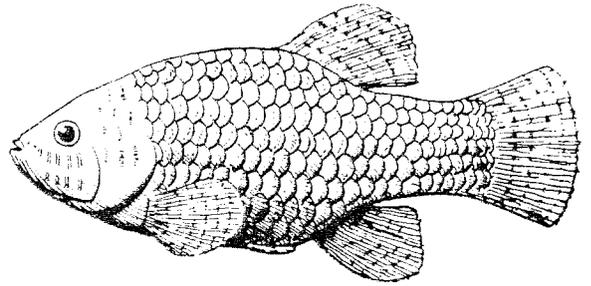


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Age and Growth of Mohave Tui Chub Gila
bicolor mohavensis from Two Ponds at Ft. Soda

by

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The endangered Mohave tui chub (Gila bicolor mohavensis) is found in two pond habitats at Fort Soda, near Baker in San Bernardino County, California. These fish, once native to the Mojave River were eliminated from it through hybridization and introgression with the Arroyo chub, Gila orcutti, introduced from the Los Angeles Basin. The Fort Soda habitats contain the only remaining Mohave tui chubs in the Mojave River drainage. These populations have provided stock for two successful introductions outside the Mojave River drainage.

The land manager (Bureau of Land Management) contracted with the Department of Fish and Game for a study of these habitats and the tui chub populations at Fort Soda. A portion of this study was an age and growth analysis to determine if differences exist between the two tui chub populations at Fort Soda.

The two pond habitats are of similar size but show important differences in water quality. Lake Tuendae has a surface area of 0.47 hectares (1.2 acres). Water is pumped into the lake from the well at Fort Soda. Water loss is by seepage and evaporation. Three Bats Pond has a surface area of 0.4 hectares (1.0 acres) and a surface elevation about one meter lower than Lake Tuendae.

Three Bats Pond operates as a sink. It is filled by ground water and water loss is by evaporation only. Consequently, summer conductivities and salinities are 2 to 3 times higher than those in the lake.

Tui chubs were captured using minnow traps baited with bread. Scale samples were taken from 200 fish captured in Lake Tuendae April 14, 1982, and 170 fish captured in Three Bats Pond April 15, 1982. Standard length was recorded for each fish.

Scales were read on a Bell and Howell ABR-610 microfiche projector at 48X by two independent readers. Total scale radius and radius at each annulus was recorded. The relationship of total scale radius to fish standard length is linear.

The lake population contained age groups 0+ to 4+ whereas the pond population was represented by only one fish in the 0+ age group and the remainder in age groups 1+ to 3+. The size at capture, by age are:

| | Lake Tuendae | | | Three Bats Pond | | |
|----|--------------|------|----|-----------------|-------|----|
| | \bar{X} SL | SD | N | \bar{X} SL | SD | N |
| 0+ | 48.3 | 5.65 | 35 | 57.0 | - | 1 |
| 1+ | 63.8 | 6.05 | 95 | 65.2 | 3.85 | 71 |
| 2+ | 82.2 | 8.60 | 55 | 78.3 | 6.36 | 94 |
| 3+ | 103.8 | 8.30 | 11 | 108.0 | 11.77 | 4 |
| 4+ | 109.5 | 9.19 | 2 | - | - | - |

The backcalculated sizes at each age are:

| | Lake Tuendae | | Three Bats Pond | |
|-----|--------------|--|-----------------|--|
| Age | \bar{X} SL | | \bar{X} SL | |
| 1 | 49.1 | | 46.9 | |
| 2 | 72.8 | | 64.7 | |
| 3 | 97.9 | | 97.4 | |
| 4 | 103.4 | | - | |

The only significant difference in backcalculated size at age between the pond and the lake populations (Student's T-test $p < 0.05$) occurs at age 2, with the pond population having smaller fish. This does not necessarily imply that the pond is a less suitable environment for the Mohave tui chub, however.

During November 1982, a water quality problem developed in the pond that resulted in a substantial die-off of Mohave tui chubs. Observers estimated the kill at 90% or more of the tui chub population in Three Bats Pond. No absolute cause for the die-off was ever identified. This fish kill reduced the population of tui chubs >40 mm SL in the pond from an October 1981 level of 4,458 (95% CI, 2,873-9,941) to a February 1982 level of 2,177 (95% CI, 1,789-2,778) (Taylor 1982). However, Lake Tuendae, which did not experience a noticeable die-off showed a similar reduction in population size; from an October 1981 level of 5,588 (95% CI, 4,314-7,929) to a February 1982 level of 1,450 (95% CI, 1,251-1,725) (Taylor 1982).

The die-off in the pond altered the population structure by nearly eliminating all fish less than 50 mm SL. It may also have resulted in premature annulus formation.

Two other important aspects of Mohave tui chub growth were discovered from information gathered during the study. It was found that Mohave tui chubs grow very little, if at all between August and April. This phenomenon was discovered when sizes and ages from August 1981 samples from Ft. Soda (Taylor 1982) were compared to the April 1982 samples. This is probably the result of the energetic costs associated with living in a warm, saline environment during the summer and fall. Mohave tui chubs have been documented to actually lose weight between August and October in their habitat at Hinckley, California (Havelka et al. 1982).

Mohave tui chubs observed at Fort Soda in the 1981-1982 study were smaller than those studied at Fort Soda in 1970 (Vickers 1973). Few large individuals were seen during the current study and only one large (220 mm SL) individual was captured. Vickers noted that tui chubs were being fed table scraps by patrons of the Zzyzx Mineral Springs Resort. These scraps may have been a significant food source that contributed to the population's growth. The resort is no longer in operation and the chubs must now rely solely on food produced within their habitat.

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