ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** AFCNC05021

Data Sensitivity: Yes

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Poeciliopsis occidentalis occidentalis*
COMMON NAME: Gila Topminnow

SYNONYMS: *Poeciliopsis occidentalis* (accepted)
Heterandria occidentalis
Girardinus occidentalis
Poecilia occidentalis
Mollienisia occidentalis
Arizonichthys psammophilus

OTHER COMMON NAMES: Sonoran Topminnow
FAMILY: Poeciliidae

AUTHOR, PLACE OF PUBLICATION: Baird, S.F. and C. Girard. 1853. Descriptions of new species of fishes collected by Mr. John H. Clark, on the U.S. and Mexican Boundary Survey, under Lt. Col. Jas. D. Graham. Procedures of the Academy of Natural Sciences, Philadelphia, 6:387-390.

TYPE LOCALITY: Santa Cruz River, near Tucson, Arizona.

TYPE SPECIMEN:

TAXONOMIC UNIQUENESS: Formerly classified as a subspecies of *P. occidentalis*, with *P.o. sonoriensis.* Hedrick et al. (2001) suggested that each subspecies be recognized as distinct species, based on genetic variation. This taxonomy is broadly accepted, and has been confirmed by Miller (2005), Minckley and Marsh (2009), and Page and Burr (2011). In total, three species in genus, with two occurring in Arizona.

Although recognition of this organism at the species level is widely accepted, the two subspecies are recognized as Species of Greatest Conservation Need in the Arizona Wildlife Conservation Strategy (Arizona Game and Fish Department 2022) with the Gila Topminnow listed under the taxonomy *Poeciliopsis occidentalis occidentalis*. The U.S. Fish and Wildlife Service (2019) also acknowledges *P. occidentalis occidentalis* as a recognized subspecies of the listed entity Gila Topminnow (including Yacqui) (*P. occidentalis*). Therefore, the Heritage Data Management System tracks the taxon as subspecies.

DESCRIPTION: The dorsal profile is slightly curved, and the body is somewhat elongated. Caudal fin rounded to almost square (Minckley 1973). Gonopodium of male elongated, reaching past the snout when in copulatory position. Males are small, rarely more than 2.5 cm

(0.98 in.) standard length; females are larger, sometimes 5.0 cm (1.97 in.) or more, usually 3.0 to 4.5 cm (1.18 to 1.77 in.), standard length (Minckley 1973).

Body is tan to olivaceous; darker above and with white often observed on the belly. The scales on the dorsum darkly outlined, extending as black speckles to upper belly and pre-pectoral area; lateral band dark and continuous along sides (Minckley 1973). Fins with rays outlined with melanophores, but lacking dark spots. Breeding males blackened, with some golden in midline of predorsum, and orange at base of gonopodium and sometimes at base of dorsal fin. Females in breeding condition with darkened peritroct (Minckley 1973).

AIDS TO IDENTIFICATION: The two subspecies of topminnows in Arizona, can be distinguished by several morphological characteristics. In *P. o. occidentalis* the snout is short, the mouth subsuperior and the dark lateral band of the female extends from the opercle to the base of the caudal fin (Minckley 1973). In *P. o. sonoriensis* the snout is longer, the mouth superior and the lateral band of the female rarely begins before the base of the pelvic fins (Minckley 1973). In addition, *P. o. sonoriensis* are found at the headwaters of the Yaqui River, whereas *P. o. occidentalis* are found below the headwaters (Arizona Game and Fish Department Native Fish Diversity Review 1995).

Female topminnow may be distinguished from mosquitofish (*Gambusia affinnis*) by the lack of dark spots on the caudal fin and lack of dark sub-orbital teardrop-shaped mark; origin of dorsal and anal fin vertically in line, perpendicular to horizontal axis of fish; in mosquitofish origin of dorsal fin posterior to origin of anal fin (U.S. Fish and Wildlife Service 1999). Male topminnow in breeding condition may or may not become dark black, while male mosquitofish never do; male topminnow gonopodium, when extended forward in copulatory position, extends very near to or past the snout, while male mosquitofish does not (Minckley 1973). Topminnows have weak, spatulate teeth whereas mosquitofish have strong conically shaped teeth, distinguishable only with a microscope (Meffe et al. 1983). Female topminnows are generally larger than males.

ILLUSTRATIONS:

B&W photo (Minckley 1973:199)
Color photos (Rinne and Minckley 1991:26)
Color line drawing (Page and Burr 1991:239)
B&W photo (Wildlife Habitat Management Staff Group 1975:31)

TOTAL RANGE: Once occupied aquatic habitats in the entire Gila River drainage in New Mexico, Arizona and Mexico below 1,524 m (5,000 ft.) in elevation, forming an almost continuous population in wetter periods (Minckley 1999). Gila Topminnow is still found throughout much of its former range in Mexico, in the drainages of the Rios de la Concepcion, Sonora, Matape, and Mayo (Varela-Romero et al. 1990, Minckley et al. 1991, Campoy-Favela 1996). In New Mexico, only one population exists, at Burro Cienega. In Arizona, topminnow are known to occupy several localities in the Santa Cruz River system and Gila River system on the San Carlos Apache Indian Reservation; some of these localities contain re-introduced populations (Arizona Game and Fish Department 2018, U.S. Fish and Wildlife Service 2018).

RANGE WITHIN ARIZONA: Historically found in most perennial springs, streams and vegetated margins of rivers in the Gila River drainage in Yavapai, Gila, Pinal, Maricopa, Graham, Greenlee, Cochise, Pima, Santa Cruz and Yuma Counties (Arizona Game and Fish Department 2018, U.S. Fish and Wildlife Service 2019). As of 2017, disjunct populations exist in 11–15 natural locations and 66 re-introduced locations within the Gila River drainage, particularly in the Santa Cruz River system, but spread across the historic range in a variety of ecological settings in Pima, Santa Cruz, Cochise, Graham, Greenlee, Pinal, Maricopa, and Yavapai Counties (Arizona Game and Fish Department 2018, U.S. Fish and Wildlife Service 2019).

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: At one time, this was the most common fish found in the Gila River Basin. Competitive and predatory interactions with introduced fish species, especially mosquitofish, have greatly reduced the range and abundance of the Gila Topminnow (Minckley 1999). The rapid replacement of topminnow by introduced mosquitofish, has been impressively documented at many localities (Minckley 1973); however, in some diverse habitats the two fishes have been able to co-exist for many years (Minckley et al. 1977, Minckley 1999). In most instances, replacement occurs through direct predation by mosquitofish on young and small Gila Topminnow, including shredding of the fins of larger topminnow, which leads to increased risk of infection (Minckley 1973). Long-term drought apparently has a synergistic and negative effect on this relationship, speeding the decline and disappearance of Gila Topminnow (Duncan 2013). Populations of Gila Topminnow historically expanded into intermittent waters during wet years and then retreated to headwater springs and perennial reaches of streams during drier years (Minckley 1999, Arizona Game and Fish Department 2018). Their high fecundity and long reproductive season, allows them to rapidly expand into new habitat (Minckley 1999). The life span of this species is approximately 1 year, but it appears to be linked to sexual maturation, which is dependent upon time of year in which they were born.

REPRODUCTION: Gila Topminnows are fertilized internally, where the young develop. Females may carry two broods simultaneously, one far more advanced than the other (U.S. Fish and Wildlife Service 1998). Females also have the ability to store sperm packets for later fertilization of eggs (Minckley 1991). The reproductive season normally lasts from March through August, but young may be produced year-round in some thermally stable springs (U.S. Fish and Wildlife Service 1998, Minckley 1999). During breeding, some males become dark black and exhibit aggressive breeding behavior, while others will not become black but still attempt to mate inconspicuously with females. The typical brood size ranges from 10–15 young, with larger broods produced during the summer. Brood time is 24–28 days, and young may reach sexual maturity in a few weeks to several months (U.S. Fish and Wildlife Service 1998).

FOOD HABITS: Gila Topminnows are omnivorous and opportunistic feeders. They utilize a broad spectrum of foods such as detritus and amphipods; but feed voraciously on aquatic insect larvae, especially mosquitos, when abundant (Minckley 1973, 1991).

HABITAT: Gila Topminnow use shallow shorelines and slackwater areas of small streams, springs, and marshes. They concentrate in protected inlets, shoreward of sandbars or debris, or associated with aquatic or streamside vegetation (Minckley 1999). This species prefers shallow warm water in a moderate current with dense aquatic vegetation and algae mats. Topminnows can withstand water temperatures from near freezing to 90–100 degrees F (Heath 1962). They also can live in a fairly wide range of water chemistries, with a pH ranging from 6.6 to 8.9; dissolved oxygen readings from 2.2 to 11 mg/l (Meffe et al. 1983); and salinities from tap water to sea water (Schoenherr 1974, in U.S. Fish and Wildlife Service 1998).

ELEVATION: Attempted re-introductions indicate the species prefers elevations below 5000 ft. (1525 m). Based on records in the Heritage Data Management System (HDMS), elevation ranges from 1,320–7,510 ft. (403–2,291 m), with most below 5,000 ft. (AGFD, unpublished data accessed 2020).

PLANT COMMUNITY: Cottonwood/willow or burro brush/seep willow terrestrial riparian communities, in association with aquatic plants such as green algae, *Nasturtium, Chara*, and *Potamogeton* spp.

POPULATION TRENDS: Gila Topminnow was once the most common fish in southern Arizona, but has declined to natural populations at 11 (possibly 15) sites in Arizona (3 populations not observed since 2004 and 2005; rediscovered population in Santa Cruz River awaiting genetic analysis, unclear if this is a natural population) (Arizona Game and Fish Department 2018). Since the 1930's, more than 200 attempted reestablishments of Gila Topminnow have occurred in the historic range, of which, the vast majority failed, mainly due to change in environmental conditions and negative interactions with nonnative fishes (Voeltz and Bettaso, 2003).

Recent reintroductions have been more successful. In 2001 there were only 15 established populations located in the wild. In 2017, 40 wild populations had been established, with an additional 26 populations established in sites that require human intervention to provide and maintain water (Arizona Game and Fish Department 2018). Of the wild populations, 32 populations are considered viable, having greater than 500 individuals and having persisted for more than 5 years (Arizona Game and Fish Department 2018). This meets the criteria for delisting. The Arizona Game and Fish Department petitioned to reclassify the Gila Topminnow to threatened status in 2018 (Arizona Game and Fish Department 2018). The U.S. Fish and Wildlife Service (2019) issued a 90-day finding that this action may be warranted and initiated a review of the status to determine whether this petitioned action is warranted.

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:	LE,UR as *Poeciliopsis occidentalis* (USFWS 1967, 2019, 2023)
STATE STATUS:	1 (AZGFD, AWCS 2022)
HERITAGE NETWORK STATUS:	G3 S1S2
OTHER STATUS:	Bureau of Land Management Sensitive, (USDI, BLM Arizona, 2017) Not Forest Service Sensitive (USDA, FS Region 3 1999, 2007, 2013) Full Species - A, Determined Threatened in Mexico (Secretaría de Medio Ambiente y Recursos Naturales 2010)

PREVIOUS STATUS

ENDANGERED SPECIES ACT STATUS:	LE (USDI, FWS 1967, 1970)
STATE STATUS:	1A (AGFD SWAP 2012) Threatened (AZGFD, WSCA 1996 in prep) Threatened (AZGFD, TNW 1988)
OTHER STATUS:	Forest Service Sensitive (USDA, FS Region 3 1988) Full Species Listed Threatened (Secretaría de Medio Ambiente 2000) Full Species Listed Threatened (Secretaría de Desarollo Social 1994)

MANAGEMENT FACTORS: Five genetic management units are defined for this species; Monkey and Cottonwood Springs, Sharp Spring, the lower Santa Cruz River, Cienega Creek, and Bylas Spring (Hedrick et al. 2001, 2006). For redundancy, multiple refugia populations should be established from each management unit. Populations of each genetic management unit are maintained at the Arizona State University Animal Care Facility (Arizona Game and Fish Department 2018). Re-introduction into available historic habitat without introduced fishes should be continued. Land Management activities such as mining, grazing, fuel-wood cutting, logging etc., should be evaluated in relation to site-specific characteristics, as these activities can have either a positive or negative effect on Gila Topminnow populations due to timing, intensity or other activity related factors (U.S. Fish and Wildlife Service 1998).

Threats: Spring habitat development; aquifer pumping; habitat destruction; drought; predation by and competition with nonnative fishes (U.S. Fish and Wildlife Service 1998).

Management needs: Protect existing natural populations; identify sites for reintroduction; re-establish populations; monitor and manage reintroductions to maintain minimum of 55 sites in Arizona (U.S. Fish and Wildlife Service 1998).

PROTECTIVE MEASURES TAKEN: Listed as endangered under the Endangered Species Act (U.S. Fish and Wildlife Service 1967), although a petition to reclassify to threatened status has been received and found warranted by the US Fish and Wildlife Service (Arizona Game and Fish Department 2018, U.S. Fish and Wildlife Service 2019). Statewide Safe Harbor Agreement between Arizona Game and Fish Department and the U.S. Fish and Wildlife Service signed in 2007 (Arizona Game and Fish Department 2007). Of 78 populations in existence, 94 percent are on protected lands (federal, tribal, state, county, and city governments, private conservation organizations or private groups enrolled in conservation agreements) (Arizona Game and Fish Department 2018). Ninety-one percent of existing populations have bariers that isolate them from nonnative fishes. Of the remaining seven, fish barriers have been proposed or scheduled, and mechanical removal is occurring at two locations (Arizona Game and Fish Department 2018). Propagation of a native fish stock to be used as baitfish could reduce or eliminate use of nonnative baitfish in the Gila River basin (Arizona Game and Fish Department 2018). AZGFD is developing agreements with counties in the Gila River basin to use Gila Topminnow instead of western mosquitofish for vector control programs. This program was successfully piloted in 2017, and will help reduce the spread of western mosquitofish (Arizona Game and Fish Department 2018).

At Cottonwood Spring, a Conservation Agreement signed between U.S. Fish and Wildlife Service, The Nature Conservancy, and the private land owner established a cattle exclosure at the spring (U.S. Fish and Wildlife Service 1998). Portions of Cienega Creek are within the Bureau of Land Management's Las Cienegas National Conservation Area. Portions of lower Sonoita Creek, Fresno Canyon, and Coal Mine Canyon have been acquired by Arizona State Parks and are now part of the Sonoita Creek State Natural Area (U.S. Fish and Wildlife Service 1998). A Memorandum of Understanding was signed in 1981 between the U.S. Fish and Wildlife Service, AGFD and U.S. Forest Service allowing coordination for the re-introduction of Gila Topminnow on Forest Service administered lands. The Coronado National Forest has tried to improve conditions for the Gila topminnow in Redrock Canyon by closing roads, constructing exclosures, modifying Allotment Management Plans, and monitoring riparian conditions (U.S. Fish and Wildlife Service 1998).

Populations of each genetic management unit are maintained at the Arizona State University Animal Care Facility. Each genetic management unit is also represented by at least 7 populations which have persisted for at least 3 years (Arizona Game and Fish Department 2018).

SUGGESTED PROJECTS: Control nonnative fish in non-isolated locations, actions to minimize spread of western mosquitofish, monitoring effect of climate change on water availability, consider delisting species, as criteria are met.

LAND MANAGEMENT/OWNERSHIP: BIA - Salt River Pima and San Carlos Reservations; BLM - Kingman, Phoenix, Safford and Tucson Field Offices; NPS - Saguaro National Park; USFS - Coconino, Coronado, Prescott and Tonto National Forests; State Land Department; Roper Lake State Park; Sonoita Creek State Natural Area; TNC - Cottonwood Spring and

Hassayampa River Preserves, and Patagonia - Sonoita Creek, Boyce Thompson Southwestern Arboretum; Private.

SOURCES OF FURTHER INFORMATION

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ADDITIONAL INFORMATION: Criteria for downlisting met in 2018. The Arizona Game and Fish Department petitioned to reclassify the Gila Topminnow to threatened status in 2018 (Arizona Game and Fish Department 2018). The petition was found warranted by the U.S. Fish and Wildlife Service in a 90-day finding (USDI, FWS 2019).

Revised: 1994-07-11 (DAW)
1995-01-31 (KLY)
2001-10-18 (SMS)
2020-08-11 (KSL)
2023-01-09 (MBL)
2024-10-11 (CPS)