Is there a link between anthropogenic disturbance and the diversity and abundance of rodent flea communities ?

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Introduction Fleas are among the most common arthropod vectors of many of rodent borne diseases like plague (*Yersina pestis*) . Human outbreaks of plague are commonly associated with the presence of peridomestic rodent species (Perry and Featherston , 1997) . Anthropogenic disturbance with respect to both habitat use and climate change can affect disease emergence and prevalence through its impact on hosts and host-parasite (vector) ecology (Daszak et al ., 2001) . Vector-borne disease transmission is often related to species diversity (Keesing et al ., 2006) . In addition , flea abundance and host spectrum (number of hosts infested) relate to the likelihood of flea-mediated disease transmission , particularly with respect to plague (Krasnov et al ., 2006) . Anthropogenic disturbance can influence rodent community diversity (Tikhonova et al ., 2006) , which in turn can affect flea diversity (Krasnov et al ., 2004) , and may lead to decreased host specificity among flea parasites (Gettinger and Ernest , 1995) . The goal of this paper is to examine the influence of anthropogenic disturbance on flea communities from a variety of habitats across the world . In particular , this analysis focuses on the effect of disturbance on flea diversity and flea species abundance and specificity behaviors .

Methods Literature was compiled on studies conducted across the world that reported the entire flea assemblage from comprehensive rodent community surveys (Friggens , 2008 for comprehensive list) . Basic criteria for inclusion in this analysis were studies that demonstrated live capture trapping and active flea collection and provided habitat characterization and detailed data for flea and rodent species . Studies sites were categorized according to three impact levels : (1) High impact such as urban or densely populated areas ; (2) Intermediate , which included rural villages , and crop and rangelands ; and , (3) Low impact sites characterized as remote or wild habitat . For each study/habitat type , rodent and flea diversity (Shannon's H) and abundance (when available) , number of infested hosts and average flea burden per host species were calculated . Data was analyzed using t-tests or linear regression in SigmaPlot 9 .0 .

Results Thirty seven studies were included in this analyses . These comprised 11 high impact , 16 intermediate , and 10 low impact sites . Desert , Grassland and Deciduous forest type habitats were represented in each impact category . Overall , rodent and flea diversity was lowest at high impact sites (Figure 1) . As rodent diversity increases , the average number of fleas/host decreased . Flea diversity and number of host species infested was highest in habitats which experienced intermediate levels of habitat disturbance (Figure 2) .

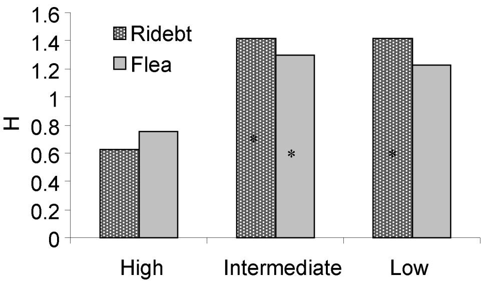

Figure 1 *Rodent vs . Flea diversity (Shannon's H) for habitats divided according to 1 of 3 disturbance levels ; * P< 0 .05 when compared to high impact sites .*

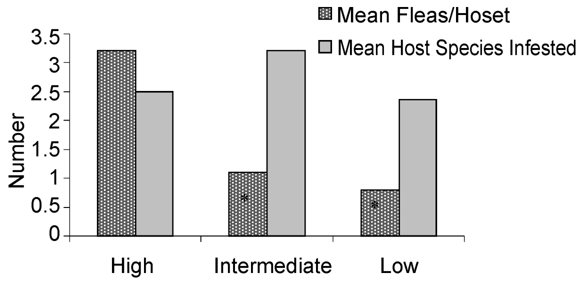

Figure 2 *Flea infestation parameters for rodents collected at 3 habitat types categorized according to disturbance level ; * P< 0 .05 when compared to high impact sites .*

Conclusions Transmission of zoonotic disease from wild reservoirs to humans most commonly occurs in rural environments . These sites provide the peridomestic rodent species essential to carrying disease from the wild reservoir hosts to commensal rodent living in proximity to humans . In addition , the results of this analysis suggest that the characteristics of flea assemblages within these communities appear to be conducive to plague transmission . Namely , flea diversity and host spectrum is greatest in areas that experience moderate amounts of disturbance .

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