Scientific Name: *Tiaroga cobitis*
Common Name: Loach minnow
BISON No.: 010290

Legal Status:

- Arizona, Species of Special Concern
- ESA, Endangered
- ESA, Proposed Endangered
- ESA, Proposed Threatened
- ESA, Threatened
- New Mexico-WCA, Endangered
- New Mexico-WCA, Threatened
- USFS-Region 3, Sensitive
- None

Distribution:

- Endemic to Arizona
- Endemic to Arizona and New Mexico
- Endemic to New Mexico
- Not Restricted to Arizona or New Mexico
- Northern Limit of Range
- Southern Limit of Range
- Western Limit of Range
- Eastern Limit of Range
- Very Local

Major River Drainages:

- Dry Cimmaron River
- Canadian River
- Southern High Plains
- Pecos River
- Estancia Basin
- Tularosa Basin
- Salt Basin
- Rio Grande
- Rio Mimbres
- Zuni River
- Gila River
- Rio Yaqui Basin
- Wilcox Playa
- Rio Magdalena Basin
- Rio Sonoita Basin
- Little Colorado River
- Mainstream Colorado River
- Virgin River Basin
- Hualapai Lake
- Bill Williams Basin

Status/Trends/Threats (narrative):

Federal (USDI): Threatened, Federal (USFS) Region 3: Sensitive, State AZ: Species of special concern, State NM: Threatened.

The loach minnow is widely extirpated in Arizona by dewatering of streams and interaction with introduced red shiner (Minckley and Deacon 1968), and is becoming increasing rare throughout the Gila basin, in part because of deterioration of its special kind of habitat, but also because of the competitive interactions of introduced fish species (Minckley 1973). The loach minnow has been eliminated from at least 80% of its historic range, and in Arizona, it remains comparatively common only in Aravaipa Creek and portions of the Blue River (Propst 1999). The status of populations of the loach minnow in New Mexico is restricted in the San Francisco and stable in the Gila drainage (Sublette et al 1990).

The loach minnow has declined where non-native piscivorous fish species are present or habitats are modified by instream activities (Propst 1999). The range of the loach minnow has declined in the past 50-75 yr because of altered flow regimes (e.g. dams and water diversion), extensive loss or destruction of habitat, and the introduction of non-native species (Rinne 1989, Propst and Bestgen 1991). Water withdrawals cause fragmentation of the range of the loach minnow (Propst and Bestgen 1991).

At least 15 nonnative fish species have been reported in New Mexico portion of the range of loach minnow (Propst et al. 1988), and among these nonnative fishes, catfish are believed to have the greatest potential to interact negatively (USFWS, 1991). The flathead catfish is mainly piscivorous and begins consuming fish at early age (Propst 1999). Where these two species are present in the Gila-San Francisco Drainage in New Mexico, loach minnows are rare or absent (Propst 1999).

Invasion of non-native fishes either from stock or domestic livestock watering tanks upstream or the Gila River downstream is an equal or greater threat. The red shiner is present in the Gila River and has been suggested as a potential competitor for native species (Rinne 1992).

Most species inhabiting the same habitat as the loach minnow ate more than 90 percent of the same food items depended upon by the loach minnow (Schreiber and Minckley 1991).

Distribution (narrative)**:**

The loach minnow is restricted to upper Gila River basin, Arizona and New Mexico (Koster 1957). The monotypic genus *Tiaroga* is restricted to the Gila River basin in Arizona, New Mexico, and Sonora, Mexico, and it is becoming increasingly rare throughout most of its range, and was uncommon in the Aravaipa (Barber and Minckley 1966). Among the areas inhabited by the loach minnow it is comparatively common only in about a 5-km reach of the Tularosa River, the San Francisco River near Glenwood, and the West Fork Gila River near Gila Hot Springs (Propst 1999). The present geographic range of the loach minnow in New Mexico is fragmented and the species is uncommon in all but a few stream reaches (Propst and Bestgen 1991). In New Mexico, the loach minnow exists in the Gila River upstream from Redrock to the lower portions of the forks of Gila River and the San Francisco River including the Tularosa River downstream from Cruzville (Sublette et al 1990).

Key Distribution/Abundance/Management Areas:

Panel key distribution/abundance/management areas:

Breeding (narrative)**:**

The loach minnow spawns late winter and early spring (Lee et al 1981). Vives and Minckley (1990), however, documented autumn spawning by loach minnow in Aravaipa Creek, Arizona. Most reproduction by loach minnows in New Mexico occurs during a 4 to 6 week period in the spring when water temperatures are 16 to 20^{o}C (Propst and Bestgen, 1991). Spawning sites are usually located along the head and margins of riffles and runs in the same areas where the adults normally occur (Propst et al. 1988).

The adhesive eggs of loach minnows are deposited in a single layer on the undersides of flattened rocks that are slightly elevated from the stream bottom (Propst et al. 1988, Propst and Bestgen, 1991). It appears that a female develops only one complement of eggs each year (Minckley 1973). In the second summer of life, producing 250 to 1,200 ova per female (Lee et al 1981). Age-I females may spawn smaller-sized ova and were less fecund than Age-II females (Propst and Bestgen 1991).

Flowing water is apparently important to egg survival as many eggs (<5cm/sec) (Propst 1991). Propst and Bestgen (1991) found eggs in water velocities averaging 32.0 cm/sec, but upon hatching larvae moved to riffle margins where the water velocity averaged 7.3 cm/sec. As individuals grew, they moved to more rapid-velocity water and as adults were found in water averaging 57.3 cm/sec. (Propst and Bestgen, 1991).

Males appear territorial and defend nests beneath stones on riffles (Minckley 1991), and some care of incubating eggs may be provided by the male (Propst et al. 1988). Incubation takes approximately six days at 21ºC (Propst et al. 1985). Upon hatching, larvae apparently seek out low velocity nursery areas along the stream margin since low numbers of drifting larvae suggest an avoidance of current (Propst et al. 1988).

Loach minnow males and females are sexually mature by their second spring (Age-I) (Propst and Bestgen 1991).

Few loach minnow survive more than 24 months and spawning appears to be followed by high mortality of all breeding fish, particularly Age 2 individuals (Minckley 1991, Propst 1999).

Habitat (narrative)**:**

The loach minnow persists mainly in streams having relatively natural flow regimes a predominance of native species (Propst and Bestgen 1991). The loach minnow is essentially restricted to gravelly riffles with substrates ranging in size from sand to rubble, where water velocity ranged from 0- 100+ cm/sec, and depths were 6-40 cm in smaller to moderately-large creeks and rivers, and is most often is taken in association with beds of filamentous algae such as *Pitophora* or *Cladophora,* either in the main channels of shallow, swift reaches, or along the margins of more torrential rapids (Barber and Minckley 1966, Minckley 1973, Minckley 1991, Propst and Bestgen 1991).

Barber and Minckley (1966) in their study on Aravaipa Creek, Arizona they reported that where algae were scarce on riffles, and the loach minnow was absent and found only in areas of coarse gravel/small rubble bottom, and in water less than 20 cm. deep.

The loach minnow is locally common in New Mexico living on the bottom of small to large creeks and rivers, on turbulent riffles in association with filamentous algae (Lee et al 1981). The air bladder is greatly reduced and their body density is such that midwater swimming is labored (Minckley 1991). Loach minnows remain on the bottom at all times because they are far heavier than water and sink quickly unless swimming vigorously (Minckley 1973).

Each life stage of the loach minnow occupied subsets of each significantly different from that available (Propst and Bestgen, 1991). Larvae were found in slightly deeper and slower water where substrate particles were smaller, and juveniles inhabited shallower, faster velocity water, with larger substrate particles than that occupied by larvae (Rinne 1985, Propst and Bestgen, 1991). Although adults were found over a wide range of water velocities, most were found between 24-80 cm/sec (Rinne 1985, Propst and Bestgen, 1991).

Key habitat components: Current (60 cm/sec or greater), cobble-pebble substrates

Breeding Season:

- January
- February
- March
- April
- May
- June
- July
- August
- September
- October
- November
- December

Panel breeding season comments:

Aquatic Habitats:

Large Scale:

- Rivers
- Streams
- Springs
- Spring runs
- Lakes
- Ponds
- Sinkholes
- Cienegas
- Unknown
- Variable

Small Scale:

- Runs
- Riffles
- Pools
- Open Water
- Shorelines

Panel comments on aquatic habitats:

Important Habitat Features (Water characteristics):

Current

- Fast (> 75 cm/sec)
- Intermediate (10-75 cm/sec)
- Slow (< 10 cm/sec)
- None
- Unknown
- Variable

Gradient

- High gradient (>1%)
- Intermediate Gradient (0.25-1%)
- Low Gradient (<0.25%)
- None
- Unknown
- Variable

Water Depth

- Very Deep (> 1 m)
- Deep (0.25-1 m)
- Intermediate (0.1-0.25 m)
- Shallow (< 0.1 m)
- Unknown
- Variable

Panel comments on water characteristics:

Important Habitat Features (Water Chemistry)

Temperature (general)
- Cold Water (4-15°C)
- Cool Water (10-21°C)
- Warm Water (15-27°C)
- Unknown
- Variable

Turbidity
- High
- Intermediate
- Low
- Unknown
- Variable

Conductivity
- Very High (> 2000 µS/cm)
- High (750-2000 µS/cm)
- Intermediate (250-750 µS/cm)
- Low (< 250 µS/cm)
- Unknown
- Variable

Panel comments on water chemistry:

Important Habitat Features (Structural elements):

Substrate
- Bedrock
- Silt/Clay
- Detritus
- Sand
- Gravel
- Cobble
- Boulders
- Unknown
- Variable

Cover
- Rocks, boulders
- Undercut banks
- Woody debris
- Aquatic vegetation
- Rootwads
- Not important
- Overhanging vegetation
- Unknown
- Variable

Panel comments on structural elements:

Diet (narrative)**:**

Loach minnows of all life stages are exclusively insectivorous in all seasons (Propst and Bestgen 1991), and loach minnows are restricted almost exclusively in diet to riffle-inhabiting aquatic insect larvae, principally baetid mayflies and simuliid dipterans (Lee et al 1981, Minckley 1991, Propst 1999) with nymphal mayflies comprised 57 percent or more of stomach contents (Schreiber and Minckley 1981). The feeding habits of the loach minnow seem closely correlated with availabilities of the various food items, with sudden shifts from one major group of organisms to another closely following insect emergences, flooding, or other factors that modify the aquatic fauna of the stream (Minckley 1973).

The primary food of larvae and juveniles were chironomid larvae and ephemeropteran naiads (mainly Baetidae) (Propst and Bestgen 1991). Adults fed largely on these food items, but also consumed Plecoptera, Trichoptera (mainly Hydropsychidae), and Simuliidae (Propst and Bestgen 1991).

Diet category (list):

- Planktivore
- Herbivore
- Insectivore
- Piscivore (Fish)
- Omnivore
- Detritivore

Grazing Effects (narrative):

No data on the effects of livestock grazing on loach minnow are available, however, the species was rare or absent where fine sediments filled interstitial spaces (Propst and Bestgen 1991). Excessive fines in substrates as suggested Propst and Bestgen (1991) has an indirect effect on reproduction and food supply. However, no data on either the amount of fines that is excessive or its link to grazing or other land uses on the watershed and in riparian-stream areas is available. The high gradient riffles inhabited by the species has a probability of cleaning substrates and moving sediment through these habitats to slower, lower gradient run and pool habitats.

Panel limiting habitat component relative to grazing and comments:
Panel assessment: Is this species a priority for selecting a grazing strategy? Throughout the species' distribution in New Mexico and Arizona YES NO UNKNOWN In key management area(s) YES NO UNKNOWN

Principle Mechanisms Through Which Grazing Impacts This Species (list):

May be Revised

- Alteration of bank structures
- Alteration of substrate
- Alteration of water regimes
- Altered stream channel characteristics
- Altered aquatic vegetation composition
- Altered bank vegetation structure
- Change in food availability
- Change in water temperature
- Change in water quality
- Habitat fragmentation
- Increased turbidity
- Other biotic factors
- Parasites or pathogens
- Population genetic structure loss
- Range improvements
- Trampling, scratching
- Unknown

Panel causal mechanisms comments:

Authors

- **Draft:** Magaña, H.A. and Rinne, J.N.
- **GP 2001:**
- **GP 2002:**
- **Revision:**

Bibliography:

Barber, W.E. and Minckley, W.L. 1966. Fishes of Aravaipa Creek, Graham and Pinal Counties, Arizona. The Southwestern Naturalist 11(3): 313-324.

Lee, D.S., Gilbert C.R., Hocutt C.H., Jenkins R.E., Callister D.E., and Stauffer J.R. 1981. Atlas of North American Freshwater Fishes: North Carolina, North Carolina State Museum of Natural History, 1981, c1980.

Minckley, W.L. 1965. Sexual dimorphism in the loach minnow, *Tiaroga cobatis* (Cypriniformes). Copeia 1965, No. 3.

Minckley, W.L. 1973. Fishes of Arizona. Arizona Game and Fish Department. Phoenix, Arizona. 293 pp.

Minckley, W.L. 1991. Native fishes of arid lands: A dwindling resource of the desert southwest. USDA Forest Service. General Technical Report RM-GTR-206. pp 18.

Propst, D.L. 1999. Threatened and endangered fishes of New Mexico. New Mexico Game and Fish Technical Report 1. Santa Fe, New Mexico. 84 pp.

Propst, D.L. and K. R. Bestgen. 1991. Habitat and biology of the loach minnow, *Tiaroga cobitis,* in New Mexico. Copeia 1991: 29-39.

Rinne, J.N. 1992. Physical habitat utilization of fish in a Sonoran Desert stream, Arizona, southwestern United States. Ecol. Freshwater Fishes 1: 1-8.

Schreiber, D.C. and Minckley, W.L. 1981. Feeding interrelations of native fishes in a Sonoran Desert stream. Great Basin Naturalist 41(4): 409-426.

Sublette, J. E., M. D. Hatch, and M. Sublette. 1990. The Fishes of New Mexico. University of New Mexico Press. Albuquerque, NM. 393 pp.