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DAILY AND SEASONAL FLIGHT OF MALE *PARANTHRENE DOLLI* (LEPIDOPTERA: SESIIDAE), MONITORED BY PHEROMONE TRAPS

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Interest in the management and culture of cottonwood, *Populus deltoides* (Bartr.), has drawn attention to one of its major pests, generally known as the cottonwood clearwing borer, *Paranthrene dollii* (Neum.). In nurseries, the larvae damage the stools and switches of cottonwood by boring into the wood and pith, and constructing open tunnels up to 16 cm in length (Solomon & Abrahamson 1972). Culling of potentially usable cuttings in cottonwood nurseries has ranged from 12% (Solomon et al. 1976) to 20% (Nebeker 1980-unpublished data) because of *P. dollii* damage. Current control methods for *P. dollii* involve insecticide applications and mechanical means, such as removal and burning of infested stools, switches and cuttings. Additional information on the biology and behavior of the species is needed to aid in the development of pest management program in cottonwood nurseries. Therefore, this study was conducted to determine the daily and seasonal flight periods of adult males.

Flight periods of males in 1980 and 1981 and daily flight activity in 1981 were determined by using pheromone traps in Mississippi. Pherocon 1-C® traps (Zoecon Corp., Palo Alto, Calif.) were baited with male sex attractants (Nielsen et al. 1979), (*Z*,*Z*)-3,13-octadecadien-1-ol (ZZ-ODDOH) and (*E*,*Z*)-3-13-octadecadien-1-ol (EZ-ODDOH). the two alcohol isomers were prepared separately at a concentration of 2 mg/ml of hexane, and then blended at a 1:3 ratio of ZZ-ODDOH and EZ-ODDOH. Aliquots of 0.25 ml of the prepared mixture were impregnated into rubber stopper (no. 8753-DD2, A. H.

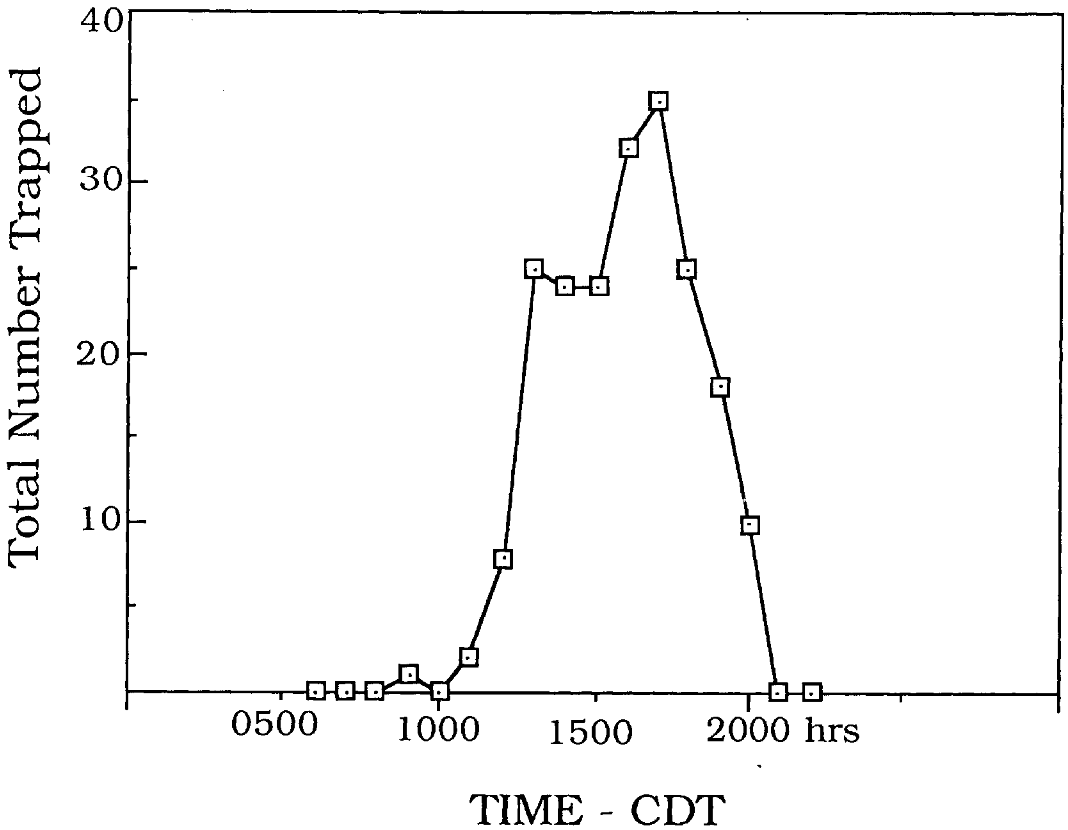

Fig. 1. Hourly flight activity of male *Paranthrene dollii* monitored at the Mississippi Forestry Commission Nursery, Winona, MS. on May 4-5 and June 6-7, 1981. CDT = Central Daylight Time.

Thomas, Co.) dispensers and were suspended by paper clips from the inside top of the Pherocon traps about 2 cm above the sticky liner.

Baited traps were suspended at 1.5 and 0.75 m heights on wooden stakes and uniformly distributed (average 60 m apart within the cottonwood clonal material) throughout the Mississippi Forestry Commission Nursery, Winona, and at Stoneville MS. They were placed at the respective sites from May 1980 through November 1981 and from May through November 1980. Trap heights were alternated at each visit. Traps were visited twice a week from May to October 1980 and once a week from April to November 1981. Ten traps were monitored at Winona and 2 at Stoneville. The attractant was replaced every 14 days from April through October, and monthly from November through March. During this winter period only 4 traps were monitored at Winona. Moths were removed with forceps, brought to the laboratory, and cleaned with paint thinner to facilitate counting and identification. Trap bottoms (liners) were changed each month or when necessary.

The daily flight activity of males was determined in 1981 (May 4-5 and June 6-7) by hourly trap counts from 0600 to 2200 hrs (CDT) (Fig. 1). Hourly flight studies revealed that male activity began as early as 0900 hr. Flight activity increased sharply at noon, peaked around 1700 hr and ceased by 2100 hr (CDT). No males were captured during the night. The daily rhythm of activity corresponds closely to the time of female calling between 1300-1800 hrs (Eroles-Harkins 1983).

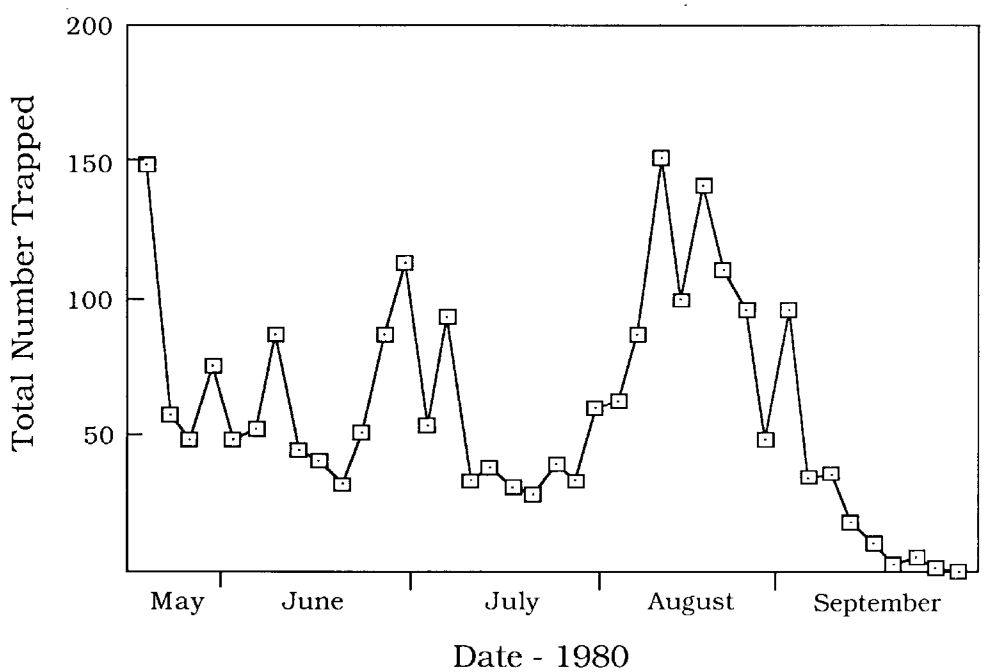

Fig. 2. Seasonal abundance of male *Paranthrene dollii* caught in the pheromone baited traps (10 traps) at the Mississippi Forestry Commission Nursery, Winona, MS.

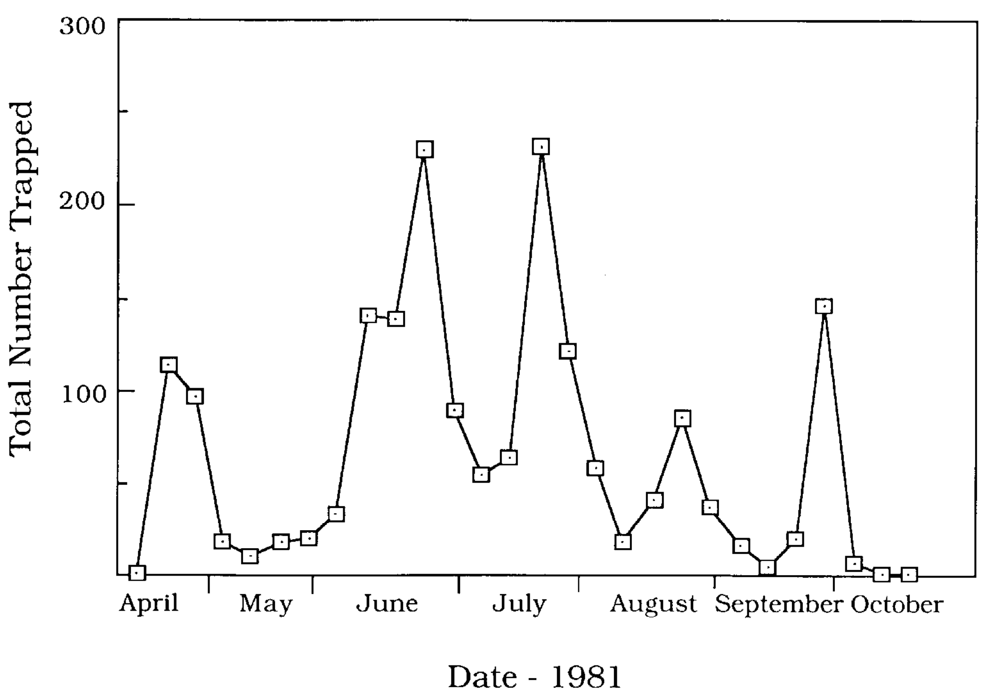

Fig. 3. Seasonal abundance of male *Paranthrene dollii* caught in pheromone baited traps (10 traps) at the Mississippi Forestry Commission Nursery, Winona, MS.

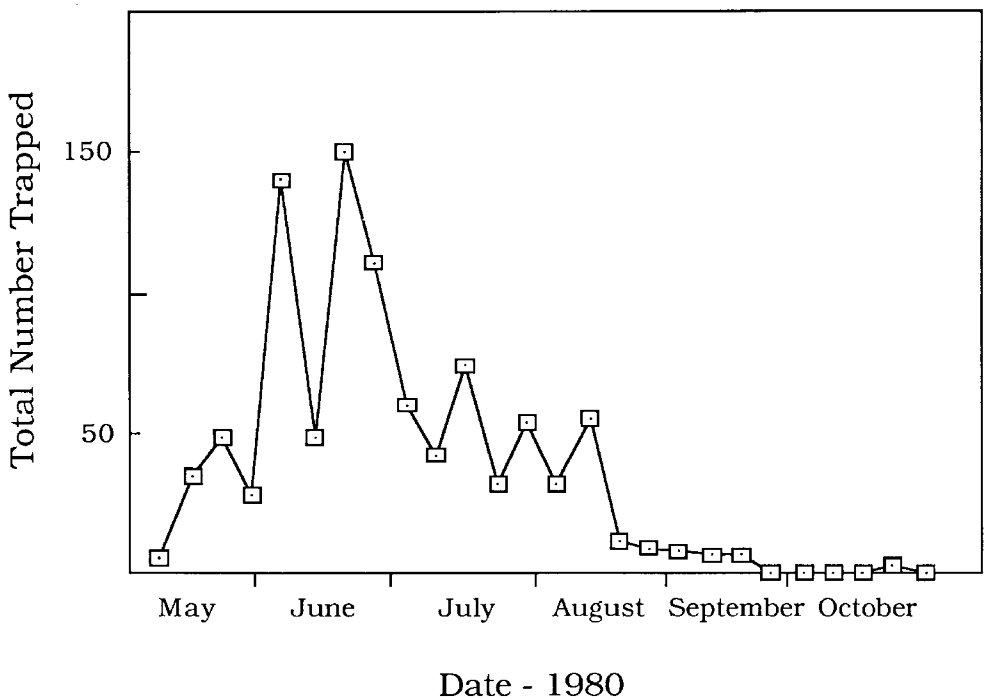

Fig. 4. Seasonal flight of male *Paranthrene dollii* monitored in pheromone baited traps (2 traps) at Stoneville, MS.

A total of 917 males were captured at Stoneville in 1980 and 4,085 males were trapped at Winona, MS during 1980 and 1981. There was no significant difference ($p = 0.05$) between trap catches at the two different heights. Several adult flight peaks were observed from April through October during 1980 and 1981 (Figs. 2-4). Based upon trapping throughout 1981 flight activity of *P. dollii* begins in late March or early April with three or more major seasonal peaks, and ceases in October. Sharp et al. (1978), using pheromone traps, recorded two periods of flight of *P. dollii* in Florida from April through June and again from September to early December. This more closely suggests two generations per year in Florida rather than a 2-year generation suggested by Sharp et al. (1978). We suggest that *P. dollii* has only one generation per year in northern Mississippi. This conclusion is based on the results of this trapping study and the results of Eroles-Harkens (1983). This is not in agreement with Sharp et al. (1978) citing Englehart (1946), where they suggest that *Paranthrene* (Hubner) species have a 2-year or longer life cycle.

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FEEDING BEHAVIOR AND DIETARY SUBSTRATES FOR REARING LARVAE OF THE CARIBBEAN FRUIT FLY, *ANASTREPHA SUSPENSA*

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Interrelationships between the nutrient and physical composition of larval diets for tephritid fruit flies were first investigated by Mourikis (1965). He discovered that Mediterranean fruit fly, *Ceratitis capitata* (Wiedemann), larvae ingest mostly liquid food released from fruit by their mouth hooks and that larvae aggregate at communal feeding sites, presumably to cooperate in liquefying the diet. Many complex diets have since been formulated to mass rear larval fruit flies, such as the Mediterranean fruit fly (Mitchell et al. 1965), *Dacus* spp. (Schroeder et al. 1972), and *Anastrepha* sp. (Spishakoff 1966, Kamasaki et al. 1970). Alternative substrates for these diets have been adopted at different times and places due to the availability of local materials, cost, associated rearing methods and equipment, and assumptions about larval feeding behavior. Consequently, substrates have remained the most variable and undefined of these requirements (Tanaka et al. 1969). The original carrot, sugarcane bagasse, citrus pulp and ground rice hull media have been replaced with diets based on wheat plus an acrylic polymer thickening agent (Tanaka et al. 1969), cottonseed flour with or without a fibrous nylon substrate (Schroeder et al. 1970, 1971), corn cob grits or agar (Burditt et al. 1975), sawdust (Aliniazee & Brown 1977), wheat (Barnes 1979), wheat and soy flour (Schwarz et al. 1985), and corn meal plus agar (Zucoloto 1987). Vargas et al. (1983) compared sugarcane and sugarbeet bagasse, and wheat mill feed as dietary substrates for mass rearing Mediterranean fruit fly larvae. They found no differences in the yields of pupae, although those from sugarbeet bagasse diet were significantly lighter. We conducted this study to determine if larvae of the Caribbean fruit fly, *A. suspensa* (Loew), shred the dietary substrate and ingest particles, and if they can reared on a liquid diet supported by tissue paper, artificial sponge, or powdered cellulose.

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