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THE POLYTECHNICS SUBWAY STATION: RUDISTS IN THE HEART OF BUCHAREST

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Abstract. The Polytechnics subway station represents one of the most important paleontological sites in Bucharest due to its pavement that consists of an entire rudist buildup cut into slabs. The whole station shows polished sections within rudist thickets, clusters and bouquets, collected from all around the buildup, from the central area to the marginal and external areas. The rudist assemblage is represented by *Vaccinites* sp. and *Hippurites* sp., to which are added nerineid gastropods, colonial anthozoans and rhodophytes. Succession of rudist generations can be recorded. The density of rudist assemblages, the degree of preservation and the clear, beautiful polished sections make of the Polytechnics subway station an important paleontological site from three points of view: scientific, educational and aesthetic.

Keywords: Polytechnics subway station, rudists, *Hipurrites* sp., *Vaccinites* sp., Nerineids, corals, rhodophytes, Bucharest.

INTRODUCTION

Rudist assemblages have been reported in Romania especially from the Apuseni Mountains and the South Carpathians and their age is mainly Upper Cretaceous. Koch (1888) mentioned various rudist species in Hasdate region (Apuseni Mountains); Patrulius (1953) identified various rudist facies in Rosia and Borod Basins and Givulescu (1954) mentioned rudist assemblages from Valea Neagra. Moisescu (1960) described an interesting association from the Gilau Mountains (Hasdate Region). A monograph regarding the Senonian rudists from the Apuseni Mountains was given by D. Lupu (1976), probably the most detailed and comprehensive work on this group of bivalves in Romania.

Within the Polytechnics subway station, the pavement is represented by polished limestone slabs containing a rich variety of marine fauna, in which the rudists are the dominant populations and demonstrate to be true reef builders. It attracted the media (Lechkun, 1994) and the public interest increased constantly.

The limestone is red, nodular, with clear or less marked nodules. For external areas of the buildup, the limestone colour is darker than within the internal parts of the reef.

The location of the rudist reef brought within the Polytechnics subway station is still a matter of debate, as far as the Metrorex subway company's archives have not been yet consulted. One possibility could be the Gilau Mountains (Apuseni Mountains), within the Santonian - Maastrichtian limestone. Another possible occurrence could be the Savadisla quarry, nearby Cluj-Napoca city. But in Savadisla, the nodular limestone is whitish, not so red like that from Bucharest.

METHODS

For illustrating the thickets of *Vaccinites* sp. and *Hippurites* sp. were used transparency slides on which the cross, tangential or longitudinal sections were drawn in outline with various thin markers. The assemblages were photographed as well but the best method remains drawing on the transparency slides for avoiding reflections on polished surfaces.

SYSTEMATICS

The assemblage occurring in the subway station is surprisingly rich and very well preserved. To this aspect is added the ideal "outcrop" represented by the polished slabs within the red limestone in which the white shells have a bright contrast, making of them a very accessible object for study. Among hippuritids, subsequent gastropods, colonial corals and rhodophytes occur but in this paper are described and figured only the first.

The gastropods are represented by *Nerinea* sp., with large shells and elongated outlines. The corals are represented by colonial types resembling *Thamnasteria* sp., with cylindrical, long polyps with wide coenenchims. The rhodophytes occur as globular concretions with irregular outlines given by prominent perithallus structures. For the last, as no thin sections were avaiable, the genus or species assignment was impossible.

Phyllum Mollusca
Class Bivalvia
Order Hippuritoida
Family Hippuritidae GRAY 1848
Genus *Hippurites* LAMARCK 1801
Hippurites sp.
Text-figs. 1, 2, Pl. 1, Fig. 1

Description. The left valve is rarely preserved, reduced to a circular piece, opercular, very delicate while the right valve is strongly developed (inverse form). The right valve is conical-elongated, almost cylindrical, circular in cross section, with sizes varying between 80-200mm in length and 20-35mm in diameter. The shell thickness is 4-6mm. The external surface of the right valve is covered with sharp, longitudinal and regular ribs, more conspicuous to the adult individuals than to younger ones (Text-figs. 1, 2, Pl. 1, Fig. 1). Sometimes, to adult or gerontic individuals, internal, longitudinal pores occur within the shell's wall and they are 1-2mm in diameter.

The inner shell shows two clear and reduced pillars and a short, rounded ligamentary crest. The pillars are 3-4mm wide and 3-5mm long, very rounded, almost circular. The ligamentary crest is 3-6m long and 3-4mm wide. All the three infolds occur together in one half of the circle of the cross section. The anterior and posterior

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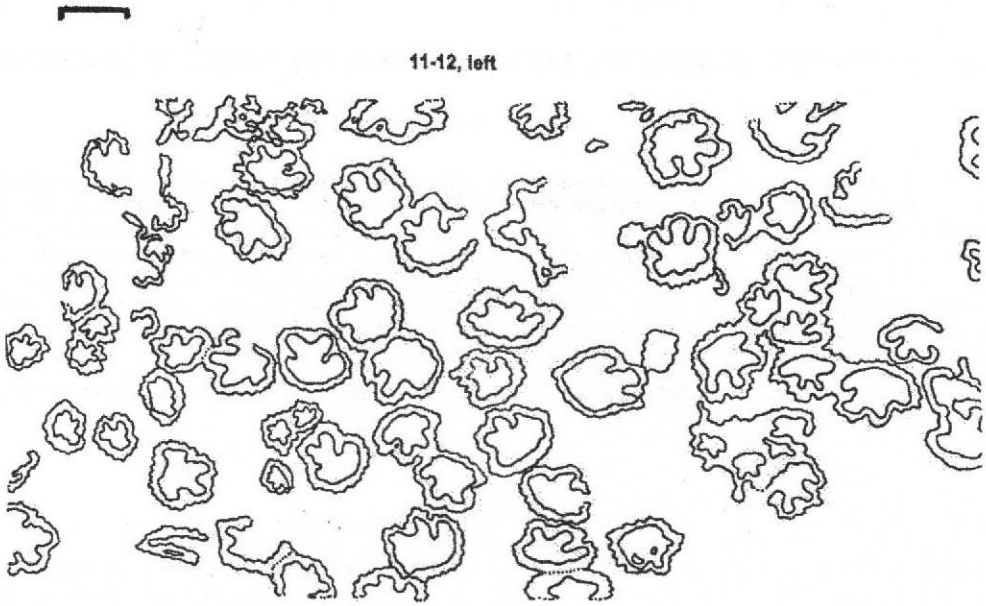

Figure 1 - *Hippurites* sp. Individuals in cross-section, parallel, central area of the basin. Between station pillars nos. 11 and 12, left side of the station. Scale bar: 2 cm.

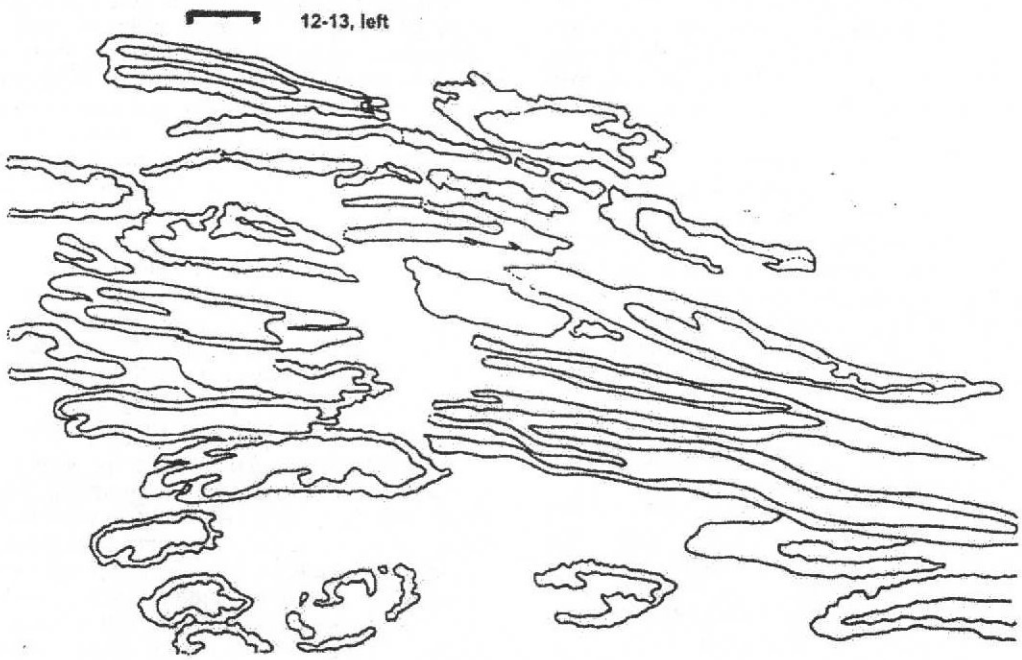

Figure 2 - *Hippurites* sp. individuals in longitudinal and oblique sections, marginal area of the reef. Between station pillars nos. 12 and 13, left side of the station. Scale bar:2 cm.

sockets are rounded as well and the myophores or the teeth of the left valve can't be recognised. The general cavity is large.

Discussion

The population of *Hippurites* sp. shows clear characters of this taxon, such as the reduced ligamentary crest and pillars, the outer longitudinal ribs and shape. The closest taxon is *H. colliciatus* (WOODWARD), but this taxon differs from the Bucharest material by having much thicker shell.

Paleoecology

As a sessile suspension feeder, *Hippurites* sp. is a gregarious semi-infaunal species, with very large populations that gave thickets, clusters and bouquets. In the thickets, this species gave accumulations of tens and hundreds of individuals, still preserved and well seen today in growing position, perfectly parallel, often connected laterally between two or three individuals (Text-figs. 1, 2). Clusters ad bouquets are less frequent. These accumulations occur only in the central areas of the "reef", while in the marginal areas the individuals are

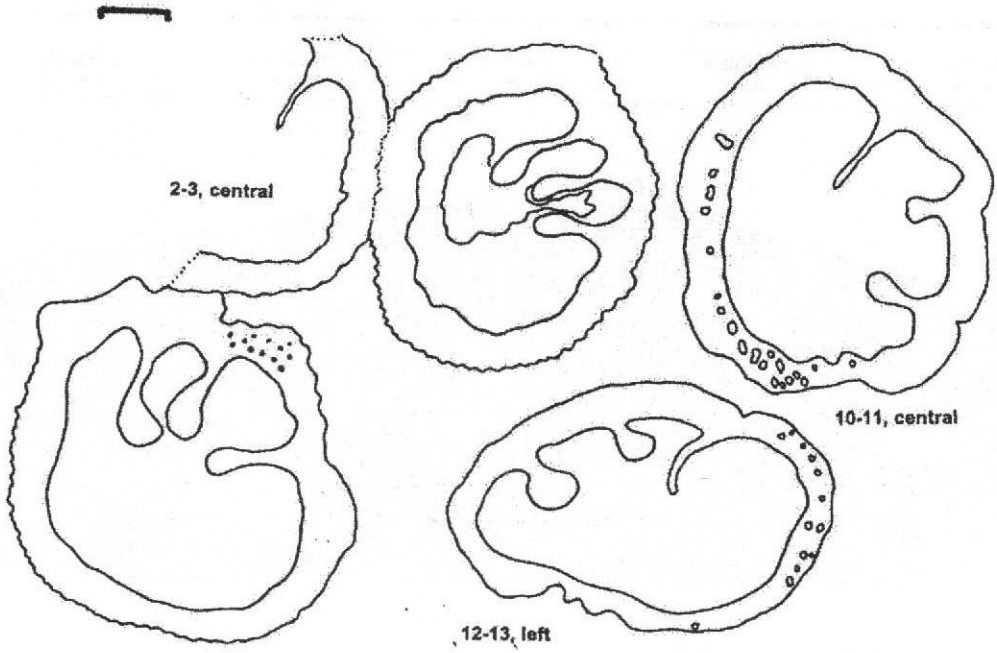

Figure 3 - *Vaccinites* sp. Individuals in cross section. Between various station pillars and sides, as indicated. Scale bar: 2 cm.

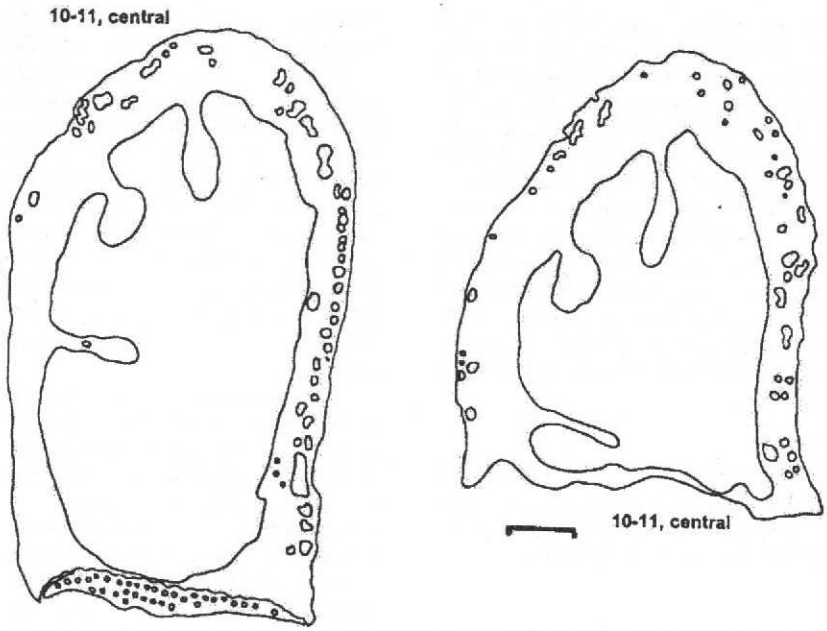

Figure 4 - *Vaccinites* sp. Individuals in cross section. Between various station pillars and sides, as indicated. Scale bar: 2 cm.

more broken, laying chaotically on the substratum, were both vertical and horizontal specimens can be seen.

It can be recorded even the succession of generations within the thicket and cluster accumulations, showing two or even three consecutive generations grown one on the top of another. The lack of higher number of recorded generations is only determined by the polished slabs surface.

Genus *Vaccinites* FISCHER 1887
Vaccinites sp.
Text-fig. 3, 4, Pl. 1, Fig. 2.

Description. Very large inverse forms of hippuritids can be recorded. They have the left valve opercular, circular and porous, rarely preserved, and with a conical, cylindrical right valve, very elongated. The right valve is circular or ellipsoidal in outline, rarely rounded-triangular, with sizes between 70-200mm in diameter and 170-1000mm in length. The shell is very thick, 10-20mm thick, often porous longitudinally in adult or gerontic specimens, with 1-3mm pore diameter. The external area of the shell is finely striated longitudinally or smooth.

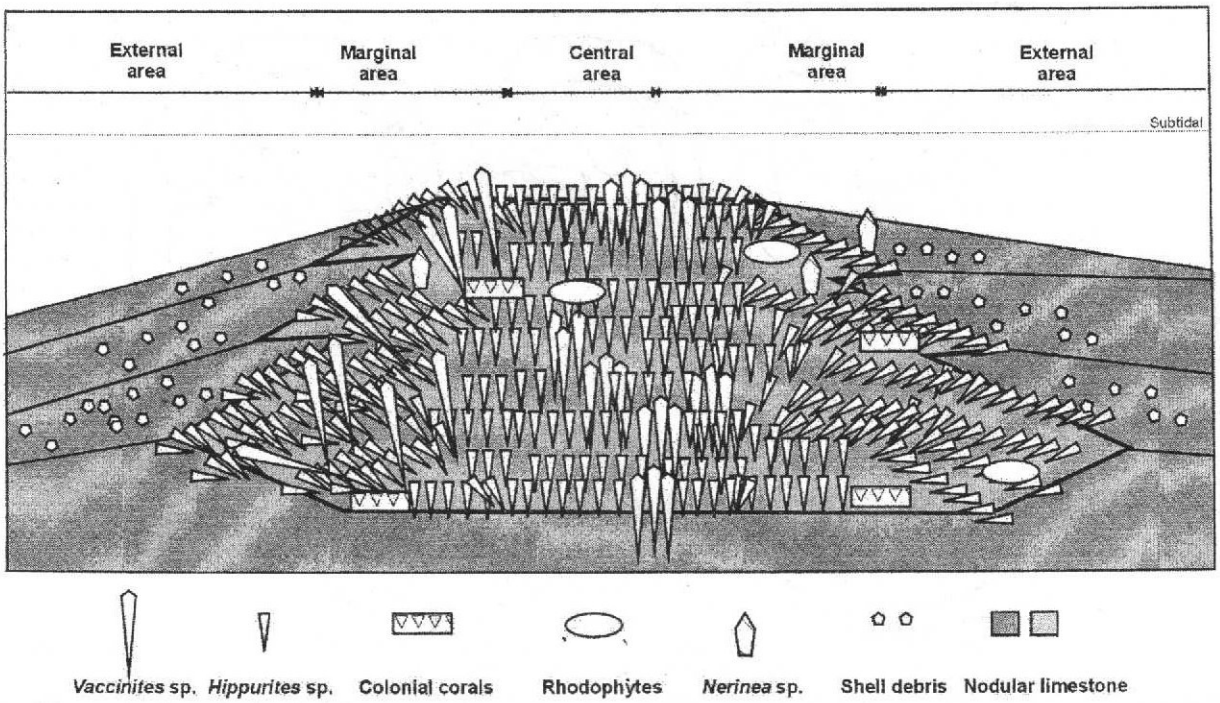

Figure 5 - Reconstruction of the rudist buildup

The inner shell has two well developed pillars and a long ligamentary crest. The pillars are inflated towards the center of the general cavity, with a narrower junction to the inner shell. Their length in cross section is 15-40mm and they are 2-5mm wide in the base and 5-15mm towards the center of the cavity. The ligamentary crest is flattened, with constant thickness, between 2-4mm wide and 20-30mm long. The pillars and the ligamentary crest are convergent or rarely parallel and they always occur within a quarter of the inner shell's cross section. The anterior and posterior sockets are wide and rounded-rectangular in outline (Text-fig. 3, 4, Pl. 1, Fig. 2.). Often, tabulae occur within the internal, lower part of the shell. The general cavity of the shell is very large.

Discussion

The ligamentary crest, pillars, the shape and size of the right valves point to sure a *Vaccinites* species. The closest taxa are *V. gosaviensis* DOUVILLE and *V. oppeli* (DOUVILLE), similar in size and dentition.

Paleoecology

Vaccinites sp. gave often bouquets in the central areas of the reef, and it is slightly less frequent as *Hippurites* sp. No thickets but rare clusters can be recorded within the Polytechnics station. When forming bouquets, *Vaccinites* sp. individuals interconnect laterally within their upper halves or simply longitudinally, linear, as two successive generations occur. Both vertical, growth positions and horizontal position are recorded for *Vaccinites* sp. indicating central or marginal areas of occurrence within the reef.

STRUCTURE AND ZONATION OF THE RUDIST BUILDUP

The slabs paving the Polytechnics station permit a reconstruction of the bioconstructed structure. This reconstruction is permitted first of all by the large area "outcropped" in the station, unveiling all the reef zones.

The dominance in all polished surfaces of the rudist populations over other invertebrate groups points to the builder role of the first within the reef structure. The only possible candidate as a builder could remain the colonial anthozoans, but their permanent subordinate frequency within the assemblages unables such a conclusion. This character is determined first of all by the turbidity of the marine environment than unabled the coral development but stimulated the boom of rudists. Such a turbid character of the marine environment is emphasised by the typical nodular character of the limestone.

The positions and structures of the rudist taphocoenoses within the slabs show three main facies or trends. The first facies is that of entire thickets or clusters of *Hippurites* sp. and *Vaccinites* sp., which are in situ, with individiuals in growth position, unfragmented, and parallel (Text-fig. 1, 2, 4). This facies corresponds to the central, inner area of the reef.

The second facies (trend) is represented by assemblages showing two or several positions of the rudist individuals (*Hippurites* sp. or *Vaccinites* sp.). These positions are divergent, never parallel, showing a vertical and a horizontal position, a third, oblique position occurring sometimes as well. These different positions within the same taphocoenosis point to a lateral, marginal area of the reef, where currents or storm waves disrupted parts of the colonies, due to their imperfect anchorage to the substratum (Text-fig. 2, Pl. 1, Fig. 1).

The third facies is that of broken shell fragments assemblages. The shells are never found entire, but broken to centimetric fragments that are buried chaotically within the nodular limestone. This assemblage corresponds to the external flanks, surrounding area of the rudist reef, where the shell debris was gradually accumulating.

All these three main facies are well recorded within the station and they permit, together with the recording of the succession of generations, to reconstruct the bioconstructed structure (Text-fig. 5). A similar approach was introduced by Philip (1972) and Cestari & Sartorio (1995) for paleoecological studies regarding rudist assemblages within the Periadriatic realm.

The reef body resembled a patch reef, with bioherm characters, several tens of meters in diameter. It was embedded in a nodular limestone lacking of fossils. The rudists generations growing more or less one on the top of another assured the height increase of the structure, while laterally the shell debris accumulated. In the central area the individuals remain parallel and vertical, while in the marginal area they were mixed, fallen among vertical specimens (Text-fig. 5).

CONCLUSIONS

The Polytechnics subway station represents a unique site with a remarkable paleontological heritage represented by an entire rudist reef cut into polished slabs that pave the station's floor. The zonation and the structure of the buildup can be well recognised due to the high preservation degree of the fossils, to their clear taphonomy and to the succession of generations. The various facies (trends) permit a detailed reconstruction of this bioconstruction.

The station has a high significance due to three important aspects, with a serious impact in the Earth Sciences education and in the media as well: a scientific aspect, related to the paleontological data recorded there, an educational aspect, as the fossils are well exposed and they can be well studied and an aesthetic aspect, related to the beauty of the station's pavement. The Polytechnics station gains so a *Memento mori* significance, as a mute, public witness of an extinct ecosystem.

Acknowlwdgements

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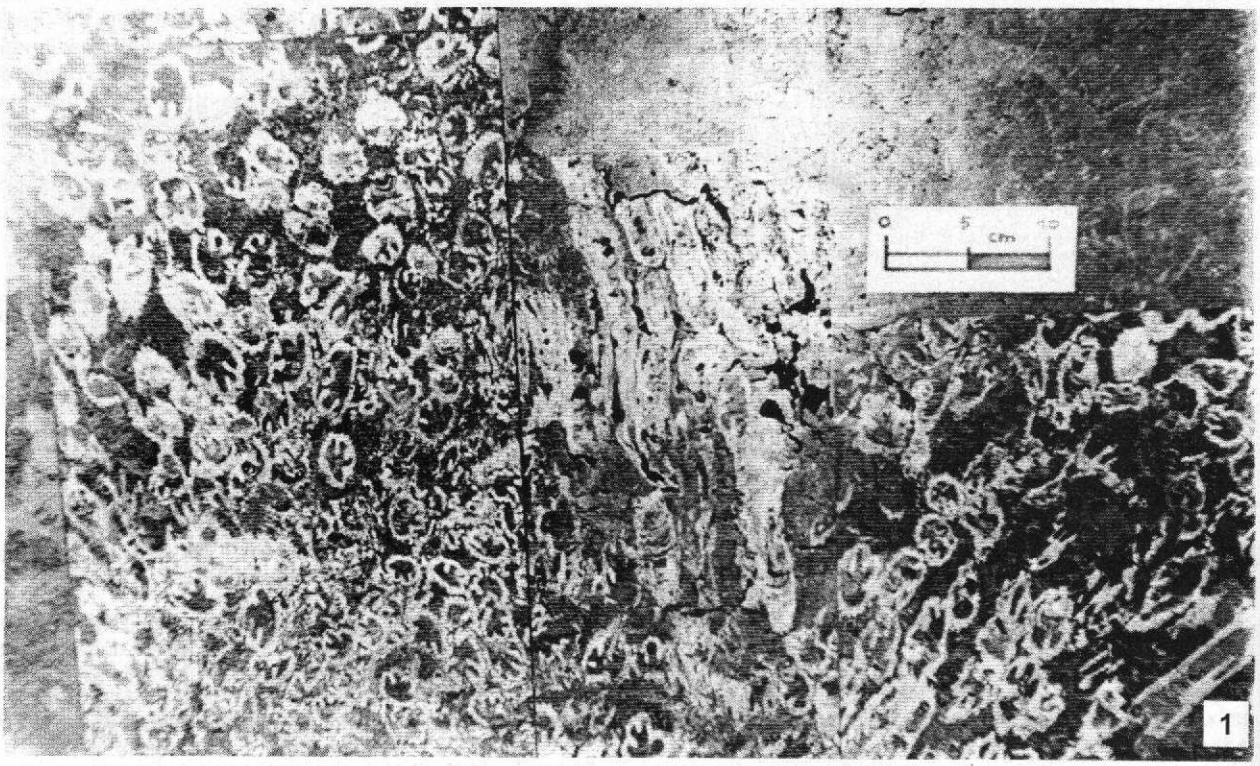
PLATE I

Fig. 1. Polished slabs with *Hippurites* sp. To the left, a slab cut from the central area of the reef, as the cross sections of undisturbed, parallel individuals in growth position show it. The right slabs occurred in the marginal reef area.

Fig. 2. Polished slabs with *Vaccinites* sp., both cut from the central-marginal area of the reef. Notice the cross and oblique sections of specimens occurring together.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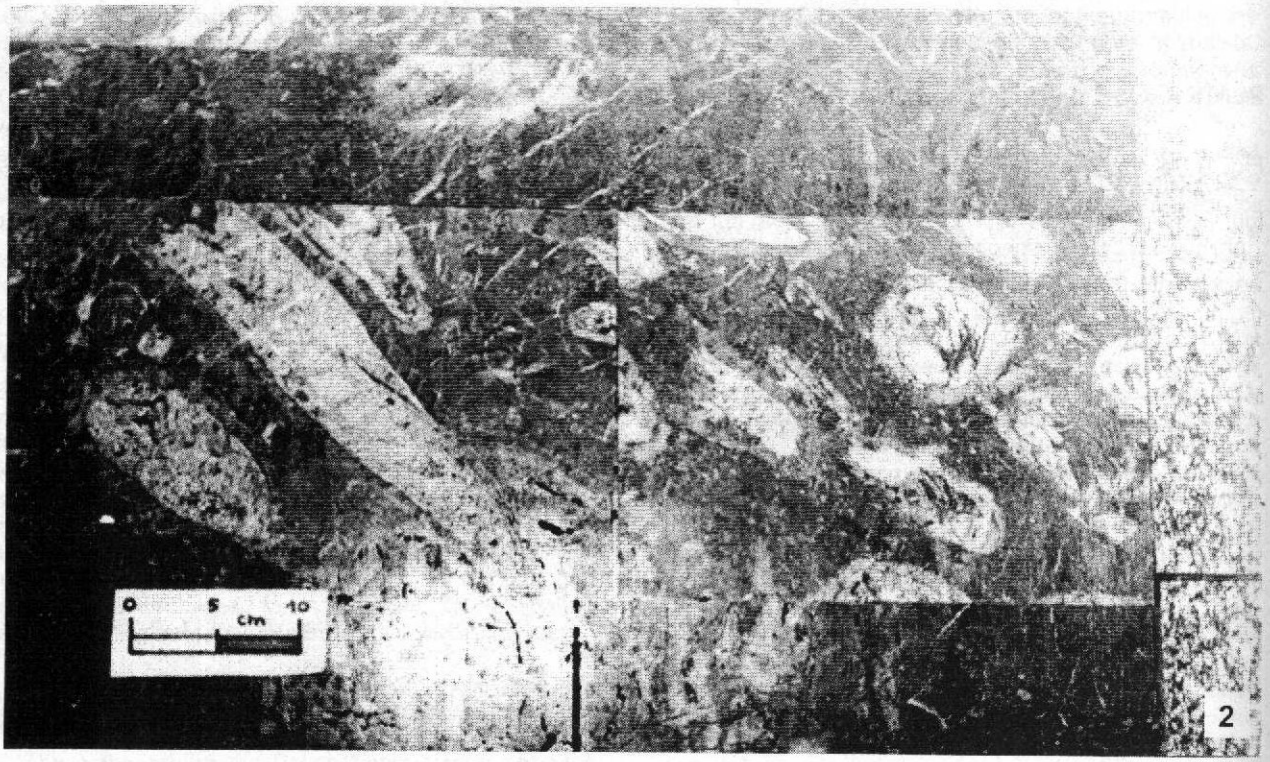
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