TABLE 2

Monthly Malaria Attendance at Hospitals and Dispensaries for the years 1937-1950.

Year	Population (calculated)	JANUARY		FEBRUARY		MARCH		APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER		OCTOBER		NOVEMBER		DECEMBER		Total for year	
		Attend-ance	Rate	Attend-ance	Rate	Attend-ance	Rate	Attend-ance	Rate	Attend-ance	Rate	Attend-ance	Rate	Attend-ance	Rate	Attend-ance	Rate	Attend-ance	Rate	Attend-ance	Rate	Attend-ance	Rate	Attend-ance	Rate	Attend-ance	Rate
1937	575331	21354	37	18720	33	20867	36	18746	33	17412	30	19790	34	18296	32	16274	28	16829	29	12920	22	13851	24	17674	31	212733	370
1938	576811	23311	40	22163	38	26524	46	22320	39	20802	36	17392	30	14247	25	13157	23	13983	24	15733	27	15564	27	16847	29	222033	385
1939	578291	24914	43	23176	41	26320	46	55483	96	124620	215	124993	216	71955	124	43921	76	27671	48	26075	45	23606	41	25380	44	598114	1033
1940	579771	22244	38	17819	31	18630	32	20709	36	45628	75	71879	124	52159	90	34055	59	22507	39	20968	36	17126	30	17716	31	361440	624
1941	581251	17134	29	13999	24	14053	24	15056	26	17055	29	17758	31	20829	36	17480	30	14326	25	15123	26	14595	25	18134	31	195542	336
1942	582731	19913	34	12833	22	14844	25	15177	26	17103	29	18085	31	15468	26	11201	19	9659	17	9438	16	10747	18	12205	21	166673	286
1943	584211	13118	22	11696	20	15078	26	33204	57	48825	84	49909	85	31124	53	15831	27	10998	19	8995	15	12844	22	14040	24	265662	455
1944	585691	11663	20	16723	29	10866	19	9003	15	12390	21	11572	20	11732	20	8402	14	6668	11	8373	14	10210	17	19138	33	136740	233
1945	587171	22217	35	16384	28	16695	28	29357	50	34464	59	37815	64	53885	92	57865	98	33992	58	34736	59	47165	80	126426	215	511001	870
1946	588651	98003	166	57119	97	47495	81	40588	69	52921	90	46058	78	34067	58	28053	48	19140	32	19048	32	18441	30	22847	39	483780	822
1947	590131	19826	34	17477	30	15994	27	11691	20	13765	23	11699	20	13522	23	10063	17	8851	15	8585	15	8655	15	8442	14	148570	252
1948	591611	8281	14	7229	12	7467	13	7734	13	10711	18	7884	13	7062	12	5735	10	4414	8	4247	7	4455	8	4174	7	79393	134
1949	593091	4546	8	4429	7	4273	7	4102	7	4049	7	4212	7	6391	11	3694	6	761	6	3444	6	4001	7	4060	7	50962	86
1950	594571	3456	6	3701	7	3832	7	4344	8	3981	7	4576	8	5908	11	4428	8	[illegible]0	5	2437	4	4576	8	3274	6	47133	85

Rate = Malaria attendance per thousand population.

of each revenue division in the basin has similarly been calculated. Graph 1, shows the combined monthly morbidity rate for all hospitals, rural hospitals, and dispensaries and the average monthly rainfall figures, calculated for all meteorological stations in the Maha Oya Basin for the years 1937-50 (Table 1).

(*a*) **Seasonal Malaria.** There are two fever seasons. The first follows the inter-monsoonal rains which end the dry period of late January, February and early March. The fever index begins to rise in April and generally keeps on rising until June, and thereafter begins to decline. The second fever season follows the inter-monsoonal rains of October, which break the dry spell of August and September. Here the morbidity curve begins to rise in November and reaches its peak in January and declines thereafter.

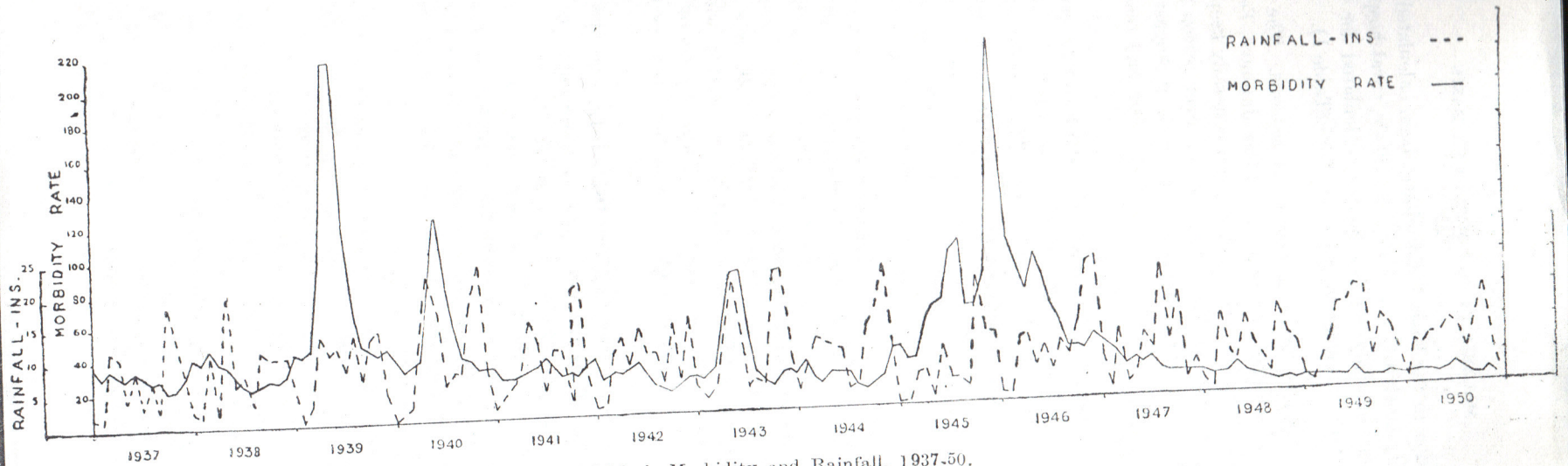
In Graph 1, the first seasonal or spring rise of malaria can be seen for 1937, 1938, 1941 (peak reached in July), and 1942. The second seasonal or autumnal rise is evident in 1937, 1938, 1941, 1942, 1943 and 1944. The correlation with rainfall is fairly close ; but monthly rainfall figures tend to be misleading, particularly in dry months. Here one heavy burst of rain on a single day may double the month's average rainfall. Weekly malaria attendance and rainfall for the period under review would have resulted in such a formidable graph that it had to be excluded.

(*b*) **Epidemic Malaria.** Epidemics of malaria every few years have long been known in the Maha Oya Basin. From Briercliffe (loc. cit.), one gathers that prior to 1900 such epidemics occurred in 1877, 1880, 1884, 1887, 1891, 1892 (?), 1894 and 1895 (?). In each of these years the Negombo District is specifically mentioned as having been involved in the epidemic. Only in 1892 and 1895 does he mention the Western Province as having been affected, so that it is not certain whether the Maha Oya Basin was also involved. Thus excluding the doubtful years or 1892 and 1895, epidemics have occurred, involving part or whole of the basin, every three years (thrice) or four years (twice).

After 1900, epidemics have occurred in 1906, 1911, 1919, 1923, 1928-29, 1934-35, 1939-40, 1943 and 1945-46. Thus the first wave of these epidemics has occurred every two years (once), four years (twice), five years (twice) and six years (once). The gap of eight years between the malaria epidemics of 1911 and the influenza pandemic in 1919, was bridged by a severe epidemic in 1914 in the Eastern Province and Uva. Whether the Maha Oya Basin was also involved is not quite certain. Gill (loc. cit.) believes that during the influenza epidemic of 1919 there was also a malaria epidemic in January and February.

Of all these epidemics none was so unexpected nor so disastrous in its effect as the epidemic of 1934-35. This has been so fully reported that it is not proposed to discuss it any further here. The various steps taken to deal with future epidemics by organising malaria control measures in rural areas have already been described (Rajendram and Jayewickreme, loc. cit.). Thus when the spring epidemic of 1939 occurred, an organisation was available for the first time to deal with such an outbreak in rural areas. But it must be emphasized that the organisation was not fully equipped and was yet short of trained personnel. It was only at the end of 1939 that the Malaria Field Training Centre was set up at Kurunegala, while the entomological measures for forecasting epidemics were put into effect only after the first

GRAPH 1



Malaria Morbidity and Rainfall, 1937-50.

wave of the epidemic was over. These measures were entirely directed towards the detection of the larva of *A. culicifacies* in rivers and streams in all parts of the Intermediate and Wet Zones, at ' detector stations ' called Subsidiary Observation Sites. These sites along rivers were mainly examined by Sanitary Inspectors once a fortnight. These examinations were to prove in future years of the utmost importance in the control of malaria in Ceylon. No sooner was the vector reported breeding at any of these sites oiling of all streams within a three-mile radius was undertaken. If a number of contiguous sites were involved and the situation was deemed dangerous a whole area was put under oil, until conditions improved. In this way later epidemics were undoubtedly minimised, although never completely controlled.

1. *The Epidemic of* 1939-40.—Rustomjee (1944) has described briefly the epidemics of 1939 and 1943 as they affected the whole of the Intermediate and Wet Zones. As such these accounts deal with the Maha Oya Basin only in a general way.

In 1938 the south-west monsoon had been considerably below average, the rainfall in September alone being above average (Table 1). The inter-monsoonal rains of October were over 10 inches short of the average and the north-east monsoon which followed was also a failure. In every month except January, when there was a slight excess, a deficit was recorded for the period November 1938 to March 1939. In spite of the slight excess recorded in January 1939, the period January to March was one of acute drought and great distress, and the pooling in all rivers and streams was resulting in a very high incidence of *A. culicifacies*. (The entomological data will be discussed in a later section).

The oiling of rivers was begun on March 1st, 1939, but the organisation was not capable of dealing with the epidemic that followed, which, though not so severe in its effect as the 1934-35 epidemic, was more extensive in its distribution. It is also obvious now that the oiling was begun too late, but this was probably due to factors such as lack of spraying equipment, storage drums, and trained personnel in sufficient numbers to deal with the vast area involved. The drought was so severe throughout the island that for the first time Colombo's water supply had to be cut off for several hours a day as the reservoir, Labugama, situated in a very wet area with a rainfall of about 150 inches a year, had sunk to an unprecedentedly low level.

Towards the end of March (between the 23rd and 28th) light rain was experienced, and in the first fortnight of April rain fell almost every day. There appears to be a close correlation between the time of onset of epidemics and the normal seasonal rises of malaria. According to Rustomjee (unpublished report), although the autumnal rise of malaria in 1938-39 was not marked in the middle and lower catchments, the numbers attending hospitals and dispensaries were on a moderately high level (600-860 a day), until the attendance began to rise significantly almost everywhere on April 15th, 1939. According to him the malaria incidence was maintained at a high level from the first week of January, 1939. The morbidity rates over the whole basin were 95·9 in April, 215·4 in May and 216·2 in June. In the upper catchment the morbidity rate was over 10 times the normal along the river from Kegalle to Aranayake. Over the rest of the upper catchment it was 6-10 times the normal. In the middle catchment, within the Giriulla-Ambepussa-Mirigama belt, the morbidity rate was 3-5 times in excess. In the lower catchment from Makandura to the coast the rate was 6-10 times the average. Thereafter the epidemic declined

sufficient for a single round of spraying in the Narammala, Pannala, Polgahawela, Kegalle and Rambukkana areas. It was perhaps this round of spraying which stopped the incipient spring rise of malaria in 1946. By 1947 DDT had become available to the Civil authorities, and uninterrupted spraying in the basin was carried out throughout the year, and subsequently in 1948, 1949, and 1950.

After the epidemic of 1945-46 the morbidity rate kept coming down gradually, but at the end of the year there was an autumnal rise with its peak in December 1946. From then on morbidity has steadily declined in the Maha Oya Basin. The fever seasons have scarcely been in evidence, though small peaks can be seen in Graph 1 in 1948 (May), 1949 (July) and 1950 (July and November). The highest of these peaks showed only a rate of 18·1 in May 1948. In years prior to 1946 such a rise would have been considered insignificant, as it would have been well below the normal usually experienced at that time of the year.

The incidence of fever during the period 1948-50 has declined to levels never known before. Thus the annual morbidity rate of 85·0 in 1950 may be compared with that of 1944, a very healthy year, when the rate was 233·4. Or it may be compared with that of 1941, another healthy year, when the rate was 336·3 to show to what a low level malaria incidence has been reduced. On the other hand, in the epidemic years of 1939, 1943 and 1945 the annual morbidity rate recorded in the basin was 1,032·9, 454·7 and 870·2 respectively. Thus in 1948 after a spring epidemic had been averted the morbidity rate fell to only 134·1. And after allowing for errors in clinical diagnosis already referred to, it is quite possible that the dispensary attendances recorded in 1948-50 may not have been due solely to malaria.

The rainfall experienced after the 1945-46 epidemic needs comment. The north-east monsoon of 1946 was well above average. In 1947 the south-west monsoon was not up to average, particularly in May, but there were very heavy and unusual rains experienced on two days in the middle of August, which caused devastating floods in many parts of the island. The October rainfall was above normal, but the north-east monsoon which followed was a failure. Thus conditions were ideal for a spring epidemic in 1948, which, however, did not arise.

SPLEEN AND PARASITE SURVEYS

(*a*) **Spleen Surveys.** In the surveys described in this paper, all degrees of enlargements of spleens have been classed together for the sake of convenience, although at the time the examinations were carried out they were placed in their respective categories. These examinations were carried out at village schools in March and September, and the results are summarised according to revenue divisions in Table 3 (March surveys, 1936-50), and Table 4 (September surveys, 1946-49). The March surveys were carried out without interruption from 1936 to 1941, and after that there was a break due to the war from 1942 to 1946. The surveys were resumed in 1947 and have been carried out ever since. The September surveys were an innovation in 1946, and have also not been interrupted. The months of March and September have been selected as coming just prior to the spring and autumnal fever seasons, when morbidity is generally at its lowest ebb. These months are also just in advance of the spring and autumnal epidemic outbreaks. For purposes of future reference the data in regard to these surveys for all the schools in each health area

TABLE 3

Spleen rates among School Children by revenue divisions—March Surveys, 1936-1950.

Revenue division	1936			1937			1938			1939			1940			1941			1947			1948			1949			1950		
	No. exd.	No. pos.	S.R.	No. exd.	No. pos.	S.R.	No. exd.	No. pos.	S.R.	No. exd.	No. pos.	S.R.	No. exd.	No. pos.	S.R.	No. exd.	No. pos.	S.R.	No. exd.	No. pos.	S.R.	No. exd.	No. pos.	S.R.	No. exd.	No. pos.	S.R.	No. exd.	No. pos.	S.R.
Tumpane	288	254	88·2	413	240	58·1	440	186	42·3	417	93	22·3	399	109	27·3	336	103	30·7	220	48	21·9	244	20	8·2	472	8	1·7	604	4	0·7
Yati Nuwara	111	12	10·8	195	5	2·6	201	7	3·5	242	3	1·2	191	1	0·5	238	1	0·4	329	0	0	451	0	0	223	0	0	241	0	0
Paranakuru Korale	669	384	57·4	739	277	37·5	726	160	22·0	757	70	9·2	772	119	15·4	643	43	6·7	752	18	2·4	1069	14	1·3	1138	8	0·7	1353	15	1·1
Galboda Korale	786	666	84·7	765	393	51·4	626	194	31·0	626	61	9·7	621	92	14·8	625	83	13·3	—	—	—	1697	112	6·6	1824	45	2·4	1793	20	1·1
Kinigoda Korale	807	720	89·2	870	519	59·7	972	456	46·9	897	270	30·1	901	426	47·3	856	350	40·9	786	112	14·2	919	31	3·4	821	37	4·5	811	16	2·0
Beligal Korale	369	211	57·2	438	98	22·4	368	105	28·5	305	65	21·3	382	171	44·8	394	144	36·5	644	23	3·6	828	12	1·4	642	0	0	881	2	0·2
Dambadeni Hatpattu	2908	2226	76·5	2846	1219	42·8	2401	914	38·1	2889	715	24·7	2546	767	30·1	2839	873	30·8	2666	174	6·5	3577	88	2·4	3967	18	0·5	4023	47	1·2
Weudavili [illegible]attu	219	164	74·9	207	14[illegible]	8·1	250	58	23·2	270	78	28·9	260	54	20·8	244	23	9·4	295	66	22·4	314	34	10·8	393	17	4·3	338	4	1·2
Katugampola Hatpattu	805	519	64·5	866	267	30·8	801	151	18·9	780	55	7·1	863	151	17·5	753	53	7·0	718	68	9·7	965	62	6·4	1030	22	2·1	1042	11	1·1
Pitigal Korale South	283	172	60·8	274	103	37·6	172	36	20·9	331	43	13·0	322	45	14·0	369	40	11·1	359	20	5·6	458	7	1·5	443	5	1·1	449	1	0·2
Alutkuru Korale North A	155	44	28·4	150	46	30·7	118	28	23·7	147	12	8·2	145	9	6·2	—	—	—	106	8	7·5	133	6	4·5	169	0	0	—	—	—
Hapitigam Korale	796	365	45·9	981	128	13·0	1163	104	8·9	1093	117	10·7	1014	168	16·6	1159	181	15·6	1627	32	1·9	1126	12	1·1	1184	68	5·7	1755	1	0·1
Total	8196	5737	70·0	8744	3436	39·3	8238	2399	29·1	8754	1582	18·1	8416	2112	25·1	8447	1894	22·4	8502	569	6·7	11781	398	3·4	12306	228	1·9	13290	121	0·9

TABLE 4

Spleen rates among School Children by revenue divisions—September Surveys, 1946-1949.

Revenue division	1946			1947			1948			1949		
	No. exd.	No. pos.	S.R.	No. exd.	No. pos.	S.R.	No. exd.	No. pos.	S.R.	No. exd.	No. pos.	S.R.
Tunpane	170	28	16·5	293	25	8·5	320	16	5·0	671	5	0·7
Yati Nuwara	209	0	0	426	0	0	506	0	0	232	0	0
Paranakuru Korale	630	27	4·3	1153	22	1·9	1177	12	1·0	1436	7	0·5
Galboda Korale	721	70	9·7	1594	175	11·0	1607	87	5·4	1873	20	1·1
Kinigoda Korale	677	136	20·1	811	38	4·7	823	16	1·9	1021	23	2·3
Beligal Korale	511	90	17·6	748	9	1·2	835	2	0·2	826	3	0·4
Dambadeni Hatpattu	2597	448	17·3	2464	66	2·7	3482	43	1·2	3382	6	0·2
Weudavili Hatpattu	246	76	30·9	326	50	15·3	384	21	5·5	377	12	3·2
Katugampola Hatpattu	699	55	7·9	956	80	8·4	1043	33	3·2	1097	26	2·4
Pitigal Korale South	362	52	14·4	384	11	2·9	414	2	0·5	452	2	0·4
Alutkuru Korale North A	93	2	2·2	122	8	6·6	153	0	0	122	0	0
Hapitigam Korale	987	37	3·7	1677	15	0·9	1914	103	5·4	1368	1	0·1
Total	7902	1021	12·9	10954	499	4·6	12658	335	2·6	12857	105	0·8

are given in Appendix I A (March surveys, 1936-50) and in Appendix I B (September surveys, 1946-49). The position of the schools in the various revenue divisions is shown in Map 2.

The data recorded in Table 3 show that spleen rates tend to be highest immediately after an epidemic, and that they tend to diminish progressively until the next outbreak as pointed out by Sivalingam and Rustomjee (1941). Thus, except for the schools in the revenue division of Yati Nuwara, spleen rates ranging from 28·4 (Alutkuru Korale North A) to 89·2 (Kinigoda Korale) were recorded in 1936. In fact in nine of the twelve revenue divisions spleen rates over 50 were recorded in this year. These high rates were a consequence of the major epidemic of 1934-35. In 1937 in only four revenue divisions were spleen rates of over 50 recorded. They were Weudavili Hatpattu (68·1), Kinigoda Korale (59·7), Tumpane (58·1) and Galboda Korale (51·4). A spleen rate of 42·8 was recorded in Dambadeni Hatpattu, usually one of the worst affected areas in any epidemic in the Maha Oya Basin. In 1938 in no revenue division was a spleen rate of over 50 recorded. The mean spleen rates for the period 1936-39 were 70·9 in 1936, 39·3 in 1937, 29·1 in 1938 and 18·1 in 1939. In 1939 five revenue divisions had spleen rates below 10. They were Yati Nuwara (1·2), Katugampola Hatpattu (7·1), Alutkuru Korale North A (8·2), Paranakuru Korale (9·2) and Galboda Korale (9·7). Hapitigam Korale (10·7) and Pitigal Korale South (13·0) had spleen rates between 10-20. The remaining revenue divisions had spleen rates ranging between 21·3 and 30·1.

In March 1940 after the spring epidemic of 1939 the mean spleen rate had risen to 25·1. Only Tumpane (0·5) and Alutkuru Korale North A (6·2) had spleen rates below 10. Five revenue divisions had spleen rates between 10-20, and in the rest they ranged from 20·8 to 47·3. In March 1941, following the second wave of the epidemic in 1940, the mean spleen rate dropped slightly to 22·4. Four revenue divisions had spleen rates below 10, and the highest rate was 40·9 in Kinigoda Korale. Further March surveys were then interrupted owing to the war.

The spleen surveys from March 1947 onwards are of great interest. They followed the spring-autumn-spring epidemics of 1945-46. But the mean spleen rate was only 6·7. In March 1948, 1949 and 1950 the mean spleen rates were only 3·4, 1·9 and 0·9 respectively. These figures may be read in conjunction with the September surveys begun in 1946 (Table 4). In September 1946 the rate of 12·9, definitely showed the effect of the epidemic which had only recently begun to subside. But from 1947-49 the mean spleen rate has progressively declined from 4·6 in 1947 to 0·8 in 1949.

(*b*) **Parasite Surveys.** These surveys were carried out in schools in March for the years 1938-41 and 1948-50, and in September from 1946-49. The results are summarised according to revenue divisions in Tables 5 and 6. The complete results, tabulated according to schools in each health area, are given in Appendix II A for the March surveys and in Appendix II B for the September surveys.

The mean parasite rate each March during the period 1938-41 for the whole basin was 3·3 in 1938, 5·2 in 1939, 6·1 in 1940, and 4·3 in 1941, only Alutkuru Korale North A registering a rate of zero for each of the years 1938-40. In 1938, in addition to Alutkuru Korale North A, Tumpane and Yati Nuwara also recorded no infections.

MAP 2.

MAHA OYA BASIN

SHOWING THE POSITION OF SCHOOLS

IN THE VARIOUS REVENUE DIVISIONS.

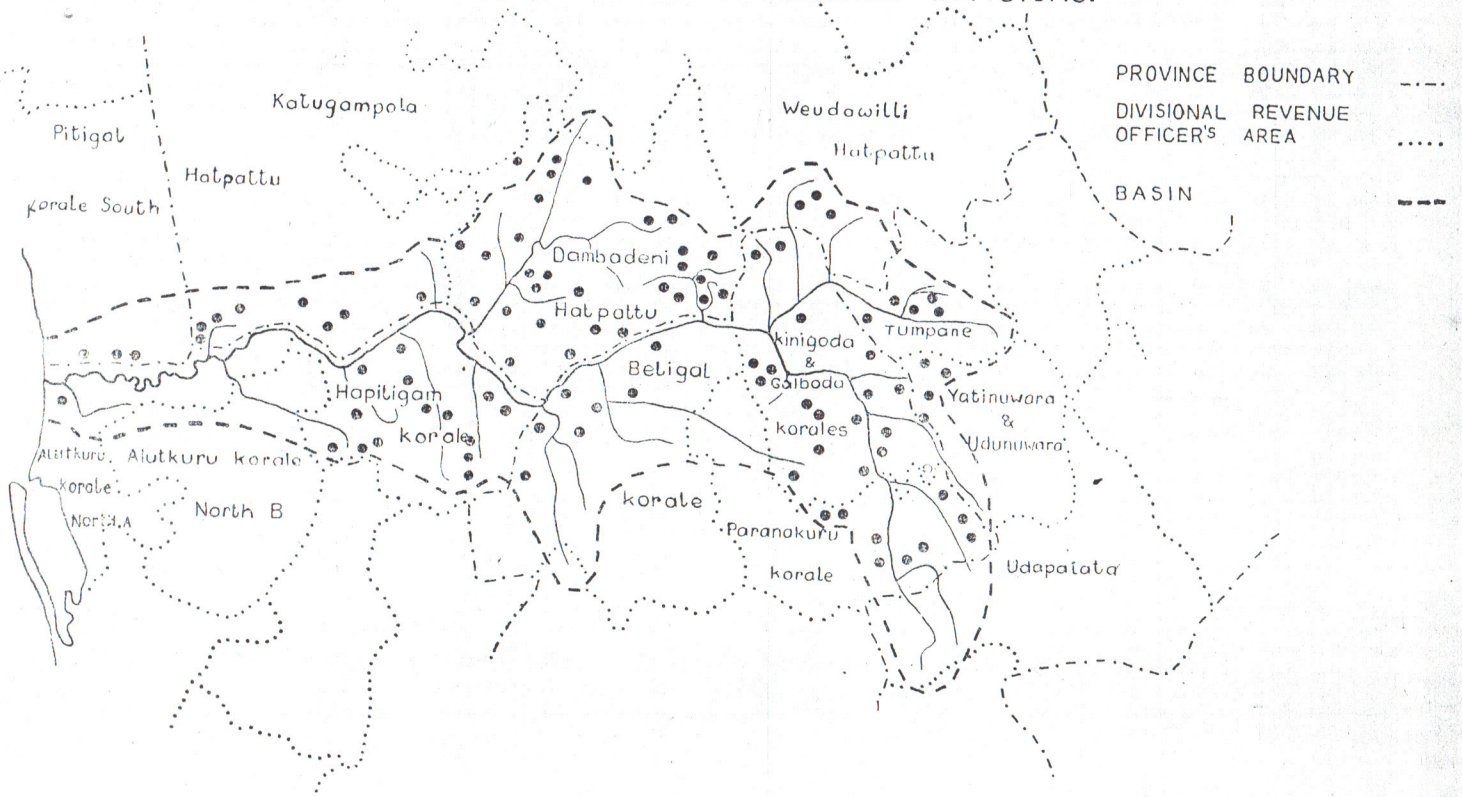


TABLE 5

Parasite rates among School Children by revenue divisions—March Surveys, 1938-1950.

Revenue division	1938			1939			1940			1941			1948			1949			1950		
	No. exd.	No. pos.	P.R.	No. exd.	No. pos.	P.R.	No. exd.	No. pos.	P.R.	No. exd.	No. pos.	P.R.	No. exd.	No. pos.	P.R.	No. exd.	No. pos.	P.R.	No. exd.	No. pos.	P.R.
Tumpane	57	4	7·0	51	1	2·0	39	2	5·1	34	1	2·9	70	0	0	36	0	0	64	0	0
Yati Nuwara	31	0	0	28	2	7·1	17	0	0	26	0	0	48	0	0	35	0	0	33	0	0
Paranakuru Korale	106	0	0	92	8	8·7	83	7	8·4	65	1	1·5	130	0	0	120	0	0	137	0	0
Galboda Korale	75	1	1·3	82	2	2·4	73	2	2·7	71	0	0	165	0	0	184	0	0	199	0	0
Kinigoda Korale	97	4	4·1	96	4	4·2	93	6	6·5	90	2	2·2	82	0	0	86	0	0	112	0	0
Beligal Korale	47	1	2·1	36	1	2·8	52	5	9·6	79	2	2·5	86	0	0	66	0	0	109	0	0
Dambadeni Hatpattu	303	17	5·6	307	23	7·5	288	20	6·9	316	20	6·3	367	3	0·8	415	0	0	421	0	0
Weudavili Hatpattu	40	3	7·5	29	1	3·4	26	0	0	26	0	0	40	0	0	43	0	0	34	0	0
Katugampola Hatpattu	77	1	1·3	76	7	9·2	87	1	1·1	75	12	16·0	120	0	0	110	0	0	145	0	0
Pitigal Korale South	18	0	0	35	0	0	32	5	15·6	37	2	5·4	44	0	0	46	0	0	45	0	0
Alutkuru Korale North A	11	0	0	14	0	0	15	0	0	—	—	—	13	0	0	10	0	0	8	0	0
Hapitigam Korale	111	1	0·9	127	2	1·6	135	10	7·4	131	1	0·8	112	0	0	119	0	0	190	0	0
Total	973	32	3·3	973	51	5·2	940	58	6·1	950	41	4·3	1277	3	0·2	1270	0	0	1497	0	0

TABLE 6

Parasite rates among School Children by revenue divisions—September Surveys, 1946-1949.

Revenue division	1946			1947			1948			1949		
	No. exd.	No. pos.	P.R.	No. exd.	No. pos.	P.R.	No. exd.	No. pos.	P.R.	No. exd.	No. pos.	P.R.
Tumpane	21	0	0	115	0	0	118	2	1·7	72	0	0
Yati Nuwara	24	0	0	42	0	0	60	0	0	32	0	0
Paranakuru Korale	57	1	1·8	125	2	1·6	141	1	0·7	142	0	0
Galboda Korale	84	4	4·8	187	1	0·5	195	1	0·5	219	0	0
Kinigoda Korale	48	4	8·3	85	0	0	116	0	0	96	0	0
Beligal Korale	66	3	4·5	82	0	0	81	0	0	91	0	0
Dambadeni Hatpattu	434	50	11·5	282	1	0·4	335	1	0·3	348	0	0
Weudavili Hatpattu	28	7	25·0	37	1	2·7	41	0	0	42	0	0
Katugampola Hatpattu	53	6	11·3	87	0	0	114	2	1·8	142	0	0
Pitigal Korale South	22	2	9·1	24	0	0	40	0	0	45	0	0
Alutkuru Korale North A	22	2	9·1	14	0	0	5	0	0	—	—	—
Hapitigam Korale	102	0	0	106	0	0	219	0	0	137	0	0
Total	961	79	8·2	1186	5	0·4	1465	7	0·5	1366	0	0

In the rest of the revenue divisions there were wide fluctuations in parasite rates, and rates as high as 7·5 in Weudavili Hatpattu and 7·0 in Tumpane were recorded.

In 1939 the parasite rates were higher generally than in 1938. Katugampola Hatpattu had a rate of 9·2, Paranakuru Korale 8·7, Dambadeni Hatpattu 7·5, and Yati Nuwara 7·1. In 1940 after the spring epidemic of 1939 the mean parasite rate had gone up to 6·1, and although Yati Nuwara, Weudavili Hatpattu and Alutkuru Korale North A had no infections the number of blood films examined in each of these divisions was not very high. Seven revenue divisions had parasite rates of above 5, the highest being Pitigal Korale South with 15·6. In 1941 the mean parasite rate had come down to 4·3, Katugampola Hatpattu having a rate of 16·0. Only two other revenue divisions had rates above 5.

From 1947 parasite rates have been uniformly low. In September 1946 (Table 6) a mean parasite rate of 8·2 was recorded. This was the highest recorded up to then in any survey, and in Weudavili Hatpattu 28 blood films gave a parasite rate of 25·0. This was due to the aftermath of the epidemic, which was then beginning to subside. In September 1947 the rate had come down to 0·4, and from then on the rates have progressively declined, until in 1950 no infections were recorded at the March survey.

VITAL STATISTICS

The vital statistics for all health areas in the Maha Oya Basin, for the period 1939-50, are given in Table 7. The birth rates have become progressively higher, particularly in the period 1947-50, when it ranged between 34·1 and 35·3. A study of the previous years is also interesting. Rustomjee (loc cit.) said that birth rates tend to be higher just before an epidemic, and revert to normal within two years after an outbreak. The birth rates given in Table 7 bear out the truth of this statement. Thus in 1942, prior to the outbreak of 1943, the birth rate was 32·7. In 1944 it had dropped to 30·1. Again after the epidemic of 1945, the birth rate dropped to 27·3 in 1946, but by 1947 it had risen to 35·3 and has remained high ever since.

The crude death rates and the infant-mortality rates, given in Table 7, are highest in epidemic years, as one would expect. Thus the death rates in 1939-40 were 16·1 and 15·1 respectively. Thereafter in 1941 and 1942 the death rates dropped to 11·1 and 13·1 respectively. During the epidemic of 1943 it rose again to 16·2, and remained high at 15·7 in 1944. In 1945-46, also epidemic years, the death rates rose to 17·7 and 16·0 respectively. Thereafter they have been decreasing steadily, until in 1950 the crude death rate was as low as 9·6. The infant-mortality rates have shown an exactly similar trend and have been highest in epidemic years. In 1939 the rate of 170 was the highest for the period under review. But since 1947 the rate has been coming down steadily until in 1950 it was 67.

There is an unavoidable discrepancy in the population and morbidity figures given in Tables 2 and 7. In the former table the population has been calculated from the census reports of 1921 and 1946, and only that fraction of the population of any revenue division which falls within the Maha Oya Basin has been taken into account. The morbidity figures have been taken from all dispensaries and hospitals situated in the basin. The population figures in Table 7 are for all the health areas, in and around the catchment. These health areas may be verified from Map

TABLE 7

Vital Statistics.

Year	Population	Number of births	Birth rate	Number of deaths	Crude death rate	Number of infant deaths	Infant mortality rate	Malaria attendance	Malaria morbidity rate	Remarks
1939*	745584	20748	27·8	11975	16·1	3526	170	550111	738	*Warakapola figures not included
1940	815908	22637	27·7	12291	15·1	3018	133	460884	565	
1941*	796323	22972	28·8	8841	11·1	2351	102	235906	296	*Pannala figures not included
1942*	799701	26159	32·7	10509	13·1	2523	96	231021	289	*Pannala figures not included
1943	855694	29714	34·7	13917	16·2	3512	118	471258	551	
1944	849389	25598	30·1	13307	15·7	2842	111	195978	231	
1945	875220	25763	29·4	15518	17·7	3478	135	606660	693	
1946	889659	24362	27·3	14276	16·0	3403	140	517039	581	
1947	895313	31650	35·3	9285	10·3	2719	86	206561	230	
1948	893111	31369	35·1	9175	10·2	2473	79	123401	138	
1949	893555	31391	35·1	8692	9·7	2419	77	65748	73	
1950	905529	31301	34·5	8695	9·6	2080	67	51663	57	

2, which shows the river basin and the revenue divisions that come within it. As health areas correspond to revenue divisions, portions of some of them lie outside the catchment, and the population figures of such areas have not been excluded from the table. It is our intention to record all this data for future reference, summarised according to each health area. Similarly, the malaria attendances include hospitals and dispensaries which lie outside the catchment. In Appendix III is recorded the vital statistics for each health area, lying in and just over the border of the Maha Oya Basin.

The morbidity rates given in Table 7 are noteworthy for two reasons. One the high rates prevailing in epidemic years, and the other the decline particularly from 1948 onwards. The rate of 57 in 1950 is probably the lowest ever recorded. It is certainly the lowest since statistical records were maintained.

BIONOMICS OF *ANOPHELES CULICIFACIES*

Since the first infected *Anopheles culicifacies* Giles was found by James and Gunasekera (1913) at Talaimannar no other mosquito has been found infected in Ceylon, except for a single gut infection in *A. hyrcanus*. In this section it is proposed to give an account of the bionomics of *A. culicifacies* from data gathered during the period 1935-50. These data record the monthly examinations made at Malaria Observation Stations situated in the Maha Oya Basin. The origin and nature of the work done at these stations has been described fully in our previous paper and it is not proposed to recapitulate it here. Suffice it to say that these Observation Stations were generally situated on or close to a river. The entomological observations included examination of dwellings by means of hand catches in the morning for adult mosquitos, trapping adult mosquitos from 6 p.m. to 8.30 p.m. in cattle-baited traps, trapping adult mosquitos in human-baited traps also from 6 p.m. to 8.30 p.m., the examination of a selected mile of river-bed for larval anopheline breeding in sand and rock pools and along the margins (banks) of the river, and finally the examination of various types of breeding places in the village, other than the main river or tributary, but including any minor streams. The results of the examination of minor streams have been included with the main river examinations to avoid unnecessary duplication of tables. It may be mentioned here that in general the smaller streams follow the same features of behaviour as the larger tributaries, and in times of drought show a greatly diminished flow of water, with consequent pooling of the bed. Human-baited trapping was carried out only from 1936-41.

At each Observation Station a selected number of houses was examined at monthly visits by a Entomological (Field) Assistant, who in addition to his headquarter station had three other stations allotted to him. These stations were worked in rotation by the Entomological Assistant, assisted by two Field Attendants. The adult mosquitos collected were despatched alive to the Colombo Laboratory for examination, together with the preserved larvae, collected from various types of breeding place. Control measures were promptly put into operation no sooner *A. culicifacies* was reported to be breeding at any station. These examinations, together with regular observations at larval dipping stations (Subsidiary Observation

TABLE 8

Malaria Observation Stations, 1935-1950.

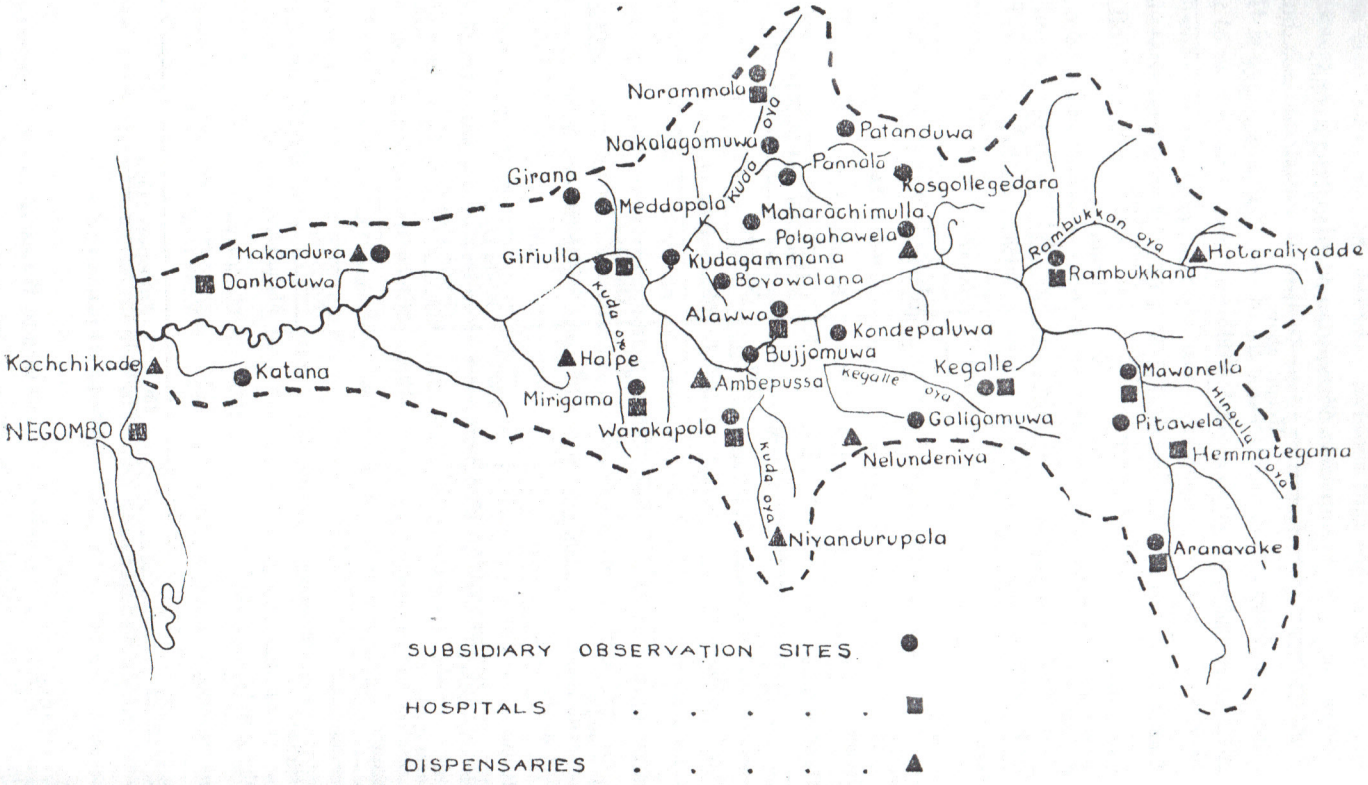
Station	Height above mean sea-level (feet)	River examined	Period of observation
Alawwa	164	Maha Oya	1935-49
Aranayake	1000	Maha Oya	1935-46
Boyawalana	176	*Kuda Oya	1947-49
Bujjomuwa	150-200	Maha Oya	1947-49
Galigomuwa	—	Galigomuwa Oya	1950
Girana	157	No river	1943-46
Giriulla	130	Maha Oya	1935-46
Katana	—	Batapat Ela	1950
Kegalle	650	Kegalle Oya	1935-48
Kondepaluwa	—	Maha Oya and Ragala Oya	1947-48
Kosgollegedera	300	No river	1947-49
Kudagammana	146	*Kuda Oya	1943-46
Maharachimulla	200	Pin Ela	1947-49
Makandura	58	Gal Oya	1937-40
Mawanella	800	Maha Oya	1935-48
Meddapola	300	No river	1943-46
Mirigama	180	Kuda Oya	1940-46
Nakalagamuwa	—	*Kuda Oya	1947-48
Narammala	189	*Kuda Oya	1940-48
Pannala	61	*Kuda Oya	1947-49
Pattanduwa	—	No river	1947-48
Pittawela	—	Maha Oya	1947-48
Polgahawela	252	Maha Oya	1947-49
Rambukkana	280	Maha Oya	1935-48
Warakapola	250	Ambepusse Oya	1935-36

*Same river—Kuda Oya

Sites) throughout the Wet and Intermediate Zones from 1940, were chiefly responsible for putting into operation river oiling measures. River oiling from 1935 to 1946 was the only anti-larval measure adopted. A list of the Malaria Observation Sites with the particular river examined and the duration of the observations made is given in Table 8 while their location is indicated in Map 3. The name Kuda Oya is given to a large number of different tributaries of the Maha Oya, and also to minor

MAP 3.

MAHA OYA BASIN



streams which are not included in Map 3. The various Observation Stations are also marked in this map.

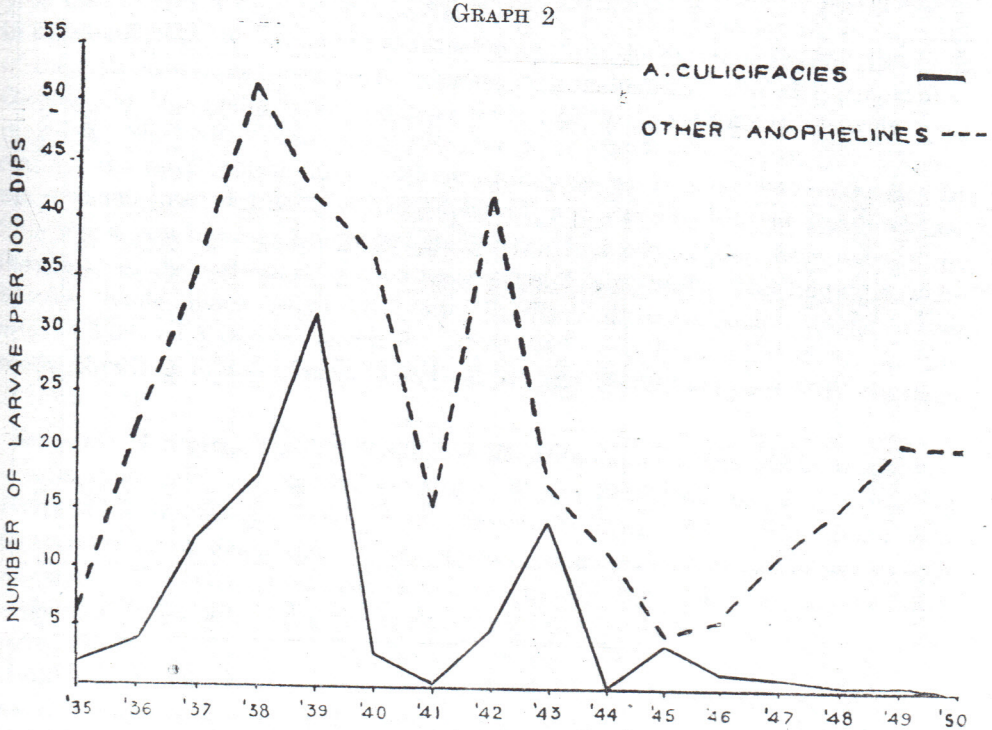
The larval rate as the term is used in this paper is defined as the number of larvae per 100 dips from a standard ladle. All references to the adult of *A. culicifacies* and other anopheline adults are confined to the female mosquito only.

In this paper no detailed reference is being made to anopheline mosquitos, other than *A. culicifacies*, as it is proposed to write an account of the mosquitos of the Maha Oya Basin at a future date. The anopheline mosquitos recorded in this river basin, apart from *A. culicifacies*, are *A. aconitus* Dönitz, *A. aitkeni* James, *A. annularis* Van der Wulp, *A. insulaeflorum* Swell. and Swell., *A. barbirostris* Van der Wulp, *A. hyrcanus* var. *nigerrimus* Giles, *A. jamesi* Theobald, *A. karwari* James, *A. leucosphyrus* Dönitz, *A. maculatus* Theobald, *A. pallidus* Theobald, *A. subpictus* Grassi, *A. tessellatus* Theobald, *A. vagus* Dönitz and *A. varuna* Iyengar.

(*a*) **Larval Habitat and Prevalence.** All the data relating to the larval bionomics of the vector are given in Tables 8-16.

1. *Sand Pools.*—In the Intermediate Zone *A. culicifacies* breeds prolifically in times of drought, whenever the river begins to pool. In this zone the vector can be regarded as being pre-eminently a pool breeder, showing no marked reference for either sand or rock pools. The annual variation in the prevalence of *A. culicifacies* and the total of all other anopheline larvae, expressed as a larval rate, is given in Table 9 and Graph 2. In 1935 observations commenced only in July, when the

GRAPH 2



The prevalence of *Anopheles culicifacies* and the total of all other anopheline larvae breeding in sand pools.

TABLE 9

Annual variation in the larval prevalence of A. culicifacies *and the total of all other anopheline larvae caught in sand and rock pools in rivers and streams at Malaria Observation Stations during the period* 1935-1950.

Year	SAND POOLS					ROCK POOLS				
	Number of dips	*A. culicifacies*		Other anopheline species		Number of dips	*A. culicifacies*		Other anopheline species	
		Number of larvae	Larval rate	Number of larvae	Larval rate		Number of larvae	Larval rate	Number of larvae	Larval rate
1935	8236	162	1·97	487	5·91	3969	112	2·82	383	9·65
1936	23397	914	3·90	5129	22·44	9855	2270	23·02	1411	14·32
1937	13046	1670	12·80	4589	35·18	9332	934	10·01	2036	21·82
1938	8130	1449	17·82	4196	51·60	4843	1622	21·10	2071	42·77
1939	7395	2338	31·62	3111	42·07	3430	988	28·80	1255	36·59
1940	11075	339	3·06	2958	26·73	5970	739	12·38	1449	24·28
1941	5380	22	0·41	837	15·55	4045	152	3·76	982	23·04
1942	4075	194	4·76	1722	42·26	5730	118	2·06	1531	26·70
1943	5725	811	14·16	1008	17·60	3970	488	12·29	746	18·79
1944	5430	1	0·02	645	11·88	7660	8	0·10	979	12·78
1945	15890	610	3·84	754	4·76	13995	544	3·89	409	2·92
1946	13925	178	1·28	817	5·87	11700	365	3·12	586	5·01
1947	12485	101	0·81	1534	12·29	6310	13	0·21	879	13·95
1948	20234	77	0·38	3022	14·94	4095	25	0·61	639	15·61
1949	8235	52	0·63	1730	21·00	175	0	0	39	22·29
1950	7170	0	0	1486	20·73	2895	0	0	675	22·31

second wave of the autumnal epidemic which commenced in 1934 was beginning to subside. The relatively high larval rates for *A. culicifacies* and the total of all other anopheline larvae recorded from 1936-38, which were non-epidemic years, were due to the fact that in these years control measures were spasmodic and poorly organised. In 1939, although emergency river oiling was carried out from March 1st, the organisation was still handicapped by lack of equipment and trained personnel, and it was not possible to avert an epidemic. The annual larval rate of 31·62 for *A. culicifacies* in 1939 was the highest recorded during the period under review. It is also interesting to note that the larval rate for the total of all other anopheline mosquitos was generally higher from 1936-39 (range 22·44-51·60), than at any other period except 1944, when it was 42·6.

From 1940 up to 1946 when river oiling became progressively better organised as a control measure, the larval rates for *A. culicifacies* never reached the high level of earlier days. The only exceptions were in the epidemic years of 1943 and 1945, when the larval rates were 14·16 and 3·84 respectively. In 1946, in the early part of which heavy breeding was going on, the larval rate was 1·28. In the period 1947-50 the larval rates were 0·81 in 1947, 0·38 in 1948, 0·63 in 1949 and 0 in 1950.

In Table 9 is summarised the annual variation in the prevalence of *A. culicifacies* for all the Observation Stations in the catchment. In Table 10 is given the annual variation in larval rates for each Observation Station. Up to 1939 some of these larval rates for individual stations were exceedingly high, even in a non-epidemic year such as 1938. Thus at Alawwa, Makandura and Rambukkana the larval rates in 1938 were 39·73, 26·40 and 20·45 respectively. In the epidemic year of 1939 some of the stations recorded even higher catches of *A. culicifacies*, and at Rambukkana, Giriulla and Mawanella larval rates of 69·50, 53·81 and 33·87 respectively were recorded. Since 1939 high larval rates were only recorded in 1943, when at six stations the rates ranged from 10·33 at Aranayake to 28·86 at Rambukkana. In the epidemic year of 1945, the highest larval rate was only 7·61 at Rambukkana. This was a year of almost uninterrupted river oiling in the basin from January to October. In the early part of 1946 there was still fairly heavy breeding of *A. culicifacies* taking place particularly at Giriulla and Rambukkana, when larval rates of 5·38 and 3·45 were recorded. After 1946 the only high larval rates for the vector have been at Bujjomuwa in 1947 (9·82) and 1948 (3·61), and at Boyawalana (5·21) in 1949.

In Table 11 is given the larval rates at monthly examinations made at Alawwa, Giriulla, Mawanella and Rambukkana in 1938 and 1942 (non-epidemic years), and 1939 and 1943 (epidemic years). In general, in a epidemic or non-epidemic year the larval rates are much higher in the period January-June, than in the period July-December. The stations selected are all notoriously unhealthy ones, and the heavy breeding of *A. culicifacies* in the early part of the year is due to the fact that the north-east monsoon is generally the weaker monsoon of the two and often dry conditions set in by late December or early January. During the second half of the year high catches in August and September are not unexpected, as these are relatively dry months. If the monthly examination were to be carried out in the second half of December high catches would not be uncommon, as pooling may have

TABLE 10

Annual variation in larval rates for Anopheles culicifacies *breeding in sand pools in rivers at Malaria Observation Stations during the period* 1935-1950.

Station	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950
Alawwa	7·14	0·46	25·86	39·73	16·65	0·73	0·67	2·78	11·62	0	4·31	0·44	0·78	0·65	0	0
Aranayake	0	0·50	0·21	0·33	7·26	2·88	0	4·37	10·33	0	0	0				
Boyawalana													0	0·22	5·21	
Bujjomuwa													9·82	3·61	0	
Galigomuwa																0
*Girana									—	—	—	—				
Giriulla	5·85	1·20	9·44	3·27	53·81	4·64	1·14	6·86	21·87	0	3·96	5·38				0
Katana																0
Kegalle	0	11·57	0	10·24	1·84	0·32	0	0·29	14·64	0	0·90	0	0·18	0		
Kondepaluwa													0	0		
*Kosgollegedera													—	—	—	
Kudagammana									0	0	3·93	0·82	0	0·73		
Maharachimulla													0	0	NP	
Makandura			0	26·40	15·33	3·06										0
Mawanella	0	16·63	3·73	11·09	33·87	6·57	0	14·79	12·93	0·09	3·05	2·33	0·28	0		0
*Meddapola									—	—	—	—				
Miriganna						NP	NP	NP	NP	NP	0	0				

*No river.
Larval rate = number of larvae per 100 dips.
NP = no pooling of river.
A blank space indicates that the station was not worked in that year.

TABLE 10 (*Contd.*)

Annual variation in larval rates for Anopheles culicifacies *breeding in sand pools in rivers at Malaria Observation Stations during the period* 1935-1950.

Station	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950
Nakalagamuwa													0	0		
Naranmala						2·63	0	NP	0	0	0	0	0	0		
Pannala													0	0	0	
*Pattanduwa													—	—		
Pittawela													0	0		
Polgahawela													0	0	0·34	0
Rambukkana	0·91	23·63	31·85	20·45	69·50	5·55	0·60	0·15	28·86	0	7·61	3·45	0·07	0		0
Warakapola	0	0·24														

*No river.

Larval rate = number of larvae per 100 dips.

NP = no pooling of river.

A blank space indicates that the station was not worked in that year.

TABLE 11

Larval rates for Anopheles culicifacies *breeding in sand pools in the Maha Oya at monthly examinations made at Alawwa, Giriulla, Mawanella and Rambukkana (Hiriwaduna) in certain epidemic and non-epidemic years.*

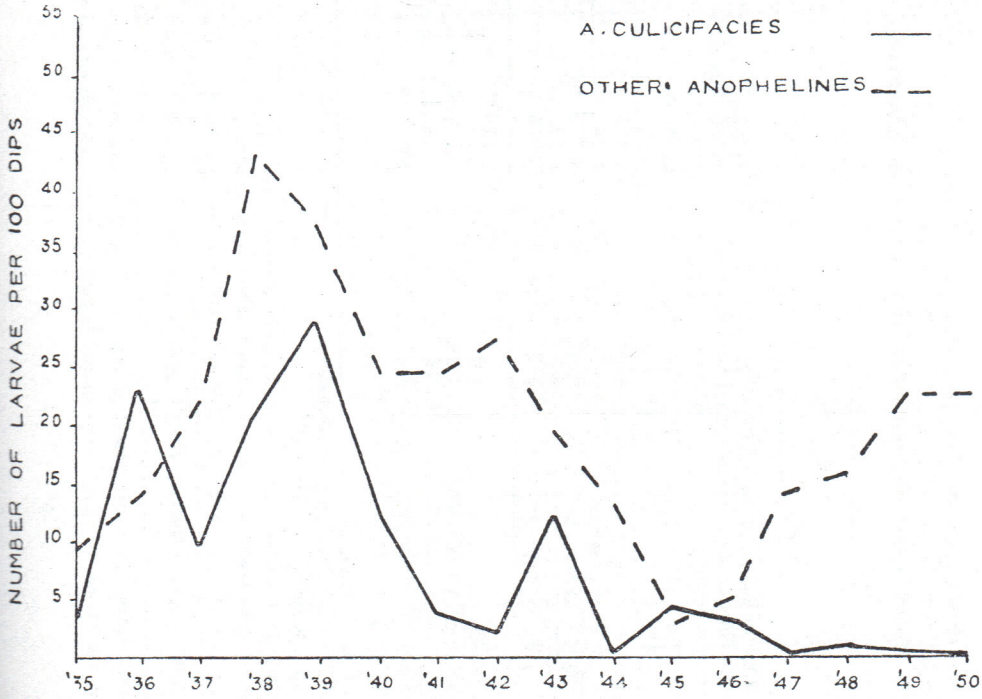
Station	Year	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Alawwa	1938	57·05								38·40		0	7·27
	1939		10·55	41·20			0	0	0	12·50			
	1942	8·57	0·66	1·73		5·27		0	0·80	0		0	
	1943	0	0	17·23		NE	0			0			0
Giriulla	1938								0	0		0	9·47
	1939	0	46·57	26·76						139·55	0		
	1942		12·00	0		0		NE					
	1943	NE	NE	36·66	7·27	NE	NE			13·33	NE	NE	NE
Mawanella	1938	0·74	6	0	0	6	0	0	10·77	0	0	1·00	83·43
	1939	94·44	17·54	1·36	0			0	0		0		
	1942	24·00	12·94	0·59		40·00		0	0	0			
	1943	0	5·83	0	47·37	0			0				
Rambukkana (Hiriwaduna)	1938	21·43	34·70	0	0	0·40	31·58	0·44	15·11	0	0·83	5·00	99·60
	1939	12·57	28·98	263·57	7·50	216·30			25·00	0	0		5·00
	1942	0	0			0·45	0		0	0	0	0	
	1943	55·55	0	0·56	111·33					0			100·00

NE = not examined.
A blank space indicates that no pooling had occurred during that particular examination.
Larval rate = number of larvae per 100 dips.
1939 and 1943—epidemic years; 1938 and 1942—non-epidemic years.

commenced by then. In Table 11 is recorded some exceedingly high larval rates, notably at Rambukkana in March and May 1939, when rates of 203·57 and 216·30 were recorded.

2. *Rock Pools.*—*A. culicifacies* breeding in rock pools is summarised in Table 9. It will be seen that the annual larval rates are highest in the epidemic years of 1939-40, 1943 and 1945-46, apart from the period 1935-38 when *A. culicifacies* was breeding virtually unchecked in both sand and rock pools. In Graph 3, the larval

GRAPH 3



The prevalence of *Anopheles culicifacies* and the total of all other anopheline larvae breeding in rock pools.

rates for *A. culicifacies* and the total of all other larval anopheline breeding in rock pools is given for the period 1935-50.

In Table 12 is recorded the annual larval rate recorded for *A. culicifacies* at Aranayake, Giriulla, Kegalle, Kudagammana, Mawanella, Rambukkana and Warakapola. These are the seven Observation Stations in the Maha Oya Basin where the river-bed is rocky. At Rambukkana very heavy breeding of *A. culicifacies* has occurred, particularly from 1935-41. It was at this station, Giriulla and Mawanella that one could invariably obtain *A. culicifacies* larvae, as some of the rock pools are high above the level of the river-bed, particularly at Giriulla, and were often evaded by oiling gangs.

The larval rates recorded for *A. culicifacies* at monthly examinations of rock pools at Giriulla, Mawanella and Rambukkana in 1936, 1938 and 1942 (non-epidemic

TABLE 12

Annual variation in larval rates for Anopheles culicifacies *breeding in rock pools during the period* 1935-1950 *at those Malaria Observation Stations in which rock pools were present in the river-bed.*

Station	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950
Aranayake	0	0·36	5·11	—	—	0	0	1·57	0·20	0	0	0				
Giriulla	14·37	16·93	2·49	28·08	31·27	19·38	0	6·47	28·41	0	2·11	2·79				
Kegalle	0	3·65	0	1·22	2·64	0·65	0	0·13	0·28	0	1·91	0	0	0		
Kudagammana									RS	RS	0	16·26	0	0		
Mawanella	0·13	38·56	1·34	17·21	10·00	13·12	0·19	2·43	14·95	0	3·78	1·74	0·25	0		0
Rambukkana	0	33·13	27·85	37·49	59·36	26·17	20·14	8·45	20·72	0·78	10·81	1·29	0·29	0		0
Warakapola	0	0														

Larval rate = number of larvae per 100 dips.
RS = river full and rock pools covered.
In 1938 and 1939 the rock pools at Aranayake were not examined.
A blank space indicates that the station was not worked in that year.

TABLE 13

Larval rates for Anopheles culicifacies *breeding in rock pools in the Maha Oya at monthly examinations made at Giriulla, Mawanella and Rambukkana (Hiriwaduna) in certain epidemic and non-epidemic years.*

Station	Year	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Giriulla	1936	0	0	2·00	94·29	NE	122·86	0	4·20	3·43	0	NE	NE
	1938	40·00						0	11·67	31·03		33·33	58·18
	1939	0	40·00	4·00						73·33	0		
	1942	0	4·44	0					0				
	1943			41·67	34·09					0			
Mawanella	1936	0	0	0	8·20	18·60	9·68	0	24·87	320·27	121·38	0	NE
	1938	90·00	0	0	0	0	0	0	0	0	0	0	0
	1939	5·22	27·50	0				0	0				
	1942	10·67	1·43	0	0	12·67	0	0	0	0	0		0
	1943	0	5·00	11·11	57·00	0	0		7·50			0	
Rambukkana (Hiriwaduna)	1936	5·16	12·28	31·67	26·34	NE	171·03	102·22	0	53·63	0	0	0
	1938	80·00	155·00	0	1·11	0	18·82	2·40	10·00	0	0		31·00
	1939	5·00	65·81	97·60	25·00	192·22			190·00	0			33·33
	1942	25·45	0	0	3·33	0	25·00			0	0	5·00	
	1943	37·27	0	0	131·00			0		15·56			1·67

NE = not examined.
A blank space indicates that no pooling had occurred during that particular examination.
Larval rate = number of larvae per 100 dips.
1939 and 1943—epidemic years ; 1936, 1938 and 1942—non-epidemic years.

years), and 1939 and 1943 (epidemic years) are given in Table 13. Once again it will be seen that breeding in the first half of the year is more general than in the second half of the year. At Rambukkana in 1939 very heavy breeding was taking place in several months of the year, notably in August and December, when larval rates of 192·22 and 190 respectively were recorded.

3. *Margins (banks) of Rivers.*—The occurrence of *A. culicifacies* along the banks of rivers is usually of negligible importance, compared with its prolific breeding in sand and rock pools. The larval rates for the period 1935-50 are summarised in

TABLE 14

Annual variation in the larval prevalence of A. culicifacies *and the total of all other anopheline larvae caught along the margins of rivers and streams at Malaria Observation Stations during the period* 1935-1950.

Year	Number of dips	*A. culicifacies*		Other anopheline species	
		Number of larvae	Larval rate	Number of larvae	Larval rate
1935	31815	470	1·48	3276	10·30
1936	51531	221	0·43	17124	33·22
1937	45324	289	0·65	15831	34·93
1938	48700	242	0·50	25943	53·27
1939	49785	1432	2·88	15746	31·63
1940	59445	380	0·64	9177	15·44
1941	58650	25	0·04	8135	13·87
1942	58360	42	0·07	10883	18·65
1943	64490	213	0·33	9744	15·11
1944	75840	27	0·03	11524	15·16
1945	67310	284	0·42	5375	7·99
1946	59305	52	0·08	5381	9·07
1947	70515	17	0·02	7673	10·88
1948	69985	45	0·06	6913	9·88
1949	52965	50	0·09	4269	8·06
1950	46065	0	0	3898	8·46

Table 14. In 1939 a larval rate of 2·88 was recorded, but since then larvae have been found in insignificant numbers.

4. *Village Breeding Places.*—The prevalence of the vector in all types of village breeding places, summarised in Table 15, shows that its presence in such situations is of even less importance than along the margins of rivers and streams. In practice these breeding places were never treated at all. In Table 16, is given a summary of the results of examination of different types of village breeding place