

Impact of human-induced disturbance on the diversity of dung beetles (Coleoptera: Scarabaeidae) and ants (Hymenoptera: Formicidae)

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Disturbance, whether natural or anthropogenic, is an important factor that affects the ecosystem functions. Although insects contribute to the major share of biodiversity, impact of disturbance on its diversity is poorly understood (Hamer and Hill, 1999). Insects are known to respond differently to disturbance dynamics (Schowalter, 1985). Some studies have shown that disturbance causes a reduction in diversity of insects (Daily and Ehrlich, 1995; Hill *et al.*, 1995) while others suggest that disturbance results in an increase in diversity (Kremen, 1992; Hamer *et al.*, 1997). In this study we have attempted to assess the response of dung beetles and ants to disturbance in a wildlife sanctuary of South India.

The study was conducted in the moist deciduous forests of Biligiri Rangan Temple (BRT) Wildlife Sanctuary, located in the Chamaraja Nagar District of

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Karnataka State, India (77°–77°16'E and 11°47'–12°9'N). The sanctuary is inhabited by indigenous people called Soligas who depend on this forest for collecting NTFPs, fuel wood and for grazing their cattle.

The major criterion for grading disturbance was based on the assumption that the most proximal sites to the human activity are likely to be more disturbed (Murali *et al.*, 1996). Accordingly 10 sites of varying disturbances from the settlements were identified on their proximity to Kannery Colony, one of the major settlements in this area. Another set of five highly disturbed sites identified in our earlier studies (Murali *et al.*, 1996) were also earmarked for this study. Number of cut stems and frequency of cattle dung in the study plot were also recorded. On each of these sites, grids of 50 m × 50 m were marked for sampling dung beetles and ants.

Eight baits of one litre dung were placed randomly in each grid. Two pats each were retrieved after 6, 24, 48 and 72 h. Dung beetles were recovered from the dung pats by floating and hand picking. Sugar solution (30%), dried coconut scrapings and egg white were used as baits for sampling ants. Three baits of each type were kept equidistant in the grids and the ants were collected after 1, 6, 24 and 48 h using renewed baits. Collected insects were preserved in 70% alcohol and later identified and counted. Shannon diversity index, avalanche index and Evenness index were calculated for ants and dung beetles with the data collected.

Diversity and species richness of ants and dung beetles were found to increase with the disturbance (see Figure 1 and 2). The most disturbed sites

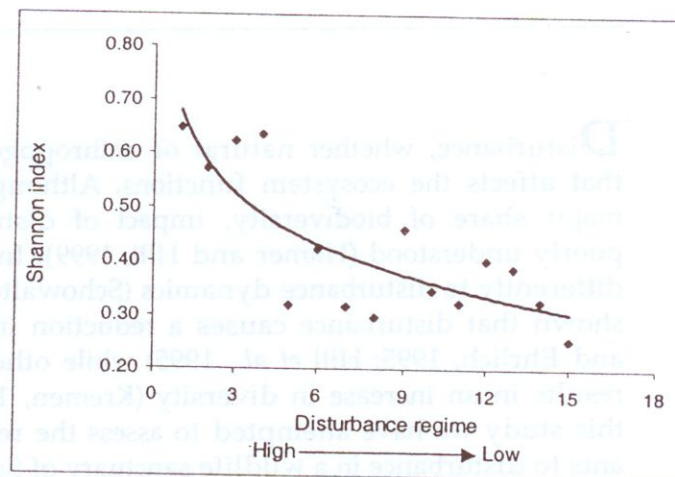


Figure 1. Shannon diversity of dung beetles at different disturbance regimes ($R^2 = 0.6499$).

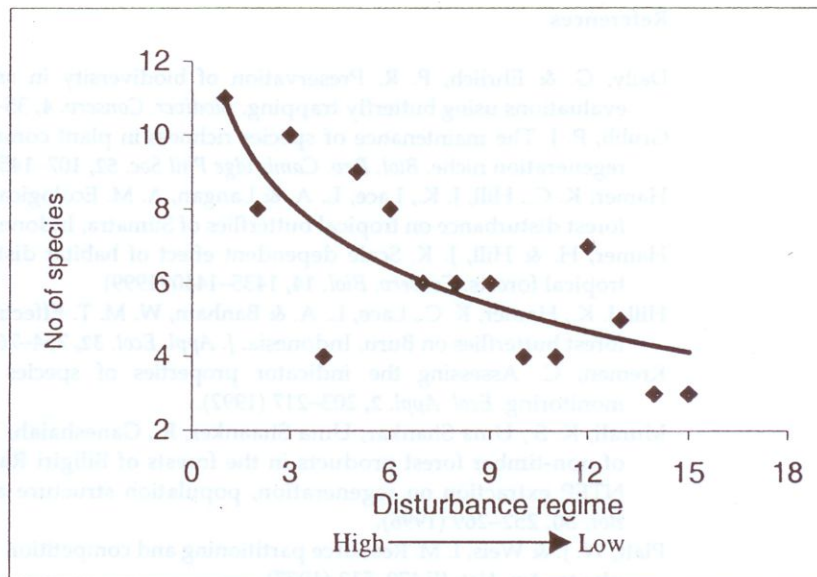


Figure 2. Species richness of ants at different disturbance regimes ($R^2 = 0.6095$).

showed high diversity for both ants and dung beetles compared to the relatively less disturbed sites. 616 dung beetles representing 18 species and 7 genera were collected from the highly disturbed sites where as 373 individuals representing 17 species and 4 genera were collected from the sites less disturbed. Similarly, 2340 individuals of ants representing 21 species and 13 genera were collected from the highly disturbed sites while 3861 ants (12 species and 7 genera) were collected from the areas of low disturbance. 887 dung beetles belonging to 14 species and 7 genera and 3530 individuals of ants representing 16 species and 11 genera were recovered from the sites of medium disturbance.

Thus it appears that human settlements and surrounding areas harbour more species of dung beetles and ants. Owing to high concentration of cattle in and around the settlements the dung pats will be highly concentrated, offering substantial resource base for the dung beetles. Similarly the high concentration of human excreta in and around the settlements is also likely to facilitate the higher dung beetle diversity and richness. The agricultural activities near the settlements perhaps offer a good supply of resources to ants facilitating their abundance and diversity.

Other studies also have shown that disturbance can enhance species diversity and the relative abundances of the species present, by increasing spatial and temporal heterogeneity of ecosystems (Grubb, 1977; Platt and Weis, 1977; Tilman 1982).

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