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MASS MIGRATION OF JUVENILE *BIOMPHALARIA GLABRATA* SNAILS BRED UNDER SEMI-NATURAL CONDITIONS

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Mass migration of juvenile Biomphalaria glabrata **snails bred under semi-natural conditions** – *For the development of studies on snail interspecific competition special in-door laboratory channels were built. In the all five channels seeded with adult specimens of* Biomphalaria glabrata *mass migration of juvenile snails outside the water was observed. Most of the migrant snails presented apertural lamellae. Data collected during the period of two years, showed the regression of the migration phenomenon and the disappearance of the lamellate snails.*

Key words: *Biomphalaria glabrata* – snail vetors of schistosomiasis – snail population migration

Apertural lamellae are known to occur in several species of planorbid snails.

Paraense (1957) described the presence of a set of six apertural lamellae in juvenile specimens of *Biomphalaria glabrata* very similar to those already known to occur in *B. janeirensis*.

The presence of lamellae in *B. glabrata* is commonly associated to a spontaneous tendency to climb out of water. This phenomenon has been interpreted as a mechanism of survival value to the snails submited to adverse conditions (Paraense, 1957; Richards, 1964, 1967; Michelson & Mota, 1982; Pieri & Thomas 1986; Danneman & Pieri 1989).

Beginning 1976 a long term project was set up at the Research Center Aggeu Magalhães, in Recife, Brazil, aiming the study of the population interactions between the vector snails of *Schistosoma mansoni* in NE Brazil, *B. glabrata* and *B. straminea*. The idea was to create an uniform environment in which the above mentioned snail species would interact as much as possible out of the influence of the natural, physical and some of the biological variables that would interfere with the dynamics of the snail populations.

The aim of the current paper is to describe a mass migration of juvenile snails that occurred in laboratory breeding channels built for the above mentioned experiments on snail interspecific competition.

METHODS

Ten channels were seeded in the first quarter of 1977, five with *B. glabrata* and the other five with *B. straminea*. During the following two years the channels were submitted to ordinary steps allowing the study of the growth and dynamics of the snail population prior to the experiments on the programed competitive interaction studies. The detailed methodology for the project was definitively established in 1979 and published (Barbosa et al., 1983).

In the current paper are presented data on the growth of *B. glabrata* populations and registered the number of juvenile snails found on the inner wall of the channels above the water level, during the years 1977/78.

During the above period the snail population growth was estimated over a 20% sample of the whole volume of water of each channel according to the methodology developed by Barbosa et al. (1983).

Migrating snails were collected during the observation period and after being examined for the presence of lamellae were re-introduced in the water of the respective channel.

The first observation on both the snail populations growth and the presence of lamellate snails in the channels were made one month after the seeding of 50 adult specimens of *B. glabrata* in each channel.

TABLE I

Biomphalaria glabrata: population growth in laboratory breeding channels. Number of snails is shown as 20 percent sample of the whole water volume

Date	Channel number														
	1			2			3			4			5		
	T	D	A	T	D	A	T	D	A	T	D	A	T	D	A
1977															
Apr.	72	2	70	53	4	49	57	1	56	132	13	119	57	11	46
Jun.	5	0	5	30	1	29	62	3	59	36	0	36	15	0	15
Aug.	14	1	13	44	1	43	26	3	23	38	2	36	17	3	14
Oct.	86	2	84	88	1	87	88	3	85	61	5	56	33	3	30
Dec.	161	0	161	85	1	84	91	1	90	133	3	130	109	1	108
1978															
Feb.	150	3	147	172	2	170	94	2	92	126	1	125	118	0	118
Apr.	155	0	155	176	1	175	113	1	112	135	0	135	121	0	121
Jun.	176	0	176	211	0	211	115	4	111	141	1	140	125	1	124
Aug.	167	3	164	180	1	179	151	2	149	158	4	154	148	2	146
Oct.	179	1	178	168	1	167	154	1	153	155	2	153	167	1	166
Dec.	156	1	155	157	2	155	161	1	160	164	2	162	172	1	171

Snail numbers: T = total; D = dead; A = alive.

TABLE II

Lamellate juvenile snails – *Biomphalaria glabrata* – collected above the water level on the walls of laboratory breeding channels

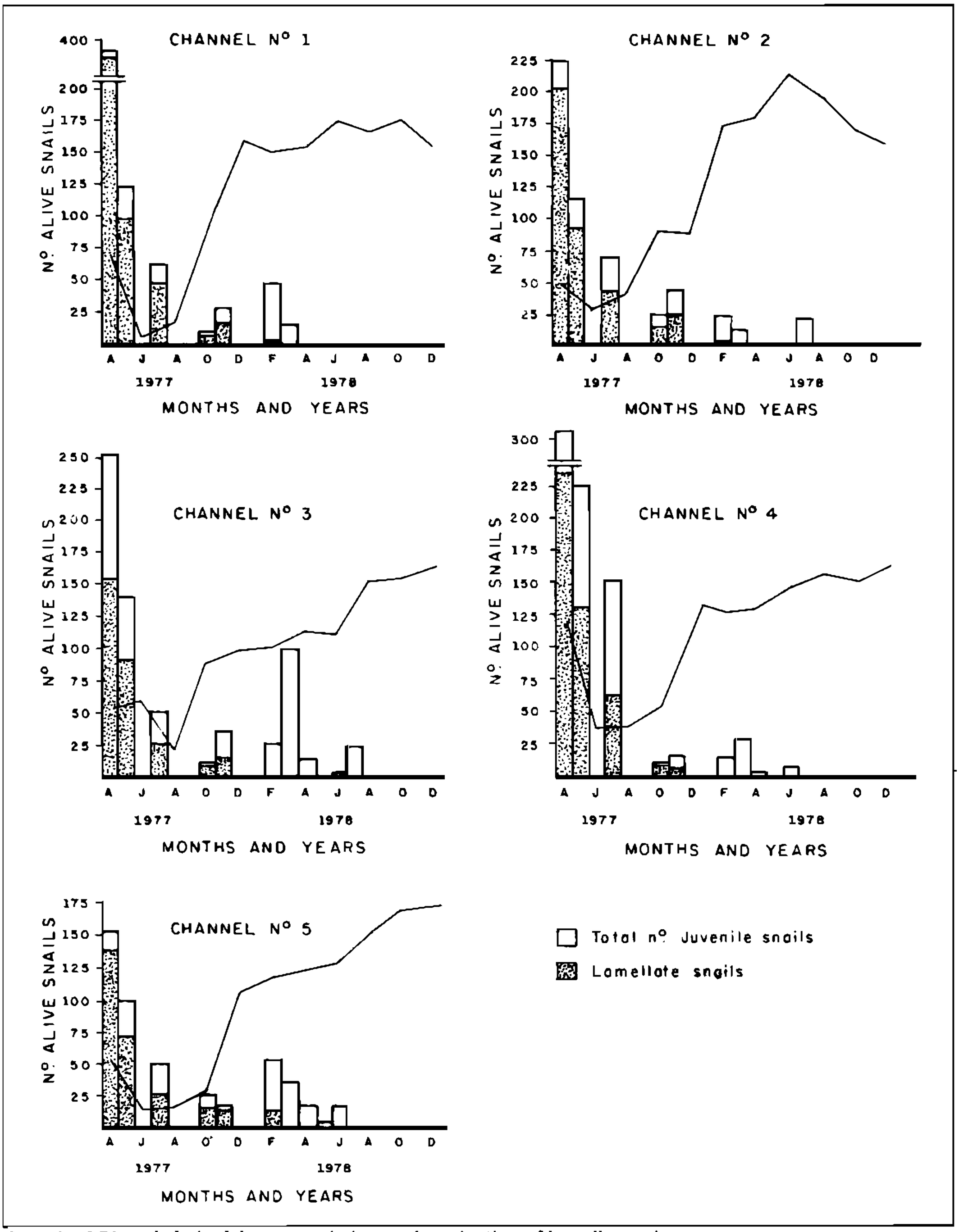
Date	Channel number														
	1			2			3			4			5		
	T	L	%L	T	L	%L	T	L	%L	T	L	%L	T	L	%L
1977															
Apr.	399	366	91.7	243	197	81.1	255	150	58.8	306	235	96.8	157	139	88.5
May	122	94	77.0	115	92	80.0	142	91	64.1	225	131	58.1	95	72	75.8
July	62	45	73.4	69	43	62.3	44	26	53.1	151	62	41.1	49	26	53.1
Oct.	8	5	62.3	24	15	62.5	11	8	12.7	10	8	80.0	25	17	68.0
Nov.	30	17	56.7	42	24	57.1	35	14	40.0	18	5	27.8	16	9	56.3
1978															
Feb.	49	5	10.2	20	3	15.0	25	3	12.0	12	1	8.3	54	11	20.4
Mar.	15	0	–	12	0	–	90	1	1.1	29	0	–	36	1	2.8
Apr.	3	0	–	2	0	–	13	0	–	3	0	–	15	0	–
June	1	0	–	3	0	–	4	0	–	1	0	–	2	0	–
July	1	0	–	19	0	–	20	0	–	9	0	–	15	0	–

Snail numbers: T = total; L = lamellate.

RESULTS

Results are limited to the five *B. glabrata* channels since the phenomenon did not occur in the channels seeded with *B. straminea*. Clear out results were obtained during the observation period, as schown in Tables I and II and in Figure.

Snail curves show the ordinary growth pattern of *B. glabrata* when living under the described conditions (Barbosa et al., 1983,



Growth of *Biomphalaria glabrata* populations and production of juvenile specimens.

1984, 1989). In the beginning there is a rapid increase of the population due to the abundance of young snails. Following that a decline of snail numbers is observed but from that point on the snail population tend to attain stability that occurs usually after one year of the beginning of the experiment.

Data show that both lamellate and non lamellate snails decrease in numbers at the moment that the snail populations show nitid ascendent trend. At the last months of the observation period juvenile snails were rarely seen outside of water and always at negligible numbers.

COMMENTS

The results show that *B. glabrata* snails, as observed by several authors quoted in the current paper, are able to get out of water, clibing the inner wall of the channel.

The observed snail behavior was very similar for all the five channels. The mass migration phenomenon, in this case, seems to be associated with the initial phase of the population growth of *B. glabrata* when high number of juvenile snails are produced (Barbosa et al., 1989). Beginning the second month of observations the number of juvenile snails found out of water is being gradually reduced. The lamellate snail percentual number is also being reduced but the non lamellate snails persist out of water for longer periods than the lamellate ones. The disapearence of juvenile snails found outside water is associated with the maturity level (climax) attained by the snail populations.

Since 1977, additional 11 channels were seeded in our laboratory with *B. glabrata* and some of them were foliowed for several years. The mass migration phenomenon as described here has never been reproduced.

Paraense (1957) who first described this phenomenon in *B. glabrata*, suggests that the lamellate snails represent an adaptative character developed by selection in environments liable to the cyclic occurrence of drowght.

Most of the authors who have studied this phenomenon admit that lamellae production associated to periods of aestivation, represents a defense mechanism utilized by the snails against distressing ecological conditions. Richards (1964) admits that the lamellae also serve as supporting structures to the shells.

The tendency for lamellae formation and aestivation in *B. glabrata* according to Richards (1968) is determined by multifactoral inheritance.

More recently Pieri & Thomas (1986) and Danneman & Pieri (1989) made extensive studies on the production or lamellate *B. glabrata* juvenile snails providing quantitative support for the observations made by Paraense (1957) and Richards (1963, 1964, 1967, 1968).

The explanation for the peculiar behavior of *B. glabrata* described in the current paper is not easy. The fact that specimens of *B. glabrata* utilized in the current study were originated from natural habitats and immediatly immersed in the channels would suggest that suddenly changing of aquatic habitat conditions would estimulate escaping of the snails from the new enviroment to which they were not adapted.

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