

TEMPORAL ACTIVITY PATTERNS IN  
TWO COMPETING ANT SPECIES  
(HYMENOPTERA: FORMICIDAE)<sup>1</sup>

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Most ant species are known to exhibit some degree of patterning in foraging rate. Interspecific differences in foraging rate can be noted both temporally and, in temperate latitudes, seasonally. Such differences can contribute to an effective partitioning of resources among coexisting species. The following set of observations documents a difference in foraging pattern that may be the significant component of coexistence of the two closely competing species observed. The system will be described, and possible implications of the observations will be discussed.

The species observed were *Dorymyrmex antarcticus* and *Tapinoma antarcticum*<sup>3</sup>, both members of the subfamily Dolichoderinae. Observations were made at Fundo Santa Laura, near Til Til, Santiago Province, Chile, during October and November of 1971 and 1972. The site was at 1,000 m elevation on the east-facing slope of the low coastal cordillera. Vegetation was mixed shrubs and annuals forming the community known as matorral, which is characteristic of the Mediterranean climate zone of central Chile.

On visits to the site in 1971 I noted that the two species compete strongly for baits. A bait of honey on a small wad of cotton would attract *Dorymyrmex antarcticus* workers when it was placed on the ground in the early morning. These workers recruited a small number of nestmates, and activity would continue until midmorning when the first few workers of *Tapinoma antarcticum* appeared. These workers, once they located the bait, would quickly recruit many of their nestmates, and the many small *T. antarcticum* workers aggressively repelled the fewer, larger, less aggressive workers of

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<sup>3</sup>Generic placement of this species in *Tapinoma* is almost certainly incorrect. Ecologically, the species is similar to *Iridomyrmex pruinosum* of the southwestern U. S.

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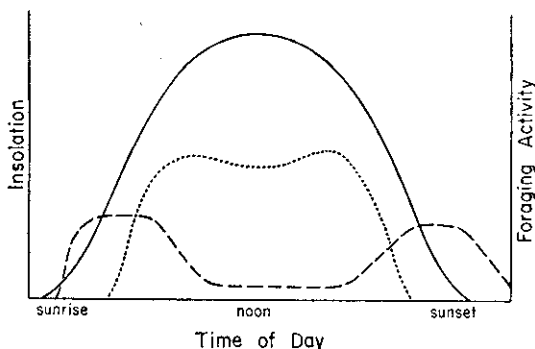


Figure 1. Activity patterns of the two ant species as observed in 1971. Solid line = solar intensity; dotted line = *Tapinoma antarcticum* foraging activity; dashed line = *Dorymyrmex antarcticus* foraging activity.

*D. antarcticus*. The *Tapinoma* workers continued on the bait throughout the midday, whereas the *Dorymyrmex* workers retreated to their nests, apparently to avoid the high midday temperatures. Late in the afternoon, as temperatures dropped, the *Tapinoma* workers would retreat to their nest leaving the bait to be reoccupied by *Dorymyrmex* workers. Activity at the bait seemed in general to parallel the apparent activity patterns of the species, which I illustrated as in Figure 1. The apparent tolerance of cooler temperatures granted an exclusive period of foraging activity to *D. antarcticus*; aggressive dominance yielded foraging success for *T. antarcticum* during the period when both species were active simultaneously.

In 1972 I documented these patterns quantitatively. Closely adjacent nests of each species were chosen, and counts of workers passing the nest entrance during a two-minute period each half-hour were tallied with hand counters. Soil surface temperatures were monitored with a bulb-type thermometer placed touching the soil near the nests. Solar intensity values were taken from a pyroheliometer (Belfort Inst. Co.) stationed 150 m from the study nests. The pattern documented for one nest of each species on 4 October is illustrated in Figure 2a.

On the following day I returned to the same nests to document the early morning activity missed the preceding day. The patterns for 5 October are shown in Figure 2b. The day was cloudy and cool, and differences in foraging activities of the ants are of interest. The *D. antarcticus* continued active all day. The *T. antarcticum* workers emerged later and were out in fewer numbers than on the

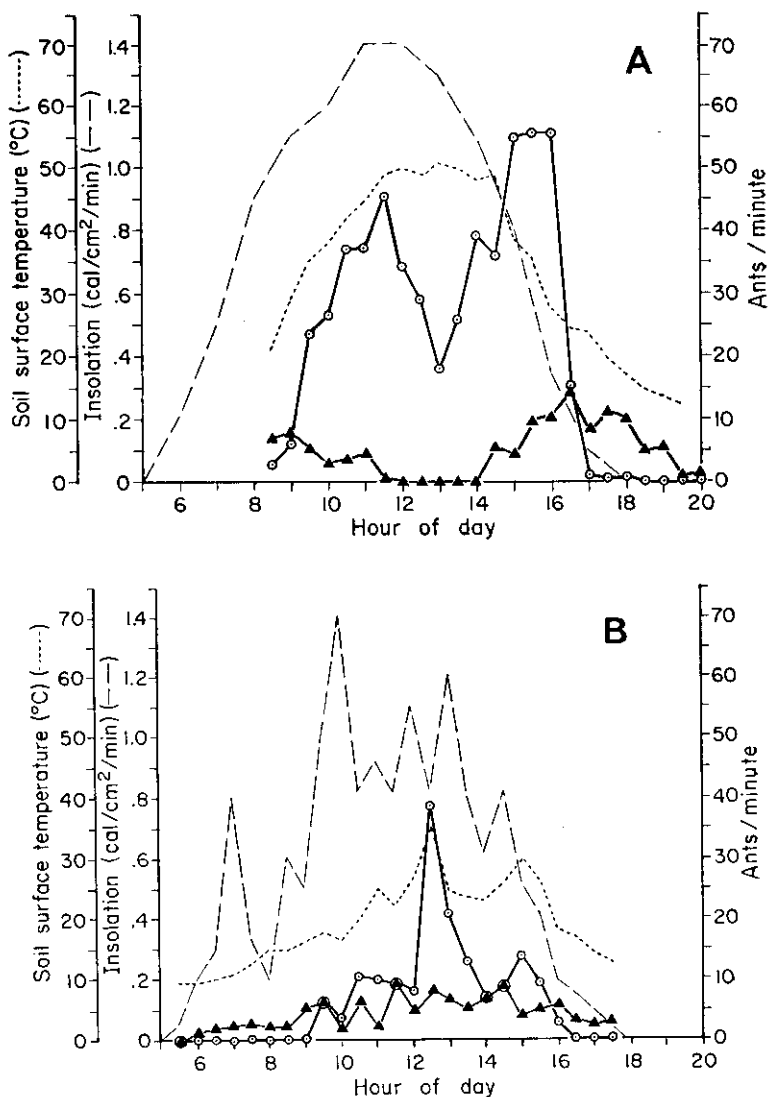


Figure 2. Activity patterns of the two ant species as documented in 1972; A = 4 October, B = 5 October. Triangles = *Dorymyrmex antarcticus*; circles = *Tapinoma antarcticum* (both in ants per minute passing nest opening); dotted line = soil surface temperature (°C); dashed line = solar intensity (cal/cm<sup>2</sup>/min).

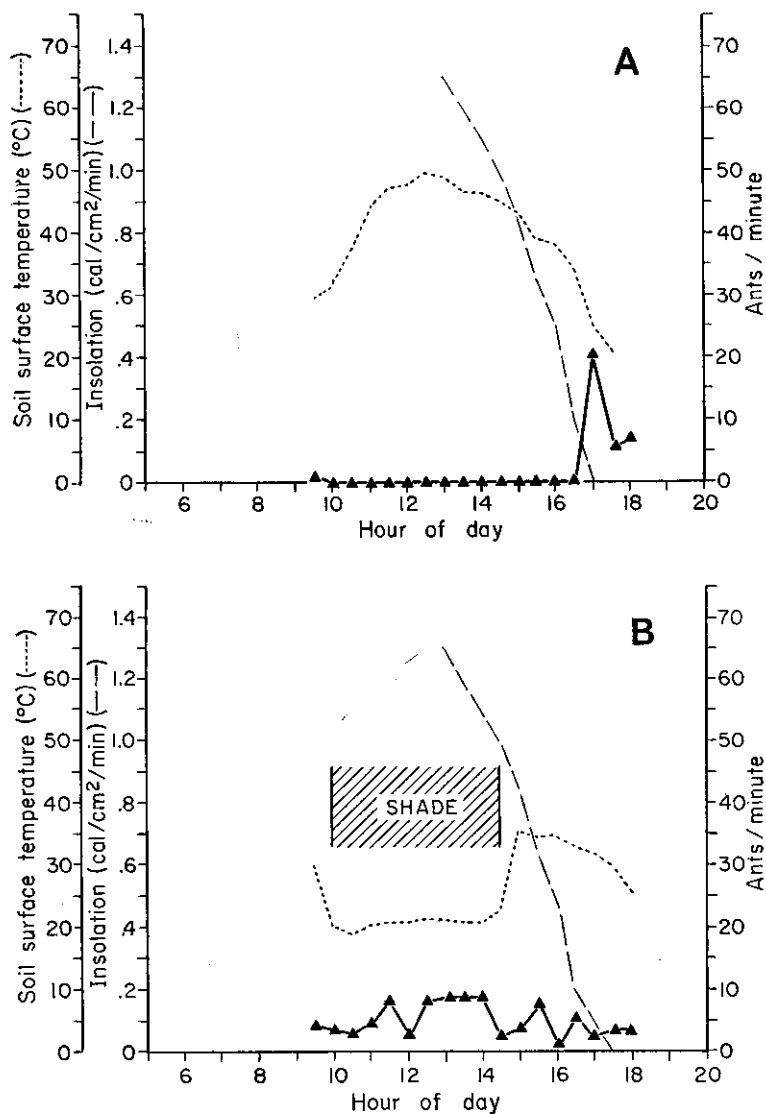


Figure 3. Activity patterns of *Dorymyrmex antarcticus* on 19 October with and without experimental shading of nests; A = an unshaded nest, B = a shaded nest.

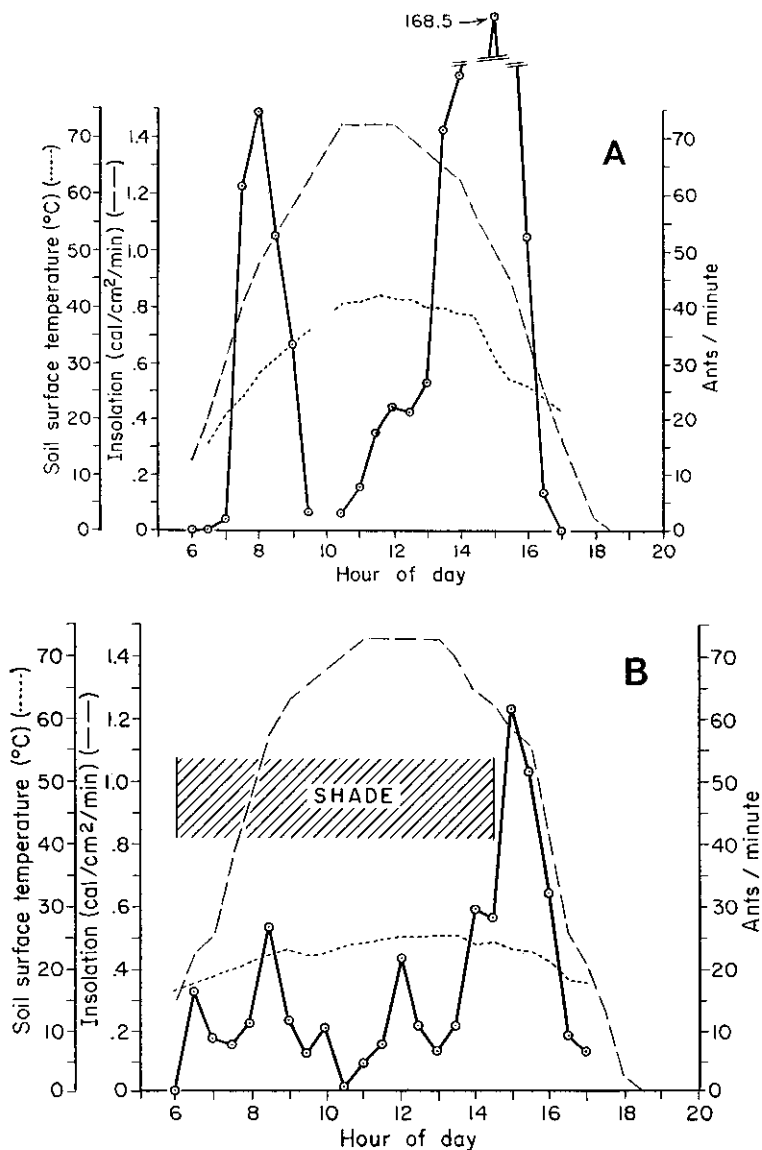


Figure 4. Activity patterns of *Tapinoma antarcticum* with and without experimental shading of the nest; A = 1 November (unshaded), B = the same nest on 2 November (shaded).

preceding day, with activity peaks corresponding to peaks of soil warmth. It seemed that foraging rates of the species were mediated by soil surface temperatures.

On 19 October I tested this hypothesis by using a Thermos Brand Space Blanket (a highly reflective material) to shade a nest of *D. antarcticus* on a hot, sunny day. Figures 3a and 3b show activity patterns at two neighboring nests of similar size. Workers of the unshaded nest illustrate the expected pattern, but workers from the shaded nest continued foraging throughout the day. Figures 4a and 4b show a similar test with *T. antarcticum*. Figure 4a illustrates activity of a single colony on 1 November; Figure 4b is the same nest, shaded, on 2 November. The shading yielded a marked reduction in foraging rate. The late afternoon peak is of workers carrying larvae and pupae and emigrating to a new nest site under unshaded stones about 1 m from the shaded site.

#### DISCUSSION

The two species studied have similar food and foraging site preferences. The observed differences in temporal foraging pattern are hypothesized to contribute significantly to the species' coexistence. Soil surface temperature seems to be the proximate factor by which the foragers regulate their activity. Endogenous activity rhythms, often keyed to environmental factors, are known for many species. This study illustrates how variation in environmental factors can yield alteration of the activity rhythms.

During the course of a year at this temperate latitude (33° S) it seems probable that *Dorymyrmex antarcticus* would have more foraging hours available to it, especially during spring, fall, and winter days, than would *Tapinoma antarcticum*. Perhaps the aggressive dominance of *Tapinoma* is a necessary requisite for survival in competition with other species. The rapid recruitment of a large number of rather small workers in *Tapinoma* may illustrate components of a foraging strategy that must yield successful foraging returns during activity periods that are more limited than those of a coexisting competitor.

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