

Spring Movements of Paddlefish in a Prairie Reservoir System

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ABSTRACT

Paddlefish (*Polyodon spathula*) movements and habitat use were monitored in the Keystone Reservoir System, Oklahoma during 1996-1998 to determine reproductive activity patterns. Paddlefish spring spawning migrations were more dependent on water flows than water temperature or photoperiod. Paddlefish moved up the Cimarron River and Arkansas River in 1997 and 1998 when spring flows increased. However, they did not migrate up the rivers in 1996, a year with extremely low flows. Suitable spawning substrate was found in the Salt Fork River, a major tributary of the Arkansas River, and the tailwaters of Kaw Dam on the Arkansas River. Paddlefish were located over suitable spawning substrate in the Salt Fork River; however, no larvae were collected. Although paddlefish migrate up the Cimarron River in spring, minimal spawning habitat may limit successful spawning in that river. In 1998, paddlefish moved into the Salt Fork River rather than the Kaw Dam tailwaters, presumably because there was limited flow from Kaw Dam that spring. Paddlefish in the Keystone Reservoir system appear to have adapted to the high spring water temperatures and fluctuating flows enabling successful reproduction.

The paddlefish (*Polyodon spathula*) is native to large midwestern rivers in the central United States, including the Arkansas River and the Cimarron River, which combine to make Keystone Reservoir in northcentral Oklahoma. Paddlefish populations have diminished in numbers during the last century due in part to destruction of spawning grounds and dam construction (Graham 1997). Paddlefish traditionally migrate up rivers in spring (Unkenholz 1982, Russell 1986), where spawning occurs in flowing water over silt-free gravel (Purkett 1961) at water temperatures of 10-18° C (Pitman 1991). However, gravel is sparse in prairie rivers of the southcentral and southwestern U.S., and paddlefish may be required to spawn over other substrates (Bonislavsky 1977).

In the last 50 years, impoundments have, in many cases, diminished the size of paddlefish populations because they block fish from their spawning grounds or inundate the spawning areas altogether. In addition, river stage and discharge are usually highly regulated and may not mimic natural spring flow regimes (Unkenholz 1986), which may prohibit paddlefish spawning. However, some paddlefish populations, including the one in Keystone

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Reservoir, have survived and even flourished (Paukert 1998). Our objective was to determine spring movement patterns associated with reproductive activity of paddlefish in the Keystone Reservoir system, Oklahoma.

STUDY SITE

Keystone Reservoir is a 10,600-ha impoundment in northcentral Oklahoma with a self-sustaining, naturally-reproducing paddlefish population (Paukert 1998). Large water-level fluctuations are common due to the size of the watershed, power generation, and regulation of the Arkansas River and the Salt Fork River. The Arkansas River drains the southern plains of Kansas and is impounded by Kaw Dam 176 km upstream of Keystone Reservoir (Fig. 1). The Salt Fork River, a major tributary that enters the Arkansas River 152 km upstream from Keystone Reservoir, is impounded by Great Salt Plains Dam. The Cimarron River drains part of western Oklahoma and is unimpounded above Keystone Reservoir. All three rivers have predominantly sand substrate and highly fluctuating flows with braided channels. Few deepwater (>1 m) habitats are present; however, high spring water levels (e.g., >3 m) aid in spring migrations of paddlefish (Paukert 1998).

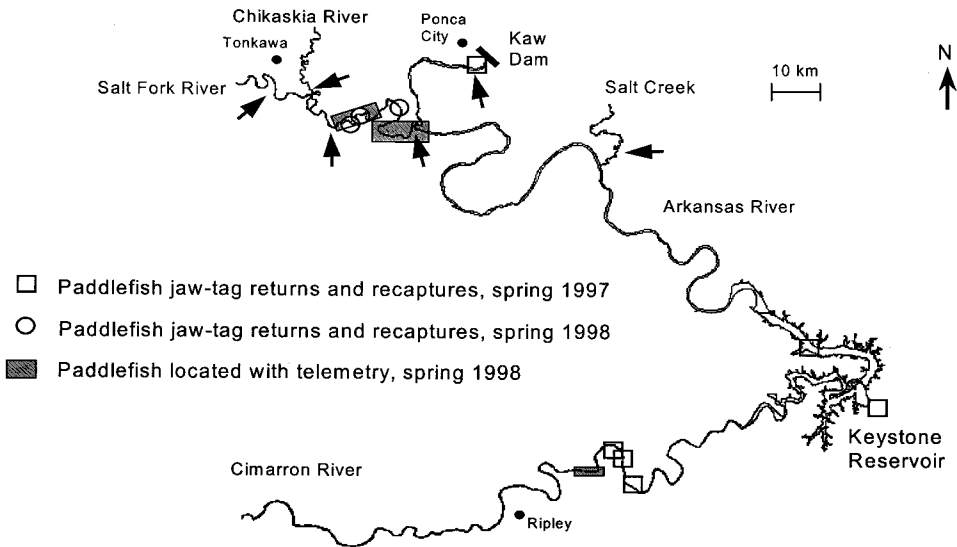


Figure 1. The Keystone Reservoir system in northcentral Oklahoma. Paddlefish spring recaptures, tag-return locations, and telemetry locations in the Keystone Reservoir system. Arrows indicate suitable spawning substrate for paddlefish. Great Salt Plains Dam is located on the Salt Fork River 165 km upstream from the mouth of the Arkansas River.

METHODS

Adult and juvenile paddlefish were collected from the Keystone Reservoir during winters 1996-1998 with monofilament gill nets (Paukert and Fisher 1999). Each fish was measured (nearest mm) from the anterior orbit of the eye to the fork of the tail (EFL; Ruelle and Hudson 1977), weighed (nearest 0.5 kg), tagged, and immediately released near its capture site.