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POLYGYNOUS COLONIES OF *SOLENOPSIS GEMINATA* (HYMENOPTERA: FORMICIDAE) IN THE GALAPAGOS ISLANDS

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The tropical fire ant, *Solenopsis geminata* (F.), introduced into the Galapagos Islands over 100 years ago (Wheeler 1919) is presently widespread in the islands of the archipelago (Lubin 1984). They are especially abundant in improved pastures, parks, residential yards and gardens, and along National Park trails. These ants sting humans and also can be serious pests on young and weak Galapagos tortoises, and land iguanas (M. H. Wilson, Terrestial Ecologist, Charles Darwin Research Station, Galapagos Islands, unpublished data). Heavy populations exist on the island of Santa Cruz, particularly in the small village of Bellavista (Figure 1), on several of the surrounding farms,

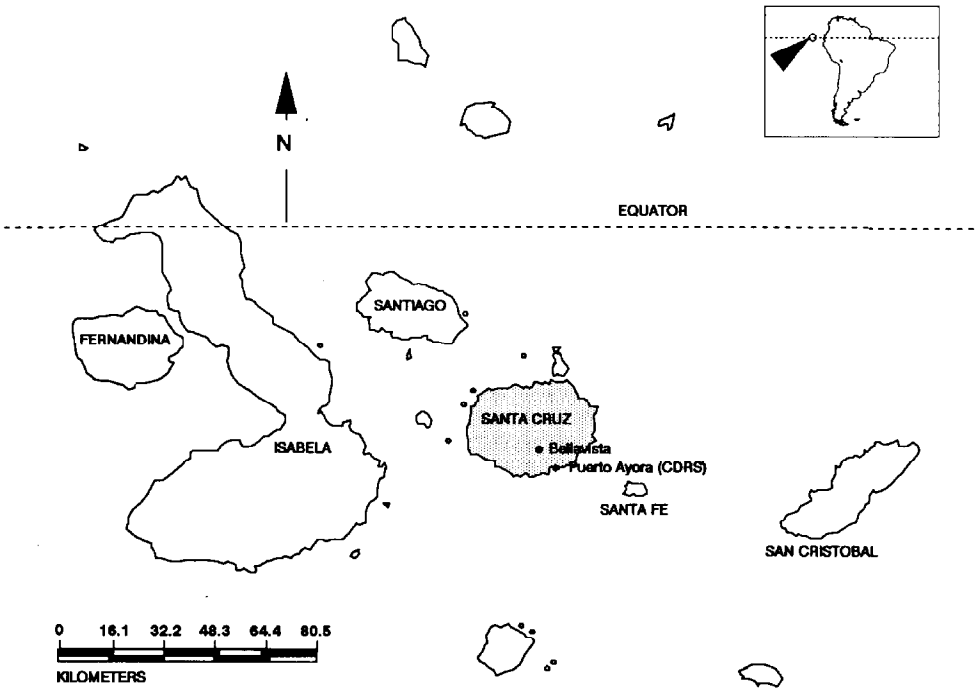

Figure 1. Galapagos Islands.

and in the town of Puerto Ayora, and on the Charles Darwin Research Station (CDRS). In the latter, they have caused problems in the rearing pens of young Galapagos tortoise and in tortoise holding pens, especially the egg-laying and feeding areas.

Attempts have been previously undertaken to control this ant with chemicals. The majority of the chemicals gave only short-term control and some had the potential to cause harm to the environment and affect other animals in the treated areas. Most of the chemicals killed foraging worker ants, but because the queen(s) were not killed, control was only temporary. The treatments appeared to control these pest ants only to have the ants reappear in a short time.

Extensive problems with *S. geminata* and another pest ant, *Wasmannia auropunctata* (Roger), prompted personnel from the CDRS to request assistance and advice from scientists at the USDA-ARS, Gainesville, Florida on methods of control. As a result, the senior author visited the Galapagos Islands to determine the extent of the problem and consult and advise officials of the CDRS and the Galapagos National Park Service on possible measures to use for control.

Trips were made in July 1987 and October 1989. During the first trip, we assessed the distribution of the two pest ants on two of the islands (Santa Cruz and Santa Fe), and conducted field tests of baits for control. During the second trip, we found several residential yards heavily infested with *S. geminata* in the small community of Bellavista north of Puerto Ayora. In addition, a field behind several of the residences also contained numerous *S. geminata* mounds. Closer inspection by digging in these mounds showed that several had characteristics such as high mound density, presence of numerous dealate queens, and the clustering of workers around these dealate queens exhibited by polygynous colonies of the red imported fire ant, *Solenopsis invicta* Buren in the United States (Glancey et al. 1975, Lofgren & Williams 1984). Five moderately physogastric dealate queens were collected from 3 different mounds (N=15) and placed in vials containing 70% isopropyl alcohol. The ants were brought to our laboratory in the U.S.

where all queens were dissected. Four of the 5 queens from each colony contained sperm in their spermathecae (13 of 15), evidence that these queens had been inseminated. We did not determine if these inseminated queens were all functional but they did have well-developed ovaries and degenerate wing muscles. Furthermore, previous studies have repeatedly demonstrated that inseminated queens in polygyne colonies are fully capable of contributing to both worker and sexual production (Ross 1988).

Polygyny has also been observed in *S. invicta* (Glancey et al. 1973, Fletcher 1983, Lofgren & Williams 1984), in *S. invicta/S. richteri* hybrid (Glancey et al. 1989), in *S. richteri* Forel and *S. quinquecuspis* Forel (Jouvenaz et al. 1989) and in *S. xyloni* McCook (Summerlin 1976). It has previously been reported in *S. geminata* in the U.S. (Banks et al. 1973, Adams et al. 1976, Porter et al. 1988) and more recently in Mexico (MacKay et al. in press), however, this is the first time polygyny has been noted in this species in the Galapagos Islands. The polygynous form of *S. invicta* can cause serious ecological problems in the U.S. (Porter & Savignano 1990). It is probable that the polgyne *S. geminata* causes similar problems in a much more fragile island ecosystem such as the Galapagos Islands. However, we only sampled a few colonies in one locality and do not know if polygyny is occurring throughout the population of *S. geminata* in the Galapagos. Although most of the queens were inseminated, we do not know whether they were functional queens in the nest. Holldobler & Wilson (1990) indicated that mature colonies of most ant species are monogynous. During evolution, properties of colony organization in social insects that bias the species towards monogyny change only when unique ecological conditions are imposed on the species (Holldobler & Wilson 1977, Oster & Wilson 1978). Probably the greatest competitor for *S. geminata*, especially on the island of Santa Cruz, is *W. auropunctata*, a true polygynous species with numerous queens and very large colonies. This unicolonial species was brought to the island of Santa Cruz sometime in the early part of this century and now has spread to several of the other islands (Lubin 1984). It is the dominate ant species in the Galapagos Islands and appears to be causing greater problems than *S. geminata*. In fact, it is believed to be causing major ecosystem changes in invertebrate diversity and density (Clark et al. 1982). Few ant species overlap with *W. auropunctata* in areas of high density and only *S. geminata* may be a successful competitor (Lubin 1984). Although we do not know what is occurring in the *S. geminata* populations in Bellavista, the competition between *S. geminata* and W. auropunctata in this area is intense. Is it possible, due to this competition, a unique ecological condition as described by Holldobler & Wilson (1977) has occurred which has initiated polygyny in *S. geminata*?

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