Gizzard Shad *Dorosoma cepedianum*

Ecology: *D. cepedianum* is black and silvery blue in color,, with a white abdomen and reach an average total length of approximately 225-350 mm (Miller 1960). Scales are large, cycloid, and deciduous. Lateral line is not present.

The gizzard shad is common in lakes, oxbows, impoundments, sloughs and large rivers with low gradients (Trautman 1981; Etnier and Starnes 1993), but reaches greatest abundance in waters where fertility and productivity are high (Robison and Buchanan 1988; Pflieger 1997). Gizzard shad avoid high gradient streams and rivers in the mountains and rivers without large, permanent pools, but can tolerate moderately turbid and, occasionally, even brackish or salt waters (Trautman 1981; Robison and Buchanan 1988; Pflieger 1997). The gizzard shad prefers living in open water, at or near the surface (Becker 1983; Harlan et al. 1987).

The gizzard shad spawns in shallow backwaters or near the shore. Gizzard shad spawn at night, spring through summer, eggs hatch in about 2-4 days. Eggs randomly scatter and adhere to plants, rocks or firm substrate. Spawning peak occurs from 19-22° Celsius. Most spawn at age II during a six-week spawning period. Fecundity ranges from 22,000 to 350,000 eggs. Buoyant larvae become plankton. They reach sexual maturity usually in 2-3 years (Robison and Buchanan 1988). Life span is generally about 4-6 years with few surviving beyond age class III (Sublette et al. 1990).

Typically found traveling in schools, juveniles are nonvisual planktivores, most commonly utilizing zooplankton and phytoplankton in the diet. Adults are primarily bottom filter-feeding detritivores; eating large quantities of organisms attached to underwater surfaces, especially from littoral areas. Gizzard shad also feed on phytoplankton in open water (Sublette et al. 1990).

Distribution: Gizzard shad were unknown in Utah until 2002, when six individuals were documented in the San Juan arm of Lake Powell. They are currently found throughout Lake Powell. Since their initial discovery, Gizzard shad have spread upstream into the Colorado River and Green River systems (Pers. Comm. Paul Birdsey. 2008. Southeaster Region Aquatic Program Manager, Utah Division of Wildlife Resources). Utah Division of Wildlife Resources introduced Gizzard Shad as a forage fish into Willard Bay Reservoir in 1990 (Pers. Comm. Craig Schaugaard. 2008. Northern Region Aquatic Program Manager, Utah Division of Wildlife Resources). This area drains immediately into the Willard Bay arm of the Great Salt Lake, so downstream escape is not considered a problem, due to the lake's high salinity.

In 2006, sampling of the Green River was conducted to evaluate the response of small- bodied native fish to non-native predator removal. Seining was conducted in suitable low-flow and backwater habitats. Of potential significance in 2006 were the observation of small, non-native gizzard shad in backwaters, a decrease in the number of native species, and the number of individuals within each native species. Most native Colorado River fish such as: Colorado River Pike minnow (*Ptychocheilus lucius*), Bonnytail Chub (*Gila elegans*), Humpback Chub (*Gila cypha*) and Razorback Sucker (*Xyrauchen texanus*) are protected under the Endangered Species Act and the others: Flannelmouth Sucker (*Catostomus latipinnis*), Bluehead Sucker (*Catostomus discobolus*) and Roundtail Chub (*Gila robusta*) are protected as state of Utah sensitive species. Not all gizzard shad were measured; however, of those that were (n=8), their mean length was 39.75 mm. Lengths of these fish ranged from 36mm to 41mm. Given that fish of such small lengths were found in several backwaters from river mile 281 to 215 (nine total backwaters), the

researchers are convinced that this species has begun to reproduce in the middle Green River (Pers. Comm. Krissy Wilson. 2008. Native Aquatic Species Program Coordinator, Utah Division of Wildlife Resources).

Pathways of introduction: The method of introduction of gizzard shad into Utah is unknown. It is likely that they came from illegal fish stocking by individuals under the assumption that they would provide good forage for Lake Powell sport fish (Pers. Comm. Krissy Wilson. 2008. Native Aquatic Species Program Coordinator, Utah Division of Wildlife Resources). Also, they may have been accidentally introduced via fish transport operations from other states in which they are common (Pers. Comm. Tim Miles. 2008. Hatchery Program Coordinator, Utah Division of Wildlife Resources). It has been reported by U.S. Fish and Wildlife that gizzard shad were accidentally introduced into Morgan Lake near Shiprock, NM with a shipment of largemouth bass in 1998 (UDWR 2006). The bass came from Inks Dam National Fish Hatchery in south-central Texas in the Rio Colorado drainage where gizzard shad are abundant in the surface water used at the hatchery. Later loads of bass transported to Morgan Lake from the hatchery, besides largemouth bass (*Micropterus salmoides*), were found to have several different species (e.g. Guadalupe bass (*Micropterus treculii*), logperch (*Percina caprodes*), gizzard shad, white bass (*Morone chrysops*), bluegill (*Lepomis macrochirus*), and dollar sunfish (*Lepomis marginatus*)).

Management considerations: A review by DeVries and Stein (1990) suggests that gizzard shad might not be an ideal forage fish. Gizzard shad can consistently produce large numbers of offspring from few adults (Miller 1960; Pierce 1977), and their larvae may compete with other fishes for zooplankton (DeVries and Stein 1992). Furthermore, because gizzard shad grow quickly (Bodola 1966), they often reach a size refuge from most predators by the end of their first year (Adams and DeAngelis 1987; Johnson et al. 1988). Impressive larval production, coupled with fast growth, was shown to limit predator consumption to a maximum of 30% of gizzard shad production in Ohio reservoirs (Johnson et al. 1988). Most importantly, however, gizzard shad are opportunistic omnivores, feeding on zooplankton as larvae, but capable of switching to phytoplankton or detritus as juveniles and adults (Miller 1960; Bodola 1966; Pierce 1977). As a result, gizzard shad can drive zooplankton to extinction, yet still survive and grow to adulthood. Gizzard shad also spawn before many sport fishes (e.g., bluegill *Lepomis macrochirus*), thus their larvae may deplete zooplankton resources to the extent that sport-fish larvae may face unfavorable conditions for growth and survival.

In 2006, threadfin shad (*Dorosoma petenense*) populations, a forage fish in Lake Powell, decreased as a response to heavy predation from large numbers of adult sport fish, while the adult gizzard shad population continued to grow. Due to the suitable habitat available and the uncontrolled population expansion of gizzard shad in Lake Powell, this species will negatively affect the management and planning of recreational sport fishing opportunities in Lake Powell. The competitive nature of gizzard shad will likely pose an additional threat to the endangered and sensitive fish species of the Colorado River (Pers. Comm. Paul Birdsey. 2008. Southeastern Region Aquatic Program Manager, Utah Division of Wildlife Resources).

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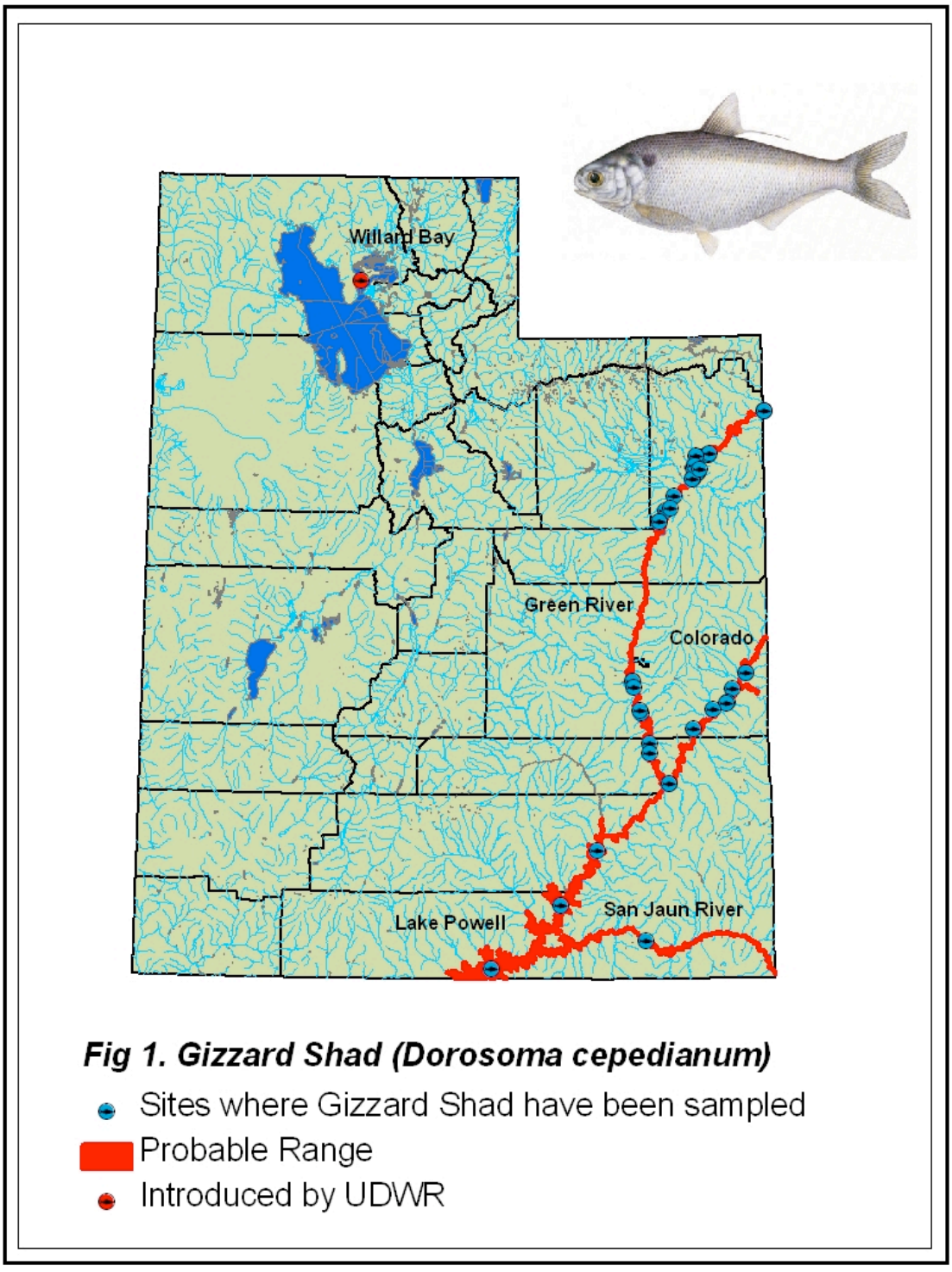

Fig 1. Gizzard Shad (Dorosoma cepedianum)

- Sites where Gizzard Shad have been sampled
- Probable Range
- Introduced by UDWR