FIVE YEAR STATUS REPORT

I. COMMON NAME: Mohave Tui Chub
SCIENTIFIC NAME: Gila bicolor mohavensis
CURRENT CLASSIFICATION: Endangered

II. RECOMMENDED ACTION: Retain Endangered classification.

III. SUMMARY OF REASONS FOR RECOMMENDED ACTION:

The Mohave tui chub has been extirpated from its native habitat and only exists in four artificial habitats. Each of these four populations has recently been threatened by human actions or accidents.

SUPPORTING INFORMATION

IV. NATURE AND DEGREE OF THREAT:

Two of three artificial ponds at Soda Springs contain chubs. The largest pond was recently threatened by a diesel fuel spill; the smallest supports few chubs and requires regular vegetation control. Chubs in the other pond died years ago due to poor water quality conditions. Habitat for the largest population of chubs (China Lake Naval Weapons Center) was recently subject to groundwater pumping mandated by the Lahontan Regional Water Quality Control Board. The pumping is now occurring at low levels and does not appear to be affecting chub habitat; however, pumping is scheduled to increase in 1993. An extensive die-off of chubs occurred during 1989 in a pond at Camp Cady Wildlife Area.

V. HISTORIC AND CURRENT DISTRIBUTION:

Historic

Distribution of the Mohave tui chub during the Pleistocene probably extended throughout the Mojave River drainage, a major portion of which consisted of three lakes at that time: Mojave, Little Mojave and Manix (Miller 1946). These lakes are now dry beds near Barstow (San Bernardino County). As the lakes dried, chubs were restricted to the Mojave River downstream of the forks south of Victorville (San Bernardino County) (Snyder 1918; Hubbs and Miller 1948). The Mojave River is believed to have been above ground prehistorically: much of the flow is now subsurface.

Current

Mohave tui chubs are the only cyprinid native to the Mojave River (U.S. Fish and Wildlife Service 1984; Roder 1985). By the 1930's, however, arroyo chubs (Gila

orcutti) had been illegally introduced into the headwater reservoirs of the Mojave River as baitfish by anglers and began spreading throughout the drainage. The native and introduced fishes readily hybridized and Mohave tui chubs rapidly decreased in abundance (Hubbs and Miller 1943; Miller 1961). Few genetically pure Mohave tui chubs could be found by 1967 (Miller 1969). Introduction of other exotic species, habitat alteration and pollution reduced available habitat and further contributed to the decline of this fish (U.S. Fish and Wildlife Service 1984).

Currently, the Mohave tui chub survives only in artificial habitats on State and federal lands, i.e.: 1) two ponds on Bureau of Land Management (BLM) land at Soda Springs near Baker (San Bernardino County), 2) one pond on DFG property at Camp Cady Wildlife Area east of Barstow (San Bernardino County), 3) seeps and drainage ditches at China Lake Naval Weapons Center (China Lake NWC) (San Bernardino and Kern counties) and 4) one pond at the Desert Research Station (DRS) on BLM land west of Barstow (Figure 1 and Table 1). A small display pond at the BLM's California Desert Information Center contains chubs, but is not considered a recovery population due to the limited habitat available.

VI. HISTORIC AND CURRENT ABUNDANCE:

Although no quantitative data exist on historic abundance, the Pleistocene lakes mentioned above are thought to have supported "dense population[s]" of Mohave tui chubs (Hubbs and Miller 1943). Subsequent drying of the lakes restricted chubs to the Mojave River, thus decreased their numbers.

Current estimates are not available for some existing chub populations. Sampling at the DRS in October 1988 estimated approximately 1,800 chubs were in the pond there (R. Schmidt, DRS, pers. comm.) Population estimates done at Soda Springs from April, 1981 - April, 1982 ranged from a high of 5,678 chubs (4,303-8,327, $p = 0.05$) in October, 1981 and 1,450 chubs (1,251-1,725, $p = 0.05$) in February 1982. Estimates for the smallest pond (MC spring) were 7 fish (no confidence limits) in October and 58 fish (42-102, $p = 0.05$) in April, 1981 (Taylor 1982). Well over 100 fish were visible here during the spring of 1990 (A. Romspert, Biology Dept., CSU Fullerton, pers. comm.).

Attempts to derive population estimates of chubs at China Lake NWC using minnow traps were unsuccessful in June 1989. A successful trapping operation was conducted in November 1989. Population estimates ranged from 5,541-6,138 chubs for the areas sampled, depending on how the

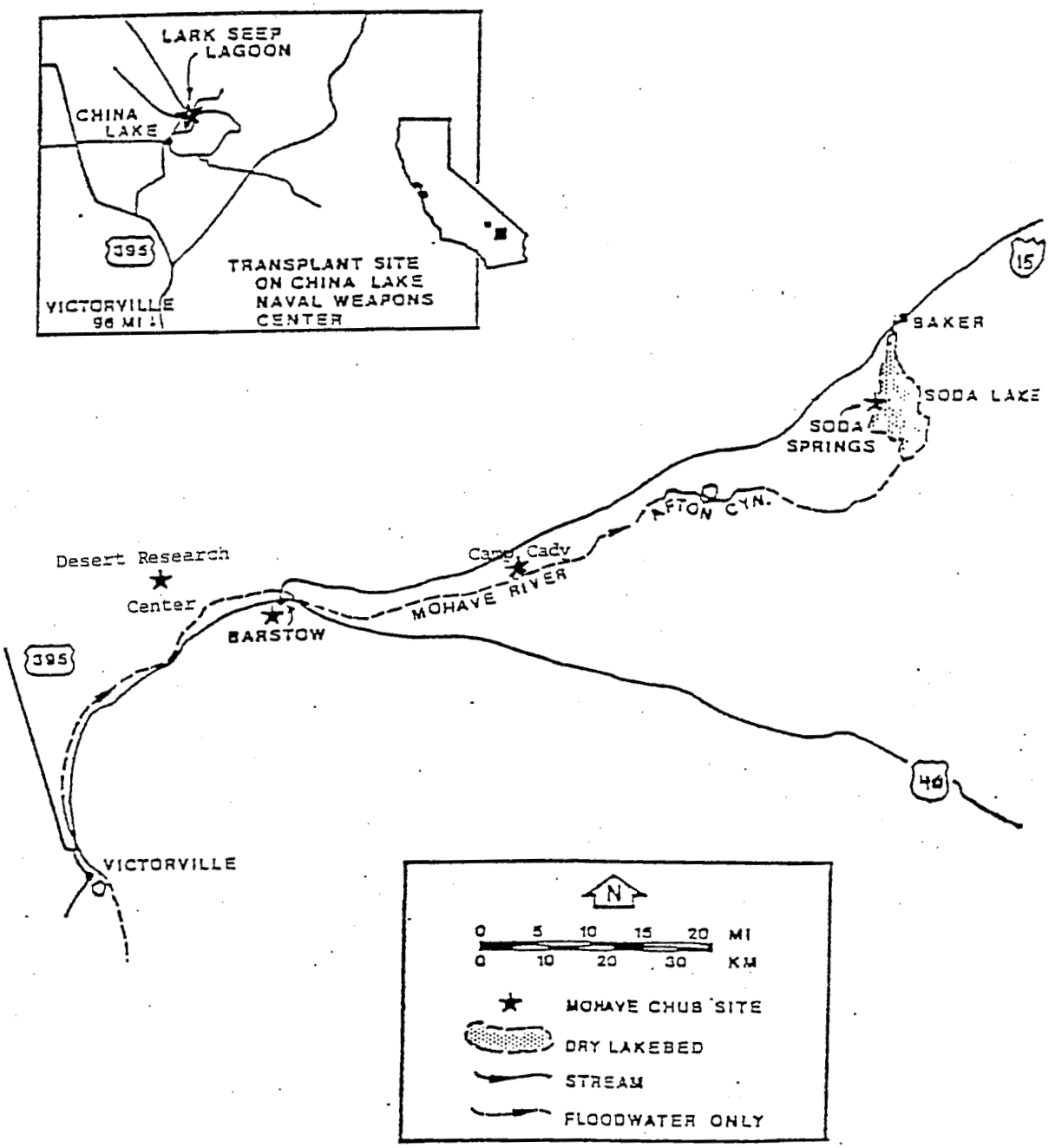

Figure 1. Mohave tui chub populations (*) as of July 1, 1990.

Table 1. Existing Populations of Mohave Tui Chubs as af July 1, 1990 (Data sources are St. Amant and Sasaki 1971, Hoover and St. Amant 1983, and unpublished DFG file information)

Introduction site	Date of introduction	Number of fish in founder population
China Lake Naval Weapons Center (San Bernardino and Kern counties)	1976	400 75
Desert Research Station Pond at Hinkley (San Bernardino Co.)	1981 1986	226 1/ 59
Camp Cady Wildlife Area near Newberry Springs (San Bernardino County)	1987 1987	10 114
Soda Springs (San Bernardino Co.)	? 2/	? 2/
California Desert Information Center in Barstow (San Bernardino County)	?	60

1/ Excessive vegetation growth caused a total die-off of these fish in 1984. The pond was restocked in 1986.

2/ These fish are probably remnants of a naturally isolated ancestral population, but may have been introduced (Soltz 1978). Records of this species presence date back to at least 1917 (Thompson 1929).

data were assembled. The total population is possibly 10-20% greater if all available habitat is considered (D. Christenson, DFG Fishery Biologist, Kernville). Camp Cady had thriving chub populations in two ponds until a significant die-off occurred in 1989. A leak in one pond precipitated the transfer of chubs to the adjacent one; overcrowding resulted in many emaciated and diseased fish and subsequent high mortality. Disease also occurred in a third pond, causing high mortality there as well.

VII. SPECIES DESCRIPTION AND BIOLOGY:

The Mohave tui chub is a member of the minnow family. The name tui chub is derived from the Paiute Indian name for the species, "tui-pagwi", where "pagwi" is the Paiute word for minnow (Loud 1929). The species is a chunky, large-scaled fish with a small, terminal, slightly oblique mouth. This subspecies is bright brassy-brown to dusky olive above, gold and finely speckled laterally and bluish-white to silver on the belly. The fins are olive to brown, the lower fins pale outward (Hubbs and Miller 1943). This fish does not exhibit obvious sexual dimorphism (Snyder 1918, Miller 1938, Moyle 1976). Additional taxonomic criteria and a discussion of the confusing nomenclatural changes regarding this fish are detailed in Hubbs and Miller (1945) and Moyle (1976), respectively.

The typical size of adults collected from a tributary of the Mojave River was 52 to 92 mm standard length (SL, measured from the tip of the snout to the base of the tail) (Hubbs and Miller 1943). Adults sampled in the DRS pond averaged 40-90 mm SL (Havelka et al. 1982), with fish as large as 215 mm SL (Vickers 1973). Adults at China Lake reached 160 mm SL, except where they had been fed by humans and reached 168 mm SL.

Mohave tui chubs typically spawn in March or April when the water temperature reaches approximately 18^{o}C (Vickers 1973), although spawning may occur at water temperatures between 17^{o}C and 26^{o}C (D. Castleberry, Univ. Calif. at Davis, pers. comm. to F. Hoover). Spawning continues throughout spring and may last into October (Taylor 1982). The number of eggs laid by each female varies considerably; Vickers (1973) found a 98 mm SL chub with 3,795 eggs, and a 215 mm SL chub containing almost 50,000 eggs. Eggs are adhesive and are laid over vegetation.

Mohave tui chub fry school in the shallows, while medium-size fish (30-80 mm SL) school in water 20-50 cm deep. Large (>80 mm SL) chubs are typically solitary and are found in deeper (>70 mm) water (Vickers 1973).

Like other tui chubs, this subspecies is morphologically adapted for feeding on plankton. The only food habits study done on this subspecies was flawed by humans feeding the chubs scrap food. The few natural foods found were insect larvae, one small chub and organic debris (Vickers 1973). Mohave tui chubs at one pond were found to lose up to 25-30% of their body weight in August-September, and began gaining weight again by October (Havelka et al. 1982).

VIII: HABITAT REQUIREMENTS:

Mohave tui chubs were historically found in deep pools and slough-like areas of the Mojave River (Snyder 1918). They are less able to endure flooding than arroyo chubs (Hubbs and Miller 1943). The Mohave tui chub is well adapted to the alkaline, hard water found in the Mojave River. In a study at Soda Springs, chubs survived a water temperature of 34°C at the surface, 11.55 ppm salinity 18,000 micromhos/cm conductivity and a pH between 9 and 10 (U.S. Fish and Wildlife Service 1984). This 34°C water temperature is near the upper lethal limit for the chub (Castleberry and Cech 1986, McClanahan et al. 1986).

Aquatic vegetation, especially ditchgrass (Ruppia maritima) provides the preferred substrate for egg attachment, a thermal refuge during the summer, and cover from avian predators (Soltz 1978). Extensive fall vegetation die-offs in shallow water, however, may cause fish kills (U.S. Fish and Wildlife Service 1984).

IX. CURRENT AND RECOMMENDED MANAGEMENT:

The Mohave Tui Chub Advisory Committee, comprised of agency personnel and members of academia, directs the management of and research on this fish. The Committee has not met since March of 1989; the group needs to meet more regularly and establish a chairperson. The Committee met to revise the recovery plan for this species in the fall of 1988. The DFG has incorporated the revisions and retyped the plan, which will be delivered to the USFWS during the fall of 1990 as a first draft. The USFWS will then be responsible for further review and revision.

Additional refugia need to be established for this fish. DFG biologists and others (Feldmeth and Soltz 1985) surveyed a number of potential introduction sites on BLM lands in 1988 but are unable to pursue the promising sites any further without assistance from the BLM. DFG biologists are in the preliminary stages of negotiations with a private landowner in the Barstow area who may

allow us to introduce chubs into two 2-3 acre ponds there. Additional introduction sites on private as well as public lands, including military reservations and Joshua Tree National Monument, need to be investigated. The feasibility of reestablishing this fish into portions of the Mojave River should also be investigated.

Some existing refugia need to be enhanced. West Pond, for example, at Soda Springs, needs to be deepened to prevent low dissolved oxygen conditions which can cause fish kills during the summer months. The BLM budgeted for this to take place in 1990, but an additional engineering estimate done subsequent to the budget process doubled the price of the work (to $60,000) (P. McClain, BLM Wildlife Biologist, Barstow, pers. comm.). It is doubtful, therefore, that this work will take place in the near future. The BLM, DFG and USFWS need to coordinate to produce funding and expedite this project. Vegetation maintenance at MC Spring, an ongoing, annual necessity, is currently being done by the Desert Studies Consortium under contract with the BLM. Vegetation removal is also an annual maintenance requirement at the DRS pond and at China Lake NWC. The DRS is planning to line another pond bottom and create additional chub habitat there.

Chub habitat at China Lake NWC has been monitored over the last two years to determine if groundwater pumping is detrimental to the chubs. This monitoring should continue for the duration of the pumping.

The DFG needs to repair its leaky pond at Camp Cady and reintroduce chubs. Coordination between DFG's wildlife and fisheries staffs needs to improve regarding management of this area.

All established populations need regular habitat monitoring and population assessment. The Advisory Committee should design a protocol for each area.

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XI. REPORT PREPARED BY:

Ms. Betsy C. Bolster, Associate Fishery Biologist
Inland Fisheries Division
California Department of Fish and Game
1701 Nimbus Road, Suite C
Rancho Cordova, CA 95670

XII. REVIEW COPIES SENT TO:

Mr. Glenn Black, Fisheries Management Supervisor
California Department of Fish and Game, Region 5
330 Golden Shore, Suite 50
Long Beach, CA

Mr. Jerry Boggs
Environmental Division (Code 2662)
Naval Weapons Center
China Lake, CA 93555

Mr. Dan Christenson, Fishery Biologist
California Department of Fish and Game, Region 4
P.O. Box X
Kernville, CA 93238

Mr. Dan Castleberry
Department of Wildlife and Fisheries Biology
University of California, Davis
Davis, CA 94616-5270

Dr. C. Robert Feldmeth
Joint Sciences Department
The Claremont Colleges
Claremont, CA 91711

Mr. Frank Hoover, Associate Fishery Biologist
Chino Fisheries Base
California Department of Fish and Game
15378 Bird Farm Road
Chino, CA 91710

Ms. Alice Low, Associate Fishery Biologist
Environmental Services
California Department of Fish and Game, Region 4
1234 East Shaw Avenue
Fresno, CA 93710

Ms. Kim Nicol
California Department of Fish and Game
47800 Madison Street #223
Indio, CA 92201

Mr. Alan Romspert
Department of Biology
California State University, Fullerton
Fullerton, CA 92634

Dr. Gerald Scherba
Desert Studies Center
Department of Biology
California State University, Fullerton
Fullerton, CA 92634

Mr. Robin Schmidt
Desert Research Station
304 North 2nd Street
Barstow, CA 92311

Mr. Alden Sievers
Bureau of Land Management
150 Coldwater Lane
Barstow, CA 92311

Dr. David Soltz
Biology Department
California State University, Long Beach
1250 Bellflower Boulevard
Long Beach, CA 90840-3702

Mr. Jerry Staley, Fisheries Management Supervisor
California Department of Fish and Game, Region 4
1234 East Shaw Avenue
Fresno, CA 93710

Mr. Peter Stine
U.S. Fish and Wildlife Service
2140 Eastman Avenue, Suite 100
Ventura, CA 93003