THE TRUE CHROMOSOME NUMBER OF AKA-TOMBO, *SYMPETRUM FREQUENS* (SEL.) OF JAPAN, WITH A NOTE ON THE KARYOTYPE OF *S. DEPRESSIUSCULUM* (SEL.) (ANISOPTERA: LIBELLULIDAE)

Inspired by the little note of S. ASAHINA (1983, *Abstr. Pap. VIIth int. Symp. Odonatol., Calgary*, pp. 1-3), indicating some "biological puzzles" of the famous Japanese "Aka-tombo" and its continental vicariant *S.depressiusculum*, we have examined the karyotypic morphology of the two taxa. It was our objective to investigate whether or not the cytotaxonomic approach could provide any evidence towards a tentative solution of the problems concerning their taxonomic status and phylogenetic relationships.

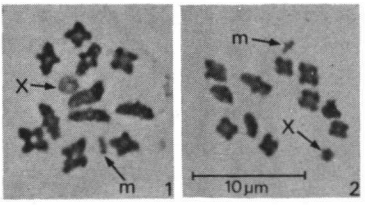
The karyotype of the Japanese *S. frequens* was originally described and figured by K. OGUMA (1915, *Dobutsugaku Zasshi* 27: 241--250), based on material from Sapporo. The karyogram No. II, shown in his figure on p. 245, is referable to this species. At primary spermatocyte metaphase there are clearly 13 elements, representing 11 "normal" bivalents, a very minute *m*-bivalent, and an X. OGUMA dealt with the same species in his subsequent, English paper (1930, *J. Fac. Sci. Hokkaido Univ.*, VI, 1: 1-32), in which he revised his earlier views, giving the male haploid number as n = 12 (shown also in fig. 2 d), and stated explicitly that "the smallest chromosome in the chromosome garniture of the primary spermatocyte is the X-chromosome..." and suggested "the fading away of [the original *m*]... through diminution of chromatin". This publication was referred to by all subsequent workers, listing the chromosome number of *S. frequens* as n = 12, without examination of any fresh material.

In 1982, Drs Hui-qian Zhu and Jing-lon Wu, University of Shanxi, P.R. China, were the first to examine the cytology of a continental population pertaining to this taxonomic complex. Their observations did not confirm Oguma's 1930 views, and will be published elsewhere, at a later date. However, they were kind enough to communicate their preliminary evidence to us, drawing therewith our attention to the cytotaxonomic problems in the Aka-tombo complex.

On August 2, 1980 we have examined the cytology of a teneral male of *S. frequens* from Hachigamine, Osaka Prefecture, on the results of which we have reported to the Kansai Research Group of Odonatology, Osaka, in a formal report, dated July 14, 1982 (cf. *OA* No. 4572, in *Odonatologica* 13 [1984]: 496-497). The Hachigamine specimen yielded 26 micrographs, showing clearly the chromosome numbers 2n = 25, n = 13, *m*. At spermatogonial metaphase the *m*-chromosomes are minute and weakly stained, while a peculiarly minute *m*-bivalent occurs in all figures of primary spermatocyte metaphase (cf. Fig. 1).

Considering this evidence, it is certain that Oguma's 1915 observations were perfectly correct. The male haploid chromosome number of the Japanese *S. frequens* is n = 13, including a tiny *m*-bivalent. It is certainly due to the minuteness of the latter that Oguma either did not notice it in his 1930 material, or he did not recognize it as a chromosome then, hence his subsequent revision of the original statement. It should be mentioned here that the provenance of Oguma's 1930 material is not indicated. From his biography, however, it can be assumed that the specimens fairly certainly originate from Hokkaido.

In this perspective, the karyotypic morphology of the continental *S. depressiusculum* is of some interest. We have examined 5 males, from 3 localities in canton St Gallen, eastern



Figs 1-2. Primary spermatocyte, early metaphase (Feulgen squash, 1500 X): (1) (Hachigamine Hills, Osaka Pref., Japan); — (2) (Diepoldsau, St Gallen, Switzerland).

Switzerland, viz. Schänis (August 29, 1984), Rorschach and Diepoldsau (both August 31, 1984). The chromosome numbers are identic to those of *S. frequens*. As is apparent from Figure 2, the karyotypic morphology of the two taxa is essentially similar, including the presence of a minute *m*-bivalent (pair) in both species.

It is worthwhile noting in this context that minute but consistent karyotypic differences between the continental and Japanese vicariants were recorded in some other taxa, viz. *Calopteryx virgo*/*C. japonica*, *Libellula quadrimaculata* (both B. KIAUTA, 1968, *Genetica* 39: 64-74), and in *Sympetrum pedemontanum* (B. KIAUTA & M.A.J.E. BRINK, 1975, *Odonatologica* 6: 249-254).

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