

## RESTORATION STATUS OF THE CUI-CUI

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### Abstract

Restoration progress for the cui-ui includes: an artificial propagation program, the Pyramid Lake Fishway, and population monitoring. Fish passage problems have been experienced with the fishway and evaluation is continuing. Population monitoring indicates that the population may be declining much more rapidly than previously thought.

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The cui-ui (*Chasmistes cujus*) is one of 3 species of suckers in the genus (*Chasmistes*). All are lacustrine and occur in separate drainages. Endemic to Pyramid Lake, Nevada, the cui-ui is presently listed as an endangered species by the U.S. Fish and Wildlife Service (USFWS). The importance of the cui-ui as a food source to the Pyramid Lake Paiute Tribe is well documented (La Rivers, 1962; Snyder, 1917; and Wheeler, 1969) and their annual spawning migration was an event for festive gathering of the ancestral Paiute tribes.

The decline of the cui-ui is primarily the result of increased agricultural and industrial demands upon Truckee River water in the early 1900's. Completion of Derby Dam in 1905 resulted in a major water diversion from the basin into the Newlands Project near Fallon, Nevada. Reduced Truckee River inflows eventually lowered the level of Pyramid Lake nearly 24.4 m (80 ft.) and created an extensive delta at the river mouth. During periods of insufficient springtime flows, the delta became an impassable barrier to ascending spawners. Extreme fluctuations in river flow also left many cui-ui stranded on the delta and unable to return to the lake (La Rivers, 1962). As a result the population has declined rapidly. Concern for the future of the cui-ui population resulted in its listing as an endangered species (Federal Register, Vo. 32(48), March 11, 1967.

### PROPAGATION PROGRAM

Before cui-ui were listed as an endangered species some basic life history had been studied by the Nevada Department of Fish and Game in conjunction with a general fisheries investigation of Pyramid Lake (Johnson, 1958, and Jonez, 1955). In 1971-72, David Koch (Koch, 1972) conducted additional life history studies in cooperation with the USFWS. The major accomplishments of this study included: 1) development of artificial propagation techniques and establishment of hatchery facilities, 2) monitoring of the spawning population, 3) initial age and growth information and 4) observation and evaluation of lake spawning. As a result of this work, an active cui-ui propagation program was begun by the Pyramid Lake Paiute Tribe and USFWS in 1973. Tribal and Service personnel have improved existing hatchery facilities and refined techniques

developed by Koch and in 1977 the propagation program was contracted to the Tribe. Since 1973, approximately 7.6 million fry have been released in the lower Truckee River and Pyramid Lake. Reduced egg takes, bacterial gill disease, and diminished hatchery water supplies all contributed to reduced stocking in 1976 and 1977. In addition, 15,000 fry were held in 1977 for continued rearing studies; these fish will be marked and released as fingerlings in 1978.

The most feasible means of evaluating hatchery recruitment is to monitor age and abundance changes in the spawning population once the hatchery fish have matured. Marked groups of hatchery fish will improve our evaluation of the propagation program.

### FISHWAY INVESTIGATIONS

Completion of Marble Bluff Dam and Pyramid Lake Fishway in 1975 was a major step towards restoration of the cui-ui. The dam serves the dual purpose of controlling streambank erosion and providing the water control structure for the fishway. Additionally, there are fish trapping and handling facilities at the dam for spawning run enumeration and egg collection. The fishway, which extends 4.8 km (3 mi.) downstream to the lake, provides access around the large river delta. There are three intermediate ladders and a terminal ladder, which are based on a modified 1-on-10 slope Ice Harbor Fishway design (Thompson and Gauley, 1965). The system was designed to provide flows ranging from 0.6-1.5 m<sup>3</sup>/s (20-50f<sup>3</sup>/s).

During the past two season's operations, 1976 and 1977, the cui-ui did not successfully migrate through the fishway. In an effort to determine the cause, studies were conducted both years. In 1976 mature adults collected from the lake were released in the fishway and lower Truckee River during May and June. The released fish were monitored using a radio telemetry system developed by Dr. Richard Weeks and Dr. Francis Long of the University of Wyoming, Department of Electrical Engineering. Ten radio tagged fish were released, 3 in the fishway and 7 in the river. On occasion, additional unmarked fish were released with the radio tagged fish to provide a schooling effect. The three fish released in the fishway showed preference for downstream movement in 1976. Limited upstream movement was noted with 2 of the fish released in the river. The remaining 5 radio tagged fish showed downstream preference shortly after introduction.

The 1977 studies began when we found cui-ui in the lower 5 pools of the terminal ladder on April 20. The reluctance or inability of the fish to ascend more than 5 pools reinforced our feeling that turbulence and/or velocity were inhibiting their movement. Study fish obtained from the ladder, 2 radio tagged and 8 float tagged, were released in various upstream sections of the canal. Both radio tagged fish initially moved upstream but soon moved back downstream. We observed sustained upstream movement with 4 of the float tagged fish. Upstream movement ceased once the fish reached the next upstream ladder or the tag broke free.

To evaluate the possibility of a velocity or turbulence barrier we determined the water velocities in the ladder. Measurements taken on the terminal and intermediate ladders indicate that velocities were consistent with design specifications (Ringo and Sonnevil,

1977). To reduce water velocity, a modification for the terminal ladder was developed with the assistance of Robert Pollack and Richard Weaver of the National Marine Fisheries Service. The modification doubles the number of pools in the ladder thus reducing the 0.3 m (1 ft.) drop between pools to 0.15 m (0.5 ft.). Measurements taken with the modification in place indicate a reduction of orifice velocities from 2.28 m/s (7.6 f/s) to 1.68 m/s (5.6 f/s). Final evaluation of the modification will occur in spring, 1978.

## POPULATION MONITORING

The spawning population has been monitored since 1971. However, previous programs were primarily designed to collect fish for the propagation program. In 1977 the program was extended to systematically monitor the spawning population throughout the spawning period using standardized gear and techniques. The expanded program has resulted in cui-ui collections for artificial propagation, age and growth information to evaluate year class composition, and assess the success of the propagation program, and evaluation of an apparent correlation between spawner abundance and Truckee River inflow. Relative abundance of the cui-ui present in the south end of the lake is determined by comparison of catch per unit of effort (C/f) data on a weekly basis. In addition, a seasonal C/f value is computed for comparison with past and future data collections.

Comparison of the 1977 C/f value (9.012 fish per minute of fishing time) to data from previous years indicates a sharply decreased spawning population (Fig. 1). This decrease is not completely understood, but may be related to the occurrence of one or more weak year classes and/or decreased river inflow into Pyramid Lake (Sonnevil, 1977). One or more weak year classes would definitely be reflected by a reduced C/f value. However, we lack the extensive age and growth analysis necessary to evaluate this factor. Mean spring inflow has been correlated to seasonal C/f values with a rank correlation coefficient of 0.80. In 1977 the river inflow was reduced (Fig. 1). The addition of the 1977 data resulted in an increase to 0.89 in the rank correlation coefficient. A linear regression was also calculated giving the relationship

$$C/f = .03 + .00017 (\text{inflow})^2 + 0.68$$

$$y = a + b x$$

Both the rank correlation coefficient and linear regression were significant at greater than the 90 percent confidence limit. Although this relationship appears reasonable in explaining the decreased observed in the spawning population, further evaluation is needed during periods of increased spring inflow.

During the 1977 sampling program we were encouraged to find a large number of smaller fish present in the run. Of the 154 fish measured in the 1977 spawning population, 51.3 percent were less than 50mm (20 in) F.L. The significance of this large percentage of smaller fish is not completely clear. Previous sampling programs did not show such a large abundance of smaller fish but this is undoubtedly a function of mesh size selectivity. The 1977 sampling incorporated a smaller mesh net than regularly used in previous sampling. These smaller fish are probably younger than the larger fish normally encountered in the run and obviously represent recent recruitment to the spawning population. However, we lack the age and growth analysis to determine which age groups are represented by the smaller fish. Consequently, we are unable to determine whether these fish represent natural or possible hatchery recruitment.

## RECOVERY PLAN

In April, 1975 the Cui-ui Recovery Team was formed with team members representing the Pyramid Lake Paiute Tribe, Nevada Department of Fish and Game and USFWS. The recovery team was assigned the task of preparing a plan which would achieve the goal of restoring the cui-ui to a non-endangered status. In addition, the team was also to delineate the minimal essential habitat necessary for survival of the specie. In February, 1977 the recovery team completed its work and prepared a draft recovery plan. Presently the plan is in Washington, D.C. awaiting final approval. The essential habitat recommendation has received initial review and is presently awaiting publication as a proposal in the Federal Register. Once published, the essential habitat proposal will be available for final comment. Final decision will follow by Department of Interior.

Restoration efforts are presently limited to the previously discussed programs. When cui-ui successfully utilize the fishway, additional studies will be necessary to determine spawning habitat requirements and relative spawning success. Extensive age and growth information is also needed for evaluation of the propagation program.

The observed decline in spawner abundance is alarming (Fig. 1). The correlation between fish abundance and river inflow may be valid, but until further data collections verify this we must assume that the population is rapidly declining. The discovery of recent recruitment within the spawning population is presently the most encouraging sign for the cui-ui.

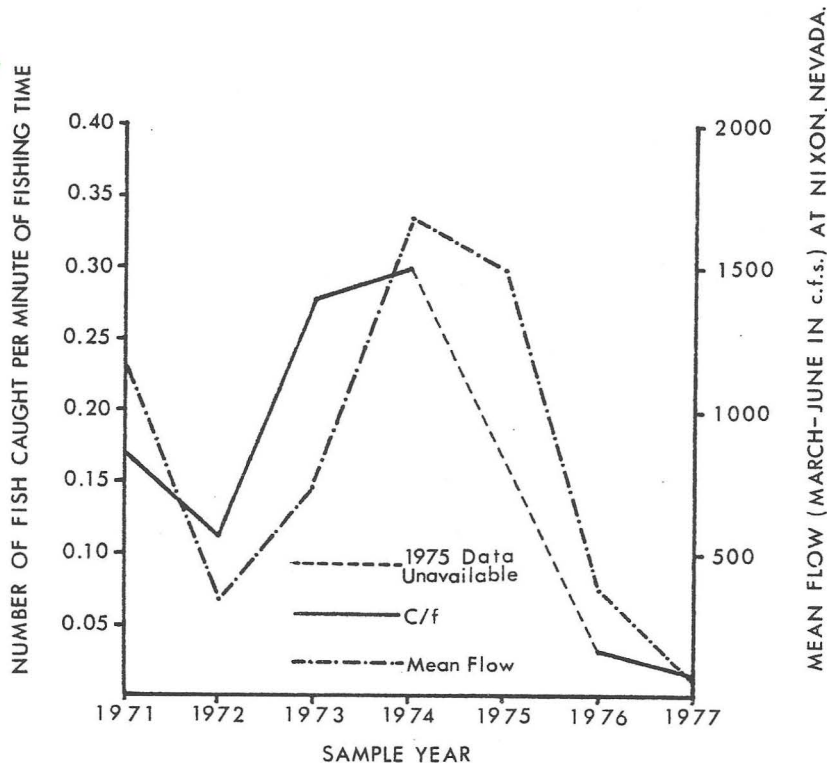


Figure 1.- Gill-net catch per unit of effort (C/f) for cui-ui during 1971-74 and 1976-77 from Pyramid Lake, Nevada, and mean Truckee River flows, in cubic feet per second (c.f.s.), measured at Nixon, Nevada, March-June, 1971-77-(After U.S.G.S. Water Resource Data for Nevada, 1971-77).

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