TO LINGER OR LEAVE: DOES CUTICULAR CHEMISTRY, DEALATION PROPENSITY AND SIZE MATTER FOR NEW *FORMICA TRUNCORUM* GYNES?

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Most members of eusocial insect societies have “surrendered” their reproductive capabilities to labour on behalf of one or several related, fecund individuals. The haplo-diploid system of sex determination in conjunction with reproductive competition seems to have been a promoting factor in the transition to a eusocial society – a relatively cohesive unit, typically consisting of a single reproductive and her reproductively depressed offspring that are, on average, 75% related to each other. The obvious benefit in one’s foregoing reproduction in these instances is that the average relatedness between female siblings is greater than the 50% relatedness to their own offspring. Hence, the inclusive fitness, or impart of a proportion of one’s genes into succeeding generations through close relations, is greater than the fitness of an individual if that individual were to reproduce. Nonetheless circumstances (environment, resources, behaviour of others or one’s self) are dynamic, and new variations on a theme emerge, presumably reflecting the struggle for genetic survival. Colony heads (reproductive females) may have mated multiply and/or more than one reproductive female may contribute to a single colony’s growth. Consequently, the relatedness among colony members change, which in turn may further modify the colony social structure, producing a ratchet effect that can lead to the seemingly absurd (e.g., unicolonial colonies with hundreds of reproducing gynes).
Permanent polygyny implies the concurrent presence of two or more reproducing gynes in a single nest, which results in decreased relatedness among nest workers. A functional polygyne nest typically evolves from a monogyne nest through either intranidal mating of new gynes or the readopting of new gynes that have dispersed, mated and returned to an established nest. Limited nesting sites (habitat saturation) and low probability of successful colony founding of dispersing gynes in conjunction with certain inclusive fitness benefits for the recipient colony seem to foster the development of polygyne colonies. Specific corresponding factors that result in non-dispersal, however, remain elusive. Here we present the results of the analyses of several elements that could be influenced by resource levels and could contribute to the lingering of new gynes.
Formica truncorum gynes from monogyne and polygyne nests were sampled for their cuticular chemicals as callows, as mature alates or dealates, or after mating to determine whether cuticular chemistry could be correlated with the acceptance/rejection tendencies of monogyne and polygyne workers found by Sundström (1997). Generally, profiles differed depending on stage of post-emergence development, although there seemed to be two profile types in the mated alate groups, one of which overlapped with the mated and mature dealates. Weight of the total body and thorax tissue was greater overall for monogyne individuals in all groups with a few exceptions, as was total wing length. Matings took place slightly sooner in the monogyne group than in the polygyne group, although approximately equal numbers mated in the allotted time period. Relatively few individuals shed their wings within 24 hrs post mating, but almost 50% more monogyne females dealated than polygyne females after mating and the rate was five times as high in mature females that had not mated. Topical applications of Juvenile Hormone, Precocene (anti-JH), and acetone on mature gynes seemed to have no effect on the propensity of monogyne and polygyne females to dealate. Again, these results indicated a greater tendency for monogyne females to dealate than polygyne females, although there appeared to be a colony effect.

Sundström, L. 1997. Queen acceptance and nestmate recognition in monogyne and polygyne colonies of the ant *Formica truncorum*. Anim. Behav., 53, 499-510.