GROWTH AND FUNCTIONAL MORPHOLOGY OF *PLEUROCYSTITES SQUAMOSUS* BILLINGS, AN ORDOVICIAN RHOMBIFERAN ECHINODERM

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An exquisitely preserved Pleurocystitid-Crinoid Community from the Middle Ordovician Dunleith Formation near Burr Oak, Iowa provides great insights into the paleobiology of *Pleurocystites* . The community lived in quiet-water on an equatorial shelf at a depth of about 40 m. All specimens occur in a single bed of fine-grained sediment made up of silt and clay-sized carbonate along with some fossil debris. The community was overwhelmed and buried by a submarine mudflow. Complete and almost complete individuals were presumably alive when buried, but the disarticulated material is attributed to organisms that had died previously. *Pleurocystites squamosus* dominates and represents about 55 percent of the specimens in the fauna. The flattened theca denotes that the pleurocystitids lived on the substrate. The side with the pectinirhombs almost always faces upward and this is considered to have been the living position. Some individuals apparently lay on the surface whereas others were largely buried under a thin film of sediment with only the pectinirhombs visible from above. The distal parts of the brachioles are oriented with the food grooves and covering plates facing the seafloor. Brachioles can be found parallel to the substrate or penetrating into the carbonate mud at a shallow downward angle. These pleurocystitids were probably deposit feeders in which the brachioles swept the surface or probed into the carbonate mud for organic detritus and/or microorganisms. The stem shows no traces of attachment and it was presumably used for temporary grasping and locomotion. The pleurocystitids seem to have altered the habitat by stirring up a fine cloud of sediment that excluded suspension feeders on and near the seafloor. Most Dunleith echinoderm communities are characterized by a diversified suite of "low-level" suspension-feeding crinoids and other echinoderms that ranged from the seafloor up to elevations of approximately six cm. Aside from the possible presence of one rare species, such organisms are conspicuously absent from the Pleurocystitid-Crinoid Community. Relative to other Dunleith environments, only "high-level" suspension feeders were present at elevations of 10 to 100 cm.

The abundant material of *Pleurocystites squamosus* is suitable for the study of growth. Development is basically isometric with several exceptions. The length of the distal region of the stem increases compared to the size of the theca, probably in response to problems of locomotion at successively larger body sizes. The pectinirhombs most likely served for respiration in which the interchange of oxygen and carbon dioxide took place across the dichopores by diffusion through the organic matrix in the calcite plates. The insides of the dichopores were presumably lined with coelomic cavities whereas sea water moved along the outsides of these structures. New dichopores form at both ends of the pectinirhombs throughout ontogeny. The width of the individual dichopores remains constant at all sizes. However, the length and the depth of the dichopores are augmented by deposition of new calcite on the plate margins and interiors. Because of these growth patterns, the area available for respiration in the dichopores is positively allometric relative to the size and volume of the animal. Several possible mechanisms of respiration were modeled for pleurocystitids. Although, the results are somewhat ambiguous, the pectinirhombs probably accounted for most of the respiratory requirements. Cloacal pumping is also plausible. Respiration through the surface area of the theca and by the water vascular system in the brachioles were clearly insignificant. All data are consistent with slow and sluggish behavior.