

**Multiple nest queens of *Atta texana* (Buckley 1860):
Hymenoptera: formicidae).**

Sumario. Se descubrió que una colonia joven de *Atta texana* tenía 16 reinas fértiles. Esto sugiere la posibilidad de que las reinas colaboren para desarrollar un nido grande. Hasta ahora éste es el único caso documentado donde la pleometrosis conduce, aparentemente, a una poligenia.

One problem facing managers of pine plantations in Louisiana and Texas is that some young colonies of the Texas leafcutting ant apparently have explosive population growth and, unless controlled, defoliate young plantations. Other colonies remain small, causing only minor damage.

Field workers have long felt that large colonies of *Atta texana* have multiple fertile queens (polygyny), and smaller colonies have only one (monogyny) or perhaps two. But this hypothesis has not been documented or rigorously tested, because of extreme difficulties in locating fertile queens in nests. Walter *et al.* (8) found 3 queens in a single cavity, Moser (4) reported 7 (5 from a single cavity) from a large nest, and Echols (2) found 2 queens in 3 of 97 new nests he dug up.

We do not know colonies get multiple queens. Echols (2) showed that very young colonies and their queens were compatible with other young colonies and queens in the laboratory; he suggested that the fast growth and development of some young nests is due to the merging of several adjacent colonies as their nests enlarge. But Moser (unpublished) has demonstrated that this compatibility is lost at some unknown age as *A. texana* colonies mature. When older colonies (with or without queens) were excavated and placed in laboratory nests, their workers quickly killed queens and workers introduced queens from other colonies. So, any nest enlargement due to colony merging probably takes place only when colonies are young.

Moser (5) showed that as many as 8 winged queens (mated an unmated) attracted to light during a mating flight may aggregate while founding new nests (pleometrosis). This discovery suggested queen aggregation as yet another mechanism accounting for the rapid development of large nests.

Material and methods

On May 16, 1979, we dug up a small (about 2 year-old) nest in Rapides Parish, Louisiana. The nest had only one visible entrance hole, which angled at about

45° to a single cavity about 1 m away. The entrance angle showed that the nest was older than 1 year because 1-year-old nests always have 90° entrance holes. The cavity was about 0.5 m diameter, about 0.5 m high, and the top of the cavity was about 0.6 m from the surface of the sandy soil. The cavity was completely filled with a fungus garden containing 16 queens and thousands of brood and workers. The queens were presumed fertile, because they were dealate, because no mating flights had yet taken place in 1979, and because the colony was too small to produce alates. And the quantity of brood suggests that most queens were laying eggs. A large nest of *A. texana* was present about 80 m away, but this nest was probably not part of the small nest that we excavated.

Results

The small size of this nest and the absence of other small nests in the same area suggests that this nest was not formed by colony merger (secondary polygyny). The 16 queens probably landed in the immediate vicinity and aggregated to form the nest. Not only does this find more than double the previous record for nest queens, but it also verifies for the first time the presence of many nest queens in small colonies-potential origins for explosive colony growth.

After being dug up, the colony was immediately transported to the Minneapolis, Minnesota Zoo and put on display. At the time of this writing (August 1980) five of the 16 queens were still alive. One of the queens died during the move, and the others died at more or less regular intervals. Only three (which died in May 1980) were checked for fertility. The spermathecae of all three were full.

Sociobiological implications

Atta texana is the only known occurrence of pleometrosis apparently leading smoothly to polygyny in ants. Rettenmeyer and Watkins (7) have the only other documented case of ant polygyny-for an army ant, *Neivamyrmex caroliniensis* (Emery 1894). This species has primary polygyny-colonies are started by swarming. Ants usually start a colony with a single queen (haplometrosis), but sometimes they have multiple queens (pleometrosis) (6). Haplo-metrotic nests may later add extra queens and pleo-metrotic nests may retain the multiple queen system for awhile. But, in either case, most colonies eventually have just one queen. Some species are

oligogynous —multiple queens exist in colonies, but each has her own territory.

For *A. texana*, then, both haplometrotic and pleometrotic colony formation is possible. We do not know whether colonies in nature may add extra queens by adoption as they can in the laboratory (2). But our finding of 16 queens in an apparently 2-year-old colony strongly suggests that its origin was pleometrotic, because 16 independent colonies are unlikely to have combined so quickly.

This finding and several unpublished excavations of polygynous mature colonies suggest that polygyny is frequent in *A. texana*. And the colonies do not seem to be oligogynous, for they have no territorial divisions. In older polygynous colonies brought into the laboratory, queens have not fought, nor have they developed individual retinues of workers.

Pleometrosis seems to be rare but is known to occur with *Atta sexdens* Huber (3) and *Atta cephalotes* (L. 1758) (9). And, as with *A. texana*, workers in an orphaned laboratory colony of *A. sexdens* "threw out" foreign queens, but when the original queen was returned 5 months later, she was immediately accepted (1).

Despite the thousands of nests that have been excavated for other species of leafcutting ants, there are no published records of true polygyny, though R. D. Akre (personal communication) found several queens in a very large nest of *Atta sexdens* (L. 1758); but those queens were in different cavities far apart and were probably oligogynous.

Summary

The discovery of 16 fertile queens in one young *Atta texana* colony suggests that some small nests develop rapidly into large nests because they have more than one queen. *Atta texana* is the only documented case of pleometrosis apparently leading smoothly to polygyny.

January 10, 1980.

J. C. MOSER*
J. R. LEWIS*

* Southern Forest Experiment Station, Forest Service, U. S. Department of Agriculture, Pineville, Louisiana 71360; and, Minnesota Zoological Garden, Apple Valley, Minnesota 55124 USA.

Literature cited

1. AUTUORI, M. Contribuição para o conhecimento da saúva (*Atta* spp. —Hymenoptera-Formicidae) IV — O saúveiro depois da la revoada (*Atta sexdens rubropilosa* Forel 1908). Arquivos Instituto Biológico 18:39-70. 1947.
2. ECHOLS, H. W. Compatibility of separate nests of Texas leaf-cutting ants. Journal of Economic Entomology 59:1 299-1 300. 1966.
3. HUBER, J. The founding of colonies by *Atta sexdens*. The Smithsonian Report for 1906. 1 762:355-372. 1907.
4. MOSER, J. C. Contents and structure of *Atta texana* nest in summer. Annals of the Entomological Society 56:286-291. 1963.
5. MOSER, J. C. Mating activities of *Atta texana* (Hymenoptera-Formicidae). Insects Sociata 16:295-312. 1967.
6. OSTER, G. F. and WILSON, E. O. Cast and ecology in the social insects. Princeton University Press, Princeton, New Jersey. 1978. 352 p.
7. RETTENMEYER, C. W. and WATKINS, J. F. Polygyny and monogyny in army ants (Hymenoptera-Formicidae). Journal of Kansas Entomology 51:581-591. 1978.
8. WALTER, E. V., SEATON, L., and MATHEWSON, A. A. The Texas leaf-cutting ant and its control. U. S. Department of Agriculture Circular 494:1-18. 1938.
9. WEBER, N. A. The biology of the fungus-growing ants. Part III. Nesting habits of the bachac (*Atta cephalotes* L.). Tropical Agriculture 14:223-226. 1937.