

The non-lethal impacts of predation on mouse behaviour and reproduction: implications for pest population dynamics

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Abstract. In this paper, we report results from an experiment investigating the influence of habitat structure on the non-lethal effects of predation on enclosed populations of house mice. Mice were enclosed in 50 m × 50 m mouse-proof pens that allowed access to free-living predators, and were subjected to various habitat and predator manipulations. Food was provided *ad libitum*. Under high predation risk, mice selectively used areas of dense cover or refuge, but foraged more readily in open areas when predation risk was reduced by the exclusion of predators. These foraging decisions had consequences for body growth rates and the onset of breeding: in pens with little refuge, mice showed low body growth rates and began breeding later in the season, even though the populations were at low densities and there was free access to good-quality food. In pens where refuge habitat provided safe access to food, mice had higher body growth rates and showed an earlier onset of breeding, despite populations being at relatively high densities. Similarly, the total exclusion of predators from pens with minimal refuge also resulted in mice having higher body growth rates and an earlier onset of breeding. These experiments show that in semi-natural systems the non-lethal effects of predation can have large effects on the physiology of mice with flow-on effects to mouse population dynamics, and that these can be mediated by habitat structure. The implications for the development of house mouse (*Mus domesticus*) outbreaks in south-eastern Australia, which are characterised by an earlier onset of breeding compared to non-outbreak years, are discussed.