

MCPHAIL TRAP CAPTURES OF *ANASTREPHA OBLIQUA*
AND *ANASTREPHA LUDENS* (DIPTERA: TEPHRITIDAE)
IN RELATION TO TIME OF DAY

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Anastrepha Schiner is the most economically important genus of fruit flies in Mexico (Aluja et al. 1987). These fruit flies are currently detected and surveyed with McPhail traps, although problems with efficiency and variability of capture have been described (Liedo 1983, Aluja et al. 1989).

A few studies of the behavior of fruit flies employing McPhail traps have been reported (Prokopy & Economopoulos 1975, Aluja et al. 1989). McPhail (1937) studied the adult activity of *Anastrepha ludens* (Loew) in mango trees using McPhail traps

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with fermenting sugar as bait. The current work reports the capture of *Anastrepha obliqua* (Macquart) and *A. ludens* in relation to time of day using McPhail traps baited with proteinaceous attractant. This information may be useful in understanding the dynamics of fruit fly trapping.

The study was carried out in the Mazapa de Madero Valley, Chiapas, Mexico, from 27 to 29 May and 12 to 16 June, 1986, with wild *Anastrepha* flies, using the same host trees in both periods. This work was conducted before a medfly program began to release parasitoids for biological control of *Anastrepha* fruit flies. The tests were done during the period when trap captures were normally at their peak (Aluja et al. 1989). Previous studies in Mazapa de Madero Valley have been described by Aluja et al. (1987) and Malo (1992).

Traps were baited with a mixture of torula yeast and borax in a ratio of 4:5 (21 g) dissolved in 300 ml of water (Lopez et al. 1971). Twelve McPhail traps were hung at a height of 7 m in mango trees, *Mangifera indica* L. variety "criollo", also known as "mango de coche". The criteria for selection of trees in which to hang the traps were mostly concerned with factors such as ease of access and the presence of mature fruits (approximately 80% on the tree). The distance between traps was a minimum of 100 m. Traps were hung on the trees at 0600 hours and serviced every two hours, ending at 1800 hours. Traps were left hanging in trees throughout the night to determine the possible capture during this time of day.

The contents of each trap were sieved, and the captured insects were rinsed with clean water and placed in a 50 ml vial filled with 70% ethanol; the traps were also rinsed and re-baited. The amount of bait used for the traps was kept constant during each 3 to 5 day-long observation period. Captured flies were counted and identified to species and sex using Steyskal's (1977) key. Temperatures and relative humidities were recorded with a hygrothermograph placed in the shade of a mango tree localized in the center of the valley. Wind velocity was measured every two hours with an anemometer placed in the canopy of the same mango tree (10 m height approximately).

A total of 1,929 flies of the genus *Anastrepha* was captured, of which 56.8% were *A. obliqua*, 39.8% *A. ludens* and 3.4% other species such as *A. serpentina* (Wiedemann), *A. distincta* Greene, *A. fraterculus* (Wiedemann) and *A. striata* Schiner. Because the catches of *A. obliqua* and *A. ludens* amounted to 96.6% of all flies caught, the analysis was made with these species only. In earlier studies reported by Aluja et al. (1992), *A. ludens* was the species most abundant, followed by *A. obliqua* and *A. serpentina* in Mazapa de Madero Valley. Malo (1992) found that the predominant species were *A. ludens* and *A. obliqua*. The findings obtained in this work confirmed that the latter two species were the most abundant. Almost all the mangoes growing in the Valley were "mango de coche", a variety highly preferred by these species (Aluja & Liedo, 1986).

Data in Table 1 show the mean number (\pm S.E.) of *A. obliqua* and *A. ludens* captured per trap per 2-hour period as a function of the time of day, mean temperature, relative humidity and wind velocity. For both species, the first flies were caught at 0800 hours; the 2-hour catch rate increased to a maximum peak between 1400 to 1600 hours, then declined from 1600 to 1800 hours. *A. obliqua* captures showed a significant difference in relation to time of day ($F = 4.21$; $df = 6,49$; $P \leq 0.01$). Similar variation was observed in *A. ludens* ($F = 6.76$; $df = 6,49$; $P \leq 0.01$). There were no flies trapped in the period between 1800 to 0600 hours.

Variations in temperature and wind velocity throughout the trapping period showed a similar profile to that of capture of fruit flies in relation to time of day. The relative humidity was high in the morning, decreased in the mid-day, and increased again in the evening. The catches of *A. ludens* and *A. obliqua* were probably influenced by all these factors. McPhail trap catches have been shown to be affected by bi-

otic factors, both of the pest and host origin, and non-biotic factors (McPhail 1937, Neuenschwander & Michelakis 1979, Kapatos & Fletcher 1982).

Of the total number of *Anastrepha* fruit flies caught, 1,216 were females and 713 were males, a male:female ratio of 1:1.7. These results confirm previous reports indicating that McPhail traps baited with a proteinaceous feeding attractant capture more *Anastrepha* females than males (Lopez & Hernandez-Becerril 1967, Houston 1981, Malo 1992). For both species, the greatest captures of females occurred at 1600 hours, whereas for males it took place at 1400 hours. However, the number of males and females captured per trap did not differ significantly (Table 1). McPhail (1937) found similar diurnal patterns for males and females of *A. ludens*, although more males than females were caught in this case. These differences between sexes in number caught may be the result of different volatiles produced by sugar fermentation and protein baits (Malo 1992).

Finally, in spite of the disadvantages of the McPhail traps in terms of fragility, bulkiness, and need of water (Liedo 1983), these traps can be used to capture a great diversity of *Anastrepha* fruit flies. From these results, it is clear that tests with McPhail traps can be performed between 1000 and 1800 hours, disregarding the nocturnal period. Better knowledge of the biology and behavior of fruit flies, as well as their preferences to different baits used, should permit the design of an improved trap system for management of fruit flies.

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SUMMARY

McPhail trap capture of *Anastrepha* fruit flies in relation to time of day was studied. Six species were caught, with *Anastrepha obliqua* and *Anastrepha ludens* being the predominant species. The first capture was obtained at 0800 hours and catches increased throughout the day up to a maximum between 1400 and 1600 hours. More females than males of both species were captured.

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TABLE 1. MEAN NUMBER (±S.E.) OF FLIES CAPTURED PER TRAP OF ANASTREPHA OBLIQUA AND ANASTREPHA LUDENS IN RELATION TO TIME OF DAY IN MAZAPA DE MADERO, CHIAPAS, MEXICO.

Time of Day	Anastrepha obliqua ¹				Anastrepha ludens ¹				T °C	R. h. %	Wind Velocity m/sec
	Total ²	Males	Females	Total ²	Males	Females	Males	Females			
06:00	0.00 ± 0.00b	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00c	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	*3	*3	*3
08:00	0.02 ± 0.01b	0.00 ± 0.00	0.02 ± 0.01	0.02 ± 0.01c	0.00 ± 0.00	0.02 ± 0.01	0.00 ± 0.00	0.02 ± 0.01	21	82	0.03
10:00	0.83 ± 0.28ab	0.18 ± 0.05	0.64 ± 0.24	0.75 ± 0.23bc	0.35 ± 0.12	0.40 ± 0.12	0.35 ± 0.12	0.40 ± 0.12	25	70	0.43
12:00	1.96 ± 0.71ab	0.49 ± 0.15	1.46 ± 0.58	1.57 ± 0.52abc	0.68 ± 0.26	0.80 ± 0.29	0.68 ± 0.26	0.80 ± 0.29	28	65	0.56
14:00	3.38 ± 1.05a	1.41 ± 0.50	1.96 ± 0.59	2.37 ± 0.53a	1.08 ± 0.25	1.28 ± 0.30	1.08 ± 0.25	1.28 ± 0.30	29	64	0.78
16:00	3.65 ± 1.24a	1.22 ± 0.45	2.42 ± 0.84	2.19 ± 0.52ab	0.84 ± 0.20	1.35 ± 0.36	0.84 ± 0.20	1.35 ± 0.36	27	69	0.43
18:00	1.43 ± 0.64ab	0.46 ± 0.22	0.96 ± 0.42	1.06 ± 0.25abc	0.35 ± 0.10	0.70 ± 0.15	0.35 ± 0.10	0.70 ± 0.15	24	79	0

¹ Student t test unpaired with two tails. (p > 0.05) showed no significant differences between males and females.

²Means in the same column followed by the same letter are not significantly different at the 5% level based on Tukey's test with ANOVA.

³These values were not obtained.

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