Species persistence and extinction following rainforest fragmentation at Chiew Larn, Surat Thani Province, Thailand.

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Forest fragmentation creates isolated patches of forest from formerly continuous habitat. Empirical studies of forest fragment document the loss of biodiversity following isolation. Most studies of this process are flawed, however, as they were done decades after the habitat fragmentation occurred and the numbers and types of species there originally is generally unknown. In contrast, we are able to overcome this deficiency at study sites in Surat Thani Province where the fauna was surveyed by Srub Nakhasathien and Sawal Wanghangsa during the actual period of habitat fragmentation. The completion of the Rajaprabha Dam in 1996 flooded 165 km² (103,125 rai) of lowland tropical forest and created approximately 150 islands of former hilltops in Khlong Saeng Wildlife Sanctuary. These new rainforest islands provide an ideal situation in which to observe the loss of biodiversity during the critical first few years following habitat fragmentation.

We are using ecological and genetic techniques to measure the loss of biodiversity from the islands at Khlong Saeng by focusing on small ground dwelling mammals. Small mammals are easy to census and are important components of the ecosystem as they form the basis of the mammalian food chain. Using live-capture techniques we have censused 18 islands ranging in size from less than 1 ha to over 100 ha for species numbers and abundances and compared them with 18 equivalent sized plots in undisturbed forest on the adjacent mainland. 12 native species were recorded including ground rodents, a tree-mouse, a tree-shrew, and ground shrews. Species numbers on islands ranged from 0 to 7. A comparison of island and mainland species numbers shows that after ~5 years following fragmentation (approximately 10-15 generations for these species), mammalian species richness is significantly lower on the islands compared to the mainland plots.

A second approach is to measure the genetic variability of small mammal populations which occur on the islands. Inbreeding and genetic drift in small fragmented population lowers genetic variability and can lead to extinction. Using tissue samples from a rodent, Mesamys surifer and a tree-shrew, Tupaiola citrina, we are examining variation in PCR amplified sequences of mitochondrial DNA from island populations and comparing them with mainland control samples.

In addition to these are and genetic effects we are also examining the effects of competition from introduced rats on the population viability of the native species. Our studies of the extinction process in small mammals are relevant to the management of Thailand's larger endangered species and highly fragmented biodiversity generally.

INDEX KEY WORDS:
The species-area curves for small mammals on islands in the Chiew Larn reservoir and mainland plots of equivalent area in continuous forest are significantly different indicating that islands are depauperate in numbers of species compared to mainland areas (Figure 1). Regression analysis of factors affecting the presence or absence of species showed that both characteristics of the site (island or mainland, area, and amount of forest disturbance) and of species (body size) influence the probability of species occurrence. This general model does not, however, adequately predict the probability of presence for individual species. Rather each species needs to be considered separately since individual species have different responses to the effects of fragmentation.

Figure 1. Small mammal species numbers on islands and mainland sites at Chiew Larn, Surat Thani Province, Thailand.

References