

## SPECIALIA

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### Shell mineralogy of *Monodonta (Osilinus) articulata* Lamark 1822

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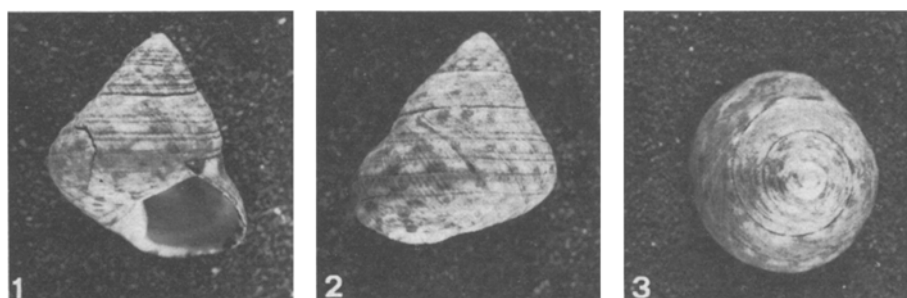
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**Summary.** The species *Monodonta (Osilinus) articulata* Lamark 1822 is recorded as having a shell with mixed minerals: a calcitic microstructural unit is comprised between 2 aragonitic layers.

Skeletal materials, as a major source of biological and paleoecological information, deserve particular attention in geochemical studies of calcareous fossils and limestones. The crystal polymorphic composition is one of the most important aspects of skeletal carbonates of carbonate-secreting marine organisms, since the crystal modification character initially determines trace-element uptake to a

large extent, and finally may exert a structural and compositional control on the sediments and rocks of which the skeletal material becomes a constituent.

1 We thank Proff. G. Bucchini and A. Greco for identifying our specimens.



Figs. 1, 2 and 3. Front-, back- and top-view of *Monodonta (Osilinus) articulata* Lamark 1822 shell.  $\times 1,5$ .

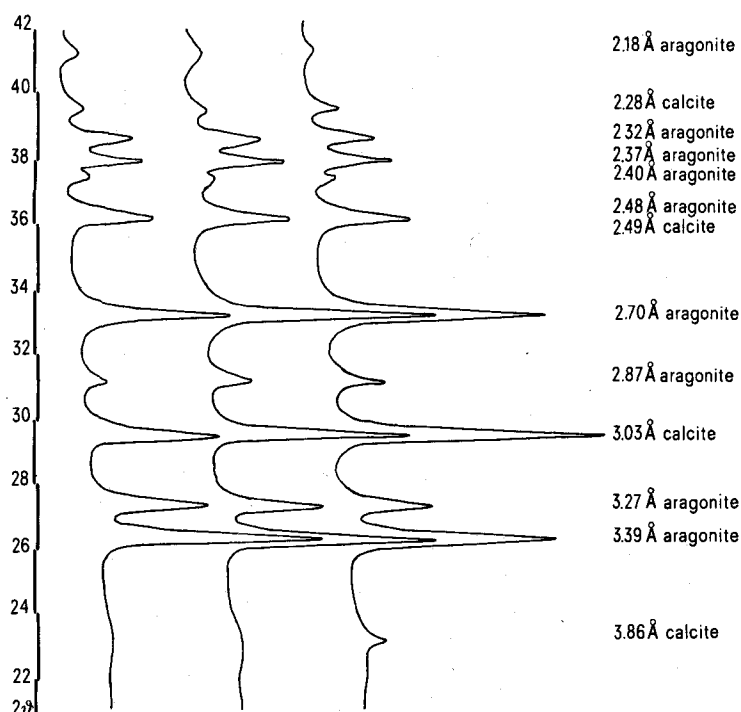
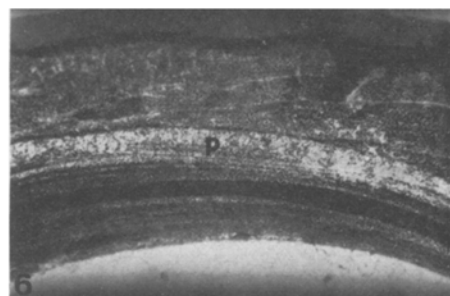
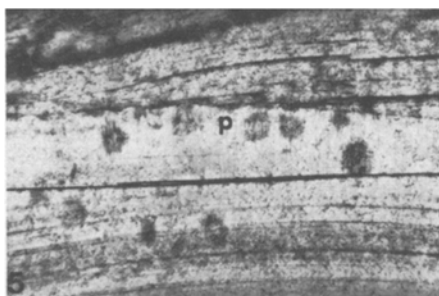


Fig. 4. Diffraction patterns of powders from different shells of *Monodonta (Osilinus) articulata* Lamark 1822. (CuK $\alpha$  radiation).

Fig. 5. Longitudinal section. p, normal prismatic (calcitic) layer.  $\times 200$ .

Fig. 6. Same section as Figure 5, stained for aragonite. p, unstained calcite.  $\times 75$ .



Investigations on shell mineralogy demonstrate that most marine gasteropod shells are aragonitic. Lowenstam<sup>2</sup> found only 5 genera with mixed mineralogies: *Patella*, *Haliotis*, *Fissurella*, *Nerita*, and *Littorina*. After Waskowiak<sup>3</sup>, *Thais*, *Neptunea*, *Purpura*, *Tegula*, *Crepidula* may be added.

A further genus, comprising at least 1 species with mixed mineralogy, is recorded in this paper: the species *Monodonta* (*Osilinus*) *articulata* Lamarck 1822 (figures 1, 2 and 3) secretes a shell containing appreciable quantities of calcite (figure 4).

In the course of an investigation on shells of *Monodonta articulata* from different localities of Western Sicily, percentages of calcite varying from 7% to 25% have been determined through calibration curves prepared following the procedure proposed by Turekian and Armstrong<sup>4</sup>. The calcitic microstructural unit, characterized by a normal prismatic structure, has been identified by mechanical separation of the structural units of the shell

and by staining technique on thin section (figures 5 and 6). Moreover, it has been observed that the calcitic unit lies anomalously between 2 aragonitic layers, as figures 5 and 6 clearly show, whereas it is well known from literature<sup>5-7</sup> that, in shells with aragonite-calcite composition, calcite forms only the uppermost layer, the only exception to this rule being some species of *Haliotidae*<sup>5</sup>.

2 H. E. Lowenstam, *Proc. nat. Acad. Sci.* 40, 39 (1954).

3 J. D. Milliman, *Marine carbonates*. Springer, Berlin 1974.

4 K. K. Turekian and R. L. Armstrong, *J. Marine Res.* 18, 133 (1960).

5 O. B. Bøggild, D. K. D. Vidensk. Selsk. Skr. naturh. Math. 9, 231 (1930).

6 R. G. C. Bathurst, *Carbonate sediments and their diagenesis*. Elsevier, Amsterdam 1971.

7 O. P. Majewske, *Recognition of invertebrate fossil fragments in rocks and thin section*. Brill, Leiden 1974.

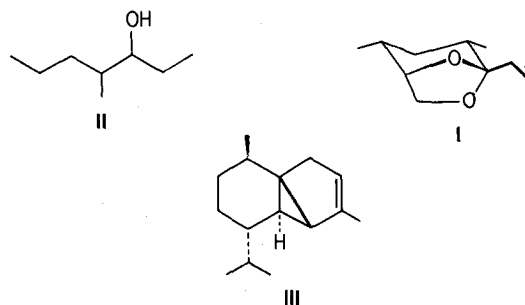
## Volatiles associated with *Scolytus scolytus* beetles on English elm<sup>1</sup>

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**Summary.**  $\alpha$ -Multistriatin, 4-methyl-3-heptanol and  $\alpha$ -cubebene, the components of the aggregation pheromone of *Scolytus multistriatus* are also associated with virgin female *Scolytus scolytus* on English elm, *Ulmus procera*.

In the USA the main vector of *Ceratocystis ulmi*, the causal fungus of Dutch elm disease, is the smaller European elm bark beetle *Scolytus multistriatus*<sup>2</sup>. When pioneer virgin females bore into American elm, *Ulmus americana*, an aggregation pheromone is produced which results in the secondary attraction of both sexes<sup>3</sup>. This attractant is now known to consist of at least 3 com-



1 We thank Dr J. F. Grove for advice and encouragement, Mrs J. Allsop for technical assistance, Dr J. W. Peacock for authentic samples of multistriatin, 4-methyl-3-heptanol and  $\alpha$ -cubebene, and the Parks and Gardens Dept., Brighton Corporation, for supplies of English elm.

2 G. T. Pearce, W. E. Gore, R. M. Silverstein, J. W. Peacock, R. A. Cuthbert, G. N. Lanier and J. B. Simeone, *J. chem. Ecol.* 1, 115 (1975).

3 J. W. Peacock, A. C. Lincoln, J. B. Simeone and R. M. Silverstein, *Ann. ent. Soc. Am.* 64, 1143 (1971). - J. W. Peacock, R. M. Silverstein, A. C. Lincoln and J. B. Simeone, *Environ. Entomol.* 2, 355 (1973).

4 R. A. Cuthbert and J. W. Peacock, *Environ. Entomol.* 4, 889 (1975).

pounds<sup>2</sup>: 2,4-dimethyl-5-ethyl-6,8-dioxabicyclo(3.2.1)octane ( $\alpha$ -multistriatin, I), 4-methyl-3-heptanol (II) and  $\alpha$ -cubebene (III). I and II are beetle metabolites, while III is a host-produced synergist. A synthetic mixture of these substances, multilure, is now being used experimentally in the USA for population sampling and control<sup>4</sup>. Since the re-introduction of an aggressive strain of