AGE STRUCTURE OF SOME MOSQUITO POPULATIONS IN A SAVANNA AREA IN SURINAM

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ABSTRACT. From the beginning of January till the end of September 1973 weekly collections of adult mosquitoes were made near Powaka, an Amerindian village, located in the savanna belt of northern Surinam. Three mosquito species were abundant enough to permit regular determinations of the age structure of the populations. Some 5,500 specimens were dissected, 1,354 of *Culex spissipes*, 1,099 of *C. mollis* and 3,037 of *C. portesi*. *C. portesi* constituted a serious threat to the health of man throughout the year, whereas *C. spissipes* was especially dangerous during July and August.

INTRODUCTION

Detinova (1968) has pointed out the great importance of establishing the age composition of certain insect populations from the standpoint of epidemiology and the appraisal of control measures. Data on parity also have an additional value. If the times of occurrence of high parous-rates in a population can be predicted, samples for virus isolation attempts can be restricted to those periods, thereby increasing efficiency (Morris and De Foliart, 1971). Irreversible physiological changes in female mosquitoes that occur during subsequent gonotrophic cycles have been fully explained by Detinova (1962).

MATERIALS AND METHODS

THE STUDY AREA. From the beginning of January till the end of September 1973 weekly collections of adult mosquitoes were made at Powaka, an Amerindian village situated 40 km south of Paramaribo in the savanna belt and surrounded by open and scrub savannas, forest and culture plots. The Surinam Forest Department owns a *Pinus* plantation in the neighborhood. The catching station, which was situated in the forest approximately 3 km north of the village, just before the *Pinus* plantation, could only be reached by a jeep trail. The forest surrounding Powaka can be classified as high xerophytic (savanna) forest, which alternates with marsh forest. Physiognomically the savanna forest is in its best developed form a forest with a continuous canopy layer at 10–18 m, consisting of a remarkably large number of thin trees, overtopped by a few bigger ones. The ground flora consists of herbs and small ferns; lianas and epiphytes are not numerous (Lindeman, 1953). A more detailed description of this study area is found elsewhere (Panday, 1974).

TRAPPING METHOD. For collecting adult mosquitoes the CDC miniature battery-operated light trap was used (Sudia and Chamberlain, 1962).

AGE DETERMINATION. Mosquitoes were transported alive from the field in collapsible bags placed in an ice-box to retard further aging. Dissections could be accurately performed only on freshly killed specimens. Refrigeration was effective for approximately 24 hr, after which time deterioration of the tissues occurred, making dissection almost impossible. The captured mosquitoes were first identified and separated according to species. A representative sample (about 100 females) of each species, which occurred in large enough numbers, was dissected weekly in a drop of distilled water. The ovaries were carefully transferred to a separate drop of distilled water, where they dried out, after which time the parousrate was determined (Detinova, 1962). This method cannot be applied when the mosquitoes have ovaries in the 3rd Christophers' stage or beyond. Nearly all mosquitoes in our catches were in the 1st to 2nd Christophers' stage of the ovarian cycle; less than 1% had ovaries in the 3rd stage or beyond and these were excluded from examination.

RESULTS AND DISCUSSION

Culex spissipes (Table 1). *Culex spissipes* is a rainpool breeder. As the first months of 1973 were very dry, no rainpools were available at Powaka and the numbers of this species were low. After the rains set in, the numbers built up and regular dissections of representative samples became possible. In the beginning the parousrate was low, owing to the emergence of the first new generations, but gradually the parousrate increased till an equilibrium was reached about July 17. If we assume that in the humid tropics the gonotrophic cycles of a single species are of equal length, the homogeneous composition of females is determined by the almost constant and uniform replenishment of the population by newly emerged females. After July 17 the parousrate was fairly constant, the mean parousrate being 0.75. Three important factors affect the capacity of a species as a vector of pathogenic organisms. These are high parousrate, abundance, and anthropophily. *C. spissipes* fulfills all three of these requirements, so we may conclude that especially during July and August *C. spissipes* constituted a danger to the health of man.

Table 1. Parousrates of *Culex spissipes*.

Date	Number of specimens dissected	Parousrate
May 24	92	0.23
May 30	82	0.12
June 8	75	0.20
June 16	55	0.38
June 23	86	0.55
June 29	62	0.66
July 11	89	0.70
July 17	102	0.70
July 24	98	0.87
July 31	106	0.76
Aug. 7	99	0.75
Aug. 15	91	0.87
Aug. 21	38	0.53
Aug. 28	105	0.80
Sept. 4	107	0.85
Sept. 11	31	0.65
Sept. 18	27*	0.67
Sept. 25	19*	0.84

* The figures marked with an asterisk are too low to permit valid determinations of parousrate.

Culex mollis (Table 2). The larvae of *Culex mollis* were found in temporary rainpools and spathes of *Euterpe oleracea* (pinapalm). As the first months of 1973 were very dry, no rainpools were available and the numbers of *C. mollis* were low.

Table 2. Parousrates of *Culex mollis.*

Date	Number of specimens dissected	Parousrate
May 25	43	0.07
May 30	28*	0.14
June 8	106	0.13
June 16	42	0.19
June 23	100	0.12
June 29	18*	0.33
July 11	95	0.23
July 17	83	0.36
July 24	91	0.34
July 31	103	0.19
Aug. 7	92	0.26
Aug. 14	96	0.27
Aug. 20	22*	0.27
Aug. 28	62	0.23
Sept. 4	68	0.44
Sept. 11	21*	0.19
Sept. 18	17*	0.41
Sept. 25	12*	0.33

* The figures marked with an asterisk are too low to permit valid determinations of parousrate.

After the rains set in, the numbers of this species built up and regular dissections of representative samples became possible. In the beginning the parousrate was very low, owing to the emergence of the first new generations, but gradually the parousrate increased. After June 29, till the end of the study period, the parousrate fluctuated between 0.19 and 0.44. As *C. mollis* occurred in fairly high numbers during most of this period, and as De Kruyf (1970, 1972) caught this mosquito (which he probably erroneously named *C. virgultus*) in considerable numbers on human bait, with peaks at 1900 and 2300 o'clock, it is very well possible that this population constituted a threat to the health of man.

Culex portesi (Table 3). Takahashi (1968) reported that most larvae of this species were found in semipermanent groundpools. This means that rainfall will not strongly interfere with oviposition. *C. portesi* was found in considerable numbers throughout the year. The parousrate was fairly constant over long periods, the mean parousrate being 0.71. There were, however, some short interruptions: January 4 till January 23, the mean parousrate being 0.53, May 30 till June 16, the mean

Table 3. Parousrates of *Culex portesi.*

Date	Number of specimens dissected	Parousrate	Mean parousrate
Jan. 4	37	0.53	
Jan. 9	82	0.50	0.53
Jan. 16	38	0.58	
Jan. 23	83	0.51	
Jan. 30	107	0.81	
Febr. 10	94	0.76	
Febr. 20	112	0.65	
Febr. 27	95	0.67	
March 6	43	0.81	
March 13	41	0.66	
March 21	97	0.78	
March 27	116	0.70	0.71
Apr. 3	92	0.84	
Apr. 10	101	0.75	
Apr. 17	98	0.34	
Apr. 28	96	0.76	
May 11	100	0.61	
May 24	94	0.77	
May 30	95	0.40	
June 8	92	0.51	0.48
June 16	97	0.54	
June 22	93	0.72	
June 29	54	0.81	
July 10	97	0.78	
July 17	45	0.78	0.71
July 24	66	0.73	
July 31	105	0.66	
Aug. 7	95	0.54	
Aug. 14	93	0.82	
Aug. 20	46	0.63	
Aug. 28	101	0.59	0.71
Sept. 4	71	0.79	
Sept. 11	88	0.43	
Sept. 18	88	0.41	0.45
Sept. 25	90	0.51	
Nov. 23	95	0.72	

parousrate being 0.48, and September 11 till September 25, the mean parousrate being 0.45. The nature of these interruptions is still not clear. In general *C. portesi* has a high parousrate. There are long periods of very high parousrate (p= 0.71). This species is abundant in Powaka, bites readily on humans and is active during the night, with peaks at sunset and sunrise (De Kruyf, 1970). Therefore this species has an extremely high potential as a vector of pathogenic organisms. This agrees with the fact that many arboviruses were isolated from this mosquito in Trinidad, French Guyana and Surinam (Aitken et al., 1969; Sérié, 1971; De Haas and De Kruyf, 1971).

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