

and fertile queens." They cite *W. auropunctata* as a unicolonial species that spreads largely or entirely by "budding off groups of workers accompanied on foot by inseminated queens." Although colony establishment was not observed, the existence of very sharp boundaries to *Wasmannia*'s distribution is consistent with the hypothesis of range expansion by budding.

Aggregations of *Wasmannia* were found in a variety of sites, such as under rocks and logs, around stems and trunks, and under loose bark or bryophyte mats. These sites offered a moist microhabitat in dry areas and relatively dry microhabitats in wet sites. Similar nest sites and social organization were found in both Florida (Spencer 1941) and Argentina (Kusnezov 1951).

Workers are apparently sterile and unable to lay viable eggs. During a 71-day period no signs of reproduction were seen in five flasks which originally each contained 50 workers. During the same period eggs, larvae, and pupae appeared in two of three flasks that originally contained 50 workers and one queen.

**DIEL ACTIVITY.**—During three 24-hr periods of observation, *W. auropunctata* were continuously active, but the level of activity varied, without obvious relation to day or night. During the cool-season observations, all active ants were counted each hour, and percent activity (relative to the mean activity of the 24 observations) ranged from 71 to 127 percent. Major activities observed were transporting food, attacking small invertebrates, and moving winged and wingless queens, as well as larvae and pupae, from one site to another. Other species of ants (*C. macilentus*, *C. planus*, *T. melanocephalum*, *P. longicornis*, and *Solenopsis globularia* (F. Smith), and two unidentified species) were observed foraging very close to *Wasmannia*. Only one instance of interspecific aggression was noted (two *Wasmannia* attacked a *T. melanocephalum*, which escaped).

To determine if nocturnal activity was an artifact of observation with a flashlight, two controls were run (18 and 26 March). A single observation at midnight on both occasions revealed apparently normal levels of activity. We therefore assume that 24-hr activity was normal in this nest and not induced by our observation technique.

These observations indicate that at least some *Wasmannia* colonies in the arid zone are active year-round, 24 hours a day. Activity patterns in the cooler humid zone were not studied; in these areas of lower temperature and higher rainfall *Wasmannia* behavior may be quite different.

#### RELATION OF DENSITY TO ALTITUDE AND CLIMATE.

—Within broad limits, the density of *Wasmannia* increased with increasing altitude and rainfall. The species occurred up to the lower portion of the *Miconia* zone on the south slope, but was never found in the very moist fern-sedge zone of the summit. Guy Coppo (pers. comm.) has noted local expansion of *Wasmannia* into the lower *Miconia* zone during the hot season, and subsequent disappearance during the following cool season. On the north slope, which is drier than the south due to the prevailing southeasterly winds, *Wasmannia* occurred in a narrow band about 3 km broad (fig. 1), stretching from the lower *Scalesia* zone into the upper transition vegetation. Kusnezov (1951) reported a similar preference for mesic habitats in Argentina.

Figure 2 shows the results of quadrat sampling at different elevations on the south slope. Density in the *Scalesia* zone is very high, an estimated 1000-5000 workers/m<sup>2</sup>. Since we only censused to a height of 2 m, actual densities are even higher.

These data support the common observation of inhabitants of Santa Cruz that *Wasmannia* is more numerous in the hot season. Density also responded to short-term weather conditions within each of the two major seasons. In a series of four censuses (two in each season) of a 25 m<sup>2</sup> plot in the transition zone, density of groups and queens in each season was substantially higher in the census with the greater amount of rainfall in the preceding 30 days.

#### DISCUSSION

The results of this study parallel those of several other studies on introduced ants. Greenslade (1972) examined native and introduced ants in coconut plantations on Guadalcanal. He identified four characteristics associated with a species' success: small workers, unicolonial social structure, honeydew an important food source, and terrestrial as opposed to strictly arboreal nests. *Wasmannia* corresponds closely to this suite of characteristics. It is one of the smallest species on Santa Cruz, and was the most successful species at mobilizing large groups of workers and maintaining them at bait stations. *Wasmannia*'s social structure was unicolonial; intraspecific aggression was never observed, and nests with multiple queens were common. Honeydew was an important food source (table 8). *Wasmannia* nested on the ground but also nested readily in trees, and was thus more versatile in this regard than the species Greenslade studied.

Similar conclusions were reached by Erickson (1971) in a study of the displacement of native ants by introduced *Iridomyrmex humilis* Mayr in Califor-