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# Utah chub (*Gila atraria*) from the latest Pleistocene Gilbert shoreline, west of Corrine, Utah

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# UTAH CHUB (*GILA ATRARIA*) FROM THE LATEST PLEISTOCENE GILBERT SHORELINE, WEST OF CORRINE, UTAH

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ABSTRACT.—A bulk sampling of gastropods collected near Great Salt Lake, Utah, revealed several fish bones of *Gila atraria* (Girard). The early date of this find, coupled with the relationship of the Gilbert lake transgression and successive regression of approximately 11,000 years B.P., reveals a death assemblage induced by a series of saline inundations into the freshwater paludal environment.

A large death assemblage of late Pleistocene gastropods, lying in an exposed roadcut along State Highway 83, 17.5 km northwest of Corrine, Utah (UTM coordinates 0390500E/4606400N, Public Shooting Grounds, 7.5 minute quadrangle), was radiocarbon dated by Miller (1980), twice by Currey (1988), and by the author. The respective dates of 10,920 ± 150 C-14 years B.P. (W-4395), 11,990 ± 100 C-14 years B.P. (Beta-16912, 11,570 ± 100 C-14 years B.P (Beta-16913), and 10,990 ± 110 C-14 years B.P. (Beta-22431) imply a period of low lake level before the Gilbert rise of 11,000 years B.P. (Currey and Oviatt 1985). Currey (1980), Miller et al. (1980), Scott et al. (1983), and Currey and Oviatt (1985) use data from this site to assign the Pleistocene-Holocene boundary to Great Salt Lake and its predecessor. The discovery of *Gila atraria* at this site provides a unique opportunity for understanding late Pleistocene and early Holocene environmental conditions and lake level fluctuations.

Gastropods from the Public Shooting Grounds were collected in 1987 for further identification of representative genera, species, and habitat. The gastropod genera *Amnicola*, *Helisoma*, *Lymnaea*, and *Physella* (Table 1) were excavated from a sand unit overlain by an organic marsh deposit. The fossil gastropods and *Gila atraria* were sampled at an altitude of 4,232 feet (1,290 m) a.s.l. Laboratory cleaning of the shells consisted of ultrasonic washing in deionized water and air drying. Several unexpected rib, pharyangeal, vertebral, and maxillary bones of *Gila atraria* (Utah chub) were discovered within the matrix of this gastropod-rich sand unit. The bones were identified in 1987 by Mark Rosenfeld of the Department of Biology at the University of Utah.

Today's Utah chub are native to Utah, a small part of Nevada, and Idaho and are common in several rivers draining into Great Salt Lake (Rawley 1980) in the Bonneville basin. Stokes et al. (1964) and Smith et al. (1968) report gastropod species and *Gila atraria*, with respective dates of 13,000 years B.P. (estimate) and 12,860 ± 100 years B.P. (W-2000), from two sites above 4,440 feet (1,350 m) on the margins of a regressive Lake Bonneville. This euryphagic species inhabits pelagic and littoral epilimnion areas (Varley and Livesay 1976).

## STRATIGRAPHY

The oldest exposed sediments from the Public Shooting Grounds site are the post-Provo to pre-Gilbert red beds (calcareous muds and minor sands). The red beds were reddened off-site and deposited basinward on mudflats and sandflats of the newly exposed regressive Bonneville basin about 13,000 years B.P. (Currey et al. 1988). The red bed deposition continued for about 1,000 years due to sediment washing into lower basin areas. This regressive stage led to the precipitation of Glauber's salt ($Na_2SO_4 \cdot 10\ H_2O$) at the deepest portion of the present Great Salt Lake (Currey and Oviatt 1985). A transgressive episode of green, muddy sands, which have a minimum limiting date of 12,000 years B.P.

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TABLE 1. Gastropod species and total percentage concentration. Sources: Chamberlin and Jones (1929) and fieldwork (1987–88).

| Species | Habitat | Concentrations (%) |
|---|---|---|
| *Helisoma trivolvis* | Quiet to stagnant fresh water | 5 |
| *Physella utahensis* | Ponds and streams | 7 |
| *Lymnaea stagnalis* | Ponds, lakes, and streams often attached to plants | 8 |
| *Amnicola limosa* | Streams, rivers, and more quiet bottom waters | 80 |

(Beta-16912-3, Currey et al. 1988), unconformably overlies the red beds and grades upward into the Gilbert shoreline deltaic sediments. Currey (1980), Scott et al. (1983), and Currey and Oviatt (1985) suggest that the Gilbert shoreline represents a fluctuating stand followed by a regressive interval to lower lake stages. The green, muddy sand exposure is common to ancient lake basins and represents a reducing environment with a high ferric iron content (Reeves 1968). Successive layers of fine, clean, silty sands and marshy deposits of the Bear River and possibly the Malad River lie conformably over the green, muddy sands. The first layer consists of clean, fine sands and is interpreted as a 10- to 20-foot (3- to 6-m) minor transgression. As the lake regressed, a dark organic layer, indicating high humic concentrations, appears predating the death assemblage. This organic layer is overlain by lacustrine silts and represents the second transgressive saline inundation of the fluctuating Gilbert stand. Three additional episodes of saline, fossil-rich sediments and subsequent clean, fine sand deposits are recorded in this banded exposure. During the third minor regression, four genera of gastropods and *Gila atraria* migrated basinward previous to 10,990 ± 110 C-14 years B.P. (Beta- 22431), a date that is based on a species-specific sample of *Lymnaea stagnalis* shells.

Gastropods are typically found in freshwater streams and ponds and usually feed on aquatic plants and organic detritus (Chamberlin and Jones 1929). *Gila atraria,* at the Public Shooting Grounds site, would have taken advantage of this newly formed marsh habitat that existed after previous saline water inundations. These faunas are suspended in a death assemblage matrix of trangressive lacustrine sands and silts. The beginning of the next transgression probably killed the remainder of freshwater organisms in this paludal margin, laying down the final, thick shell layer containing *Gila atraria*. This final, highest fossiliferous layer is 7.5 inches (19 cm) thick and is overlain by light brown, fine sands. Two organic marsh layers of 1.75 to 3 inches (4.4 to 7.6 cm) overlie the death assemblage. These undated layers are thought to be the last marsh deposits prior to the transgression that geomorphically marks the highest stage of the Gilbert shoreline. A fine, poorly sorted, nearshore sand layer deposited by this Gilbert high stage and a 4- to 5-inch (10- to 12.7-cm) modern soil comprise this exposure (Fig. 1).

## DISCUSSION

The paleoenvironment of *Gila atraria* was probably an ephemeral, shallow, freshwater marsh that is evident today at lower elevations in the area. Aquatic plants, pioneering organisms, insects, and detritus would have provided a minimum of sustenance for the euryphagic *Gila atraria* and gastropod species.

As the lake transgressed, gastropods died and were deposited in 3- to 7.5-in (7.6- to 19-cm) layers within weak sand matrices. It is inferred from the thickness of these layers that the paludal margins were inundated by saline water depositing the faunal remains in small depressions. Due to the quality of the remains, it is hypothesized that the fossils were covered by nearshore sands rather quickly.

Pleistocene-Holocene transitions in Great Salt Lake marginal deposits tend to have had faunal assemblages that are restricted to gastropods. The discovery of *Gila ataria* in these deposits, with radiocarbon date association, suggests greater faunal diversity than previously thought.

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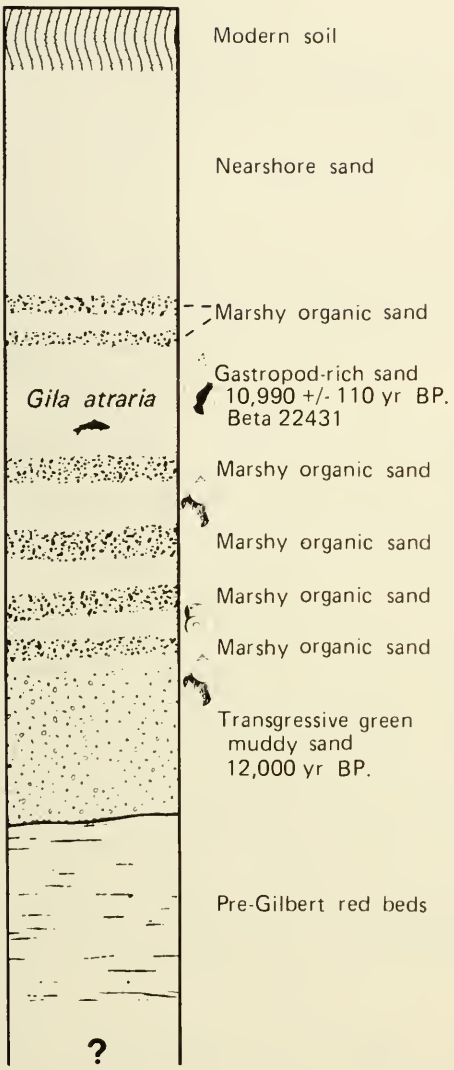


Fig. 1. Generalized stratigraphic column containing *Gila atraria*; radiocarbon date on *Lymnaea s.*

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