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Effect of Slave Raiding of *Polyergus samurai*
on Nest Persistency of Its Host,
Formica (Serviformica) japonica

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Abstract The effect of slave raiding of *Polyergus samurai* on nest persistency of its host, *Formica (Serviformica) japonica* was investigated. Nest persistence rate after the raiding season was not different between raided and unraided nests. Many raided nests stopped aboveground activities for 2-3 weeks after a raiding but surviving workers maintained underground nest structure. These observations suggest that it is required to reconsider the previous interpretation that the raided nests died out from nest site during raiding season.

Key words: slave-making; raiding; nest persistency.

Introduction

Polyergus samurai is a slave-making ant that enslaves workers of another ant species, *Formica (Serviformica) japonica*, as their labor force. *P. samurai* workers attack *F. japonica* nests and rob hosts' nests of many pupae. YASUNO (1964) showed that the attacked *F. japonica* nests disappeared from areas adjacent to a *P. samurai* nest during the raiding season but hosts reoccupied the area after the termination of parasite activities (see Fig. 2 of YASUNO, 1964). He interpreted this phenomenon as death of the attacked colonies and re-invasion of new host colonies to the area. We investigated raiding activities of nine *P. samurai* colonies through a raiding season (HASEGAWA & YAMAGUCHI, 1994, 1995) and monitored both raided and unraided *F. japonica* nests within the study area. In this report, we examine YASUNO's interpretation and propose an alternative one for nest persistency of raided *F. japonica* nests.

Methods

In early spring of 1992, nine *P. samurai* nests and 160 *F. japonica* nests were located within the study area (ca. 2.3 ha) in the Ecological Park of the Natural History Museum and Institute, Chiba, Japan. *F. japonica* colonies start to open nest entrances in early spring, and remove soil particles from inside of nests. We could easily find their nests because the color of soil particles removed was very different to that on the surface (for general nest structure of *F. japonica*; see KONDOH, 1968). We covered all nests with a tile plate (15×20 cm) and checked them once a week for presence/absence of nest structure and workers under the plate (cf. HASEGAWA & YAMAGUCHI, 1994). During the raiding season, all raiding trips of 6 *P. samurai* nests were observed, and locations of all the attacked *F. japonica* nests were recorded. For raided nests, we checked the condition under the plate several days after each raiding. For the both raided and unraided nests, the condition under the plate was checked on October 30, 1992 and May 13, 1993.

Results and Discussion

Table 1 shows presence/absence of *F. japonica* nests on October 30, 1992 and May 13, 1993. Because several colonies did not open nest entrances in May 1993 and disappeared from the study site, the total number of observed colonies decreased from 160 to 144. On both days, nest persistence rates were not different between raided and unraided nest groups (for October, $\chi^2=0.689$, n.s.;

Table 1. Number of persistent *F. japonica* nests on October 30, 1992 and May 13, 1993. The nests are classified by number of raidings by *P. samurai* colonies.

Number of raidings by <i>P. samurai</i>	Date of investigation					
	October 30, 1992			May 13, 1993		
	Present	Absent	Total	Present	Absent	Total
0	40	74	114	66	33	99
1	8	15	23	18	4	22
2	3	7	10	7	3	10
3	2	2	4	3	1	4
4	0	5	5	5	0	5
6	0	1	1	0	1	1
8	0	1	1	1	0	1
12	0	2	2	0	2	2
Total	53	107	160	100	44	144

for May, $\chi^2=1.152$, n.s.), although overall persistence rates were different (for the reason, see below). For the raided nests, persistence rates were compared between the nests raided once and those raided more than once. For both periods, the difference is not significant (for October, $\chi^2=0.970$, n.s.; for May, $\chi^2=0.914$, n.s.). These results suggest that slave-raiding of *P. samurai* did not result in the disappearance of the attacked *F. japonica* nests.

For raided *F. japonica* nests, when the condition under the plate was checked several days after the raiding, we found that, in many cases, nest structure had disappeared. In such cases, nest entrances also disappeared, and aboveground activities of the colony had completely ceased. This condition seemed to indicate the death of the colony. However, when we dug up soil under the plate, we found nest structure was often maintained in the soil by many workers. At least of those we dug up, 8 of 10 colonies maintained underground nest structure, and we confirmed that these colonies resumed aboveground activities a few weeks after the raiding. This suggests that many raided nests do not actually die, but just stop aboveground activities for a few weeks after raidings.

The low whole nest persistence rate in October 1992 may be a result of the normal annual life cycle of *F. japonica* because this species normally ceases aboveground activities by the end of November (see KONDOH, 1968). However, low persistence rate also suggests that *F. japonica* may stop aboveground activities when nest condition is poor. There was little rain in the autumn of 1992, and the ground dried to a depth of 20–30 cm. Many nests may have therefore withheld aboveground activities in the survey period in order to avoid unsuitable soil conditions. Such a conclusion is supported by our observation that even unraided colonies sometimes maintained their nest structure in deep soil although it disappeared just under the plate. Furthermore, during this period, nest condition resembled that of a perished colony. Thus, low activities of ants due to poor weather in October 1992 may be a cause of the difference in the overall nest persistence rate from May 1993.

This study suggests that contrary to YASUNO's (1964) interpretation, raided *F. japonica* nests do not die but stop aboveground activities for a few weeks after a raid.

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