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**Notes on the Biology of the Slave-making Ant
Polyergus lucidus Mayr (Hymenoptera: Formicidae) in Georgia**

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ABSTRACT: Two colonies of *Polyergus lucidus* were discovered in Athens, Georgia and observations were made of their activity for one season, providing the first information on the biology of this species in Georgia. The raiding parties of these two colonies were considerably larger and traveled greater distances than colonies observed in other parts of its range.

Ants of the genus *Polyergus*, the so called Amazons, are obligate social parasites which conduct spectacular raids of the nests of certain species of the related genus *Formica*. *Polyergus* workers are so specialized for raiding that they are totally dependent upon the individuals of their host, which they capture as brood, to perform normal tasks of colony life such as foraging, defense of the nest, and tending both brood and queen.

Polyergus is represented in North America by two species with broad and patchy distributions (Smith, 1979). The western species, *P. breviceps* Emery, ranges from British Columbia to southern

California and east to Indiana and Ontario (Wheeler, 1968). The eastern species, *P. lucidus* Mayr, is currently divided into two subspecies (Smith, 1979). *P. lucidus lucidus* Mayr has been reported from Massachusetts to North Carolina and west to the Rockies (Creighton, 1950). *P. lucidus longicornis* Smith appears to be restricted to the southeastern U.S., with limited records available: North Carolina [three colonies from the south-central region (Carter, 1962)], South Carolina [one colony from Florence (Smith, 1947) and one from McCormick Co. (J. Trager, pers. comm.)], Georgia [a single winged female from Waycross (Smith, 1947), one colony from Oglethorpe Co. (Duffield, 1976), and one colony from Macon (J. Trager, pers. comm.)], and most recently from Florida [three colonies near Gainesville (Trager and Johnson, 1985)].

The ecology and behavior of *P. lucidus lucidus* have been studied by a number of authors (Harman, 1968; Talbot, 1967, 1968; Marlin, 1968, 1969, 1971; Kwait and Topoff, 1983, 1984). In contrast, Trager and Johnson (1985) have provided the sole account of the biology of *P. lucidus longicornis*, the only form of *P. lucidus* occurring in the extreme southeastern U.S. Their descriptions are based on observations of three colonies near Gainesville, Florida, where the ant differs from populations in other parts of its range in that it uses *Formica archboldi* Smith as its host. We report here on the discovery of two *P. lucidus longicornis* colonies in Athens, Georgia, along with the first report of its raiding behavior and nuptial flights in Georgia based on observations during the summer of 1986.

Colony A was discovered on 5 June 1986 and was located on a N facing slope near the NW corner of the Riverbend Laboratory on the campus of the University of Georgia. The nest was situated at the base of a clump of fescue grass (*Festuca arundinacea* Schreb.) in moderately rich red clay soil. The surrounding vegetation was composed of grasses and low weeds, especially fescue grass, Johnson grass (*Sorghum halepense* (L.) Persoon), daisy fleabane (*Erigeron annuus* (L.) Persoon) and bush-clover (*Lespedeza* sp.). Just upslope from the nest was a brushy area dominated by winged elm (*Ulmus alata* Michaux) with Japanese honeysuckle (*Lonicera japonica* Thunberg) abundant in the thick understory. Raids proceeded in all directions and through both grassy and brushy areas.

Colony B was located ca. 4 km from colony A in the yard of 165 Doe Run, the residence of one of the authors (PRG). This colony was under casual observation since it was discovered in June 1984 and is known not to have moved during this time. The nest occurred at the top of a SSW facing slope, in a relatively flat lawn of fescue grass shaded by large specimens of Loblolly pine (*Pinus taeda* L.), short leaf pine (*P. echinata* Miller) and winged elm. The site was mesic with moderately rich clay-loam soil. Adjacent to the lawn was a young pine-oak community with an abundance of Japanese honeysuckle in the understory.

Both colonies were found to use *F. schaufussi dolosa* Wheeler as their host. Voucher specimens of both slave and slave-maker from each colony have been deposited in the entomological collection of the University of Georgia Museum of Natural History and the Florida State Collection of Arthropods in Gainesville.

The first raid observed was conducted by colony B on 1 June. This colony was checked for several days prior to this for signs of raiding activity; thus the raid observed on this date was most likely the first raid of the season. From 1–15 June, this colony was observed continuously from 1600 hr to 1900 hr EDT, at which time raids occurred daily. After 15 June, observations were made occasionally through mid August. The first raid observed for colony A was 5 June, the day of its discovery. This colony was observed occasionally from 5 June through mid August.

A total of 10 raids for colony A and 30 for colony B were observed. Raiding activity was typically confined to the period from 1600 hr to 1700 hr, but raids were seen as early as 1500 hr and as late as 1900 hr. The date that raiding ceased is not known, since observations were not made after mid August. However, raids were observed up until this time and a large raiding party of a third, unknown colony approximately 6 km from colony A and 9.5 km from colony B was seen ca. 10 September (M. Tomalski, pers. comm.). Thus it seems likely that colonies in the vicinity of Athens actively raid from early June to at least mid-September. If so, the timing of the raiding season in this area appears to be more similar to that reported for *P. lucidus lucidus* colonies to the north in central Illinois (Marlin, 1969), southeastern Michigan (Talbot, 1967), and New York (Kwait and Topoff, 1984) than that reported for *P. lucidus longicornis* in northern Florida (Trager and Johnson, 1985), where raiding commences in mid-May and ceases in early July.

Several attempts were made to count the number of *Polyergus* workers participating in raids, but because the ants moved rapidly in a tightly packed mass, obtaining an accurate count proved difficult. The most reliable counts were 610 from colony A and 700 from colony B, although these were almost certainly undercounts. For most raids by both colonies we estimated well over 500 to about 1000 workers, considerably larger than those observed for other *P. lucidus* colonies elsewhere. Burrill (1908)

and Wheeler (1910) observed about 200 workers on a raid in Pennsylvania and New York, respectively. Talbot (1967) reported a maximum number of 536 workers and a mean of 276 for 47 raids over two seasons of observations involving 25 colonies in southeast Michigan. In Illinois, Marlin (1969) observed a maximum number of 200 workers participating in a raid, with a mean of 87 for 26 raids. Trager and Johnson (1985) reported a maximum size of 45 workers in a raiding party for three colonies in Florida, although one of these colonies is known to have subsequently grown (J. Trager, pers. comm.). If the size of raiding parties is correlated with the population of the colony, as seems likely, the two colonies we observed in Georgia are among the largest colonies of *P. lucidus* discovered, in contrast to the observation of Jones (1943) that the largest *P. lucidus* colonies occur near the center of its range (presumably Ohio and Indiana) and that they get smaller further south and west.

Raiding parties of colony A were seen to go over 100 m on three occasions (200, 135, and 110 m). Colony B was observed to go a maximum of 75 m, a distance traveled four times. Given the infrequency of our observations, it is not unlikely that greater distances were attained. Apparently, raids by these two colonies frequently cover longer distances than those of *P. lucidus* colonies in other parts of its range. For one colony observed closely over an entire season on Long Island, Kwait and Topoff (1984) reported a maximum distance of 48 m with most raids occurring within 30 m of the nest. Talbot (1967) observed a maximum distance of 88 m and a mean of ca. 23 m for raids conducted by 25 colonies in southeastern Michigan over two seasons. In central Illinois, Marlin (1969) reported a maximum distance of 110 m and a mean of 20 m for 26 raids, primarily involving nine *P. lucidus* colonies. It would be interesting to know whether the distance attained by the raiding parties of a *Polyergus* colony is related to the availability and distribution of host colonies, and if so, whether the longer legs found in this southern population (J. Trager, pers. comm.) may be an adaptation to having to cover more ground in search of host colonies.

Multiple raids, i.e., raids on different host nests at simultaneous or overlapping times, appear to be common in *P. lucidus*, having been reported throughout its range (Talbot, 1967; Marlin, 1969; Kwait and Topoff, 1984). Multiple raids were observed once each for colonies A and B and probably occurred more often; the first raiding party observed to leave was followed closely during which time others could have left the nest unnoticed. On one occasion, a raiding column from colony B was observed to divide and attack different host nests. Reraiding of the same host nest during one season is also common in this species (Talbot, 1967; Marlin, 1968, 1969; Kwait and Topoff, 1984; Trager and Johnson, 1985). Colony B was observed to raid each of eight separate host nests at least twice; one was raided three times in the period 1–13 June. Raiding parties of colony A were not observed to raid any host nest on more than one occasion, but observations of this colony were too infrequent to indicate whether or not reraiding occurred. Compound raids, i.e., repeated raids of the same nest on one day were not observed for either colony, whereas this seems to be frequent in areas where the *Polyergus* raiding forces are smaller relative to host colony populations (Marlin, 1968, 1969; Trager and Johnson, 1985).

The first mating flight was observed for both colonies on 3 July at 1330 hr EDT, on a warm (ca. 32°C), clear day, some 20 hr after a thundershower. At this time numerous males departed followed by several queens at ca. 1400 hr. This date is later than the first mating flight of the season reported in Florida (June; Trager and Johnson, 1985) but earlier than 28 July as reported for central Illinois (Marlin, 1971) and 31 July for southeastern Michigan (Talbot, 1968). Both males and females were strong fliers and mating was not observed near either nest during or after any of the mating flights.

On 27 and 31 July, a single dealate queen was seen clinging to a blade of grass near the nest entrance of colony A. Shortly after a mating flight from colony A on 4 August, two dealate queens were seen near this nest. Dealate queens were seen loitering near the nest of colony B on several occasions. The fate of these dealate *P. lucidus longicornis* queens is uncertain, as none were observed to enter an established nest as reported by Marlin (1971) and Kwait and Topoff (1984), or follow a raiding party (Marlin, 1968, 1969; Talbot, 1968; Kwait and Topoff, 1984; Trager and Johnson, 1985), although raids were observed infrequently during the time dealate queens were present. But on one occasion in 1985 PRG witnessed a dealate queen follow a raiding party away from the nest; she entered a host nest during the ensuing raid and was not observed to leave.

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