

NOTES ON THE REPRODUCTION OF *Neritina virginea* (LINNAEUS, 1758) IN NORTHEAST BRAZIL (MOLLUSCA: GASTROPODA: NERITIDAE)

Notas sobre a reprodução de *Neritina virginea* (Linnaeus, 1758)
no Nordeste do Brasil (Mollusca: Gastropoda: Neritidae)

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RESUMO

A morfologia do sistema reprodutivo, o desenvolvimento larval, o período de reprodução e a ooteca de *Neritina virginea* (Linnaeus, 1758) foram estudadas a partir de material coletado no estuário do Rio Cocó, Estado do Ceará, nordeste do Brasil. O sistema reprodutor da fêmea de *N. virginea* tem dois gonóporos; o poro vaginal e o poro para a saída da ooteca. A ooteca tem em média 45 ovos, formato circular e geralmente é coberta com grãos de areia. *N. virginea* tem desenvolvimento intracapsular que leva em média 288 horas. A atividade reprodutiva ocorre durante os meses de julho a dezembro, que corresponde ao período de estiagem na região. Dados de campo e de laboratório são comparados.

Palavras-chaves: *Neritina virginea*, reprodução, desenvolvimento larval, Mollusca, Gastropoda.

ABSTRACT

Reproductive system morphology, spawning, larval development, maturation period, and egg capsules of *Neritina virginea* (Linnaeus, 1758) were studied in the estuary of Cocó River, State of Ceará, Northeast Brazil. The female reproductive system of *N. virginea* has two gonopores; the vaginal pore and the egg capsule exit. The egg capsules have in average 45 eggs a circular shape and are covered with sand grains. *N. virginea* has a intracapsular development that takes 288 hours in average. Reproductive activity concentrated during the months of July to December that is the dry season in this region. Field and laboratory data are compared.

Keywords: *Neritina virginea*, reproduction, larval development, Mollusca, Gastropoda.

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INTRODUCTION

Neritina virginea (Linnaeus, 1758), is an intertidal prosobranch gastropod that inhabits the estuaries of the State of Ceará, Northeast Brazil. This species is found in the tropical and subtropical areas in the Atlantic West (Andrews, 1940; Flores & Cáceres, 1973; Matthews-Cascon *et al.*, 1990; Rios, 1994). In Brazil, *N. virginea* has a distribution since the State of Pará (North) to the State of Santa Catarina (South) and is found in large numbers in estuarine areas (Matthews-Cascon *et al.*, 1990; Rios, 1994). According to Flores & Cáceres (1973), the species of the genus *Neritina* are found in the sand and mud, in protected areas. *Neritina virginea* has a short proboscide, radula rhipidoglossate, and long tentacles. This species is herbivorous, feeding on diatoms and usually eats at night. The eggs of *Neritina virginea* are little white capsules round or elliptic, and they are attached strongly on peaces of wood, rocks, and fallen leaves from the trees. The objectives of this study were to investigate the reproductive pattern and the morphology of the reproductive system of *Neritina virginea*.

MATERIALS AND METHODS

Monthly samplings were made on the estuary of Cocó River, Fortaleza, State of Ceará, Northeast Brazil (3° 46' S, 38° 25' W), from July, 1990 through September 1991. During those, samples of 50 adult individuals were measured and the presence of individuals breeding noted. At the study site all specimens over 5 mm in length were considered adult. Thirty adults were taken to the laboratory for observations in aquaria. They were held in a 20 liter aquaria in aerated water from the study site. Egg capsules collected in the field were placed in 600 ml laboratory aquaria for further observations.

The developmental stage of the eggs of 10 different capsules was observed daily during a week under a microscope (25 x). The number of eggs in 31 capsules was counted through a microscope (25 x). For anatomical studies 50 specimens were anesthetized with menthol, and preserved in 70% alcohol.

RESULTS

Reproduction System Morphology

The female of *Neritina virginea* has two gonopores: one for the egg capsule exit (called by Hyman (1967) the main female gonopore), and the vaginal pore. Near the main female gonopore, on its left side, a reinforcement sac is present (plate 1; figure 1) containing sand grains. A long, straight vagina opens

at the vaginal pore, leading to a spermatophore sac. The vagina has a left lateral diverticulum leading to an albumen gland. This diverticulum before reaching the albumen gland gives off a branch connecting to a seminal receptacle (plate 1; figure 2).

The albumen and capsule glands compose a single unit (plate 1; figure 2) that can only be histologically identified. The ovary, connected to the albumen gland, has many small parallel digitiformes vilosities. The spermatophore sac contains a minimum of five and a maximum of seven circular spermatophores with a long thread like filament (plate 1; figure 3).

Egg Capsules

The egg capsules were deposited on any available substrate, such as wood, mollusk shells, plastic bags, but mainly on fallen *Rhizophora mangle* leaves. Capsules are whitish when deposited, and become yellowish as development occurs. They have a circular shape and measure about 1 mm in diameter. The capsule surface in contact with the substrate is flat, while the opposite one is convex. They are always covered with sand grains, probably from the reinforcement sac and have on the average, 45 eggs each (± 2.16 SE, range 26-71, N = 31).

Larval Development

Spawning that occurred in the laboratory allowed the study of the duration of each developmental stage from cleavage to the eclosion of young specimens. The following were observed:

a) 18 hours after spawning, the eggs had 2 to 4 blastomeres. The cleavage process lasted for 72 hours in average.

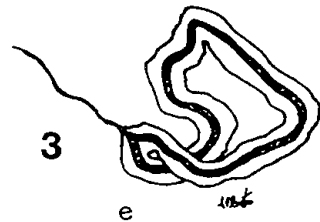
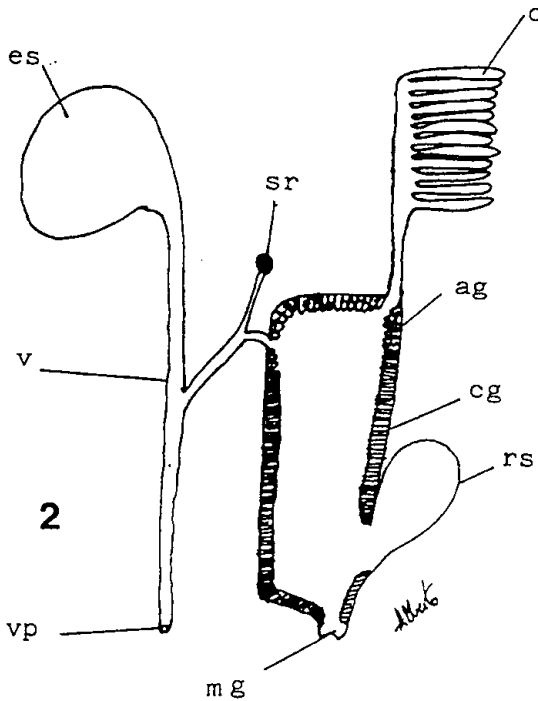
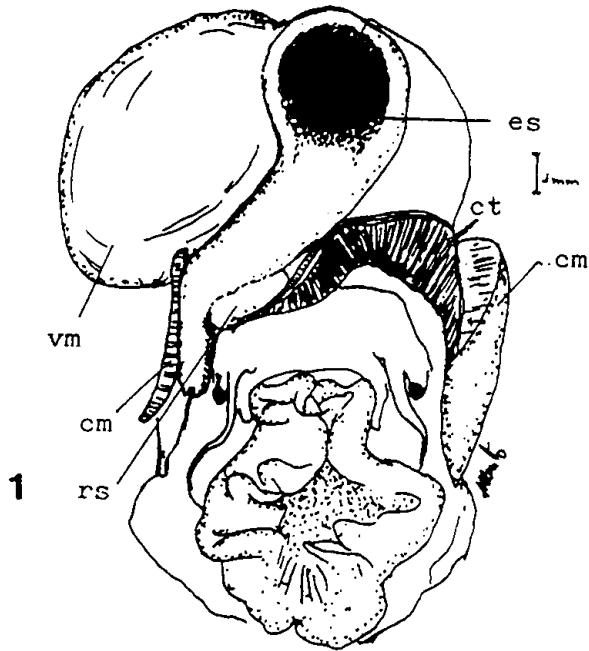
b) At the end of the dividing process it was possible to observe the trocophore stage, with its typical rotatory movement inside the capsule. The trocophore stage also lasted for 72 hours in average.

c) After the trocophore stage, the larvae already has an embryonic shell and a statocist, having reached the veliger stage, that lasted 144 hours in average also inside the capsule. The young *N. virginea* took 288 hours in average to complete the development, when they were found in the aquaria, and the capsules were found to be broken or loosened to permit the exit of the crawling snail.

Reproduction and Maturation Periods

Egg capsules were common from July to December, that is the dry season in the region. From January to May, the rainy season, very few egg capsules were found.

Plate 1



Figures 1-3.1 - Adult female, showing the pelear cavity; 2 - Schematic detail of the female reproductive structures; 3 - Schematic drawing of the spermatophore. ag - albumen gland, cg - capsule gland, cm - collumelar muscle, ct - ctenidium, e - apertophore, es - spermatophore sac, mg - main gonopore, o - ovary, rs - reinforcement sac, v - vagina, vm - visceral mass, vp - vaginal pore.

Most of the individuals reared in the laboratory survived and became sexually mature. Eight months after they hatched, most females produced egg capsules. The average size of the adult females and males breeding in the laboratory was 6.0 mm in length.

DISCUSSION

According to Risbec (1937) and Andrews (1935), the reinforcement sac contains foreign bodies such as sand, sponge spicules, diatoms, foraminiferan shells, and calcareous spherulites, and adds these to the egg capsule. However, we found that the reinforcement sac of *Neritina virginea* contained only sand grains, and consequently, so did the egg capsules, although diatoms were abundant in the estuary where the animals were collected (personal observation).

In most genera of the family Neritidae the females have three genital pores (Hyman, 1967). Nevertheless, we found just two genital pores in *Neritina virginea*, as it was previously registered for *Theodoxus fluviatilis* (Hyman, 1967).

Andrews (1940) said that *Neritina virginea* is found widely in rivers but also occurs in estuaries and in the sea, near shore. Nevertheless, in the State of Ceará *Neritina virginea* is found only in estuaries.

CONCLUSION

Neritina virginea has a intracapsular metamorphose. In Ceará State, Brazil this species concentrates

its reproductive activity in the dry season, when the salinity in the estuary is higher.

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