THE MOLLUSCAN FAUNA OF THE GENESEE RIVER.

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THE study of faunal distribution has always been a favorite occupation of zoölogists, and particularly of those interested in the study of the Mollusca, as in this branch we find a very large number of species, covering wide areas and subject to every variation of environment. In no department of the Mollusca is this of such absorbing interest as in the fresh-water forms (unless we except, perhaps, the air-breathing pulmonates), especially those inhabiting a large river where there are several barriers to the homogeneous distribution of its shell fauna. During the past summer the writer spent several months in such a study of the Genesee River, where the environments are quite different in several parts of the stream, with a corresponding difference in the mollusk fauna. The river was carefully surveyed from near its mouth on Lake Ontario to beyond South Park, a distance of ten miles. A large collection was made, which is now in the museum of the Chicago Academy of Sciences. My thanks are due to Miss Edna E. Hall for valuable assistance in collecting, and to Rev. John Walton for many notes.

The Genesee River rises in Potter County, Pennsylvania, and flows in a generally northward direction for about 120 miles, emptying into Lake Ontario, seven miles north of Rochester, N. Y. The Genesee valley is very fertile, and the river flows between low banks rich in vegetation. Before passing Rochester the river is deep, the banks muddy, and the current steady but not very swift. From a point a little north of Genesee Valley Park (or South Park) the bottom of the river becomes very rocky, the current swift, and at Rochester the river drops to the valley below in three series of falls of considerable magnitude.

TABLE OF COMPARATIVE DISTRIBUTION.

Above First Falls.	Between First and Second Falls.	Between Second and Third Falls.	Lower River.
Planorbis trivolvis *	Planorbis trivolvis *	Planorbis trivolvis *	Planorbis trivolvis *
Limnæa palustris †		Limnæa palustris †	
	Limnæa catascopium *	Limnæa catascopium *	Limnæa catascopium *
	Limnæa caperata †	Limnæ caperata †	Limnæa caperata †
Ancylus rivularis †			
Physa integra *		Physa integra †	
	Physa sayii *	Physa sayii *	Physa sayii *
			Physa gyrina *
			Physa heterostropha †
			Bythinia tentaculata
Goniobasis livescens *			
Campeloma rufum *			
Campeloma decisum *			
Campeloma integrum †			
Calyculina transversa †			Calyculina transversa *
		Calyculina partumeia †	Calyculina partumeia †
Sphærium simile *			
Sphærium stamineum *			
Anodonta lewisii †			
Alasmodonta pressa *			
Alasmodonta rugosa *			
Alasmodonta deltoidea †			
Alasmodonta marginata †			
Strophitus edentulus *			
Anodontopsis ferussacianus †			
Quadrula rubiginosa *			
Quadrula undulata †			
Lampsilis iris *			
Lampsilis luteolus *			
Lampsilis ventricosus †			
Lampsilis alatus †			
Lampsilis radiatus †			
Lampsilis complanatus *			
Lampsilis tappanianus †			

A study of the table will show a first will be the abundance of Un total absence below, showing tha insurmountable barrier to their direction. Another fact of equa certain gastropods in all four sect Physa). The general absence of falls (Bythinia excepted) is notew addition to the fauna of the lower numbers in 1898. It was very cc river, in Lake Ontario, in 18 5, became one of the most abundant

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A study of the table will show a few interesting facts. The first will be the abundance of Unios above the falls and their total absence below, showing that the upper falls afford an insurmountable barrier to their further distribution in this direction. Another fact of equal note is the abundance of certain gastropods in all four sections of the river (Planorbis, Physa). The general absence of ctenobranchiates below the falls (Bythinia excepted) is noteworthy. Bythinia is a recent addition to the fauna of the lower river, appearing in immense numbers in 1898. It was very common at the mouth of the river, in Lake Ontario, in 1895, and in these three years it became one of the most abundant mollusks in the lower river.

The distribution of Physa is also peculiar. *Physa integra* is the dominant and (so far as I know) the only form above the falls, and *Physa gyrina* below. *Physa sayii* is the only species between falls 1 and 2 and is very abundant only between the upper and lower falls, a very peculiar distribution, for which I cannot account. *P. integra* does not occur between the upper river and falls 2 and 3, and I was not able to find it between falls 1 and 2, which, if borne out by future observations, offers an interesting phase of distribution. Why *P. integra* should be so interrupted in its distribution may be accounted for by two hypotheses: (1) that specimens may have been carried over the first and second falls and found lodgment above the lower falls; or (2) specimens might have been carried by birds or other animals. Why *Physa sayii* is found everywhere except in the upper river is also an interesting question.

Limnæa seems to be evenly distributed, and yet in this genus we find the same peculiar distribution as in Physa. *L. palustris* has been collected in small numbers in the upper river, but *L. catascopium* and *L. caperata* take its place in the other three regions, the former being very abundant. Ancylus has been found only in the upper river, in the dead valves of Unios, but it may be that it inhabits all parts of the river. As in the case of *Physa integra*, we find the distribution of *Limnæa palustris* to be peculiar, jumping, as it does, the first fall and occurring sparingly between falls 2 and 3. *Planorbis trivolvis* is the only evenly distributed species. Among the bivalves,

Calyculina transversa is interrupted in its distribution, but, like *Physa gyrina*, *P. heterostropha*, and *Bythinia tentaculata*, may have come up the river from Lake Ontario. This, however, will hardly account for *Calyculina partumeia*, which is found in the lower river and between falls 2 and 3.

As one glances over the table the fact presents itself that there is a marked division in the faunas between the upper river and the series of falls, and the lower river. This may be accounted for by the fact that for a distance of about two miles above the first fall the river is shallow and very rocky, in fact flowing over great ledges of Niagara limestone, and the Unios all seem to prefer the deeper, more quiet waters above this section of the river, only a few stragglers, like *Lampsilis luteolus*, *L. iris*, and *Alasmodonta rugosa*, being found in this rocky region. The writer was unable to find Unios within a half mile of the upper falls, showing conclusively that this environment is unsuitable for them. Another reason why Unios are not found below the falls is probably that their heavy shells and also their habit of burying themselves in the mud prevent them from rising to the surface and being swept over the falls, as might be the case with Planorbis, Limnæa, or Physa, which come periodically to the surface for air.

The foregoing discussion indicates that a series of falls like those at Rochester will prove an effective barrier to the distribution of some mollusks (as the pelecypods with mud-burrowing habits and the ctenobranchs, which cling to the rocks and do not come to the surface), while to others (like the fresh-water pulmonates, which come to the surface frequently and hence could be swept over the falls) it is not a barrier. Future studies and collections, however, may modify the above conclusions.

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