STEALING THE YOUNG: A CASE STUDY IN THE INDIAN QUEENLESS ANT

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INTRODUCTION

Brood stealing has been recorded in 13 genera of slave-making ants. Brood is stolen from other colonies of their own species (intra-specific) or other species. Slaves work for their host colony so that the hosts can allocate more resources towards their own reproductives. In this lab-based study, we are reporting for the first time the occurrence of intra-specific brood stealing in a native ant, *Diacamma indicum* – belonging to the subfamily Ponerinae.

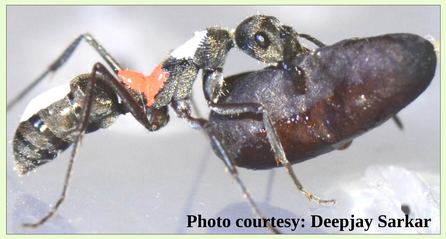

Photo courtesy: Deepjay Sarkar

METHODS

❖ Ten replicates were conducted, each having a Control and a Manipulated Period.

❖Two colonies, with individually marked ants, were placed together in two randomly assigned corners of an arena (1.75 x 1.45 m^2).

❖ **Control Period:** Observed for two hours without any disturbance.

❖ **Manipulated Period:** Colonies were disturbed and motivated to relocate by removing roof of their artificial nest. Only one new empty nest was provided. This period is further subdivided into three phases – Pre-Relocation, Relocation and Post-Relocation. Observations were conducted during the relocation process and continued for 1 hour after the relocation.

❖ Data analysis was done using StatistiXL 1.10 and R 3.0.2. Two-tailed tests were conducted, using $p < 0.05$ as the cut-off for significance.

RESULTS

❖ **Aggression:**

• Higher rate of aggression is observed in the Manipulated as compared to Control Period (Wilcoxon Paired-Sample Test: T = 1, n = 10, p = 0.004). However, the rate of aggression was not significantly different across the three phases of Manipulated Period (Wilcoxon Paired-Sample test: T = 15, 15, 20, n = 10, p > 0.05) (Fig. 1).

• The pattern of aggression did not change in the Control as compared to Manipulated Period. Antennation (AT) > Bite-Drag-Hold (BI-DR-HD) > Chase (CH) (Wilcoxon Paired-Sample Test: Control: T = 1, 0, 0, n = 10, p < 0.05; Manipulated: T = 4, 0, 0, n = 10, p < 0.05) (Fig. 2)

• Only the rate of Bite-Drag-Hold is significantly higher in Manipulated as compared to Control Period (Wilcoxon Paired-Sample Test: T = 0, n = 10, p = 0.002) (Fig. 2).

❖ **Attempts:**

• Higher rate of attempts is observed in the Manipulated as compared to Control Period (Wilcoxon Paired-Sample Test: T = 0, n = 11, p = 0.001). However, the rate of attempts was not significantly different across the three phases of Manipulated Period (Wilcoxon Paired-Sample Test: T = 16, 13, 31.5, n = 11, p > 0.05) (Fig. 3).

• The no. of attempts was not dependant on whether the colony successfully relocated (Mann-Whitney Test: U = 29.5, df1 = 7, df2 = 7, p = 0.620).

❖ **Thieves:**

• 4.3% ± 2.7% of the colony members acted as thieves by attempting to steal brood.

• Rate of attempts made by a colony is positively correlated with the no. of thieves in the colony (Spearman Rank Correlation: $r_s = 0.91$, df = 10, p = 0.001) (Fig. 4).

• There was no correlation between the colony size and no. of thieves (Spearman Rank Correlation: $r_s = -0.01$, df = 10, p = 0.987)

• Tandem run leaders made similar no. of attempts as non-leaders of a colony (Wilcoxon Paired Sample Test: T = 1, n = 5, p = 0.125) (Fig. 5).

❖ **Stealing:**

• Stealing was observed in 7 out of 10 experiments, and a total of 51 items were stolen. Of this 50 were pupae and only 1 was larva.

• All of the stealing occurred during the Manipulated Period.

• 6.54% of the brood was stolen and this represented 23.15% of the pupae (Fig. 6).

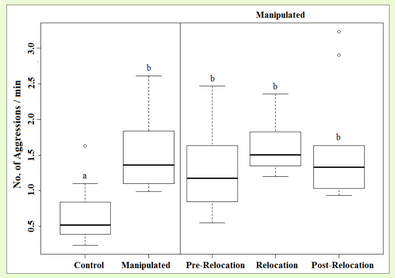

Fig. 1

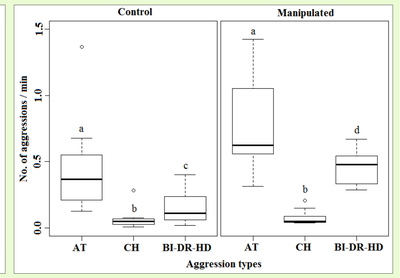

Fig. 2

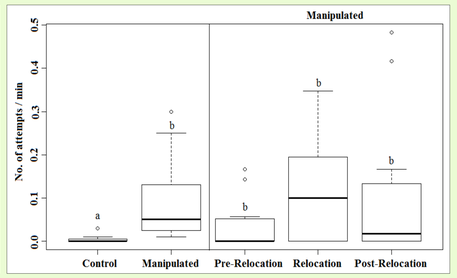

Fig. 3

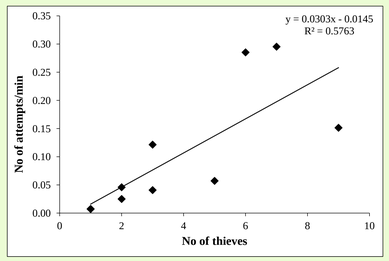

Fig. 4

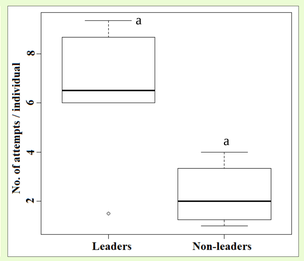

Fig. 5

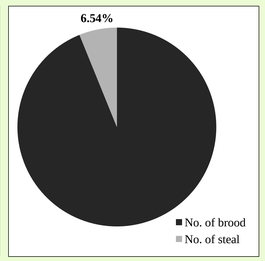

Fig. 6A

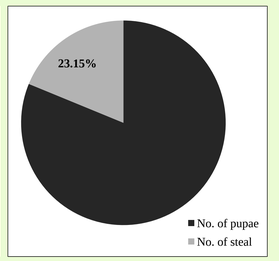

Fig. 6B

Box plots: Bands show median, boxes show 1st and 3rd quartiles, whiskers show 1.5 inter-quartile range (IQR) and dots show outliers. Bars carrying different letters signify that they are statistically different.

SUMMARY

❖ Both the rate of aggression and rate of attempts were significantly higher when the colonies were disturbed.

❖ Rate of most aggressive behaviour (BI-DR-HD) was significantly higher during disturbance.

❖ Relocating and non-relocating colonies made similar no. of attempts.

❖ Even though there was a positive correlation between no. of thieves and no. of attempts, there was no relationship between colony size and no. of thieves.

❖ Both leaders and non-leaders acted as thieves and made similar no. of attempts.

❖ In almost all cases, the stolen item was pupa.

DISCUSSION

❖ This study shows the occurrence of brood stealing in *D. indicum* in lab based condition, a very novel phenomena in this primitive ponerine ant.

❖ All the stealing occurred during the disturbed phase and a quarter of the host colony's future workforce was stolen. Based on this, we hypothesize that intra-specific brood stealing is an important factor impacting the cost of relocation.

❖ Brood raiding and slave making have been reported previously in members of the subfamilies Formicinae, Myrmicinae and Dolichoderinae, all belonging to the Formicoid clade.

❖ As *D. indicum* belongs to the Poneroid clade, it is possible to envisage that the ancestor of both these clades was capable of brood stealing. Alternatively, brood stealing might have originated independently multiple times.

❖ Future studies are required in the natural habitat of *D. indicum* and other ponerine ants to confirm and corroborate our findings.

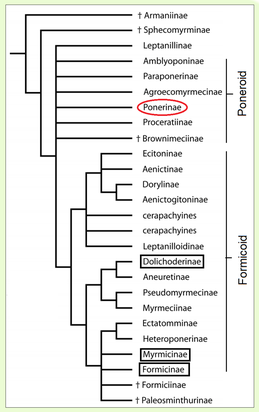

Fig. 7, adapted from Ward (2007), Zootaxa

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