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The Crayfish (Decapoda: Astacidae and Cambaridae) and the Freshwater Mussels (Mollusca: Pelecypoda) of the lower New River, Virginia and West Virginia.

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ABSTRACT

A survey in the summer of 1979 produced six species of crayfish and six species of freshwater clams. *Cambarus sciotensis* was the most abundant crayfish species collected. The introduced species, *Orconectes virilis*, has increased its distribution in the New River accounting for three new county records in West Virginia. The introduced freshwater clam, *Corbicula manilensis*, was the most abundant clam species present, occurring at 9 of 11 sites. *Cyclonaias tuberculata* was the most abundant unionid species present.

INTRODUCTION

New River originates in the Blue Ridge Mountains of North Carolina and flows northward through Virginia and West Virginia to its confluence with the Gauley River at Gauley Bridge, W. Va., to form the Kanawha River. The study area lies in two physiographic provinces, the Valley and Ridge Province and the Appalachian Plateau Province. Most of the study area located in West Virginia is in the Appalachian Plateau Province. However, the Greenbrier River Valley and east, including the small portion of the study area located in Virginia, lie in the Valley and Ridge Province.

From the vicinity of the Virginia-West Virginia state line downstream to near the confluence with Gauley River, a river distance of approximately 90 km, the river flows through the New River gorge. Less than 2.0 km downstream of the confluence is the 7.3 m high Kanawha Falls, which has long been considered a barrier to

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fish dispersal into the upper Kanawha (New) River drainage (Hocutt, 1979). Other falls above the Kanawha Falls are Wylie, Bull, and Sandstone (Hocutt *et al.*, 1978), all located within the impressive New River gorge. Sandstone Falls presents as formidable an obstacle to fish dispersal as Kanawha Falls (Hocutt, 1979). Lachner and Jenkins (1971) suggested that the series of rapids, cascades and low falls of the gorge, which has now incised up to 457 m into the Appalachian Plateau, may have hindered downstream as well as upstream dispersal.

Although numerous studies of fish distribution have been conducted in the New River drainage (Hocutt *et al.*, 1978), little published work has been performed on the distribution of the crayfish and freshwater clams. Ortmann (1913) collected five species of mussels and two species of crayfish in his search for fauna along the Alleghenian divide. Newcombe (1929) recognized six species of crayfish from New River drainage in his West Virginia state survey. Ortmann (1931) noted species native to West Virginia in his "Crayfish of the Southern Appalachians and the Cumberland Plateau". Hobbs (1969) considered the distribution of the crayfish genus *Cambarus* in the southern Appalachians. Lawton (1979) described nine species of crayfish distributed in the New River drainage in his West Virginia state survey. The main objective of this manuscript is to discuss the present distribution of the crayfish and freshwater clams of the New River gorge.

METHODS AND MATERIALS

Fifty-eight collections of crayfish and eleven collections of freshwater clams were made during the summer of 1979 in the New River drainage. Crayfish collections were made with a 1.3 x 3.3 m, 3.6 mm mesh nylon seine during collections for fish using a substrate disturbance technique. Clams were collected by scuba divers, but high and turbid waters during the summer made the collection of clams fairly difficult. An effort was made to collect a representative qualitative sample at each location. All specimens were preserved in 70% isopropanol. Nomenclature for crayfish followed Hobbs (1974) and, for freshwater clams, Burch (1973).

Localities collected for crayfish (Fig. 1) and their respective station numbers are: (Station 1) New River at Lurick, Va.; (2) New River at Glen Lyn, Va.; (3) New River at the mouth of Round Bottom Creek; (4) New River at the mouth of Indian Creek; (5) New River just below Bluestone Dam; (6) New River below the mouth of Madam Creek; (7) New River "Island Station", 1.2 road km downstream of Madam Creek; (8) New River, 10.9 road km downstream of Madam Creek; (9) New River just above Sandstone Falls; (10) New River at the mouth of Laurel Creek at Sandstone, W. Va.; (11) New River at the mouth of Meadow Creek; (12) New River at the mouth of Piney Creek; (13) New River, beach area upstream of Stone Cliff road bridge, Fayette Co.; (14) New River, old Rt. 82 bridge, Fayette Station; (15) New River Rt. 16 bridge, Cotton Hill,

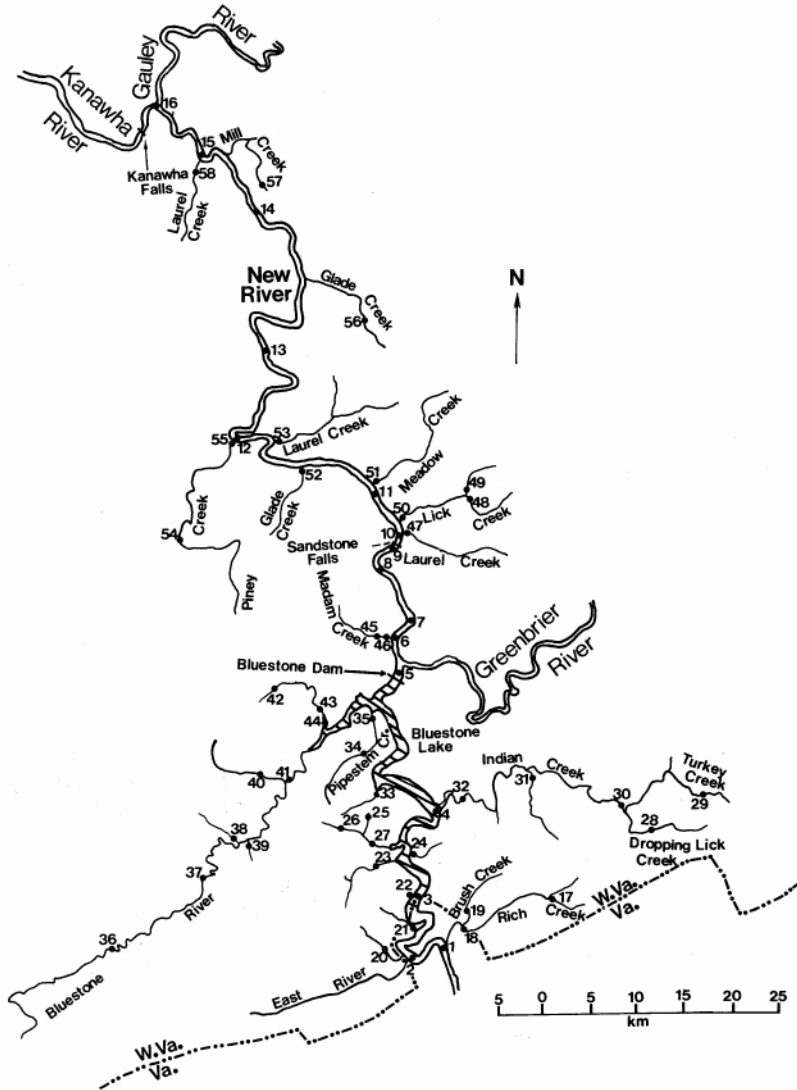


Fig. 1. Localities for crayfish collections, New River, Virginia and West Virginia.

W. Va.; (16) Kanawha River at the mouth of Gauley River; (17) Rich Creek above the confluence with Dry Creek, off Rt. 219; (18) Rich Creek at Co. Rt. 219/23 bridge, Peterstown, W. Va.; (19) Brush Creek at Co. Rt. 24/8 bridge off St. Rt. 24, north of Peterstown, W. Va.; (20) Adair Run below Woodall at proposed site 7 dam; (21)

Coopers Branch about *0.2 road km* upstream of New River, at Co. Rt. bridge; (22) Roundbottom Creek at the mouth; (23) Island Creek at Co. Rt. 22/4 bridge; (24) Crooked Run at the mouth, Shanklin Ferry Camp; (25) Unnamed tributary to Lick Creek along Co. Rt. 16, *7.2 road km* from the Junction with Co. Rts. 26 and 20, on Co. Rt. 26/2; (26) Hackett Creek, tributary of Lick Creek, along Co. Rt. 28/2; (27) Lick Creek off Co. Rt. 26/1 at the first bridge off Co. Rt. 28; (28) Dropping Lick Creek at St. 29 bridge, Northeast of Rock Camp; W. Va.; (29) Turkey Creek at Willow Bend, W. Va.; (30) Indian Creek at St. Rt. 122 bridge, Raines Corner, W. Va.; (31) Hans Creek at Co. Rt. 25 bridge at Co. Rt. 25/2; (32) Indian Creek at Co. Rt. 33/2 bridge, South of Indian Mills, W. Va.; (33) Tom's Run about *1.6 road km* above confluence; (34) Pipestem Creek at the mouth of an unnamed tributary along Co. Rt. at proposed site 3; (35) Pipestem Creek *1.2 road km* above the mouth, below falls; (36) Bluestone River along Co. Rt. 10/7, *5.2 road km* from St. Rt. 71 downstream of Rock, W. Va.; (37) Bluestone River, midway between both U.S. bridges, at island, Spanishburg, W. Va.; (38) Camp Creek, U.S. Rt. 19 bridge; (39) Brush Creek, Co. Rt. 3, below the falls; (40) Mountain Creek, Co. Rt. 2 bridge, Dunns, W. Va.; (41) Bluestone River below the mouth of Mountain Creek at the end of Co. Rt. 4; (42) Little Bluestone River, Co. Rt. 25/3 bridge at Streeter, W. Va.; (43) Little Bluestone River at the mouth, upstream about *0.4 km*; (44) Bluestone River at its confluence with Little Bluestone River; (45) Madam Creek at Co. Rt. 3/21 bridge above the falls, Hinton, W. Va.; (46) Madam Creek at Co. Rt. 3/21 bridge below the falls, Hinton, W. Va.; (47) Laurel Creek from the mouth to *60 m* above the first riffle; (48) Lick Creek just above its confluence with Mill Creek along Co. Rt. 4; (49) Mill Creek at Co. Rt. 4 bridge, Green Sulphur Springs, W. Va.; (50) Lick Creek above Co. Rt. 20 bridge, to the mouth; (51) Meadow Creek, from the mouth upstream to the railroad bridge, Meadow Creek, W. Va.; (52) Glade Creek at the mouth along County road paralleling New River; (53) Laurel Creek from the railroad bridge downstream to the mouth, off Fayette Co. Rt. 41/27, Quinimont, W. Va.; (54) Confluence of Piney Creek and Little Beaver Creek at U.S. Rt. 19; (55) Piney Creek at St. Rt. 41 bridge at the mouth, McCreery, W. Va.; (56) Glade Creek at Co. Rt. 19/33 bridge; (57) Mill Creek at Co. Rt. 5 bridge, Ames Height, W. Va.; (58) Laurel Creek above and below the old mill at Beckwith, W. Va.

Mussel collection localities (Fig. 2) and their respective station numbers are: (Station 1) New River at Glen Lyn, Va.; (2) New River at the mouth of Round Bottom Creek; (3) New River at the mouth of Indian Creek; (4) New River at the head of Wiley Islands, W. Va.; (5) New River approximately *0.8 km* below Wiley Islands, W. Va.; (6) New River just below Bluestone Dam; (7) New River approximately downstream of Bluestone Dam; (8) New River at the mouth of Madam Creek; (9) New River "Island Station", downstream of Madam Creek; (10) New River, downstream of Madam Creek; (11) New River at the mouth of Meadow Creek.

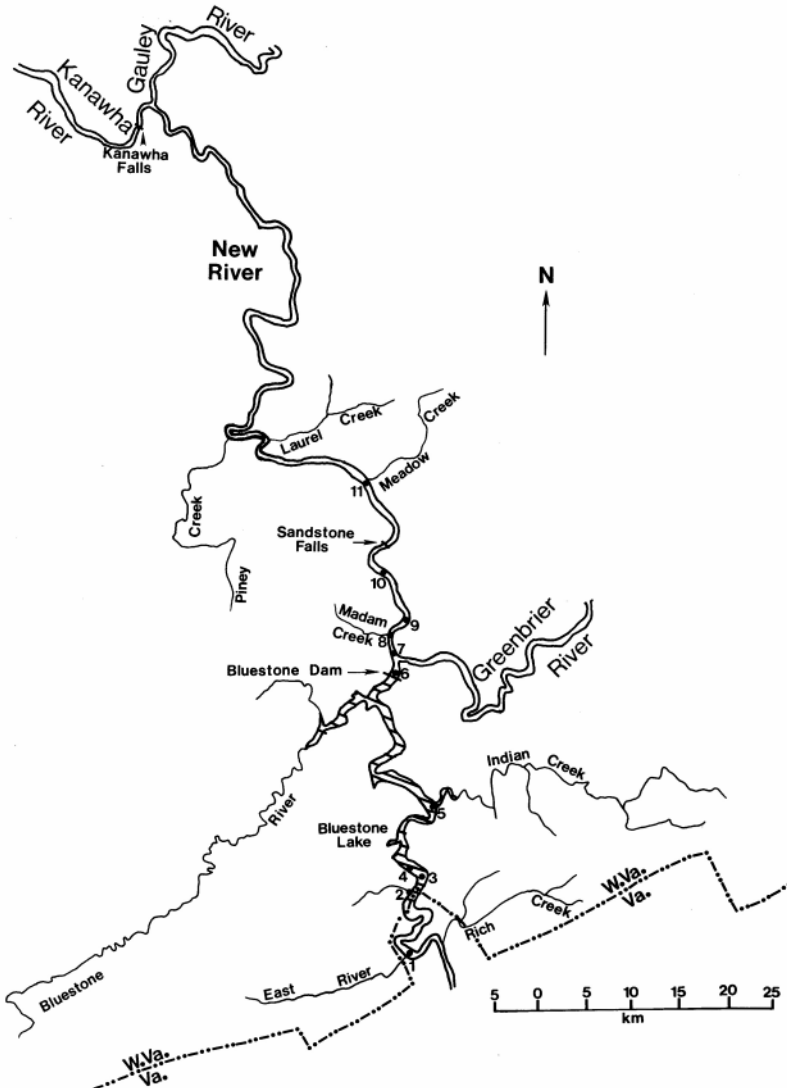


Fig. 2. Localities for mussel collections, New River, Virginia and West Virginia.

RESULTS

Six species of crayfish were collected from the New River drainage in the summer of 1979 (Table 1). *Cambarus sciotensis* was the most abundant crayfish judged by numbers and sites collected.

Table 1. Crayfish (Decapoda) collected from New River, Virginia and West Virginia, in the summer of 1979.

Station No.	<i>Orconectes obscurus</i>	<i>Orconectes spinosus</i>	<i>Orconectes virilis</i>	<i>Orconectes sp.</i>	<i>Cambarus b. bartonii</i>	<i>Cambarus sciotensis</i>	<i>Cambarus robustus</i>	<i>Cambarus sp.</i>
1		2						
2		10		2	1	3		
3		6				7		
4		4	1	1		3		
5	2		26			1		
6			8			2		
7			7					
8			3					
9		1	8					
10		2				9		
11		2	2	2				
12		2	2					
13								
14				1				
15								
16								
17		5	1		9	4		1
18		12			3	6		
19		6				5		
20					5	12		
21		12			2	18		
22					5	9		
23					2	16		
24		3			9	5		
25		2				4		
26						5		
27		4						2
28					1	6		
29						5		
30			1			24		
31			4			3		

Table 1. (cont'd).

Station No.	<i>Orconectes obscurus</i>	<i>Orconectes spinosus</i>	<i>Orconectes virilis</i>	<i>Orconectes</i> sp.	<i>Cambarus b. bartonii</i>	<i>Cambarus sciotoensis</i>	<i>Cambarus robustus</i>	<i>Cambarus</i> sp.
32		7	11			16		
33						17		
34		3				27		
35		8			3	20		
36		23			8	7		
37						1		
38		22			1	1		
39					6	7		
40					10	9	1	
41		1				1		
42					7	22		
43		1	1	1				
44		1			1			
45			7					
46			3			3		
47			1			2		
48		5				8		
49		26		2		18		
50		6			1	6		
51			1			6		
52								
53						10		
54	4							
55		1						
56	2							
57					2			
58						5		

Cambarus robustus was collected from only one site (Station 39) in this survey. *Orconectes spinosus* was the most common crayfish of the Astacidae collected. *Orconectes virilis*, which was previously reported only from Bluestone Lake, Summers County (Lawton, 1979), has begun to radiate throughout the New River system and was collected from three new counties—Monroe, Raleigh and Fayette.

Six species of freshwater clams were collected from the New River drainage in the summer of 1979 (Table 2). The introduced freshwater clam, *Corbicula manilensis*, was the most abundant clam species present, occurring at 9 of 11 stations. *Cyclonaias tuberculata* was the most abundant unionid species present.

DISCUSSION

In reference to fishes, Hocutt (1979) states that the New River gorge and the several falls along the river act as a faunal filter to upstream dispersal. Lachner and Jenkins (1971) suggest that this might also hamper downstream dispersal. This appears to be the case for some crayfish. Crayfish species had very limited populations below Sandstone Falls, especially *Cambarus bartonii* and *Orconectes spinosus*. *O. spinosus* was found in only two tributaries to New River below Sandstone Falls. It was found throughout Lick Creek, but a road parallels this tributary for some distance and this could possibly be the result of a bait bucket introduction. *C. bartonii* was found in only two locations below the Falls, but was widely distributed above. Ortmann (1913) states that *C. bartonii* is not a river species, but a species of small creeks. Only one specimen of *C. bartonii* was found in the main channel at Station 2.

Cambarus sciotensis was found throughout the drainage, but was not found in the downstream stations of the main channel. Hobbs (1969) states that this crayfish has a discontinuous range in the upper Kanawha drainage and in the tributaries of the Ohio River in Ohio and Kentucky. However, it is suspected to occur throughout the entire Kanawha drainage. *Cambarus robustus* was found only in Brush Creek, a tributary to Bluestone River. This crayfish prefers larger streams or quieter waters (Hobbs, 1969) and is not usually found in cascading waters that typify the New River drainage.

Orconectes virilis, an introduction which was previously found only in Bluestone Lake, has increased its distribution dramatically. It is tolerant of poor environmental conditions, and it exhibits highly aggressive behavior (Schwartz *et al.*, 1963). It was found to have expanded its range rapidly in the Patapsco River, Md., after being introduced. *O. virilis* has increased its distribution both upstream and downstream of Bluestone Lake and was found in three new counties—Monroe, Raleigh and Fayette. The taxonomic status of *Orconectes spinosus* and the closely related *O. juvenilia*

Table 2. Mussels (Pelecypoda) collected from New River, Virginia and West Virginia, in the summer of 1979.

	1	2	3	4	5	6	7	8	9	10	11
Amblemiidae											
Ambleminae											
<i>Tritogonia verrucosa</i>	1	5			3	14	9	10	11		
Unionidae											
Pleurobeminae											
<i>Cyclonaias tuberculata</i>		1	18	22	10	5	5	13		1	5
<i>Elliptio dilatata</i>				1							
Lampsiliinae											
<i>Actinonaias carinata carinata</i>		3	2				3		2	39	20
<i>Lampsilus ovata ventricosa</i>				2	3	1		1			
Corbiculidae											
<i>Corbicula manilensis</i>	2	2	5	3		50		8	28	4	1

and *O. putnami* is currently unstable. Until the ranges and taxonomy have been clarified, H. Hobbs (personal communication) advised identifying the West Virginian specimens as *O. spinosus*. Ortmann (1931) considered *O. spinosus* and *O. putnami* as synonyms of *O. juveniles*, but they were re-elevated to specific status in 1972 (Hobbs, 1974).

Ortmann (1913) collected four species of clams in the New River. One, *Lasmigona subviridis* was not collected in this study. Three species, *Actinaias carinata*, *Lampsilus ovata ventricosa* and *Corbicula manilensis*, were collected in addition to those reported in Ortmann (1913). All three species have been collected in the Kanawha River (Morris and Taylor, 1978). The introduced Asian clam, *Corbicula manilensis*, is well established throughout the study area; populations were found at all stations except 5 and 7.

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