

MATTERS OF THE RECORD

Predation defeats competition on the seafloor

Steven M. Stanley

Department of Geology and Geophysics, University of Hawaii, 701 POST Building, 1680 East-West Road, Honolulu, Hawai'i 96822. E-mail: stevenst@hawaii.edu

Accepted: 26 August 2007

*. . . the snail, whose tender horns being hit
Shrinks backward in his shelly cave with pain,
And there, all smothered up, in shade doth sit,
Long after fearing to creep forth again. . . .*

— William Shakespeare,
Venus and Adonis (1593)

For many decades, ecology textbooks presented classical competition theory without reservation. The central principle here is that two species sharing an essential resource that is in limited supply cannot coexist for long because the competitively superior species will eliminate the other one. The implication is that ecological communities should be characterized by division of resources among species, or niche partitioning. Thus, it is understandable that many paleontologists have continued to invoke concepts of competitive exclusion and niche partitioning in their studies of ancient guilds and communities. By now, however, there is a large body of neontological literature demonstrating that interspecific competition and resource partitioning play only a minor role in many ecological communities—especially benthic marine communities, which are the primary focus of the following discussion. Predation and physical disturbance inflict so much damage on biotas of the seafloor that populations of one species seldom monopolize a potentially limiting resource, except sporadically and locally. As a result, it is uncommon for any species to drive another to extinction through competitive exclusion—or even to force another species to drastically change its exploitation of any environmental resource throughout its geographic range. Furthermore, what particular species or group

of species occupies a particular microhabitat is often simply a matter of time of arrival.

The present contribution follows a memoir (Stanley 2007) showing that the taxonomic diversification of the large groups of marine taxa that Sepkoski (1981) identified as the Paleozoic and Modern faunas has entailed intervals of unbridled exponential increase separated by episodic mass extinctions. On this largest biotic scale, it is evident that no carrying capacity for the environment has ever significantly hindered diversification in the benthic marine realm. This should be no surprise when we reduce our focal length to observe the unstable, and often transient, nature of local populations. I will argue here that, in terms of resource partitioning, benthic marine communities have always been weakly structured at the primary consumer level.

Widespread sharing of resources by primary consumers in the benthic marine realm leads to another notion to be advanced here: the idea that rates of speciation are retarded for benthic animals by the rapid extinction of small populations that constitute incipient species. Inasmuch as a highly localized new species is likely to consume the same kind of food and utilize the same kind of space as numerous co-occurring species, it is unlikely to be occupying a distinctive new ecological niche that would permit it to expand its population size quickly, so as to have a good chance of surviving for more than a brief interval of time. If predation and physical disturbances affect it as strongly as they do more populous species, it will remain at small population size and be vulnerable to early accidental extinction.

Benton (1987) argued that paleontologists