

MICROBORINGS IN FORAMINIFERAL TESTS: an ecological and paleoecological cross-reference

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Résumé: LES ENDOLITHES DANS LES COQUILLES DES FORAMINIFÈRES:

Présentation écologique et paléoécologique

Les endolithes microbiens ont la propriété de former des cavités dans le substrat carbonaté. Ces cavités correspondent à la forme de leur corps. Après le dépérissement de l'organisme nous les considérons comme des traces de fossiles. Les endolithes sont répandus des hautes Alpes calcaires aux sédiments carbonatés dans les océans les plus profonds. Les endolithes que nous présentons proviennent des squelettes calcaires des organismes marins, actuels et fossiles.

Le creusage des endolithes se déroule à la surface du fond marin, ou se touchent les sédiments et l'eau. Dans la densité des microcavités se reflète la durée de peuplement des endolithes dans la particule carbonatée. La possibilité existe de développer la mesure semi-quantitative de la vitesse de la sédimentation. Une telle méthode serait applicable aussi à la détermination du degré de vitesse de la paléosédimentation.

Nous avons établi que la paroi de la coquille des foraminifères de carbonate de calcium sert de substrat pour le creusage des endolithes microbiens. Nous avons présenté la liaison des endolithes avec les foraminifères jusqu'au Paléocène. La thanatocénose de deux groupes d'organismes non apparentés permet de nouvelles possibilités et une amélioration de l'étude de la paléoécologie et de la paléobathymétrie.

Microbial endoliths are microscopic organisms with members of different groups of plants and animals (fungi, Prokaryota, Protists) which share a common property: they are capable of chemical dissolution of hard carbonate substrates. They thereby create the cavities which they inhabit. These cavities most often conform closely to the shapes of their bodies. Long after the organisms die and degrade this imprint of their life activities remains. Thus, their empty boreholes are considered trace fossils. The fossil record of endolithic microorganisms has been found to extend as far back as the late Precambrian. Virtually any kind of carbonate substrate, biogenic or inorganic in origin, is subject to boring. Endoliths are distributed from the high carbonate Alps to the carbonate sediments of the deepest sea. Apparently, there is no limit to their depth distribution save that imposed by the depth of the lysocline (carbonate compensation depth of the deep oceanic water) beyond which all mineral carbonate enters solution.

Endolithic boring is a benthic phenomenon which occurs primarily at the sediment-water interface. The residence time of a sediment particle at the surface is reflected in the density of microboring it exhibits. Thus, a semi-quantitative measure for the study of sedimentation rate may be developed. Such a method would also be applicable for determination of paleosedimentation rates.

We have now determined that the tests of all types of calcium carbonate shell-bearing foraminifera act as substrates for boring by microbial endoliths. The association of endoliths with foraminifera is also found to have a long fossil history (to the Paleocene). Thus, we are presented with its own ecological requirements in life, and specific and durable signature in death. The resulting thanatocoenosis may reveal new keys and allow refinement of the study of paleoecology and paleobathymetry. The combined study of the independent variables provides a new ecological and paleoecological cross-reference.

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Boreholes of endolithic organisms in the wall of a Foraminifera from Oligocene, enlarged 600 x

