The frequency of *In(3R)P* from the Guam population of *Drosophila melanogaster* is the highest ever reported in the world.

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Natural populations of *Drosophila melanogaster* were found to show the inversion polymorphisms on the four major autosome arms in world-wide scale. These naturally occurring inversions are all the paracentric type. Most of them are found only once in a particular local population, being called "*Unique"* inversions, and some are observed repeatedly in many populations. In view of the frequency and geographical distribution, Inoue and Igarashi (1994) categorized these repeatedly observed inversions into four classes (*Common Cosmopolitans*, *Rare Cosmopolitans*, *Quasi Cosmopolitans*, and *Endemics*). *Common Cosmopolitan* inversions are usually maintained in most populations all over the world, on occasion being more frequent than the standard rearrangement, and show frequency clines by latitudes over large geographical regions. Four inversions, *In(2L)t*, *In(2R)NS*, *In(3L)P*, and *In(3R)P* are in this category, each of which exists in the left and right arms of two major autosomes. *Rare Cosmopolitan* inversions, *In(3R)C* and *In(3R)Mo*, are also distributed all over the world, but their frequencies are usually low, not enough to show the geographical cline. *Quasi Cosmopolitan* inversions are also widespread in the world, but just enough to say "cosmopolitan" in their distribution. They always appeared with very low frequencies and were absent in many populations. *Endemic* inversions are found more than once in a given population but appear in a geographically region-limited manner. Occasionally they show higher frequencies than *Rare Cosmopolitans.*

In the present study we report the recent result of two successive year surveys from the population of Guam island belonging to the Mariana Islands in the Pacific Ocean, and four Japanese populations (see Table 1). Wild caught females were individually transferred to culture vials and allowed to lay eggs. Established strains were kept at 25°C for examination. Inversions were determined through direct observation of the chromosomes of one larva from each female by identifying the inversion homozygotes. This method gives two genomes sampled per each female. Cytological analysis was made on salivary gland chromosomes stained with the lactic-acetic orcein method. Breakpoints and nomenclature of inversions were established by comparing with representations of Bridges' map (Lefevre, 1976). Average frequencies of total cosmopolitan inversions per major autosome arm (Arm Average in Table 1) were also calculated to compare the degree of inversion polymorphisms, because significant positive correlations were observed among these frequencies for all four major autosome arms (Inoue *et al.*, 1994).

Table 1. Frequencies of the cosmopolitan inversions in Guam and Japanese populations.

Locality (Year)	N*	*In(2L)t*	*In(2R)NS*	*In(3L)P*	*In(3R)P*	*In(3R)C*	*In(3R)Mo*	Arm Average**
1. Guam (2012)	42	0.404	0.190	0.190	1.000	0	0	0.446
2. Guam (2013)	262	0.523	0.230	0.172	0.940	0	0	0.484
3. Kyoto (2012)	122	0.165	0.157	0.008	0.107	0.074	0.025	0.110
4. Kobe (2013)	200	0.175	0.130	0.030	0.235	0.030	0.020	0.168
5. Ogasawara (2012)	68	0.148	0.044	0.018	0.471	0	0	0.170
6. Iriomote (2012)	72	0.444	0.236	0.347	0.444	0	0	0.368

* Number of genomes examined

** Average frequency of inversions per major autosome arm

Table 1 shows the frequencies of the cosmopolitan inversions in the present study. The Guam sample in 2012 (No. 1) was collected by the banana bait traps in the agricultural field of Guam University, and the

sample in 2013 (No. 2) was collected in and around the agricultural field of the university. These two samples showed almost the same results. The *In(2L)t* frequencies were 0.404 in 2012 and 0.523 in 2013, which showed that the ratio of the standard chromosome and *In(2L)t* was about half and half in the left arm of the second chromosome. Both the *In(2R)NS* and *In(3L)P* frequencies were about half of *In(2L)t* in the two samples. The point of the present report is the frequency of *In(3R)P*. In the sample of 2012, all right arms of the third chromosome were fixed by *In(3R)P*. In order to confirm the fixation of *In(3R)P* in the Guam population, we examined more chromosomes the following year and found that all right arms of the third chromosome were not fixed, but most of all 3R arms had *In(3R)P*, being 0.940 of the frequency. *Rare Cosmopolitan* inversions, *In(3R)C* and *In(3R)Mo*, were not found in the two samples. The arm averages were 0.446 and 0.484, being almost the same. Additionally *In(3R)K* was found by the collection of 2013 in the heterozygous condition with the standard chromosome, which is classified to *Quasi Cosmopolitan* inversions.

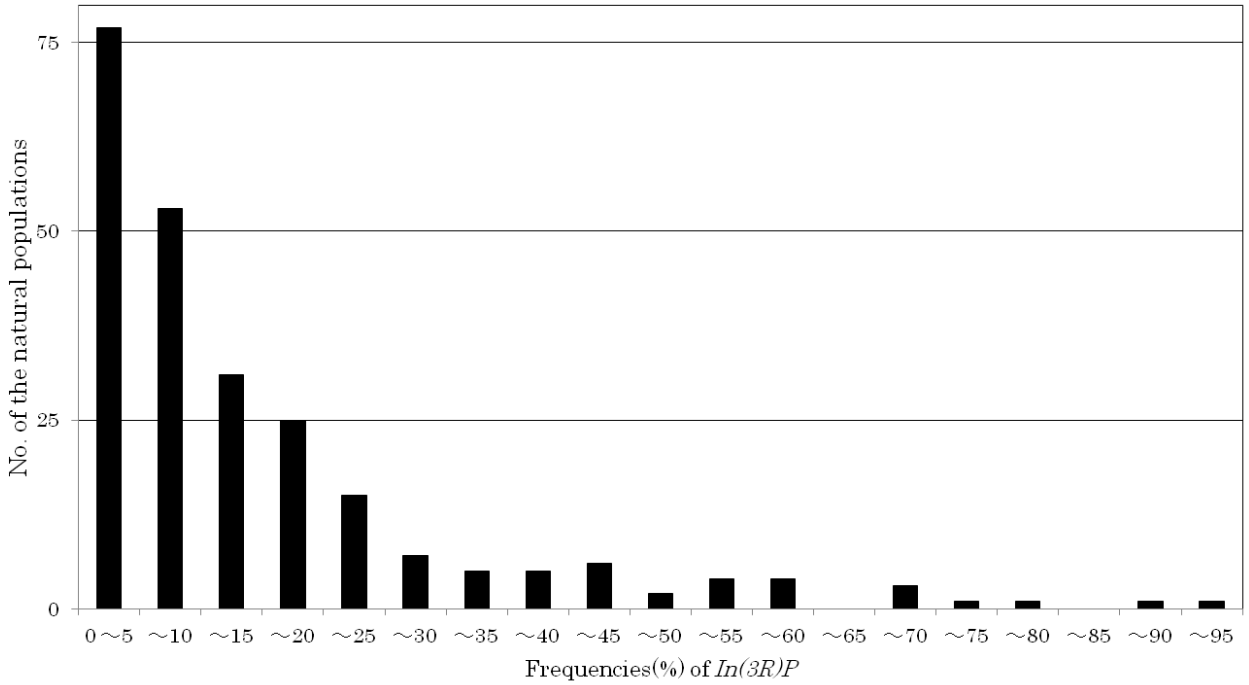

Figure 1. The distribution of the maximum In(3R)P frequencies in a total of the 241 separated local populations all over the world analyzed in 1944 ~ 2013.

Kyoto (No. 3) and Kobe (No. 4) exist in the center of Japanese Mainland. In comparison with Guam (No. 1 and 2), these Japanese populations had a much smaller amount of inversions, being 0.110 and 0.168 of the arm average. Especially *In(3L)P* showed very low frequencies in both cases (0.008 and 0.030). Inoue *et al.* (2002) also reported very low frequencies of *In(3L)P* in the Japanese mainland populations. But *Rare Cosmopolitan* inversions, *In(3R)C* and *In(3R)Mo*, were observed constantly, which were not found in the two Guam populations. Additionally two *Unique* inversions, *In(2R)46B;55F* and *In(2L)23F;26B*, were found twice in Kyoto populations and once in the Kobe population, respectively. They are *Unique* inversions. Moreover, the *In(2R)O* which is found recently in Japan and increasing its distribution gradually (Inoue *et al.* 2011), appeared with a frequency of 0.05 in Kyoto and 0.025 in Kobe. Ogasawara (No. 5) is the islands, which are located 1,000 km south of Tokyo. The arm average was 0.170, which was similar to Kyoto (No. 3) and Kobe (No. 4). But the Ogasawara population showed very low frequency of *In(2R)NS* (0.044) as well as *In(3L)P*, and had no *Rare Cosmopolitan* inversions, *In(3R)C* and *In(3R)Mo*. So in Ogasawara major cosmopolitan inversions were only *In(2L)t* and *In(3R)P*, which was the same result as the past Ogasawara data of 2000 and 2004 (Inoue and Watada 2006). Iriomote (No. 6) belongs to the South-west Islands of Japan. According to the latitudinal cline

(Mettler *et al.*, 1977; Knibb *et al.*, 1981) that the populations near the equator incline to have more inversions, the Iriomote population was found to have much more inversions than the mainland and Ogasawara populations (No. 3, 4, and 5). Its arm average (0.368) was less than that of the Guam populations, but the frequency of *In(3L)P* (0.347) was the highest in the present study. It confirmed the result of Inoue *et al.* (2002) that *In(3R)P* is relatively adaptive in the South-West Islands in comparison with the other regions. *Rare Cosmopolitan* inversions, *In(3R)C* and *In(3R)Mo*, were not found there as well as Guam (No. 1 and 2) and Ogasawara (No. 5).

Figure 1 shows the distributions of *In(3R)P* frequencies by almost all the data from 1944 to 2013 all over the world (see the references). The samples of less than 40 genomes examined were not used in Figure 1. A total of 241 separate local populations were used, each of which was the highest frequency in each given locality. The only one highest value among the data at differing sampling time was used in each locality. The numbers of populations of *In(3R)P* frequencies were counted by every 5% level. A total of 77 local natural populations was put between 0 ~ 5% level, 53 populations between 5 ~ 10% level, 31 populations between 10 ~ 15% level, 25 populations between 15 ~ 20% level, and 15 populations between 20 ~ 25% level. After that level, the number of populations decreased gradually to the zero point. Only a few populations showing more than 65% were found in the South-west Islands of Japan, Florida in the U.S.A., and New Guinea, among which the highest frequency (0.890) was from the Iriomote 1979 population (Inoue *et al.*, 1994). Thus, the present data of 0.940 from the Guam 2013 population with a total of 262 genomes examined is so far the highest frequency for *In(3R)P* in the world.

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Organically grown banana fruit effects on reproductive fitness of *Phorticella straiata.*

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Introduction

Diet is one of the external factors known to affect on an organism's growth, development, reproduction, and survival (Sisodia and Singh, 2012). The diet consumed by an individual can be grouped