of spawners in the population during this study were Age Group I fish. Some Age Group III fish may spawn twice during a spawning season as demonstrated by fecundity studies. Maturation of gonads appears to be regulated in part by increasing water temperature, discharge and photoperiod. The majority of the population in the study area were Age Group 0 or Age Group I fish. Females appeared to live longer than males and dominate Age Group II and III collections. Distribution was found to be similar to apparent historic distribution but population reduction has occurred because of loss of habitat and competition and predation from introduced exotics.

Spinedace populations have declined in the Virgin River since the 1930's. At present, small intact populations exist near the mouth of Beaver Dam Creek, the north and lower east fork of the Virgin River in Zion National Park, and portion of the Santa Clara River and its tributaries (Cross 1975). The continued decline in distribution and abundance of spinedace as demonstrated by Rinne (1971) and Cross (1975) signal the need for a closer review of the status of this species.

Aspectos de la Historia y Distribución del Virgin Spinedace (Lepidomeda Mollispinis)

Presentado en el Duodécimo
Desert Fishes Council Cologuio
Monterrey, N. L., Mexico
November 5-7, 1980

por

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Aspectos de la Historia y Distribución del Virgin Spinedace (Lepidomeda mollispinis)

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El Virgin Spinedace (Lepidomeda mollispinis) es miembro de una tribu única del grupo del oeste, el plagopterini. Antes de 1960 poco se habia escrito sobre la clasificación, distribución y biologia de esta especie.

Este discurso reporta resultados de investigaciones del Virgin Spinedace hechas en el campo y en el laboratorio desde octubre 1969 hasta marzo 1971. Tambien se presentan discusiones de los cambios y abundancia relativos que fueron determinados por esta investigación cuando se comparan con los resultados de la investigación hecha por Cross (1974) desde junio 1973 hasta marzo 1975.

El spinedace prefiere arroyos con aguas limpias, de corientes rápidas y de poca profundida. La comida preferida son insectos, tambien utilizando plantas pero nadamas cuando no se encuentran insectos. Las crias ocurren una vez por año durando desde la primavera hasta el verano. La mayoria de los pezes dando cria en esta población durante esta investigación eran pezes del Age Group I. Algunos pezes del Age Group III dan crias dos veces durante esta temporada como fue demonstrado por los estudios de fecundación. Maduración de los pollados parece ser regulada, en parte, por el aumento en la temperatura del agua, descargo y luz. La mayoria de la población de pezes en la región del estudio eran del Age Group 0 o Age Group I. Hembras parecian vivir mas largo tiempo que los machos y dominan el Age Group II y Age Group III. Esta distribución es semejante a la distribución historica pero reducion en la población ha ocurrido por el perdido de habitación y competición y predatores de exoticos introducidos.

Populaciones de spinedace han rebajado en el Virgin River desde los 1930's. Presentemente, populaciones menoras existen cerca de la boca de Beaver Dam Creek, en el norte y baja este horguilla del Virgin River en Zion National Park, y partes del Santa Clara River y sus tributarios (Cross 1975). La declinación continuada en distribución y abundancia del spinedace como es demonstrada por Rinne (1971) y Cross (1975) señalan la necesida de una suma revisa del estado de este especie.

ECOMORFOLOGIA DE LOS PECES EN LA PRESA VENUSTIANO CARRANZA JUAREZ, COAHUILA, MEXICO.

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Los ecosistemas mantienen su autoregulación por retroalimentación. Una de sus caracteristicas importantes es su pirámide alimenticia que indica niveles tróficos bien definidos. La determinación de estos niveles tróficos y sus interacciones con el medio ambiente, indicaría las relaciones de biomasa y energía del ecosistema, mediante el conocimiento de los niveles tróficos de los organismos, sus posibles relaciones inter específicas e intraespecíficas y su relación con los parámetros ambientales. Se puede establecer factores que afecten a las especies y las condiciones óptimas para su desarrollo y mejor aprovechamiento.

Por tal motivo se plantea realizar un inventario de las especies que se encuentren en la Presa Venustiano Carranza, establecer sus caracteristicas y morfología, los niveles tróficos de las especies de acuerdo a su alimentación y habitat y determinar la época de aparición de las gónadas maduras.

Se realizarán dos colectas por día (a las 10:00 a.m. y 22 :00 p.m. aproximadamente), se seleccionarón cuatro áreas de muestreo a 100 mts. de distancia cada una, las áreas presentan fondos diferentes (grava, cieno, piedra y plantas), con el propósito de obtener datos sobre selectividad de habitat. Se tomarán muestras de agua para evaluar los siguientes parámetros físico-químicos : OD, CO_2, cloruros, alcalinidad, pH, turbiedad, temperatura del aire y del agua.

ECOMORPHOLOGY OF THE FISHES IN THE VENUSTIANO CARRANZA RESERVOIR, JUAREZ, COAHUILA, MEXICO.

The ecosystems maintain their autoregulation by retrofeeding. One of their important characteristics is their food pyramid that indicates well defined trophic levels. The determination of these trophic levels and their interaction with the mean environment, would indicate the relationship of biomass and energy of the ecosystem, by way of the knowledge of the trophic levels of the organisms, their possible interspecific and intraspecific relationships, and their relationship with environmental parameters. It is possible to establish factors that affect the species and the optimal conditions for their development and better utilization.

For that reason it is proposed to make an inventory of the species that are found in the Venustiano Carranza Reservoir, to establish their characteristics and morphology, the trophic levels of the species according to their feeding and habitat, and to determine the time of appearance of mature gonads.

Two daily collections will be made (between 10:00 a.m. and 10:00 p.m., approximately). Four sample areas will be selected, each 100 meters long and having different bottom types (gravel, mud, rock and plants) with the purpose of obtaining data concerning the selectivity of the habitat. Water samples will be taken to evaluate the following physico-chemical parameters: DO, CO_2, chlorine, alkalinity, pH, turbidity, temperature of air and water.

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DATOS ICTIOBIOLOGICOS DEL RIO ALAMO, SUBCUENCA DEL RIO BRAVO, NOR ESTE DE MEXICO.

Gorgonio Ruiz Campos

Lab. de Ictiología y Pesquerías.

RESUMEN:

El área de trabajo se localiza en la parte NE de Nuevo León y la porción NW de Tamaulipas. Es una pequeña subcuenca del Río Bravo, situada entre la de los ríos Salado y San Juan.

La importancia del presente estudio, es debida a que el Río Alamo es una zona poco explorada y estudiada, con recursos naturales que requieren estudios ictiologico-pesqueros para una futura explotación.

Los objectivos que pretende dicho estudio son: 1) Realizar un inventario de especies en la ictiofauna del Río Alamo, 2) Realizar una comparación ictiofaunística en dife rentes estaciones de muestreo, en base a parámetros físico-químicos, y 3) Contribuir con algunos datos biológicos a un mejor conocimiento de la ecología íctica del Noreste de México.

Se efectuarán 12 colectas con una frecuencia aproximada de 30 días y duración de 3 días cada una. El material bio lógico se obtendrá con el uso de redes agalleras de va---rias medidas, trasmallos de 8-1.5-8", chinchorros y palan gres.

Se efectuarán estudios ictiofaunísticos cualitativos y cuantitativos en cada estación de muestreo, en base a variables físicoquímicas. Se observará la variación alimenticia y hábitos reproductivos de las especies de importan cia económica actual y potencial, según métodos recomenda dos por Lagler (1978).

Monterrey, N.L. 9 de Marzo de 1981.

ICHTHYOBIOLOGICAL DATA OF THE ALAMO RIVER, SUBBASIN OF THE BRAVO RIVER, NORTHEASTERN MEXICO.

The work area is located in the northeast part of Nuevo Leon and the northwest part of Tamaulipas. It is a small basin of the Bravo River, situated between the Salado and San Juan rivers.

The importance of this study results fromthe fact that the Alamo River is a zone that has been studied and explored very little, with natural resources that require ichthyological-fishery studies for future development.

The objectives of said study are: 1) Make an inventory of species in comprising the ichthyofauna of the Alamo River, 2) Make an ichthyofaunic comparison at different sampling stations, basing them on physico-chemical parameters, 3) Contribute, by way of various biological data, to a better knowledge of the ichthyological ecology of northwestern Mexico.

There will be twelve monthly collections, each comprising a three day period. The biological material will be obtained with the use of gill nets of various sizes, trammel nets of 8-1.5-8 inches, dragnets, and trotlines.

Quantitative and qualitative ichthyofaunic studies will be made at each sampling station, based on physico-chemical variables. The variation of feeding and reproductive habits of the species of current and potential economic importance will be observed, according to methods recommended by Lagler (1978).

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DIRECTIONS FOR FUTURE RESEARCH: CONCLUSIONS OF A SYMPOSIUM ON FISHES IN NORTH AMERICAN DESERTS

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ABSTRACT

In this past decade many aspects of the biology of fishes in desert regions have received considerable study. Scientists, from a variety of disciplines, find these aquatic ecosystems interesting for several reasons. For example, evolutionary biologists find desert fishes often have small populations, isolated for "known" lengths of time in a diverse array of frequently harsh environments. Such systems are ideal for research on genetic and behavioral divergence and speciation. Physiologists are attracted by the seemingly harsh environmental extremes, particularly temperature, salinity, and dissolved gases to which these fishes have adjusted. There aquatic ecosystems characteristically have depauperate fish faunas and simple food webs, with large numbers of a few species at each trophic level. These attributes make them ideal ecosystems for study by community and ecosystem ecologists yet, surprisingly, few such studies have been attempted. The characteristics of these aquatic ecosystems, combined with their limited number and restricted distributions, create a situation whereby the fauna and flora are highly susceptible to disturbance by man. In particular, the ever increasing demand for water by an expanding human population in arid regions and changing land use patterns have drastically altered many habitats in the past 25 years. In response to these changes great strides have recently been made in managing the desert fauna and flora, and in the conservation of aquatic ecosystems.

Because of scientific and managerial advances during the past decade we felt it necessary to summarize the value of this work, attempt a synthesis of some of the more extensively studied disciplines, and to evaluate the state of knowledge about desert fishes. Consequently, we convened a symposium sponsored by the American Society of Ichthyologists and Herpetologists as part of the 60th annual meeting, June 15-20, 1980, at Texas Christian University, Fort Worth, Texas. The 15 papers presented covered a large proportion of the recent research on the biology of fishes in the deserts of North America. The coverage of biological themes was not uniform, which largely reflects the current state of knowledge rather than the biases of the conveners. The large number of papers dealing with pupfishes (Cyprinodon) is a consequence of their preponderance in desert fish faunas, their diversity of ecological and physiological adaptations, and their resultant intensive study. The limited information on community ecology and ecosystem dynamics reflects a lack of extensive research in these areas. However, the information presented was exciting, and the directions for future productive and useful research are clear.

Direcciones de investigaciones futuras; conclusiones de un simposio sobre los peces de los desiertos norteamericanos

En la década pasada se ha estudiado mucho varios aspectos de la biología de los peces de las regiones desiertas. A científicos de una variedad de disciplinas les interesan esos ecosistemas acuáticos por varias razones. Por ejemplo, los biólogos evolucioistas encuentran que los peces del desierto a menudo tienen poblaciones pequeñas, aisladas por períodos fijos en una variedad diversa de medios ambientes.muchas veces ásperos. Tales sistemas son ideales para investigaciones sobre la divergencia genética y comportamentista y la especiación. Los extremos ambientales aparentamente ásperos atraen a los fisiólogos, sobre todo la temperatura, la salinidad, y los gases disueltos a los cuales estos peces se han acomodado. Característicamenta estos ecosistemas acuáticos tienen faunas despáuparas de peces y telas alimenticias sencillas, con grandes números de unas pocas especies en cada nivel trófico. Estos atributos los hacen ecosistemas aptos para estudios de ecólogos de comunidad y de ecosistemas, sin embargo es sorprendente que tan pocos estudios de esta clase han sido atentados. Las características de estos ecosistemas acuáticos, así como sus números limitados y sus distribuciones restringidas, crean una situación en la cual la fauna y la flora son muy susceptibles a disturbios humanos. En particular, la creciente necesidad por agua de una población humana extendida en regiones áridas, así como los diferentes modelos de uso de tierras, han cambiado drásticamente muchos ámbitos naturales en los últimos veinticinco años. Correspondiente a estos cambios, se ha hecho muchísimo recientemente para manejar la flora y fauna desiertas y para conservar los ecosistemas acuáticos.

Debido a los avances científicos y directoriales de la década pasada, creíamos que era necesario resumir el valor de este trabajo, tratar de sintetizar algunas de las disciplinas más estudiadas, y evaluar el desarrollo de conocimiento acerca de los peces del desierto.

Por consiguiente, convocamos un simposio patrocinado por La Sociedad Americana de Ictiólogos y Herpetólogos, como parte de su sesenta reunión anual, junio quince a veinte de mil, novecientos ochenta, en la Universidad Cristiana de Texas, Fort Worth, Texas. Las quince conferencias se trataron de las recienten investigaciones sobre la biología de los peces de los dêsiertos de Norteamérica. El trato de temas biológicas no fue uniforme, lo cual refleja el actual estado de conocimientos más bien que las predisposiciones do los conferenciantes. La gran cantidad de papeles tratando de pupfishes (Cyprinodon) se debe al gran número de estos peces en las faunas de peces del desierto, su diversidad de adapciones ecológicas y psicológicas, y el resultante estudio intensivo de ellos. La limitada información sobre la ecología de comunidad y sobre la dinámica de ecosistema refleja una falta de investigación extensiva en estos campos. Sin embargo, la información que se presentó fue excitante, y son claras las direcciones de investigaciones productivas y útiles del futuro.

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STATUS OF THE DISTRIBUTION AND TAXONOMY OF THE HUMPBACK CHUB, *GILA cypha*, IN THE UPPER COLORADO RIVER

by

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ABSTRACT

Two, and possibly three, new populations of the endangered *Gila cypha* were encountered in habitat assessment studies by the Colorado River Fisheries Project of the U.S. Fish and Wildlife Service in 1979-80. These populations are located in Debeque Canyon, Colorado, and in Westwater Canyon, Utah, of the Upper Colorado River. The third population is indicated by catches of one adult and several juveniles in Cataract Canyon, Utah. A fourth population, encountered by other investigators in 1977 in Black Rocks, Colorado, was also studied. No estimates of population abundances are presented. Taxonomic studies on individuals of each population continue in order to more clearly distinguish *G. cypha*, *G. robusta*, and *G. elegans*, and to subsequently facilitate their identification afield.

ABSTRACTO

Dos, y posiblemente, tres poblaciones nuevas del pez *Gila cypha* (en peligro de extinción) se han encontrado en estudios de habitat conducidos por el Proyecto de Estudios Pesqueros del Río Colorado bajo del Servicio de Pesca y Fauna de los Estados Unidos en 1979-80. Estas poblaciones estan localizadas en el Cañon de Debeque, Colorado, y en el Cañon de Westwater, Utah, de la región alta del Río Colorado. La tercer población fue indicada por la captura de un pez adulto y algunos peces juveniles en el Canon de Cataract, Utah. La cuarta población se encontró durante investigaciones previas en el año 1977; las mencionadas se hicieron en Black Rocks, Colorado. No se presenta la cantidad de peces de ningunas poblaciones. Estudios taxonómicos en individos de cada población continuan para destinguir claramente *G. cypha*, *G. robusta*, y *G. elegans*; asi mismo facilita su identificación en el campo.

TEMPERATURE, SALINITY AND THE TAXONOMY OF THE DEATH VALLEY PUPFISHES (Cyprinodon)

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Published data for 40 morphometric and meristic characters for 15 populations of Death Valley Cyprinodon were subjected to a principal components analysis. The first principal component accounted for 38.4% of the total character variance. Characters with high loadings (correlations) on the first principal component were those known to be affected by temperature and salinity. A three-dimensional plot of the 15 Cyprinodon populations on the first three principal components indicated that the first principal component separates populations from warm, saline springs from populations inhabiting cooler, less saline springs. Therefore, I concluded that the first principal component represents character variation due to temperature and/or salinity.

Character variation associated with the first principal component was removed from consideration. A phenogram based on the remaining 61.4% of the character variance was constructed. This phenogram shows the phenetic (= phenotypic) similarities between the 15 populations of Cyprinodon. The systematic relationships implied by this phenogram are very compatible with the currently recognized relationships among these fishes. This analysis lends credence to the long-time assumption by ichthyologists, that character differences between populations are indicative of genetic differences, even when correlated with temperature and/or salinity.

REPORTS BY AGENCY REPRESENTATIVES

INFORMES POR REPRESENTATIVOS GUBERNATIVOS Y AGENCIAS

ASPECTOS DE ACTIVIDADES QUE DESARROLLA EL DEPARTAMENTO DE PESCA EN EL ESTADO DE NUEVO LEON.

Grupo Técnico de la Delegación Federal de Pesca en N.L. 1980.

RESUMEN:

Se presentan las actividades desarrolladas por el personal técnico de la Delegación Federal de Pesca en Nuevo León. Debido a que no existen grandes recursos acuíferos en el Estado, es necesario mantenerlos en un nivel óptimo de aprovechamiento. Se hace hincapié en el fomento de las actividades acuaculturales tratando de no afectar a los ecosistemas acuáticos.

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Agency Report
Bureau of Land Management

Neil B. Armantrout

Desert Fishes Council
November, 1980

Utah

The Least Chub contract work has been completed by the Utah Division of Wildlife Resources (DWR) and Gar Workman of Utah State University. All potential habitats were inventoried, but no new populations located. The MX missile proposal for the Snake Valley has been modified so that the least chub habitat would not be directly impacted.

Several projects have been completed on the native trouts. Stream improvements were implemented on Deep Creek and Birch Creek for the Bonneville cutthroat. BLM, DWR and the Fish and Wildlife Service transferred cutthroat into Bettridge Creek on Pilot Peak. Some stream improvements have been implemented on the creek. A section of Donner Creek was acquired by exchange to protect the existing cutthroat population. Fish in Rock Creek, Desolation Canyon, were taken from the headwaters; these were cutthroat but showed rainbow hybridization.

The Bonneville Chapter, American Fisheries Society (AFS), has available a slide-tape program on the endangered fishes of Utah.

Wyoming

Two Habitat Management Plans are being implemented by Bruce Smith, Rock Springs District; one for the Utah cutthroat, one for the Colorado cutthroat.

A new population of Colorado cutthroat was discovered in Savory Creek, Little Snake River System, Rawlins District. A Habitat Management Plan (HMP) is being prepared.

Idaho

Studies on the Redband trout are continuing in the Boise District. Two studies, one on electrophoresis and one on length-weight, were published this year. The studies showed definite differences between the Snake River and Owyhee trout populations, and between the native fishes and the introduced rainbow trout. Individual populations in the upper Owyhee system could be distinguished. One population of rainbow-cutthroat was found in the Snake River that spawned in November and reached 15#.

A study is underway on the Shoshone sculpin. The fish has been proposed for listing.

Nevada

A portion of the Ash Meadows has been acquired through exchange, and an attempt has been made to acquire additional portions through the same methods.

The work is being closely coordinated with state agencies and the Nature Conservancy. A HMP has been prepared that covers all of Ash Meadows. Some habitat improvement work has been performed in the acquired areas.

State-wide endangered species inventories are being conducted in cooperation with the Nevada Department of Wildlife. Native trout projects are being implemented in coordination with the work in Utah.

Colorado

BLM is partially funding Fish & Wildlife Service (FWS) studies on the Colorado River fishes. Several cooperative agreements have been developed with Colorado Division of Wildlife for habitat improvement projects. Ten streams have been rotenoned and habitat improvements made prior to reintroduction of Colorado cutthroat. Similar projects are also being implemented for the Rio Grande cutthroat.

California

A project for the Owens pupfish on public lands will be implemented soon. Funding was provided in FY 80 but implementation was delayed in the district. The project involves raising a dam to prevent upstream invasion by bass that could threaten the fish. A cooperative project is being implemented with California Fish and Game to improve and upgrade facilities for the Mohave Chub. New pumps are being installed and the ponds improved. A contract with Fish and Game is being implemented for electrophoretic studies on the Mohave Chub populations.

A study was contracted on the hydrological condition of San Sebastian Marsh relative to pupfish habitat. The study is completed but the report was not yet available. The area is being considered for Area Critical Environmental Concern (ACEC) status.

A monitoring program has been instituted in the Tuledad/Home Creek Management area for habitat improvement and fish. A general inventory will be done for the Modoc Sucker. Some additional studies on desert fishes are being considered. One, for Armargosa Canyon, will probably be done soon.

New Mexico

A reintroduction program for the Pecos gambusia is being considered. It is now found on private land but not public land. Potential sites on public land are being reviewed.

Improvement projects are planned on the Pecos River, but work probably will not begin until FY 83. An HMP is being written for the Quatro Cienegas but is not completed. The area presents problems because the habitat on public lands is maintained by pumping well water, but the wells are becoming too expensive to operate.

Oregon

BLM entered into consultation with the FWS on the Borax Lake Chub. At this time agreement had been reached on protection for the chub, permitting issuance of geothermal leases in the adjoining areas.

An HMP has been written and is being implemented for the Foskett Springs dace and Warner sucker by the Lakeview District. The HMP provides for habitat development and protection on public lands. The Vale District is implementing an HMP for the Whitehorse trout, involving stream improvements and protection from livestock. A land exchange is being finalized that will provide BLM with ownership of most of the trout habitat.

Arizona

BLM has, in the past, opposed reintroduction of the woundfin into the Upper Gila River. The new State Director has indicated a willingness to discuss the situation and reach a compromise.

Several inventories were conducted for threatened and endangered (T/E) species, but no new populations located. In Burro and Boulder Creeks the endemic fishes are an important prey species for black hawks, but have been threatened by pollution from the Baghdad/Cypress copper operation. The Phoenix District has cooperated with Environmental Protection Agency (EPA) and state agencies in the investigation, which resulted in an enforcement action requiring the company to cease all discharge and develop an abatement program within 30 days. A similar situation is being investigated with the Zonia copper mine on French Gulch, a tributary to the Hassayampa River.

The Arizona Strip District has begun extensive riparian and habitat inventories along the Virgin Basin. Protection continues for Aravaipa Canyon although no other fish work is planned.

Bill Rinne recently completed a study for BLM. Other studies are underway on the populations of C. macularius on public lands.

A jeopardy decision was issued in consultation on topminnow populations in the San Bernardino Valley where oil and gas leasing was proposed. Artesian wells in the Safford area are being considered for introduction of Gila topminnow and C. macularius. Gila topminnow appear to be locally extirpated from Cocio wash as a result of green sunfish introductions. Arrangements have been made with the FWS to remove the sunfish from Cocio and reintroduce topminnow next spring.

General

A major share of the efforts throughout the Bureau are connected to preparation of environmental impact statements. While grazing provides the bulk of the work, statements are also being prepared on energy, timber harvest, recreation and minerals. During the preparation, inventories are conducted and management recommendations developed. Greater emphasis is being given to habitat improvements, with increased funding in FY 80 and 81 for such improvements. Work is hampered by lack of adequate trained fisheries personnel. The Bureau lost at least four positions during the last year, but also acquired at least three new positions, including a fisheries biologist in the Washington Office and the first fisheries biologist in Arizona. A number of studies, many of them for T/E species, are underway.

WATER AND POWER RESOURCES SERVICE AGENCY REPORT
LOWER COLORADO REGION

Presented at the Twelfth Annual
Desert Fishes Council Symposium
Monterrey, N. L., Mexico
November 5-7, 1980

by

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LOWER COLORADO REGION
AGENCY REPORT

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This report summarizes selected Water and Power Resources Service (Water and Power) projects and studies in the Lower Colorado Region with significant aquatic interest. At the present time emphasis is being placed on programs related to increased power generation, as well as flood control and water conservation. A brief description of some of the principal projects is presented below.

Hoover Powerplant Uprating - This project has been initiated and consists of rewinding existing generators to over 1,800 megawatts. The project will increase power generating capacity at Hoover Powerplant. The maximum rate of discharge will increase from 40,000 ft^3/s to 49,000 ft^3/s (1133 m^3/s to .388 m^3/s). The project is planned for completion by 1987.

Hoover Modification - This project is in the planning stage and would include construction of two 250 megawatt generator units in the existing powerplant to further increase peaking power capacity. Maximum discharge rates from Hoover Dam would increase by 13,000 ft^3/s (368 m^3/s). The average weekly discharge from Hoover Dam would remain unchanged, but daily release patterns would vary to utilize increased peaking power capacity.

Pumped Storage Projects - Two projects are in the planning stage. Both would include construction of off stream reservoirs and powerplants above and/or below Hoover Dam to generate power during periods of peak demand. The general cyclic pattern would be to pump water from Lake Mead or Lake Mohave into the side storage reservoir during periods of low energy demand. Water would be released back into the appropriate mainstream reservoirs during periods of high energy demand.

Yuma Division Flood Control - This project would initiate measures which will prevent overtopping of the levee in the Yuma, Arizona area in the event of high flows in the Colorado River. The project is in the early planning stages. Habitat conditions have been evaluated by a multiagency team of biologists using Habitat Evaluation Procedures (HEP). In addition, a comprehensive program for environmental compliance and public involvement is being initiated by the Yuma Projects Office of Water and Power.

Vegetation Clearing in Cibola Division - The purpose of this study is to evaluate the effects of selectively removing vegetation along a 6-mile reach of the Colorado River inside the levees to allow passage of high flows. A 2-year biological follow-up study will be used to evaluate the effects of the project on wildlife.

Several biological studies funded by Water and Power are currently in progress or planned in the Lower Colorado Region. In some cases funding is also being contributed from other agencies.

Lake Mead Largemouth Bass Study - This is a 5-year study being completed by Arizona Game and Fish Department and Nevada Department of Wildlife with funding from Water and Power. The study is in its third year and emphasis has been placed on nesting success, cover requirements and foods of largemouth bass. The purpose of the study is to determine the cause for decline of the largemouth population in Lake Mead as indicated by reduced harvest and to develop recommendations to restore the harvest to the 1959 levels.

Coachella Canal Fish Inventory - A complete inventory of two sample reaches of the old Coachella Canal is planned for November 10, 1980. The purpose of this project is to gather quantitative data on the fishery resources in the unlined canal. The inventory will be under the funding and direction of Water and Power biologists in cooperation with other state and Federal agencies.

Lake Mohave Razorback Sucker and Bonytail Chub Study - This is a proposed 2½-year contract study presently being negotiated by Water and Power. The purpose of the study will be to determine the biology of the bonytail chub and razorback sucker in the river reach between Hoover Dam and Lake Mohave. The study may be initiated by February 1981.

Agency Report, USDA-Forest Service

John N. Rinne
Forestry Sciences Laboratory
Rocky Mountain Forest and Range Experiment Station
Arizona State University Campus
Tempe, Arizona 85281

Since summer 1976 the above fisheries biologist has been studying threatened and endangered species of fishes in Arizona and New Mexico. Research on the habitat, biology and distribution of two native trouts and the Gila topminnow has been accomplished. Results of this research, in part, are available in published form (see below) and other future papers will appear.

For the period 1981-85 research will continue primarily on native southwestern U. S. fishes with a new emphasis on state-listed species and cooperation with Mexico on fisheries-related problems.

Publications available:

1. Minckley, W. L., J. N. Rinne, and J. E. Johnson. 1977. Status of the Gila topminnow and its co-occurrence with mosquitofish. USDA For. Serv. Res. Pap. RM-198. 8 p. Forest and Range Exp. Stn., Fort Collins, Colo.

2. Rinne, J. N. 1978. Development and applicability of methods for population estimation and habitat evaluation for Arizona and Gila trouts, p. 113-125. In, J. R. Moring (ed.), Proc. Symp. Wild Trout-Catchable trout. Ore., Dept. of Fish and Wildlife. Corvallis, Ore.

3. Rinne, John N., Bryce Rickel, and Dean Hendrickson. 1980. A new topminnow locality in southern Arizona. USDA Forest Service, Rocky Mtn. For. Range Exp. Stn., Res. Note RM-382. 4 p. Fort Collins, Colo.

4. Rinne, John N. 1980. Arizona trout, p. 104, In, Lee, D. et al. (eds.) Atlas of North American Fishes. North Carolina State Museum, Raleigh, N. C.

5. Rinne, John N. 1980. Gila trout, p. 107, In, Lee, D. et al. (eds.) Atlas of North American Fishes. North Carolina State Museum, Raleigh, N. C.

6. Rinne, John N. 1980. Spawning habitat and behavior of Gila trout, a rare salmonid of the southwestern United States. Trans. Amer. Fish. Soc. 109:83-91.

7. Johnson, P. 1980. Helping rare native trout in the Southwest. Forestry Research West. May: 8-10.

8. Lee, Raymond M. and John N. Rinne. 1980. Critical thermal maxima of five trout species in the Southwestern United States. Trans. Amer. Fish Soc. 109(5): In press.

9. Rinne, J. N., B. Robertson, R. Major, and K. Harper. 1981. Sport fishing for the native Arizona trout, Salmo apache Miller in Christmas Tree Lake: A case study. Wild trout II Symposium, in press.

Manuscripts in progress:

1. Rinne, John N. Chemical Renovation of Ord Creek, Arizona: Procedure, results, and implications.

2. Rinne, John N. Taxonomic analysis and distribution of native Arizona trout, Salmo apache.

3. Harper, Ken and John N. Rinne. Aggressive behavior between two salmonids, Salmo apache Miller and Salvelinus fontinalis (Mitchell) (Salmonidae).

4. Rinne, John N. Stream habitat improvement and native southwestern trouts.

5. Rinne, John N. Movements of a rare Southwestern salmonid relative to habitat.

6. Rinne, John N. and Martin Jakle. The Photarium: a technique for taking natural photographs of live fishes.

John N. Rinne
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Desde el verano de 1976 el Sr. John N. Rinne, biólogo de pesqueras, ha estudiado las especies amenazadas de los peces de Arizona y de Nuevo México. Se han logrado investigaciones sobre la habitat, la biología y la distribución de dos truchas nativas y del pececillo gila. Los resultados de estas investigaciones y otras en preparación, en parte, están disponibles en ediciones publicadas en la lista abajo.

Durante el período de 1981-85 se continuarán las investigaciones de los peces nativos de la región sudoeste de los EEUU con un énfasis en las especies de las listas oficiales de los estados y con un énfasis en la cooperación de México y los EEUU en la resolución de los problemas de pesqueras.

U.S. Fish and Wildlife Service
Sacramento Endangered Species Office

Jack E. Williams

The Sacramento Endangered Species Office is currently involved with listing efforts, recovery plans, and research contracts on many fishes within California, Nevada, and southern Oregon. Documentation to list the Warner sucker (Catostomus warnerensis), Modoc sucker (Catostomus microps), desert dace (Eremichthys acros), Borax Lake chub (Gila boraxobius), desert pupfish (Cyprinodon macularius), and the Ash Meadows populations of speckled dace (Rhinichthys osculus nevadensis) have recently been completed or are nearing completion. Emergency listing procedures, in addition to normal listing procedures, have been requested for the desert pupfish due to agricultural development in the Salton Sea area. Further listing activity includes a contract awarded to James Deacon at the University of Nevada, Las Vegas to prepare listing documents for seven Nevada fishes.

The unarmored threespine stickleback (Gasterosteus aculeatus williamsoni) faces serious problems in San Antonio Creek due to withdrawal of subsurface water from the basin. Critical habitat, including portions of San Antonio Creek, is now proposed. David Soltz at California State University, Los Angeles has been contracted to study aspects of the life history of the San Antonio Creek population.

Efforts are now being made to lead a recovery effort for the Paiute cutthroat trout (Salmo clarki seleniris). California Department of Fish and Game, U.S. Forest Service, and U.S. Fish and Wildlife Service are cooperating in this effort.

La Oficina de Protección de Animales en Peligro de Extinguirse de Sacramento está actualmente realizando esfuerzos para incluir más especies de peces en la Lista Federal de Animales que Necesitan Protección, también esta trabajando en planes de recuperación de estas especies y ha hecho contratos para la investigación de muchas de ellas dentro de California, Nevada, y el sur de Oregon. Documentaciones para incluir en la Lista el Warner sucker (Catostomus warnerensis), Modoc sucker (Catostomus microps), desert dace (Eremichthys acros), Borax Lake chub (Gila boraxobius), desert pupfish (Cyprinodon macularius), y el speckled dace (Rhinichthys osculus nevadensis) de Ash Meadows han sido completadas recientemente o están por completarse. Procedimientos de enlistamiento de emergencia, además de los procedimientos normales de enlistamiento han sido solicitados para el desert pupfish debido a desarrollo agricola en el area de Salton Sea. Las actividades de enlistamiento incluyen un contrato otorgado a James Deacon de la Universidad de Nevada en Las Vegas, para preparar documento de enlistamiento para siete especies de peces de Nevada.

El unarmored threespine stickleback (Gasterosteus aculeatus williamsoni) afronta serios problemas en San Antonio Creek debido a extracción de agua en la cuenca del rio. Habitación esencial para la especie, que incluye sectores de San Antonio Creek, ya ha sido propuesto para designacion. David Soltz de la Universidad Estatal de California, en Los Angeles, ha sido contratado para realizar estudios sobre ciertos aspectos ecológicos de esta especie en esta area.

Se ha organizado un grupo de personas que está realizando esfuerzos para proteger al Paiute cutthroat trout (Salmo clarki seleniris). El Departamento de Pesca y Caza de California, el Servicio Forestal de los Estados Unidos, y el Servicio de Pesca y Fauna de los Estados Unidos, están cooperando en este esfuerzo.

U.S. FISH AND WILDLIFE SERVICE
ALBUQUERQUE, NEW MEXICO

James E. Johnson

1. Listing

During 1980 the following southwestern fish species were listed:

Gila elegans
Gambusia georgei
Etheostoma fonticola (Critical Habitat)
Gambusia amistadensis
Cyprinodon bovinus

In addition, *Dionda diaboli* was proposed but not listed because the Director of the Service declined to sign the listing package. His reasoning included failure of local residents of Del Rio, Texas, to understand the meaning of critical habitat and biological weakness of the listing package (failure to determine numbers of Devil's River minnows).

2. Contracts

The following aquatic studies were initiated or completed during 1980:

Survey of rare molluscs of Texas and Oklahoma
Survey of rare molluscs of Arizona and New Mexico
Status of *Gila nigrescens*
Comparisons of *Poeciliopsis occidentalis* populations
Composition of cienegas
Plagopterus argentissimus competition and monitoring
Gila elegans brood stock collections
Xyrauchen texanus survey, Colorado River
Gambusia heterochir monitoring

3. Dexter National Fish Hatchery

Dexter NFH presently is rearing the following species:

woundfin
Colorado squawfish
Yaqui chub
Chihuahua chub
bluntnose shiner
beautiful shiner
Gila hybrids (2)
Yaqui sucker
Pecos gambusia
Big Bend gambusia
Amistad gambusia
Gila topminnow
Yaqui topminnow
San Marcos gambusia
Comanche Springs pupfish
Leon Springs pupfish
fountain darter

Biologists wishing to utilize any of the above species for research should contact the Albuquerque Regional Office.

4. Reintroductions

On October, 15, 1980, approximately 30,000 Yaqui chubs (Gila purpurea) were stocked in two ponds on the San Bernardino Ranch in southeastern Arizona. The ranch, purchased by The Nature Conservancy for eventual acquisition by the Service, will eventually maintain all six of the native Rio Yaqui fish species it once harbored. Gila purpurea will be proposed as an Endangered Species in 1981. To date, this is the first major restocking effort from Dexter NFH.

Additional work is underway with States and other Federal agencies to reintroduce listed species back into historic habitats. Species presently under consideration are the Gila topminnow, Pecos gambusia, woundfin, and Colorado squawfish.

5. Acquisition

San Bernardino Ranch (Arizona) will be obtained from The Nature Conservancy in FY 1982. We are now looking into acquisition of Clear Creek Ranch (Texas).

6. Recovery Teams/Recovery Plans

The following teams are presently active or being formed:

Gila trout - plan completed
Arizona trout - plan completed
woundfin - plan completed
San Marcos ecosystems - team now being formed
Rio Grande fishes - Clear Creek gambusia - plan under review
- Big Bend gambusia - management plan completed
- Comanche Springs pupfish - plan drafted
- Pecos gambusia - plan drafted

DEPARTMENT OF THE NAVY
NAVAL WEAPONS CENTER
CHINA LAKE, CALIFORNIA 93555

20 Aug 1980

MEMORANDUM

From: Wildlife Biologist (Code 26309)
To: Head, Natural Resources Management Office (Code 26309)

Subj: 1980 Mojave Chub Population Census - Lark Seep, NWC

1. INTRODUCTION:

The Mojave Chub (Gila mohavensis) is recognized by both the state and federal government as an endangered member of the minnow family, Cyprinidae. Originally found in the Mojave River from above the junction of the east and west forks downstream to Soda Lake, this unique fish species is now found natively only at Lake Tuendae and nearby Fort Soda (formerly known as the Zzyzx Mineral Springs Resort). It has since been successfully introduced at three other locations in Southern California, one of which is Lark Seep at the China Lake Naval Weapons Center. The original transplant in 1970 of two to three hundred Mojave Chub by the California Department of Fish and Game was made in an attempt to establish a new population of this fish in the seemingly ideal conditions offered at Lark Seep.

From August 4-8, 1980, the NWC Natural Resources Management biologists, comprised of Dianne Beckingham, Karen Karner, Beverly Kohfield, Denise LaBerteaux, and supervisor Tom McGill assisted Department of Fish and Game officials Frank Hoover and Taira Yoshimura from the Chino Fish and Wildlife Base (region 5), in a mark and recapture survey to determine an approximate population estimate of the Mojave Chub in Lark Seep. By conducting such a survey, the California Fish and Game hoped to gain pertinent information indicating the success or failure of the original transplant and thus the overall progress of the project.

2. MATERIALS AND METHODS:

The mark and recapture of Mojave Chub for the four day census was accomplished through the use of thirty-three minnow traps furnished by the Department of Fish and Game. Each trap was composed of two sloping cylindrical sections, framed with quarter inch wire mesh, and separately measuring 8" high, 9" wide at the inside (larger) end, and 7½" wide at the outside (smaller) end. A 5" high cone, complete with 2" round opening, extended from this outside edge into the center (Figure A). These individual sections were fastened together with three interclasping projections to form one complete trap (Figure B).

The minnow traps operate on the simple and effective theory that most fish are capable of finding their way into the funnel-like ends of the trap, but once inside are unable to locate the small entrance leading back to open water.

Bait for each trap consisted of a single 6 oz. can of Petuna brand canned catfood (chopped mackerel), which had been perforated with a can opener at four locations around the lid and placed in the center of the trap. An empty white plastic bottle, tied to a single pin with rope cording, was then attached

to each baited trap to serve as a float marking location. Each bottle was numbered (1-33) with black waterproof pen for identification. The traps were then submerged at random locations and depths around the seep (Figure C and Table 1).

The trap line was checked for Mojave Chub at regular three hour intervals (average three times daily)*. A five gallon plastic painter's bucket containing shallow water was used to contain captured fish while the sorting and clipping process was accomplished.

It is important to note that there are two species of fish which are known to inhabit Lark Seep: 1) Mojave Chub (Gila mohavensis) and 2) Mosquitofish (Gambusia affinis). The ability to distinguish between the two is essential in order to maintain project accuracy. There are several external features which may be used to effectively differentiate between these two species: the Mojave Chub has a decurved lateral line, a terminal mouth, and a distincitve "hump" behind the head. It may be dusky olive, brown, or brassy on the dorsal surface, and white to silver on the ventral surface. The caudal fin is forked (Figure D). Mosquitofish, in contrast, have an oblique mouth, flattened head, and a dorsal fin located behind the origin of the anal fin. It may be gray or olivaceous dorsally with lighter coloring ventrally. It often gives the appearance of having a distinct "pot belly". The caudal fin is blunt and rounded (Figure E).

The sorting process between species was accomplished after the fish had been taken from the trap and placed in the capture bucket. Mojave Chub were retained in the bucket for marking, while mosquitofish were removed and released back into the seep. The use of an aquarium net was found to be the best method when handling fish, since it avoided direct contact with the body which could result in injury or contamination of the specimen.

The marking of Mojave Chubs was accomplished by clipping the upper or lower tip of the caudal fin with a hole punch. Each fish was then tabulated and released at the point of capture. (Table 2).

3. DISCUSSION

A total of 194 Mojave Chub* were trapped and marked during the course of this four day census. Of these, only 4 of the marked chub were ever recaptured. In lieu of the obvious lack of sufficient recapture data compiled on the total population, it can be surmized that the results therefore obtained from the available figures are insufficient to tabulate an accurate population estimate.

*This figure does not include the 24 fish which died during the census. Water samples taken may indicate a direct correlation between fish mortality and the presence of Sedge (Carex sp.) in the locality of traps where mortality is high.

*The exception to this was the trapping line checked on August 8 which had remained in the water for 36 hours.

20 Aug 1980

Subj: 1980 Mojave Chub Population Census - Lark Seep, NWC

There are, however, some conclusions that can be drawn from the data collected:

A) Most productive trapping locations in view of water depth and available protective cover:

Lark Seep measures approximately 53 cm. at its deepest point. The traps for this census were placed in water depths varying from 21 cm. to 53 cm. The most productive traps were those located close to the shoreline in medium depth water (38.2 cm average depth with most productive trap submerged at 37 cm), near some kind of shelter - either cattail border, dense underwater plant growth, or artificial shelter in that order of preference. Those traps which proved to be least productive were located in open water or in open water with artificial shelter.

B) Most productive trapping times and resulting correlation with water temperature:

The most productive trapping times were found to range, in order of success rate, from 0800 to 1100 (after 12 hours submerged); from 1200 to 1400 (after 3 hours submerged) and finally from 1600 to 1800 (after 3 hours submerged). The success of fish capture during these specific hours may be directly related to and/or affected by water temperature. The water temperature, at those times when trapping proved to be at its highest peak, ranged between 70^{0}-78^{0}F. Interestingly enough, the water temperature at Lark Seep usually remained with this range in the morning and early afternoon hours. When water temperature exceeded 80^{0}F, however, as it usually did in the late afternoon, a rapid drop in fish capture was noted.

C) Average body measurements of trapped Mojave Chub:

A random sampling (136) of captured Mojave Chub from all trapping locations revealed the following results: 38.9% of all captured Chub measured between 2.54 cm - 5.08 cm in length; 32.2% measured between 7.62 cm - 10.16 cm in length; 14.7% measured between 5.08 cm - 7.62 cm in length; 9.5% measured between 10.16 cm - 12.7 cm in length; and 4.4% measured 12.7 cm or larger (largest chub captured measured 20.32 cm in length). This sampling would then suggest that Lark Seep maintains a high population of fry chub, indicating that reproduction has been successful.

Conclusions:

The results from the 1980 chub census clearly indicate that the Mojave Chub refugium located at Lark Seep on the China Lake Naval Weapons Center is an established and thriving habitat for this endangered fish species. This fact is demonstrated by the relatively large number of trapped, unmarked specimens and in the low recapture rate, indicating a large population

26309.[illegible]
29 Aug 1980

Subj: 1980 Mojave Chub Population Census - Lark Seep, NWC

size. To insure the continued success and growth of the population which now inhabits Lark Seep, it is important to maintain and manage the refugium under the cooperative management plans developed by the Department of Fish and Game and the China Lake Naval Weapons Center. In addition to these protective measures, further security patrolling by Code 24 is recommended to prevent vandalism.

Karen Karner

KAREN KARNER
Wildlife Biologist

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TABLE 1: DEPTH AND LOCATION OF MINNOW TRAPS
1980 MOJAVE CHUB CENSUS, AUGUST 4-6

Trap #	Depth set (cm)	Location
1	30	near island
2	33	at edge of cattails
3	37	" " " "
4	34	" " " "
5	34	at edge of cattails near RR tracks
6	35	at rocks near RR tracks
7	38	at RR tracks near tules
8	37	at cattail border
9	35	" " "
10	30	at cattail border near bottle neck
11	30	at cattail border
12	31	" " "
13	31	near cattail margin
14	33	at artificial shelter
15	38	at cattail border
16	21	" " "
17	31	open water
18	25	" "
19	33	artificial shelter
20	27	open water
21	29	" "
22	32	artificial shelter open water
23	38	" " " "
24	42	" " " "
25	53	" " " "
26	44	" " " "
27	42	" " " "
28	45	open water
29	42	open water & artificial shelter
30	40	" " " "
31	47	" " " "
32	45	open water
33	48	open water & artificial shelter

TABLE 2: CAPTURE DATA - 1980 MOJAVE CHUB CENSUS - AUGUST 4-6

DATE	TIME	CONDITIONS	TRAP NUMBER 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	TOTAL CATCH	NUMBER UNMARKED	NUMBER MARKED
8/4	1600 1700	Air=103°F	0	0	2	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
8/5	0815 0900	Air= 85°F Wtr= 70°F	0	0	3	0	5	4	0	9	1	0	0	4	0	1	1	0	1	0	5	1	1	0	0	2	1	1	3	0	2	1	1	0	7	54	54	0
8/5	1215 1315	Air= 93°F Wtr= 78°F	0	0	0	0	0	3	2	4	1	1	0	1	0	2	1	0	0	0	1	0	1	0	4	0	2	0	4	0	2	1	3	0	1*	34	33	1
8/6	1545 1645	Air=102°F Wtr= 82°F	0	0	0	0	0	0	5	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	1	0	2	0	0	0	0	2	1	0	0	14	14	0
8/6	0800 0900		0	0	0	3	0	1	0	10	2	4	0	2	1	2	0	1	0	0	1	1	0	0	3	2	0	0	3	3	0	1	0	1	2	43	43	0
8/6	1225 1305	Wtr= 77°F	0	5*	1	1	0	0	9*	10	1	1	0	0	0	0	1*	0	0	0	0	0	1	0	3	1	0	2	0	0	2	0	0	0	7	45	42	3
																																		TOTAL:		194	190	4

*recapture

NOTE: This data reflects only the results of trapping done between August 4-6. Data collected on August 8 was not included here due to the relocation of several traps and 36 hour period between trap checks.

FIGURE A

SINGLE MINNOW TRAP SECTION

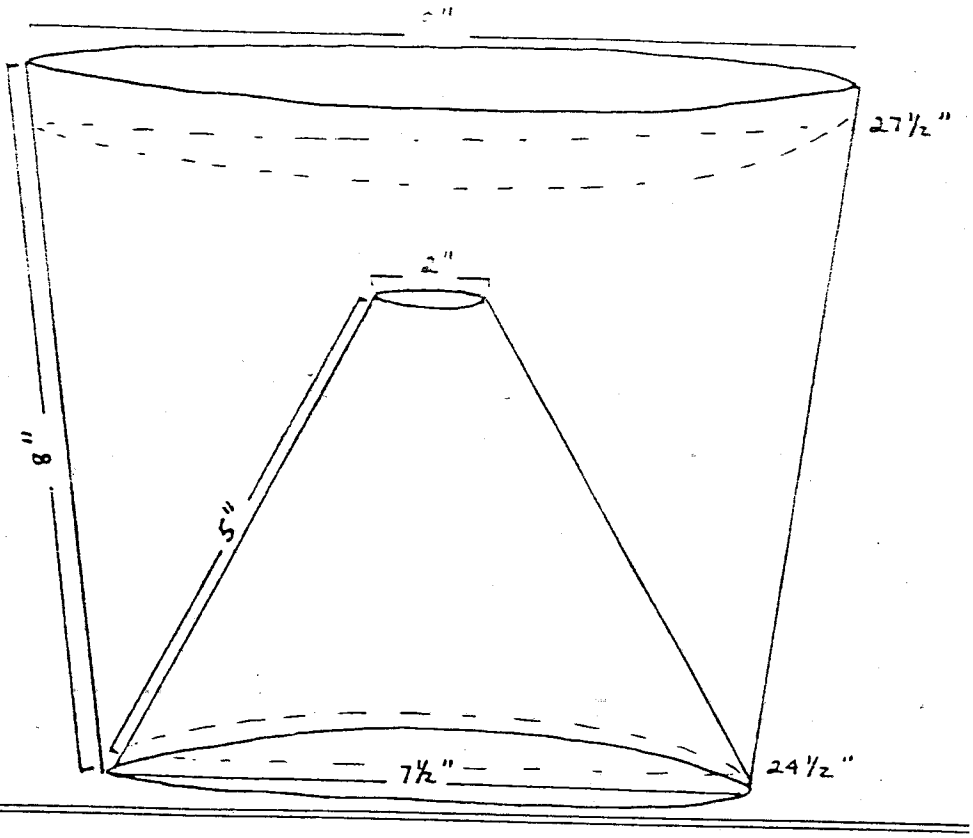
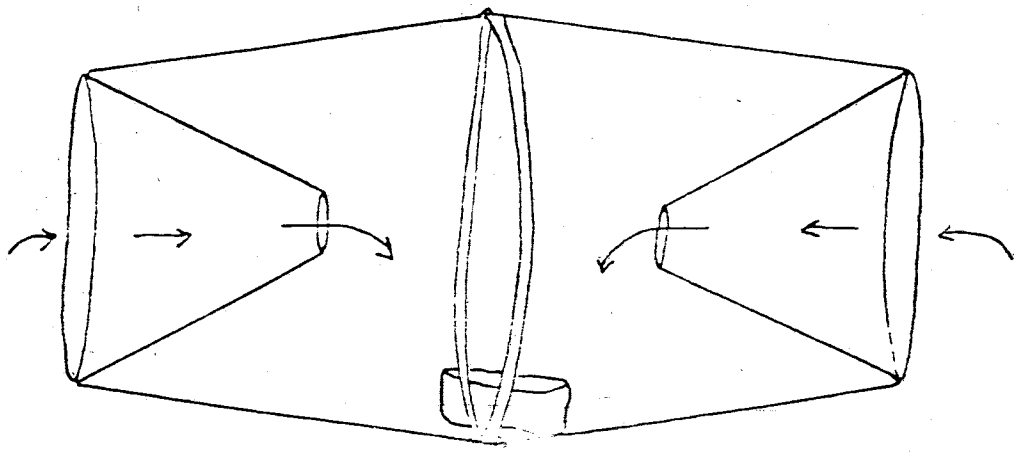


FIGURE B

COMPLETE MINNOW TRAP WITH BAIT



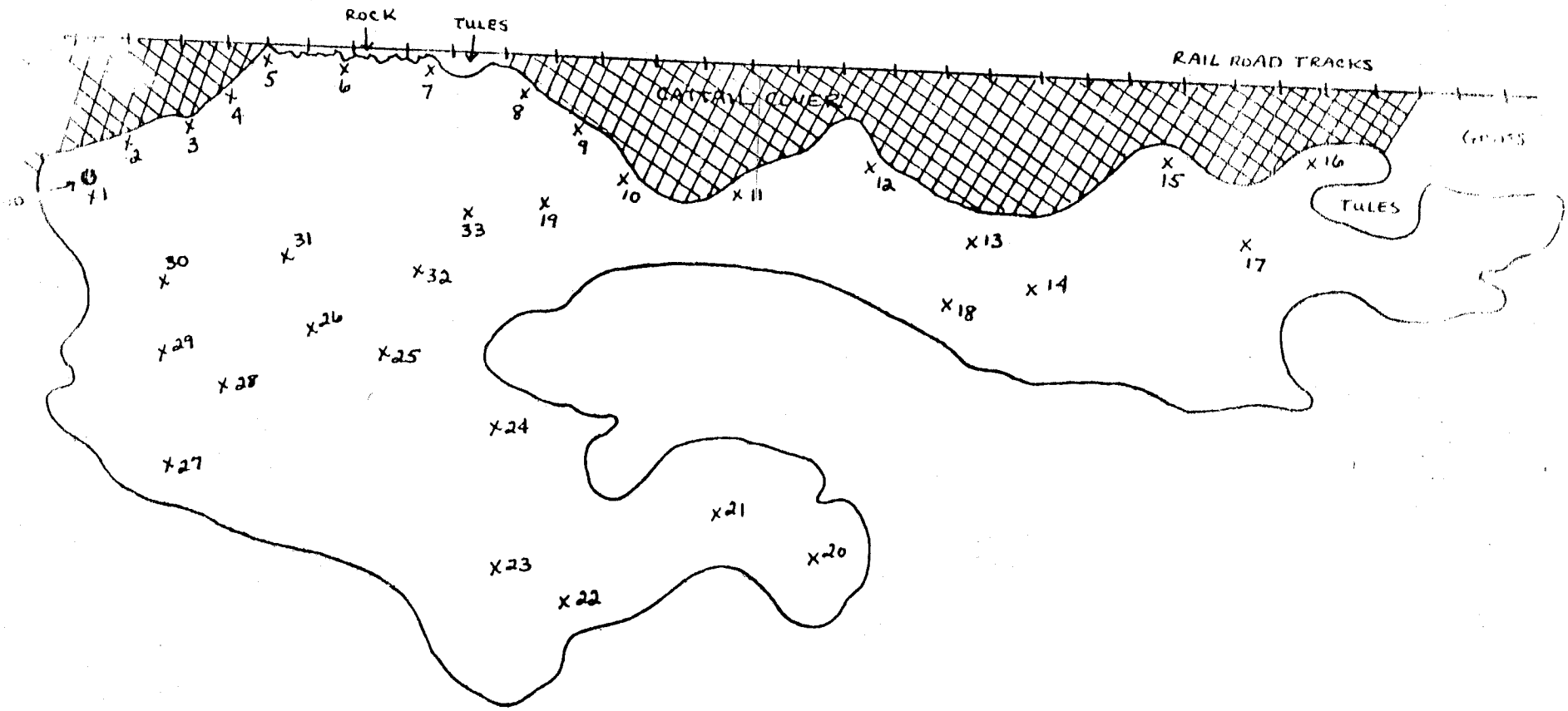


FIGURE C: LARK SEEP, NWC

MINNOW TRAP DISBURSAL - 1980 MOJAVE CHUB CENSUS

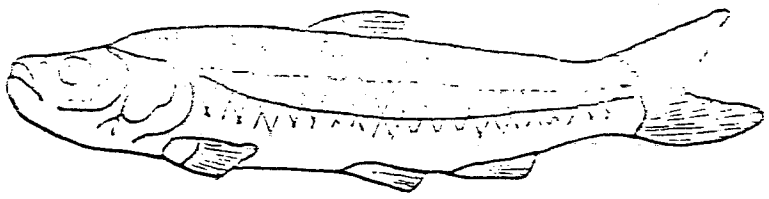


FIGURE D : MOJAVE CHUB
(GILA MOHAVENSIS)

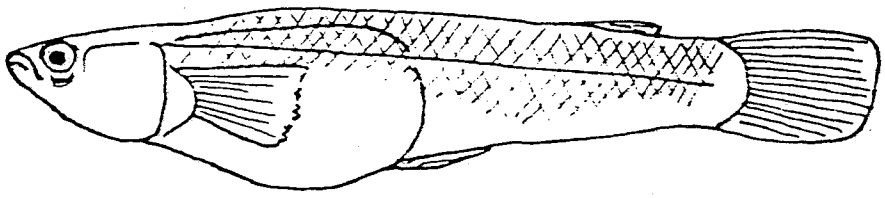


FIGURE E: MOSQUITOFISH
(GAMBUSIA AFFINIS)

AGENCY REPORTS - CALIFORNIA DEPARTMENT OF FISH AND GAME

Phil Pister - Bishop.

California is engaged in an increasingly active program of endangered and nongame research and management, with personnel assigned to this work from both staff and regional functions. Of particular significance in this respect are two herpetologists, an invertebrate zoologist, and a botanist to supplement three fishery biologists. The cooperative agreement with the Fish and Wildlife Service has been of major assistance in implementing California's nongame program, and the results of Tuesday's election cannot help but make one speculate on the future of such programs under the new administration. My concern here is less for California than for the other Great Basin states, several of which are just now beginning to develop their nongame programs with federal assistance. Loss of this momentum will no doubt cause an inertial period of indeterminate length. It may be years, or decades, before such programs are started again. I am confident that California will continue on pretty much as before, but with less staff support. In any case, the loss of such programs, whether in California or in other areas of the United States, seems both unnecessary and tragic.

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

Phil Pister - Bishop

California está envolverado en un programa bien activo de investigación y manejo de las especies empeligradas y no-caza, con personal asignados a este trabajo del estado y de las agéncias regionales. De significado particular en este aspecto son dos herpetólogos, un zoólogo invertebrado, y un botánico, suplementario a tres biólogos pesqueras. El acuerdo cooperativa con el Servicio de Peces y Fauna ha sido de gran ayuda al poner en ejecución el programa de no-caza de California, y la elección del PresidenteReagan el martes pasado le hace a uno pensar en el futuro de tales programas bajo la nueva administración. La preocupación mía no es tanto para California, sino para los otros estados de la cuenca grande que acaban de empezar, con la ayuda del gobierno, a desarollar sus programas de no-caza y de especies empeligradas. La pérdida de esta iniciativa sin duda causará un período inercial de una duración de tiempo indeterminable. Quizas sea años o décadas, antes que dichos programas se empiezan de nuevo. Tengo confianza de que California continuará como antes, pero con menos apoyo. Sea lo que sea el caso, la pérdida de estos programas es innecesario y trágico.

Abstract

SESSION IV-REPORTS BY AGENCY AND GOVERNMENTAL REPRESENTATIVES

Colorado Division of Wildlife; Upper Colorado River Investigations, 1977-1980
Charles M. Haynes, Fort Collins

The Colorado Division of Wildlife began investigating the distribution and status of the endangered Colorado squawfish (Ptychocheilus lucius) and humpback chub (Gila cypha) in 1977. Capture success was low in 1977-78 while field crews gained familiarity with the river systems and sampling techniques. Increased experience in 1979 and 1980 has resulted in a more thorough understanding of the distribution and status of both species in the Upper Colorado River and its tributaries. Tagging studies, begun in 1979 in a cooperative effort with the U.S. Fish and Wildlife Service, have yielded too few recaptures to date for meaningful density estimates; however, observations relative to movement and range have been possible.

In Colorado, both species appear to reach their greatest densities in an area of the mainstem Colorado River known as Black Rocks, and appear to reproduce successfully there. Squawfish reproduction has also been documented in the Yampa River in 1980, based upon collections of several young-of-the-year in Dinosaur National Monument. A single humpback chub was collected at Cross Mountain Canyon on the Yampa in August, 1980 - the first time this species has been collected in the Yampa River during the course of these investigations. Investigations will continue through 1985, with increased emphasis placed upon habitat requirements the water quality effects.

Abstracto

SESIÓN: IV-INFORMES POR REPRESENTATIVOS GUBERNATIVOS Y AGENCIAS

"Colorado Division of Wildlife" (La División de Colorado de Fauna)
Investigaciones del alto Río Colorado, 1977-1980.
Charles M. Haynes, Fort Collins

La División de Colorado de Fauna comenzó a investigar en 1977 la distribución y condición de los peces de Colorado que están puestos en peligro: Ptychocheilus lucius (nombre común en inglés: "squawfish") y Gila cypha (nombre común en inglés: "humpback chub"). El éxito de captura resultó bajo entre 1977-78, mientras los equipos de campo alcanzaron familiaridad con los sistemas de río y con las técnicas de toma de muestras. La experiencia aumentada en 1979 y 1980 ha resultado en un entendimiento más profundo de la distribución y condición de ambas especies en el alto Río Colorado y sus afluentes. Estudios de etiqueta, comenzados en 1979 en us esfuerzo cooperativo con el "U.S. Fish and Wildlife Service" (El Servicio de Pesca y Caza de los EE.UU.), han producido demasiado pocas nuevas detenciones hasta la fecha para estimaciones significativas de densidad; no obstante, observaciones relativas al movimiento y distancia han sido posibles.

En Colorado, ambas especies aparecen alcanzar sus mayores densidades en un área del tronco principal del Río Colorado, conocido como "Black Rocks" (Piedras Negras), y aparecen reproducir allí con éxito. La reproución de "squawfish" (Ptychocheilus lucius) también ha sido documentada en el Río Yampa en 1980, basada en colecciones de varias crías del año en "Dinosaur National Monument." Uno solo "humpback chub" (Gila cypha) fue recogido en "Cross Mountain Canyon" en el Río Yampa en agosto, 1980 -- la primera ves en que esta especie ha sido recogida por el transcurso de estas investigaciones. Las investigaciones sequirán hasta 1985 inclusive, con un énfasis aumentado puesto en los requisitos que efectúa la cualidad del agua.

The Nature Conservancy

- Dave Livermore, San Francisco

The Nature Conservancy is the only private conservation organization in the U.S. dedicated solely to preserving biological diversity through the acquisition of ecologically significant lands which are threatened with development. Since 1951, we have worked constructively with corporations, individuals, and state and federal agencies to preserve over 1.6 million acres of land nation wide. TNC is not a high profile lobbying organization. We have accomplished our goals efficiently and quietly by working with the tools of the free market system.

TNC is concerned that 15% of the remaining plant and animal species on earth may disappear by the year 2000. This may mean a reduction in global natural diversity by one-seventh to one-fifth. We are concerned that the U.S. may lose 64 million acres to development in major urban areas before the year 2000. We are concerned that a conservative estimate of the current extinction rate is 1,000 species a year. These concerns clearly coincide with the Desert Fishes Council's programs and goals. We, too, are "dedicated to the preservation of America's desert fishes." In the past, TNC's activities in the Great Basin have been limited by funding and personnel shortages. We are now interested in taking a more active role in preserving the natural diversity in this area. Necessarily, desert aquatic systems are of high priority for acquisition because of their immediate need for protection. TNC encourages Council members to:

1) Make specific suggestions as to which acquisition projects might be appropriate for Conservancy involvement in the Great Basin, and
2) Join The Nature Conservancy if you have not done so already!

BUSINESS MEETING

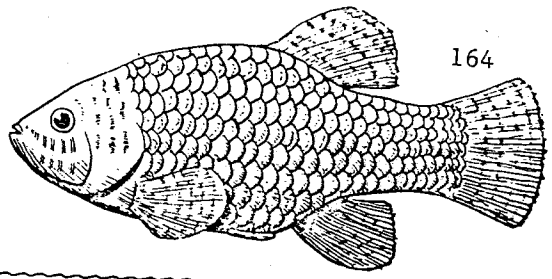
Owing to the late hour (as is usual in Desert Fishes Council symposia), the business meeting was restricted essentially to the formulation of resolutions (see Appendix), the treasurer's report, the election of the chairman-elect, and the installation of the new chairman.

The treasurer reported a balance of $1,480.86 as of November 7, 1980. However, expenses incurred during the symposium reduced the amount rather drastically. Dues payments and member contributions since the symposium have, as of this writing (July, 1981), restored the financial stability of the Council.

Dr. Salvador Contreras-Balderas was elected chairman-elect of the Council, to assume office at the 1982 symposium. James E. Johnson was installed as the current chairman, replacing Peter G. Sanchez, who had served in that capacity since 1978. Highlighting the chairmanship of Mr. Sanchez was his unprecedented ability to bring the publication of the Council's proceedings up to date.

APPENDIX

Desert Fishes Council



"Dedicated to the Preservation of America's Desert Fishes"
407 West Line Street
Bishop, California 93514
January 14, 1981

RESOLUTION 80-1

RELATIVE TO THE COMMENDATION OF WILLIAM D. SWEENEY

WHEREAS the United States Fish and Wildlife Service bears the lead responsibility in implementing and coordinating the Endangered Species Program, and

WHEREAS the Endangered Species Program in Nevada and California has been under the supervision of William D. Sweeney, Area Manager, United States Fish and Wildlife Service, Sacramento, California, and

WHEREAS the conservation of endangered and threatened desert fishes is a major component of the overall Endangered Species Program, and

WHEREAS the preservation of many desert fishes in Nevada and California is of utmost importance to the desert fishes conservation effort, and

WHEREAS William D. Sweeney has given outstanding and superior support in the Desert Fishes Council's efforts to conserve the endangered and threatened fishes of California and Nevada and has given similar support to the Endangered Species Program in general, now therefore be it

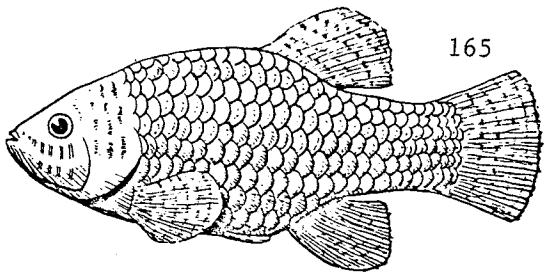
RESOLVED that the Desert Fishes Council, an organization numbering in excess of 300 persons and comprising a nationwide and international representation of federal, state, and university scientists and resource specialists, members of conservation organizations, and individuals concerned with long-term environmental values, assembled at the Council's Twelfth Annual Symposium on November 5-7, 1980 at the University of Nuevo Leon, Monterrey, Mexico, does hereby officially recognize this support and commend the actions of Mr. Sweeney in supervising the Endangered Species Program in Nevada and California, and be it further

RESOLVED that copies of this resolution be forwarded to the Assistant Secretary of Interior for Fish, Wildlife, and Parks; to the Director of the United States Fish and Wildlife Service; to the Regional Director of the United States Fish and Wildlife Service in Portland, Oregon; and to the Area Manager of the United States Fish and Wildlife Service in Sacramento, California.

PASSED BY UNANIMOUS 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
January 14, 1981

RESOLUTION 80-2

RELATIVE TO THE PROTECTION AND PRESERVATION OF HABITAT ESSENTIAL TO THE CONTINUED EXISTENCE OF THE MOAPA DACE (MOAPA CORIACEA)

WHEREAS the destruction of viable habitat is continuing in the headwaters of the Moapa River, and

WHEREAS the United States Fish and Wildlife Service has purchased Pedersen's Resort as a refugium for the dace, and

WHEREAS the continued development of Plumber's upper spring is evident, and

WHEREAS this development poses serious threats to preservation efforts being conducted on the refugium, 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, assembled at the Council's Twelfth Annual Symposium on November 5-7, 1980 at the University of Nuevo Leon, Monterrey, Mexico, does hereby urge the United States Fish and Wildlife Service to take the necessary action to acquire Plumber's upper spring system and to pursue all reasonable measures to protect habitat in the remaining range of the species, and be it further

RESOLVED that copies of this resolution be forwarded to the Director of the United States Fish and Wildlife Service; to the Regional Director of the United States Fish and Wildlife Service in Portland, Oregon; to the Area Managers of the United States Fish and Wildlife Service in Boise, Idaho and Sacramento, California; and to the Director of the Nevada Department of Wildlife.

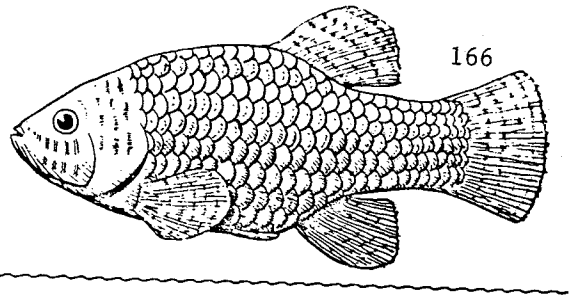
PASSED WITHOUT DISSENTING VOTE

ATTEST:

Edwin P. Pister

Edwin P. Pister
Executive Secretary

Desert Fishes Council



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

407 West Line Street
Bishop, California 93514
January 15, 1981

RESOLUTION 80-3

RELATIVO A LA ALABANZA DEL DR. SALVADOR CONTRERAS-BALDERAS Y DE LA FACULTAD DE CIENCIAS BIOLÓGICAS DE LA UNIVERSIDAD AUTÓNOMA DE NUEVO LEÓN

WHEREAS The Twelfth Annual Symposium of the Desert Fishes Council was held at the University of Nuevo León in Monterrey, México on 5-7 November, 1980, and

WHEREAS the arrangements made by Dr. Salvador Contreras-Balderas, Dean of the Graduate School of Biological Sciences at the University of Nuevo León, permitted an unusually well organized, informative, and enjoyable meeting, and

WHEREAS the students and faculty members affiliated with the Facultad de Ciencias Biológicas at the University of Nuevo León made special and extraordinary efforts to welcome the Desert Fishes Council to the University, and

WHEREAS the student papers presented by those individuals affiliated with the Facultad de Ciencias Biológicas were of exceptional quality, covered a broad spectrum of basic and applied aquatic science, and demonstrated an unusually vigorous program of research, and

WHEREAS the members of the Desert Fishes Council were individually and collectively impressed and pleased with the arrangements, the quality of the meeting, and the opportunity to learn about the exceptional programs in aquatic sciences at the University of Nuevo León, 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, assembled at the Council's Twelfth Annual Symposium on November 5-7, 1980 at the University of Nuevo León, Monterrey, México, does hereby express its profound and heartfelt thanks to Dr. Contreras, to the students and staff associated with the Facultad de Ciencias Biológicas, and to the University of Nuevo León for providing us with our most memorable meeting to date, and be it further

RESOLVED that copies of this Resolution be forwarded to Dr. Alfredo Piñeyro Lopez, Rector of the University of Nuevo León, and to Biol. Adolfo Gonzalez Castillo, Director of the Facultad de Ciencias Biológicas of the University of Nuevo León.

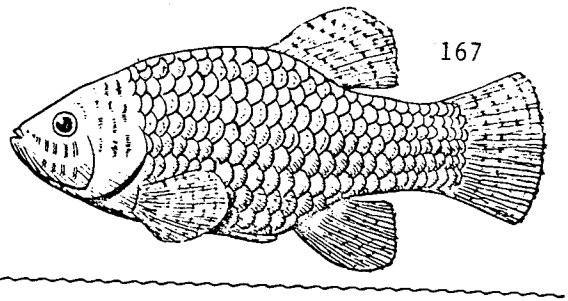
PASSED BY UNANIMOUS VOTE

ATTEST:

Edwin P. Pister

Edwin P. Pister
Executive Secretary

Desert Fishes Council



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

407 West Line Street
Bishop, California 93514
January 15, 1981

RESOLUTION 80-4

RELATIVE TO THE CONSERVATION OF NATIVE YAMPA RIVER FISHES

WHEREAS the Colorado River Water Conservation District and Colorado-Ute Electric Association, Inc. have filed an application to construct two dams on the Yampa River known as the Juniper-Cross Mountain Project, and

WHEREAS the free-flowing Yampa River is recognized as habitat essential to the survival of four native fishes: the Colorado squawfish, Ptychocheilus lucius; the humpback chub, Gila cypha; the bonytail, Gila elegans; and the razorback sucker, Xyrauchen texanus, 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, assembled at the Council's Twelfth Annual Symposium on November 5-7, 1980 at the University of Nuevo Leon, Monterrey, Mexico, does hereby request that the Federal Energy Regulatory Commission assure that the Juniper-Cross Mountain Project be constructed in such a manner as to afford full protection to the above-listed species; preferably that the dams not be built, and be it further

RESOLVED that copies of this Resolution be forwarded to the Colorado River Water Conservation District; to the Colorado-Ute Electric Association, Inc.; to the Director of the United States Fish and Wildlife Service; to the Director of the Denver Region of the United States Fish and Wildlife Service; to the Director of the Colorado Division of Wildlife; and to the Superintendent of Dinosaur National Monument.

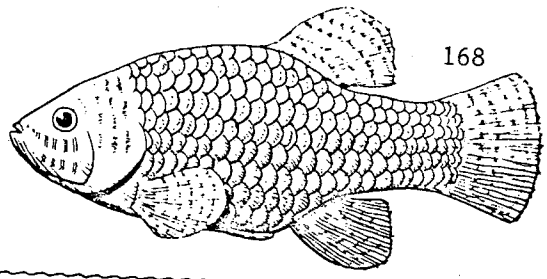
PASSED WITHOUT DISSENTING VOTE

ATTEST:

Edwin P. Pister

Edwin P. Pister
Executive Secretary

Desert Fishes Council



"Dedicated to the Preservation of America's Desert Fishes"
407 West Line Street
Bishop, California 93514
United States of America
November 28, 1980

RESOLUTION 80-5

RELATIVE TO THE ADOPTION OF ENDANGERED SPECIES POLICY AND LEGISLATION BY THE UNITED MEXICAN STATES (ESTADOS UNIDOS MEXICANOS)

WHEREAS the United Mexican States are blessed with a magnificent abundance and diversity of flora and fauna, and

WHEREAS this abundant and diverse flora and fauna are of great value to the people of Mexico and to the world scientific community, and

WHEREAS the retention of maximum biological and genetic diversity is of profound importance in the development of food crops and all other biological resources, and

WHEREAS the rapid growth currently being experienced by the Mexican economy is certain to alter various segments of the environment, and

WHEREAS such environmental alteration is likely to prove detrimental to the flora and fauna dependent thereon for their existence and

WHEREAS the protection and preservation of Mexico's flora and fauna was brought up as a major item of discussion by the Mexican attendants at the Twelfth Annual Symposium of the Desert Fishes Council, held on November 5-7, 1980 at the Universidad Autónoma de Nuevo León in Monterrey, Nuevo León, now therefore be it

RESOLVED that the Executive Committee of the Desert Fishes Council, which constitutes an international representation of more than 350 federal, state, and university scientists and resource managers, students, members of conservation organizations and individuals concerned with long-term environmental values, does hereby strongly support its Mexican colleagues, citizens, and professional organizations in proposing that the government of the United Mexican States formulate, adopt, and enact the necessary policies and legislation to assure the long-term preservation of its own native flora and fauna, and be it further

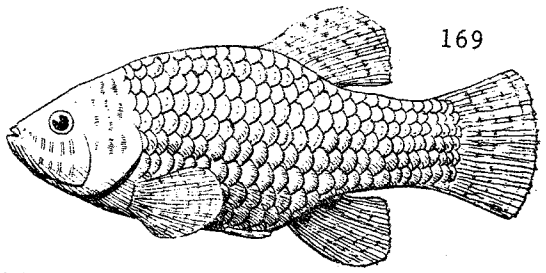
RESOLVED that copies of this resolution be forwarded to the President of the United Mexican States, to the Chairman of the International Union for the Conservation of Nature and Natural Resources, to the Executive Director of the American Fisheries Society, and to the Secretary of Interior of the United States of America.

PASSED WITHOUT DISSENTING VOTE

ATTEST:

James E. Johnson
Chairman, by
Edwin P. Pister
Executive Secretary

Desert Fishes Council



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

407 West Line Street
Bishop, California 93514
United States of America
November 28, 1980

Dr. Salvador Contreras-Balderas
Apartado Postal No. 732
San Nicolas de los Garza
Monterrey, Nuevo Leon
Mexico

Dear Dr. Contreras:

This is to inform you that the Executive Committee of the Desert Fishes Council does hereby authorize and urge you to bring up for discussion the subject of endangered and threatened species protection and preservation at the IV Congreso Nacional de Zoología to be held in Ensenada, B.C., 7-12 December 1980.

It is our feeling that your recent election to the office of Chairman-elect of the Desert Fishes Council, and your widely recognized concern and efforts in studying and protecting Mexico's native flora and fauna, eminently qualify you to discuss this subject. We wish you every success in your efforts, and we enclose for your review a resolution on this subject passed following the recent symposium of the Council held at the Universidad Autónoma de Nuevo Leon.

Sincerely,

Edwin P. Pister
Executive Secretary

ALAN CRANSTON
CALIFORNIA

170

United States Senate

WASHINGTON, D.C. 20510

October 22, 1980

Mrs. Buela Edmiston
814 West Markland Drive
Monterey Park, California 91754

Dear Buela,

As you know, Alan is campaigning in California until November 4. I know that you have a meeting soon in Monterey, Mexico, and I want to give you an update on the Desert Pupfish situation prior to the time Alan will be able to write personally.

In February of this year, Alan asked the General Accounting Office to research and report to him on the most effective and feasible federal action to protect and preserve the Desert Pupfish, specifically those species and subspecies residing in the Ash Meadows area of the Death Valley National Monument, species Cyprinodon diabolis. The GAO study has been carried out and preliminary findings should be available to Alan in mid-November.

It is my understanding that the GAO believes that some protections for the Desert Pupfish can be provided through an exchange of lands. As you know, a Nevada development firm has offered to exchange property in Ash Meadows for Bureau of Land Management holdings in the Pahrump Valley. The BLM is exploring this possibility, and I expect GAO will comment on feasibility of the exchange. It is not yet clear what the recommendation will be regarding legislation. I do know that GAO does not feel that all of the acreage specified in the current bill, S. 42 need be acquired.

I know that Alan would send greetings to those of you who are assembling in Monterey and would renew his commitment to do all he can to provide permanent protection for the Desert Pupfish.

Sincerely,

Gary Aldridge
Legislative Assistant

ALAN CRANSTON
CALIFORNIA

United States Senate

WASHINGTON, D.C. 20510

October 22, 1980

Sra. Buela Edmiston
814 West Markland Drive
Monterey Park, California 91754

Querida Buela,

Como usted ha de saber, Alan está Haciendo su campaña en California hasta Noviembre 4. Estoy enterado de que usted tendrá una reunión muy pronto en Monterrey, Mexico, y la quierro poner hal corriente sobre la situación de Desert Pupfish despues Alan le enviarra una carta personalmente Escrita.

En Febrero de este año, Alan le pidio ha la Officina General de Contabilidad una investigación y reporte para el en el mas efectivo y hacedable acción federal para proteger y preservar los Desert Pupfish, especificamente aquellas especies viviendo en Ash Meadows parte de Death Valley Monumento Nacional, especie Cyprinodon diabolis. El Estudio de GAO ha sido distribuido y resultados preliminares seran disponible para Alan ha mediados de Noviembre.

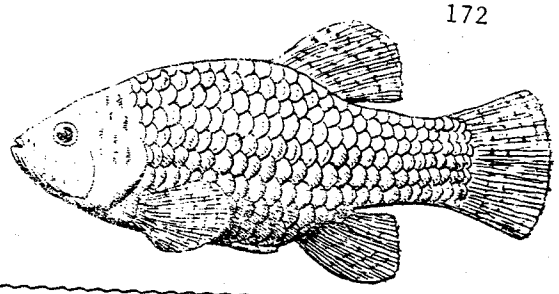
Es mi entendimiento que el GAO cree que ciertas protecciónes para los Desert Pupfish puede ser ha cambio de tierras. Como usted ha de saber, en Nevada una compania de desenvolvimiento ha ofrecido un intercambio de propiedades en Ash Meadows para la Oficina de Manejo de Tierras en Pahrump Valley. El BLM está explorando las posibilidades, y yo espero que GAO comentara sobre el hacedero de el intercambio. No esta claro que recomendación sera tocante la legislación. Segun yo se que GAO no creen que todo el acre especificado en el proyecto de ley corriente, S.42 necesite ser adguirido.

Yo se que Alan les manda saludos ha todos ustedes que se encuentren en la reunión en Monterrey y quirre renovar su promesa para aser todo en su poder para proteger los Desert Pupfish.

Sinceramente,

Gary Aldridge
Legislative Assistant

Desert Fishes Council



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

PUBLIC INFORMATION

Scientists, educators, and resource specialists identify endangered species and habitats in urgent need of protection.

However, in order to secure the necessary laws and regulations, it is important for the public to be informed and to actively support protective measures.

For information on how you can help in the United States, please contact:

THE DESERT FISHES COUNCIL
407 West Line Street
Bishop, California 93514

INFORMACION PARA EL PUBLICO

Los cientificos, educadores, y especialistas en recursos identifican especies en peligro y lugares de urgente protección.

Sin embargo, para a fin de asegurar las necessaries leyes y reglamentos, es importante que el público se entere y que le de su apoyo a los proyectos de ley.

Para mas información en como usted puede ayudar en Mexico, por favor de ponerse en contacto con:

Dr. Salvador Contreras-Balderas
Universidad Autonoma de Nuevo Leon
Monterrey, N.L., Mexico

REGISTRATION - DESERT FISHES COUNCIL - UNIVERSIDAD AUTONOMA DE NUEVO LEON

Twelfth Annual Symposium, November 5-7, 1980

Juan Ortiz R.	Departamento de Pesca	Villagran 219 Nte., Monterrey, N.L.
Delfino Navarro T.	" " "	" " " " " "
Alberto Gonzalez G.	Fac. Ciencias Biológicas	Ciudad Universitaria, Monterrey, N.L.
Royal D. Suttkus	Tulane University	Mus. Nat. Hist., Belle Chasse, LA
Luis Alberto Castro V.	Fac. Ciencias Biológicas	Ciudad Universitaria, Monterrey, N.L.
Thom Hardy	Bio-Consultants of Nevada	Las Vegas, NV
Nadine Kanim	Calif. Dept. Fish & Game	407 W. Line St., Bishop, CA 93514
Jeannine Koshear	" " " "	" " " " " " "
Jim Deacon	Univ. Nevada, Dept. Bio.	Las Vegas, NV 89154
Don Sada	U.S. Fish & Wildlife Svc.	4600 Kietzke Lane, Reno, NV 89502
Barbara Sada		
Bob Love	The Nature Conservancy	P.O. Box 1006, Yorba Linda, CA 92686
Dave Livermore	" " "	156 2nd St., San Francisco, CA 94105
Clark Hubbs	Univ. Texas, Dept. Zool.	Austin, Texas 78712
Jerry Stefferud	Inyo National Forest	873 N. Main St., Bishop, CA 93514
Sally Stefferud		
Bob Furtek	Univ. Nev., U.S.EPA	2621 Bello Dr., N. Las Vegas 89030
Martin R. Brittan	Calif. State Univ., Sacto.	6000 J St., Sacramento, CA 95825
Elisabeth Milstead	Ariz. State Univ. Dept.Zool.	Tempe, Arizona 85281
Frances H. Miller		Ann Arbor, Michigan
Robert R. Miller	Univ. Mich., Mus. Zool.	Ann Arbor, Michigan 48109
Laura C. Hubbs	Scripps Institution	La Jolla, California 92037
Beula Edmiston		814 W. Markland Dr., Monterey Pk, CA.
Tasker Edmiston	" " " " " " " "	
David L. Soltz	Calif. State Univ., L.A.	Los Angeles, CA 90032
Irv Kornfield	Univ. Maine, Dept. Zool.	Orono, Maine 04469
Paul V. Loiselle	Univ. Calif., Dept. Zool.	Berkeley, CA 94720
Alfred Castro	Calif. Academy of Sciences	San Francisco, CA 94118
Lenora J. Bond	Oregon State U., Dept. F&W	Corvallis, Oregon 97331
Carl E. Bond	" " " " "	" " "
Terry J. Hickman	U.S. Fish & Wildlife Svc.	Ft. Collins, CO 80526
Charles Haynes	Colorado Division Wildlife	Ft. Collins, CO 80526
Pauline James	Pan American University	Edinburg, TX 78539
Edna J. Rodriguez	" " "	" " "
Bill Gallagher	A.K.A., Univ. San Fran.	Pleasant Hill, CA
Darrell M. Wong	Calif. Dept. Fish & Game	407 W. Line St., Bishop, CA 93514
Phil Pister	" " " "	" " " " " " "
J. Jerry Landye	Bio-Geo Southwest, Inc.	Flagstaff, AZ 86001
William G. Kepner	B.L.M., Phoenix District	Phoenix, AZ 85017
John Rinne	U.S.F.S., For. Sci. Lab.	Tempe, AZ 85281
Jim Johnson	U.S.F.W.S.	P.O. Box 1306, Albuquerque, NM 87103
David Bowman	"	" " " " " "
Paul Greger	Univ. Nevada, Dept. Bio.	Las Vegas, NV 89154
Bill Rinne	Water & Power Resources	Boulder City, NV
Gary Garrett	Univ. Texas, Dept. Zool.	Austin, TX 78712
Linda Garrett	" " " "	" " "
Tony Echelle	Oklahoma State U., Zool.	Stillwater, OK 74074
Alice Echelle	" " " "	" " "
Neil B. Armantrout	B.L.M., Oregon State Off.	Portland, Oregon 97212
Cindy D. Williams	Sacramento State Univ.	Sacramento, CA 95825
Jack E. Williams	U.S.F.W.S.	Sacramento, CA 95814

Jorge L. Diaz-Machuca	Lab. de Ictiología, U.A.N.L.	Monterrey, N.L., Mexico
Pete Sanchez	U.S. Nat. Park Svc.	Death Valley, CA 92328
Mary Sanchez	" " " "	" " " "
Paul Holden	Bio/West, Inc.	P.O. Box 3226, Logan, UT 84321
Mary Holden	" "	" " " " " "
Carl Richards	" "	" " " " " "
Larry Crist	" "	" " " " " "
Karl Seethaler		98 E. 500 S., Providence, UT 84332
Pat Mangan	U.S.F.W.S.	Grand Junction, CO 81501
Rich Valdez	"	" " " "
Astrid Kodric-Brown	Univ. Arizona, Dept. Ecol.	Tucson, AZ 85721
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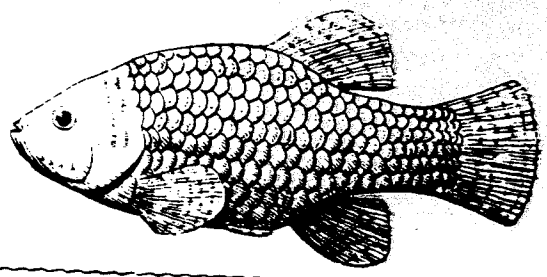
Desert Fishes Council



W E L C O M E

RESTAURANT "E L H E R R A D E R O"

== M E N U ==

T.BONE

SIRLON

AGUJAS (BROCHETAS)

ARRACHERAS (DIAPHRAGM)

FILETE MEXICANO (WITH CHILE)

GUACAMOLE

TORTILLAS

SALSA MEXICANA

REFRESCOS

CERVEZA

MONTERREY, N. L., A 5 DE NOVIEMBRE DE 1980.

LA COMISION