STUDIES OF THE MALARIA PROBLEM IN PORTO RICO

PAPER VII

SUGAR CANE

The cultivation of this plant has been so widely extended about the coast of Porto Rico that there are few areas in which malaria is a problem in which at least part of the area is not planted to cane. On the other hand it is difficult to definitely determine the relative importance of the cultivation of cane for there are only few areas in which swamp lands, seepage areas, and rain water collections are not also quite prominent.

Detailed consideration on the influence of cultivation on anopheline mosquito production can probably best be taken up with a discussion of—

SEASONAL CHANGES IN INTENSITY OF BREEDING OF ANOPHELES ALBIMANUS

In the greater portion of the coastal plain in Porto Rico and especially in areas like Barceloneta there is no time of the year in which water deposits are not present, nor is there any season in which full grown larvae and adult mosquitoes cannot be found. There are not many studies, however, which show whether the breeding is more widespread and abundant at certain seasons than at others.

In the middle of May 1924, ninety-six stations, representing all types of water deposits widely distributed, were selected and collections of larvae made weekly by trained inspectors. All larvae for each station were brought to the office, identified by use of microscope, and counted. These studies were continued until the first of May, 1925. Records were interrupted for short periods due to the numerous official holidays and to the fact the inspectors at times were sick or the river so high that it could not be crossed. Except for certain short holiday periods, however, observations were made in a large percentage of stations every week and in most stations as a rule. Because of the fact that the total number of stations visited each week varied in certain months quite considerably, the larvae record is presented as average catches per station by weekly intervals and by monthly intervals. The latter interval was not

exactly the calendar month but every third 4-weekly interval, an extra week averaged in so that in general the so-called monthly averages correspond to those for calendar months.

SEASON OF MAXIMUM AND MINIMUM BREEDING

It will be seen from Table XIII that there was a slight rise in catches in June, but that beginning with September the average catches increased steadily to a maximum weekly average at the end of October or first of November. The average catches were highest for the months of November, however, whence they dropped off rapidly through December, January, February to March when they were lowest. In April a rise was again to be noted. It would seem, therefore, that the period of maximum breeding of albimanus was from the middle of October to the end of November.

TABLE XIII

ALBIMANUS LARVA CATCHES BY THE WEEK AND MONTH

Month	Weekly catches				Monthly catches		
	Week	Stations visited	Total larvæ	Lar. per station	Stations visited	Total larvæ	Lar. per station
May	2	63	1161	18.4			
	3	59	836	14.2			
	4	46	685	14.9	168	2682	16.0
June	1	55	894	16.2			
	2	58	1299	22.4			
	3	49	805	16.4			
	4	44	890	20.2			
	5	39	1114	28.6	245	5002	20.4
July	1	69	622	9.0			
	2	64	925	14.4			
	3	65	1355	20.8			
	4	61	1259	20.6	259	4161	16.0
August	1	69	1004	14.6			
	2	78	1344	18.4			
	3	75	1089	14.5			
	4	75	1524	20.3	292	4961	17.0
September	1	73	1650	22.6			
	2	68	1292	19.0			
	3	80	2165	27.1			
	4	76	1654	21.8	297	6761	22.7
October	1	79	1607	20.3			
	2	86	1371	16.0			
	3	78	2357	30.0			
	4	78	2257	29.0			
	5	52	3125	60.0	373	10717	28.6
November	1	26	958	36.8			
	2	64	2048	32.0			
	3	50	1860	37.2			
	4	61	2840	46.5	201	7706	38.4
December	1	86	1952	22.7			
	2	93	2309	24.8			
	3	90	1970	22.0			
	4	47	797	16.7			
	5	71	1422	20.0	387	8450	21.8

Month	Weekly catches				Monthly catches		
	Week	Stations visited	Total larvæ	Stations visited	Total larvæ	Lar. per Station	Lar. per Station
January	1	65	893	13.7			
	2	76	1364	17.9			
	3	91	1774	19.5			
	4	86	1370	16.0	318	5401	17.0
February	1	77	915	11.9			
	2	71	1235	17.4			
	3	70	1235	17.6			
	4	53	823	15.5	271	4208	15.6
March	1	79	777	9.8			
	2	81	1104	13.6			
	3	71	959	13.5			
	4	60	906	15.1			
	5	78	904	11.6	369	4650	12.6
April	1	65	1135	17.5			
	2	60	1470	24.5			
	3	93	1368	14.7			
	4	76	1696	22.3	294	5669	19.3

Whether the slight rise in June is of any significance is not definitely known. Practically every week some stations were found without larvæ. Two other tables are of interest in this connection. In one (Table XIV) is shown the monthly average number of times that breeding was encountered in all stations examined. It will be seen that the highest percentage of stations were found with breeding in October, November and December, the highest in November. Numerous water deposits, especially small ponds and surface wells, which had not had larvæ at other seasons were found breeding during these months.

TABLE XIV

RELATION BETWEEN TOTAL VISITS OF LARVA STATIONS AND VISITS AT WHICH LARVAE WERE FOUND

Month	Visits to stations						
	Total	Yielding larvæ			Per cent with larvæ		
		alb.	grab.	vest.	alb.	grab.	vest.
May	170	133	24	.....	78	14	.....
June	267	175	32	.....	66	12	.....
July	270	178	27	.....	66	10	.....
August	292	191	23	.....	65	8	.....
September	303	210	22	.....	70	7	.....
October	378	308	36	3	81	9	1
November	214	194	56	14	90	26	7
December	395	346	182	79	88	46	20
January	330	244	187	57	74	57	17
February	280	203	149	25	73	53	9
March	372	245	145	18	66	39	5
April	294	228	92	18	78	31	6

The other table (Table XV) shows the per cent of stations found with medium and heavy breeding according to inspectors' estimates. It will be noted that there are two high points, one in May when work started and the other in November. Thus was it found not only that more places were found breeding in months of October and November but there were more stations breeding heavily than at any other time. This agrees with data already presented. Beginning with April, 1925 there is again evidence of increased production of albimanus.

In the stations found breeding, the presence of full-grown larvæ were noted almost as frequently in the period June to August as from September to November.

TABLE XV

EXTENT OF ANOPHELINE BREEDING ACCORDING TO INSPECTOR'S ESTIMATE

Month	Visits to stations					Per cent of visits				
	Without larvæ	With larvæ				Without larvæ	With larvæ			
		light	medium	heavy	Total		light	medium	heavy	medium heavy
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
May	37	83	31	19	170	22	49	18	11	29
June	92	124	41	10	267	34	46	15	5	20
July	92	153	22	3	270	34	57	8	1	9
August	101	152	28	11	292	35	52	9	4	13
September	93	167	24	19	303	30	55	8	7	15
October	70	210	77	21	378	19	55	20	6	26
November	22	131	57	4	214	10	61	27	2	29
December	49	287	53	6	395	12	73	13	1	15
January	86	200	40	4	330	26	60	13	1	14
February	77	177	23	3	280	27	63	9	1	10
March	127	215	25	5	372	34	58	7	1	8
April	66	207	14	7	294	22	70	5	2	7

NOTE: After November, grabhamii and vestitipennis were present in sufficient numbers to influence estimate of extent of breeding so that after that month the figures in the last column do not apply to albimanus only. Before that time (and for all months in columns 1, 2, 6, 7) the figures apply only to albimanus.