3. *Karyotype analysis*

A. osimensis: A diploid chromosome number of $2n=32$ was observed in the 35 oogonical cells of queen pupae and also in 9 somatic cells of the brain of queen prepupae. Haploid sets of chromosomes of $n=16$ were counted in 16 first spermatocyte cells of male pupae. The chromosome constitution of the haploid set is shown by the following karyotype formula:

$n=1SM^{2SC}+1ST^{SC}+2M+2SM+10A=16$ (Plate 3, figs. 1, 2).

(Where, SM^{2SC}: Submetacentric chromosome having one secondary constriction in both short and long arms; ST^{SC}: Subtelocentric chromosome having one secondary constriction in long arm; SM: Submetacentric chromosome; M: Metacentric chromosome; A: Acrocentric chromosome.)

A. famelica: A diploid chromosome number of $2n=34$ was observed in brain cells, 19 cells from queen and 15 cells from workers. Haploid set of chromosomes of $n=17$ was examined in 8 first spermatocytes of male pupae. The chromosome constitution of the haploid set is shown by the following formula:

$n=2T^{SC}+1ST^{SC}+2M+2SM+10A=17$ (Plate 3, figs. 3, 4).

(Where, T^{SC}: Telocentric chromosome having one secondary constriction in long arm.)

In contrast to the karyotype of *osimensis*, the SM^{2SC} chromosome does not occur in this species; while two telocentric chromosome, each of which has one secondary constriction, are found anew. The other components are the same as those of *osimensis*.

A. smythiesi: A diploid chromosome number of $2n=22$ was observed in 3 oogonial cells from queen pupae, and 19 somatic cells from brains of workers. Haploid sets of chromosome of $n=11$ were counted in 50 first spermatocytes of male pupae. The karyotype formula of the haploid set is as follows:

$n=10SM+1M$ (Plate 3, figs. 5, 6).

This formula is entirely different from those of *osimensis* and *famelica*. Namely, the largest SM chromosome which corresponds to SM^{2SC} of *osimensis* has no secondary constrictions; and no acrocentric chromosome is observed in this species, whereas ten acrocentric chromosomes are counted in other two species.

Discussion

From the morphological view point, excellent characters are available in the shape, rugosity pattern, and size of several body parts. The resemblance of each character was compared with the worker, queen, and male castes to be expressed by three symbols: 1) remarkably different character states (designated as //), 2) similar character states (designated as ∞), and 3) transient character states (designated as→). Based on these criteria five groups of interspecies correlation could be established: o→f→s, o∞f∞s, o∞f // s, o // f∞s, and o∞s // f (where, o: *osimensis*, f: *famelica*, s: *smythiesi*) (Table 1). At first sight, no clean evolutional relation among these species seems possible, because it will be difficult to decide which groups of interspecies correlation represent the true phylogenetic correlation.