

organic matter in the soil may be representative of leaf litter inputs to the aboveground invertebrate community. High levels of soil organic matter may be due to soil accumulation resulting from slow decomposition rates, which may indicate a less productive ecosystem. Alternatively, excess organic matter may represent high leaf litter input and a potentially productive ecosystem. In the latter scenario, high leaf litter inputs, coupled with high moisture levels, may increase resource availability to the detrital community.

If soil moisture and organic matter content indicate soil productivity, our results suggest that more productive soils can support a greater number of invertebrates across a wider range of morphotypes. Productivity, defined as the amount of energy available to a system, is essential to organismal growth and reproduction. High productivity may relax resource limitation and allow more individuals to coexist.

Our data suggest a positive linear relationship between diversity and productivity. To

determine the shape of the relationship between productivity and diversity of highly productive tropical soil communities, future studies should investigate the interactions between soil moisture, organic matter, soil productivity, and community structure.

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## Work it! Tropical aerobics near sea and sky

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**Abstract:** We hiked to the top of a mountain. We counted our heart rate for 30 seconds. We did 50 spirited jumping jacks and counted again. One minute later, we did a final count. Then, at sea level, we repeated the process. As predicted, the FSP group's hearts beat much faster at high elevation. We suggest you enjoy the rest of this paper for what it is: a light-hearted composition that should only be taken seriously for its remarkable results.

**Key Words:** Ben's mom, Cerro de la Muerte, La Selva, MEJENGA!, swarthy

## INTRODUCTION

Dr. David Peart had wanted to do it for years. The other FSP groups just hadn't been willing, hadn't been ready. This was the year he was going to organize the greatest comparative project ever done. He was going to take the group to the top of a mountain to deprive us of oxygen and make us exercise. Then, in the middle of the jungle, we would do it again. The good doctor knew we would have some interesting results, but with this wild and crazy group of kids, he just wasn't quite sure what they would be.

## METHODS

On 11 February 2003 a tired and weary FSP group reached the paramo of Cerro de la Muerte, 3,400 m above sea level. After scarfing down a delicious lunch purchased by Nira and Pauline, Katie "All I ever do is exercise" Theoharides decided she needed another workout to follow up the 22 km hike out of Corcovado. David knew this was his chance to do ground breaking research. His biological career was about to peak at the top of a mountain in Costa Rica. Then Jay was given responsibility and all dreams came to a screeching halt. In the confusion of starting his watch and writing down data, Jay couldn't find his own pulse. The rest of us successfully counted our heart rate for 30 seconds. Then it was time to turn it up a notch. Kirtley was chosen to lead the group in 50 intense jumping jacks, even though she is argu-

ably the laziest of the group. After enduring the most exercise Jenn Casler has ever done, we counted our heart rates for another 30 s. A minute later, the count was repeated.

At La Selva, we found a few minutes without rain to repeat the routine. Jay failed again and couldn't find his pulse. Apparently, the stress of correcting papers was too much for Pauline, and she lost her pulse too. The data from the incompetent TA's was not included in the final results.

## RESULTS

Our intense exercise regime made the whole group's pulse rise at both the high and low elevation sites (Fig. 1; paired-t = 13.37, df = 15,  $P < 0.0001$ ; paired-t = 11.61, df = 15,  $P < 0.0001$ ). We had a higher pulse rate at the high elevation site than at the low site before the jumping jacks (Fig. 1; paired-t = 4.32, df = 15,  $P < 0.001$ ). The mean ( $\pm$  SE) pulse rate at the low site was  $30.94 \pm 1.32$  beats / 30s, and was  $37.03 \pm 2.20$  beats / 30s at the high altitude site. Similarly, after exercise, our pulse rate was significantly greater at high elevation than at low (Fig. 1; paired-t = -3.70, df = 15,  $P < 0.001$ ). The high elevation mean was  $63.63 \pm 3.41$  beats / 30s after exercise, and the low elevation mean was  $54.19 \pm 2.19$  beats / 30s.

## DISCUSSION

It turns out that hearts beat faster at high elevations. The group's average heart rate was significantly higher at Cerro de la Muerte than La Selva, both before and after Kirtley's butt-busting workout. Besides the obvious elevation and oxygen differences, this could be for a couple reasons. First, a certain female was at a closer proximity to a certain male member of the group that made her heart race. Her actual count at high elevation was 90 beats / 30 s! At La Selva, we decided to move her next to Ingrid before she had a heart attack. Also, Nira and Cathy hadn't run their normal 12 miles a day at Corcovado and were a little out of shape by the time we got to the mountain. At La Selva, they were back up to 15 miles per day, and their heart rates only increased by two beats after the jumping jacks.

At the low elevation site, our heart rates increased an average of  $23.3 \pm 0.87$  beats / 30 s after strenuous exercise. Kirtley worked her magic again at the high elevation site and got our hearts working even harder at an average of  $26.6 \pm 1.21$  beats / 30 s higher than at rest.

One minute seemed to be enough to get our hearts back to a normal beat. Although, Art's heart needed a little more time to recover from his ridiculous jumping jacks. We suggest he return to third grade gym class and learn how to do them properly.

## ACKNOWLEDGEMENTS

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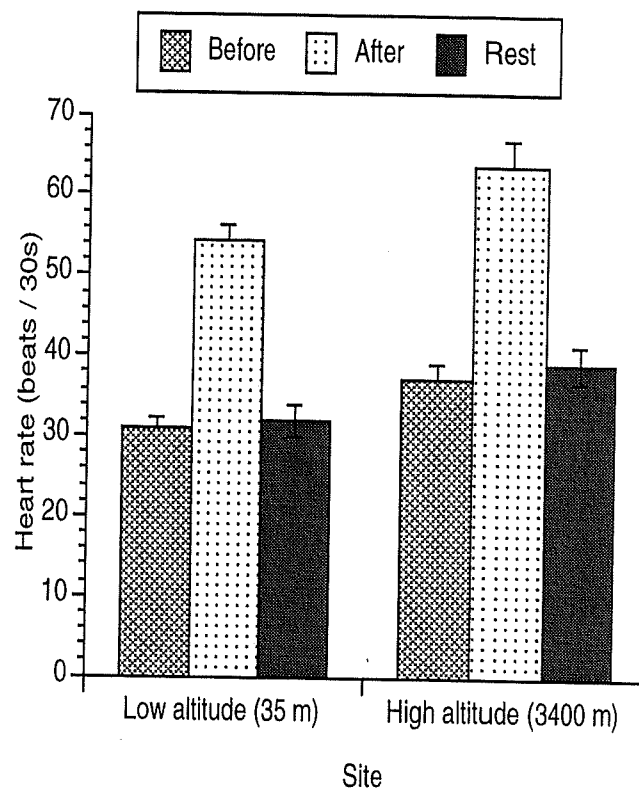


FIG. 1. Heart rates in beats / 30s (mean  $\pm$  SE) of the Dartmouth FSP group ( $n = 16$ ) at La Selva (low altitude), and Cerro de la Muerte (high altitude), Costa Rica, before and after exercise, and after a 1-minute post-exercise rest.