A.G. CONTRACT NO. KPSL_ 21321

AGREEMENT

FOR CONSULTANT SERVICES

FOR

SPIKEDACE AND LOACH MINNOW STUDY

Agreement between the Arizona Game and Fish Commission ("Commission") acting pursuant to A.R.S. 17-231.B.3 and "Consultant". The term Department as used herein refers to the Arizona Game and Fish Department acting as agent for the Commission.

WITNESSETH:

WHEREAS, the Commission wishes to contract with a Consultant to survey the Status of Spikedace **and** Loach Minnow **Study and**

WHEREAS, the Consultant has reviewed the Proposal Guidelines for Consulting Services on this project, submitted a Proposal and represented itself as willing and qualified to perform this work, and

WHEREAS, the Department has selected the Consultant to complete the project under the procedures set forth in A.R.S. 41-2578 acting in **reliance upon the information contained in Consultant's Proposal.**

NOW THEREFORE, it is agreed as follows:

1.) **Scope of Work**

The services to **be** provided by the Consultant are described in the attached Proposal, entitled:

Spikedace and Loach Minnow Study

The Consultant will furnish the Department, upon request and

without restriction or limitation, the original copies of all reports, maps, drawings, and data completed or partially completed for this project.

2.) **Time of Performance.**

Consultant will begin work on the project within fifteen(15) days after receiving a Notice to Proceed from the Department and will complete work as specified in the time schedule section of the Proposal.

3.) **Payment.**

This is a cost-reimburseable contract, not to exceed $ 58,350 Consultant shall be paid as follows for the above-described consulting services:

Payment will be made monthly based upon the amount of work completed during the preceding month as shown by itemized invoices submitted by Consultant and approved by the Department.

4.) **Contract Documents.**

The contract documents include this Agreement, the Proposal Guidelines and the Proposal submitted by Consultant.

5.) **Disputes.**

The Consultant agrees to perform all services in accordance with generally accepted principles and practices. In any dispute concerning a question of fact under this Agreement or in connection with the quality of services performed by the Consultant, the final determination will be made by the Department. Performance is subject to the provisions of the Arizona Procurement Code, A.R.S.

Title 41, Chapter 23, and all regulations adopted thereunder.

The parties agree to use arbitration, after exhausting applicable administrative reviews, to resolve disputes arising out of this Agreement where the sole relief sought is monetary damages of $15,000 or less, exclusive of interest, attorney fees and costs.

6.) Additional Services by Consultant

If additional services are requested of the Consultant by the Department, such further Agreement shall be in writing and describe the scope, time frames and other information necessary for such additional service. Compensation to the Consultant shall be based upon the hourly rates set forth in the fee breakdown section of the Proposal.

7.) Conflict of Interest

A.U. parties are put on notice that this Agreement is subject to cancellation by the Governor of the State of Arizona, pursuant to A.R.S. 38-511 without Penalty further obligation, if any person significantly involved in initiating, negotiating, securing, drafting or creating the contract on behalf of the state or any of its departments or agencies is, at any time while the contract or any extension of the contract *is* in effect, an employee of any other party to the contract with respect to the subject matter of the

contract.

8.) Equipment

All equipment items with a depreciable life of one year or more and with a value of $500 or more that will be required for the performance of this contract shall be itemized in the fee proposal. This equipment shall become the property of the Department and shall be surrendered by the consultant, to the Department on conclusion of this contract.

9.) Non-Discrimination

Provisions relating to non-discrimination in the performance of public contracts as set forth in A.R.S. Title 41, Chapter 9, Article 4, Governor's Executive Orders 74-5 and 75-11 (and, if Federal monies are involved in the funding of this work, Federal Executive Order 11246 of September 24, 1965, and Federal Executive Order 11375 of October 13, 1977) are incorporated herein. In performing the work under this Agreement, Consultant agrees not to discriminate against any employee or applicant for employment on the *basis* of race, religion, color, sex, or national origin and further agrees not to engage in any unlawful employment practice.

10.) Termination or Abandonment

The Department reserves the right, at its discretion, and upon not less than seven (7) days written notice to the Consultant, to terminate the services provided for in the Agreement, or abandon any portion of the project for which services have not been performed by the Consultant.

In the event of termination of abandonment, the Consultant shall be paid for services performed to the termination or abandonment date, including reimbursements then due, not to exceed the lump sum amounts specified in the fee schedule section of the Proposal. Such payments shall be made on the basis of the Consultants documented time records of services performed, at its established billing rates for its employees and expenses which are identified in the fee breakdown section of the Proposal.

11.) Liquidated Damages

Liquidated damages for the untimely completion of the Consultant's services for the plan development phases shall be assessed to and either deducted from future payments to the Consultant or, if an inadequate balance *is* due, paid by the Consultant to the Department in the amount of $50.00 per day for each and every calendar day that the work remains incomplete after the completion date of that phase, as eablished in the time schedule of the Proposal.

I the event of situations not under the reasonable control of the Consultant, including but not limited to fire, unusual transportation delays, unavoidable casualties or accidents, civil desruption, war, weather, or any other causes beyond the Consultant's control, the Consultant may make written application for an extension of the completion date and the Department may grant an extension, in writing, *if* it finds the request to be justified.

12.) Non-Waiver of Covenants

The failure of either party to insist in any one or more instances upon strict performance of any provision of this Agreement shall not be construed as a waiver or relinquishment for the future performance of such provision.

13.) Assignment

The award of contract ***was*** based, in part, upon the personal qualifications of employees and principals of Consultant. Therefore, Consultant shall not *assign,* sublet or transfer its interest in the Agreement or any work to be performed without the written consent of the Department.

14. Records Clause

Pursuant to A.R.S. 35-214 and 35-215, and Section 41-1279.04 as amended, all books, accounts, reports, files and other records relating to the contract shall be subject at all reasonable times to inspection and audit by the State for five years after completion of the contract. Such records shall be reproduced as designated by the State of Arizona.

IN WITNESS WHEREOF, the parties have executed this Agreement, to be effective on the date written below.

Consultant

By: _____

Ronald E. Barr
Asst. Vice President
for Research

Date: 12/31/86

Arizona Game and Fis Commission

By: Duane L. Shroufe

Duane L. Shroufe
Secretary to the Commission

Date: Jan 9, 1987

APPROVED AS TO FORM
This 24th day of December,
By
By
Assistant Attorney General

REQUEST FOR PROPOSAL
Nongame Branch

An Investigation of Interactions between Native and Exotic Fishes in Arizona and New Mexico

The Arizona Game and Fish Department will be receiving funding to study the status of spikedace (Meda fulgida and loach minnow (Tiaroga cobitts) in Arizona. These species currently are listed in Group 3 of the Arizona Game and Fish Commission's list of Threatened Native Wildlife and have been proposed for listing as Threatened species by the Federal Government. Little is known regarding the distribution and ecology of these species.

The loach minnow (Tiaroga cobitis) and spikedace (Meda fulgida) represent, monotypic genera endemic to streams of the Gila River basin of southwestern North America (Minckley et al. 1986). The loach minnow is darter-like and typically occupies gravel/cobble bottoms of shallow riffles while the spikedace is a midwater inhabitant of turbulent and eddying currents associated with inflow of riffles into pools (Barber and Minckley 1966, Minckley and Barber 1970, Anderson 1978, Minckley 1981, Britt 1982,.Propst et al. 1985a, b). Each has experienced substantial reductions in geographic range and population sizes during the past century (Minckley 1973). These reductions are due at least in part to stream modifications directly or indirectly attributable to human activities in the drainage basin, but interactions with introduced fish species (especially Notropis lutrensis) have also been implicated (Minckley and Deacon 1968, Minckley 1973, LaBounty and Minckley 1973, Minckley 1985). Both Tiaroga and Meda are proposed for listing by the U.S. Department of Interior (1985) as Threatened under the Endangered Species Act of 1973 (16 U.S.C., 1531-1543; 87 Stat. 884; as amended).

Proposals are hereby solicited for a study designed to answer basic questions about community level interactions among fish species and their habitats. The fish species of interest include Tiaroga cobitis and Meda fulgida and all others, native and exotic, which are presently found syntopic with them. Primary emphasis will be placed on interactions of Meda ana liaroga with Notropis lutrensis and detailed analysis of the ecology of loach minnow and spikedace as required to determine and quantify factors involved in their apparent declines toward extinction.

Justification for study

Long term trends toward extinction which have been well documented over the past century (Minckley and Deacon 1968, Minckley 1973) for both Tiaro a cobitis and Meda fulgida are continuing today (Minckley 1985, Propst et al. 1985a, b). Once widely distributed in the Gila River basin above Phoenix (Minckley 1973), Meda fulgida now is known from only a fe

localities in Arizona (upper Verde River, Aravaipa Creek and Eagle Creek). In New Mexico it occurs in few scattered localities in the Gila River basin above Redrock (Propst et al. 1985a, b). Tiaroga cobitis occurs in Arizona only in Aravaipa Creek, the upper White River and the Blue and San Francisco rivers above their confluence (Britt 1982). Unlike the spikedace, the loach minnow persists in the San Francisco River drainage of New Mexico, but its distribution in the Gila River drainage of that state resembles that of Meda.

In general, native fish abundance and diversity in the Gila River basin are inversely correlated with abundance and diversity of exotic species (Minckley 1985, Minckley and Meffe 1986). With few exceptions (e.g. Meffe 1985), however, it remains unknown whether presence of exotics is the direct cause of the decrease in native faunas. It could be that both exotic and native faunas are simply responding independently in different ways to altered environments. Such is surely the case in extreme cases such as impoundment where lentic adapted exotic fishes have replaced lotic adapted natives in habitats transformed from rivers to reservoirs. Replacement of lotic adapted natives such as Meda and Tiaroga, however, by similarly adapted exotics such as Notropis lutrensis must be attributable to less obvious and more complex mechanisms. These replacements are occurring in relatively little-altered physical habitats and with varying rapidity. While very rapid replacement of Meda by Notropis has been documented at some sites (Anderson 1978), the two species are known to have occurred syntopically at one site for at least 15 years (Barrett et al. 1985).

Evidence that Notropis lutrensis is the direct causal factor in its replacement of Meda fulgida is mostly circumstantial. Following introduction of red shiner to the Colorado River as a bait fish (Hubbs 1954), Deacon and Minckley (1969) reported its spread and were first to note disappearance of both spikedace and loach minnow in areas where Notropis lutrensis had become abundant. Since then, progression of red shiner upstream in the Gila basin has continued (Minckley 1973) such that its range is almost mutually exclusive of that of the two endemic species which now persist only in upstream areas (Propst et al. 1985a, b, Minckley 1985). While the correlation of Notropis establishment with Meda decrease or extirpation is clear, no studies to date have intensively investigated mechanisms to which this pattern might be attributable.

The biology of Meda fulgida is relatively well studied in comparison to other native southwest desert fishes. Autecological studies of Meda fulgida are available (Barber et al. 1970, Barber and Minckley 1983), which have investigatea ecology of the species in Aravaipa Creek where it occurs with 5 other native fishes and no exotics. Also from Aravaipa Creek, the study of Schreiber and Minckley (1982) provides data on the diet of spikedace and other native fishes. Anderson (1978) and Propst et al. (1985b) provide information on the biology of Meda

over a broader geographic range In New Mexico, including data from sites where it presently lives with exotics. Schreiber and Minckley (1982) and Britt (1982) provide similar data on Tiaroga cobitis.

Since trends toward extinction are continuing for virtually all native southwestern fishes, intensive management is needed to recover them ana remove them from danger of extinction. Not only do diffuse impacts such as land management practices altering their habitats and broadly established exotic species appear to be affecting them, but point impacts threaten them as well. Much of the range of Meda and Tiaroga is within impact zones of planned impoundments which would surely result in local extirpation of large populations if constructed. If spikedace and loach minnow are to be managed to reverse present trends toward extinction and assure their perpetuation, much more detailed knowledge of their biology, and especially of their inter-relationships with the physical, chemical and biotic components of their habitats will be required. It will be necessary to know mechanisms by which these species are being reduced toward extinction so that steps may be taken to counteract them. Increased knowledge of community ecology obtained from this study will be useful in management not only of the spikedace and loach minnow, but also of all native fish species to assure perpetuation of intact desert stream communities and habitats.

Objectives

With particular emphasis on Meda, Tiaroga and Notropis, but not excluding other faunal components, objectives of the proposed study will be:

1. To determine if loach minnow and/or spikedace interact directly with red shiner and other exotics and to elucidate the nature of any such interactions (e.g. predation, competition, interference, etc.).

2. To describe and quantify the extent of any interspecific interactions that may be found (e.g. extent of dietary overlap, extent of predation mortality, reproductive success, habitat displacement, etc.).

3. To elucidate and quantify physical and chemical habitat requirements and preferences of all life history stages of native species, especially Meda and Tiaroga, as well as those of exotics.

4. To describe and quantify spatial and temporal aspects of occurrence of any interspecific and/or habitat interactions that may be found.

5. To relate findings to the pattern of historic decline of the native species and to construct hypotheses, with

supporting evidence, regarding the mechanisms by which the decline has occurred.

6. To suggest management methods which, if implemented, would act to curtail or reverse present trends toward decline of native fish faunas.

Methods

Methods to be used are left to the discretion of individual investigators. It is expected, however, that studies will employ descriptive, as well as experimental, approaches to analyses of the problems and address the entire geographic range (in the Gila River basin) of the primary species (Meda, Tiaroga and Notropis lutrensis) involved. Studies could be conducted in field and/or laboratory settings. Study designs should emphasize quantification of community/habitat interactions and sound statistical design.

Literature Cited

Anderson, R.M. 1978. The distribution and aspects of life history of Meda fulgida in New Mexico. Unpublished M.S. thesis. New Mexico State University, Las Cruces.

Barter, W.E., and W.L. Minckley, 1966. Fishes of Aravaipa Creek, Graham and Pinal counties, Arizona. SW Nat. 11:313-324.

_____ 1983. Feeding ecology of a southwestern cyprinid fish, the spikedace, Meda fulgida, in Arizona. SW Nat. 28:33-40.

Barber, W.E., D.C. Williams, and W.L. Minckley. 1970. The biology of the Gila spikedace, Meda fulgida, in Arizona. Copeia 1970:9-18.

Barrett, P.J., W.G. Kepner, J.E. Burton, and M.D. Jakle. 1985. Upper Verde River Aquatic Study Draft Report. U.S. Fish and Wildlife Service Ecological Services, Phoenix, AZ.

Britt, K.D. 1982. The reproductive biology and aspects of life history of Tiaroga cobitis in southwestern New Mexico. Unpublished M.S. thesis. New Mexico State University, Las Cruces.

Deacon, J.E. , and W.L. Minckley. 1974. Desert Fishes, p. 385-488. In: Desert Biology, Volume 2. Brown G.W. Jr. (ed.). Academic Press, New York and London.

Hubbs, C.L. 1954. Establishment of a forage fish, the red shiner (Notropis lutrensis, in the lower Colorado River system. Calif. Fish & Game 40:287-294.

LaBounty, J.F., and W.L. Minckley. 1972. Native fishes of the upper Gila River system, New Mexico. Proceedings of the Symposium on Rare and Endangered Wildlife of the United States 134-146:134-146.

Meffe, G.K. 1985. Predation and species replacement in American Southwestern fishes: a case study. SW Nat. 30:173-187.

Meffe, G.K., D.A. Hendrickson, W.L. Minckley, and J.N. Rinne. 1983. Factors resulting in decline of the endangered Topminnow Poeciliopsis occidentalis (Atheriniformes: Poeciliidae) in the United States. Biol. Cons. 25:135-159.

Minckley, W.L. 1973. Fishes of Arizona. Ariz. Game & Fish Department, Phoenix, AZ.

_____ 1981. Ecological studies of Aravaipa Creek, Central Arizona, relative to past, present and future uses. U.S. Dept. of Interior, Bureau ,of Lana Management, Saffora District Office, Safford, AZ.

1985. Native fishes and natural aquatic habitats in U.S. Fish and Wildlife Service Region II west of the Continental Divide. Dept. of Zoology, Arizona State University, Tempe, AZ.

Minckley, W.L., and W.L. Barber. 1970. Some aspects of the biology of the longfin dace, a cyprinid fish characteristic of streams in the Sonoran desert. SW. Nat. 15:459-464.

Minckley, W.L., and J.E. Deacon. 1968. Southwestern fisnes and the enigma of "Endangered Species." Science 159:1424-1432.

Mtnckley, W.L., D.A. Hendrickson, and C.E. Bond. 1986. Geography of western North American freshwater fishes: description and relations to intracontinental tectonism, pp. 519-613 In: Zoogeography of Freshwater Fishes of North America. Hocutt, C., and Wiley, E.O. (eds.). Wiley Interscience, New York, NY.

Propst, D.L., K.R. Bestgen, and C.W. Painter. 1985. Distribution, status and biology of the spikedace (Meda fulgida) in New Mexico. New Mexico Dept. of Game & Fish, Santa Fe.

Propst, D.L., P.C. Marsh, and W.L. Minckley. 1985. Arizona survey for spikedace (Meda fulgida) and loach minnow (Tiaroga cobitis): Fort Apache and San Carlos Apache Indian Reservations and Eagle Creek, May 1985. U.S. Fish & Wildlife Service, Albuquerque, NM.

Schreiber, D.C., and W.L. Mtnckley. 1982. Feeding interrelations of native fishes in a Sonoran Desert stream. Gr. Basin Nat. 41:409-426.

The Department is soliciting proposals to conduct and report on the study outlined above. The project is presented as a one-year study. Continuation of the project over a 4 year period will be contingent upon the Department developing the necessary funds. The anticipated starting date for this project is 1 September 1986, with quarterly progress reports due 1 December, 1 March and 1 June and a final report due no later than 30 September 1987.

The contractor will provide all necessary equipment, supplies and manpower.

The Department will provide a technical liaison (Dean A. Hendrickson) for the project.