Newly Mated Queen Adoption & Polygyny

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Abstract:

There are several ways in which polygyne *Solenopsis invicta* colonies could originate. (A) Multiple newly mated queens are known to often attempt to found colonies in groups. However, soon after the first workers eclose all but one queen is executed creating a monogyne colony. (B) Multiple monogyne colonies could fuse and maintain more than one queen, but monogyne colonies are territorial and there is no evidence that fusion between queenright monogyne *S. invicta* colonies occurs. (C) Newly mated queens could be adopted by queenright monogyne colonies; however, conspecific worker aggression from queenright colonies extends to newly mated queens. In laboratory experiments 100% of introduced newly mated queens were executed by monogyne workers. (D) Male and female sexuals within a monogyne colony could mate within the nest (intranidal mating), thus creating a polygyne colony. There is no evidence that supports intranidal mating, and it is known that queens in United States polygyne colonies are unrelated. None of the above appear to explain polygyne *S. invicta* in the United States.

We suggest a mechanism for the initiation of polygyny that involves adoption of NMQs into queenless worker groups. Insight into the mechanism of polygyne formation in fire ants came from the discovery that highly aggressive and territorial fire ant workers from monogyne colonies quickly become less aggressive toward conspecifics after they lose their queen. In addition, these queenless worker groups readily fuse to form new colony groups that contain several matrilines and patrilines, as are found in polygyne colonies. Queenless polygyne and monogyne colony workers, as well as fused monogyne worker groups adopt newly mated fire ant queens (normally executed by workers with queens). We propose that the probability for development of polygyne populations increases with the formation of population-wide queenless worker groups. Chemical treatment of soil, controlled burns, and fire ant toxic baits could lead to the population-wide formation of queenless worker groups, providing the conditions for the development of a polygyne population. We used toxic baits to test our working hypothesis that formation of multiple queenless worker groups would promote the development of polygyny within a monogyne population in the field. Of five replicate monogyne field plots treated with bait toxicant (hydramethylnon) four developed patches of polygyne colonies within 54 weeks after treatment, whereas all associated controls maintained their monogyne status. This is the first time that an association has been demonstrated between bait treatment and the development of polygyne fire ant colonies.