

LIFE HISTORY OF THE BLUE SUCKER IN THE RED RIVER, ARKANSAS

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Abstract

Blue suckers represent a major component of the fish fauna in the Red River of Arkansas. Sampling was conducted in various seasons of the year during 2006 and previously in 1997 and 1998. Adult blue suckers utilize deep, fast water in main channels the entire year except for spawning. Blue suckers spawn over coarse sand on the outside of inside bends in the river adjacent to strong currents but in slower water toward shore. Rising water levels and temperatures of 66 to 68 degrees F are required to trigger spawning. Drought conditions resulting in the absence of proper spawning habitat may impeded recruitment from reproduction. Blue suckers in the Red River spawn at ages of 4+ years. Juvenile blue suckers may be present in adjacent channels near spawning areas during summer but we were able to only collect one juvenile specimen of 37 mm TL during the study. Dams on tributary streams resulted in low water levels when temperatures were optimal. No entrance was made by blue suckers into tributaries during spawning in 2006. Data suggest that water levels in the RedRiver could be manipulated by Millwood Reservoir and Denison Dam to provide suitable habitat for blue sucker spawning during mid-March through mid-April to insure recruitment.

INTRODUCTION

The blue sucker, *Cypleptus elongates* (Lesueur), is a large, terete sucker with a long snout, small scales, and a subterminal mouth. Lips are heavily papillose. Dorsal fins are extremely long and possess a definite falcate appearance. Similarly, pectoral and pelvic fins are also falcate. The lateral line is complete and curves upward anteriorly (Ross 2001). Original description is by Lesueur (1817).

Adult blue suckers have been known to reach a maximum size of 927 mm (Carlander 1969). During 1997-1998, Layher and Phillips (2001) sampled fishes of the Red River in Arkansas and the largest blue sucker captured was reported at 770 mm and weighed 5.2 kg. Robison and Buchanan (1992) describe the blue sucker as rarely exceeding 635 mm in Arkansas waters. Layher and Phillips (1999 and 2000) found blue suckers in the Arkansas River below the last dam down to the confluence with the Mississippi River, in the St. Frances River, and also the White River. Only three blue suckers were captured by Layher and Phillips (1999) in the St. Francis River and these specimens represented the first records of the species from that river in Arkansas. Layher and Phillips (1999) captured ten blue suckers in the White River at depths between 15 and 24 feet in moderate to high velocities. Thirty-three blue suckers were captured by Layher and Phillips (1999) in the Lower Arkansas River at depths between 6.5 and 29 feet. Twenty-one of the specimens collected in the Arkansas River were caught in 18 feet of water in a gill net which was not typical of capture locations. Specimens were in spawning condition. Mean length of blue suckers was reported at 680 mm.

Blue suckers are considered by some as rare or declining in numbers. Robison and Buchanan (1992) report the fish as having declined across the country since 1900.

Reservoir construction, slower water velocities, and siltation may have caused the decline. However Buchanan (1976) suggests a stable population in the Arkansas River. Interestingly, Layher and Phillips (1999) did not catch a single specimen above the beginning of the Lock and Dam system on the Arkansas River, though as noted above, substantial numbers were found below the navigation system to the mouth of the river where it joins the Mississippi River. Cross (1967) considered the species impacted by pollution and silt, as well as dams which block migrations and inundate spawning areas. The depletion of blue suckers in the upper Mississippi River and the Ohio River and tributaries in the early 1900's was noted by Carlander (1954) and Trautman (1957). Coker (1930) reported that catches of blue suckers in the late 1880's exceeded over two million pounds annually from a 21 mile section of the Mississippi River. The fish is considered one of the finest tasting of freshwater fishes and once was a commercially sought species. Today on the Red River in Arkansas, commercial fishermen often use the blue sucker as cut bait on long-lines fishing for blue catfish (Layher, personal communication 2007).

The Arkansas Game and Fish Commission recently developed a species of concern listing that included the blue sucker as one of those species. The American Fisheries Society considers the fish as one of special concern. According to Ross (2001), the species was under consideration for potential federal listing by the U. S. Fish and Wildlife Service (Elstad and Werdon 1993) but policy changes eliminated all category 2 candidate species (United States fish and Wildlife Service (1996). Blue suckers were formerly noted as occurring rarely in the Red River of Arkansas near the confluence of the Little River. Blue suckers composed 7.4 % of the total catch of fishes in 1997 and

17.6% of the total catch of fishes in 1998, in the Red River (Layher and Phillips 1998). The presence of such a large population of blue suckers which had not previously been reported may be indicative of populations in many large river systems. The difficulty of sampling deep and fast waters presumably may affect the considered status and known distribution of the species (Robison and Buchanan 1992).

Objectives of this study, as it pertains to the Red River of Arkansas, were as follows: to determine growth rates of the species by sex; to identify spawning times; to identify spawning habitats; and to identify age of sexual maturity.

STUDY AREA

Mean monthly discharges for the Red River range from a low of just over 6,000cfs in August to over 33,000 in May. The maximum discharge recorded on the Red River at Fulton is 338,000 cfs.

Flows on the Red River are controlled in Texas by Denison Reservoir which impounds Lake Texhoma. The Little River which joins the Red River near Fulton is impounded upstream at Millwood Reservoir. The Sulphur River is also impounded in Texas.

High chloride levels as well as high total dissolved solids render the waters of the Red River unsuitable for drinking water and makes electrofishing difficult. High turbidity levels also occur in the Red River. Stream banks of the Red River are susceptible to erosion in many areas and are often undercut by the stream with banks caving into the river. Large areas of the Red River are farmed up to the edge of the stream bank on outside river bends or have been converted to cattle pastures.

The Sulphur River, a tributary to the Red River, joins the Red River just above the Louisiana state line. It has a monthly mean of 777 cfs in August and the highest flows occur in May; it exhibits a monthly mean value of 4,152 cfs.

The Red River forms the boundary between Texas and Oklahoma and enters the southwestern corner of Arkansas before turning southward and entering the State of Louisiana. (Figure 1). For a description of land use habitat alteration, topography, geology, hydrology, wetland types and related information in the Red River basin, see Layher (2007).

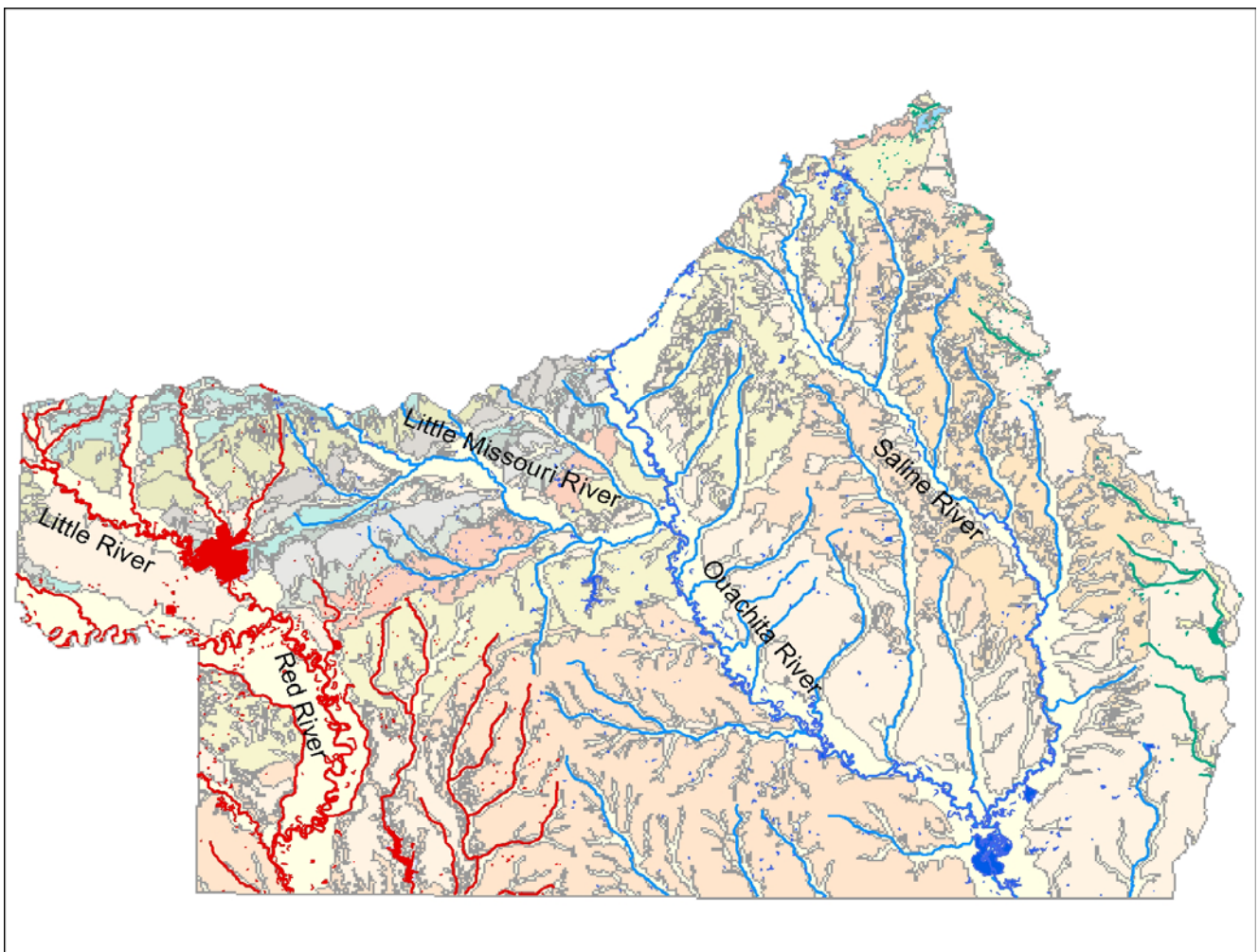


Figure 1. West Gulf Coastal Plain Region of Arkansas with major river systems labeled.

METHODS

An attempt was made to determine if blue suckers utilized tributary streams to spawn and also whether they spawned in the Red River mainstem. Areas sampled prior to and during suspected spawning times included riffles in the Little River as well as gravel bars and shoals. Areas where the channel narrowed and resulted in deeper and faster flowing water were also sampled in an effort to capture blue suckers which might be moving upstream into spawning areas. During 2006, water levels were quite low in the Red River. Boat ramps near Dodderidge, Arkansas were unusable to access the Red River near the Sulphur River confluence. The nearest boat ramp upstream was at Garland City which precluded sampling the Sulphur River. Additionally, Layher and Phillips (1998) had not previously caught blue suckers in the Sulphur River. Hence a decision was made to focus on the Little River which contained larger substrate including gravel, cobble, and bedrock. Areas sampled within the Red River included areas above and below the confluence of the Little River. Other areas sampled included river reaches both below and above Garland City. Due to construction and replacement of the boat ramp at Allen's Ferry on the Little River, we had to access the Red River near Fulton by entering the Little River just below Millwood Dam and traveling downstream to the Red River, a distance of nearly 40 miles by boat.

Hoop nets utilized for sampling were 4-ft. diameter with 1.5 inch bar mesh. Nets were ran every 24 hours. Fishes captured were identified, weighed (gm), and measured (TL mm). Sampling of fishes began in February. Sampling was conducted until spawning was recorded. Additional data was collected after spawning during summer

months. During summer months, a trawl was utilized to attempt to capture juvenile blue suckers in the Red River. Mini-fyke nets were also placed along the stream and in backwater areas. Some seining occurred along sandbars and river bends. Depth, velocity, and substrate as well as water temperature and turbidity were measured. Data from Layher and Phillips (1998) were also reviewed to determine habitats used during monthly periods.

Blue suckers captured were tagged with thin cylindrical tags (flag tags), which were numbered, by using a canula and implanting the tag anchor below the dorsal fin. Scales were removed from the third and fourth row of the dorsum as recommended by Moss et al. (1983). At least three scales were removed from each fish. Scales were observed through microscopes, overhead projectors, stereoscopes, and digital programs of microscopic application and projected on TV monitors.

Length-weight relations were calculated for male and female blue suckers. Length histograms were constructed to assist in age identification.

RESULTS

Blue suckers were not captured in the Little River despite persistent and concentrated efforts. Sampling occurred from Millwood Dam to the confluence of the stream with the Red River. Hoop nets were placed in riffle areas, and along the edges of gravel and cobble bars, which were described by Moss et al. (1983) as preferred spawning habitats. Hoop nets were also placed in the thawleg of the river in areas where the river was quite narrow with swift current. It was realized that any blue suckers moving upstream would have to pass through these narrow chutes or channels.

Hoop nets resulted in the capture of thirty six blue suckers in the Red River. Only six blue suckers were captured in the Red River in July. No blue suckers were captured in the Little River during summer of 2006. Blue suckers were found spawning at 66 degrees F above Garland City on the inside-bend of the river. This was the principal area in which we found fish spawning. Some twenty-six blue suckers were collected in one hoop net placed in a depth of 11 feet with current that was relatively slow. Nets were also located closer to shore, farther out in faster current, and up and downstream of the net which contained the blue suckers. No other captures occurred in nets in proximity.

Upstream of this capture area, we found a male and female blue sucker in a hoop net placed adjacent to a sand bar in a bend in the river on the opposite side of the river from the previously described spawning area. These fish were also in spawning condition. Nets placed in habitats where we caught blue suckers in former years, deep water with fast currents, yielded no captures. Length-weight relations for male blue suckers (figure 2) and female blue suckers (figure 3) were calculated.

Males were between 527 and 693 mm in length and averaged 612 mm in TL. A length frequency histogram (figure 4) indicates that one, perhaps two year classes were present during spawning. Males averaged 2,055 g at spawning with a range between 1,120 g to 2,720 g.

Female fish exhibited somewhat similar findings (figure 5). Females averaged somewhat larger than males at 640 mm TL with a range of 565mm to 692 mm. Females averaged 2,586 g at spawning with a range between 1,720 g and 3,780 g.

Ovaries were taken from three female fish and placed in formalin. Weights were recorded prior to preservation. Counts of ova were made from 5 g subsamples. Estimates of the number of ova in three female fish examined ranged from 21,000 to 24,000.

Scales from nearly 70 % of the fish sampled were regenerated. Other scales contained no definitive annuli. Only three fish exhibited faint annuli marks. All were female fish and appeared to be 5+ years of age.

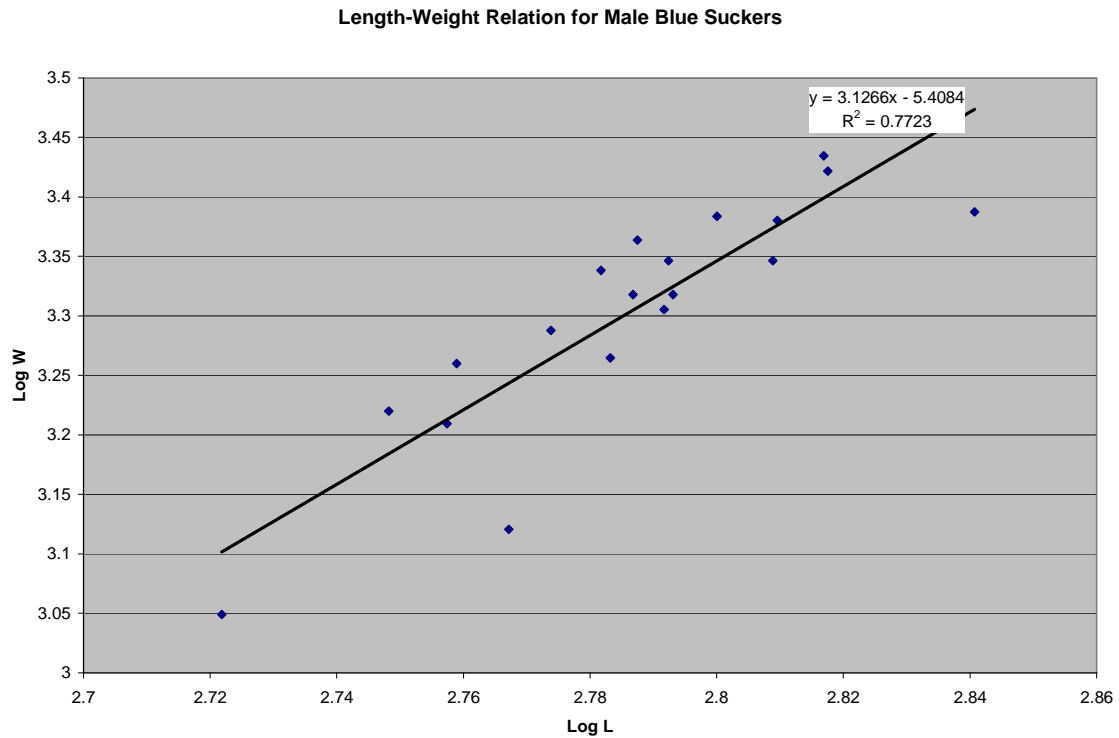


Figure 2. Length-weight relation for male blue suckers collected during spawning.

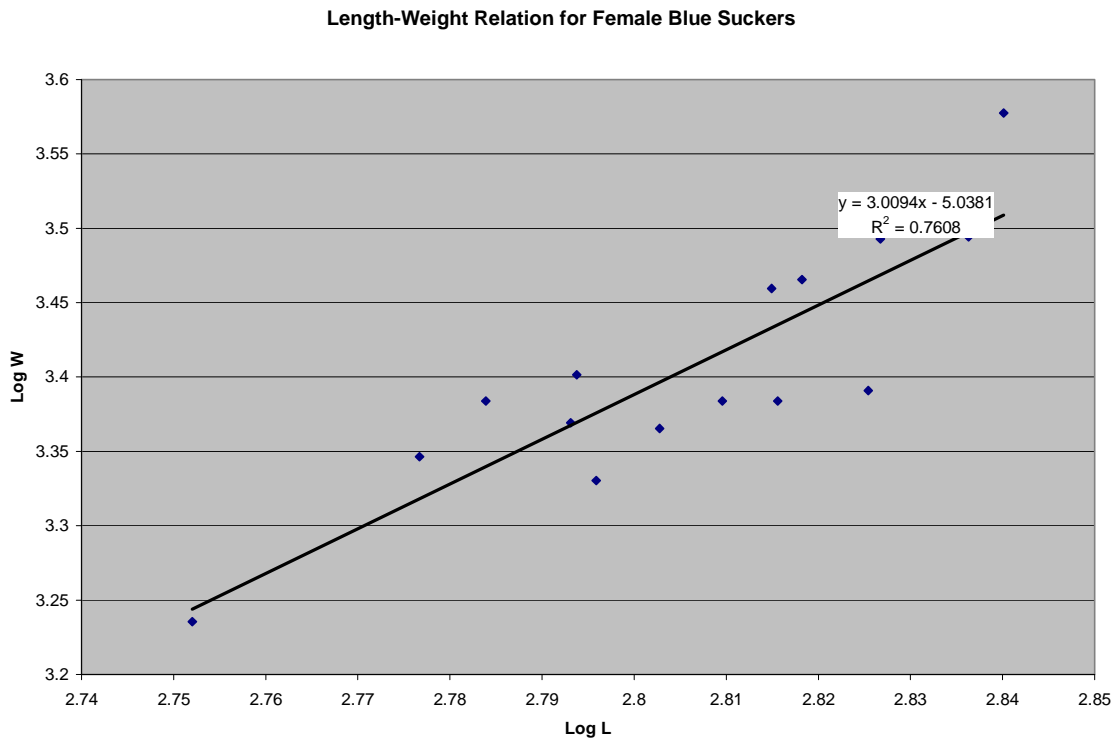


Figure 3. Length-weight relation for female blue suckers collected during spawning.

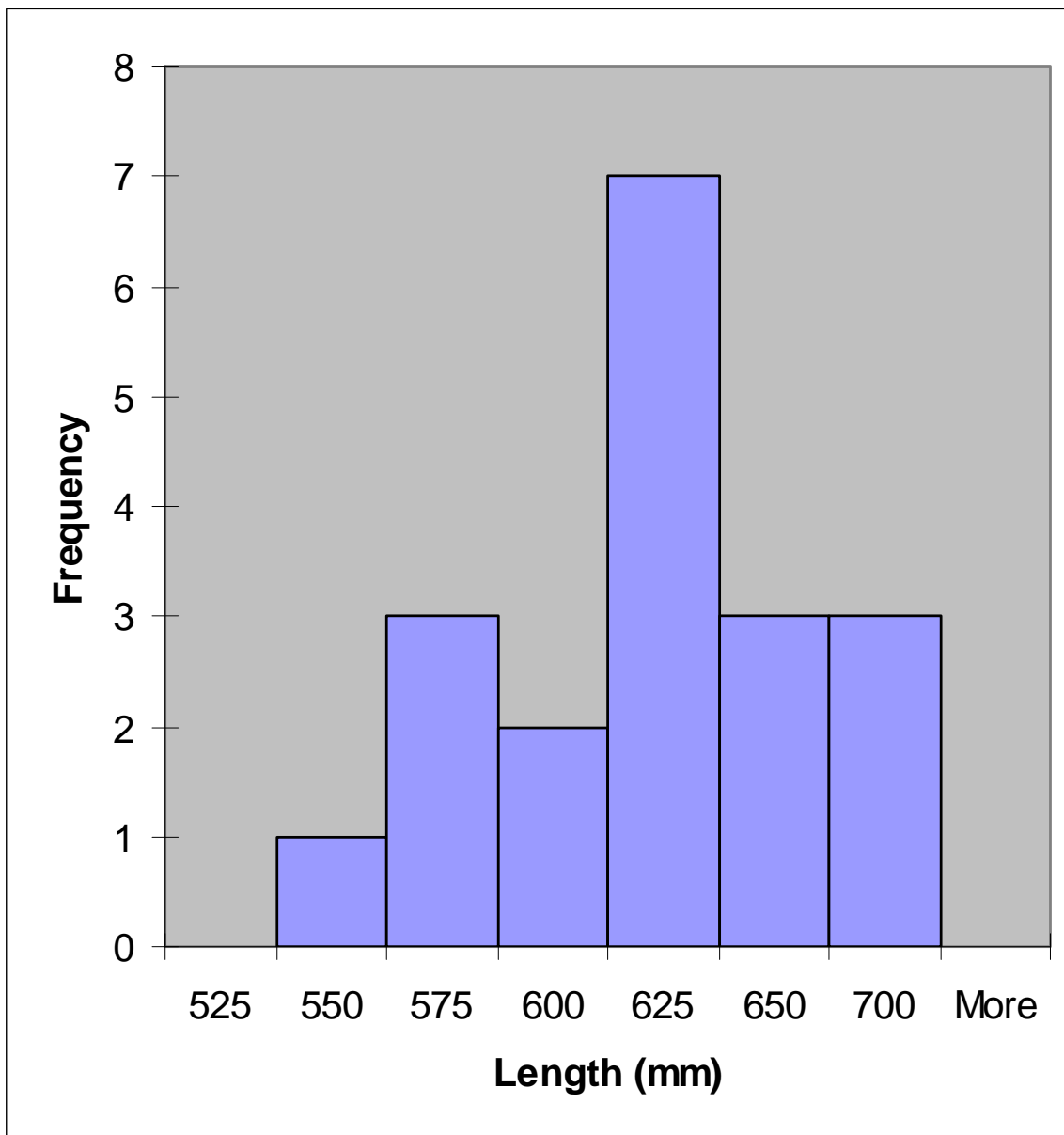


Figure 4. Length-frequency histogram for spawning male blue suckers.

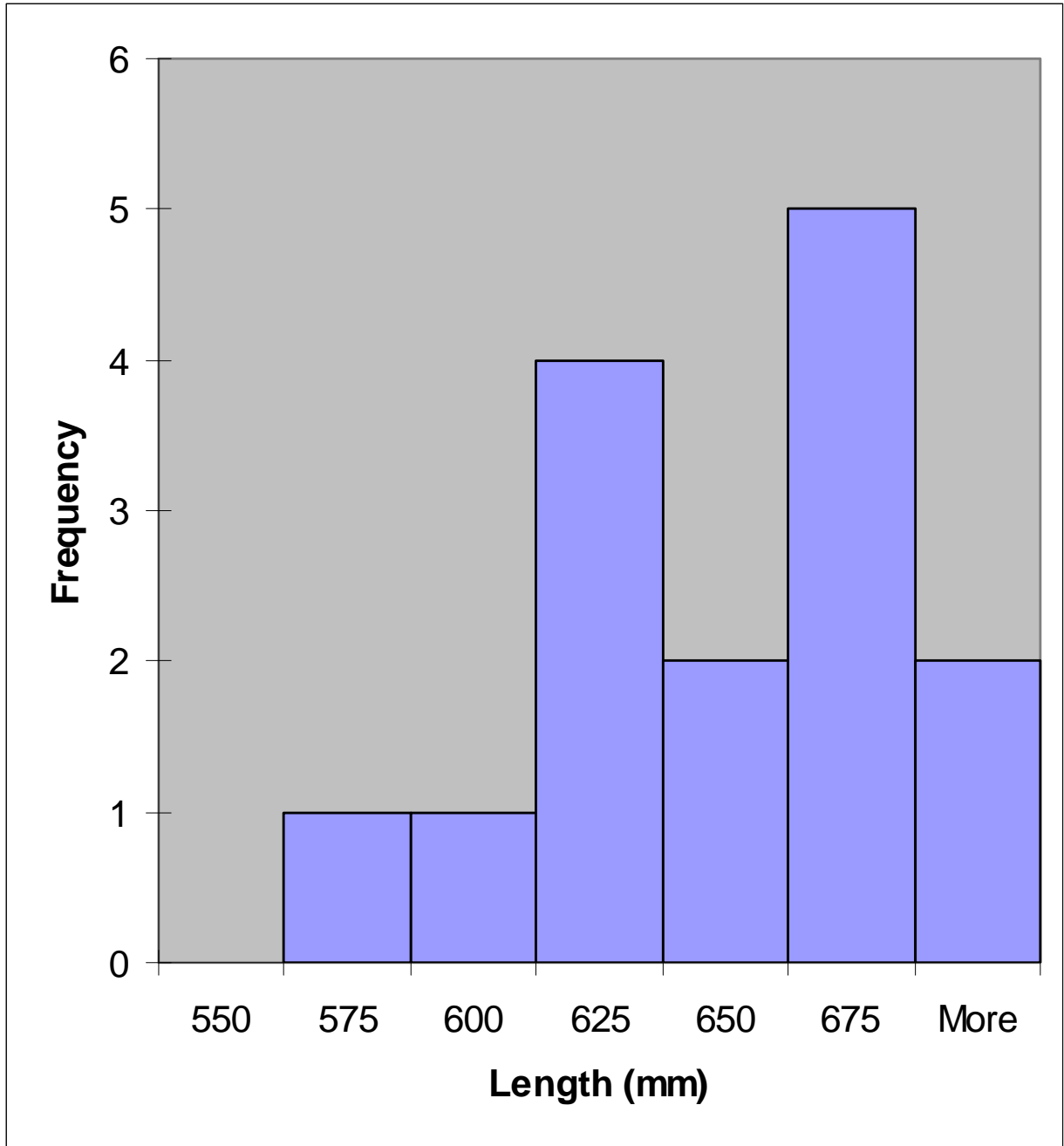


Figure 5. Length-frequency histogram for female blue suckers at spawning.

DISCUSSION

The Red River contains a viable population of the blue sucker. Layher and Phillips (1998) found blue suckers to be the second most abundant fish in their collections on the Red River. Layher and Phillips (1998) compared habitats where nets were placed to the distribution of blue sucker captures and found that blue suckers occupied deep areas within the river and also moderate to high current velocities.

In previous studies, Layher and Phillips (1998) caught large numbers of blue suckers during summer months in deep, fast channels. During this study few blue suckers were captured during summer in 2006.

Earlier studies produced only three specimens during February samples. Blue sucker lengths ranged from 492 mm to 575 mm and depths of capture ranged from 13 ft to 28 ft. Velocities ranged from 1 to 3 ft/sec. May samples in these earlier studies resulted in 9 blue sucker captures at depths from 5 to 11 ft, and velocities averaged greater than 3 ft/sec. Fishes captured ranged from 541 mm to 636 mm TL. Forty-eight blue suckers were captured during June ranging in size from 422 mm to 770 mm. Depths of capture ranged from 8 ft to 30 ft with nearly all captures exceeding velocities of 3 ft/sec. Sixty-two captures were made in July at depths from 5.6 ft to 34 ft again with most captures in areas exceeding 3 ft/sec in velocity. Fish TL ranged from 456 to 734 mm. It is evident that blue suckers during all times of the year reside in deep pools or channels with moderate to high velocities. These areas contain firm substrate and in the Red River could best be described as hard mud surfaces. Slower velocity areas in the Red River are primarily sand substrates with virtually no cobble or rock substrates.

The small number of specimens captured during our study in 2006 is cause for concern. In past collections, we have caught more blue suckers in a single net than during the entire present study. In former years, some blue suckers were captured to provide specimens for spawning in hatcheries. Over forty blue suckers were caught in an area just below an inside bend with a conical shape which extended to over 18 ft in depth. This area was located just above the railroad bridge west of Fulton and downstream from the confluence with the Little River. This area resembles the type of habitat where we found blue suckers spawning in the present study above Garland City. The area where fish were collected during spawning also presented a dome shaped substrate with sand near shore and larger particle sizes projecting out into the stream. Deeper areas eventually were hard mud bottoms. GPS coordinates of the spawning area in the present study are N33.3823; W093.9664.

During the study by Layher and Phillips (1998) river flows were quite high, especially during 1997. River flows during this study were quite low for any season and especially for spring. Flows were less than 3,000 cfs. Three blue suckers were captured at the spawning site on March 25 2006. The following day 24 blue suckers were caught at the same location. Water temperature was 66 F. The river rose by some two feet overnight between the time of net examination on March 25 and March 26. The following day resulted in a drop in river elevations by some 3 to 4 feet and no blue suckers were captured. The following week we attempted to sample the same areas as the previous week and only succeeded in capturing one specimen. It would appear that river flows which provide a select velocity over suitable substrate is as important to trigger spawning as perhaps temperature.

Prior to our sampling efforts in 2006, the Red River had experienced low flows for nearly three years due to a prolonged drought. In the Neosho River in Kansas, Deacon (1961) found no blue suckers in spawning areas during three years of drought. Moss et al. (1983) found no blue suckers during a drought in 1980 in the same area where they conducted life history studies of the blue sucker in previous years. The low water levels in the Red River preceding our current investigation may have prevented successful spawns in three previous years resulting in low population levels with young fish present not being of spawning condition and perhaps older fish had already expired.

The few scales we were able to detect annuli on suggest that both males and females were age 5+ fish. Fish of similar size in Moss et al. (1983) were fishes of ages 7 to 9 years. This would suggest a much faster growth rate in the Red River which is of a lower latitude than where Moss et al. (1983) conducted their studies. It may be that flows released by dams such as Millwood Reservoir and Denison Dam result in somewhat warmer winter temperatures allowing fish to continue feeding and growth during the winter season resulting in the lack of definite annuli on scales. Assuming then that the data presented in this study reflect two year classes of fish, we might conclude that blue suckers spawn at age four in the Red River and males are somewhat smaller than females in TL. We returned to the spawning area in April of 2007. Flows in the Red River had been higher in the preceding weeks. Water temperature reached 68 F during the month of March and remained there for a week and one-half. A cold front resulted in water temperatures falling toward the end of March and water temperatures again reached 67 F on April 21 2007. We set hoop nets both near Fulton in the little River and Red River and at the spawning site near Garland City. At the later site, nets were placed across the

entire river. We captured no blue suckers at the Garland City location. We did capture four blue suckers near Fulton in the Red River. Two males and one female were captured above the confluence of the Little River in the Red River. The female was already spent and males possessed reduced tubercles. Another female was captured on the opposite bank in deep fast water and she was also spent. It would appear that fish spawned successfully during 2007 when river flows were considerably higher than they were in the previous four years when water temperatures reached those required for spawning.

We were unable to find juvenile blue suckers except for one specimen which was collected by trawling during July. The specimen was caught just down stream of the area where we found fish spawning in March in a deep channel with fast current. We are unable to explain why we were unable to capture blue suckers smaller than 450 mm despite sampling virtually all types of habitat present with multiple gear types.

In conclusion, we were able to document that blue suckers spawn at age 4+ years in the Red River. Spawning is dependent on suitable flows over substrates near fast current along inside bends of the river. Hence tributaries for this population do not seem to be important as spawning areas. Low flow conditions during spawning in 2006 may have prevented blue suckers from entering the Little River as little water was being released from Millwood Reservoir upstream. Blue suckers spawn in late March or early April when water temperature reaches 66-68 degrees F.

We would recommend that management practices be implemented by insuring that releases occur from Millwood Reservoir and Denison Dam during late March when water temperatures reach 65 F. This would provide rising water levels over suitable

substrates at temperatures required for spawning. Such a yearly scenario would insure recruitment of blue suckers into the Red River population on an annual basis.

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Photo 1. Suspected spawning site below bend in river and this side of the railroad bridge. Location is just downstream of the Little River confluence and west of Fulton.



Photo 2. Spawning location above Garland City. Spawning occurred just inside of strong current toward shoreline.



Photo 3. Male blue sucker with tubercles during spawning.



Photo 4. Gravid female blue sucker.

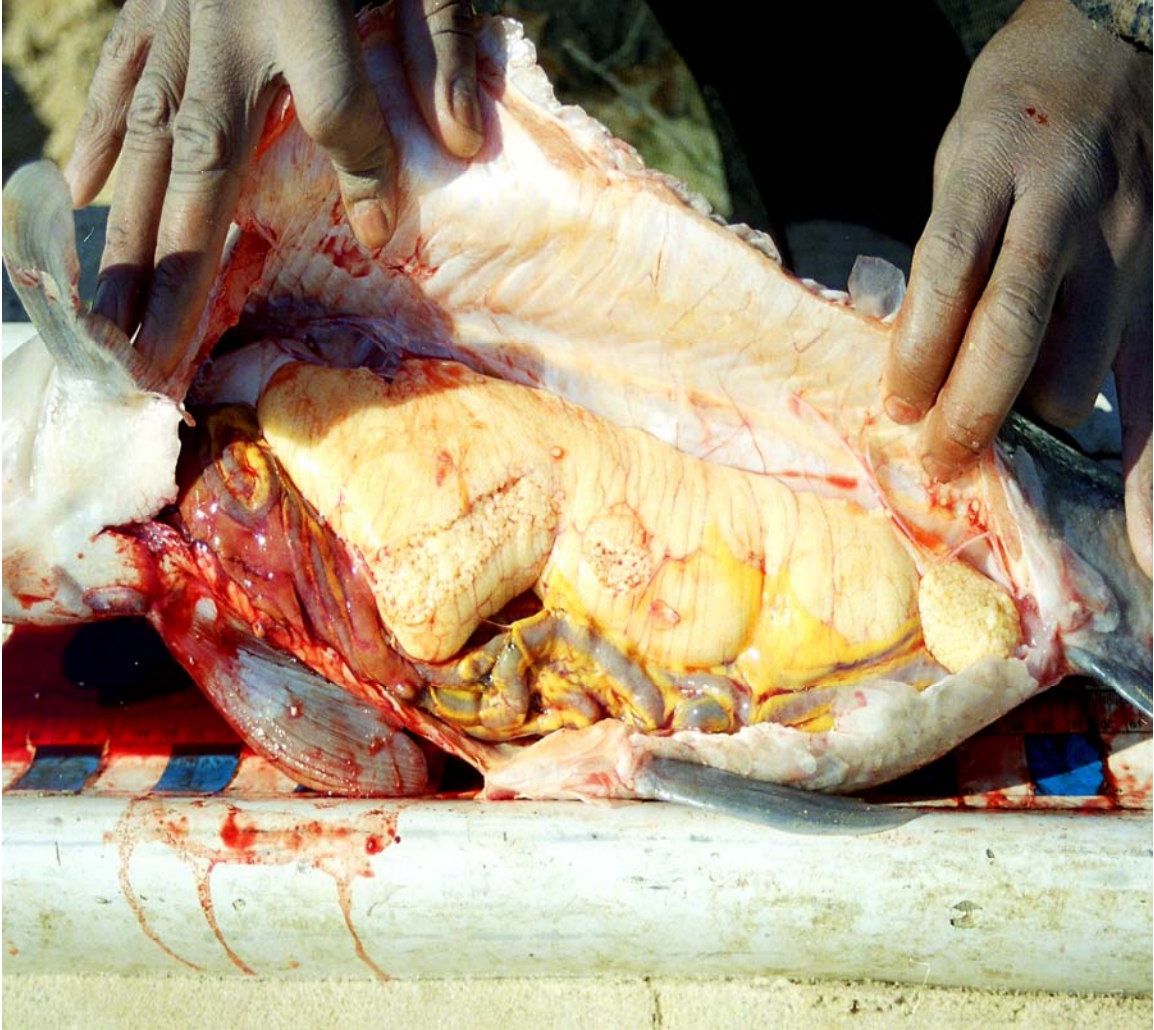


Photo 5. Removing ova from a gravid female blue sucker.