

Coral-fungus agriculture	Yeast agriculture	Leafcutter agriculture		
<i>Apterostigma pilosum</i> group	<i>Cyphomyrmex rimosus</i> group	<i>Acromyrmex</i>	<i>Atta</i>	
widespread (Mexico to Argentina)	widespread (Mexico to Argentina; Caribbean)	widespread (US to Argentina; Caribbean)	widespread (US to Argentina; Caribbean)	Geographic distribution
mostly wet forests; 2 cerrado spp.	diverse	diverse	diverse	Habitat
small (10 - 100 workers)	small (25 - 500 workers); <i>C. cornutus</i> : intermediate (> 4000 workers)	large (17,000 - 270,000 workers)	very large (up to 8,000,000 workers)	Colony size
monomorphic	monomorphic	polymorphic	polymorphic	Worker size
monandry	monandry	polyandry	polyandry	Queen mating frequency
haplometrosis, multiple queens may be common; semi-claustral	haplometrosis, occasional multiple queens; semi-claustral	haplometrosis, occasional pleiometrosis; semi-claustral	haplometrosis, occasional pleiometrosis; claustral	Nest-founding behavior
insect frass, seeds, flower parts, fruit, wood particles, arthropod parts?	arthropod frass, plant sap, nectar, arthropod parts?	workers cut fresh vegetation; also fruit, seeds, insect frass	workers cut fresh vegetation; also fruit, seeds	Substrate use

Mycetagroicus (*M. cerradensis*) were recently located and excavated in the Brazilian cerrado; in one nest, two adjacent garden chambers were located at a depth of nearly 4 meters (S. Solomon & U. Mueller, pers. comm.).

Foraging and defense: Lower-attine agriculturalists forage opportunistically for substrate items relatively near to their nests (LEAL & OLIVEIRA 2000). The group contains diurnal- as well as nocturnal-foraging species (WEBER 1972) and the same species may alternate between diurnal and nocturnal foraging depending on seasonal conditions. Garden substrates include a variety of organic material encountered in the leaf litter, including insect frass, seeds, flower stamens, the flesh of fruits, grass stalks and pieces, and wood particles (WEBER 1972, OLIVEIRA & al. 1995, MURAKAMI & HIGASHI 1997, LEAL & OLIVEIRA 2000, DIEHL-FLEIG & DIEHL 2007). By foraging for organic detritus as garden substrate, lower-attine ants have escaped direct competition with other ants for protein sources such as living and dead arthropods (TOBIN 1994). The competitors of these attine-ant foragers are, instead, fungal and bacterial detritivores and the challenge for lower-attine-ant foragers is therefore to locate fresh substrate before it has been invaded and degraded by competing microbes (MURAKAMI & HIGASHI 1997, SCHULTZ & al. 2005).

Arthropod corpses are also frequently reported as substrate items (e.g., WEBER 1945, WEBER 1972, LEAL & OLIVEIRA 2000), and, although they may indeed be used for this purpose, there is reason to be cautious about interpreting their function for a number of reasons. First, ob-

servations of arthropod corpses incorporated directly into attine gardens are rare. Second, most reports of attines foraging for arthropod parts are due to the habit of *Cyphomyrmex* species, which transport large quantities of arthropod parts (especially ant heads and beetle elytra) into the nest. Rather than being incorporated into the garden, however, the exoskeleton fragments are usually found adjacent to the garden in mycelium-growing *Cyphomyrmex* species (*C. strigatus* and *C. wheeleri* groups) (U. Mueller, pers. comm.; T.R. Schultz, unpubl.), or serving as platforms for the gardens of yeast-growing *Cyphomyrmex* species (*C. rimosus* group, see below), at least in laboratory colonies (U. Mueller, pers. comm.; T.R. Schultz, unpubl.). It is thus possible that such arthropod parts serve as semi-sterile platforms for the incipient garden (much as the queen's shed forewing does in some other lower attines (FERNÁNDEZ-MARÍN & al. 2004) rather than as garden nutrient substrate, although this hypothesis does not fully explain why workers in mature nests continue to import them in such quantities. Another possibility is that arthropod exoskeletons may serve as substrate for mutualistic actinomycete bacteria, which are known to digest chitin. Whatever the explanation is, the energy expended by *Cyphomyrmex* species to import arthropod parts strongly suggests that they serve an important, as yet unknown, function.

In a comparative study of foraging behavior between lower- (*Cyphomyrmex*, *Mycetarotes*, *Mycocepurus*, and *Myrmicocrypta*) and higher- (*Sericomyrmex* and *Trachymyrmex*) attine genera, LEAL & OLIVEIRA (2000) found