

**ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM**

Animal Abstract

Element Code: AFCJB13180

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CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Gila nigra* (Cope) Cope & Yarrow

COMMON NAME: Headwater Chub

SYNONYMS: *Gila intermedia*

FAMILY: Cyprinidae

AUTHOR, PLACE OF PUBLICATION: Cope in Cope & Yarrow, U.S. Geol. Surv. West 100. Meridian v. 5 (Zool.) Chapter 6: 663, Pl. 30 (figs. 3, 3a-b), 1875.

TYPE LOCALITY: Original description was made by E.D. Cope from specimens collected in 1874 from Ash Creek and the San Carlos River (Cope and Yarrow 1875).

TYPE SPECIMEN: Collections of *G. nigra* were made by H.W. Henshaw, from "San Carlos" [USNM 16972 original collection no. 1019, October 17, 1874; (Cope and Yarrow, 1875)], presumably near Camp San Carlos [established in 1873 and located roughly 1 mile north of the confluence of the San Carlos and Gila Rivers (Nearing and Hoff, 1995)], and from Ash Creek in 1874, by J.T. Rothrock, (USNM 16987, original collection no. 204, July 1874; USNM 15991, original collection number 204A, July 25 1874).

TAXONOMIC UNIQUENESS: *Gila nigra* is 1 of 7 species in the *Gila robusta* complex or species group (Minckley and DeMarais 2000), all of which are endemic to the Colorado River Basin. Other taxa that occur in the *G. robusta* complex include *G. elegans* (bonytail chub), *G. cypha* (humpback chub), *G. seminuda* (Virgin chub), *G. intermedia* (Gila chub), *G. jordani* (Pahranaगत roundtail chub), and *G. robusta* (roundtail chub). The first four are Federally-listed as endangered, and the fifth is proposed for such listing. Previously, *Gila r. robusta*, *G.r. grahami* (= *nigra*), and *G.r. seminuda* had been discussed as the three subspecies making up the "robusta complex." DeMarais et al. (1992), recognizes the Virgin River chub as a full species, *Gila seminuda*, which is accepted today. Research looking into subspecies *G.r. grahami* vs. full species *Gila nigra* is ongoing at this time. However, full species level has been proposed (WL Minckley and BD DeMarais 2000) and generally accepted. They indicate that headwater chub most likely has a hybridizational origin of species (*Gila robusta* x *Gila intermedia*). They justify it at the full species level in that although it is intermediate between the *G. robusta* and *G. intermedia*, there are no coherent geographic patterns indicating intergradation between adjacent populations of either *intermedia* or *nigra* and *robusta*, nor is there morphological variation attributable to hybridization through natural contact between any of the three. Persistent parapatry of morphologically distinguishable *robusta*, *intermedia*, and *nigra* has been documented, confirmed, and reconfirmed since the 1920s.

DESCRIPTION: Body thick and chunky to streamlined, but not markedly attenuate. Maximum size is about 50 cm (19.7 in); females are about 10-18 cm (4-7 in) total length. Coloration is dark olive-gray or brown above; silver side, white below. Often with diffuse longitudinal stripes, rarely with dark dorsolateral blotches. Head length/least depth of caudal peduncle is less than 3.2. Caudal peduncle not pencil-like, its length less than head length; fins small to moderate in size, sometimes convex, rarely falcate; inter-radial membranes of fins variously pigmented. Scales developed and imbricate over entire body; basal radii variable. There are 73-83 lateral scales (extremes 71-90, typically fewer than 80), usually 8 dorsal and anal fin rays (rarely 7 or 9); pharyngeal teeth 2,5-4,2.

AIDS TO IDENTIFICATION: Similar species include the humpback chub (*Gila cypha*) and bonytail chub (*G. elegans*), however, these fish have extremely slender caudal peduncles, smaller eyes, angle along anal fin base continuing above caudal fin; large individuals have hump on nape, and a depressed head which is absent on headwater chub. *Gila nigra* are somewhat trout-like in appearance, except they lack an adipose fin. Not surprisingly, they are morphologically intermediate between *Gila robusta* and *Gila intermedia*.

ILLUSTRATIONS:

TOTAL RANGE: Headwater chubs are endemic to the Gila River basin of Arizona and New Mexico where they occupy the middle and headwater reaches of middle-sized streams. Populations have been recognized from the mainstem Gila River (above confluence with Mangus Creek) in New Mexico. This includes West, Middle and East forks of the Gila River, along with the San Carlos River (a tributary to the Gila). They are also identified from Ash Creek (tributary to San Carlos River), Tonto Creek (tributary to the Salt River), and Spring Creek, (tributary of Tonto Creek). In the Verde River system, they inhabit Upper Fossil Creek (above the diversion dam), East Verde River and Deadman Creek.

RANGE WITHIN ARIZONA: In Arizona, they are identified from Ash Creek (tributary to San Carlos River), Tonto Creek (tributary to the Salt River), and Spring and Marsh Creeks, (tributaries of Tonto Creek). In the Verde River system, they inhabit Upper Fossil Creek (above the diversion dam), East Verde River and Deadman Creek.

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: Headwater chub life span is 8-10 years. They grow rapidly but growth is dependant on water temperature. Maximum size is about 50 cm.

REPRODUCTION: Headwater chub first reproduce between 2-5 years of age. Females are about 100-180 mm total length. Both males and females produce spawning tubercles. In males, tubercles are usually uniformly distributed from the head to the base of the dorsal fin and rarely to the base of the tale. Females display tubercles only on the head, operculum, pectoral and caudal fins. Both males and females may develop red/orange coloration on the

opercles, posterior parts of the lips and fin bases. Spawning occurs in spring and early summer at the end of spring runoff. Suitable water temperatures range 14-24°C. Each female is escorted by several males and spawning is performed in pool, run and riffle habitat. Eggs are scattered randomly over substrate. Eggs hatch in 4-7 days at a water temperature of 19-20°C. Larval stage lasts up to 53 days.

FOOD HABITS: Stomach analysis of fish from Fossil Creek in 1976 showed headwater chubs feed on aquatic and terrestrial insects, ostracods, and some plant material (Neve 1976). Adults show seasonal variation in their diet, with greatest diversity in spring and summer. Various aquatic invertebrates, macrophytes, and algae were present in spring with terrestrial insects and diatoms being added in the summer. No fish were found in headwater chubs from Fossil Creek, however two iguanid lizards were. Juvenile chubs (<50mm) consisted almost exclusively of filamentous algae and diatoms. Young feed on small insects, crustaceans, and algae in quiet backwaters until they reach 25 to 50 mm (0.99 to 1.97 in.) in length. In stomachs of chubs <100 mm from the mainstem Gila, Bestgen (1985) found algae to be predominant, along with trichopterans and miscellaneous insect parts. In chubs between 150-170 mm he found algae to be a major dietary component along with ephemeropterans, trichopterans, and unidentified insects. Fish >170 mm contained algae, trichopterans, and ephemeropterans, in addition to fish and crayfish.

HABITAT: Adult headwater chub occupy cool to warm water in mid- to headwater stretches of mid-sized streams of the Gila River basin. They are associated with deep, near shore pools adjacent to swift riffles and runs, and near obstructions. Cover consists of root wads, boulders, undercut banks, submerged organic debris, or deep water. In Fossil Creek, they were found in water >1.8 m deep with velocities of <0.10 mps (Barret and Maugham 1995). Substrates they associated with were gravel, small boulders, and large instream objects. Preferred water temperature ranges 20-27°C with minimum temperature around 7°C. Juveniles are associated with shallow, low velocity habitat with overhead cover. In Fossil creek, they seem to select depths between 0.9-1.5 m and velocities of 0.15 mps and are found over sand substrate. (Voeltz, 2002).

ELEVATION: Bestgen and Probst (1989) reported headwater chubs in the upper Gila River basin of New Mexico at elevations from 1,325 m to 2,000 m (4,347-6,562 ft). Unpublished records from the Arizona's Heritage Data Management System reports Headwater Chubs from about 1,200 m (4,200 ft) in Fossil Creek to nearly 1,520 m (5,000 ft) in Marsh Creek.

PLANT COMMUNITY:

POPULATION TRENDS: As with many native fish, reductions in range and numbers are likely the result of habitat loss, as well as competition with, and predation by, non-native fish species.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: PT USDI,FWS, 2015
 [C* USDI, FWS, 2007]
 [C USDI, FWS 2006]
 [C USDI, FWS 2007-2011]

STATE STATUS: 1A (AGFD SWAP 2016)

OTHER STATUS: Forest Service Sensitive (USDA, FS Region
 3 2007, 2013)

MANAGEMENT FACTORS: **Threats:** aquifer pumping; stream diversion; reduction in stream flows; predation by and competition with nonnative fishes. **Management needs:** watershed and stream flow protection; research to determine mechanisms of disappearance; ameliorate effects of deleterious nonnative fishes.

PROTECTIVE MEASURES TAKEN: Currently being considered for T & E listing by the US Fish and Wildlife Service. In 2006 a Statewide Conservation Agreement was completed and signed by nine natural resource management entities in 2007: U.S. Fish and Wildlife Service, Arizona Game and Fish Department, U.S. Bureau of Reclamation, the Hualapai Tribe, Salt River Project, U.S. Bureau of Land Management, Arizona State Land Department, Arizona Department of Water Resources, The Nature Conservancy, and the U.S. Forest Service (AGFD 2006).

SUGGESTED PROJECTS: Monitor populations. Maintain, improve, and augment habitat. Reintroductions to historic range. Further investigation of the “*robusta* complex.”

LAND MANAGEMENT/OWNERSHIP: USFS - Apache-Sitgreaves, Coconino, and Tonto National Forests; State Land Department; Private.

SOURCES OF FURTHER INFORMATION**REFERENCES:**

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ADDITIONAL INFORMATION:

Gila grahami Baird and Girard. 1854. Proceedings Academy Natural Sciences Philadelphia, 7:24-29. Synonymized to *Gila robusta* by Jordan and Evermann (1896). Designated a subspecies (*Gila robusta grahami*) by Minckley and Rinne (1970). Minckley and DeMarais (2000) suggested elevating *grahami* to specific status, however, specimens of *Gila grahami* were reidentified as synonymous with *G. robusta* (Minckley and DeMarais 2000), and therefore, *grahami* was unavailable for a replacement name. The earliest replacement name was *Gila nigra* (Cope and Yarrow 1875, Geography and Geology Exploration and Survey West of the 100th Meridian (Wheeler's Survey), 6:635-703, pls. 26-32.)

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2015-10-07 (BDT)

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