LETTER

Reply to Gamfeldt: Biodiversity and ecosystem functioning

In his letter (1), Gamfeldt asks questions concerning broader aspects of our study (2). In response, salamander biomass has been substantially reduced. In the upper cloud forest habitat at El Rincon, San Marcos, Guatemala, 3 formerly abundant salamander species and a 4th relatively rare species were not found. Although 3 other species were found as often or slightly more so than in the past, the overall salamander density at El Rincon is much lower compared to previous decades. These 7 species constitute the entire salamander community at this site, and no species were found on our recent surveys that were not present in the 1970s. The total salamander biomass at the site is only a fraction of what it once was; vastly fewer amphibians and reptiles (specifically salamander-eating snakes) were encountered than in the past. Similarly, forest habitat with formerly dense populations of *Pseudoeurycea* and *Thorius* on Cerro San Felipe, Oaxaca, Mexico, now contain no *Pseudoeurycea* (based on our surveys) and very few *Thorius* compared with previous decades, although suitable habitat remains. All salamander species have declined at this site, with no compensation from any other salamander species.

These results suggest that ecosystem processes involving salamanders have been substantially affected by the decline in salamander abundance and species diversity. Salamanders are important mid-level predators that participate in ecosystem processes and represent a critical store of energy and nutrients for tertiary consumers (3). Although the ecological role of tropical salamanders is not well understood, the formerly high density of these species and the importance of salamanders for ecosystem processes in temperate forests imply that these declines have consequences for ecosystem function.

***Sean M. Rovito*[a], *Gabriela Parra-Olea*[a,b], *Carlos R. Vásquez-Almazán*[c], *Theodore Papenfuss*[a], *and David Wake*[a,1]**

[a]*Museum of Vertebrate Zoology and Department of Integrative Biology, University of California, Berkeley, CA 94720-3160;* [b]*Instituto de Biología, Universidad Nacional Autónoma de México, AP 70-153, CP 04150, Ciudad Universitaria, México D.F., México; and* [c]*Museo de Historia Natural, Universidad de San Carlos, Calle Mariscal Cruz 1-56, Zona 10, Cuidad de Guatemala, Guatemala*

1. Gamfeldt L (2009) Biodiversity and ecosystem functioning: Effects of salamander species richness loss. *Proc Natl Acad Sci USA*, 10.1073/pnas.0902579106.
2. Rovito SM, et al. (2009) Dramatic declines in neotropical salamander populations are an important part of the global amphibian crisis. *Proc Natl Acad Sci USA* 106:3231–3236.
3. Davic RD, Welsh HW, Jr (2004) On the ecological roles of salamanders. *Annu Rev Ecol Evol Syst* 35:405–434.

Author contributions: S.M.R., G.P.-O., C.R.V.-A., T.P., and D.W. wrote the paper.

The authors declare no conflict of interest.

[1]To whom correspondence should be addressed. E-mail: wakelab@berkeley.edu.