

## MATURITY OF THE SECOND GENERATION OF HATCHERY-CULTURED MURICID SNAIL (*CHICOREUS RAMOSUS* (L., 1758))

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### ABSTRACT

Muricid snails, *Chicoreus ramosus*, reared in Prachuap Khiri Khan hatchery spawned for the first time at the age of two years. The second generation raised in a shallow fiberglass tank was sexually mature at an age of one year, with sizes ranging from 54.2 to 98.4 mm in shell length and 19.05 to 85.0 g in total weight. Three snails were laying eggs during November 1995 to January 1996. Spawning duration of each spawner was 22, 37 and 58 days respectively. The number of egg capsules were 401, 595 and 713, respectively. Capsules measured from 7.7 to 11.0 mm in height and 3.0 to 3.9 mm in apical plate width. They are smaller than those of older snails. Size of newly hatched veligers ranged from 410 to 775  $\mu\text{m}$ , with a mean of 698  $\mu\text{m}$  while those from older broods had a mean size of 715  $\mu\text{m}$ . The veligers obtained from these young parents exhibited normal development through metamorphosis, and early juvenile growth was comparable with that of older spawners.

### INTRODUCTION

*Chicoreus ramosus* (Linnaeus, 1758) has been successfully cultured in Prachuap Khiri Khan Coastal Aquaculture Development Center since 1991 (Nugranad 1992; Nugranad *et al.* 1994). The cultured snails were capable of sexual maturation in captivity, with the spawning season from around September to March as in nature. The first batch of hatchery-produced snails began laying egg-capsules at the age of about two years in the 1993–1994 spawning season (Nugranad & Promchinda 1995). These young spawners yielded normal, but smaller egg capsules as well as normal larvae and juveniles compared to the ones produced by older spawners. Further observation in the 1995–1996 spawning season has led to the new finding that the second generation snails produced from the hatchery-cultured parents speeded up sexual maturation and began spawning at an age of only one year. This report will give the details of this spawning performance and the resulting offspring.

### MATERIALS AND METHODS

The second generation (F2) of *C. ramosus* in

this study was produced from three years old hatchery-cultured snails (F1) in their second spawning in the 1993-1994 spawning season. Hatchery and nursery techniques were as explained by Nugranad *et al.* (1994). After reaching the size of over 2 cm shell length, a total number of 307 juveniles were held in a flow-through system in a shallow fiberglass tank (width 40, length 200, and depth 20 cm). A flow of 1-2 litre  $\text{min}^{-1}$  of filtered seawater was provided. An adequate amount of live bivalves (*Isognomon* sp., *Pinctada fucata* (Gould, 1850) and *Saccostrea* spp.) was provided as food for the snails. The dead or eaten bivalves were checked and removed from the tank every morning. Debris and feces were siphoned out of the culture tank.

When snails began spawning, the culture tank was inspected daily. Spawners were marked and observed individually. Egg capsules were taken out from the spawning tank as soon as possible when the spawner had moved away from the mass. The number of capsules was counted. Capsule height and width of apical plate were measured by Vernier callipers following Bussarawit &

Table 1. Spawning of second generation (F2) hatchery-reared *Chicoreus ramosus*.

Spawner No.	Spawning period (initial-ended)	Duration (days)	Number of capsules
1	28 Nov. 1995 - 04 Jan. 1996	37	595
2	04 Dec. 1995 - 31 Jan. 1996	58	713
3	13 Dec. 1995 - 02 Jan. 1996	22	401
Average		39	569.6

Table 2. Spawning of the first generation (F1) of hatchery-reared *Chicoreus ramosus*.

Spawner No.	Spawning period (initial-ended)	Duration (days)	Number of capsules
1	14 Nov. 1995 - 02 Jan. 1996	49	463
2	25 Nov. 1995 - 12 Jan. 1996	48	598
3	18 Nov. 1995 - 23 Jan. 1996	66	1,851
4	02 Dec. 1995 - 03 Jan. 1996	32	223
5	02 Dec. 1995 - 26 Jan. 1996	52	913
Average		50	809.6

Table 3. Variation of egg capsule sizes from different groups of spawners. \* signifies that the age was unknown.

Broodstock	Age (years)	Capsule length (mm)			Capsule's apical plate width (mm)		
		Min	Max	Mean	Min	Max	Mean
Nature	*	17.0	26.8	23.50	4.5	7.7	6.17
F1	3	17.6	25.7	21.77	4.0	7.2	6.10
F1	2	12.0	25.8	18.47	4.1	7.4	5.80
F2	1	7.7	11.0	9.34	3.0	3.9	3.30

Ruangchua (1991). Shell length of newly hatched veligers was measured under microscope following Middelfart (1992). Similar observations on spawning were made for comparison with other spawner groups of the snails during the same spawning season.

### RESULTS AND DISCUSSION

At the age of one year, the second generation hatchery-produced *C. ramosus* ranged from 54.2 to 98.4 mm in shell length and 19.1 to 85.0 g in total weight. Three of these F2 snails laid their egg capsules during November 1995 to January 1996. Spawning duration of each spawner lasted 22, 37 and 58 days, with an average of 39 days. The number of egg capsules were 401, 595 and 713 respectively, with an average of 570 capsules per spawner (Tab. 1).

During the same spawning season, spawning duration of the older F1 spawners lasted for 32-66 days with an average of 50 days, and the number of egg capsules ranged from 223 to 1,851 with an average of 810 capsules per spawner (Tab. 2). These results showed that the younger spawners laid fewer egg

capsules than the older ones, corresponding with the previous observation of Nugranad & Promchinda (1995) that older and larger spawners laid more egg capsules than the younger and smaller snails.

Egg capsules produced from the F2 spawners ranged from 7.7 to 11.0 mm in length (mean 9.3 mm), and 3.0 to 3.9 mm in apical plate width (mean 3.3 mm), which were smaller than capsules from the older snails. Comparison of the capsule sizes of different groups of spawners is shown in Tab. 3.

The size of newly hatched veligers ranged from 410 to 775  $\mu\text{m}$  (mean 698  $\mu\text{m}$ ) while the ones from older broods ranged from 600 to 880  $\mu\text{m}$  (mean of 715  $\mu\text{m}$ ). After hatching, the veliger larvae spent 15 to 19 days before settlement. The early one month old juveniles ranged from 0.90 to 1.35 mm shell length (mean 1.13 mm). The veligers produced by these young parents exhibited normal development through metamorphosis, and early juvenile growth was comparable with other groups being reared during the same period. However, one month old juveniles of this batch attained smaller sizes

than the previously reported (Nugranad *et al.* 1994). The batch resulting from wild broodstock, ranged from 1.28 to 2.84 mm shell length (mean 2.09 mm). This growth variation is not fully understood. The rapid sexual maturation at the age of one year might be caused by unsuitable conditions in the culture tank, or some other stress that made the young snails attempt to produce their offspring as fast as possible for surviv-

ing. In nature, it is not possible to find mature snails of this small size.

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