What makes life go at the tropics?

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What causes tropical life to thrive: temperature, or sunlight? The answer is not necessarily "both." According to a study published online this week in *PNAS Early Edition*, the explosion of species at the tropics has much more to do with warmth than with light.

"The diversity was unrelated to productivity (from photosynthesis), but it was strongly related to temperature," said University of Southern California biologist Jed Fuhrman, who led a group that analyzed bacterial samples from warm and cold oceans.

Fuhrman's group found far greater diversity in samples taken near the equator. In particular, samples from low-productivity waters still contained many bacterial species, suggesting that photosynthesis has little influence on diversity.

Many researchers have tried to separate the influence of temperature and sunlight, Fuhrman said, but have found it hard to do by studying higher organisms.

Bacteria are ideal subjects because of their wide distribution and the recent availability of genetic fingerprinting, he added.

The question of what drives diversity is important to biologists who seek to uncover the basic rules governing life.

"Is diversity ruled by fundamental laws, and if so, what is the basis of them?" Fuhrman asked.

The so-called kinetic law links the rates of metabolism, reproduction and many other biological processes to the motion of atoms and molecules. Such motion increases with temperature, presumably speeding up the biological processes.

Fuhrman calls this “the Red Queen runs faster when she is hot” hypothesis.

Productivity also is thought to promote diversity by increasing the food supply. This is “the larger pie can be divided into more pieces” hypothesis.

The two hypotheses may both be valid, Fuhrman said, but his group’s results show that “the kinetics of metabolism, setting the pace for life, has strong influence on diversity.”

Biologists have known for centuries that animal and plant biodiversity is greatest at the tropics, though they have not agreed on whether temperature or productivity was the cause.

The Fuhrman group is the first to show that bacteria follow the same pattern. And as the PNAS study shows, bacteria are useful vehicles for probing the causes of biodiversity.

Fuhrman, holder of the McCulloch-Crosby Chair for Marine Biology in the USC College of Letters, Arts and Sciences, has been studying bacteria since the early 1980s, when new instruments and techniques greatly improved scientists’ ability to identify microbial species.

Since then, marine biologists have realized that bacteria play a dominant role in the oceans. More than half the carbon dioxide respired by marine organisms comes from bacteria, Fuhrman said. Bacteria also comprise most of the diversity on earth, control vital biogeochemical cycles, and

form an integral part of the food chain.

“I study them because, even though they’re invisible, they’re incredibly important,” Fuhrman said.

Source: University of Southern California