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EGG MASSES AND LARVAE OF TWO SPECIES OF *CYPRAEA* (MOLLUSCA: GASTROPODA) FROM THE COAST OF KARACHI BORDERING THE NORTHERN ARABIAN SEA

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The egg masses of two species of *Cypraea, C. arabica* and *C. turdus* are described and illustrated for the first time. Both species deposit benthonic egg capsules; the egg capsules are of generalised type, which is a characteristic of the genus. The two species differ considerably in the size of their egg capsules and number of eggs per mass.

INTRODUCTION

The members of the family Cypraeidae (cowries) display a remarkable range of colour patterns. Despite the fact that cowries are among the most popular and best known of all molluscan shell groups, very little information is available on their breeding biology. Anderson[1] pointed out that no work had been done on the life histories of Australian species. Similarly no work has been published on the reproduction of Indian cowries save that of Natarajan[2] who was the first to described the spawn and early larvae of *Erronea errones* from the tropical waters of India. Ostergaard[3] described, with other gastropods, the egg masses of six species of *Cypraea* from Hawaii. The other studies on *Cypraea,* known to the present authors, include the work of Bandel[4] and D'Asaro[5].

Several species of *Cypraea* occur on the coast of Pakistan[6]. The present paper describes the egg masses and larvae of two species of *Cypraea* namely *C. arabica* and *C. turdus* from this coast.

MATERIAL AND METHODS

Regular biweekly trips were made to Buleji (20 km noth west of Karachi), a rocky and sandy-cum-muddy beach, during the period June 1976 to July 1977. During this period egg masses of *C. turdus* and *C. arabica* were searched and specimens were collected and brought to the laboratory, where the animals and their spawns were kept in bowls of fresh aerated sea water. The water in the bowls containing the cowries was changed twice a day, yet very few of them survived for a long period in the laboratory. The spawn of both the species in the natural environment adhere so firmly to the substratum that it is almost impossible to collect the egg masses intact. To avoid the fragmentation of the egg masses measurements were made on the spot and only those egg masses were collected that were easily detachable from the substratum. Measurements of egg-capsule incubating specimens of *Cypraea* and their larval shells were recorded. These are given in Table 1 as height, which denotes the distance between the anterior and posterior end of the shell, and as width, which simply means the thickness.

OBSERVATIONS

Specimens of both the species were kept in large glass aquaria (60 x 30 x 30 cm) filled with aerated sea water. It is difficult to keep them alive for a long period under laboratory conditions, perhaps because of their dependence on sessile animals for food as pointed out by D'Asaro[5]. It was because of this limitation that neither species deposited egg mass in the laboratory, although several other snail species did so[7-9].

Fifty seven specimens of *C. turdus* were collected on November 20, 1976 from the infra littoral fringe of the Buleji rocky shore near Karachi, at a low tide of 0.5 ft. Thirty one of the 57 specimens were incubating their eggs beneath the foot. During a visit to Buleji on September 8, 1975, one of us (M.A) found two specimens of *C. turdus* depositing egg capsules. The egg mass of *C. arabica* was collected only once from the same locality on September 22, 1979, when a brooding female of 6.75 cm high and 4.0 cm wide covered her spawn completely with her foot. Recently an egg mass of *C. turdus* was collected from Buleji on January 1, 1983. The present observations suggest that the spawning period of *C. turdus* extends from September to January. However, there is a possibility it may be longer

because sometimes the shore is not sufficiently exposed at low tides and hence egg masses may not be found.

The egg masses of *C. turdus* (Fig. 1.A) were found on the undersurface of small or large stones and boulders and also on empty shells of oysters and mussels. The egg masses of *C. turdus* are either oval or circular in shape. The egg masses of 31 specimens of this species ranged from 20 to 27 mm in diameter. The size of the specimens whose egg masses were measured ranged from 21 to 35 mm in height and 20 to 26 mm in width. The egg masses of *C. turdus* consist of 3 to 6 layers deposited one upon the other in such a way that there are more layers in the centre than at th periphery. The capsules of the lowest layer are glued to the substratum but those of the upper layer are glued to those immediately below. The arrangement of egg capsules in the egg mass of *C. arabica* (Fig..2A) is the same as in

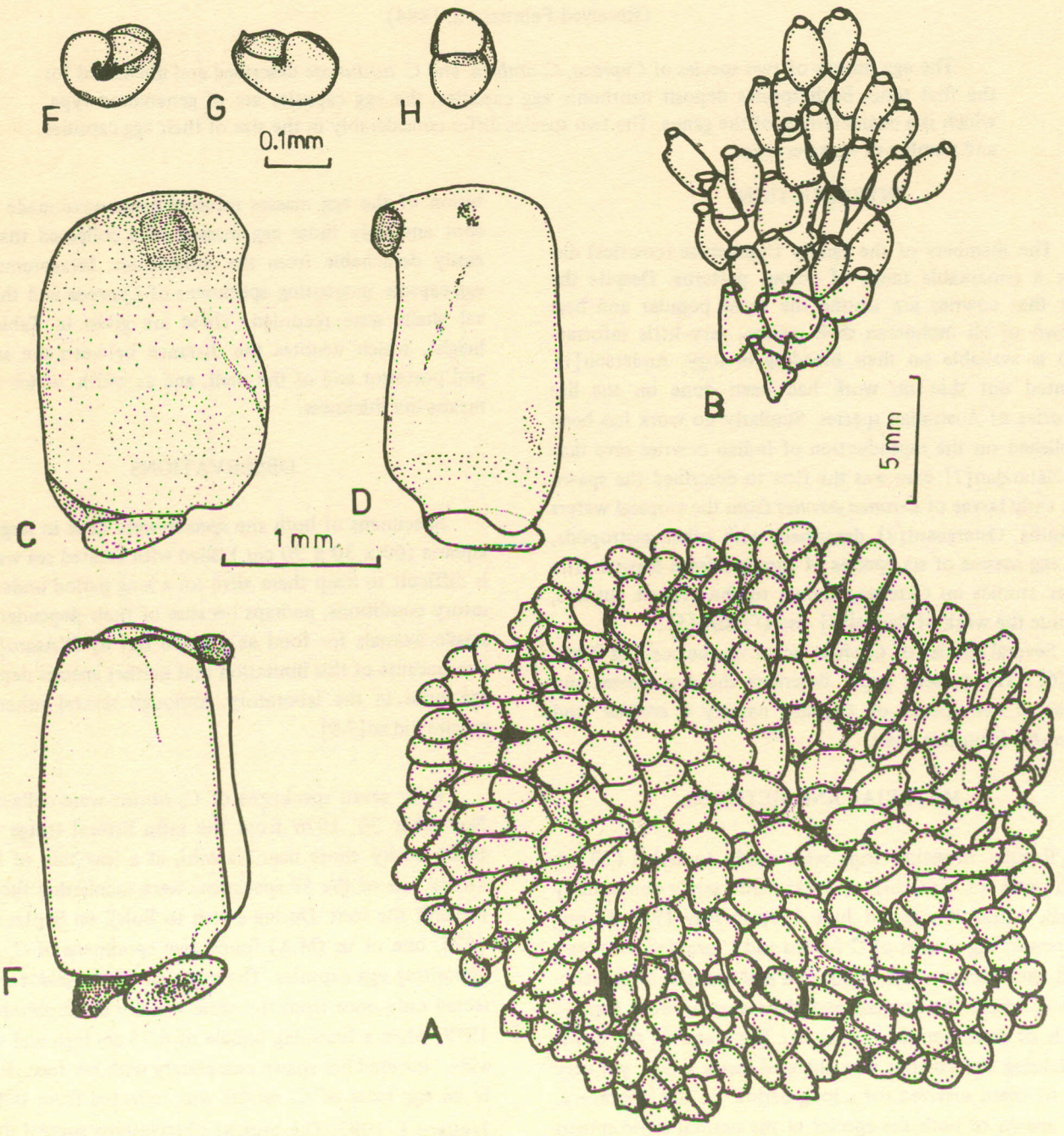

Fig. 1. *Cypraea turdus.* A. dorsal view of an egg mass; B. portion of an egg mass; C, D and E. front, dorsal and ventral views of egg capsule; F. G and H. ventral, dorsal and front views of a veliger shell 24 hours from hatching.

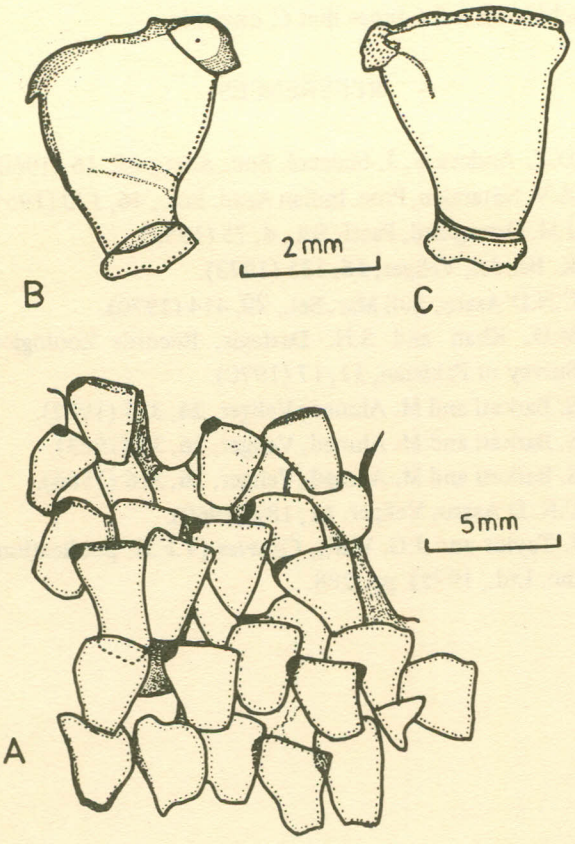

Fig. 2. *Cypraea arabica*. A. dorsal view of a portion of egg mass; B and C. ventral and dorsal views of an egg capsule.

C. turdus. The spawn of *C. arabica* is circular in outline mesuring 6.5 cm in diameter. In both species the freshly laid egg masses are pale yellow in colour and change to pink and purple with advancing development. Characteristics of egg masses, capsules and eggs are given in Table 1.

The egg capsules of *C. turdus* (Fig. 1.C, D, E) are smooth, thin-walled and transparent. The eggs are clearly seen suspended in an albuminous fluid. The capsules are of variable shape which may be mainly due to the compactness of the whole egg mass. The capsules are stalkless, pouch-like and vasiform. The walls of the capsules are comparatively thicker at the point of attachement with other capsules. The escape aperture which occupies the upper end of the lateral sides is quadrangular in shape and measures 0.52 mm in diameter. The capsules of *C. arabica* (Fig. 2. B, C) vary in shape and size but the generalized type of the genus persists. They are almost triangular in form with broader sides upwards and tapering towards the base. The capsule walls are smooth save that of single short ridge extending down to the centre of the capsule from the upper corners. The capsules of *C. arabica* are also stalkless. All the capsules in the egg mass are attached to one another

Table 1. Dimensions of eggs and larval shells of *Cypraea arabica* and *C. turdus*. The values in the table are means with standard deviation followed by number of observations in parenthesis.

	Cypraea arabica	*Cypraea turdus*
Size of females (shell height; mm)	65.00	30.23±3.52 (31)
No. capsules/spawn	1500	443±45 (7)
Capsule height (mm)	3.14±0.19(9)	2.30±0.32(7)
Capsule width (mm)	2.32±0.35(9)	1.36±0.48 (7)
No. Eggs/capsule	1204±97.9 (8)	446±26.8(9)
No. eggs/spawn	1806000	195794
Egg diameter (μm)	137±11.03 (11)	1-3±9.39 (10)
Larval shell height at hatching (μm)	–	159±7.64 (11)
Larval shell width at hatching (μm)	–	118±7.41 (11)

at more than two points so that the whole spawn becomes a completely packed structure. There is no escape aperture in this species, the entire capsule becomes thin and soft when the embryos are ready to hatch.

In both species all eggs devlop into embryos. Incubation period of eggs could not be established as neither species spawned in the laboratory. In *C. turdus* the embryo hatch as free-swimming veligers measuring 159μm in avaerage height (range: 148 to 171 μm) and 118 μm in width (range:103 to 125 μm). The larval shell in *C. turdus* has one and a half whorls, is purple brown in colour and has numerous shallow pits all over the surface. The larvae of *C. turdus* (Fig. 1, F-H) survived for 24 hours in the laboratory. *Cypraea arabica* eggs had not hatched in the laboratory even 17 days after collection. Some of the capsules after this period were found with dead veligers.

DISCUSSION

Ostergaard[3] and D'Asaro[5,10] emphasise the existence of a generalized type of capsule in the genus *Cypraea*. The parameters differing at the species level are the size of the capsule, number of eggs, position, and presence or absence of an escape aperture. The number of capsules laid varies considerably from species to species[3]. The larvae of most species of *Cypraea* that have been studied are released from the egg capsules as free-swimming veligers ([2-5], and the present investigation), Taylor and Walls [11], however, mentioned that a few species of cowries

found on the southern coast of Australia do not have a free living veliger stage but the young hatch from the egg capsules as miniature cowries.

Brood protection is well documented in the genus *Cypraea*[3]. The females remain constantly on their spawn covering the entire mass with their foot. The egg capsules were always found covered by the females in the present investigation. Layered egg capsule deposition is also a characteristic of the family Cypraeidae and has been described for all the *Cypraea* so far studied including the present species. Layered spawn masses are also found in the genus *Erronea*[2]. Ostergaard[3] recorded 500,000 eggs per mass of *C carneola* from Hawaii, which has so far been considered as the highest number of eggs spawned by a cypraean species. The results of the present study, however, indicate that the number of eggs spawned by *C. arabica* from the Karachi coast is 3.6 times that *C. carneola.*

REFERENCES

1. D.T. Anderson, J. Malacol. Soc. Aust., **45**, 16 (1960).
2. A.V. Natarajan, Proc. Indian Acad. Soc., **46**, 170 (1957)
3. J.M. Ostergaard, Pacif, Sci., **4**, 75 (1950).
4. K. Bandel, Veliger, **15**, 335 (1973).
5. C.N.D'Asaro, Bull Mar. Sci., **20**, 414 (1970).
6. M.D. Khan and S.H. Dastagir, Records Zoological Survey of Pakistan, **11**, 17 (1970).
7. S. Barkati and M. Ahmed, Veliger, **24**, 335 (1982).
8. S. Barkati and M. Ahmed, Veliger, **26**, 30 (1983).
9. S. Barkati and M. Ahmed, Veliger, **26**, 316 (1984).
10. C.N. D'Asaro, Veliger, **11**, 182 (1969).
11. J. Taylor and J.G. Walls, *Cowries* (T.F.H. publications Inc. Ltd., 1975). pp. 288.