Colony Recognition in the Ant *Cataglyphis cursor* (*Hymenoptera, Formicidae*)

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The closure of social groups is almost the universal rule amongst insect societies. It is based on colonial recognition as indicated by strong reactions towards non nestmates. The aim of this research was to investigate colonial recognition between adults which is known for many species as can bee seen in other papers in this volume, but also colonial recognition of larvae by adults, which is less known.

Cataglyphis cursor was chosen because we observed in the field that during some periods of the year workers can pass from one nest to another. This is very exceptional in monogynous societies which are considered generally as very closed (1). All the experiments were carried out with colonies reared in the laboratory with the same food supply.

1. Recognition of adult nestmates

Workers marked with a dot of paint were introduced in the foraging arena of an alien society and observed for at least 2 days, after which they were generally adopted or killed. As could be predicted with field observations, when the tested colonies came from the same habitat, they accepted some alien individuals. The % of adoption varied a lot, from 25 to 90% (mean 54.5%). When the nests were very close to one another (less than 1 m) 90 to 100% of the workers were adopted (9). This exception to the rule of the closure of monogynous societies can be understood if we consider the mode of colony foundation in this species. The colony is founded by fission with a newly inseminated female (8). As a consequence in the same place colonies are more or less kin. We can suppose that relatedness between colonies decreases with the geographic distance as was suggested by adoption experiments. The % of adoption varies in negative correlation with the distance. In the extreme cases the adults intruders are almost always killed and macro-geographic variations can be identified in the species C. cursor (9).

It is well known with ants that callow workers are not considered as mature workers and they are always adopted when they are introduced into the nest chambers of any alien colony. This was verified in C. cursor. Otherwhise in this species, when young ants are introduced in the foraging arena of another colony, they are sometimes recognized as aliens by the foragers. The 4 days old workers are always rejected and are considered as mature workers. This fact could indicate progressive change in the individual odour of the young ants. The adopted ants have been reintroduced at different ages in their native colony, where they were always recognized and accepted by their sisters (10). Finally these ants were accepted in 2 colonies where the mature workers do not tolerate each other. This fact is to be discussed with the problem of the origin of the colonial odour.

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2. Brood recognition

Colony discrimination also exists for brood as indicated by differencial brood-nursing activities on the part of adopted ants (7) or in the case of choice tests (5). It was observed that a familiarization with the odour of larvae can occur during the first days of adult life. If callow workers are transferred into an alien colony or reared in small groups with alien workers and larvae their preference for the sister brood is slightly attenuated, but not reversed (3, 5). So we hypothesized that colony-brood recognition could be acquired during preimaginal life.

To investigate this question, Cataglyphis eggs were transferred from their parent colony to a recipient colony. The larvae hatched from these eggs spent their whole larval life in an alien colony, and the cocoons were transferred back into their native colony. The adults were tested to detect their larval preferences. The workers showed a clear preference for the larvae of the familiar alien colony. This result was confirmed with larvae transfers at different ages. It was shown that the nursing behaviour of workers cannot be altered during the last instar of larval life. This demonstrates the existence of an **imprinting like learning,** occuring during the early larval life, a learning which determines the orientation of brood-nursing behaviours of the adult (5).

This research suggests that spatial proximity, or **fellowship** as proposed by Jaisson (6), between individuals is crucial for kin recognition which appears through a learning process. Under natural conditions colonial recognition is associated with genetic relatedness, and so fellowship is superposed on kinship. Altruistic behaviours are directed towards fellows, which are generally related individuals (2, 5). A genetic determination of kin recognition seems to be involved for some species but it is not a general rule (4). One can imagine that early learning is one way used by natural selection to assume the inclusive fitness of individuals, this means does not need genetic relatedness, and so this is a very flexible process.

References

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