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NOTES ON INCUBATORY INQUILINISM BETWEEN SQUAMATA (REPTILIA) AND THE NEOTROPICAL FUNGUS-GROWING ANT GENUS *ACROMYRMEX* (HYMENOPTERA: FORMICIDAE)

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ABSTRACT

Egg clusters of Leptodeira annulata *and of an unidentified snake species were found within two distinct fungus chambers of a nest of the neotropical gardening ant,* Acromyrmex octospinosus, *in a cacao farm at Caucagua, Estado Miranda, Venezuela. Literature reports on oviposition and development of reptiles in South American ant nests are reviewed.*

INTRODUCTION

In March 15, 1982, while collecting ants from a very large nest of *Acromyrmex octospinosus,* in a cacao farm at Caucagua, Estado Miranda, Venezuela (10.°, 17'N, 66.°, 22'W), one of us (CRFB) found two clusters of eggs within two distinct fungus-gardens chambers. The embryos of one the clusters could be assigned to the colubrid snake *Leptodeira annulata*. The eggs of the other group (fig. 1) were too immature for identification.

The nest, comprising at least ten interconnected fungus chambers, fully occupied a rotten trunk about 3 meters long and 1 m in diameter. The colony consisted of one mated queen, several alates of both sexes, workers and brood. Nest population was estimated at about 100,000 individuals, an unusually high number for this particular species (Weber, 1945, 1946; Lewis, 1975). The fungus chambers where the eggs were found had no distinctive features in relation to the remaining chambers. No aggressive behavior of the ants toward the eggs was observed.

DISCUSSION

The systematics of *A. octospinosus* and its subspecies was reviewed by Wheeler (1937) and Gonçalves (1961). Weber (1945, 1974) discussed the distribution, nest structure, colony foundation and establishment of the fungus garden, nest sites, myrmecophiles and predators of the species. He opened several nests in Trinidad, Guyana, Barro Colorado (Panamá), the Orinoco delta and other localities in Venezuela, but never found any reptilian egg within the fungus chambers (personal communication to CRFB).

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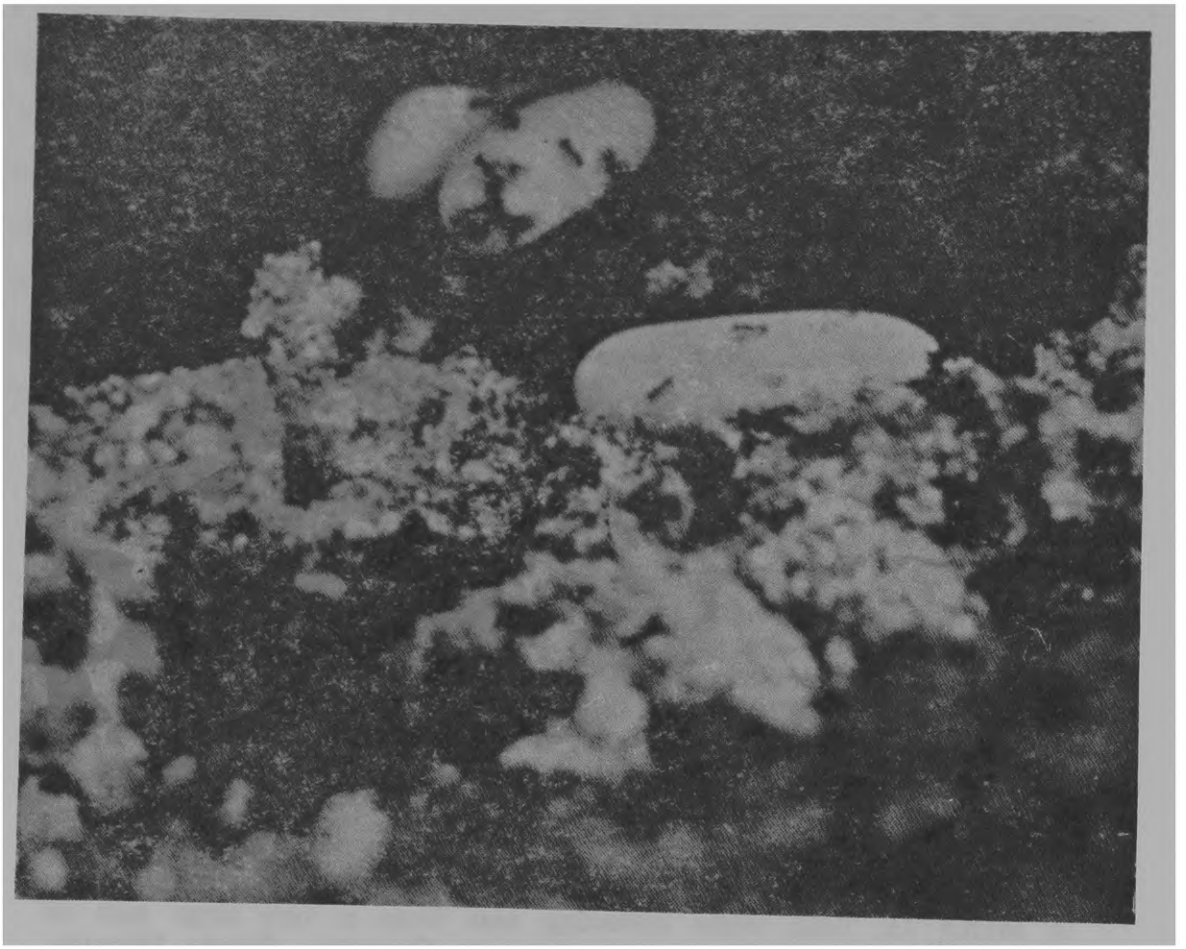

Fig. 1. Eggs of unidentified snake within the fungus chamber of *Acromyrmex octospinosus*.

Vaz-Ferreira and co-workers (1970, 1973, 1976) revised the known cases of incubatory inquilinism in neotropical ant nests; we include their data in Table 1. Table 2 lists the literature records of adult Squamata found within neotropical ant nests. In only two cases *Acromyrmex* was not the ant involved in oviposition. Goeldi (1987) observed eggs of *Anops kingii* (Amphisbaenidae) inside a nest of an unidentified *Camponotus*. It is well established, however, that *Camponotus* ants may occupy deserted nests of other ant species. Azevedo (1894:52) reported the discovery of an unidentified amphisbaenid inside the fungus chamber of *Oecodoma cephalotes* (= *Atta cephalotes* ora *A. sexdens).*

Attini, the myrmicine fungus-growing tribe, can rear pure colonies of symbiotic fungi. The ants nourish the fungus in order to eat the gongylidia (inflated tips of hyphae). Among the eleven recognized genera of Attini only *Atta, Acromyrmex* and *Trachymyrmex* cut leaves and flowers to culture the fungus. The remaining genera use as substrate for their gardens the corpses of arthropods (mainly insects), insect faeces, dead plant matter or fragments of rotten wood. *Atta* and *Acromyrmex* can buid very large nests with up to a thousand chambers filled with bulky masses of fungus (Wilson, 1971). Perhaps these two genera are the only Attini with suitable nest sizes

TABLE 1

Squamata oviposition within neotropical ant nests

Ant		Reptile	Reference
Acromyrmex heyeri	(*)	*Teius teyou* — Teiidae	Vaz-Ferreira et al., 1970, 1973
"		*Liophis obtusus* — Colubridae	"
"		*Philodryas patagoniensis* — Colubridae	"
Acromyrmex lobicornis		*Clelia rustica* — Colubridae	"
"		*Elapomorphus bilineatus* — Colubridae	"
"		*Liophis jaegeri* — Colubridae	"
"		*Philodryas patagoniensis* — Colubridae	"
		Micrurus frontalis — Elapidae	"
Acromyrmex hispidus		*Clelia rustica* — Colubridae	"
"		*Philodryas aestivus manegarzoni* — Colubridae	"
Acromyrmex ambiguus		*Liophis obtusus* — Colubridae	"
"		*Philodryas patagoniensis* — Colubridae	"
Acromyrmex striatus	(*)	*Teius teyou* — Teiidae	"
Acromyrmex sp.		*Leposternon microcephalum* — Amphisbaenidae	Goeldi, 1897
Acromyrmex sp.		*Pseudablabes agassizii* — Colubridae	Vaz-Ferreira et al., 1970
tanajura (**)		*Amphisbaena alba* — Amphisbaenidae	Tschudi, 1866
"		*Chironius bicarinatus* — Colubridae	"
Camponotus sp.		*Anops kingii* — Amphisbaenidae	Goeldi, 1897

(*) also found outside *Acromyrmex* nests
(**) common name for Attini ants in Brasil

TABLE 2

Adult Squamata found inside neotropical ant nests

Ant	Reptile	Reference
Acromyrmex heyeri	*Gymnophthalmus rubricauda* — Teiidae	Gallardo, 1951
Acromyrmex heyeri	*Leptotyphlops munoai* — Leptotyphlopidae	Vaz Ferreira et al., 1970
Acromyrmex lobicornis	*Leptotyphlops borrichianus* — Leptotyphlopidae	Freiberg, 1951
Acromyrmex lundi	*Anops kingii* — Amphisbaenidae	Gans & Rhodes, 1964
Atta sexdens rubropilosa	"4 reptiles"	Autuori, 1942

for reptilian oviposition. One possible explanation of why reptilian eggs other than amphisbaenians have never been found in *Atta* nests may be that the soldiers of this genus are much larger and more powerful biters than the largest workers of *Acromyrmex*.

Vaz-Ferreira et al. (1970, 1973, 1976) suggested that reptiles search ant nests for oviposition sites to prevent predation, keep the immatures in stable conditions of temperature and humidity (thus avoiding desiccation) and to prevent infestation of the eggs by other species of fungi.

For equatorial and tropical snakes hygroscopic stability may well be the most important factor, since ambient temperature does not oscillate too widely. Reptile eggs lose water continuously to compensate for metabolic heat. Embryos developing within an egg raise the temperature of the egg and eggshell slightly above that of the surrounding air mass. The corresponding difference in vapor pressure of water drives the evaporation from egg surface to the atmosphere (Adolph, 1932). Eggs obtained from ant nests always have a moist surface (present observation and Vaz-Ferreira et al., 1970, 1973).

Leptotyphlopid, typhlopid and colubrid snakes are able to follow pheromone trails of various ants and termites selectively (Gehlbach et al., 1971 and references; Vanzolini, 1970). Although these observations were actually related to predation, it is also possible that snakes and other Squamata use olfactory stimuli to locate *Acromyrmex* nests to lay heir eggs.

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Note added in proof

We have received a paper by Gotwald (1984, Sociobiology, 9(1):9-18) on a find of eggs of *Gonatodes humeralis* (Gekkonidae) in an arboreal paper carton nest of the neotropical ant *Azteca* sp. Gotwald considers egg-laying by geckos in *Azteca* nests as occasional, which does not seem to be the case of reptiles laying in subterranean *Acromyrmex* nests. Gotwald lists two references missed in our review. Donisthorpe (1927, *The Guests of British Ants. Their Habits and Life-Histories,* George Routledge & Sons, Ltd., London, 244 p.) mentions an unidentified amphisbaenid and a misidentified caecilian as living in fungus-growing ant nests in the Amazon and Guiana. Weber (1972, *Gardening Ants. The Attines.* American Philosophical Society, Philadelphia, 146 p) collected a snake (possibly *Elapomorphus lemniscatus)* in a nest of *Acromyrmex lobicornis* in Patagonia and observed snake eggs several times in the fungus gardens of *Atta colombica tonsipes* in Panamá.