PHEROMONAL BASIS OF COURTSHIP BEHAVIOR IN TWO GYPSY MOTH PARASITOIDS: 
Brachymeria intermedia (Nees) and Brachymeria lasus 
(Walker) (Hymenoptera: Chalcididae)

M.A. MOHAMED and H.C. COPPEL

Department of Entomology
University of Wisconsin–Madison
Madison, Wisconsin 53706

(Received March 25, 1986; accepted July 7, 1986)

Abstract—The pheromonal basis of the courtship behavior of two gypsy moth parasitoids, Brachymeria intermedia and Brachymeria lasus, was traced to a single component in each case. This component was isolated by a combination of absorption and gas–liquid chromatography and shown to elicit some of the courtship behavior typical of these species. Bioassays of extracts from several independent techniques for sequestering pheromones, as well as interspecific assays, support this conclusion. Comparative analyses of both mate and female extracts by capillary chromatography show the uniqueness of the pheromonal peak to the female volatile profile.

Key Words—Brachymeria intermedia, Brachymeria lasus, courtship behavior, chromatography, sex pheromone, Chalcididae, Hymenoptera.

INTRODUCTION

The mating behavior of many parasitic insects consists of a series of discrete, highly complex courtship responses (Matthews, 1975; Leonard and Ringo, 1978). Chemical, visual, auditory, and tactile cues have been implicated. However, with the exception of two species of ichneumonids (Robacher et al., 1976; Eller et al., 1984) little is known of the pheromonal basis of parasitoid courtship behavior. Considering the wealth of evidence existing for other groups of insects (Lepidoptera, for instance), and that parasitoids account for approximately 15% of Insecta (Askew, 1971), with possibly the greatest species diversity within a group of animals, it is of obvious import to any comprehensive knowledge of pheromones that this lacuna be explored. Biocontrol programs involving
the release of exotic or native beneficials in new habitats require knowledge of their establishment and spread (Coppel and Mertins, 1977). This can be achieved with pheromones. Integrated pest-management programs can be better practiced by knowledge of the flight activity of parasitoids which may enable directed application of pesticides to avoid any detrimental impact on beneficials. Further, pheromone trapping of both host and its parasitoid may provide information on the degree of control exerted by the latter (Morse and Kulman, 1985).

Within this context, a study was initiated to define the pheromonal basis of the mating behavior of two species of gypsy moth endoparasitoids, *Brachymeria intermedia* (Nees) and *Brachymeria lasus* (Walker).

**METHODS AND MATERIALS**

Adult parasitoids were reared on the pupal stage of the factitious host, the greater wax moth, *Galleria mellonella* (L.). To this end, a small-scale mass-rearing technique was developed to provide a continuous and reliable source of the pupal stage (Mohamed and Coppel, 1983). Cocooned pupae reared singly, or in sheets of 50–100 of the wax moth were allowed to be parasitized by stock cultures of both species of parasitoids. The parasitized cocoons were placed singly in vials sealed with perforated plastic caps. They were incubated at 28.5°C, 16:8 light–dark, and 60 ± 5% relative humidity. Upon eclosion (males in 5–6 and females in 8–9 days), the adults were sexed and either treated to obtain crude pheromone or returned to stock cultures.

Several techniques were employed to collect crude pheromone samples. Some were based on literature reports on other species (Young and Silverstein, 1975) while others were designed to incorporate elements of the biology of these species. Within this framework, crude samples were collected from the parasitoids from the time of eclosion to death. Each technique was sufficiently distinct to allow several independent means of pheromone isolation and maximization of collection of crude samples. These techniques were as follows: (1) Emerging male or female parasitoids from cocoons in sheets were placed singly in 4-ml shell vials and sealed with a perforated cap; and, similarly, a male and female were placed in each vial. (2) Parasitoids emerging from singly parasitized cocoons previously held in vials were allowed to remain in these vials. The vials with parasitoids were incubated at 28.5°C and 16:8 light–dark for 24 hr. They were then removed and transferred to screened cages holding either males, females, or both sexes. The empty vials were stored until treatment to obtain crude pheromone. (3) Within these cages the parasitoids were allowed to aggregate daily on filter paper (Whatman No. 40) -lined vials (55 × 25 mm) during scotophase. The filter paper was removed and extracted monthly. (4) Dead parasitoids from all cages, of either sex, or a combination of the sexes were collected and refluxed in a solvent. (5) Virgin females from rearing cages