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Coral reefs around the world have experienced a dramatic decline during the past 25 years. Overfishing is believed to be a major cause, but the mechanisms are not well understood. Damaged reefs can not repair themselves during human time scales. The first step in restoring any ecosystem is to understand the functioning of the ecosystem in its natural state. Our research project attempts to mechanistically model coral reefs in their natural or pristine state, and to use the model to examine the deleterious effect role of fishing.

Very recent studies discovered that the apex predators and their prey form an inverted biomass pyramid. At Kingman reef, 85% of the biomass is in apex predator, and is in sharp contrast to most reefs where the fish biomass pyramid is bottom heavy. Our model explains the existence of the inverted pyramid within an extended framework of consumer resource theory. (Received September 01, 2008)