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A BRIEF ACCOUNT OF THE SPAWN OF *CONUBER INCEI* (PHILIPPI, 1853) (GASTROPODA : NATICIDAE)

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Reproduction in the Pheasant Shell, *Phasianella australis* (Gmelin, 1788)

(GASTROPODA : TURBINIDAE)

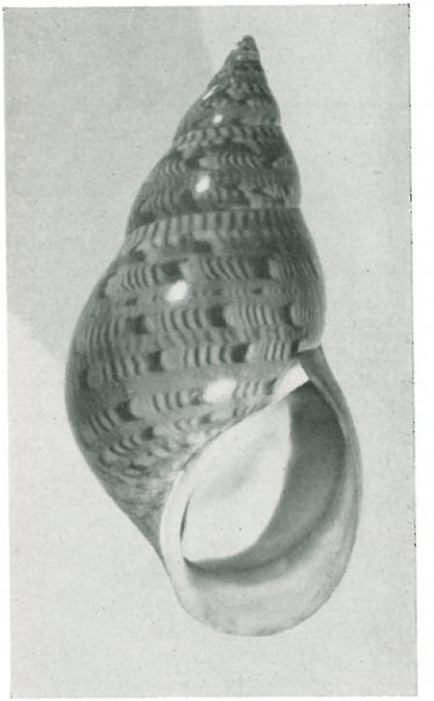
By Florence V. Murray*

Introduction

Commonly known as the "Pheasant Shell" or "Painted Lady", this turbinid is one of the most colourful molluscs found in southern Australian waters, and reaching up to five inches in length, is the largest species within the genus. The polished, porcellaneous shell, with its rich and variable colours and patterns, is a popular collector's item; the white, china-like, calcareous operculum fitting closely within the fragile lip, adds to its attraction. The animal is coloured to tone with the shell, and in life is active and spectacular.

The species ranges from Western Australia, east along the south coast, to Victoria and Tasmania, inhabiting bays and inlets where rocks and sand meet, and where there is a growth of the algae on which it feeds. Juveniles and young adults may be found in intertidal areas under algae-covered rocks and stones; large specimens are usually in deeper water on weed beds, particularly *Cympodacea australis,* where they may occur in vast numbers.

Since the turbinids are grouped in the Order Archaeogastropoda, the most primitive living gastropods, it could be expected that their mode of reproduction would follow, in general, that of similar primitive species. The British Pheasant Shell, *Tricolia pullus* (L.), is recorded as shedding its eggs freely into the water (Lebour, 1937), but otherwise nothing appeared to be known about turbinid life histories (Anderson, 1960), and this suggested an investigation into the spawning habits of the Australian species *Phasianella australis.*



Phasianella australis (Gmelin, 1788) Ventral view.

The Experiment

This was carried out in a 4-gallon aquarium fitted with a filter, a substratum of sand and stones, and a supply of "Sea Lettuce", *Ulva lactuca*. Three medium-sized specimens, 39, 48 and 60 mm in length, taken at Balnarring and Westernport, on the 17th November, 1963, were placed in the aquarium where they crawled up the walls and settled down at the water level.

* 13 Gaynor Court, Malvern, Victoria.

No further inspection was made until about 9.00 o'clock the following evening when, shortly after the light had been switched on, the largest specimen, still in the same position at the water level, drew back its body into the shell, and, still clinging to the glass with its foot, pushed forward convulsively and expelled a jet of cloudy material. This procedure was repeated several times during the next 30 minutes, making the water in the aquarium quite turbid. Presumably this was a male animal spawning. While a sample of the ejaculate was being collected with a syringe, a movement causing a slight splash, was made by one of the smaller specimens also still clinging to the glass at the water level. Perhaps this was a female responding to the stimulus of the male emission; therefore another syringe was quickly directed to draw off water surrounding the animal, and this was found to contain minute green-coloured eggs only 0·14 mm in diameter. The male ejaculate contained myriads of motile cells, or spermatozoa, with heads 0·003 mm and tails 0·048 mm long. The two samples were placed together in a petri dish where fertilization of the eggs took place, and almost immediately development began. Within 12 hours ciliated embryos were revolving in the egg envelopes, and after another 12 hours they hatched as brilliant-green, lively little primitive, free-swimming larvae known as trochophores.

Phasianella australis (Gmelin, 1788) Dorsal view.

Further studies are needed to gain information on the development of the trochophore into a shelled veliger; the behaviour of this larval form in the plankton; and the transition from its free-swimming life to that of its benthic, crawling parent.

Acknowledgements

I am indebted to Mr. J. E. Petersen of the C.S.I.R.O. Animal Health Laboratory for the micro-measurements, and to Mr. A. M. Rowlatt of the same Laboratory for the photographs.

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Pls. 6, 7.

SUMMARY

C. incei releases an egg mass which differs essentially from the classical sand-collar spawn of the naticids in being sand-free. The larvae hatch as free-swimming planktotrophic veligers.

Genus *CONUBER* Finlay and Marwick

Conuber Finlay and Marwick, 1937, *Palaeont. Bull. N.Z.* 15: 53.

Conuber incei (Philippi)

Natica incei Philippi, 1853, *Proc. Zool. Soc. Lond.*, 1851: 233.

INTRODUCTION

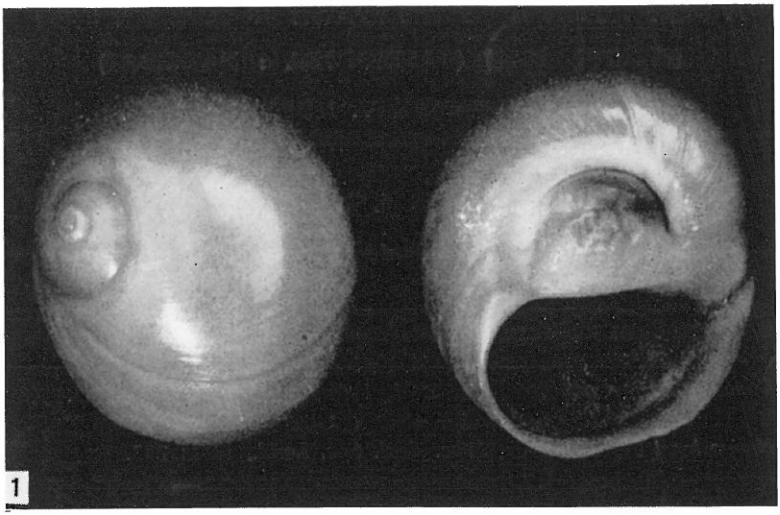
The presence of sand grains is characteristic of naticid spawn, which, typically, is a collar-shaped, sand-encrusted, gelatinous ribbon, but in 1962 it was found that three species, *Conuber conicum* (Lamarck, 1822), *C. sordidum* (Swainson, 1821) and *C. melastoma* (Swainson, 1822), produced voluminous, gelatinous egg masses free of sand (Murray, 1962), and this suggested an investigation into the spawning behaviour of *Conuber incei*, a species inhabiting ocean beaches and ranging throughout Australia generally, with the exception of Tasmania. (Pl. 6, fig. 1).

BREEDING HABITS

The experiment was carried out with specimens from the sheltered ocean beach at Waratah Bay on Wilson's Promontory in southern Victoria. There, in November 1962, at low tide, on the extensive sandy inter-tidal area the snails were surfacing in abundance, both juveniles in various stages of growth and adults reaching up to 28 mm. in length. Mating pairs were located at the ends of trails in the sand and five of these, of medium size, were selected and transferred to a two-gallon aquarium with a substratum of sand from their habitat. Pairing also took place in the aquarium. In all cases observed the male was the smaller of the two and clung tenaciously to the back of the shell of its partner in such a position as to allow its penis to pass down over the edge of the outer lip of the female shell aperture and then to turn upwards into the mantle cavity; at the same time the anterior reflexion of the propodium, inflated laterally, afforded protection from sand etc. Pairs were noted to remain in union for several hours and were not easily separated: if disturbed, the female would push down into the sand without unsettling or interrupting the male.

Egg collars were released from December through to March. Possibly spawning would begin before December; although the experiment was repeated in 1963 and 1964 the collection of material at an earlier date in either year proved personally impracticable. No collars were found in the field but only a few searches were made and their size and nature would make them difficult to see.

* 13 Gaynor Court, Malvern, Victoria.



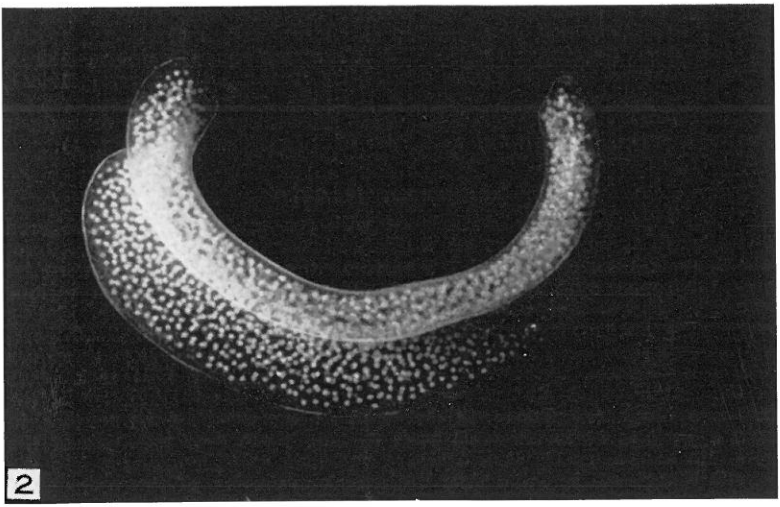


PLATE 6.

1. *Conuber incei* (Philippi). Shells: 29 x 24 x 15 mm.
2. *Conuber incei* (Philippi). Gelatinous egg collar. Basal length 45 mm; height 13 mm.

FOOD

The snails were constantly supplied with the small Wedge Shell, *Donacilla nitida* (Deshayes), which they bored and sucked voraciously, preferring them to other bivalves offered.

THE SPAWN

(Pl. 6, fig. 2)

The egg mass is a firm, flexible, gelatinous ribbon in the form of an incomplete annulus: its wall is concave on the outer and convex on the inner face; several layers of egg capsules are contained within the matrix, except at the margins, which are acapsular; the apical margin tends to thicken, while the basal margin tapers away to a thin edge on which the ribbon rests in its natural position: the whole is invested with a thin, transparent integument.

In size, the collars varied considerably (basal length from 25-50 mm., width (height) 8-13 mm., thickness 1.3-2.5 mm.); these were produced by parents with shells averaging 20 x 16 x 9 mm. in length, width and height: larger parents presumably would release larger egg masses.

Specimens have been deposited in the National Museum of Victoria, Melbourne (reg. no. F 26386).

THE EGG CAPSULES

(Pl. 7)

The eggs are yellow, spherical and average 0.25 mm. in diameter; each is covered by a vitelline membrane and is contained within an elastic

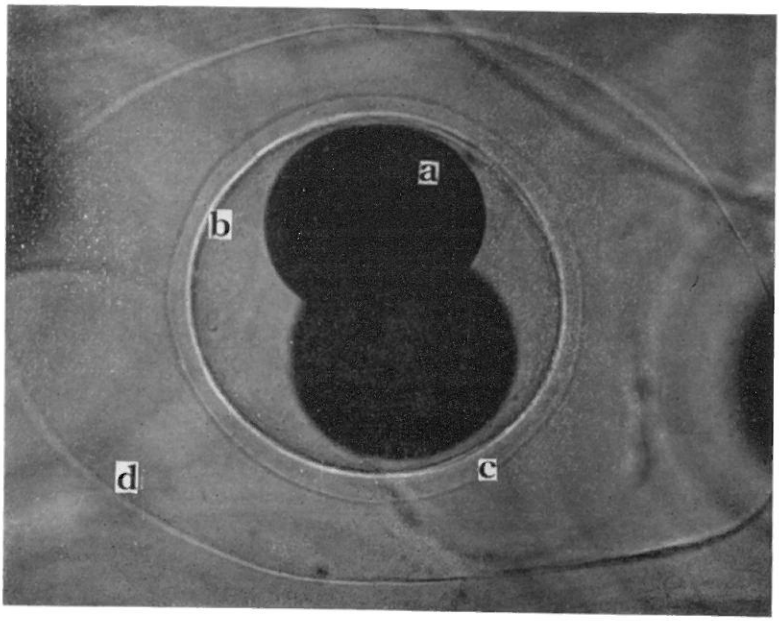


PLATE 7.

Conuber incei (Philippi). Egg. capsule.
a = egg in cleavage, b = egg envelope,
c = envelope covering, d = outer capsule.
Photomicrograph x 112

envelope which in turn is suspended in a larger or outer capsule. The envelope is invested with a membranous covering and is spherical with an average diameter of 0.35 mm.: it enlarges as the embryo develops and prior to hatching, when it ruptures, it almost fills the outer capsule which is oval averaging 0.75 x 0.50 mm. These capsules are closely packed within the matrix of the ribbon, and being dovetailed into each other may be irregularly shaped.

As the mass ripens the integument sloughs away in fragments, and the gelatinous matrix slowly dissolves allowing the veligers, which have escaped from the ruptured capsules into the jelly, to enter the water. Dissolution begins in 10-14 days according to the temperature.

DEVELOPMENT

Spawning takes place beneath the sand and in one collar, which was examined as soon as it had been pushed to the surface, the eggs at the initial end of the ribbon were beginning to cleave. The first two cleavages are equal and are achieved within a few hours at a water temperature of 21°C: subsequent cleavages result in the formation of large macromeres and small micromeres which spread rapidly over the former giving rise to a blastula within 12 hours. A flattening at the animal and vegetative poles leads on to gastrulation during the next 12 hours and the trochophore stage is reached within 48 hours. Subsequent development follows, in general, the pattern outlined for other *Conuber* species in a previous paper (Murray, 1962).

The veligers have large, almost rectangular velum lobes heavily pigmented with purple at the borders. Their shells are colourless, consist of about one whorl and average 0.425 mm. across at hatching.

ACKNOWLEDGEMENTS

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