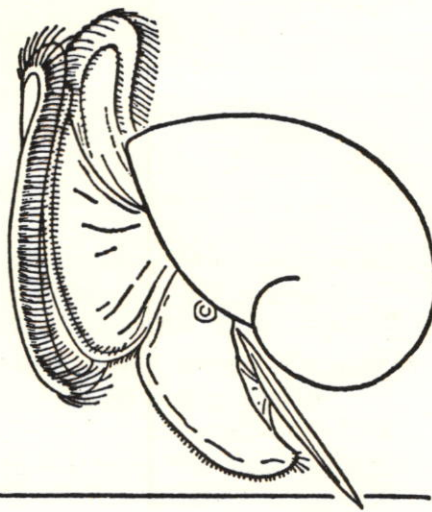


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ORDER, Suborder, DIVISION, Subdivision, SECTION,
SUPERFAMILY, FAMILY, Subfamily, Genus, (Subgenus)
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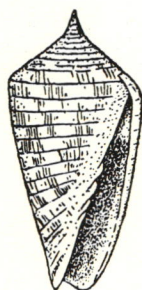
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Notes on *Cypraea cinerea* Gmelin and *Cyphoma gibbosum* (Linnaeus) from the Caribbean Sea and Description of their Spawn

BY

KLAUS BANDEL

Institute of Paleontology of the University Bonn, Germany

(2 Text figures)

INTRODUCTION

IN SHALLOW WATER AREAS with abundant coral-growth in the region of Santa Marta, Colombia and of Curaçao, Netherlands Antilles, *Cypraea cinerea* Gmelin, 1791 is the most common species of the genus *Cypraea*. Usually the brownish mauve to light orange-brown shell is hidden under a blackish-gray to dark brown mantle with gray specks and many smooth, small tubercles. In more or less the same habitat sea-fans are to be found and living on them are usually 2 or 3 *Cyphoma gibbosum* (Linnaeus, 1758). The rich cream-orange to pure-white shell usually is covered almost completely with the translucent, opaque mantle with dark orange spots surrounded by a brown rim. Both species are cypraeans, one belonging to the family Cypraeidae, the other to the family Ovulidae.

Descriptions of cypraeacean spawn are found in VAYS-SIÈRE (1923), LÉBOUR (1932), ØSTERGAARD (1950), NATARAJAN (1958), THEODOR (1967), and D'ASARO (1969).

METHODS

Egg masses were collected by the author while working in the Instituto Colombo Aleman (ICAL) in Santa Marta, Colombia from fall 1970 to spring 1972 and while visiting the Caraïbisch Marien-Biologisch Instituut (Carmabi) in Curaçao, Netherlands Antilles in July 1971.

Adult specimens were kept in aquaria with sea-water running 12 hours a day in the laboratory of the ICAL in Santa Marta for over a year. Egg masses were kept in dishes until hatching of the young. Water was exchanged in these dishes daily or every other day and temperature of the water was that of the airconditioned laboratory (air between 25° and 27° C). Egg capsules and masses were

measured and drawn from freshly laid living material in the laboratory, afterwards fixed in 70% alcohol.

Cypraea cinerea Gmelin, 1791

(Figure 1)

In aquaria *Cypraea cinerea* were fed with tunicate and sponge crusts on rocks and oysters which were collected in the sea below the institute. The animals grew and lived a long time but did not spawn.

In the sea spawn was found in June 1971 in 60 cm depth on the underside of a flat stone in the little bay of Taganilla, a part of the bay of Santa Marta and in July 1971 on the underside of a dead *Acropora palmata* near the Carmabi Institute in Curaçao in about 1 m water depth.

On both egg masses a breeding female was sitting, covering her spawn with her foot.

The egg mass is a rounded oval cluster of club-shaped capsules, tightly glued to each other. One cluster had the dimensions of 2 cm length, 1.5 cm width and 0.5 cm height. The cluster is composed of 4 layers of capsules. Each egg mass contains about 400 individual capsules.

The oothecae are somewhat variable in shape. The walls are translucent, colorless and smooth. Each capsule contains about 200 - 300 white embryos, which swim in an opaque, albuminous liquid. The foot of the capsule has a round sole, which in the lowest layer of the egg mass is glued to the substrate (surface of rock or coral). Inside of the egg mass an ootheca is glued to the top of a capsule of the layer below, mainly onto the escape aperture. The escape aperture is on the upper end of the ootheca, mostly in an extended lobe. The oothecae are 2 to 2½ mm high, about 1 mm wide and a little under 1 mm thick.

All embryos undergo development and hatch as long-term planktotrophic veligers.

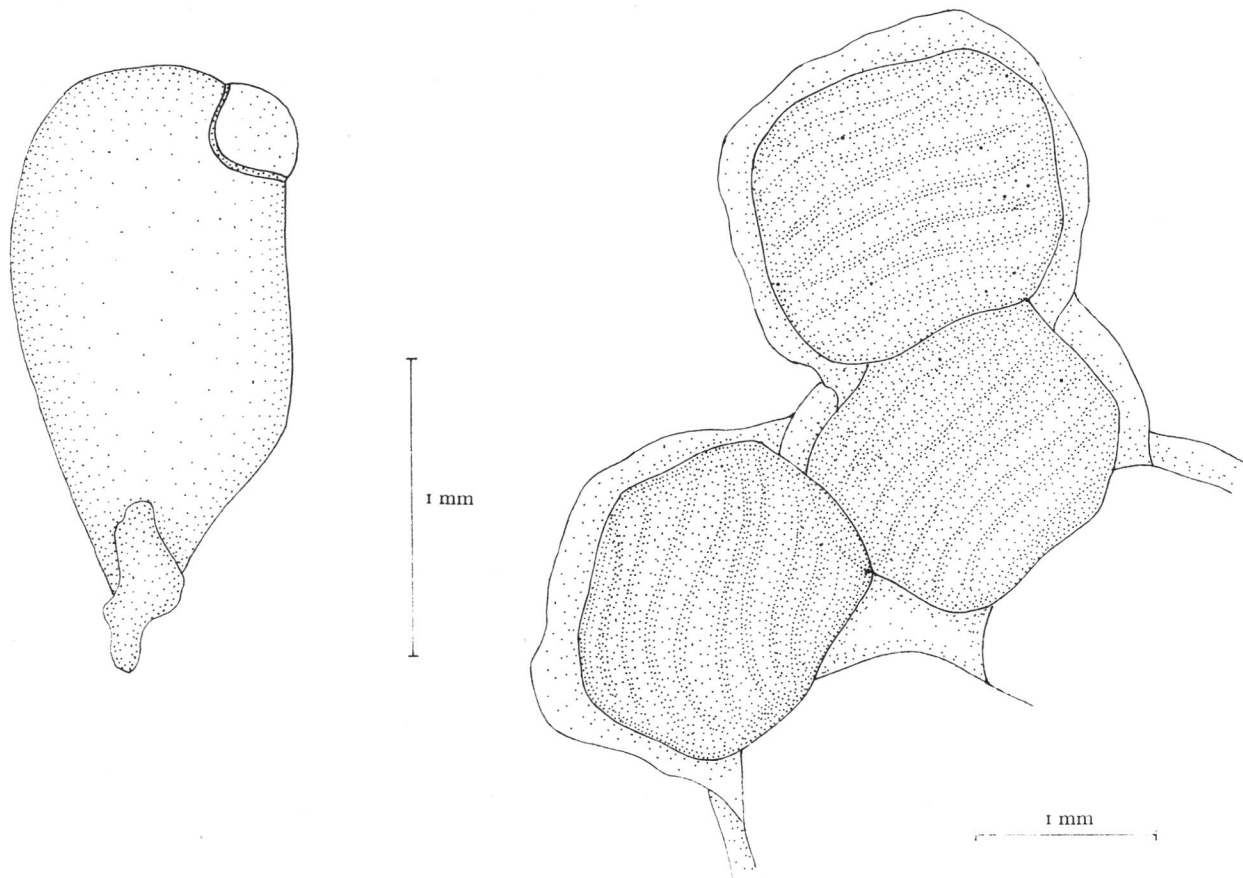


Figure 1

Ootheca of *Cypraea cinerea* Gmelin, 1791. Lateral View.

Cyphoma gibbosum (Linnaeus, 1758)

(Figure 2)

On rocky bottom in clear waters of the bays near Santa Marta sea-fans (gorgonians) are common and on them *Cyphoma gibbosum*. On most of the larger fans in areas, where little collecting of shells for souvenirs is done by local fishermen, 1 - 4 animals can be found, mostly more than one per fan. Specimens collected below the ICAL in Santa Marta were kept in aquaria and fed weekly with living sea-fans. *Cyphoma gibbosum* eats the flesh of these Anthozoa and due to this chews off all purple parts of the sea-fan branches, leaving only the internal black skeleton.

Cyphoma gibbosum scattered in all parts of the aquarium will find freshly introduced sea-fans within a very short time and start feeding on them. They even reach sea-fans through free water, letting themselves down from

Figure 2

Ootheca of *Cyphoma gibbosum* (Linnaeus, 1758) with the rim membranes which provide attachment to the substrate and the convex upper walls. Inside of the freshly deposited capsules the embryos are concentrated in curved rows, discernible through the transparent walls.

some projection on their own mucus secreted by the foot.

Fresh spawn can be found throughout the year on sea-fans in the habitat of *Cyphoma gibbosum*. The transparent rows are very difficult to detect on free-living gorgonians.

Well fed *Cyphoma gibbosum* specimens in the aquaria spawn from time to time. Usually the first spawning animal induces spawning in all other females in one aquarium, and one or more communal egg masses are produced. Copulation takes place up to 4 days before spawning and is continued while spawning. In the aquaria females at-

tach egg masses to the walls and also to dead and living sea-fans. The spawn of one single female contains 4 to 34 capsules, with an average of 18 capsules.

The ootheca are arranged in lines and nets, when attached to the cellular structure of sea-fans; and in clusters, when attached to the walls of the aquaria.

Communal egg masses in the aquaria had up to 120 capsules. This is probably an unusually large mass, for free-living animals show a less close settlement.

Oothecae of *Cyphoma gibbosum* are transparent, colorless and smooth (except for very fine microscopical lines) structures, which are somewhat variable in shape. The basal outline of each capsule shows roughly the shape of a rectangle with rounded angles. No escape aperture is existent. Both walls of the cushion-like ootheca are fused at the sides, forming a clear membrane, which surrounds the whole capsule and attaches the capsule to the substrate or the neighboring rim membrane of another capsule. If attached by the rim and hanging free in the holes of a sea-fan the capsular walls are both convex. When attached to the walls of the aquarium or the axis of a sea-fan, the basal capsular wall is flat or concave, but attachment to the substrate is only made by the rim. One capsular rim only overlaps onto the rim of the next capsule, but never onto the capsular walls.

The average dimensions of the capsules are: length 2 mm, width 1.7 mm, height 0.3 - 0.5 mm.

Individual oothecae contain 250 to 500 embryos with an average of about 300.

The embryos in just produced oothecae are concentrated in longitudinally curved rows, giving the capsule a striped appearance. On the 5th day of development the rows have disintegrated and the formerly white embryos have grown to colorless, round, and in the internal cavity of the capsule rotating larvae. On the 8th day a completely colorless veliger, with a transparent larval shell, is seen swimming around in the capsule and on the 9th day a pink pigment in the shell marks a color change. On the 10th to 11th day the capsular walls disintegrate and pink, long-term planktotrophic veligers hatch.

DISCUSSION

Cypraea cinerea produces egg masses which are very similar to those of *C. spurca acicularis* Gmelin, 1791, described and figured by D'ASARO (1970) and two other cypraeids as described by VAYSSIÈRE (1923) and OSTERGAARD (1950).

Breeding continues until hatching takes place, as OSTERGAARD (1950) has shown for *C. isabella* Linnaeus, 1758 and *C. helvola* Linnaeus, 1758.

THEODOR (1967) describes the life of *Simnia spelta*, an ovulid, which just like *Cyphoma gibbosum*, feeds on the flesh of anthozoans and also fixes mimetic eggs around the branches of gorgonian colonies in the Mediterranean Sea.

The oothecae are similar in size and form to those of *Cyphoma gibbosum*. THIRIOT-QUIÉVREUX (1967) states that a color change prior to hatching occurs in the larval shell of *Simnia spelta* (Linnaeus, 1758). Similar capsules are also produced by *Jenneria pustulata* (Lightfoot, 1786) (D'ASARO, 1969) and *Simnia patula* (Pennant, 1777) (LEBOUR, 1932). The major differences of these capsules in comparison with *Cyphoma gibbosum* capsules is the existence of an escape aperture and of pustulate wall structures in the former.

SUMMARY

The egg masses and oothecae of *Cypraea cinerea* Gmelin and *Cyphoma gibbosum* (Linnaeus) are figured and described for the first time and some data are given on the ecology of both species in the sea and on keeping them in aquaria.

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