Sex determination and sexual organ systems of the babylon snail *Babylonia spirata* Linné

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Babylonia spirata has separate sexes. Hermaphroditic snails have not been encountered. Male and female can be distinguished from a shell length of 20 mm. The main sexual components of the male and female reproductive systems are described. A small, pointed, cylinder-shaped, light to dark brown penis located above right tentacle characterises males.

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INTRODUCTION

The neogastropod *Babylonia spirata* is a carnivorous gastropod in the family Buccinidae. The species has considerable value in Indonesia, but it is now over-exploited with the result that babylon snail caught at Pelabuhan Ratu is becoming smaller (Yulianda & Danakusumah 2000).

Generally neogastropods are gonochoristic (Webber, 1977) and they have a balanced sex ratio (Fretter 1984). According to Yulianda *et al.* (2000) the sexual ratio of male to female *Babylonia spirata* was 1: 1.3. Gonochoristic snails are also characterised by having sexes of similar size. In agreement, Yulianda *et al.* (2000) found that shell lengths of male and female snails were not significantly different. Sexes cannot be distinguished from size and colour of their shells. The reproduction system of the babylon snail is little known. In the present study I describe the morphology and anatomy of male and female reproductive systems.

MATERIALS AND METHODS

Babylonia spirata of various sizes were collected from the shore of Pelabuhan Ratu, West Java. They were stored in the laboratory at Bojonegara Research Station for Coastal Aquaculture, Serang, Bojonegara. External morphology was observed and histological preparation made of gonads.

RESULTS AND DISCUSSION

Snails with a shell length of about 20 mm were sexually mature. The present findings show that *Babylonia spirata* has separate sexes (is gonochoristic). Hermaphroditic snails have not been encountered. Males are characterized by a small pointed cylinder-shaped, light to dark brown penis located behind the mantle edge above right tentacle (Fig. 1).

The female organ has two openings: a genital pore and a female opening. The genital pore is pipe-like and located above its head. It functions as an entrance for the penis and release of egg capsules. A ventral pedal gland is also present in females, which is located ventrally near the anterior end of the foot. This gland functions to shape and harden the egg capsules released and transferred from the capsule gland to the underside of the foot (Fig. 2). Egg capsules are attached to sand grains.

The gonad of sexually mature *Babylonia spirata* has the form of a spiral on one side of the digestive gland (Figs. 1,2). The colour of

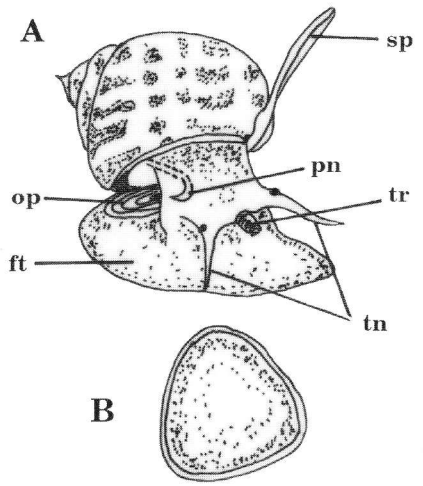

Figure 1. Morphology of the male *Babylonia spirata*. (A) Body and shell: ft = foot, op = operculum, pn = penis, sp = siphon, tn = tentacle, tr = mouth; (B) Foot, ventral view.

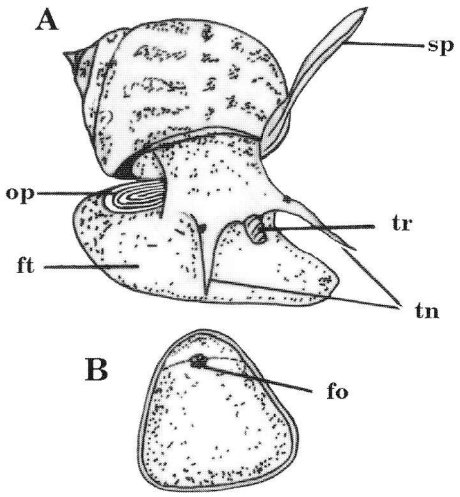

Figure 2. Morphology of female *Babylonia spirata*. (A) Body and shell: ft = foot, op = operculum, pn = penis, sp = siphon, tn = tentacle, tr = mouth; (B) Foot, ventral view, fo = female opening.

the digestive gland is cream to light brown. The testis is yellow or orange, and the ovary dark brown.

At maturity the testis and ovary occupy a large part of the tissue. The gonad of a mature female contains eggs, which are orderly compiled in tubes. Sperms in the testis are also contained within a tube-like membrane. Egg tubes in the ovary appear clearer than the sperms tubes of the testis. The tubes become clearer with increasing maturity of the gonads.

In male, the sperm duct connects the testis to the penis through prostate. Vas deferens connects the prostate and the penis. The penis

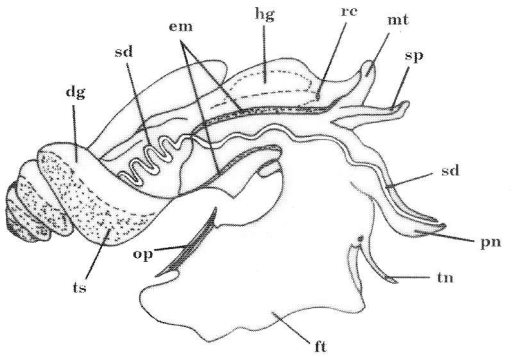

Figure 3. Reproductive system of male *Babylonia spirata* (viewed from the right side); dg = digestive gland, em = edge of mantle, ft = foot, hg = hypobranchial gland, mt = mantle, op = operculum, pn = penis, rc = rectum, sd = sperm duct, sp = siphon, tn = tentacles, ts = testis.

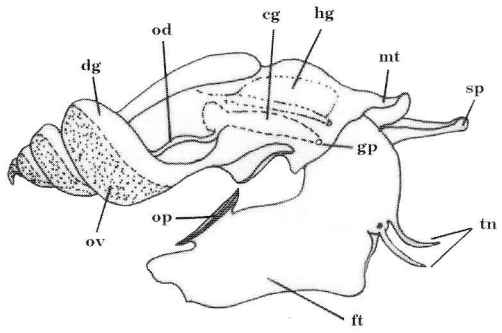

Figure 4. Reproductive system of female *Babylonia spirata* (viewed from the right side); cg = capsule gland, dg = digestive gland, ft = foot, gp = genital pore, hg = hypobranchial gland, mt = mantle, op = operculum, od = oviduct, ov = ovary, sp = siphon, tn = tentacle.

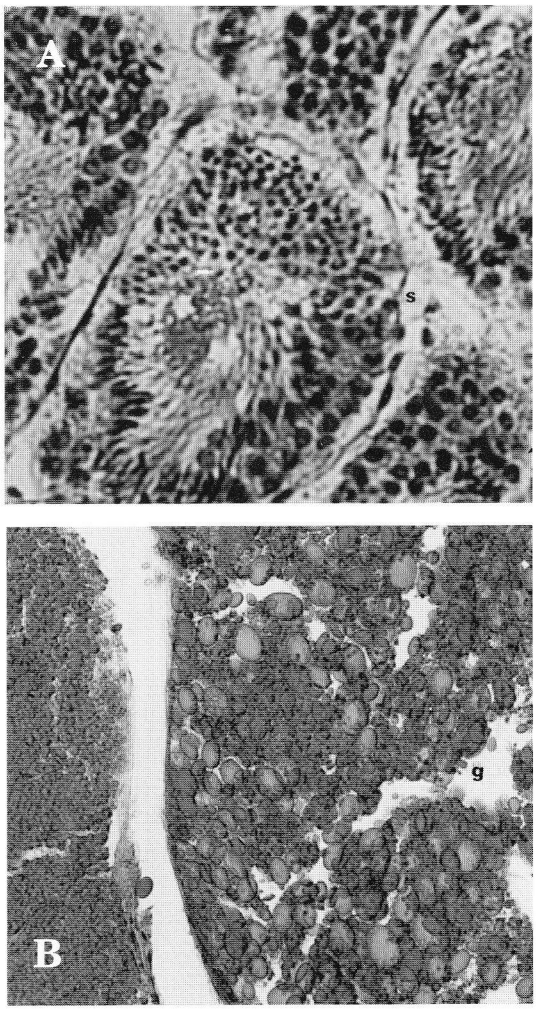

Figure 5. Sections of the gonads of male (A) and female (B) *Babylonia spirata*.(s = Sertoli cell, g = germ cell)

can be seen in live snails when the head and the tentacles of the snail emerge from the shell. The tip of the penis has a genital pore through which the sperm is released during copulation (Fig. 3).

In the reproduction system of female (Fig. 4) the gonad is connected to the oviduct to capsule gland. The fertilized eggs are prepared for release in the capsule gland before the egg capsule is attached to the substrate via the female opening.

Sections of babylon gonads only showed gonochoristic organs. Epithelial cells (Sertoli cells) lining testes and nursing developing spermatozoa were identified in testes (Fig. 5). Mature female gonads contained numerous oval eggs. Oogenesis and the germinal epithelium covering the ovary were identified (Fig. 5)

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