ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** AFCJB13090

Data Sensitivity: YES

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Gila ditaenia*
COMMON NAME: Sonora Chub

SYNONYMS: *Richardsonius gibbosus*
FAMILY: Cyprinidae

AUTHOR, PLACE OF PUBLICATION: R.R. Miller, Copeia 1945(2): 104-110. pl. 1. 1945.

TYPE LOCALITY: Rio Magdelena, 0.5 km west of La Casita, Sonora, Mexico; approximately 40 km south of Nogales, Arizona. (Miller 1945)

TYPE SPECIMEN: USNM – 129954. Mearns, E.A. 1893; see Snyder, J.O. 1915. Miller, R.R. 1945.

TAXONOMIC UNIQUENESS: There are 21–23 species in the genus, all of which occur in Western North America (Page et al. 2023, Froese and Pauly 2024). Seven species of *Gila* occur in Arizona (Arizona Game and Fish Department 2022). There are no subspecies of *G. ditaenia.*

DESCRIPTION: Medium sized fish averaging 5 inches (12.5 cm) in total length. May achieve lengths up to 7.9 in (20.0 cm) in the United States, but in Mexico may grow up to 10 in (25 cm) long. Body moderately chubby, fusiform and terete. Scales relatively small, 63 to 75 in lateral line, bearing prominent radii on all fields. Eight fin rays in dorsal, anal, and pelvic fins; rarely 9 in dorsal and 7 in pelvic and anal fins. Pharyngeal teeth, 2, 5-4, 2 (Minckley 1973).

Coloration dark, with two prominent, black lateral bands above and below lateral line. Lower sides and belly lighter. Breeding colors red at bases of paired and anal fins, with some orange on belly and other ventro-lateral areas, basicaudal spot discrete, round oval in shape. (Minckley 1973)

AIDS TO IDENTIFICATION: Basicaudal spot distinguishes from other fish within species range. *Gila ditaenia* is almost identical to *G. pandora* (Rio Grande Chub), but can be distinguished by smaller scales (the Rio Grande chub has a lateral line with 51–67 scales, the Sonora Chub has a lateral line with 63–75 scales), the lack of two stripes on the side, and geographic separation of species range (Page and Burr 2011).

ILLUSTRATIONS:
B&W photo (Minckley 1973:108)
Color photo (Rinne and Minckley 1991:25)

B&W photo (Wildlife Habitat Management Staff Group 1975:12).
Color photo (USFWS 2013)

TOTAL RANGE: The Sonora chub is a small minnow endemic to southern Arizona and Sonora, Mexico (CBD 2023). In Sonora, it inhabits the Rios Altar and Magdalena. In Arizona, it occurs in California Gulch and Sycamore Creek, tributaries of the Rio Altar, 25 km (15.5 miles) west of Nogales in Santa Cruz County (USFWS 1992).

RANGE WITHIN ARIZONA: California Gulch and Sycamore Creek (Coronado National Forest 2013, U.S. Fish and Wildlife Service 2013). Also has been reported from unnamed tributaries of Sycamore Creek in Penasco and Atasco canyons, Atascosa Mountains, Santa Cruz County (Bell 1984, Newman 2002).

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: Can persist in small isolated pools during periods of drought. Lives for 2–3 years (USFWS 2012).

REPRODUCTION: Sonora Chub spawn at multiple times in spring and summer, and may spawn into fall, most likely in response to rains (Bell 1984, Hendrickson and Juarez-Romero, 1990, Carpenter 1992). Adults with breeding coloration have been observed April through September (USDI, Fish and Wildlife Service 1992). Carpenter (1992) and Bell (1984) have suggested that spawning occurs after spring and summer rains. Sonora Chub broadcast spawn eggs onto fine gravel substrates in areas of slow flow, where eggs develop and hatch. No parental care is given. Larvae likely use shallow habitats at pool margins (USFWS 2013).

FOOD HABITS: Aquatic and terrestrial insects, and algae, in decreasing order of volume (Biota Information System of New Mexico. 2014).

HABITAT: Sonora Chub are able to persist in small, marginal habitats and persist in intermittent desert streams. Adults utilize riverine habitats when available, and have been found in runs, riffles, and pools. In dry periods, Sonora Chub persist in pools of clear water created by cliffs, boulders, and cover that remain wet year round in intermittent streams. Found in largest, deepest, and most permanent pools, with bedrock-sand substrates, and areas free of thick pads of floating algae (Carpenter and Maughan 1993). Known to rapidly expand and recolonize newly re-wetted reaches after drought conditions (USFWS 2013).

ELEVATION: Based on records in the Heritage Data Management System (HDMS), elevation in Arizona ranges from 3,500–4,190 ft (1,068–1,278 m) (AGFD, unpublished data accessed 2001).

PLANT COMMUNITY: Riparian vegetation includes *Platanus* spp. (sycamore), *Populus fremontii* (cottonwood), *Alnus* spp. (alder), *Salix* spp. (willow), *Quercus* spp. (oak), *Pinus* spp. (pine) (Wildlife Habitat Management Staff Group 1975).

POPULATION TRENDS: Unknown. A lack of rigorous surveys or demographic data exists throughout the range of the species. In Sonora, the Rio de La Concepcion was last surveyed in 1990, and the Rio Cocospera at Rancho el Aribabi was last surveyed in 2006 (Duncan 2006). In addition to the difficulty of international coordination, surveys in the United States and northern Sonora are limited because illegal border activity presents a safety concern. Thus, surveys are generally presence- or absence-based and spatially limited. Estimates of population sizes and trends are not known at this time (USFWS 2019).

SPECIES PROTECTION AND CONSERVATION

Status definitions: https://bit.ly/hdms-status-definitions
Heritage Network Conservation Status Rank definitions: https://bit.ly/hdms-rank-definitions

ENDANGERED SPECIES ACT STATUS:	LT with Critical Habitat (USDI, FWS 1986)
STATE STATUS:	1 (AZGFD, AWCS 2022)
HERITAGE NETWORK STATUS:	G2G3
	S1
OTHER STATUS:	Not Forest Service Sensitive (USDA, FS Region 3 1999, 2013)
	Listed Threatened (Secretaría de Medio Ambiente 2000, 2010)
	IUCN Vulnerable (NatureServe 2019)

PREVIOUS STATUS

ENDANGERED SPECIES ACT STATUS:	
STATE STATUS:	1A (AGFD SWAP 2012)
	Endangered (AGFD, WSCA 1996 in prep)
	Endangered (AGFD, TNW 1988)
OTHER STATUS:	Not Forest Service Status (USDA, FS Region 3 1999, 2013)
	Forest Service Sensitive (USDA, FS Region 3 1988)
	Listed Threatened (Secretaría de Desarollo Social 1994)

MANAGEMENT FACTORS: The three primary threats to the Sonora Chub are non-native species, degradation of habitat, and continued demand for water for human consumption (USFWS 2019).

Non-native vertebrate species present a threat through predation and competition. Bluegill (*Lepomis macrochirus*) have been observed in California Gultch and nearby lakes, and extirpation has not been successful (USFWS 2019). Bullfrogs (*Lithobates catesbeianus*) management has been undertaken with success in the area (USFWS 2013). In Sonora, bluegill, green sunfish (*Lepomis cyanellus*) and black bullhead (*Ameiurus melas*) have been observed with Sonora Chub on the Rio Magdalena (Hendrickson and Juarez-Romero 1990). It is unknown if any non-native species actions are being implemented in Mexico. In addition to threats from non-native fish, the risk of infestation from Asian tapeworm (*Bothriocephalus acheilognathi*) is high, due to the presence in the region of the non-host-specific parasite. Although the threat of infestation is high, the level of threat to the Sonora chub is considered low, due to low mortality in a similar species, the Yaqui Chub (*G. purpurea*) (USFWS 2013).

Habitat degradation is a threat of wide scope, and additional threats have been identified since the publication of the 1992 Recovery Plan. Although broad conservation objectives are part of the Coronado National Forest Land and Resource Management Plan, the management plans for the Gooding Research Natural Area and the Pajarita Wilderness do not contain specific protections for Sonora chub (U.S. Fish and Wildlife Service 2019). Both canyons which the species inhabits in the United States are known routes for undocumented immigrants and drug traffickers. Cross-border law enforcement activities, and border wall construction pose threats which are not mitigated (U.S. Fish and Wildlife Service 2012, 2013). Finally, climate change is the most serious unmitigated threat to Sonora chub. Climate change is expected to lead to increasing drought conditions in the Southwest, as well as more extreme flood events (Hoerling and Eischeid 2007, Seager et al. 2007, Gutowski et al. 2008, Gershunov et al. 2013)

Water consumption is a threat that is unlikely to be mitigated, as legal protection would be junior to existing water rights, and groundwater is not legally linked to surface water in Arizona (U.S. Fish and Wildlife Service 2019). Border wall activities have increased groundwater consumption in the area in recent years. Construction of walls in 2019-2021 likely increased cross-border traffic and the associated law enforcement response into non-fenced areas near California Gulch and Sycamore Canyon (U.S. Fish and Wildlife Service 2022b). Water development and climate change threaten to alter hydrologic conditions of the border region, and threaten the sustained flow of the streams in which Sonora chub occur (USFWS 2019).

Mining, grazing, road construction and maintenance, and fire pose additional threats to Sonora chub (USFWS 2013).

PROTECTIVE MEASURES TAKEN: Listed as threatened under the Endangered Species Act (USDI 1986). Critical habitat was listed at the time of the Federal listing to include Sycamore Creek, extending downstream from and including Yanks Spring. Also designated was the lower 2.0 km of Penasco Creek and the lower 0.4 km of an unnamed stream entering Sycamore Creek from the west, about 2.4 km downstream from Yanks Spring. In addition, critical habitat includes a 12 meter-wide riparian area along each side of Sycamore and Penasco Creeks. The Center for Biological Diversity (CDB) (2021) petitioned the Fish and Wildlife Service (FWS) requesting that critical habitat be revised, but FWS ruled that a revision was not warranted

(USFWS 2022a). CBD (2023) resubmitted a petition to revise the critical habitat designation in March 2023.

One half of the Sycamore Creek drainage is within Pajarita Wilderness and Gooding Research Natural Area and thus subject to the protections of the Wilderness Act. U.S. Fish and Wildlife Service produced a Recovery Plan for Sonora Chub (*Gila ditaenia*) in 1992. Arizona Game and Fish has evaluated sites for reintroduction.

Additional efforts to conserve the Sonoran chub have been taken by the Coronado National Forest. A bridge was constructed on Ruby Road, replacing a low water crossing of Sycamore creek, reducing direct mortality and reducing sediment erosion in the stream. (USFWS 2013). In other efforts to minimize sedimentation of the stream, roadways in Sycamore Canyon south of Ruby Road have been closed to traffic and OHVs, and livestock have been eliminated from the riparian corridor of Sycamore Canyon, and portions of California Gulch (USFWS 2012). An agreement between the Coronado National Forest and the Fish and Wildlife Service allows for the use of fire retardant in chub habitat, establishing a buffer area around waterways to prevent entry of toxic material into chub habitat.

A captive assurance population was established at the Arizona Sonora Desert Museum in 1988. Wild fish are brought in every 3-4 years, and the population averages 400-500 fish (USFWS 2019). This population can serve as a source to repopulate if catastrophic decline or stochastic event takes place. However, the absence of information regarding genetic diversity in wild populations precludes our ability to determine if the captive population is genetically representative (USFWS 2019). Though not a captive population, the population at Hank and Yank's Tank can be considered a reserve population as the tank is hydrologically stable and the population is self-sustaining, though population size is unknown (USFWS 2013).

Measureable and objective recovery criteria have not been determined, due to knowledge gaps such as species range, status of populations, lack of monitoring protocol, life history, genetic variability, habitat needs, and taxonomy. It is not practicable to develop objective and quantifiable Recovery Criteria, as safety concerns preclude necessary sampling to close knowledge gaps (U.S. Fish and Wildlife Service 2013).

SUGGESTED PROJECTS: Specific actions recommended by the U.S. Fish and Wildlife Service (2013) include:

1. Revising the Recovery Plan to include new information and establish objective and measurable recovery criteria;
2. Develop a standardized survey protocol for the species;
3. Conduct systematic species and habitat surveys to evaluate population trends and habitat requirements;
4. Model climate factors within the range of the Sonora chub; and 4. Strengthen relationships with agencies and organizations in Mexico to better study, plan, and implement recovery actions.

LAND MANAGEMENT/OWNERSHIP: USFS - Coronado National Forest.

SOURCES OF FURTHER INFORMATION

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ADDITIONAL INFORMATION:

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