



## Note on the spawning and development of the common spider conch *Lambis lambis*

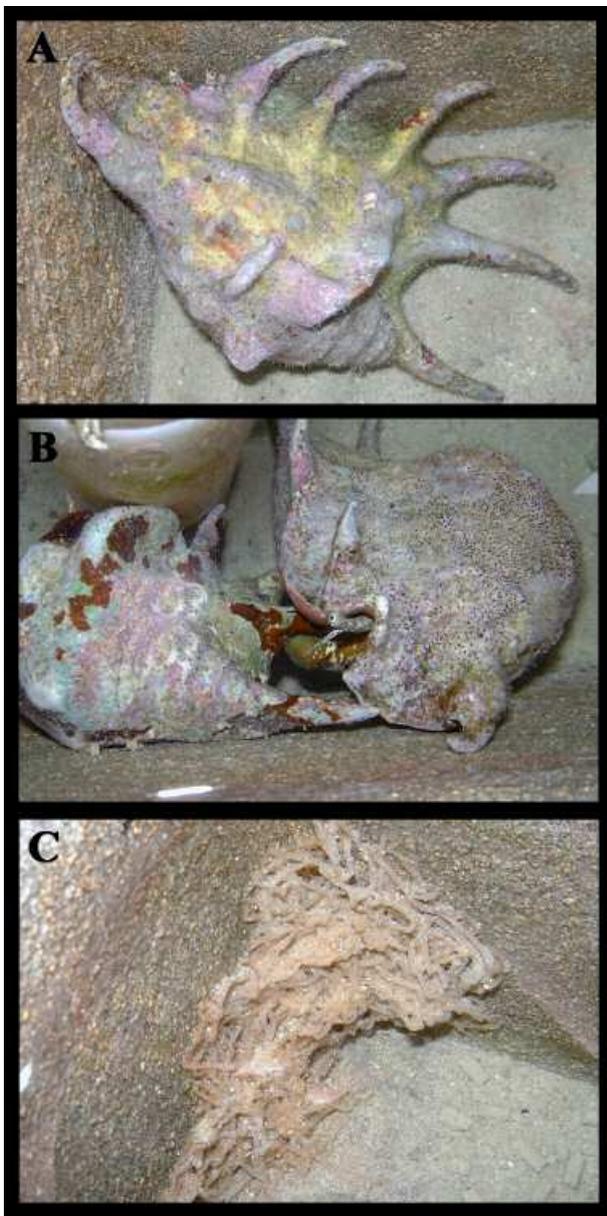
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The common spider conch *Lambis lambis* (Fig. 1a) of the family Strombidae is abundant in the shallow waters of the Indo-Pacific. The species is sought by shell collectors in several locations

including the Philippines, Solomon Islands, Indonesia and India, and is harvested for food in Japan. Common spider conches are found mainly on sand among rocks or on coral reefs from the intertidal zone to ca 20 m depth. For the present study, 12 specimens were collected in the lagoon of Majuro atoll, Marshall Islands, in ca 2–3 m of water on protected sand beds. They measured ~ 20 cm long. The conches were maintained at the Marshall Islands Science Station in groups of four individuals per 50 L concrete tank under flow-through conditions at ca 200 L h<sup>-1</sup>. All parameters fluctuated naturally, including salinity (29 to 33‰), temperature (24 to 29°C) and photoperiod.

Pairing and copulation were recorded on three occasions (Fig. 1b) in the middle of the day. Male and female were positioned face to face throughout copulation, which lasted at least 2–3 h (probably more, as copulation was already in progress when noticed). Spawning occurred at night in the 2 weeks following copulation and was not correlated with any obvious environmental factor. Several masses of cylindrical egg filaments (Fig. 1c) were observed early in the morning of 10 October 2001. The maze of egg filaments (ca 1800 µm in diameter) looked like very fine, pale brown threads of various lengths tangled and glued together as if they were one continuous coil.

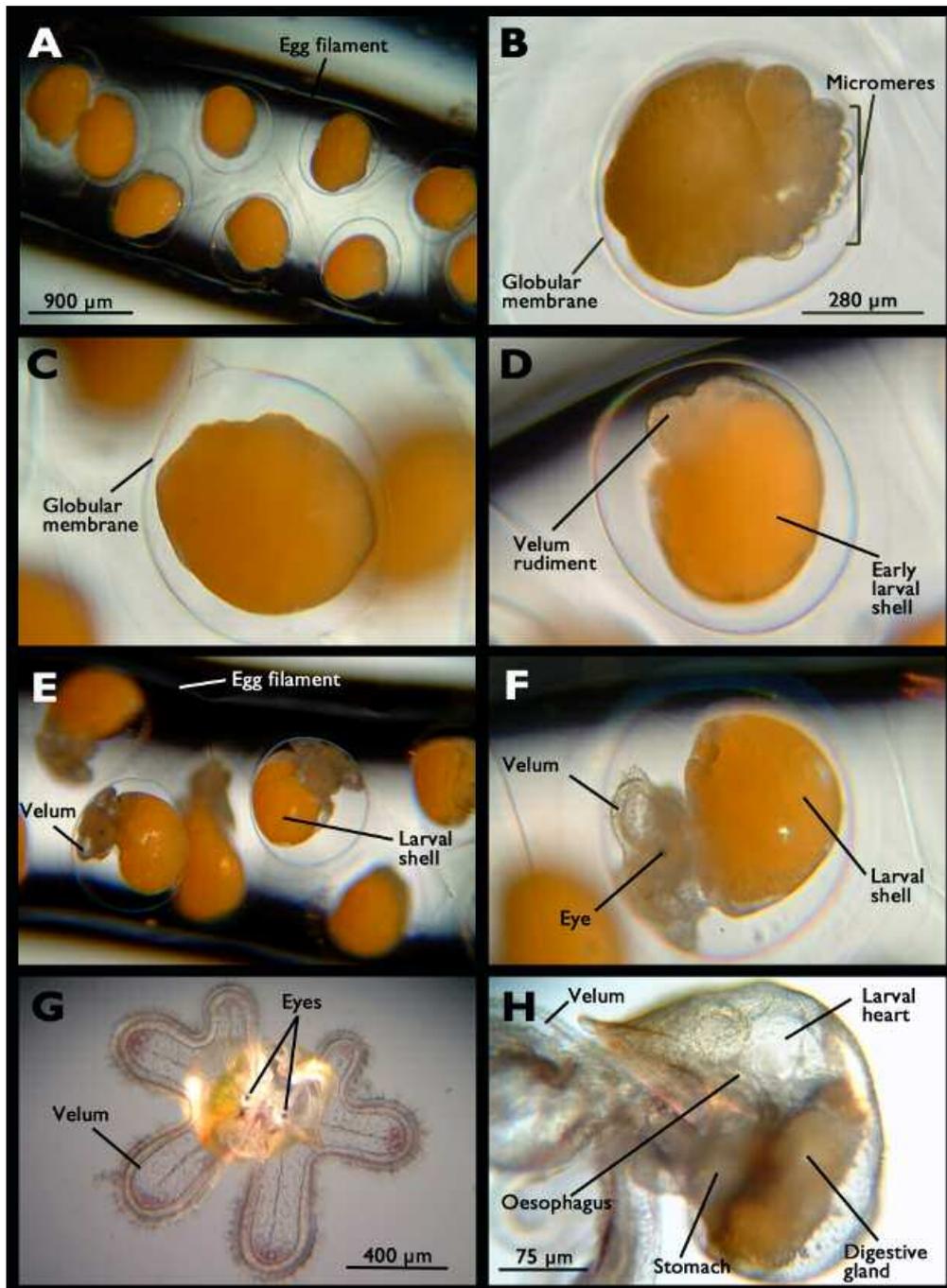
The lecithotrophic embryos were already in the cleavage stage, typically positioned in a single or double row within the egg filament (Fig. 2a). Embryos measured ca 560 µm in



**Figure 1.**

- (A) The common spider conch *Lambis lambis* collected in Majuro, Marshall Islands;  
 (B) male and female *L. lambis* during copulation;  
 (C) newly deposited egg filaments.

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**Figure 2.** Development of *Lambis lambis*.

- (A) Egg filament containing embryos at the cleavage stage;
- (B) embryo at the cleavage stage showing the globular membrane and micromeres;
- (C) embryo at the late gastrula stage;
- (D) trocophore larva showing the rudiments of the early larval shell and velum;
- (E) egg filament containing early veliger larvae still enclosed in the globular membrane, showing the larval shell and velum;
- (F) close-up of the early veliger before hatching, showing the eyes, velum and shell;
- (G) newly hatched veliger larva swimming in the water column, showing the velum with the crown of cilia and eyes;
- (H) close-up of fully developed free-swimming veliger showing the oesophagus, stomach, digestive gland, shell, velum and larval heart.

The scale bar in A also applies to C, D and F and the scale bar in B also applies to E.

diameter and were ciliated and rotating clockwise (Fig. 2b) within a transparent globular membrane. The macromeres and micromeres were distinctly visible (Fig. 2a, b). About 10 h later, the embryos started developing early larval shell and velum rudiments (Fig. 2d). Roughly 24 h later, 50% of all embryos had reached the early veliger stage, measuring 670  $\mu\text{m}$  (Fig. 2e, f). Still in the egg filament, they had developed a well-defined larval shell, velum, crown of cilia and two eyes.

From egg-laying until the early veliger stage, the females remained close to the spawn, covering it entirely or in part with their shell. This protective behaviour ceased at the beginning of the third day of development. The females moved away a few hours before the veligers hatched from the filament at a size of 900  $\mu\text{m}$  on day 3 (Fig. 2g). After five days of development, the veligers measured 1100  $\mu\text{m}$  and were swimming close to the water surface. They possessed a

well-defined stomach, digestive gland, oesophagus and larval heart (Fig. 2h). Cardiac pulse was around 1 pulsation  $\text{sec}^{-1}$  during active swimming but varied with the level of activity of the velum and the response to stress that also elicited retraction of cilia into the shell. The veligers were very photo-reactive and sensitive to physical contact. They were fed *Spirulina* powder. Although they seemed to feed, as shown by the green coloration of the stomach, the veligers died after a total of seven days under laboratory conditions for reasons unknown.

### Acknowledgments

We would like to thank the staff of the Marshall Islands Science Station (MISS), College of the Marshall Islands, for their help during the collection of *L. lambis* and the laboratory observations.