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Effect of the Payment-In-Kind (PIK) Program on the Psorophora columbiae Mosquito Population of a Northeast Arkansas Ricefield Community

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HEDRICK, R. M. 1955. A trypanosome from the big brown bat, *Eptesicus fuscus fuscus* (Beavois), in Minnesota. J. Parasitol. 41:629-624.

HERBERT, W. J., and W. H. R. LUMSDEN. 1976. *Trypanosoma brucei:* A rapid "matching" method for estimating the host's parasitemia. Exp. Parasitol. 40:427-431.

KOFOID, C. A., and B. G. WHITAKER. 1936. Natural infection of American human trypanosomiasis in two cone-nosed bugs, *Triatoma protracta* and *Triatoma uhleri* Neiva, in the Western United States. J. Parasitol. 22:259-263.

McKEEVER, S., G. W. GORMAN, and L. NORMAN. 1958. Occurrence of a *Trypanosoma cruzi*-like organism in some mammals from Southwestern Georgia and Northwestern Florida. J. Parasitol. 44:583-587.

MEURER, R. D. 1980. A study of *Trypanosoma cruzi* and its apparent absence in Northeast Arkansas. Unpubl. M.S. Thesis, Arkansas State Univ., State Univ., AR. 27 p.

OLSEN, P. F., J. P. SHOEMAKE, H. F. TURNER, and K. L. HAYS. 1964. Incidence of *Trypanosoma cruzi* (Chagas) in wild vectors and reservoirs in East Central Alabama. J. Parasitol. 50:599-603.

PACKCHANIAN, A. 1941. Reservoir hosts of Chagas' disease in the state of Texas. J. Parasit. Suppl. 27:30.

TOBIE, E. J., T. von BRAND, and B. MEHLMAN. 1950. Cultural and physiological observations on *Trypanosoma rhodesiense Trypanesoma gambiense*. J. Parasitol. 36:48-54.

TROMBA, F. G. 1951. *Trypanosoma vespertilionis* and *Litomosoides* sp. in *Eptesicus fuscus fuscus*. J. Parasit. 37:324.

WALTON, B. C., P. M. BAUMAN, L. S. DIAMOND, and C. M. HERMAN. 1956. *Trypanosoma cruzi* in raccoons from Maryland. J. Parasit. 42:20.

WORLD HEALTH ORGANIZATION. 1960. Chagas' disease. Report of study group. Technical Report Series No. 202, Geneva.

YEAGER, R. G., and A. D. BACIGALUPO. 1960. Further studies on *Trypanosoma cruzi* in Louisiana. J. Parasitol. 46:7.

YEAGER, R. 1971. Transmission of *Trypanosoma cruzi* infection to opossums via the oral route. J. Parasit. 57:1375-1376.

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EFFECT OF THE PAYMENT-IN-KIND (PIK) PROGRAM ON THE *PSOROPHORA COLUMBIAE* MOSQUITO POPULATION OF A NORTHEAST ARKANSAS RICEFIELD COMMUNITY

Since 1904, when rice was initially cultivated as a commercial crop within the state, Arkansas has developed into one of the five major rice-producing states in the U.S. with an annual production of ca. 6,000,000 ha (Meisch, et al., 1982). Although some rice is grown in central and southwestern counties, the majority of the crop is planted in the eastern half of the state, particularly in the "Grand Prairie" area of east-central Arkansas which includes Arkansas, Lonoke, Monroe, and Prairie counties.

It has been well established by a number of investigators in Arkansas, and in other rice-growing states, that the rice agroecosystem provides suitable breeding sites for several mosquito species including the dark ricefield mosquito, *Psorophora columbiae* (Dyar and Knab). In Arkansas, Schwardt (1939), Horsfall (1942), Whitehead (1951), Meisch and Coombes (1975), and Olson and Huggins (1983), among others, all have reported *P. columbiae* to be the dominant mosquito species wherever rice is cultivated. Whitehead (1951), in particular, noted that ricefield mosquito numbers have increased in direct proportion to the state's increased rice acreage.

In Craighead County in NE Arkansas, land devoted to rice production in 1981 and 1982 was 33,590 and 33,376 ha, respectively (Olson and Huggins, 1983). Light trap studies conducted in Jonesboro by these investigators indicated that, of 34,041 adult mosquitoes captured between 30 May and 2 October of 1981, 21,085 (61.9%) were *P. columbiae*. During the same period in 1982, *P. columbiae* numbered 24,675 (72.3%) of the 34,114 mosquitoes trapped.

In 1983, a federally funded payment-in-kind (PIK) program was implemented in an attempt to reduce national agricultural surpluses and to improve market prices by paying growers to keep land out of commercial crop production. As a result, American farmers idled some 31,000,000 ha including significant rice acreage in NE Arkansas. Under the PIK program, the amount of Craighead-County rice land was lowered by 39.0% to 20,350 ha (Fagala, Craighead Co. Extension Service, pers. comm.).

The primary aim of this study was to evaluate the effect which this acreage reduction had upon the relative abundance of *P. columbiae* in Jonesboro. To accomplish this objective, a standard New Jersey light trap was placed at each of four locations within the city limits. Sampling dates and trap locations (two peripheral and two central) were identical to those described by Olson and Huggins (1983). Light trap catches were collected daily and adult mosquitoes sorted and identified. Daily trap totals were summed for each week of the 18-week study period and compared with data obtained in 1981 and 1982.

It should be noted that, as in 1981 and 1982, all traps were in areas subjected to periodic applications of a mosquito adulticide by ground-operated ULV cold-aerosol generators. This undoubtedly lowered the total number of mosquitoes collected, particularly in the central-city area which was further from rice fields which served as the main source of *P. columbiae* reinfestation.

A total of 18,232 adult mosquitoes was captured between 30 May and 2 October of 1983, with the PIK program in effect. This represented an overall decrease in the general mosquito population of 46.5% in comparison with 1981 and 1982 pre-PIK totals reported by Olson and Huggins (1983). As anticipated, *P. columbiae,* with 13,394 trapped individuals, was the dominant species and it comprised 73.5% of the season's catch. Other genera contributing to the remainder of the total were *Anopheles* (16.0%), *Aedes* (6.5%), *Culex* (4.0%), and *Culiseta* (less than 0.1%). It was observed that the 39.0% decrease in Craighead-County rice acreage in 1983 was accompanied by a 43.4% reduction in the *P. columbiae* population trapped within the Jonesboro city limits. This was believed to have been a direct result of the lessening of available breeding sites normally

General Notes

provided by waters associated with rice cultivation.

Figure 1 clearly illustrates the relatively depressed *P. columbiae* population level throughout most of the 1983 season. It also can be observed that the 1983 ricefield-mosquito population peak occurred somewhat later than in each of the two preceding years. Rainy conditions and cool early-season temperatures which delayed rice planting in many fields, especially in 1983, were thought to have been the primary reasons for this occurrence.

Horsfall (1942) reported that although *P. columbiae* normally exhibits two periods of maximum abundance during the summer in Arkansas, these peaks may be affected by the timing of rice planting dates. A short planting interval usually results in two distinct peaks of abundance because adults emerging after the initial flood will have largely disappeared before the second peak occurs following normal mid-season drainage and reflooding. Whenever planting extends over several weeks, as in 1983, the two separate peaks of abundance tend to overlap or be somewhat obscured. This occurs because adults produced by early-planted fields, that have been reflooded following cultural drainage, will be emerging at the same time as those coming from the initial flooding of late-planted fields. In Figure 1, it can be noted that the magnitude of difference in the two 1983 population peaks was considerably less than in either 1982 or 1981. This reduction may well have been the result of the weather-related spread of the 1983 planting dates. As expected, the abrupt decline in ricefield mosquito numbers in late August of 1983 correspond closely with late-season drainage of area rice fields.

A more detailed comparison of the number of *P. columbiae* adults collected in the two peripheral and the two centrally-located traps is presented in Table 1. Despite a reduced ricefield-mosquito population in 1983, the peripheral traps, which were within 0.9 km of several nearby rice fields, accounted for over 90.0% of the total catch while the central traps, which were situated in excess of 1.2 km from the nearest rice, caught only 9.8% of the *P. columbiae* adults. This was generally consistent with 1981 and 1982 observations made by Olson and Huggins (1983) and may further substantiate the reported short flight range for this species.

In summary, our data support the conclusion that a significant decrease in cultivated rice acreage in Craighead County resulted in a corresponding reduction in the number of *P. columbiae* adults within the Jonesboro city limits. The timing of the increase and the decline of the ricefield mosquito population was closely associated with area rice-cultivation practices. The capture of more than 90.0% of all *P. columbiae* adults within 0.9 km of rice fields was in agreement with the reported short flight range for this species.

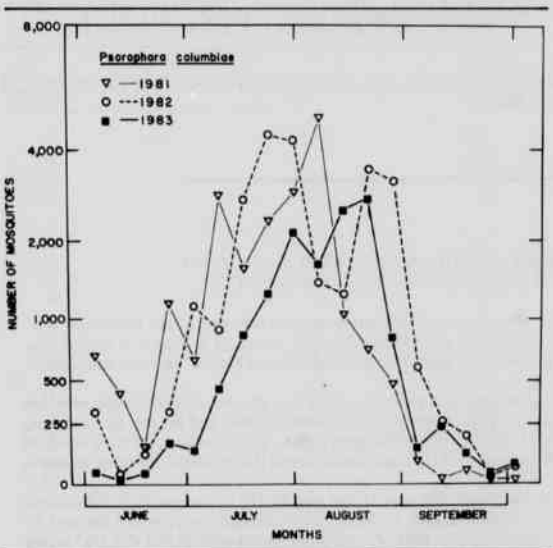

Figure 1. Comparison of weekly totals of adult *Psorophora columbiae* trapped at 4 locations in Jonesboro, Arkansas in 1981, 1982, and 1983.

Table 1. Comparison of numbers of adult *Psorophora columbiae* trapped at 2 peripheral and 2 central locations in Jonesboro, Arkansas in 1981, 1982, and 1983.

	PERIPHERAL TRAPS	N	%	CENTRAL TRAPS	N	%	ANNUAL TOTALS N	%
1981	AIRPORT	15,031	71.3	ASU	531	2.5		
	RACE ST.	5,171	24.5	CULBERHOUSE ST.	352	1.7		
		20,202	95.8		883	4.2	21,085	100.0
1982	AIRPORT	11,599	47.0	ASU	619	2.5		
	RACE ST.	11,996	48.6	CULBERHOUSE ST.	461	1.9		
		23,595	95.6		1,080	4.4	24,675	100.0
1983	AIRPORT	6,622	49.4	ASU	594	4.4		
	RACE ST.	5,461	40.8	CULBERHOUSE ST.	717	5.4		
		12,083	90.2		1,311	9.8	13,394	100.0

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LITERATURE CITED

HORSFALL, W. R. 1942. Biology and control of mosquitoes in the rice area. Ark. Agr. Expt. Sta. Bul. 427. 46 pp.

MEISCH, M. V., A. L. ANDERSON, R. L. WATSON, and L. OLSON. 1982. Mosquito species inhabiting ricefields in five rice growing regions of Arkansas. Mosq. News. 42(3):341-346.

MEISCH, M. V., and L. E. COOMBES. 1975. A pilot abatement district in the rice growing areas of Arkansas. Proc. N. J. Mosq. Exterm. Assoc. 62:190-195.

OLSON, L. A., and J. A. HUGGINS. 1983. Abundance and seasonal occurrence of *Psorophora columbiae* (Diptera: Culicidae) in a northeast Arkansas ricefield community. Proc. Ark. Acad. Sci. 37:58-61.

SCHWARDT, H. H. 1939. Biologies of Arkansas ricefield mosquitoes. Ark. Agr. Expt. Sta. Bul. 377. 22 pp.

WHITEHEAD, F. E. 1951. Rice field mosquito control by pellet-borne insecticides. Ark. Agr. Expt. Sta. Bul. 511. 30 pp.

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