

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

Invertebrate Abstract

Element Code: IMBIV04020

Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Anodonta californiensis* Lea

COMMON NAME: California Floater

SYNONYMS: *Anodonta dejecta*

FAMILY: Unionidae

AUTHOR, PLACE OF PUBLICATION: Lea, 1852, Descriptions of new species of the family Unionidae. Trans. Amer. Phil. Soc.: 286 [42], pl. 25, fig. 47.

TYPE LOCALITY: "Rio Colorado," actually a former distributor of the river, approximately New River, Imperial County, California.

TYPE SPECIMEN: Holotype [USNM_86393](#), Colo. R., Calif..

TAXONOMIC UNIQUENESS: A recent genetic study was conducted by Culver et al. (2012), due to the question of uncertainty pertaining to the taxonomic status of Arizona's *Anodonta*. Although California floaters (*A. californiensis*) are identified in all six ecoregions of Arizona by AGFD's Arizona Comprehensive Wildlife Conservation Strategy: 2005-2015 (CWCS), indications are that native *Anodonta* have been extirpated from all but the "AZ-NM Mountains." Here they inhabit the Black River, a part of the Gila River Basin System (Culver et al. 2012 report apart of the Colorado River Basin System, but the Black River drains into the Salt and eventually to the Gila River). Mussels that historically inhabited one of the six ecoregions in which they have been extirpated ("Apache Highlands-South", San Bernardino River System) are considered by many to be a different species of *Anodonta* (i.e. *A. dejecta*). This mussel likely still inhabits the Rio Yaqui drainage in Mexico (Culver et al. 2012). A genetic study has been conducted by researchers from the University of Utah on *Anodonta* in the Western U.S., but did not include *Anodonta* from Mexico. The study conducted by Culver et al. (2012) not only looked at populations in the Western U.S., but also populations in Mexico, citing the importance of including Mexican populations to fully understand the taxonomic status in Arizona. Their study indicates evidence to support species recognition of *Anodonta* from Owens River basin in California, Colorado River basin (Colorado River), Gila River basin (including Black River system), and Guzmán and Yaqui rivers in Mexico as one species of *Anodonta* (*A. californiensis*), and specimens from Rios Lerma, Mezquital, and Ameca basins in Mexico, as a second species (*A. impure*). Additionally, the Culver et al. (2012) study indicates subdivisions below the species level are important taxonomic units, particularly for conservation purposes.

DESCRIPTION: A freshwater clam (bivalve) with an extremely thin, large shell, about 8.0 cm (3.2 in.) up to 12.7 cm (5.0 in.) in length, with no teeth. Shell coloration can be yellow-

green, yellow-brown, and olive, pale brown, red-brown, or black (Nedeau et al. 2009, in Wyoming State Wildlife Action Plan 2010).

AIDS TO IDENTIFICATION:**ILLUSTRATIONS:**

Color photo of collected shells from Boneyard Creek in Arizona (In Culver et al., 2012, Figure 4)

Color photos of shells and habitat from Bishop Creek Canal, Owens River, California (D. Becker, CA Dept. Fish & Game, 2008, in Culver et al., 2012, Figure 33)

Color photo (<http://www.pacificbio.org/> accessed 2012)

TOTAL RANGE: From British Columbia south throughout California into Chihuahua and possibly Sonora, Mexico, and east to Washington, Oregon, Idaho, Wyoming, Utah, Nevada, and Arizona. Historically found in a majority of the Arizona drainages including the Black, Salt, Santa Cruz, Verde, Gila and Colorado rivers. In Arizona today, it is found only in the Black River system, part of the Gila River Basin System. The species (if the same species of *Anodonta*) has been extirpated from the San Bernardino River system, but likely still inhabits the Rio Yaqui drainage in Mexico

RANGE WITHIN ARIZONA: Apache and Greenlee counties, Black River part of the Gila River Basin System, Arizona.

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: *Anodonta californiensis* is a bivalve with larval, parasitic, juvenile and adult stages. Although the life span of this species is unknown, closely related species live about 10 to 15 years (Hulen 1988). PacificBio.org (accessed 2012) reports adult *A. californiensis* can live as long as 100 years. Adults begin to reproduce after reaching 6 to 12 years of age. Eggs are held in the brood pouch formed by gills of the female until they hatch into larvae (glochidia). A female floater may release several million larvae during one year, but the survivorship is extremely low due to the specific requirements of finding and attaching to a host fish. Upon release by female, glochidia fall to substrate in clean waters. After growing for some time, attachment threads (byssi) dissolve and young clams are washed downstream to settle in slower water where further maturation takes place. If the clams survive, they await attachment to the tail edges or fins of a host fish. At present, it is unknown whether or not the host is species specific. The host produces tissue around the larvae forming a cyst, which is the beginning of the parasitic stage lasting about 27 days; these cysts are not harmful to the host. At completion of this stage, a young mussel detaches from the host and the juvenile stage, lasting about two years, begins. During this time, organs are transformed from the immature to the adult state.

Predators include raccoons, muskrats, otters, fishes, crawfish, turtles, and birds.

REPRODUCTION: Fertilization occurs internally with eggs fertilized by sperm brought through brood pouch with respiratory currents of water. Eggs are continually bathed by currents while incubating. See ‘**Biology**’ above for description of egg stage to juvenile stage.

FOOD HABITS: As mentioned above, in the larval stage *A. californiensis* is parasitic on fins of host fish. Whether *A. californiensis* is host specific to a certain species or genus of fish is poorly known. Certain minnows (Nedeau et al. 2009, in Wyoming G&F Dept. 2010), chubs (*Gila* spp., Hovingh 2004, in Wyoming 2010) and some trout species (*Oncorhynchus* spp.) may be natural hosts. There is no direct observation information about adult *A. californiensis* feeding at the present time, however, it is known that detritus, animal plankton and bacteria make up the majority of mussel diet.

HABITAT: *Anodonta californiensis* prefers shallow areas, less than 2 meters deep in unpolluted lakes, reservoirs, and perennial streams with relatively stable water levels of low velocity flow regimes. They are generally found in pools, near channel banks, and in sedge-occupied substrates. Adult mussels typically live in mud or sand and juveniles in loose sand.

ELEVATION: 4,000 - 8,670 ft. (1,220 - 2,644 m)

PLANT COMMUNITY:

POPULATION TRENDS: “When the proper (specific) host fish disappear from the habitat, the clam also will become extinct. This explains why *A. californiensis* is now near extinction in Arizona, while perhaps only a century ago it may have been widespread in the State” (Bequaert and Miller, 1973). “Declining throughout much of its former range, and may be nearing extirpation in some of the more southern states, including parts of California” (Burke 1994). Utah is seeing an apparent decline of this species with possible extirpation at some sites (Utah Div. Wildl, Res. Accessed 2012). Historically found in seven ecoregions within Arizona, now occupies a few sites in the Black River system.

SPECIES PROTECTION AND PRESERVATION

ENDANGERED SPECIES ACT STATUS:	SC (USDI, FWS 1996) [C2 USDI, FWS 1995] [Petition to List USDI, FWS 1994] [C2 USDI, FWS 1991] [Insufficient info. to warrant listing, USDI, FWS 1990] [Petitioned to List, T. Hulen, City of Phoenix 1989]
STATE STATUS:	1A (AGFD SWAP 2012)
OTHER STATUS:	Forest Service Sensitive (USDA, FS Region 3 1999, 2007)

MANAGEMENT FACTORS: As *A. californiensis* is closely associated with species of fish, once the host or hosts are known, a total fish-molluscan management plan should be

developed to avoid developing a habitat to improve one native species at the expense of another native species. No information is available on the California floater in the majority of its range. According to the Fish and Wildlife Service, as of August, 1990, there is no data to support an assumption that the California floater has been substantially depleted or is subject to heavy threats through all or a significant portion of its range.

Their status may be tied to a specific fish or group of fish that serve as hosts for the larval stage. Many of the native fishes within the range of the floater are depleted by habitat alteration and by competition and predation by non-native fishes introduced by humans either inadvertently or for various purposes. The proliferation of the introduced Asian clam (*Corbicula manilensis*) may also be adversely affecting the California floater through interspecific competition.

Threats: alteration and destruction of riverine habitats including: channelization, dredging, impoundment, erosion, siltation, water diversion, groundwater pumping, pollution and watershed modifications. Declining water quality, predation by non-native fish and introduced crayfish, and a possible link to reduced populations of native fish that serve as larval hosts, are additional threats to this mussel. **Management needs:** identification of potential for restoration of original habitat and reintroduction; research on effects of suspected competitors and predators.

PROTECTIVE MEASURES TAKEN: The California floater is not specifically protected. Some populations could be indirectly protected if they are located on Federal, state or local lands. However, no public agency is known to specifically manage sites for the California floater.

SUGGESTED PROJECTS: Additional genetic work on populations in the southwest, to determine if subspecies designation is warranted. This would be in addition to the genetics study (at species level) by Culver et al. (2012). A status review for the California floater in Washington, Oregon, Idaho and Nevada should be done as no data on current distribution or population dynamics is available. Continued monitoring and protection of known populations in state needed.

LAND MANAGEMENT/OWNERSHIPS: USFS Apache-Sitgreaves National Forest;
Private.

SOURCES OF FURTHER INFORMATION

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ADDITIONAL INFORMATION:

The common name of *Anodonta* is derived from the tendency for these mussels to float to the surface of the water after death; a result of gas build-up behind their thin shells.

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