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PREDATION AND REPAIRING PHENOMENA IN CERTAIN CLYPEASTROID, ECHINOID, FROM THE MIOCENE AND PLIOCENE EPOCHS OF EGYPT

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ABSTRACT

Ten specimens of Tertiary echinoids from Egypt—belonging to three genera : *Clypeaster*, *Laganum*, and *Scutella*—display repaired damaged margins and damaged surfaces possibly attributable to the attacks of predatory animals such as shell-crushing sharks or other echinoids. This brief observation describes and figures the damage sustained by some species as a consequence of predation. A discussion on how the echinoid was able to repair the damaged parts is also included.

INTRODUCTION

During the study of some Miocene and Pliocene irregular echinoids from some localities in Egypt, the author noticed specimens belonging to the genera *Clypeaster*, *Laganum* and *Scutella* that showed evidence of predatory attacks, and the possible repair of the damaged parts of the test. The Miocene specimens were collected from the Marmarica Limestone formation, Vindobonian, of Wadi Um el Ashtan, Wadi el Habis, west of Mersa Matruh, Mediterranean Sea coast, and Gebel el Takrour, east of Siwa Oasis, western Desert of Egypt. The Pliocene specimens were collected from Wadi Shagra, north of Mersa Alam on the Red Sea coast.

PREVIOUS WORK

Literature dealing with predation on fossil irregular echinoids is very rare, but there are available studies of predation on and by living regular echinoids. Hyman (1955), noted that *Echinus esculentus* feeds on tube worms, crustaceans and other echinoderms, but no mention is made as to the types of echinoderms that it attacked.

Moore (1956), observed that a large gastropod, genus *Cassis*, may attack living sea urchins. He showed on one attacked urchin an area of approximately 25 mm in diameter that had been cleared of spines. In this area there was a neatly drilled hole through the thin test.

Kier and Grant (1965), reported many cases of predation on some sea urchins from the Florida Keys. The taxa mentioned include *Mema ventricosa*, *Encope michelini*, *Leodia sexiesperforatus* and *Clypeaster subdepressus*. The attacks were made by marine organisms such as starfish and small fish at times when the echinoids were oriented in a vertical position. They also noticed a test of *Brissus unicolor* that had a small circular hole caused by the large gastropod *Cassis madagascariensis*.

Quinn (1965), studied two cases of predation by the long-spined black sea urchin of the West Indies, *Diadema antillarum*, on certain other species of sea urchins such as *Tripneustes esculentus* and *Clypeaster rosaceus*. He noticed that when *Diadema antillarum* was deprived of food, it tended to attack other echinoderms, including sea urchins.

Hughes and Hughes (1971), described how the gastropod *Cassis tuberosa* cuts a disc from the test of regular echinoids in order to feed on them.

Zinsmeister (1980), observed two types of predation that occurred on fossil clypeastroid echinoid specimens of *Monophoraster darwini* (Desor), from the upper Miocene of Argentina. The first type was damage along the margin of the test, the second was restricted to the aboral surface.

DISCUSSION AND CONCLUSION

Three types of test damage were observed on the following echinoid species : *Scutella ammonis* Fuchs ; *Laganum tumidum* Duncan and Sladen ; *Clypeaster humilis* (Leske) ; *C. suffarcinatus* Duncan and Sladen ; *C. kamaranensis* (Cotteau) ; and *C. latirostris laganoides* Agassiz.

The first type and the most common form of damage was along the margin of the test, (Pls. I & II). The degree of this type of damage varied from one specimen to another.

The second type of damage due to predation, restricted to the aboral surface, are large irregular opening through the outer part of the test (Pl. II—5a). Five specimens of *C. kamaranensis* displayed this type.

The third type of damage was observed on both oral and aboral surface of the test and consisted of small boreholes. The borings are of two major type : (1) more or less rounded holes penetrating the test and perpendicular or inclined to the surface, (Pl. I—5 & 6c) ; and (2) grooves or tunnels parallel to the test surface, (Pl. I—

5d). The holes are circular or elliptical in outline and relatively uniform in size, having a mean diameter of 0.38 mm. The two types of bores are found most commonly near the margin of the test. There is no clear evidence of test repair suggesting that the animal did not survive.

A remarkable aspect of the predation on *Clypeaster latirostris laganoides* Agassiz, was the ability of the individuals to survive the initial attack and repair the damage, (Pl. I—3). A major question is how the animal was able to repair these damaged parts.

The skeletal parts of the echinoids are of mesodermal origin and, therefore, are susceptible to great modification. In life, the hard parts of the echinoid test are normally completely convered by a thin layer of ectoderm (Durham. 1955). The hard parts are composed of calcium carbonate deposited in the form of calcite crystals ; each plate of the cronal test being a single crystal. During the life of the animal, the canaliculi of the test are filled with mesodermal tissue which can then secrete the hard parts. In this way the test is easily repaired, when damaged, by the secretional material, which is always deposited from beneath the broken edge of the damaged plate, on the inner surface of the test until the plates around the damaged part overlap. However, the test does not take on the exact shape it had before the predatory attack.

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EXPLANATION OF PLATES

PLATE I

1-3. *Clypeaster latirostris laganoides* Agassiz, (marginal damage), 1 : aboral view ; 2 : oral view ; 3 : side view of repaired marginal damage in figure 1 a-b. (×1).

4-7. *Laganum tumidum* Duncan and Sladen, 4 : undamaged test (×1) ; 5-7 : marginal damage (×1) ; c & d : boreholes in oral and aboral surfaces.

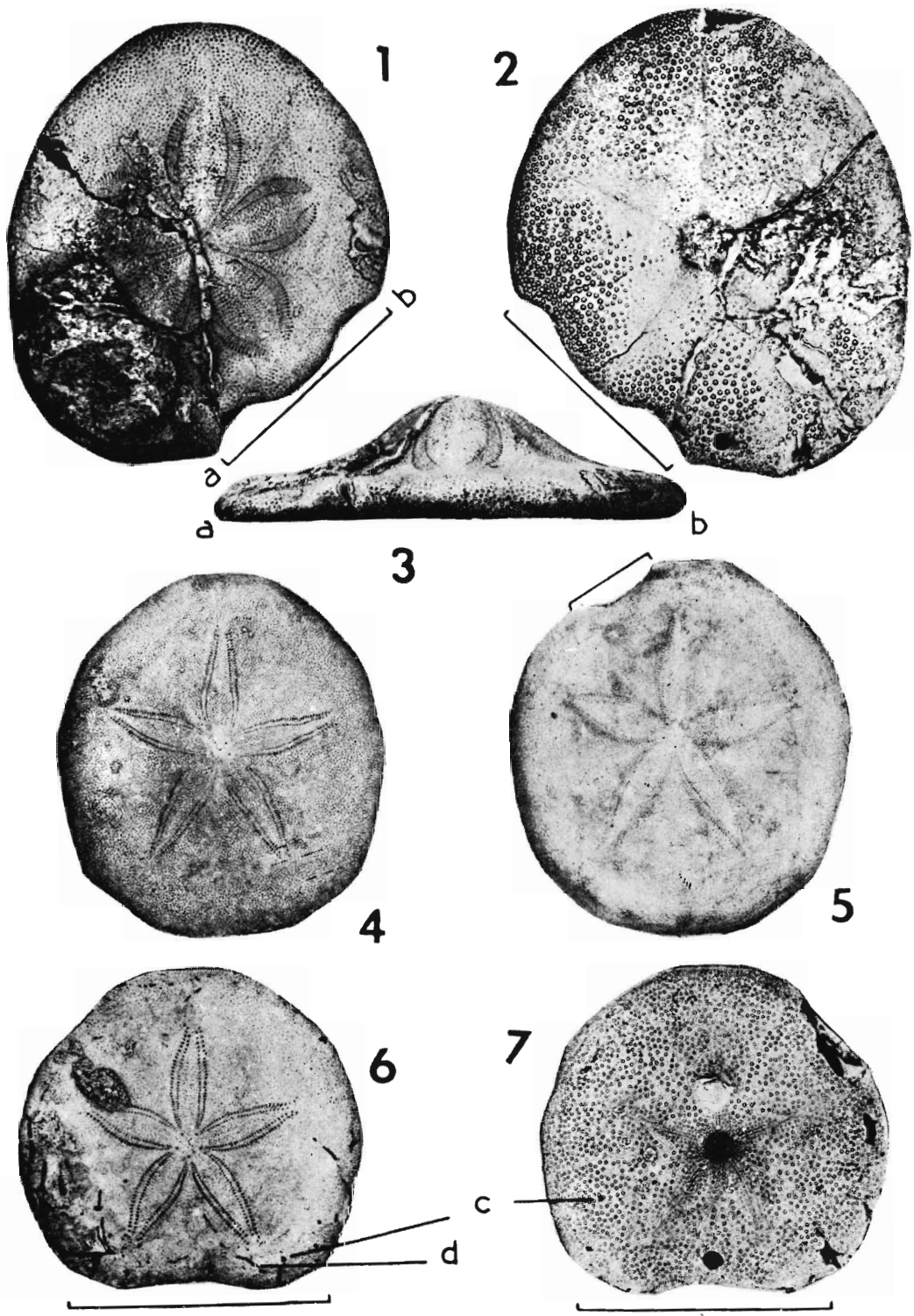
PLATE II

1-3. *Scutella ammonis* Fuchs, 1 : undamaged test (×1) ; 2-3 : marginal damage, 2 : aboral view (×1) ; 3 : oral view (×1.5).

4. *Clypeaster suffarcinatus* Duncan & Salden, marginal damage (×1.25).

5. *Clypeaster kamaranensis* (Cotteau), aboral damage (×1.5).

6. *Clypeaster humilis* (Leske), marginal damage (×1.25).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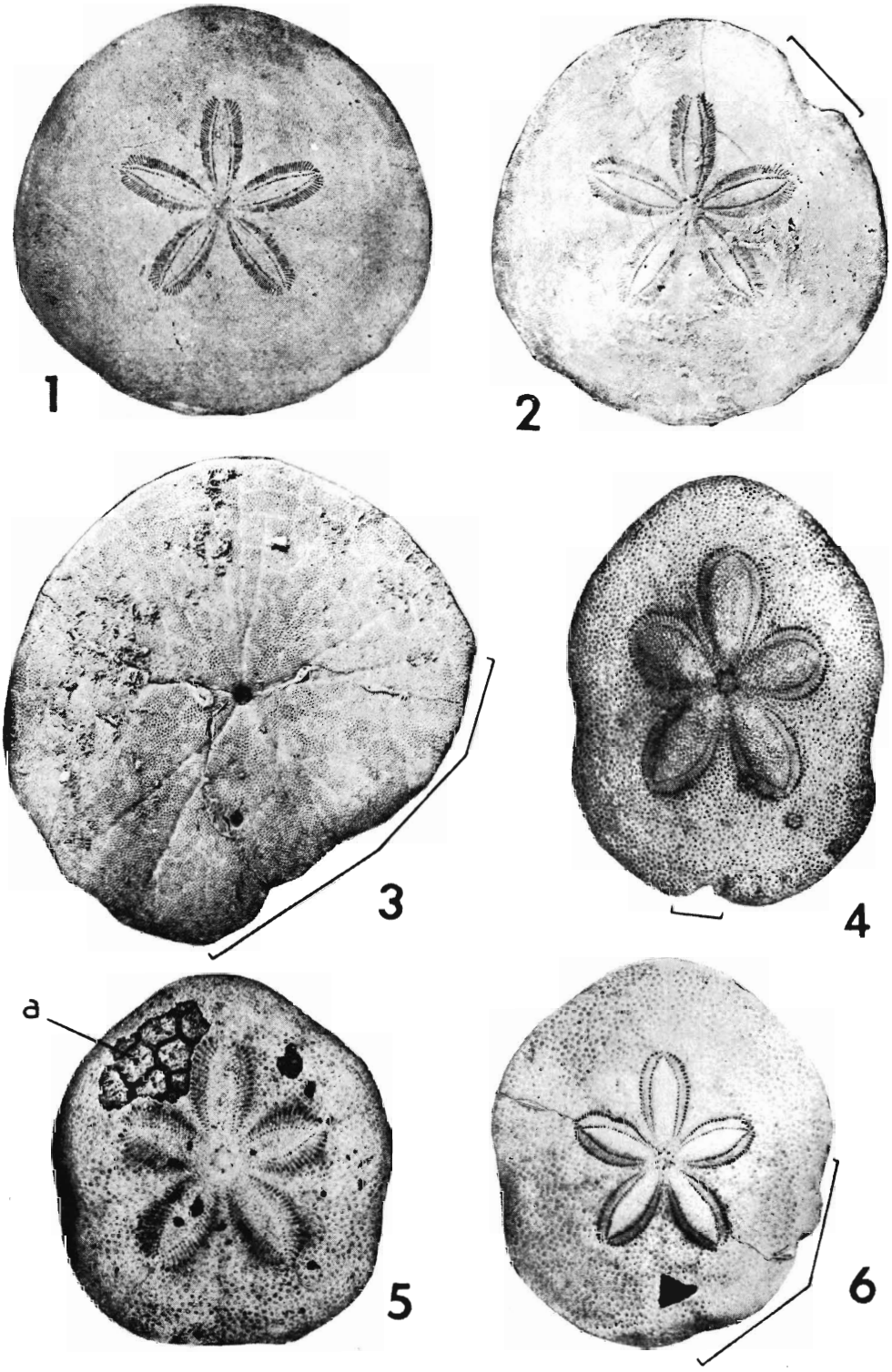
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