h6 Mesozoic reefs < rudists, scleractinians >

Cretaceous and Late Jurassic organic reefs are distinctive for the presence of rudists (extinct reef building pelecypods). Adapted to a sedentary mode of life, sometimes forming extensive mounds, rudists are remarkable and distinctive for having converged in their evolution on earlier extinct horn corals. Of such variable morphology, some rudist species are hard to identify as bivalves. Species with a cylindrical and coral-like shapes have a large horn-shaped lower valve and a small plate-shaped upper valve that forms a lid. The lower valve is often very thick and may have a complex wall structure; some even have tabula!

Mesozoic corals are of the order Scleractinia (hard-rayed). With still living descendants, these corals evolved as a new type of reef building coral during the Middle Triassic. They are hexacorals, which secrete septa in cycles of six. This distinguishes them from older orders of solitary and colonial corals, which they replaced: the tetracorals that secreted septa in cycles of four.[1]

Other Mesozoic reef contributors were dasycladaceous green algae (which continue and while alive become raggedly sheathed by calcareous encrustations that broken off and shed after death add prodigiously to lagoonal sand),[2] and the bryozoans. ❏

Footnote h5.1

Dinoflagellates are protists that swim about powered by two flagella. They are key players in aquatic ecosystems. However, they defy neat categorization as at one stage of their complex life cycle a dinoflagellate can photosynthesize and be food for other organisms and, at another stage, it can be a predator. Their range of habitat is very great. For example, diverse and large numbers of them live only in the pores of ice. Because of their tininess (a high power optical microscope is needed to view their forms) and daunting variability, few have been well described. One, *Pfiesteria piscida* (fee-STEER-e-ah pis-SEED-uh), made headlines when its treacherous ways were exposed. It caused memory and health problems in 13 people who were investigating its implication in fish kills in Chesapeake Bay, MD, and in North Carolina. Described by its codiscoverer JoAnn M. Burkholder in 1992 as "plant- and animal-like," *Pfiesteria* can photosynthesize, but only if it has stolen the green organelles, called *chloroplasts*, from true algal cells. To acquire these "kleptochloroplasts," it uses a hose-like appendage. When fish are around, it can turn into a predator. In this role, it abandons its usual swirling swim-pattern and makes a beeline for its prey in response to an unknown cue; perhaps fish oil or excrement. On arrival, it emits a toxic cocktail: one compound to kill the fish, and another that opens up the fish's skin so that it can feed on the tissue inside. At other times, hiding in bottom muds, it exists in forms that only DNA studies can show are *Pfiesteria*. In all, *Pfiesteria* has a known 24-stage life cycle! [8]

Iron Ocean waters between Antarctica and the southern tips of the Americas and Africa are nutrient rich in nitrates and phosphates but are poor in phytoplankton. John Martin, using ultra-clean glass sampling apparatus determined that iron could be the missing factor that limits phytoplankton growth.[9] Ecological concerns made him reluctant to test this finding, which he published in 1988, but since his death in 1993 several expeditions have sprinkled iron in large scale tests (ecology be damned) and have found Martin's hypothesis of iron as a biolimiting element in the oceans to be true.

Red tides Jason Lenes in 2001 reported that when the NE Trade Winds deliver dust from the iron-rich Saharan soil to West Florida, off-coast surface water iron concentrations can increase 300 percent and a tenfold count-increase of *Trichodesmium* (a genus of marine photosynthetic cyanobacteria) can result. Such diazotrophs fix dissolved inorganic nitrogen (N_2) as nutritive dissolved organic nitrogen (NH_4^+).[10] This nutrient feeds huge blooms of toxic "red algae," which are actually the dinoflagellate *Karenia brevis* (formerly *Gymnodinium breve*: reclassified in the taxonomy in honor of Dr. Karen Steidinger, a prominent red-tide scientist from the Florida Marine Research Institute, St. Petersburg, FL). The toxic bloom in turn decimates other marine life and "brevetoxin" can cause in humans sea-bathing skin and sea-breeze related respiratory ills, and death by eating at the time, filter-feeders as clams and oysters.[11]