15. Karyotypes of the Black Rats in Borneo and New Caledonia

A Preliminary Note^{*)}

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As already described (Yosida 1980), the Asian type black rats with $2n=42$ were remarkable by having a polymorphism of the pair no. 1 resulted from the acrocentric and subtelocentric chromosomes. So far as our survey of the black rats in Southeast Asia, those distributed in some islands such as Luzon and Mindanao (Philippines) and Celebes and Java (Indonesia) showed the subtelocentric pair no. 1, but those collected from the continent of Southeast Asia, such as Thailand and Malaysia showed the acrocentric and subtelocentric polymorphism. On the other hand, the black rats collected in Oceania, such as Australia, New Guinea and New Zealand (Yosida *et al.* 1969, 1971), Hawaii (Yosida and Tsuchiya 1970) showed the Oceanian type characterized by $2n=38$ due to the Robertsonian fusion of 4 acrocentric pairs in the Asian type one. On the specimens distributed in Pacific Ocean, Yosida *et al.* (1985) reported that those in Guam, Saipan, Palau, Truk and Ponape islands had the Asian type ($2n=42$), while those in West Samoa and American Samoa showed the Oceanian type ($2n=38$). Both types of the black rats with $2n=42$ and 38 or the hybrids between these two types have been found in three Pacific islands, such as Chichijima (Yosida 1978), Eniwetok (Yosida 1980) and Fiji (Yosida *et al.* 1985).

We, however, have not any information of the black rats in the big island, Borneo, in Southeast Asia and also New Caledonia on South Pacific Ocean. Fortunately we could observe the karyotypes of only three specimens from Borneo and one specimen from New Caledonia. Although the number of specimens examined was very few, it seems to be very important materials to know the distribution of this species on Pacific Ocean. The present paper deals with a preliminary report on the karyotypes in these specimens with regard to the distribution of the black rats in Southeast Asia and Pacific Ocean.

Material and methods. Three specimens ($\text{♀}1:\text{♂}2$) were collected in the town of Kota Kinabalu, Sabah, Borneo. One male specimen was collected in Noumea, New Caledonia. They were sent to Japan and the cultured cells of the tail tip according to our routine procedure (Yosida 1980) were used for chromosome observations. Conventional Giemsa staining was used for all specimens.

Results and discussion. 1) Specimens from Borneo. Three specimens herein studied were the Asian type having 42 chromosomes. Among them 13 autosome pairs were of acrocentric or subtelocentric chromosomes and the remaining 7 autosome pairs were of metacentrics. The X and Y chromosomes were

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of the median sized and small acrocentrics, respectively (Fig. 1). The Asian type black rats were generally characterized by showing the polymorphism in the pair nos. 1, 9 and 13 in respect to the acrocentric and subtelocentric chromosomes. The pair no. 1 chromosome in three specimens, however, was characterized by the subtelocentric homomorphism as we expected. While, the no. 9 of two males was

Figs. 1-2. The karyotypes of the black rats collected in Borneo and New Caledonia. 1: Specimen from Borneo ($2n=42$). 2: Specimen from New Caledonia ($2n=38$).

heteromorphic as regard to the acrocentric and subtelocentric chromosomes, but that in the other one female showed the subtelocentric homologous pair. In the no. 13 chromosomes, two males showed the acrocentric homologous pair, but the other one female was the subtelocentric homologous pair (Fig. 3).

Although it is difficult to generalize on the karyotype of the black rats in

Fig. 3. Frequencies of the chromosome polymorphism of pair nos. 1, 9 and 13 in the black rats collected in Borneo. The black circle or sectors represent the frequency of the subtelocentric homozygous pair, the hatched sector shows the acrocentric and subtelocentric heterozygous pair, and the white sector, the acrocentric homozygous pair.

Borneo, because the observations were carried out on only three specimens, it would be stated that these specimens could be regarded as the representative in this island. The subtelocentric no. 1 chromosomes had been expected, because those in the other islands located near Borneo, such as Mindanao, Celebes and Java, showed mostly the subtelocentric pair no. 1. One of the present authors (Yosida 1980), suggested that the pair no. 1 of the black rats developed originally in the continent of Southeast Asia would be of the acrocentric type. Somewhere in the continent, the pericentric inversion would have occurred in the pair no. 1. These animals would be migrated to the islands of Southeast Asia and then they distributed widely in these area. On the black rats with polymorphism nos. 9 and 13, it was rather widely distributed in the world than those carrying the pair no. 1 polymorphism. In the present material, the polymorphism of nos. 9 and 13 was also observed. In this reason Yosida (1980) has explained that the inversion of pair nos. 9 and 13 would have occurred earlier than that in the pair no. 1. Therefore, the polymorphism of these chromosomes would be distributed more widely than in the pair no. 1 in the black rats.

2) Specimen in New Caledonia. The karyotype of a specimen collected in New Caledonia was characterized by having the typical Oceanian type with 38 chromosomes. Among them, 2 chromosome pairs were of large metacentric which occurred by the Robertsonian fusion between pair nos. 4 and 7 and also pair nos. 11 and 12. The other chromosome pairs were similar to the Asian type black rat with $2n=42$. Pair nos. 1 and 9 were of subtelocentric as seen in the other Oceanian type black rats (Fig. 2). On the distribution of the black rats on Pacific Ocean, Yosida *et al.* (1985) have drawn a border line on the map to divide them into the Asian and Oceanian types. According to them the black rats in Oceania should be Oceanian type. Therefore New Caledonia was expected to distribute the Oceanian type black rats as described already. To make more surely the distribution of the black rats on Pacific Ocean, it needs to observe more number of specimens from New Caledonia and also from the other islands on the Ocean.

Summary. The karyotypes of three black rats collected in Kota Kinabalu, Sabah, Borneo, and one specimen collected in New Caledonia are analysed. The former three black rats are the Asian type having 42 chromosomes. Among them no. 1 chromosomes are characterized by having all subtelocentric pair, but pair nos. 9 and 13 are polymorphic with regard to the acrocentric and subtelocentric chromosomes. One specimen from New Caledonia is characterized by a typical Oceanian type idiogram with 38 chromosomes.

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