

### CASTE DIFFERENTIATION IN THE PARER WASP *ROPALIDIA MARGINATA* (LEP.)

WASPS are remarkable amongst the higher social insects in exhibiting all stages of development of sociality from completely solitary to highly advanced colonial species with females clearly differentiated into reproductive and worker castes. The tropical paper wasp genus *Ropalidia* (= *Icaria*) occupies a particularly crucial stage in the evolutionary sequence of the development of social habit amongst the wasps<sup>1</sup>. Roubaud's<sup>2</sup> pioneering observations on the African members of *Ropalidia* suggest that this genus includes species with multiple egg-layers morphologically indistinguishable from the workers at a single colony. He reported that in two colonies of *R. guttatipennis* four out of six, and five out of seven females possessed functional ovaries. Apart from this sixty year old observation nothing seems to be known of caste differentiation in this interesting genus. The investigation reported here showed that the Indian species *R. marginata* is somewhat more advanced in caste differentiation, though belonging to the same crucial evolutionary stage.

*R. marginata* is a common Indian species which regularly builds its combs under the eaves and window sills of houses. The adult wasp is about 25 mm in length and about 60 mgm in weight. The number of adults in a colony ranges from two or three to seventy. Our observations suggest that the colony is founded by several females, and is perennial. We have been engaged in a study of the ecology and life-history of this species since October 1971 and this letter is the first report of this investigation.

During the course of this study we have collected twelve entire colonies of *R. marginata* from Pooa. Adults at these colonies were sexed, weighed and dissected to ascertain the state of development of their reproductive organs. Apart from variation in size, there were no morphological differences amongst the females. There were, however, marked differences in the extent of development of the ovaries, the majority possessing totally atrophied ovaries. In each case one or two females possessed well-developed and obviously fully functional ovaries, while in a few cases upto four more females had moderately developed ovaries which may have been functional to some degree. Females with functional ovaries were always amongst the heavier individuals, often, but not always, being the heaviest wasp in the colony. Figure 1 presents the data on the weights and the state of ovarian development for four representative colonies.

It is clear that *R. marginata* resembles *R. guttatipennis* in the occurrence of a functional differen-

tiation of egg-layers and workers without any corresponding morphological distinction. However the caste differentiation in *R. marginata* has progressed further in that only a minority or often just one female possesses functional ovaries. This caste differentiation is presumably brought about through behavioural interactions. We have observed extensive food sharing at the *R. marginata* colonies. It may therefore be conjectured that workers expend more labour in food gathering but receive a disproportionately smaller share of the food. The ovaries of workers may then be atrophied due to this "nutritional castration". We hope that our further studies with individually marked wasps will enable us to test this hypothesis and lead to a solution of this problem.

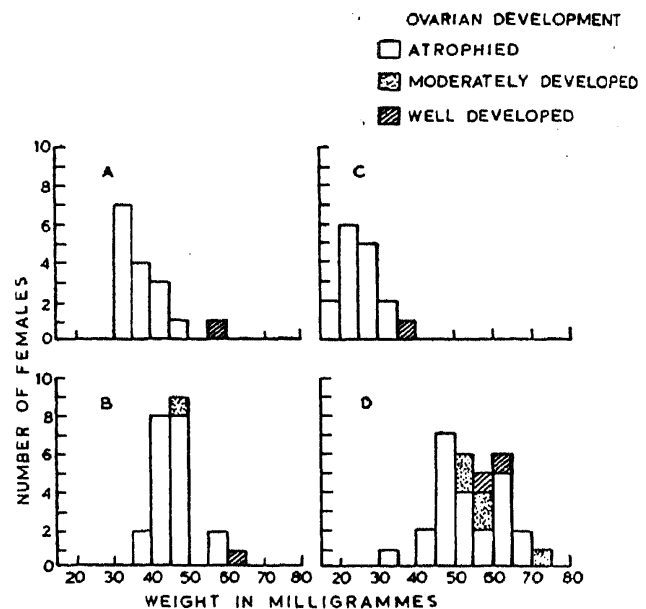


FIG. 1

We are grateful to Prof. O. W. Rishards of British Museum for identifying the specimens.

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1. Wilson, E. O., *Insect Societies*, Harvard University Press, Cambridge, Mass., 1971, p. 548.
2. Roubaud, E., *Ann. Sci. Nat. Zool.*, 1916, 10 (1), 1.
3. van der Vecht, J., *Zool. Ver.*, 1962, 57, 1.