Chromosome Polymorphism in the Ant,  
*Pheidole nodus*

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Abstract. A survey of chromosome polymorphism was made in populations of *Pheidole nodus* (Hymenoptera, Formicidae). A total of 1,666 males were collected from 11 localities in Japan. Four polymorphic karyotypes were observed: (1) n = 17 with 4 metacentrics (abbreviated as 4M), (2) n = 18(3M), (3) n = 19(2M) and (4) n = 20(1M). These differences are due to the Robertsonian type rearrangement. The karyotype 18(3M) is found in all the populations examined, but the others are more or less localized in their distribution. The 17(4M) appears mainly in Shikoku and the northern Kyushu populations, 19(2M) along the Pacific coast of Honshu, Shikoku and Kyushu, and 20(1M) in the eastern part of Honshu and Shikoku. This distribution pattern indicates that 18(3M) is the oldest, 19(2M) and 20(1M) are derived from 18(3M) by centric fission, and 17(4M) by centric fusion. The most probable mechanism of karyotype evolution in this species is considered to be the centric fission.

Introduction

It was previously reported that the myrmicine ant *Pheidole nodus* collected in Misima (Central Japan) showed a wide range of variation in chromosome number (n = 17–20) (Imai and Kubota, 1972). This type of chromosome polymorphism which was observed in some mammals (e.g. Matthey, 1963) is valuable for analysing population structure and karyotype evolution. In ants, Crozier (1969) has found it in an Australian ponerine ant, *Rhytidoponera metallic* but our study is the first case in Myrmicinae. The present paper deals with a population survey of the polymorphic karyotypes in *Pheidole nodus*, and discusses their possible evolutionary pathway based on their distribution pattern.

Materials and Methods

The ant *Pheidole nodus* F. Smith is a subtropical species occurring in the southern part of Japan (Yano, 1927). Their nests are mostly found in a naked wall of loam or in sandy soil lying between sea level and an altitude of 500 meters. A mature colony contains a few queens (1–64; Kuboki, personal communication), several thousand small workers and several tens of soldiers with large heads. The larvae of males and females (presumptive queens) develop in June and turn to pupae in early July.

Employing the improved squash method of Imai (1974), the chromosome preparations were made from pupal testes. Male material was preferred because karyotype analysis is easier in haploid than in diploid cells. The chromosome number of each individual was determined by counting at least ten good metaphase figures.

Observations

1. Geographic Distribution of *Pheidole nodus* in Japan

About a century ago, the first sample of *Pheidole nodus* was recorded by F. Smith (1874) from Hyogo in Japan. Since then, this species has been found

often by many authors from various localities in Japan (Fig. 1). So far as the data now available are concerned, the northernmost distribution is Kamogawa (Lat. 35°5'N; Yano, 1927) and Izumo (Lat. 35°30'N) of Honshū, and the southernmost sample is recorded from Yakushima (Lat. 30°20'N) of Kyushū. The distribution pattern strongly suggests that *Ph. nodus* is one of the endemic species of Japan, occurring in the southern half of Honshū, Shikoku, Kyushū and their adjoining islands.

2. Polymorphic Karyotypes of Pheidole nodus

The haploid number varies in this species from \( n = 17 \) to 20. Each karyotype is formulated as follows;

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\begin{align*}
n = 4M + 0T + (11SM, ST & A + 2T) &= 17 \ [17(4M)], \\
n = 3M + 2T + (11SM, ST & A + 2T) &= 18 \ [18(3M)], \\
n = 2M + 4T + (11SM, ST & A + 2T) &= 19 \ [19(2M)], \text{ and} \\
n = 1M + 6T + (11SM, ST & A + 2T) &= 20 \ [20(1M)]
\end{align*}
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