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THE RELATION BETWEEN SEASONAL MIGRATION AND SPAWNING
OF A PERIWINKLE, *LITTORINA BREVICULA* (PHILIPPI)¹⁾

By

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(With one figure)

From September, 1955 to August, 1956, the writer observed the seasonal migration of *Littorina brevicula* (Philippi) (= *Littorivaga brevicula*) on the sea coast in the neighborhood of the Asamushi Marine Biological Station in Aomori Prefecture.

At the said situation, nine vertically serial quadrates, each of which covers an area of 2500 cm², were set from the supra-tidal level down to the low tide level, viz. U₂, U₁, 1, 2, 3, 4, 5, 6 and 7. Here, U₂ and U₁ are above the high tide level, and quadrates Nos. 1-7 are submerged during high tide and exposed at low tide except for the quadrate No. 2 where a fairly large rock pool appears at low tide.

The observation was made once a month during low ebb tide, and all snails in each quadrate were collected. The height of the shell was measured, wherefrom the snails were classified into seven groups as follows.

Group	Shell height	
1		less than 2.0 mm
2		2.0 - 4.0
3		4.0 - 6.0
4		6.0 - 8.0
5		8.0 - 10.0
6		10.0 - 12.0
7		more than 12.0

As all the snails found in each quadrate were collected once a month, those obtained in each catch should be immigrants migrated into each quadrate from its neighborhood during the previous one month and therefore their number obtained every month may be regarded as the immigration index of the snail. As the shell height of the mature snail exceeds 6.5 mm, those belonging Groups 1-3 are immature snails and Group 4 includes both mature and immature individuals and the other groups consist of mature snails.

1) Contributions from the Marine Biological Station of Asamushi, Aomori Ken, No. 254.

Though the snail migrates throughout the year, it is noticed that the immigration is very active in January and May, and is rather inactive in March, July and August.

The seasonal change of the distributing zone was also observed. In Table 1 the seasonal change of the distributing zone is shown with the collected individual number and some environmental conditions. During July, August and September the snails distribute extending from the supra-tidal level to a level somewhat higher than the mid-tide level, while during January, February and March they inhabit covering the widest and lowest zone which extend from the high tide level to the low tide level. Consequently the distributing zone moves downwards and becomes wider during October, November and December, while it moves upwards and becomes narrow during April, May and June.

Table 1
Seasonal change of the immigrated number of snails and their distributing zone and of the temperature conditions

	Number of snails	Distributing range							Air temp.	Sea water temp.
		U ₂	U ₁	1	2	3	4	5			6	7
29 Sept.	702	.....	.....	.....	.....	.....	.....	.....	20.7	22.5
25 Oct.	800	.....	.....	.....	.....	.....	.....	.....	15.9	18.2
25 Nov.	741	.....	.....	.....	.....	.....	.....	.....	9.1	13.0
27 Dec.	686	.....	.....	.....	.....	.....	.....	.....	5.0	9.0
21 Jan.	1216	.....	.....	.....	.....	.....	.....	.....	0.8	6.7
14 Feb.	796	.....	.....	.....	.....	.....	.....	.....	-0.3	5.5
15 March	367	.....	.....	.....	.....	.....	.....	.....	3.9	6.6
27 April	936	.....	.....	.....	.....	.....	.....	.....	10.0	9.0
29 May	1558	.....	.....	.....	.....	.....	.....	.....	16.3	13.2
29 June	580	.....	.....	.....	.....	.....	.....	.....	17.6	17.1
30 July	337	.....	.....	.....	.....	.....	.....	.....	20.5	19.6
24 Aug.	379	.....	.....	.....	.....	.....	.....	.....	22.9	22.9

The seasonal change in age distribution is recognized in the above mentioned snail population (Table 2). From the statistical treatments it is found that the younger snail is rather numerous during the winter, namely in November, December and January, and also in early summer, while large snails are predominant during early spring and summer.

Table 2
Seasonal change of the snail stages which are most numerous in number in each catch

Group	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.
1												
2	*											
3	*	*	*	*	*	*	*	*	*	*	*	*
4	*	*			*	*	*	*	*	*	*	*
5	*					*	*	*				
6												
7												

The most active season of each stage of snail

Group	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.
1									*			
2					*				*			
3					*			*	*			
4		*			*			*	*			
5					*			*	*			
6								*	*			
7								*	*			

As for the seven groups of snails, it is generally observed that the migration of each group is most active in January and in April and May.

The seasonal change of the distribution in each of the seven groups is shown in Fig. 1. Group 1 does not immigrate into the supra-tidal zone and its distributing zone is narrowest compared with the other groups. Immature snails of Groups 2 and 3 migrate into the supra-tidal zone during from July to October and the distributing zone extends seawards twice a year, viz. in winter and early spring.

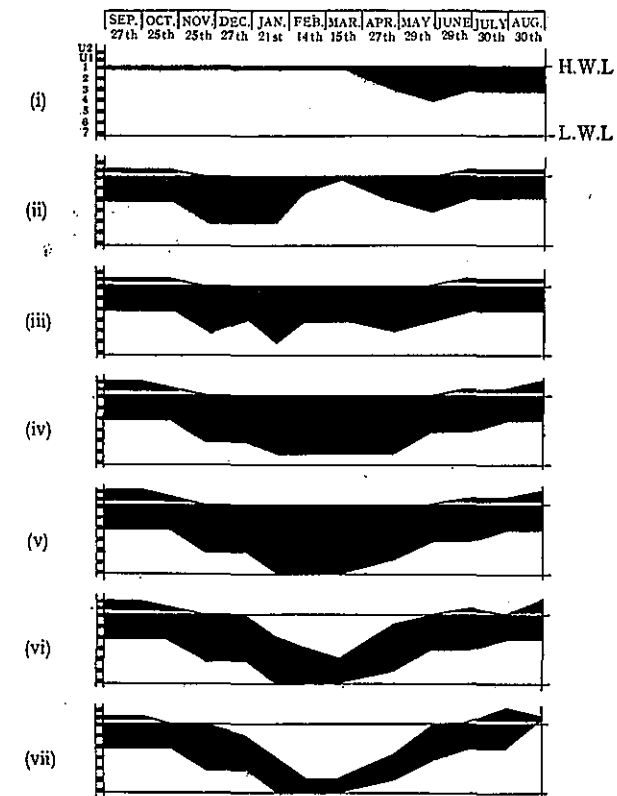


Fig. 1. Seasonal migration of each stage of snails.

The seasonal migration of the mature snail differs from the immature ones. In autumn they migrate downwards from the summer habitat of the supra-tidal level to the mid-tide level, to the winter habitat which covers the mid-tide level to the low tide level, and then in early spring they migrate again upwards to the summer habitat. This seasonal migration is outstanding in the old snails belonging to Groups 6 and 7. It is noted that though in winter the old snails are confined to the low tide level and nearby, the young snails of Groups 4 and 5 distribute widely from the high tide level to the low tide level.

As mentioned the mature snail groups inhabit in general the low tide level during from February to April, and it should be noted that this season is the breeding season of this snail. That the largest groups of snails aggregate densely near the low tide level suggests the close relation between the seasonal migration and the spawning of this species.