Beetle Tree The Second

In his interesting article in the the Fall 1994 issue (Am. Entomol. 40: 168–177), David Denlinger describes the wonderful life of a tropical beetle, Stenotarsus rotundus Arrow (Endomychidae). I studied cold hardiness in this beetle during its diapause in Panama in 1991–1992, and here I present some suggestions on the ecological and evolutionary consequences of other observations made.

Among other information, Dr. Denlinger writes that despite many years of effort, no other aggregation of the beetle was found other than on a single palm tree. During my stay, in February 1992, David Roubik found another aggregation of similar beetles. While the former aggregation was (and every year is) on a stem of the palm Oenocarpus mapora, this new aggregation was on the trunk and branches of a dicotyledonous tree Tetragastris panamensis. This tree is situated in the lowland (while the former is on a hill slope) in Gigante peninsula, near Barro Colorado Island (about three miles from the original aggregation). However, there is again nothing special about the site, no landmark for the beetles to find the mass dormancy site. Another difference from the original aggregation was that the beetles in the former site were almost all hidden in the soil crevices by the palm stem base, while these new beetles were sitting in the open, exposed to the dry air in the advanced dry season. Large rusty spots of tens of thousands of the diapausing beetles were shining on the bark at a height of one foot to ten yards above the ground.

You could say, “That is nothing special; there must have been other aggregations and one was just found.” However, Dr. Denlinger’s affirmation that there was only one aggregation of S. rotundus found in Panama is still true. The newly found beetles belong, in fact, to a different species! At first glance they look similar, but the males have a very different shaped aedeagus, and there are also some other minute differences suggesting that we have found another species. Definitely a new one, because J. M. Kingsolver in Florida State Collection of Arthropods, who has access to the Strobecker’s collection, failed to determine the species.

We might speculate about the origin of the new species (let’s hypothetically call it S. gigante). One of the roles of aggregating in S. rotundus (and in insects in general) is to find a mate. Dr. Denlinger describes the frenzy of mating of the beetles just before dispersion from the dormancy site. If all individuals of the local subpopulation return every year to the same tree to diapause, there is almost random and complete panmixy within the subpopulation and almost complete reproductive isolation from the rest of the population. If several beetles miss this particular tree and find another one available for diapause, they will mate within a small group and then disperse to lay eggs. Supposing that the new generation of these beetles from the near vicinity return to the newly found site, there is a good chance to fix alleles rare in the original population (the founder effect) and new mutations within a few generations. With more time, the two subpopulations can accumulate divergent mutations that would prevent future hybridization. On the new tree, we could find a new species of beetle. We can seek other trees inhabited by Stenotarsus in the Panamanian rain forest and, with good luck, we may find more undescribed species. One tree, one new species! Of course, there is a chance that the new subpopulation will remain genetically unchanged, especially if it is large, and, thus, the original species may have many populations inhabiting a large area (S. rotundus is known also from Guatemala).

Other questions are what are the food and the nature of the breeding site of S. rotundus, and why do the beetles breed only at the beginning of the rainy season while fungi are present in the forest during the entire rainy season? The answer becomes apparent when we visit the forest during the dry season. The forest ground is covered with up to one foot of litter from the canopy trees. But, all disappears within several weeks after the onset of the rains. Fungi—the food of endomychids—are likely to be the main decomposers. For a short time, fungi are available in abundance, but later in the rainy season, the decomposition occurs too fast to leave enough food for the beetles. Some species are adapted to searching and utilizing limited food resources (I have found active Stenotarsus ovalis Arrow in the beginning of dry season), while S. rotundus and S. gigante don’t rely on such a way of life and possibly are adapted to a resource that is abundant for a short time, and thus, rely on diapause.

During the dry season, there are also waste heaps of the leafcutting ants (genus Atta, which plant specific fungi in underground gardens) among the plant litter on the forest ground. I tried to cultivate this waste, and I got fertile fungi in considerable amounts. Are the Stenotarsus species among the utilizers of this resource? I did not manage to test this idea. This remains to be solved by other entomologists staying on Barro Colorado Island in May and June.

Oldrich Nedved
Institute of Entomology
Academy of Sciences
Czech Republic

Dr. Denlinger replies:

I am confident that lots of other beetle trees exist. I was aware of the aggregation of a similar species discovered by David Roubik and, in response to my article, I received several letters and e-mail messages reporting aggregations of “similar-looking” beetle species from other sites in Central America. Whether any of these other sightings are indeed Stenotarsus rotundus remains unknown. I welcome any such information and would be most grateful for samples of specimens for comparison.

Dr. Nedved suggests an intriguing evolutionary scenario of one tree and one beetle species. For S. rotundus, this is unlikely because specimens are known from as far away as Guatemala, but I certainly agree with Dr. Nedved that the aggregation and mating pattern observed in S. rotundus offer a powerful isolation mechanism that could easily lead to speciation. It’s an idea well worth testing!

If the beetles are as strongly linked to a single tree as our observations suggest, there is one experiment I would love to do. The experimenter within begs to observe the beetles’ fate when the tree disappears. The palm that hosts S. rotundus, however, is likely to occupy the same site for long stretches of time. In this species, new shoots quickly replace a mature tree that may fall victim to a tropical storm or other calamity. But, my respect for the beetles, not to mention the regulations governing Barro Colorado Island, restrain me sufficiently from seriously proposing to execute this tempting experiment.

David Denlinger
Ohio State University
Columbus, OH