

To determine whether or not such worker oviposition actually occurs under natural conditions, we examined the ovaries of workers from three colonies collected in June, July and December. Most of these workers had one or two matured eggs (mean 1.3 ± 0.8 per worker) in June (*fig. 3 B*, *table III*). The workers collected in July also had mature eggs (mean 0.5 ± 0.6 per worker). These seemed to be functionally normal, in that we did not observe any abnormality, either in egg size and yolk content, or in a histological examination (*fig. 4 C*). On the other hand, no mature eggs were seen in workers dissected in December. These series of observations, and the seasonal change of colony composition shown in *table I*, strongly suggest that workers of *P. pungens* can lay eggs without previous insemination by males during summer, and that 97-98 % of such worker-laid eggs are destined to become workers.

Chromosomes of *P. pungens*

The chromosome number was $2n = 24$ in the cerebral ganglion cells of workers (*fig. 5 A*). Chromosomes were also observed from males collected at Amami Oshima (June 2, 1972). A total of 24 spermatocytes obtained from three male pupae showed the haploid chromosome number $n = 12$ (*fig. 5 C*). There were no abortive spermatocytes, and both spermatids and sperms were observed in the late pupal stage, so that spermatogenesis seems to proceed normally in this species. The copulatory organ is also normal (*fig. 3 C*). These results agree exactly with the previous observations by IMAI (1966). We observed chromosomes in ovaries from worker pupae, and found many oocytes at pachytene, in which homologous chromosomes are associated completely, and 12 pairs of bivalents ($n = 12$) can be identified (*fig. 5 B*).

DISCUSSION

Ants belong to the order Hymenoptera, and, like other members of the order, are male-haploid. In general males develop from haploid, unfertilized eggs and females from diploid fertilized ones (CROZIER, 1975: 1-2). There is good evidence that sex-determination in many hymenopterans, especially in the Aculeata to which ants belong, involves individuals heterozygous at one or more specific loci, which become female, and hemi- and homozygotes, which become male (CROZIER, 1977). As in other social Hymenoptera, male ants are restricted to a reproductive role, and are rare compared to females. Females are divided, roughly, into mated, highly-fertile reproductive specialists, the queens, and the great bulk of the colony, the workers, which are generally virgin and sterile, or at any rate of low fertility. The workers are also often subdivided into specialist castes, such as soldiers (OSTER and WILSON, 1978: 130-143).