ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** AFCJB13100
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CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Gila elegans*
COMMON NAME: Bonytail Chub, Bonytail
SYNONYMS: *Gila emoryi*, *Gila robusta elegans*
FAMILY: Cyprinidae

AUTHOR, PLACE OF PUBLICATION: Baird and Girard, Proc. Acad. Nat. Sci. Phila. V. 6: 369. 1853.

TYPE LOCALITY: Zuni River (now dry), New Mexico, U.S.A. [but probably Little Colorado R., below Grand Falls, Coconino Co., Arizona, U.S.A. (CAS 2004).

TYPE SPECIMEN: USNM – 20079 [orig. USNM 251] plus 1 pharyngeal arch.

TAXONOMIC UNIQUENESS: There are 14 species in the genus, all of which occur in the intermountain west of North America. 9 species of *Gila* occur in Arizona. *Gila elegans* is considered a full species. It has previously been considered as a subspecies and an ecotype under *Gila robusta*.

DESCRIPTION: Bonytail Chub generally reach 300 to 350 mm (12-14 in.) in total length, although larger specimens of up to 600 mm (24 in.) have been taken from Mohave and Havasu lakes, Arizona. They have a highly streamlined body that arches smoothly into a predorsal hump in adults. The skull is concave on the dorsum, and head is small. Total vertebrae are 47-50. Its caudal peduncle is thin and pencil-like. Squamation sometimes incomplete, with scales absent or highly embedded on predorsum, venter, or caudal peduncle. Fins large, falcate, with origin of dorsal nearer tip of snout than to caudal-fin base. Dorsal fin rays almost always 10 or more; anal fin rays usually 10. Mouth terminal and somewhat oblique. Dorsal and ventral rami of pharyngeal arches about equal in length, teeth 2, 5-4, 2 (Minckley 1973).

Color dark above and light below, very dark (almost black) when from clear waters, or pallid when from turbid streams. Fins often dusky, with yellow pigment near bases, especially paired fins (Minckley 1973). Breeding males have bright red-orange lateral slashes between the paired fins (similar to other closely related chubs), and small tubercles on the head and anterior portions of the body. Breeding colors are more subdued and tubercles less well developed in females.

AIDS TO IDENTIFICATION: A combination of characters, are used to differentiate adult bonytail, humpback (*Gila* cypha), and roundtail *(Gila robusta*) chubs in and below the Grand

Canyon. In the upper Colorado River basin, several studies have yielded evidence of hybridization among these taxa (Gerber et al. 2001).

Dorsal/anal fin-ray counts are usually 10-10 in Bonytail Chub, 9-9 in Roundtail Chub, and 9-10 in Humpback Chub. The number of gill rakes on the anterior row of the second arch is usually 18 (15-21) in Bonytail Chub, 15 (13-17) in Humpback Chub, and 13 (12-15) in Roundtail Chub (R. Muth in USDI, FWS 1980). Bonytail Chub have a much narrower and longer caudal peduncle than Roundtail Chub with the ratio of head length to caudal peduncle depth generally greater than five. The nuchal hump in adult Bonytail Chub rises smoothly from a concave skull, while those of adult Humpback Chub arise more abruptly from the skull (USDI, FWS 1990).

ILLUSTRATIONS:
B&W photo (Minckley 1973:95)
Photo (Minckley and Deacon 1991:209)
Color drawing (Page and Burr 1991:74)
Color photo (Rinne and Minckley 1991:34)
B & W photograph (Wildlife Habitat Management Staff Group 1975:143)

TOTAL RANGE: Once widely distributed throughout the Colorado River into Mexico and its main tributaries, to include the Green River in Utah and Wyoming, and the Colorado, Gila, Salt, and Verde rivers in Arizona. Populations began a drastic decline in the 1950's. No reproducing populations are known in the wild, though evidence of reproduction by stocked fish in the upper Colorado River basin has recently been documented (Bestgen et al 2017). A small number of wild adults existed in Lake Mohave, the Green River and the upper Colorado River towards the end of the twentieth century. A viable wild population may no longer exist and potential for recruitment is limited to fish released from propagation programs (Kappenman et al. 2012, Bestgen et al. 2008).

RANGE WITHIN ARIZONA: No reproducing populations are known in the wild. A small number of wild adults may exist in Lake Mohave, with possible individuals downriver as far as Parker Dam. However, the wild population is considered functionally extinct.

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: The biology of the wild Bonytail Chub is poorly understood, as few ecological studies were conducted prior to the population crash (Bestgen 2008).

The smaller, reduced or embedded scales and relatively smaller eyes of these fishes may be adaptations to the high silt loads which characterized the remarkably erosive, turbid Colorado River systems prior to constraint of dams (Minckley 1973). Increased turbidity was strongly correlated with decreased predation of bonytail chub by sight feeding predators in laboratory experiments (Ward and Vaage, 2019). Individual Bonytail Chub that inhabit lakes of the lower

Colorado River, retain their streamlined body shape, and apparently occupy an active, limnetic niche in the reservoirs. Many specimens, identified as bonytail from the upper Colorado River basin, show physiological and genetic evidence of hybridization with roundtail or humpback chubs (Minckley et al. 1988, Gerber et al. 2001).

REPRODUCTION: In Lake Mohave, spawning has been observed during the month of May, while in the upper Green River, spawning occurs in June and July at water temperatures of about 18ºC (64ºF) (Minckley 1973). Eggs are scattered over the bottom; no parental care occurs. Cold water released below dams precludes successful hatching of eggs (Bagley 1989). Protected backwater habitat has been demonstrated as productive spawning habitat by stocked fish. Parentage analysis demonstrated that most adults contribute to progeny production across multiple locations each year, with both sexes exhibiting multiple mating. Environmental factors appear to be the primary driver of variance in reproductive success (Osborn et al. 2018). Water temperatures of 22-26° C allow optimal growth of young fish, and cold water may result in decreased growth or failure of eggs to hatch (Kappenman et al., 2012 and Bagley 1989).

FOOD HABITS: Adults eat primarily terrestrial insects, plant debris, and algae, while young bonytail eat aquatic insects.

HABITAT: Available information suggests that Bonytail Chub utilized the main stream portions of mid-sized to large rivers (both strong current and pools), usually over mud or rocks. During spring flooding, they utilized the ponded and inundated terrestrial habitats and backwaters for spawning (Bestgen et al., 2017). In reservoirs, they occupy a variety of habitat types, but seem to appear to prefer the open water areas (AZGFD 2011). Radio telemetry studies suggest adults prefer interstitial spaces associated with shoreline boulder fields during the day, and utilize open-water areas during nighttime hours. Bonytail are able to persist in turbid waters at a higher tolerance than any other *Gila* species, and select turbid water when available (LCR MSCP 2019).

ELEVATION: Arizona records include elevations from 235 - 1,960 ft. (72 - 598 m).

PLANT COMMUNITY:

POPULATION TRENDS: Populations are declining; population sizes are small to nonexistent. Population declines in this species are the result of habitat modification caused by dams and predation by nonnative species (Bestgen et al., 2008). The conditions in which this fish now lives are very different from those in which it evolved (Bagley 1989).

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: LE (USDI, FWS 1980)
Determination of Critical Habitat (USDI, FWS 1994)

STATE STATUS:
[PE (USDI, FWS 1978)]
1 (AZGFD, AWCS 2022)
[1A (AGFD SWAP 2012)]
[WSC (AGFD, WSCA 1996 in prep)]
[Endangered (AGFD, TNW 1988)]

OTHER STATUS:
Bureau of Land Management Sensitive, (USDI, BLM AZ 2017)
Not Forest Service Sensitive (USDA, FS Region 3 2013)
[Forest Service Sensitive (USDA, FS Region 3 1988, 1999)]
Group 1 (NNDFW,NESL 1994, 2000, 2008, 2020)
E, probably Extinct in the wild of Mexico (NORMA Oficial Mexicana NOM-059-SEMARNAT-
Listed Endangered (Secretaría de Medio Ambiente 2000).
[Listed Endangered Secretaría a de Desarrollo Social 1994]

MANAGEMENT FACTORS: USFWS 1990 Recovery Plan long term goals include: prevent extinction of Bonytail Chub in the wild, protect populations of Bonytail Chub and their habitats, reintroduce hatchery-reared Bonytail Chub into the wild, obtain essential information on the life history and habitat requirements of the Bonytail Chub, resolve taxonomic problems in Colorado River basin, promote and encourage improved communication and information dissemination, and develop quantitative recovery goals and a long term habitat protection strategy.

Threats: altered hydrology and cold tailwater releases from reservoirs; predation by and competition with nonnative fishes; parasitism; genetic bottleneck.

Management needs: improve critical habitat for chub; ameliorate effects of nonnative fish species in chub habitat; monitor status of chub populations; establish refugium populations in lakes Mohave, Havasu, and Mead.

PROTECTIVE MEASURES TAKEN: Critical habitat was established for Bonytail Chub in March, 1994. It designated portions of the Colorado, Green, and Yampa rivers in the upper basin and the Colorado River from Hoover Dam to Parker Dam (including Lake Mohave and Lake Havasu). The Bonytail Chub Recovery Plan was revised and approved September 4, 1990. Currently, a refugium for Bonytail Chub exists at Dexter National Fish Hatchery, New Mexico.

In 2005, the Lower Colorado River Multi- Species Conservation Program (LCR MSCP) was

developed to balance the use of the Colorado River water resources with habitat and species conservation. The Bureau of Reclamation is the implementing agency for the LCR MSP, and 57 entities, including state and Federal agencies, water and power users, municipalities, Native American tribes, conservation organizations are in partnership. The LCR MSCP will be implemented over a 50-year period and extends over 400 miles of the lower Colorado River, from Lake Mead to the Mexican border. The program provides ESA compliance for multiple listed species through the implementation of a Habitat Conservation Plan which calls for the creation of more than 8,100 acres of habitat (LCRMSCP 2004).

As of fiscal year 2019, 108,520 bonytail have been stocked into the Lower Colorado River. Creation of a broodstock for propagation and a refuge population, housed at Mora National Fish Hatchery in New Mexico have been established. A conceptual ecological model has been developed, and data gaps are examined to determine future research topics. Multiple hatcheries contribute Bonytail Chub to the LCR MSCP fish augmentation program including; Willow Beach National Fish Hatchery, Achii Hanyo Native Fish Rearing Facility, Lake Mead Fish Hatchery, Dexter National Fish Hatchery, Valle Vista Golf Course, and Emerald Canyon Golf Course.

SUGGESTED PROJECTS: Implementing the LCR MSCP will help create 360 acres of backwater habitat and produce 620,000 bonytail over 50 years to augment existing populations in the Lower Colorado River (LCRMSCP 2019). Research focused on identifying locations of persistence, improving post-stocking survival, and identifying needs to inform backwater creation and management. Monitoring of stocked fish will continue.

LAND MANAGEMENT/OWNERSHIP: BOR; FWS - Bill Williams, Cibola, and Havasu National Wildlife Refuges; NPS - Lake Mead National Recreation Area; Lake Havasu State Park; La Paz County Park; TNC - Hassayampa River Preserve; Private.

SOURCES OF FURTHER INFORMATION

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ADDITIONAL INFORMATION:

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