

THE MATING ACTIVITIES OF THE ANT *MYRMICA AMERICANA* WEBER

PAUL B. KANNOWSKI AND PHYLLIS M. KANNOWSKI

Department of Biology, Bowling Green State University¹

INTRODUCTION

Myrmica americana Weber is a frequent inhabitant of lawns as well as open pastures and undisturbed fields and meadows in the northern parts of middle-western United States. Its nests are commonly formed of soil chambers at the roots of grasses. The number of chambers to a nest and the depth of the nests is variable, but there is a general uniformity of construction such as is also present in soil nests of other species of *Myrmica* in this region (see Talbot, 1945a, for the description of soil nests of *Myrmica emeryana* Forel). Surface chambers formed of bits of plant debris at the bases of grass clumps are common, especially in late summer. Such chambers function primarily in speeding brood development, but they are secondarily used to house the mature alates at the mating season.

Alates of *americana* begin to appear in nests in the southeastern Michigan—northwestern Ohio area about the latter part of July, and may usually be found in nests during August and September. The earliest record of mature alates in nests in this region is July 26 for a nest in Ann Arbor, Michigan in 1955. The latest record for this same area is October 15, also for a nest in Ann Arbor in 1955. However, mating observations presented below indicate that alates may be present in some nests for several days past this latter date.

The mating flights of this ant were first noted on September 15, 1955 from a nest on the University of Michigan campus, Ann Arbor. Subsequently, six more flights were observed from this and one other nest in Ann Arbor during September and October 1955. An additional flight was seen there on September 29, 1956. Flights from five nests on the campus of Bowling Green State University, Bowling Green, Ohio, were observed on 22 days between September 11 and October 18, 1956.

None of the nests under study were examined to determine the populations of the colonies because this would interfere with the normal flight activity. However, estimates of alate production per colony may be based upon the number of alates seen in flight. On this basis we believe that the most populous colony produced about 1000 alates, while the colony with the most sparse flights produced probably 100–150 alates during 1956. The ratio in each colony was usually two or three males to one female; however, there were about five males per female in the most populous colony. One small colony apparently produced only females.

CLIMATIC CONDITIONS

The conditions under which flights occurred were similar in the two localities; the observations obtained in Bowling Green in 1956 have been summarized in table 1. Flights of *americana* took place in late summer and early fall. The earliest seen were those of September 11, 1956 in Bowling Green. Because of the presence of many dead males in spider webs near the nests, it is presumed that flights had taken place earlier. Most of the alates apparently flew during September, but some were flying as late as October 18. Flights started as early as 9:30 A.M. and occurred as late as 6:30 P.M., but the period of greatest activity was from 12:30 P.M. to 4:30 P.M. The early flights all took place during cool weather in October, and the late afternoon flights all occurred during warm weather in the early part of September (fig. 1).

¹Present address: Department of Biology, University of North Dakota.

Air temperature approximately six inches above the surface varied from 64° F to 88° F at the time of flights. Warmer temperatures were required for flights during the early part of the mating season than in October. There seemed to have been no direct influence of a maximal temperature within the time of study. The cool weather of early October apparently prolonged the duration of the flight season. A few more warm days in early October might have resulted in all alates flying much sooner.

Direct sunlight appeared to play an important role in the occurrence of flights early in the mating period. When temperatures were favorable, flights were often

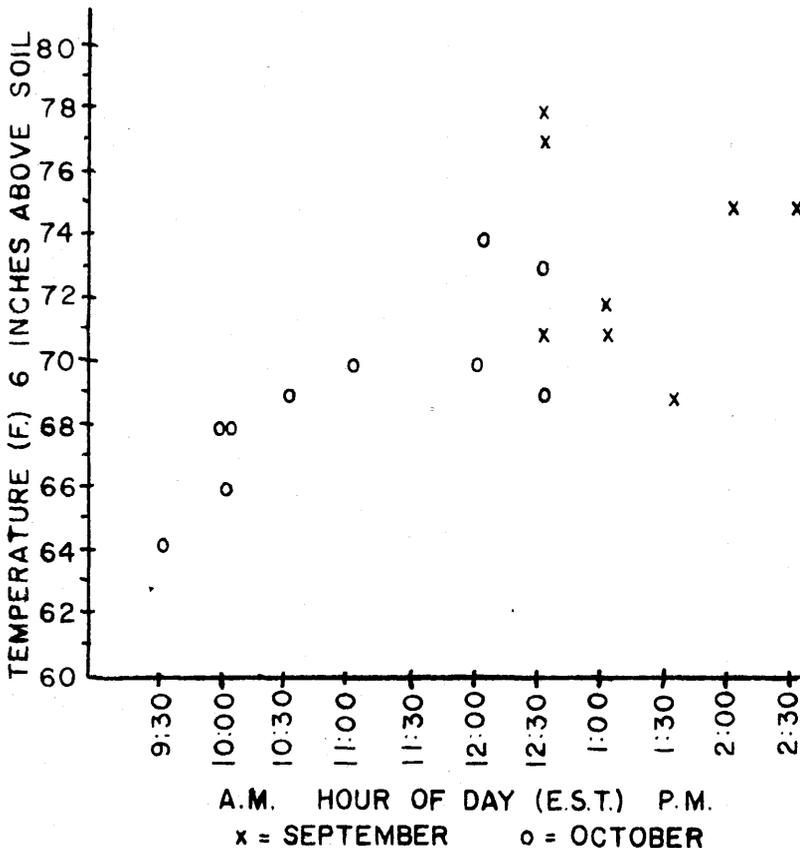


FIGURE 1. Correlation of temperature and hour at which flights of *Myrmica americana* Weber began in Bowling Green, Ohio, 1956. During the warm days of September flights occurred after noon and at temperatures of 69°F or higher. During the cooler weather of the first half of October the alates left the nests much earlier in the day and at considerably cooler temperatures. The presence of direct sunlight on the nest surface affected the time of flight during September, but this factor has not been considered in this figure.

large and continuous on cloudy days; on partly cloudy to clear days they were discontinuous, taking place when the nest sites were shaded, and ceasing (with the alates often returning to the nest) when sunlight covered the area. However, from the last week of September until the flights ended, mating flights seemed to be independent of light conditions.

Flights were most frequent on days that were calm or had only slight breezes.

Alates appeared not to come out of nests on days of moderate to high winds. Except for a few rainy periods, moderate humidities prevailed during the mating season. With the exception of an absence of activity during rains, no noticeable correlation was found between flights and humidity.

MATING BEHAVIOR

The amount and kind of mating activity varied considerably according to the favorableness of all weather conditions, with the largest flights occurring on warm, calm, cloudy afternoons in mid-September. On such occasions flights were usually observed from all nests in the study areas.

Many of the flights in September took place under optimum climatic conditions, and the number of alates participating from a single nest was generally 30 or more. However, in October, with a few exceptions on very warm days, the flights were small (10 or less alates) and sporadic. Most nests that were under observation had flights on those days in September during which conditions were optimal (see Table 1). In the case of three nests all alates had left the nests by the end of September, but sparse flights continued from the other two nests until October 18.

TABLE 1

Conditions under which mating flights of Myrmica americana took place in Bowling Green, Ohio, 1956

	Date	Time	Temperature	Light	Humidity	Wind
Range of Observed Conditions	September 11 to October 18	9:30 A.M. to 6:30 P.M.	64°F to 88°F	Broad Sunlight to Dense Shade	30% to 80%	Calm to Slight Breezes
Optimum Conditions	September	12:30 P.M. to 4:30 P.M.	72°F to 80°F	Shaded from Direct Sunlight	45% to 60%	Calm

Apparently, all alates had left the nests by then, for no others were found later, although workers were seen on several occasions.

The larger flights were very noticeable, the smaller ones inconspicuous. In all flights the alates flew singly; there were no mass emergences. No swarms were noted; however, on days of heavy flights there would often be so many alates leaving the nests and the surface that the air a few feet above the ground would seem to be filled with swarming ants.

Early in the flight period there was considerable pre-flight activity. The alates left the nest entrances and crawled about on the ground surface and on stems and leaves for some time before actually flying. Much of this behavior seemed to be directed toward finding the proper site from which to fly. Late in the fall, when temperatures were cooler, the alates spent less time in choosing such a site, and often flew from the ground surface.

The alates preferred to fly from some object that was raised above the surface. Because of its great abundance in the study areas, grass provided most of the promontories for these ants. Prior to becoming airborne the alates would hold tightly to the end of a blade of grass or some other object with the hind and middle pairs of legs, and would flutter their wings several times. Then, releasing their grip on the object, they would rise into the air. Alates flew in all directions and were seen to fly to heights of 40 feet or more before being lost to view.

Copulation was observed to take place on the surface and in the air. Mating probably also took place within the nests for shed wings were found in nests, and

on several occasions dealate females were seen to crawl out of nest entrances and hide themselves in and under debris at distances of 3 to 17 feet from the nests. The amount of mating that took place within the nest is unknown. Copulation was frequently observed on the surface, and was seen to take place between presumed members of the same colony. Aerial copulation was observed on few occasions, usually on days of heavy flights. Pairs of alates which had mated in air would fall to the ground together and separate shortly. Some males were seen to copulate more than once on the ground, but no females were observed mating with two different males.

On the ground the males seemed able to recognize other ants only within distances of one to two inches. Males appeared to be just as excited when they encountered other males as when they met females. On several occasions males were seen to mount other males, but they usually separated quickly. Apparently visual recognition was rather ineffective, and recognition was due largely to odors or faint sounds, or both.

During copulation the male assumes a position dorsal to the female, holding on to the posterior portion of her thorax and to her gaster with his legs. When mating takes place on the surface, the wings of the female are held at the normal resting position, *i.e.*, horizontally over the back. Pairs were observed *in copula* on the surface for periods of 30 to 60 seconds. Those pairs that dropped to the ground after meeting in the air usually retained their union for no more than 30 seconds.

After copulation, the males would either fly off or crawl about on the surface in order to find other females. The latter, after copulation, would sometimes take flight, but in most cases would quickly cast off their wings. These newly dealated females would then seek places in which to start new colonies, generally under objects such as leaves, stones, pieces of wood, etc.

Late in the day, therefore, the mass of alates in the vicinity of a nest was composed largely of males. At the end of a day's flight some males and alate females were seen to return to the nest, but it was not possible to determine whether any of these had actually taken flight, or whether any had mated. Later in the evening other males could be found hiding in the vegetation. These males would reappear in the vicinity of the nest the next day shortly before the alates were to emerge from the nest. Thus, an abundance of males was maintained for the breeding population.

COMPARISON WITH OTHER MYRMICAS

The only other North American species of *Myrmica* for which detailed observations on mating activities have been published is *Myrmica emeryana* Forel. Talbot (1945b) studied the flights of *emeryana* from nests in a lawn in Tiffin, Ohio (approximately 30 miles southeast of Bowling Green), and found that the flights took place in mid-July from 6:00 A.M. to 8:00 A.M. at temperatures of 64° F to 74° F. None of these conditions correlates well with the conditions under which the flights of *americana* were observed.

However, certain aspects of the mating behavior of these two species are comparable. The size of the flights is small, usually less than 100 alates per colony on a flight day. Alates of both species apparently take flight singly and at random. In addition, their pre-flight behavior is similar in that they spend considerable time moving over the surface and vegetation searching for suitable sites from which to fly.

LITERATURE CITED

- Talbot, Mary. 1945a. Population studies of the ant *Myrmica schencki* ssp. *emeryana* Forel. Ann. Ent. Soc. Amer. 38(3): 365-372.
———. 1945b. A comparison of the flights of four species of ants. Amer. Midl. Nat. 34(2): 504-510.