

Reproductive Isolation in the Snails, *Pomatiopsis Lapidaria* and *P. Cincinnatiensis*

Author(s): Henry Van Der Schalie and Lowell L. Getz

Source: *The American Midland Naturalist*, Vol. 68, No. 1 (Jul., 1962), pp. 189-191

Published by: The University of Notre Dame

Stable URL: <http://www.jstor.org/stable/2422644>

Accessed: 05-05-2016 16:55 UTC

Your use of the JSTOR archive indicates your acceptance of the Terms & Conditions of Use, available at

<http://about.jstor.org/terms>

JSTOR is a not-for-profit service that helps scholars, researchers, and students discover, use, and build upon a wide range of content in a trusted digital archive. We use information technology and tools to increase productivity and facilitate new forms of scholarship. For more information about JSTOR, please contact support@jstor.org.



The University of Notre Dame is collaborating with JSTOR to digitize, preserve and extend access to *The American Midland Naturalist*

Reproductive Isolation in the Snails, *Pomatiopsis lapidaria* and *P. cincinnatiensis*¹

HENRY VAN DER SCHALIE and LOWELL L. GETZ²

ABSTRACT: Even though their ranges overlap, two species of the American snail *Pomatiopsis* are usually ecologically isolated, with *Pomatiopsis lapidaria* (Say) inhabiting seepage areas and *P. cincinnatiensis* (Lea) occurring only on river banks. A site was found on the River Raisin in Michigan where both species occurred together. Intensive studies over an extended period indicated that these species do not interbreed under natural, sympatric conditions.

Previous to World War II, when the interest in human blood fluke was revived, Bartsch (1936) had grouped the Oriental snails which serve as intermediate hosts of *Schistosoma japonicum* under three genera: *Katayama*, *Schistosomophora* and *Oncomelania*. These are now all included in the single genus *Oncomelania* (Abbott, 1948). The status of the four species (*O. quadrasi*, *O. nosophora*, *O. formosana*, and *O. hupensis*) within this genus is now also open to question. In this connection, Pesigan and co-workers (unpublished data) were able to intercross three species (*O. quadrasi*, *O. nosophora* and *O. formosana*) in any combination. These crosses were later confirmed by Wagner and Chi Wong (1959); in addition, they were able to cross *O. hupensis* with the other three species. The hybrids of all these *Oncomelania* crosses produced fertile offspring. Furthermore, it has been possible to cross males of the North American species, *Pomatiopsis lapidaria*, with females of *Oncomelania quadrasi* and *O. formosana* (van der Schalie, *et al.*, in press). The offspring of at least the former cross proved to be fertile. Attempted crosses of another North American species, *Pomatiopsis cincinnatiensis*, with the four species of *Oncomelania* and *P. lapidaria* were all unsuccessful.

All of the nominal species of *Oncomelania* are allopatric. The taxonomic status ascribed to them depends on the definition of a species when dealing with allopatric populations. Judgments regarding the relationship between *Oncomelania* and *Pomatiopsis* also involve groups widely separated in nature. Although the ranges of *P. lapidaria* and *P. cincinnatiensis* overlap throughout an extensive area (van der Schalie and Dundee, 1955; Dundee, 1957), these species are usually ecologically isolated. Studies over an extended period indicate that *P. cincinnatiensis* occurs only on the banks of rivers, while *P. lapidaria* normally lives in seepage areas in the vicinity of streams and lakes. However, the latter species may occasionally appear on river banks (probably in

¹ This manuscript was supported by a contract with the U. S. Army Medical Research and Development Command (DA-49-007-MD-604), and sponsored by the Commission on Parasitic Diseases, Armed Forces Epidemiological Board.

² Authors' addresses: University of Michigan, Ann Arbor, Michigan and University of Connecticut, Storrs, Connecticut, respectively.

situations where individuals are washed into rivers during rains), but their numbers are too few to afford valid evidence as to whether *P. lapidaria* is reproductively isolated from *P. cincinnatiensis*.

A situation in which both species occur together has recently been discovered on the River Raisin, one mile north of Clinton, Washtenaw County, Michigan. This site consists of a small seepage zone, about thirty meters wide, extending down towards the bank of the river (Fig. 1). This seepage area has a large and flourishing colony of *P. lapidaria*. The river bank at this point also has extensive colonies of *P. cincinnatiensis*. Consequently, the two species are sympatric at the boundary of their habitats (Table I). A sample taken from a quadrat (25 x 30 cm) on the lower portion of the bank in the normal habitat of *P. cincinnatiensis* contained 146 *P. lapidaria* and 89 *P. cincinnatiensis*. In some intensive studies during the past three years numerous collections were made both in this seepage area and on the adjacent river bank. A re-examination of the several hundred specimens obtained, revealed no evidence of interbreeding between these two species. It is obvious, therefore, that *P. lapidaria* and *P. cincinnatiensis* do not interbreed under natural, sympatric conditions.

Burch (1960) has shown that "the spermatogonial cells of *Pomatiopsis lapidaria* have thirty-three chromosomes, sixteen pairs and a heterochromatic chromosome, presumably a sex chromosome" while "spermatogonial cells of *P. cincinnatiensis* have only thirty-two chromosomes, fifteen pairs plus a heteromorphic pair." He further indicated

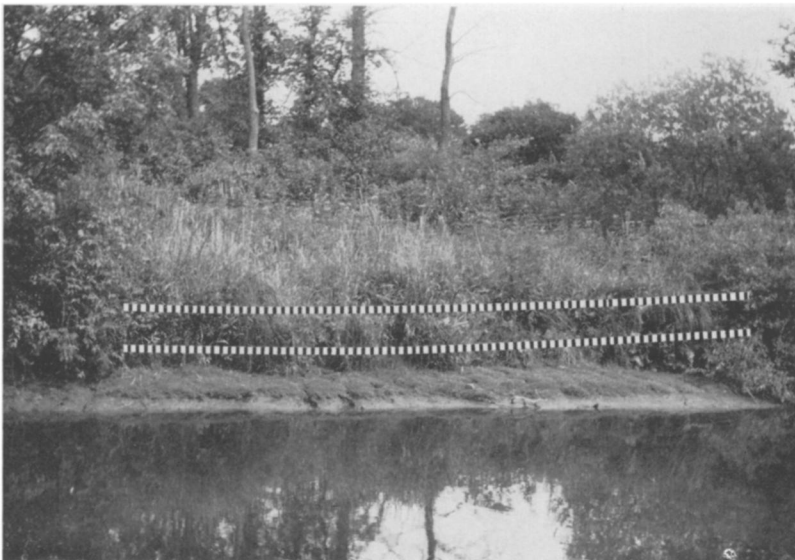


Fig. 1.—Station on River Raisin, 1 mile north of Clinton, Michigan, where *Pomatiopsis cincinnatiensis* and *P. lapidaria* occur together.

TABLE I.—Distribution of *Pomatiopsis cincinnatiensis* ("C") and *P. lapidaria* ("L") in a zone of overlap of the two species (the table represents a grid with each row and column five centimeters wide; thus, there are forty-five squares, 5 x 5 cm, shown in the table. See Fig. 1 for location of grid; row 1 is at the top of the grid)

Row	Column										Total	
	1		2		3		4		5			
	L	C	L	C	L	C	L	C	L	C	L	C
1	3	1	1	1	6	1	3	4	1	3	14	10
2	2	3	0	3	0	3	1	3	0	2	3	14
3	3	1	0	3	1	0	1	4	1	1	6	9
4	0	6	1	0	1	1	1	1	0	2	3	10
5	1	3	2	5	2	3	0	2	3	3	8	16
6	1	1	2	3	0	2	0	1	0	3	3	10
7	3	2	0	1	0	3	0	4	1	1	4	11
8	4	5	1	0	0	0	2	2	3	2	10	9
9	4	2	0	0	0	0	1	1	1	2	6	5

that *O. nosophora* and *O. quadrasi* have the same number of chromosomes as does *P. lapadaria*. On the basis of these differences in chromosome numbers, it would appear *a priori* that *P. cincinnatiensis* would not be able to produce fertile offspring with *P. lapadaria* or any of the species of *Oncomelania*. Although our culture methods have, as yet, not been perfected for *P. cincinnatiensis*, the laboratory experiments to date have supported this conclusion (van der Schalie, et al., in press). The field data tend to support laboratory observations in that they also indicate that *P. lapidaria* and *P. cincinnatiensis* are reproductively isolated. This evidence, along with other indications of differences, seems to indicate that *P. cincinnatiensis* belongs to a different taxon than *P. lapadaria* or the species of *Oncomelania*. At present, the several levels of difference are being determined and a comprehensive account of species interrelations is contemplated.

REFERENCES

- ABBOTT, R. TUCKER. 1948. Handbook of medically important mollusks of the Orient and the Western Pacific. *Bull. Mus. Comp. Zool.*, **100**:245-328.
- BARTSCH, PAUL. 1936. Molluscan intermediate hosts of the human blood fluke, *Schistosoma japonicum*, and species confused with them. *Smithsonian Misc. Coll.*, **95**:1-60.
- BURCH, JOHN B. 1960. Chromosomes of *Pomatiopsis* and *Oncomelania*. *Bull. Am. Malacol. Union*, No. **26**:15-16.
- DUNDEE, DEE S. 1957. Aspects of the biology of *Pomatiopsis lapidaria* (Say) (Mollusca: Gastropoda: Prosobranchia). *Univ. Mich. Mus. Zool. Misc. Publ.*, **100**:1-37, 14 plates, 2 maps.
- VAN DER SCHALIE, HENRY AND D. S. DUNDEE. 1955. The distribution, ecology and life history of *Pomatiopsis cincinnatiensis* (Lea), an amphibious operculate snail. *Trans. Am. Micros. Soc.*, **74**:119-133.
- , L. L. GETZ AND B. C. DAZO. In press. Hybrids between American and Oriental *Oncomelania* snails. *Am. J. Trop. Med. and Hyg.*
- WAGNER, E. D. AND L. W. CHI. 1959. Species crossing in *Oncomelania*. *Ibid.*, **2**:195-198.