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NOTES ON THE INDIVIDUAL ACTIVITY, DIET, AND ABUNDANCE OF THE ANTS *POGONOMYRMEX VERMICULATUS* AND *SOLENOPSIS* GAYI (HYMENOPTERA: FORMICIDAE) IN A SEMIARID ECOSYSTEM OF NORTHERN CHILE

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ABSTRACT

In this note we document some aspects of the individual activity, diet, and abundance of the ants *Pogonomyrmex vermiculatus* Emery, 1905, and *Solenopsis gayi* (Spinola), 1851, in Fray Jorge National Park (IV Region). Workers of *P. vermiculatus* exhibited individual activity along the year. On the contrary, *S. gay*i exhibited columnar activity. The two species include seeds of annual plants in their diet. However, differences in the specific items were striking. *P. vermiculatus* consumed mainly seeds of *Erodium cicutarium* and few seeds of *Plantago hispidula*, and the reverse trend was observed in *S. gayi*. Apparently, the number of active colonies of the two species revealed complementary trends of abundance along the year.

RESUMEN

En esta nota documentamos algunos aspectos de la actividad individual, dieta y abundancia poblacional de las hormigas *Pogonomyrmex vermiculatus* Emery, 1905, y, *Solenopsis gayi* (Spinola), 1851, en el Parque Nacional Fray Jorge (IV Región). Las obreras de *P. vermiculatus* presentaron actividad individual durante el año. Por el contrario, las obreras de *S. gayi* presentaron actividad columnar. Ambas especies incluyen en su dieta semillas de plantas anuales. No obstante, hubo diferencias importantes en los items específicos. *P. vermiculatus* consumió principalmente semillas de *Erodium cicutarium* y pocas semillas de *Plantago hispidula*, el patrón opuesto fue observado para *S. gayi*. Aparentemente, el número de colonias activas de las dos especies revela tendencias complementarias de abundancia a través del año.

Ants are one of the most important seed-eating taxa in arid and semiarid regions (Davidson *et al.*, 1980; Brown *et al.*, 1986). Although harvester ants are usually diverse in desert ecosystems of other latitudes, several authors have documented the paucity of granivorous ant species in Chilean arid zones (e.g., Hunt, 1973; Snelling & Hunt, 1975; Kusnezov, 1963). For instance, Argentinian communities exhibit at least four times higher harvester ant species richness than comparable Chilean communities (Medel & Vásquez, 1994). Ipinza-Regla & Covarrubias (1982) analyzed the frequency of the species belonging to the subfamily Myrmicinae in Chile by pooling data of several regions. They concluded that *Solenopsis gayi* (Spinola), 1851, is the most frequently observed ant sepecies in the Chilean territory followed by *Pogonomyrmex vermiculatus* Emery, 1905. Althought the large scale biogeographic patterns seem to be well defined at present, more specific antecedents of the two referred species are scarce (but see Goetsch, 1932, 1933; Ipinza-Regla, 1969; Hunt, 1973). The objective of this note is to circumvent partially this difficulty by documenting some of this aspects in the arid ecos-

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ystem of Fray Jorge National Park in northern Chile (IV Region).

We recorded the individual activity, diet, and the population abundance of *P. vermiculatus* and *S. gayi* in the valley "Quebrada de las Vacas" (71°40' W, 30°38' S), Fray Jorge (IV Region) in 1990-1991. The taxonomical determinations of ants were made following Snelling & Hunt (1975) . The study site is located approximately 100 km South La Serena and 350 km North Santiago. Annual vegetation in 1991 consisted mainly of *Plantago hispidula*, *Parietaria debilis*, *Camissonia dentata*, *Moscharia pinnatifida*, *Oxalis micrantha*, *Microseris pgmaea* and only few *Erodium cicutarium*. Non-granivorous ant species were represented by the omnivorous *Nothidris bicolor* (Ettershank).

Food habits were recorded in february 1990 by robbing food items transported to the nest by workers of 8 colonies of each species. Seed samples were identified at the laboratory with a binocular stereoscopic microscope. Regarding population abundance, we performed censuses bimonthly by counting the number of active colonies of each species, in four randomly selected fixed plots of $100m^2$ during 1991. Because the low number of colonies, we decided to present the information by pooling the data of the four plots. Colonies of *P. vermiculatus* are easily distinguishable because they are usually in ciry soils devoided of vegetation except for the accumulated seed remains near the nest entrance (Goetsch, 1932, 1933) . Consequently, colonies of this species were recorded by visual inspection. A different sampling procedure was used for *S. gayi* because the higher difficulty to find their nests (Hunt, 1973) . We set nine 5 g baits of cracked millet seeds distant 1.5 m each from another. Censuses were carried out four times a day and consisted in the visual inspection of baits for workers of *S. gayi*. Because workers of the same colony may forage in different baits simultaneously, visual inspection might overestimate the number of active colonies. In order to avoid such potential error, we followed workers transporting seeds in their nest and considered the colony as the sampling unit.

Hunt (1973) made several observations of one variety of *Pogonomyrmex bispinosus* (Spinola) at Fundo santa Laura in central Chile (indicated in the appendix A, "Preliminary list of Chilean ants") which was not synonymyzed to *P. vermiculatus* in the subsequent work of Snelling & Hunt (1975). This variety was characterized as locally uncommon, monomorphic, with a poor recruitment, solitary forager, mainly from matorral habitats and with few seeds in its diet (Hunt, 1973). We recorded the activity of *P. vermiculatus* and *S. gayi* in February 1990. Each observation consisted in assigning the activity exhibited by workers during 5 minutes into two categories: individual and columnar. Although we cannot distinguish foraging activities from other social activities, most workers of *P. vermiculatus* exhibited individual activity (N = 8 colonies, 32 observations). Hunt (1973) also referred to *S. gayi*, as probably the most common species in the matorral, with monophasic allometry, good recruitment, solitary forager, mainly on matorral habitats and highly swarm aggressiveness on baits. We found that *S. gayi* exhibited columnar activity, that is, they move in a columnar fashion following a well defined trail between the baits and the nest entrance (N = 6 colonies, 45 observations), such as was previously reported by Goetsch (1933).

Regarding food habits, *P. vermiculatus* consumed mainly seeds of *Erodium cicutarium* and marginally seeds of *Plantago hispidula* (Table 1). The opposite pattern characterized the food habits of *S. gayi* which consisted in a large extent of seeds of *Erodium cicutarium* with a small fraction of seeds of *Plantago hispidula* (Table 1). These results indicate that the two species exhibited complementary food habits during the sampling period. However, it is quite possible that diet changes along the year or with latitude in response to differences in seed availability (Goetsch, 1932) . This fact might explain the discrepancy in the food habits of *S. gayi* reported in this note with that of Hunt (1973). Clearly more work is needed to elucidate if food habits change between seasons or with latitude.

Regarding population abundance, ANOVA (for repeated measures and square root transformed data) showed not significant differences between ant species ($F=3.042$, $p=0.132$) or months ($F=0.691$, $p=0.658$). However, the

same analysis detected significant interaction between these factors ($F=2.832$, $p=0.023$), suggesting that although *P. vermiculatus* does not exhibit a significant higher abundance than *S. gayi* along the year, its abundance seems to depend on the month as revealed by the stricking differences about June (Figure 1). Interestingly, censuses revealed an apparent symmetry in the abundance of each species along the year, with *P. vermiculatus* decreasing its abundance in the winter season and *S. gayi* increasing in the same period. Besides symmetry, the two ant species apparently exhibited a complementary pattern of abundance during the year (Figure 1). Ipinza-Regla (1969) documented two annual peaks in abundance of *Solenopsis* species inhabiting the foliage of *Acacia caven*. He hypothesized that the summer and winter population peaks exhibited by *Solenopsis* might be related to the high mortality suffered by arthropods and plants as a consequence of climatic factors. Discrepancy of our data with that of Ipinza-Regla (1969) and observations made by Goetsch (1932), suggest that the more arid climate conditions of our study site in comparison to the central Chile savanna may be an important factor affecting resource availability and the population dynamics of *S. gayi*.

TABLA 1.

Food habits of *Pogonomyrmex vermiculatus* and *Solenopsis gayi* in february 1990. Diet was assessed by robbing the seeds transported to the nest by workers. The number of seeds and their relative contribution to the total of items are indicated.

Ant species/seeds	N	(%)
Pogonomyrmex vermiculatus		
Erodium cicutarium	68	86.1
Plantago hipidula	7	8.9
unidentified	4	5.0
Total	79	100.0
Solenopsis gayi		
Erodium cicutarium	14	14.3
Plantago hispidula	84	85.7
Total	98	100.0

In summary, our results indicate that *P. vermiculatus* and *S. gayi* exhibited striking differences in individual activity and diet, and complementary trends in population abundance. The extent to which differences are occasioned by ecological interactions such as interspecific competition or are simply the result of independently evolved attributes should be assessed in further studies.

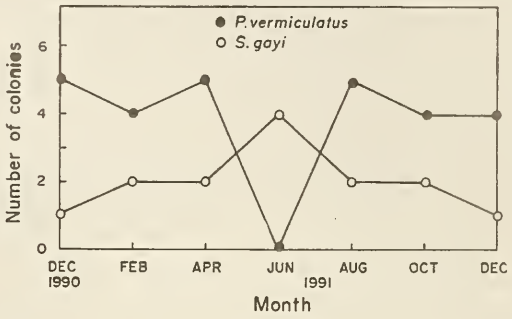

Figure 1. Number of active colonies of *Pogonomyrmex vermiculatus* and *Solenopsis gayi* in a total area of 400 M^2.

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LITERATURE CITED

Brown, J.H.; D.W. Davidson; J.C. Munger & R.S. Inouye. 1986. Experimental community ecology: the desert granivore system. In: Diamond, J.M. and T.J. Case (Eds.), Community Ecology. pp. 41-61. Harper and Row, New York.

Davidson, D.W.; J.H. Brown & R.S. Inouye. 1980. Competition and the structure of granivore communities. Bioscience, *30*: 233-238.

Goetsch, W. 1932. Estudios sobre Zoogeografía Chilena. Boletín de la Sociedad de Biología de Concepción, *5/6*: 1-19 (1931).

Goetsch, W. 1933. Formicidae Chilensis. Boletín de la Sociedad de Biología de Concepcion, *7*: 11-28.

Hunt, J.H. 1973. Comparative ecology of ant communities in mediterranean regions of California and Chile. Ph.D. dissertation, University of California, Berkeley.

Ipinza-Regla, J.H. 1969. Las hormigas como organismos recuperadores en la sabana espinosa Chilena. Noticiario Mensual Museo Nacional de Historia Natural, *153*: 13-14.

Ipinza-Regla, J.H. & R. Covarrubias. 1982. Distribución de especies de la subfamilia Myrmicinae Formicidae en Chile. Eos, *58*: 135-141.

Kusnezov, N. 1963. Zoogeografia de las hormigas en Sudamérica. Acta Zoológica Lilloana, *19*: 3-186.

MEDEL, R.G. & R.A. VASQUEZ. 1994. Comparative analysis of harvester ant assemblages of Argentinian and Chilean arid zones. Journal of Arid Environments, *26*: 363-371.

SMELLING, R.R. & J.H. HUNT. 1975. The ants of Chile (Hymenoptera: Formicidae). Revista Chilena de Entomología, *19*: 63-129.