

7. Allochronic nuptial flight and separate mating places as possible factors isolating phenotypes P and R

The isolating factors explained above are probably enhanced by a partial segregation of mating time and mating place in **pht P** and **pht R**. DLUSSKY (1967) reported that the swarming periods of *F. polyctena* (= **pht P**) and *F. rufa* (= **pht R**) were frequently allochronic in the same locality, although there was much overlap if larger territories were considered. I have not observed many flights directly. However, concluded from time of appearance of alates on nest surface, flights of **pht PP** should be on average earlier than in **pht RM** of the same locality which confirms DLUSSKY's statements. This temporal segregation is surely not perfect but a certain contribution to reproductive isolation is expected. The main reason for this allochrony could be the much larger average population size in **pht PP** nests allowing a faster brood development by intranidal heat production in early spring.

Another factor enhancing isolation is very probably an average difference in mating places. Males of **pht PP** showed an excessive copulation behaviour already on mound surface; in nests without queens they tried to mount workers or even individuals of own sex. If **pht PP** alates left the nest area, I had the impression that the flights were short-ranged. Copulations were seen in close vicinity of the nest, on ground or on bushes. In contrast, I could not observe copulation behaviour in **pht RM** alates on mound surface or near the nest. They showed an elevating flight after leaving the mound and quickly disappeared for the human eye. Very likely there are different orientation mechanisms guiding alates of **pht PP** and **pht RM** which reduce the mating place overlap.

In case of direct encounter of **pht P** and **pht R** alates during swarming, there is obviously no principal mechanism to prevent a mating and successful insemination: GÖSSWALD & SCHMIDT (1960) observed "*F. polyctena*" and "*F. rufa*" to copulate freely and got developing broods of F₁ generation in laboratory experiments. Unfortunately this F₁ generation was not reared up to imaginal state because the laboratory nests were infested with parasitic mites.

8. The influence of size and type of nest populations on worker body size

It is common use among Central European wood ant observers to obtain an approximate reflection of nest population size by estimation of the outer diameter d of the nest area which is defined by the position of the most peripheral nest entrances. In nests with a conspicuous surrounding belt of soil ejections, as typical for medium-sized to large polygynous nests, these most peripheral entrances are normally located near the outer margin of the ejection zone. In nests with no or weak ejections, as frequently seen in monogynous or newly founded polygynous nests, these entrances are normally located very near to the margin of mound base.

However, an estimation of population size from outer diameter d has several sources of error. To name one of the most important errors, monogynous colonies of all phenotypes have a clearly lower ratio of population size against basal area than polygynous nests. Often we observe in monogynous nests rather large mounds made with coarse plant materials but inhabited by a rather small population which is sometimes no longer able to guarantee a complete turnover of mound material. As a consequence, the base of such mounds is often being in decomposition and the actual population is confined to the top of mound which is constructed larger and larger throughout the years but the worker number does not grow proportionally.

To avoid this kind of error, I have tried to make an assessment of nest population by estimation of the surface area covered by ants. If, for instance, the nest surface area within outer diameter d was calculated as 300 dm² and I estimated 20% of this area to be covered with ants, a "population size figure" A of 60 dm² could be derived. The value A gives on average a better reflection of the real population size but is heavily dependent from temperatures and seasonal effects which strongly influence activity and distribution of ants. In this context, it should be noted that the depression of ant coverage of the nest surface caused by direct solar insolation on hot summer noon may be much stronger than a depression by very low temperatures. To minimize these errors, estimates of A were