(4) respond to environmental change in ways similar to other taxa (Oliver and Beattie 1996a).

Most groups selected as potential indicator taxa meet the first two criteria. Biodiversity surveys generally focus on vascular plants and vertebrates (e.g., mammals, birds, reptiles, and amphibians; Landres et al. 1988). These groups are, for the most part, readily sampled using standardized techniques (Heyer et al. 1994; Wilson et al. 1996) and fairly easily identified through keys and collections. Ecologically, many of these groups have been proposed (although not often verified) to have broad requirements that encapsulate those of other species, thus serving as "umbrella species" (Noss 1990; Launer and Murphy 1994). Plants and their associated habitat types are often considered to be reliable predictors of the overall diversity of a habitat, since all organisms directly or indirectly rely on plants for food or shelter (e.g., Lesica 1993). Many invertebrate groups have been considered as potential indicator taxa owing to their high diversity and ecological importance (Kremen 1992; Kremen et al. 1994).

The usefulness of indicator taxa basically rests on the third and fourth criteria: that the species richness or diversity of the selected taxa and their responses to habitat change overlap with those of other organisms. Conservation decisions based on these taxa are assumed to be appropriate for other organisms living in the area. However, few data have been collected on the relationships between groups of organisms. For those groups for which we do have information, few correlations have been found between groups (e.g., Wilcox et al. 1986; Prendergast et al. 1993; Lawton et al. 1998; Pharo et al. 1999).

Why Consider Ants as an Indicator Taxon?

Ants have been used as bioindicators in Australia for many years and have been considered for use in other areas of the world as well. They appear to be an ideal candidate for use as an indicator group because they are diverse (approximately 9000 described species), found abundantly in almost every terrestrial habitat in the world, and easily collected (Majer 1983).

Ants are particularly appropriate for inventory and monitoring programs because most species have stationary, perennial nests with fairly restricted foraging ranges (ranging from less than a meter to a few hundred meters). Therefore—in contrast to other insects that move frequently between habitats in search of food, mates, or nesting sites—ants are a more constant presence at a site and can thus be more reliably sampled and monitored. Ants are important ecologically because they function at many levels in an ecosystem—as predators and prey, as detritivores, mutualists, and herbivores.

Correlations between the Species Richness or Diversity of Ants and That of Other Organisms

If ants are to be used as an indicator of the diversity of other organisms, the relationship between the species richness or diversity of ants and that of other target organisms must be understood. In recent years, several studies have investigated this relationship.

The most comprehensive study was conducted by Lawton et al. (1998), who investigated nine taxa, including canopy ants and ground-dwelling ants, in a semideciduous humid forest in southern Cameroon, Africa. Species richness of these taxa was compared across a gradient of habitat types of increasing intensity and frequency of disturbance. They found few correlations between taxa in change in species richness across the disturbance gradient (Table 6.1). Of all the groups, canopy ants were positively correlated with the most other taxa, including butterflies, canopy beetles, and ground-dwelling ants (Table 6.1).