

OCCASIONAL PAPERS OF THE MUSEUM OF
ZOOLOGY

UNIVERSITY OF MICHIGAN

ANN ARBOR, MICHIGAN

UNIVERSITY OF MICHIGAN PRESS

STUDIES OF THE GASTROPOD FAMILY
PLEUROCERIDAE. II

BY CALVIN GOODRICH



FIG. 1. *Pleurocera* of *canaliculatum* group, showing groove above periphery.

THE groove which suggested to Say the name of *canaliculata* for the *Melania* he found so abundantly at the Falls of the Ohio River begins on the spire as a slight depression of the lower part of the upper half of the whorl, the beginning ranging from the eighth to the thirteenth whorl. It is emphasized in certain forms and individuals by bordering ridges of thick shell material. The ridges are sometimes an apparent extension of early carinae, but inasmuch as they are not always present, while the carinae are a constant, it is not clear that the carinae have any bearing on the development either of ridges or grooves. The groove lies below the plane of the

whorl, appearing in the aperture of most specimens as a low, rounded projection. A second, or even a third small ridge occurs occasionally as an intercalation between the two border ridges. About as frequently, the ridges are so closely approximated that the groove is a mere chink.

Upon the basis of the groove, Tryon (1873) separated species with channelled shells from those having shells either inconspicuously grooved or wanting the groove entirely. He admits, however, that:

the deep sulcus which distinguishes Mr. Say's *Mel. canaliculata*, in its typical form, shades off so gradually into a smooth, flattened surface, that not only is it difficult to arrange the species in this group, but it is even doubtful whether many of the species which are placed in other groups are really distinct.

Observing that the *Pleurocera* of Pitman Creek at Burnside, Pulaski County, Kentucky, was shallowly grooved whereas the corresponding mollusk of Cumberland River, scarcely two hundred yards away, was deeply grooved, I undertook a study of all available canaliculate pleuroceras in order to learn whether variations in grooving were correlated with stream position as seemed to be indicated at Burnside. A few difficulties arose. Measuring the depths of the grooves, for example, was impracticable. Precise descriptive terms were wanting, and to avoid the awkward repetition of "shallowly grooved" and "deeply grooved," the words "furrowed" (or "furrow") and "channelled" (or "channel") have been used as substitutes without prejudice to exact meanings. A "furrowed" shell is to be understood as one whose groove lacks ridges or is so small as to be revealed only by a magnifying glass. A "channelled" individual is one the groove of which is bordered by ridges or is otherwise conspicuously sulcate. Again, a distinction has had to be drawn between shells concave from suture to periphery and those which in addition to this concavity have the characteristic groove, the former being counted as ungrooved.

The table which follows shows the findings for Cumberland River and two of its tributaries:

	number of shells	not grooved in %	furrowed in %	channelled in %
3 mi. E. of Burnside, Ky.	54	0	20.4	79.6
Burnside, Ky.	42	0	2.4	97.6
Russell Co., Ky.	76	0	25	75
Gainsboro, Tenn.	10	0	30	70
Nashville, Tenn.	38	0	44.7	55.3
Canton, Trigg Co., Ky. .	12	0	58.3	41.7
Pitman Creek, Burnside, Ky.	10	10	90	0
Caney Fork, Tenn.	30	3.3	33.3	53.3

The locality east of Burnside is of rocky shoals, the water fast. The river at Burnside is deep enough for steamboat navigation. Caney Fork is a large tributary with the typical main river molluscan fauna extending for several miles above the mouth. Pitman Creek is small, and apparently contains pleuroceras only near its discharge. It will be seen by the table that the climax of channelled shells is at Burnside, and that such shells decrease in relative numbers downstream.

The first of the grooved forms of *Pleurocera* that is encountered in the headwater streams of the Tennessee River is that named *Melania gradata* by Anthony. It is replaced by *undulatum* (Say) downstream. This shell continues as far at least as Tuscumbia, Alabama. About opposite Dayton in eastern Tennessee, other forms, subspecies or species—whatever they should be called—make their appearance. One of these, *excavatatum* (Conrad), continues nearly to the mouth of the river. Because of their seeming distinction from the general complex of canaliculate pleuroceras, *P. nobile* Lea and *P. incurvum* Lea, were passed over in this study.

The two lots of shells from Powell River, one taken near Cumberland Gap and the other at the mouth of the stream, are made up of ungrooved and furrowed specimens; so also is material from the upper Clinch River. Channelled forms first appear in the Clinch River in Anderson County, Tennessee, in small numbers. They increase in Roane County so as to constitute 42.3 per cent of a series of 156 shells. Specimens from the North and South Forks of the Holston River dupli-

cate, in the matter of grooving, the mollusks of Powell and the upper Clinch rivers. In the main Holston River at Rogersville, Tennessee, about 70 per cent of the shells are furrowed, the rest channelled. At a locality in the Holston River just above Knoxville, Tennessee, 49.1 per cent of 59 mollusks are furrowed and 47.3 are channelled, while only 2 specimens are ungrooved. Taking the Tennessee River as a whole, the lots totaling 253 specimens, only 12 ungrooved individuals are yielded. Furrowed and channelled shells in the Tennessee River at Knoxville are in the proportion of about 3 to 2. Below Knoxville, the proportion is 10 to 1 at Loudon, 6 to 1 near Dayton, and about 8 to 1 at Bridgeport. Of 77 shells from Muscle Shoals, 3 are ungrooved, 46 furrowed, and 28 channelled.

A progressive change is indicated by the pleuroceras from the Sequatchie River, a tributary of the Tennessee River.

	number of shells	not grooved in %	furrowed in %	channelled in %
Pikeville	35	88.5	11.4	0
Dunlap	65	78.4	21.5	0
8 miles below Dunlap ..	89	74.1	25.8	0
Jasper	36	50.0	47.2	2.7

Two tributaries, the Little Sequatchie River and Spring Branch, enter the Sequatchie River near Jasper. In the detail of proportion of ungrooved to furrowed shells, the pleuroceras from the Little Sequatchie River most nearly resemble those from the station 8 miles below Dunlap; those from Spring Branch, the lot from Pikeville. Neither, as regards grooving, corresponds to the neighboring Jasper colony.

Body whorls concave from suture to periphery are characteristic of the *Pleurocera* of Duck River, the largest downstream tributary of the Tennessee River. Grooves are more frequently absent than present. Where they do appear, they fall within the definition of furrowed, as used in this paper. Downstream in the Duck River, the tendency is for the concavity to disappear and the upper part of the whorl to flatten.

This is repeated in Buffalo River, a branch of Duck River. The flattening of the upper half of the body whorl, while here a downstream feature, is elsewhere characteristic of far upstream pleuroceras. It is also that of pleuroceras in three small streams of the Duck River basin. In Buffalo River at Beardstown, Perry County, Tennessee, the *Pleurocera* is concave above the periphery of the body whorl. In Cane Creek, entering the Buffalo River above Beardstown, the pleuroceras are flattened above the periphery.

Of 62 shells from the Ohio River at Cincinnati, 13 per cent are furrowed, 87 per cent channelled. This ratio of the two forms is only slightly different among the 30 specimens the Museum of Zoology has from the Falls of the Ohio. The lot from the Ohio at Elizabethtown, Illinois, consisting of 222 specimens, is made up of furrowed and grooved shells in almost equal numbers. Material from the Wabash River shows a fairly regular decrease of furrowed shells going downstream and an increase of channelled shells without a recrudescence of furrowed forms near the mouth of the stream. This is true also of pleuroceras from the two forks of the White River, a tributary of the Wabash, and true as well of a long series of specimens from the Green River of Kentucky.

Only a few grooved pleuroceras have been taken in the Conasauga River, a headwaters stream of the Alabama River system. These were from near the mouth of the river. The shells are lightly furrowed. The Conasauga River joins the Coosawattee River to become the Oostanaula River. A short distance below this junction ungrooved and furrowed pleuroceras have been collected in the proportion of about 1 to 4. Collections in the Oostanaula at Rome, Georgia, farther downstream, show the presence of colonies made up of ungrooved, furrowed, and channelled shells. Three small creeks at Rome have ungrooved and furrowed shells near the mouths. The Coosa River begins at Rome by the junction of the Oostanaula and Etowah rivers. Pure colonies of channelled pleuroceras occur in the Coosa below Rome, persisting to the vicinity of Cedar Bluff, Cherokee County, Alabama. A branch of the Coosa River known as the Chattooga River discharges near

Cedar Bluff. Upstream, the pleuroceras of Chattooga River are without grooves. Far downstream, furrowing and channelling appear among them.

A characteristic *Pleurocera* of the middle and lower parts of the Coosa River and of the Alabama River is *prasinatum* (Conrad), extremely variable sometimes even within colonies. For the purpose of comparing the grooving, shells have been examined according to sections of the two rivers that are more or less faunistically distinct so far as the mollusca is concerned.

	number of shells	not grooved in %	furrowed in %	channelled in %
Coosa River, Ala.				
Etowah-St. Clair coun- ties	49	4.3	68.9	26.7
Talladega Shelby coun- ties	109	23.9	54.3	21.7
Chilton-Coosa-Elmore counties	61	41.1	49	10.0
Alabama River, Ala.				
Selma, Dallas County.	51	52.9	39.2	7.8

Taking the Alabama River system as a whole, it will be seen that the occurrence of *Pleurocera* varying in degree of grooving corresponds to that of *Pleurocera* of the Cumberland, Tennessee, and Ohio rivers.

SUMMARY

In the Cumberland, Tennessee, and Ohio rivers and in the Alabama River system, grooving progresses downstream from furrowed to channelled to furrowed.

In the Sequatchie, Wabash, and Green rivers, the gradient is from furrowed to channelled without reversion to furrowed grooving as the mouths of the streams are approached.

Shells of small tributary streams are usually ungrooved or furrowed, seldom channelled.

The degree of channelling may definitely be considered to have an ecological bearing.

