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RESULTS OF A SURVEY OF THE MUSSEL FAUNA AT SELECTED STATIONS IN THE BLACK WARRIOR RIVER SYSTEM, ALABAMA, 2009

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In cooperation with the Alabama Department of Conservation and Natural Resources
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ABSTRACT

During the summer of 2009, sampling for federally listed and state conservation concern priority mussel species in the Black Warrior River system yielded 21 species from 16 main channel and 13 tributary stations. A cumulative total of about 8.0 hours bottom time was spent sampling main channel stations (average 0.5 hour per station) and about 22 hours in tributaries (average 0.6 hour per station). Main channel collections yielded 675 live or fresh dead individuals, with the most numerically dominant and frequently encountered species *Plectomerus dombeyanus*, the Bankclimber, (9 stations, 28.4 collected per hour), *Quadrula apiculata*, the Southern Mapleleaf (11 stations, 23.8 collected per hour), and *Obliquaria reflexa*, the Threehorn Wartyback (11 stations, 22.0 collected per hour). The federally listed threatened species *Potamilus inflatus*, Inflated Heelsplitter, was collected live at two main channel stations. Fresh dead, weathered dead, and relic shells were found at a few tributary stations. A badly eroded valve of what may be *Pleurobema rubellum*, the Warrior Pigtoe, was collected from a tributary station.

INTRODUCTION

The mussel and fish faunas of the Mobile River Basin are noteworthy for their high degrees of endemism and diversity. Those phenomena can be attributed to the large size of the basin, numerous habitat types available due to the diverse physiography of the basin, geographic barriers such as the Fall Line, and the proximity of the basin to adjacent drainages with diverse faunas (Williams, 1982). Hinkley (1906) reported 40 mussel species from the Tombigbee River system alone, while Williams and others (1992) reported that 50 species were known to have occurred in the upper Tombigbee River system (upstream of the confluence of the Tombigbee and Black Warrior Rivers) and 48 in the Black Warrior system, adjusted to taxonomic revisions in recent decades. Williams and others (2008), in a comprehensive review of the mussels of Alabama, tallied 51 species known from the Black Warrior system. However, effects of anthropogenic factors such as impoundment, eutrophication, sedimentation, pollution, and

channel modifications and resultant population fragmentation of mussels and their obligate fish hosts, have suppressed gene flow and caused a steep and possibly fatal decline in the fauna (Hartfield, 1994; Mott and Hartfield, 1994).

While the mussel population in Alabama remains among the most diverse on Earth, significant declines in many areas have been documented (see Williams and others, 2008, for a review). With the rapid increase in urbanization in much of the Black Warrior River system and uncontrolled runoff from mining, farming, and silvicultural activities leading to sharply elevated sediment loads and nutrification, many areas of the state face further declines if measures to protect the habitat of mussels and their host fishes are not established and enforced.

The purpose of the present study is twofold: first, to document current populations of federally listed State of Alabama Conservation Priority mussel species (Mirarchi, 2004) at selected stations in the Black Warrior River system; and second, to document other species in the system. It is hoped that information gathered during this study will serve as a guide for regulatory agencies to target streams in need of protection and provide stakeholders with information to lead them in appropriate activities to protect the existing fauna and foster recovery of the fauna as a whole.

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STUDY AREA

The Mobile River Basin is the largest Gulf of Mexico river basin east of the Mississippi River, draining about 43,683 square miles (mi^2) in Alabama, Mississippi, Georgia, and Tennessee, including 32,207 mi^2, or 62 percent, of the land area of Alabama (Mettee and others, 1996). The Tombigbee River system is the westernmost tributary of the Mobile Basin and drains an area of 19,984 mi^2 in Alabama and Mississippi, and the Black Warrior River drains 6,228 mi^2 in north-central Alabama (fig. 1). Sampling in the main channel Black Warrior River extended from the tailwater of Oliver Lock and Dam at Black Warrior River mile (BWM) 113.6 upstream in the Oliver and Holt Pools to the Bankhead Lock and Dam tailwater at BWM 146.6. Tributary

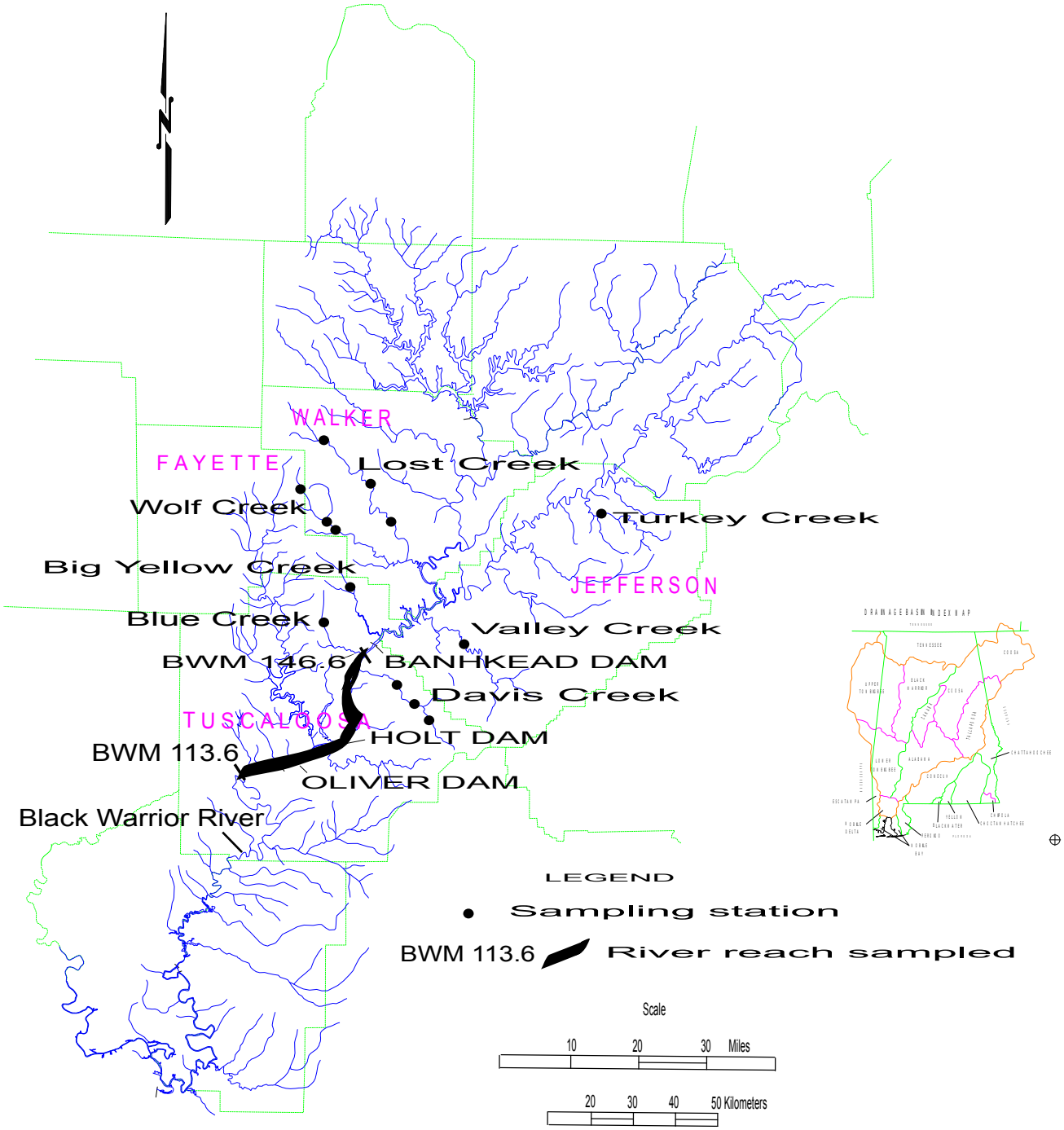

Figure 1. Map of the study area showing mussel sampling locations.

stations were all located upstream of the Fall Line and were selected based on accessibility and presence of suitable habitat for target species. Sampling locations were determined with the aid of Black Warrior River charts, DeLorme's Atlas and Gazetteer, and hand-held Global Positioning System (GPS) units.

METHODS

Mussel sampling was performed at stations within the Black Warrior River system where mussels were known historically and in streams with no historic data available. Stations were accessed at bridge crossings, foot trails, or by boat. Mussel collections were made by hand often with the aid of mask and snorkel in tributary stations and with a surface air source at main channel stations. Sampling in tributaries was restricted to larger tributaries of the Black Warrior River upstream of the Fall Line, an area where numerous species including current federally listed and State Conservation Priority species, were historically reported. Main channel stations were randomly selected on presumed presence of suitable habitat for mussels from the tailwater of Oliver Lock and Dam near Tuscaloosa upstream to the tailwater of Bankhead Lock and Dam in the Holt Pool.

Due to the nature of the project and limited sampling time and resources, a generally qualitative sampling protocol (timed search) was employed, with emphasis on sampling habitats favored by target species (Strayer and Smith, 2003). Sampling time was dictated by the habitat or fauna encountered at each station. If a meager fauna or poor quality habitat was encountered, we terminated our efforts at that station and moved to another sampling station. Stations where the potential for finding target species was highest (generally stable substrate with mixed sand, gravel, cobble, or boulders) received more attention; therefore, species that might occupy other habitat types were likely underrepresented.

Live animals were identified and returned to the stream where they were found. A few problematic specimens were retained for verification and possible genetic work and were deposited in the University of Alabama Malacological Collection. Representative specimens of shell material collected were retained and will be deposited in the North Carolina State Museum of Natural Sciences or the University of Alabama Malacological Collection. Nomenclature follows Williams and others (2008).

RESULTS AND DISCUSSION

During this project 16 stations were sampled in the main channel Black Warrior River and 13 in tributaries (table 1, fig. 1). Approximately 8 hours of bottom time were spent sampling in the main channel (average 0.5 hour per station) and 22 hours in tributaries (average 0.6 hour per station). An aggregate total of 21 species were collected, with 16 found in the main channel and 6 in tributaries (tables 2, 3). *Quadrula asperata* was found in both main channel and tributary stations.

A cumulative total of 675 mussels either live or fresh dead were collected in the main channel, for a catch per unit effort (CPUE) of 84.4 mussels/hour. The most numerically dominant and frequently encountered species in the main channel were the Bankclimber, *Plectomerus dombeyanus* (9 stations, CPUE 28.4), the Southern Mapleleaf, *Quadrula apiculata* (11 stations, CPUE 23.8), and the Threehorn Wartyback, *Obliquaria reflexa* (11 stations, CPUE 22.0). Only four individuals of the federally threatened Inflated Heelsplitter, *Potamilus inflatus*, were collected, with three live individuals collected in the Oliver Lock and Dam tailwater at BWM 118.5 near the Black Warrior Parkway Bridge, and one live individual near the city of Tuscaloosa at BWM 122.0. A breakdown of species encountered is presented in table 2.

Mussels were usually found in areas of stable gravel and sand sometimes mixed with cobble and boulders and generally had varying deposits of silt. The two most downstream main channel collections (BWM 113.6 and 116.5, table 1, fig. 1), located in the Oliver Lock and Dam tailwater just downstream of the Fall Line on the Coastal Plain, had relatively poor habitat and little effort was spent sampling there. Habitat generally improved with upstream progression in the main channel. Habitat in the Oliver and Holt pools was comprised primarily of fairly stable gravel and sand substrate with occasional cobble, boulders, woody debris, and bedrock with some areas of mud, often with a layer of fine silt in eddies and areas protected from the current. Visibility was often 3 to 4 feet with a light source.

Tributary stations yielded very few mussels, likely due to the effects of past coal mining activities and other anthropogenic factors. Blue Creek at Alabama Highway 69 in Tuscaloosa County yielded a few individuals of several species, including the Little Spectaclecase, *Villosa lienosa*, Alabama Rainbow, *Villosa nebulosa*, and an old, worn valve of what appeared to be a Southern Creekmussel, *Strophitus subvexus*. The Alabama Rainbow was once widespread in the Black Warrior, Cahaba, and Coosa River systems upstream of the Fall Line. The Southern

Table 1.—Summary information for stations sampled in the Black Warrior River system, Alabama, 2009.

Locality[1]	County	Map coordinates
Main channel stations[1]		
BWM 113.6 opposite Snow's Drift in Clement Bend, Oliver tailwater	Tuscaloosa	N 33.1954° W 87.6794°
BWM 116.5, Oliver tailwater near mouth of Big Creek	Tuscaloosa	N 33.2028° W 87.6605°
BWM 118.5 downstream of Black Warrior Pkwy., Oliver tailwater	Tuscaloosa	N 33.1972° W 87.6286°
BWM 121.3 near old Oliver Lock and Dam, Oliver Pool	Tuscaloosa	N 33.2113° W 87.5821°
BWM 122.0 at Bama Belle mooring facility, Oliver Pool	Tuscaloosa	N 33.2141° W 87.5723°
BWM 123.4 downstream of old lock wall near Tuscaloosa, Oliver Pool	Tuscaloosa	N 33.2304° W 87.5500°
BWM 123.6 upstream of old lock wall near Tuscaloosa, Oliver Pool	Tuscaloosa	N 33.2221° W 87.5459°
BWM 124.8, Oliver Pool upstream of U.S. Hwy. 82 bridge	Tuscaloosa	N 33.2241° W 87.5246°
BWM 126.3 downstream of new bridge, Oliver Pool	Tuscaloosa	N 33.2395° W 87.5083°
BWM 128.0, Oliver Pool near Waterfalls Branch	Tuscaloosa	N 33.2524° W 87.4808°
BWM 129.1 upstream of Hurricane Creek mouth, Oliver Pool	Tuscaloosa	N 33.2529° W 87.4648°
BWM 133.3 upstream of Rocky Branch boat ramp, Holt Pool	Tuscaloosa	N 33.2811° W 87.4214°
BWM 137.5 upstream of Bluff Creek at Laurel Branch, Holt Pool	Tuscaloosa	N 33.3184° W 87.4140°
BWM 141.4 downstream of Harold's Lake, Holt Pool	Tuscaloosa	N 33.3715° W 87.4095°
BWM 144.4 opposite mouth of Davis Creek, Holt Pool	Tuscaloosa	N 33.4090° W 87.3945°
BWM 146.6 at mouth of Blue Creek, Bankhead tailwater	Tuscaloosa	N 33.4365° W 87.3796°
Tributary stations		
Blue Creek at Alabama Hwy. 69	Tuscaloosa	N 33.5218° W 87.4849°
Big Yellow Creek at Alabama Hwy. 69	Tuscaloosa	N 33.5684° W 87.4080°
Wolf Creek at Alabama Hwy. 18 W of Oakman	Walker	N 33.7088° W 87.4777°
Wolf Creek alongside County Rd. 173	Walker	N 33.7300° W 87.4724°
Wolf Creek at Wolf Creek Rd. upstream of AL. Hwy. 102	Fayette	N 33.7994° W 87.5334°
Lost Creek at County Rd. 20 W of Parrish and E of Oakman	Walker	N 33.725° W 87.3111°
Lost Creek at Pleasant Grove Rd. SW of New Jagger	Walker	N 33.8025° W 87.3679°
Lost Creek at Alabama Hwy. 118 near Carbon Hill	Walker	N 33.8816° W 87.5098°
Davis Creek at County Rd. 59 near Kellerman	Tuscaloosa	N 33.3882° W 87.2969°
Davis Creek at Hannah Rd.	Tuscaloosa	N 33.3319° W 87.2375°
Davis Creek downstream of County Rd. 99 near Pattersontown	Tuscaloosa	N 33.3104° W 87.2221°
Valley Creek near Oak Grove at Lock 17 Rd. (Co. R d.54)	Jefferson	N 33.4469° W 87.1225°
Turkey Creek upstream of Morris-Majestic Rd. 0.5 miles W of Crosston	Jefferson	N 33.7292° W 87.7391°

[1] BWM = Black Warrior River mile

Table 2.—Overview of freshwater mussels collected in the Black Warrior River, Alabama, 2009.

Species	Status[1]	Results of sampling, summer 2009
Anodonta suborbiculata, Flat Floater	P4	Two live individuals were found in the upper reach of Holt Pool; these are the first main channel Black Warrior records of this adventitious species
Arcidens confragosus, Rock Pocketbook	P3	Two live individuals were found in the Oliver Pool near Tuscaloosa
Lampsilis teres, Yellow Sandshell	P5	Live individuals were frequently encountered throughout the study area
Lasmigona alabamensis, Alabama Heelsplitter	P3	Live individuals were frequently encountered throughout the study area
Leptodea fragilis, Fragile Papershell	P5	Live individuals were frequently encountered throughout the study area
Megalonaias nervosa, Washboard	P5	A few live individuals were found at two stations in the upper reach of Holt Pool
Obliquaria reflexa, Threehorn Wartyback	P5	The third most frequently encountered and numerically abundant species encountered, it was common throughout the study area
Plectomerus dombeyanus, Bankclimber	P5	The most frequently encountered and numerically abundant species encountered, it was common throughout the study area
Potamilus inflatus, Inflated Heelsplitter	T, P2	Four live individuals were encountered at two stations, one downstream of Oliver Dam and one in the Oliver Pool near Tuscaloosa
Potamilus purpuratus, Bleufer	P5	Live individuals were frequently encountered throughout the study area
Pyganodon grandis, Giant Floater	P5	A few live individuals were found at several scattered stations in the study area
Quadrula apiculata, Southern Mapleleaf	P5	The second most frequently encountered and numerically abundant species encountered, it was common throughout the study area
Quadrula asperata, Alabama Orb	P5	Only one live individual of this otherwise common and widespread Mobile Basin endemic was encountered in the Oliver Pool near Tuscaloosa
Quadrula rumphiana, Ridged Mapleleaf	P4	A fairly commonly encountered species, especially in the Holt Pool; it can be difficult to distinguish from *Quadrula apiculata*, with some evidence of intergradation
Toxolasma parvum, Lilliput	P3	A single live individual of this diminutive species was found in the Holt Pool
Utterbackia imbecillis, Paper Pondshell	P5	A few live individuals and fresh dead shells of this common and widespread species were found

[1] T=federally listed threatened; Alabama priority conservation ranks follow Mirarchi (2004): P2=High Conservation Concern, P3=Moderate Conservation Concern, P4=Low Conservation Concern, P5=Lowest Conservation Concern.

Table 3.—Overview of freshwater mussels collected in tributaries of the Black Warrior River, Alabama, 2009.

Species	Status[1]	Results of sampling, summer 2009
Lampsilis straminea, Southern Fatmucket	P3	One valve of a relic shell was found in Turkey Creek
Pleurobema rubellum, Warrior Pigtoe	X	One valve of a relic shell tentatively identified as this species was collected from the most upstream station in Davis Creek
Quadrula asperata, Alabama Orb	P5	Single weathered dead valves were found at each of the lowermost Davis Creek stations
Strophitus subvexus, Southern Creekmussel	P3	One partial valve of a relic shell was found at the Blue Creek station
Villosa lienosa, Little Spectaclecase	P5	One fresh dead and two weathered dead shells were found at the Blue Creek station
Villosa nebulosa, Southern Rainbow	P3	Two fresh dead shells were found at the Blue Creek station

[1] Alabama priority conservation ranks follow Mirarchi (2004): P3=Moderate Conservation Concern, P5=Lowest Conservation Concern, X=not assigned.

Creekmussel was also widespread upstream of the Fall Line in the Black Warrior and Tombigbee River systems. Both are currently species of moderate conservation priority due to decreasing population trends and habitat vulnerability. Neither species was reported from Blue Creek by Williams and others (2008).

Each of three stations in Davis Creek (fig. 1) yielded a single weathered dead valve, two of which were the Alabama Orb, *Quadrula asperata*, and one possibly a Warrior Pigtoe, *Pleurobema rubellum*. The Warrior Pigtoe is endemic to the Black Warrior River system, mostly upstream of the Fall Line, and the Cahaba River system upstream of the Fall Line.

RECOMMENDATIONS

Based on the results of this study we make the following recommendations:

- Further sampling of the mussel fauna should be executed to further refine the current distribution of mussels in the system.
- Stations that currently harbor diverse and abundant mussel populations in the system should be established and monitored periodically to document trends.
- Habitat factors that influence mussel distribution and abundance should be evaluated by such means as land cover/land use mapping, intensive evaluation of

water and sediment quality, rates of sediment loading, and other means as deemed necessary.

- Upon determination of the limiting factors to the population, steps should be taken to ameliorate those factors.
- Long-term monitoring of the system should be enacted to document recovery.

REFERENCES CITED

Hartfield, Paul, 1994, Status review of select mussel species in the Mobile River basin: U.S. Fish and Wildlife Service, Jackson, Mississippi, 3 p.

Hinkley, A. A., 1906, Some shells from Mississippi and Alabama: The Nautilus, v. 20, nos. 3, 4, and 5, p. 34-36, 40-44, and 52-55.

Mettee, M. F., O'Neil, P. E., and Pierson, J. M., 1996, Fishes of Alabama and the Mobile basin including Mobile basin tributaries in adjacent states: Oxmoor House, Birmingham, Alabama, 820 p.

Mirarchi, R. E., 2004, Alabama wildlife, Volume 1, A checklist of vertebrates and selected invertebrates: Aquatic mollusks, fishes, amphibians, reptiles, birds, and mammals: Tuscaloosa, The University of Alabama Press, 209 p.

Mott, Seth, and Hartfield, Paul, 1994, Status review summary of the Alabama pearlshell, *Margaritifera marrianae*: U.S. Fish and Wildlife Service, Jackson, Mississippi, 6 p.

Strayer, D. L., and Smith, D. R., 2003, A guide to sampling freshwater mussel populations: Bethesda, Maryland, American Fisheries Society, Monograph 8, 103 p.

Williams, J. D., 1982, Distribution and habitat observations of selected Mobile basin unionid mollusks, *in* Miller, A. C. ed., Report of freshwater mollusks workshop: Vicksburg, Mississippi, U.S. Army Corps of Engineers, Waterways Experiment Station, p. 61-85.

Williams, J.D., Bogan, A.E., and Garner, J.T., 2008, Freshwater mussels of Alabama and the Mobile basin in Georgia, Mississippi, and Tennessee: The University of Alabama Press, Tuscaloosa, 908 p.

Williams, J. D., Fuller, S. L., and Grace, Randall, 1992, Effects of impoundments on freshwater mussels (Mollusca: Bivalvia: Unionidae) in the main channel of the Black Warrior and Tombigbee Rivers in western Alabama: Bulletin of the Alabama Museum of Natural History, v. 13, p. 1-10.

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