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A FAUNISTIC AREA OF FIVE ISOLATED SPECIES
OF CRAYFISH IN SOUTHEASTERN MISSOURI

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DURING the last four years the Museum of Zoology of the University of Michigan has participated in zoological exploration of the Missouri Ozark region. The first three summer's work consisted of a survey of the fauna present. During the fall of 1933 a special study was made in an area which had previously been determined as one of unusual interest as regards crayfish. The area, which is in the southeastern section of Missouri, includes the headwater streams of the Mera-mec, Big, Black, and St. Francis rivers.

CRAYFISH OF THE AREA

The following crayfish species are present in the above mentioned drainage areas: 1. *Faxonius punctimanus* Creaser 1933; 2. *Faxonius luteus* Creaser 1933; 3. *Faxonius hylas* (Faxon) 1890; 4. *Faxonius medius* (Faxon) 1884; 5. *Faxonius harrisonii* (Faxon) 1884; 6. *Faxonius peruncus* Creaser 1931; 7. *Faxonius quadruncus* Creaser 1933; 8. *Cambarus hubbsi* Creaser 1931. Of these species *punctimanus*, *luteus*, and *hubbsi* are rather widespread in their distribution while the other five species are very local in occurrence.

RELATIONSHIPS OF THE CRAYFISH FAUNA

The three species, *hylas*, *peruncus*, and *quadruncus*, comprise a natural group known only from this section of the

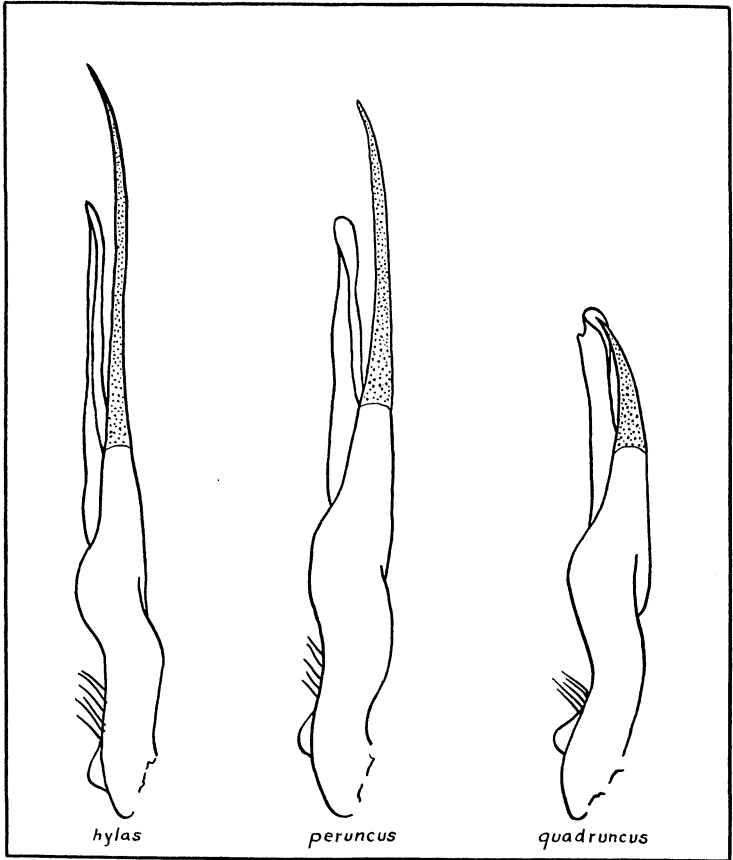


FIG. 1.—Sexual appendages of the three members of the *hylas* group taken from specimens of the same length (55 mm.). Drawn with the aid of the camera lucida.

Missouri Ozarks. Female specimens of each have an annulus ventralis which is peculiar in the possession of a triangular ledge-like protuberance along the posterior wall. In life the three species are mottled brown or dark green. Each species

has tufts of setae on the chelae, but there is some variation in the degree of pilosity. The hooks on the walking legs are found on the third pair in *hylas*, the third and fourth pairs in *quadruncus*, and on the third and fourth or third, fourth, and fifth in *peruncus*. The sexual appendages are different and must in the last analysis be relied upon to distinguish the three species.

The species *medius* is quite clearly related to several species of crayfish which are known as the *rusticus* group. The specific peculiarities of *medius* are the long sexual appendage, the thick, blunt, deeply punctate, gaping chelae, and the convex-edged antennal scale. Faxon's original description stresses the lack of lateral spines on the rostrum. This character is exceedingly variable, and many individuals of this species possess well developed lateral spines on the rostrum.

The last of the group of isolated species is *harrisonii*. This crayfish is an orphan since both rami of the sexual appendage are corneous, a condition which prevails in no other species of the genus *Faxonius* (a subgenus in the opinion of many).

A recapitulation of the relationships of these five isolated crayfish follows: The three species, *hylas*, *peruncus*, and *quadruncus*, form a natural group. The *rusticus* group has a single representative in the species *medius*. *Faxonius harrisonii*, the fifth species, is an orphan in the genus.

THE DRAINAGE AREAS

The Big and the Meramec rivers flow in a northeasternly direction. The Big River empties into the Meramec near its mouth. The St. Francis River flows in a southerly direction through Arkansas and empties into the Mississippi River. The Black River flows in a southerly direction through Arkansas and empties into the White River which, in turn, empties into the Mississippi. Accordingly, four drainage areas are involved in this study.

FAUNA OF THE BLACK RIVER

Of the five species peculiar to the drainages mentioned above, but a single species, *Faxonius hylas*, occurs in the Black

River. All of the major tributaries of the Black River north of Piedmont contain this species. *Faxonius luteus* although common in other and adjacent drainages is seemingly absent from the Black River drainage. *Faxonius punctimanus* is common here, particularly in the muddier sections of the river and streams.

FAUNA OF THE ST. FRANCIS RIVER

In respect to distribution of species the St. Francis River is the most interesting of those studied. Big Creek and tributaries on the western side of the drainage contain *Faxonius peruncus*. The same species is likewise found in the Twelve-Mile Creek on the eastern side. The headwaters above the mouth of Twelve-Mile Creek with a single exception contain the closely related *Faxonius quadruncus*. Other Ozarkian species, *hubbsi*, *luteus*, and *punctimanus*, which are not isolated in range also occur in this drainage area.

FAUNA OF THE BIG RIVER

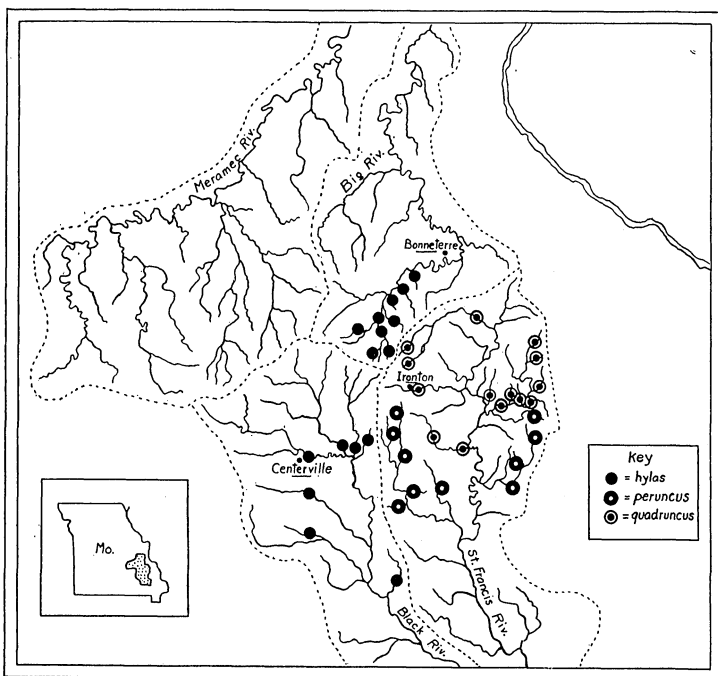
The Big River has a single species which is peculiar to it alone. This is the morphologically peculiar *Faxonius harrisonii*. Several streams which have their headwaters adjacent to streams in the Black River drainage contain *hylas*. Doubtless some headwater stream in the Big River drainage has captured a headwater stream in the Black River drainage. In all probability the migration of the fauna has been from the Black to the Big, otherwise *harrisonii* and *medius* should be found in the Black. Although *medius* occurs throughout the Big River drainage, it is not abundant in the section where *hylas* is found. *Faxonius luteus* and *punctimanus* also occur in the Big River.

FAUNA OF THE MERAMEC RIVER

Faxonius medius is common in the headwater streams of the Meramec River drainage. It is the only one of the five isolated species that is found there although *luteus* and *punctimanus* also occur.

CAUSE OF DISTRIBUTIONAL PECULIARITIES

The reconstruction of the past history of river systems by a study of their present fauna is usually a hazardous mental gymnastic. In the present case an exception may possibly



MAP 1.—Distribution of the three species of the *hylas* group. The map insert shows the geographical relationship of the area to the state of Missouri.

exist. A headwater stream of the Big River has apparently captured a stream of the headwaters of the Black River. This explains the presence of *hylas* in the headwaters of the Big River while the other species, *medius* and *harrisonii*, are absent in the Black. Just east of the town of Enough and extending in a southerly direction from the extreme headwaters of the Big River, a hollow a mile and one-half long occurs. This is known as Guyser Hollow and may well have been an old stream bed extending across the divide which now

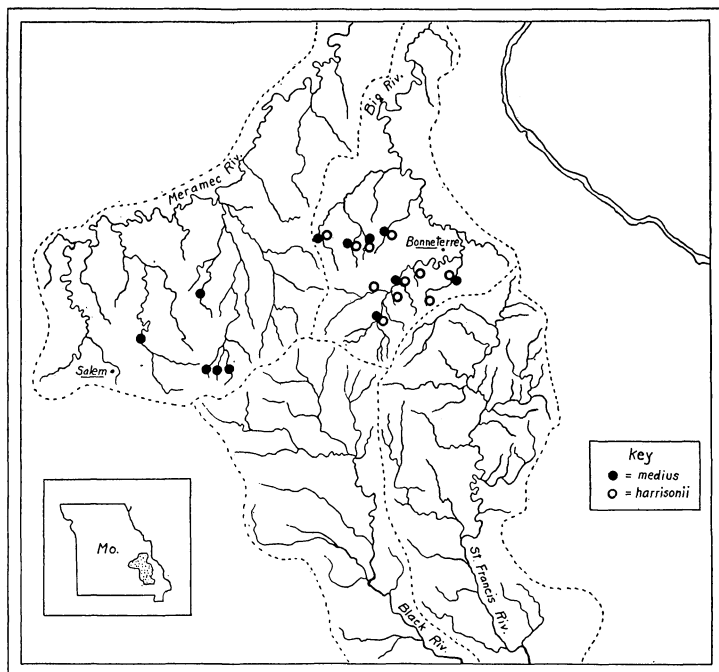
exists. The Missouri Ozarks have many underground connections, and dispersal by means of these is also a possibility for I have seen eyed crayfish in several streams in caves.

The relationships of the members of the *hylas* group are rather easy to trace. The most specialized species is *quadruncus*. This specialization is noted in the peculiarities of the sexual appendage. This appendage has undergone shortening, and superfluous sculpturing has evolved on the soft inner ramus of the gonopodium. Quite clearly, however, this appendage is patterned closely after that of *peruncus*. The evolutionary step between *hylas* and *peruncus* has been one of a reduction in length of gonopodium and of a flattening and flaring-out of the tip of the inner ramus. The evolution of the group has seemingly been from *hylas* to *peruncus* and *peruncus* to *quadruncus*.

An attempt to reconstruct the history of the dispersal of this group may accordingly be in order. The original home of the *hylas* stock was in the Black River. It will be recalled that the Black River flows into the White River which has a very peculiar crayfish fauna in other respects. From there the ancestral stock of *peruncus* was able to establish itself in the Big Creek on the far western side of the St. Francis drainage. This establishment may have occurred by virtue of stream capture. The species *peruncus* was rather widespread in the headwaters then existing in the St. Francis River. As the river expanded its headwater streams the older headwaters containing *peruncus* were ecologically shut off by deepening of the river and by the deposition of sediment. The species *quadruncus* meanwhile differentiated in these newly formed or newly found headwaters, which perhaps may have flowed into another drainage.

Concerning the species *harrisonii* which is peculiar to the Big River, practically nothing can be said. It is an isolated local species without any existing relatives: an orphan. Either it is a lone survivor of a group which has since perished or else it is a sport resulting from mutation. The other form in this peculiar faunistic area, *medius*, is doubtless a

local race of the *rusticus* group which has become specifically differentiated by isolation among the streams of this section of the Missouri Ozarks.



MAP 2.—Distribution of the species *medius* and *harrisonii*. The map insert shows the geographical relationship of the area to the state of Missouri.

SUMMARY

A faunistic area containing five isolated species of crayfish has been established by field work in southeastern Missouri.

Three of the species of this area comprise a peculiar group of crayfish known as the *hylas* group. One species is a member of the *rusticus* group, and the fifth species is an orphan.

The Black River has a single peculiar species which has become established in adjacent headwater streams of the Big River.

The St. Francis River has two species which occur nowhere else. The extreme northern headwaters contain *quadruncus* while the tributaries on the east and west in the lower headwater stretches contain *peruncus*.

The Big River has two local species: *harrisonii*, peculiar to it alone, and *medius* which also occurs in the Meramec.

Stream capture and isolation are presented as factors involved in the distribution and local differentiation of the five crayfish peculiar to the area.