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# OLDEST CORAL BANDS IN THE TRIASSIC OF NORTH AMERICA AND THE EVOLUTION OF PHOTOSYMBIOSIS

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Scleractinian corals first appeared in Middle Triassic time. Modern zooxanthellate descendants secrete aragonitic skeletons with discrete, periodic (annual) growth bands. Alternating low-density and high-density skeletal layers comprising annual bands, have been associated with variables of light, temperature, reproduction, nutrients, and other factors affecting the energy budget of coral growth. Such annual bands provide direct records of linear growth rates and are best developed in living zooxanthellate species. Growth bands are rare in fossil corals, previously being known from the Jurassic (Insalaco 1996). Debate exists about when the symbiotic relationship between single-celled zooxanthellae and their scleractinian hosts originated and whether the earliest scleractinians that first appeared in Middle Triassic time were zooxanthellate and thus capable of reef building. We present evidence supporting the premise that the zooxanthellate photosymbiosis with corals was present during the Middle Triassic based on apparent banding analogous to annual density banding present in modern-day zooxanthellate scleractinians.

Middle Triassic biostromes from central Nevada, USA, yield corals with distinct bands interpreted to be relict images of annual density bands which were preserved in spite of diagenesis. These growth bands are present in a massive cerioid scleractinian, *Ceriostella variabilis* (Roniewicz and Stanley, 1998), which is abundant and the principal builder of these biostromes. Although phylogenically unrelated, *C. variabilis* compares quite favorably with the common Caribbean zooxanthellate coral, *Montastraea faveolata*, both in general corallum shape and corallite characteristics as well as being a common reef species. Modern *M. faveolata* samples were chosen from a site at a general latitudinal limit to reef growth which is assumed to be most consistent with the Nevada biostromes.

Colony size and shapes of *C. variabilis,* coupled with an analysis of the growth bands, reveals morphologies consistent with light-adaptations and also yield bandwidths comparable in size, variability, and coefficients of variation with those of *M. faveolata.* No significant difference was detected in variability of bandwidth between species which supports the premise that the *C. variabilis* bands were likely produced on an annual basis akin to those of *M. faveolata.* Further, the low-/high-density ratio is comparable with values obtain from Jurassic and modern zooxanthellate corals. Results suggest that Triassic *C. variabilis* was thus a photosymbiotic and zooxanthellate coral. This gives credence to the idea that the coral-zooxanthellae symbiosis was in the early stages of its evolution or already present in scleractinian corals during Middle Triassic time.

## References

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