species (including those not collected) are present in the sampled community. Calculation of the ICE is based on the number of species found in ten or fewer sampling units, whereas calculation of the jackknife is based on the observed frequency of unique species. To estimate what proportion of the total species richness was collected by each of the methods employed in the current study, plots of cumulative species-per-sample curves were generated in which species accumulation was plotted as a function of the number of samples taken. Three values were plotted for each succeeding sample: the observed number of species, the ICE of the total number of species present, and the first-order jackknife estimate of the total number of species present. For species-accumulation curves, sample order was randomized 100 times and the means of the ICE and jackknife estimates were computed for each succeeding sample station using the program EstimateS (Colwell 1997; see also Colwell and Coddington 1994; Chazdon et al. 1998).

The asymptote of a species-accumulation curve (i.e., the value that the curve approaches as a limit) is interpreted as the total number of species present at the sample site, including those that were not collected. In the current study, the asymptote of the observed species-accumulation curve was calculated with EstimateS (Colwell 1997) using the two-parameter Michaelis-Menten (M-M) equation (Colwell and Coddington 1994) and the maximum likelihood method of Raaijmakers (1987), which is based on the Eadie-Hofstee transformation of the M-M equation. The observed number of ant species and the proportion of the M-M asymptote represented by this number were evaluated for different sample sizes for each of the sampling methods.

The numbers of species collected by different combinations of the various sampling methods have important implications for future sampling studies. To elucidate the optimal combination of sampling methods tested in the sampling methods experiment, first a table was prepared listing the total number of species sampled by each method. The method that sampled the most species was identified, and combinations including one and two additional sampling procedures were assessed in order to elucidate the optimal combinations of two and three sampling methods for maximizing the species count.

To evaluate the influence of the size of the litter sample from which ants were collected by Berlese funnel or Winkler extraction, the mean number of individual ants and the number of species per extraction were calculated; the total number of species from 20 samples of a particular area was also calculated.

Results and Discussion

Interpretation of species richness estimates should take into account a number of factors. A species-accumulation curve is specific to the area of the survey, the season or year, and the collecting techniques employed. The use of additional collecting methods, or a survey in a different area or season at the same site, would most certainly collect additional species. The actual number of species in an area at a given time is of course finite, but, in most cases, exhaustive sampling is not physically or logistically possible. If an observed or estimated species-accumulation curve indicates a decrease in the rate of species accumulation across the number of samples collected, then, for the particular methods employed, that number of samples is arguably adequate for estimating the species richness in the area or transect surveyed. Conversely, if the curve continues to rise rapidly for the number of samples collected, then more intensive sampling may be necessary to obtain an adequate measure of the diversity at that site.

The number of samples sufficient for achieving a high level of species completeness is thus