DEPARTMENT OF COMMERCE.

BUREAU OF FISHERIES.

Economic Circular No. 10 : : : : : : : : : Issued February 27, 1914

# MUSSEL RESOURCES IN MISSOURI.[a]

As a part of a general reconnoissance of the mussel-bearing waters of the United States, conducted by the Bureau of Fisheries through the Fairport Biological Station, the streams and lakes of Missouri were examined during the summer of 1913.

Since the Missouri River itself has been known to be practically if not entirely devoid of mussel resources, its tributaries have been generally neglected until the past year or two. Under pressure resulting from the general depletion of mussel beds in streams of wonted fishery, however, the trade has become more and more urgent in the search for new fields of operation. Certain tributaries of the lower portion of the Missouri, and at least one farther up in its basin, the James River of South Dakota, have been found to be sufficiently productive to support a profitable fishery.

The investigation reported in this paper was limited to the State of Missouri, except for an examination of the headwaters of the Osage River in Kansas. At a later time the scientific observations in detail will be reported by Prof. Utterback in connection with data collected by him in course of an investigation of earlier date. The following is a summarized statement of such observations as may be of most immediate interest.

## GENERAL CONDITIONS.

Because of the different conditions, associated especially with different physiographic provinces, the mussel life north of the Missouri River is very distinct in kind and quantity from that in the territory south of it. In relation to soils, topography, and geologic conditions, Missouri is naturally divided into four general areas: (1) The prairies, which occupy the territory north of the Missouri River and a triangular section south of it, bounded on the south and east by the divide from the Osage Basin; (2) the Missouri-Mississippi Valleys—that is, the alluvial flood plains lying within the State for both the Mississippi and Missouri Rivers; (3) the Ozarks, which may be divided into three regions, the border, the plateau, and the center, occupying the western, central, and eastern parts of south Missouri,

[a] Based upon a preliminary report of Prof. W. I. Utterback. During the investigation of the Osage River in June and July, 1913, Mr. Elliott M. Campbell served as assistant.

respectively; and (4) the Mississippi lowlands, which occupy the extreme projecting southeast corner of the State.

Owing to the muddy and sluggish character of the streams of northern Missouri, the mussels differ, especially in shell characters, from those of the various provinces of the Ozark uplift, where the streams, in marked contrast, are clear and swift.

The Osage Basin, on account of its geographic position and ecologic conditions, possesses a mussel fauna intermediate between those of the northern and southern parts of the State.

### THE PRAIRIE DRAINAGE.

The Platte River, the largest of the northwest Missouri streams, has at various times been carefully examined throughout its course; mussel resources are found to be comparatively scant, their greatest occurrence being about midway between the source and the mouth. The mussels are of the mud-loving species, many of which are of commercial value. The river at the present time is practically depleted, but it is thought could be made to yield good returns by propagation. The principal commercial shells are the Wabash pigtoe, three-ridge, washboard, pimple-back, maple-leaf, buckhorn, and yellow sand-shell. The predominant shell of this river, and of all of the northwest Missouri streams, is the paper-shell.

The largest northern tributary to the Missouri in this State is the Grand River, which has a large drainage basin, and extends over the greater portion of the northern section of the State. The river was examined near Darlington, Chillicothe, and Sumner. The mussel fauna is about the same as that of the Platte, but three additional species were noted—the monkey-face, Missouri niggerhead (or hickorynut), and pocketbook. Shells of good quality and in comparative abundance are found from Utica to a few miles below Sumner.

The Chariton River, which lies from 40 to 50 miles east of the Grand, is similar to the last-mentioned in possessing a flood plain of about equal width for its lower half, and in draining nearly the same character of level glaciated territory; but the Chariton is much smaller than the Grand, and its mussel life is less varied. By reason of a drainage ditch designed to straighten its bends, and extending nearly the full length of the river, many of its mussel beds are liable to extinction. Similar dredging has been done along the Nodaway and Tarkio Rivers, where tons of shells are now easily available in the old channels at low water.

As a rule, the commercial shells of the streams of north and northwest Missouri are heavier and less eroded than those found in the swift, clear streams of the southern part of the State.

## THE MISSOURI-MISSISSIPPI VALLEYS.

On account of the unstable condition of the bars, with the shifting sand and mud bottoms, together with the excessive turbidity of the water, the Missouri, and that part of the Mississippi between the mouths of the Missouri and the Ohio, are generally unsuited for mussel life. A few mussel beds, composed mostly of slough sand-shells, rock pocketbooks, etc., are found in the sheltered bayous, but none of much economic importance. Lake Contrary and all other cut-off lakes and sloughs, especially of the northwestern part of the Missouri, contain some good quality maple-leaf shells. It is possible that lakes of this type are suited to mussel propagation, since they have a good supply of hard water and abound in the best natural mussel hosts, such as the crappie, bass, and perch.

That part of the Mississippi above the mouth of the Missouri has afforded the best mussel beds of the State, but extensive fishing during the last few years has greatly reduced the output. The principal button shells found in this stretch of the river are the niggerhead,[a] yellow sand-shell, and pimple-back.

## THE OZARK DRAINAGE.

The main river basins south of the Missouri are being extensively worked for their shells and incidentally for their pearls. The pearling industry, however, is carried on more particularly in the extreme southern rivers, where shelling has been scarcely profitable because of remoteness from the markets.

The Osage River has been commanding commercial attention for the last year or two. Because of this fact and because it is the largest tributary of the Missouri in the State, the party made an investigation of the river from its headwaters at Ottawa, Kans., to Bagnell, Mo., a distance of more than 300 miles. Since the river lies partly within the Old Prairie Plains and partly within the Ozark border, the mussel faunas of the two general regions are perceptibly fused.

Among the best portions of the river the following may be mentioned: The Marais des Cygnes River, from La Cygne, Kans., where a cutting plant is located, is worked profitably for button shells all the way to the junction of this river with the Marmiton, to form the Osage proper; from this junction to Warsaw is the metropolis of economic shells, especially at Colleys Ford, Schell City, and Osceola. From these points many carloads of good marketable shells have been shipped to button factories within the last two years. These shells consist chiefly of the three-ridge, washboard, lady-finger, mucket, butter-

[a] It may be stated that the niggerheads have not been found in any Missouri stream except the Mississippi. The so-called Missouri niggerhead, or hickorynut, is a *different species*.

fly, buckhorn, pimple-back, and pigtoe. The mussel fishermen report a less return from pearl finds in this river than in the streams south of the Osage Basin.

The Gasconade River is reported to furnish more pearls than the Osage; the commercial shells, such as the muckets and pigtoes, are of better quality, but at no point are the resources equal in quantity to those of the Osage. It is stated that some shells for the pearl-button market have been collected along the course of this river and shipped from Gasconade, on the Missouri Pacific Railroad, and Jerome, on the Santa Fe Railroad. This river was examined at Gascondy, the crossing of the Rock Island Railway, where the stream was found to be clearer, swifter than the Osage, and more narrow and rocky, but with similar characteristic banks of limestone bluffs scattered here and there at rather long intervals. Despite the efforts of game wardens, this and other most accessible rivers of the State are being depleted of fish, most of which are agents for the distribution of mussels during their parasitic life.

The White River of the rugged southern slope in south Missouri is famous for the production of valuable button shells and of pearls, especially along its lower course in Arkansas. In its course through Missouri, this river has carved steep and terraced banks in most places through limestone; hence the water being hardened and the stream bed being of rock overlaid with enough mud brought down from its "bench land," good natural conditions are given for mussel growth and there is a great variety of mussels, many of which are valuable. The principal shells in Missouri are the three-ridge, buckhorn, black sand-shell, and mucket. Three miles above Forsyth a 50-foot power dam has been constructed, and unless suitable fishways be provided it may prove a barrier against the distribution of some species of mussels. The White River has been one of the most profitable streams in the United States for the production of pearls. In this State more attention has been given to pearling than to the shelling phase of the industry. Some fishermen have attempted to market the shells, but so many inconveniences are encountered in transporting the shells to a shipping point that no profit has been realized. However, after this rough hill country is better developed, the facilities for marketing may be improved.[a]

A collection of shells made at Williamsville, Mo. (September, 1913), 40 or 50 miles from the Arkansas State line, gave about the following percentages: Commercial shells 32 per cent, and noncommercial shells 68 per cent. The commercial shells consist of muckets, black sand-shells, and round pigtoes. Twenty-three per cent of the shells were pocketbooks, which were not included as commercial shells,

[a] For detailed reference to a tributary of the White River, see "The Mussels of the Big Buffalo Fork of White River, Arkansas," by S. E. Meek and H. Walton Clark, Bureau of Fisheries Document No. 759.

although they are frequently used; 15 per cent were pink pimple-backs, which can be used, but are not desirable on account of the color. If these two species were regarded as commercial, there would be 70 per cent of marketable shells against only 30 per cent to be discarded.

The beautiful Meramec River drains the northern part of the Ozark center and empties into the Mississippi about 25 miles below St. Louis. Although the mussel beds of this river are being exhausted, it could be restocked by propagation, since it offers favorable conditions as regards stream bed, water supply, plankton, and limestone. Niggerheads and other good shells, in paying quantities, have been shipped from its largest tributary, the Bourbeuse. The mussels of this river in kind and quality are more like those of the southeastern streams than those of the Missouri tributaries.

The upper St. Francis River is the largest of the Ozark center, and also drains most of the Mississippi lowlands. The part of the river which forms the western boundary of the southeast "toe" of the State is very wide and broken into many channels through the swamp district, where the Mississippi flowed before the famous stream capture was made by the Ohio. A mussel bed 2 miles in length near Greenville contains an abundance of shells, but the heavier ones, such as the three-ridge, mucket, etc., are badly eroded.

The Black River and its longest tributary, the Current, complete the drainage of the southern slope of the Ozark center. Since the drainage basins of the Black and upper St. Francis lie so near to each other and are tributaries of the Mississippi, their fish and mussels are almost identical. The shells of this basin are more uniform in size and weight than those of the neighboring Ozark streams. There is, too, less variation in color of nacre. Such shells as the black-sand, lady-finger, and round pigtoe in this river are generally white in color and thus make passable button shells. The predominant mussel in the Black River in Missouri is the pocketbook, averaging about 23 per cent.

After passing into Arkansas the Black River becomes the seat of one of the most important shell fisheries now existing, where it yields niggerhead shells of very fine quality; muckets are less numerous, but are of unusually good quality.

### THE MISSISSIPPI LOWLANDS DRAINAGE.

The great swamp lands of southeast Missouri are drained by the St. Francis, Little, and Castor Rivers, whose feeble currents in these level lowlands are inadequate for successful drainage; thus there are numerous wide channels with countless sloughs and bayous. Such conditions are, on the whole, unfavorable to the growth of thick-shelled mussels. Some mussels of economic importance are found along the middle course of the St. Francis, but the best shells are

found along its lower stretches in Arkansas. The upper waters of the Castor and Little Rivers have identical mussel faunas with that of the upper St. Francis; but in their lower courses the unstable bottoms present conditions unfavorable for mussel life, as do the lower portions of some of the tributaries of the Missouri River. This investigation did not comprehend a study of the St. Francis River in Arkansas, but it may be mentioned that in its lower courses the river supports rich beds of niggerheads of unsurpassed quality, with some yellow sand-shells and other species. The beds are now greatly depleted.

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## SCIENTIFIC NAMES OF MUSSEL SPECIES.

For the benefit of those who may wish to use the data herein given for scientific purposes, there is added a list of the scientific names corresponding to the common names as used in this report. For convenience only, the nomenclature of Simpson is followed, although many of the recent changes of Ortman and others will doubtless prove well founded.

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|---|---|---|
| 1. | Niggerhead | *Quadrula ebena.* |
| 2. | Pigtoe | *trigona.* |
| 3. | Wabash pigtoe | *rubiginosa.* |
| 4. | Pimple-back | *pustulosa.* |
| 5. | Maple-leaf | *lachrymosa.* |
| 6. | Monkey-face | *metanevra.* |
| 7. | Washboard | *heros.* |
| 8. | Blue-point | *undulata.* |
| 9. | Three-ridge | *plicata.* |
| 10. | Round pigtoe (flat niggerhead) | *coccinea.* |
| 11. | Lady-finger | *Unio gibbosus.* |
| 12. | Buckhorn | *Tritogonia tuberculata.* |
| 13. | Butterfly | *Plagiola securis.* |
| 14. | Missouri niggerhead | *Obovaria ellipsis.* |
| 15. | Paper-shell | *Lampsilis gracilis.* |
| 16. | Black sand-shell | *recta.* |
| 17. | Yellow sand-shell | *anodontoides.* |
| 18. | Mucket | *ligamentina.* |
| 19. | Pocketbook | *ventricosa.* |

WASHINGTON : GOVERNMENT PRINTING OFFICE : 1914