Great Barrier Reef: A youngster to the core

Once deemed as ancient as 20 million years, Australia's Great Barrier Reef now appears a mere babe in the waters — an infant whose growth has waxed and waned markedly with fluxes in sea level.

Geoscientists on a recent expedition of the Ocean Drilling Program (ODP) recovered sediment cores from 16 sites off Australia, including four spots on the slope of the Great Barrier Reef. This dynamic complex of coral, plants and animals stretches more than 2,000 kilometers along Australia's northeastern shore, and its calcium carbonate framework — secreted by coral polyps (see story, p.364) — ranks as the world's largest structure built by living organisms. Microfossil dating of the cores shows that the reef began forming less than 1 million years ago, and perhaps as recently as 500,000 years ago, says project co-chief Judith A. McKenzie of the Swiss Federal Institute of Technology in Zurich.

The ODP scientists, who will detail their findings in a future issue of GEOTIMES, were surprised that such a large amount of calcium was "pulled from the sea" to form the reef skeleton in such a short period of time, McKenzie told SCIENCE NEWS. The rapid evolution of the reef complex might also imply that it could quickly disappear under detrimental conditions, she adds.

Two decades ago, oil-industry and scientific drilling data indicated that the northernmost extremity of the Great Barrier Reef near New Guinea was 20 million years old, leading geologists to assume a similar age for its central portion off Australia. But no one ever found evidence to support that theory, and in the 1970s scientists began hypothesizing that the reef dated back only 2 million to 5 million years, says biologist Don W. Kinsey of the Great Barrier Reef Marine Park Authority in Townsville, Australia.

The new findings — the first hard proof of the reef's young age — indicate the structure formed even later than that.

Kinsey says the sediment analysis suggests that until 1 million years ago, "for some reason or another . . . conditions were not favorable for growth [of this reef]." One possible explanation is that rapid changes in sea level disrupted the conditions necessary for reef initiation, he says.

The relationship between sea levels and coral reef growth is well documented. Indeed, the ODP scientists found that variations in calcium carbonate production at the Great Barrier Reef correlate strongly with as many as 24 cycles of major rises and falls in sea level, says team geologist Amanda Palmer-Julson of Texas A&M University in College Station. Sediment cores displayed "alternating layers of mud and then coral bits, then more mud and more coral bits," she says.

"When sea levels dropped, the reef would be exposed and the [reef] creatures would die," she explains. This is reflected in the sediments from the reef slope, which in low-seas periods contained less reef material and more magnetic minerals deposited in mud by continental rivers, she says. As sea levels returned to normal, reef organisms would start to grow and make calcium carbonate again. But if the seas rose too high, they could leave the reef so deeply submerged that its organisms would die from low temperatures or insufficient sunlight.

Sea levels shift when the ocean floor subsides or when global climate changes occur. During ice ages, for example, glaciers lock up water and cause oceans to recede. The Earth is currently in a high-seas period, McKenzie says, and according to the geologic record and the reef cores, the oceans are due to fall again, though not for at least another several thousand years. Before then, however, a global warming may offset any ice-age-bound planetary cooling, McKenzie says. Reef-core studies at various locations may prove useful in predicting future sea level fluxes, she adds. — *I. Chen*