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OBJECTIVES AND ACHIEVEMENTS OF THE PRE-ERADICATION SURVEY IN THE EGYPTIAN PROVINCE OF THE UAR

by

G.D. Georgopoulos, MD., MPH.,
WHO Senior Adviser

1. INTRODUCTION:

In accordance with the agreement signed last year between the Ministry of Public Health of the United Arab Republic and the WHO Regional Office for the Eastern Mediterranean, a preliminary survey has been started in the Egyptian Province, in order to determine the extent of the malaria problem in the country, and the methods to be adopted in the subsequent malaria eradication campaign.

It was decided that the survey should be extended to the whole territory of the Egyptian Province and it was estimated that the necessary investigations would take approximately a one-year period.

A National Team (one malariologist, one entomologist, and two technicians) was provided by the Government to assist the WHO Malariologist, while the closest co-operation with the Malaria Services in the field (about 100 Malaria Stations) was secured.

A detailed plan of operations prepared for the survey was discussed, not only with the authorities at the Ministry of Health, but also with the Chiefs of the main Malaria Stations in the field, while a refresher course on parasitology and entomology was given to the technicians of the Stations.

Instructions and special forms for reporting were prepared and forwarded to the Malaria Stations in the field, and a close supervision of the field work by our Team was secured.

2. OBJECTIVES OF THE SURVEY

The role of a pre-eradication survey team is:

a. to define the areas of the country where eradication is envisaged;

b. to assess the conditions of the future operations and the local facilities in terms of personnel, equipment, supplies, transport and administration;

c. to advise on programmes of training needed in local conditions; and

d. to assist the Government in drawing up a plan of operations.

Apart from the information needed for the preparation of the plan of operations, as mentioned in the "Outline for the submission of programmes on malaria eradication - WHO" (Chapters: I-V), for the assessment of the "malarious areas" and areas of operations, data must be collected, elaborated and properly presented on the following subjects:

a. the prevalence of malaria (stability and intensity), together with data on parasite prevalence;

b. the distribution and seasonal prevalence of the anopheline vector species;

c. the habits of the vector species, particularly in regard to resting and feeding;

d. the mortality of the vector species achieved by insecticides; and

e. the duration of the residual insecticide deposits.

Thus, the work to be done by a pre-eradication survey team can be divided into:

- Office work, for the collation of data obtained and for the elaboration and proper presentation of all data collected, and

- Field work, on malaria, the anopheline vector species, and insecticides, as mentioned above.

3. OBJECTIVES OF THE SURVEY IN EGYPT

The training of the personnel needed for the malaria eradication campaign in Egypt has been undertaken by the "Regional Malaria Eradication Training Centre" in Cairo (Dr. A.Zahar, WHO Senior Adviser), in collaboration with the Ministry of Public Health, and a Working Group formed by the Malaria Eradication Technical Board gives its assistance in the preparation of the Malaria Eradication plan of operations with our collaboration.

The field work which has been undertaken for the collection of data on malaria, on anopheline vector species and insecticides has the following objectives:

a. Collection of sufficient and comparable data on:

- malaria prevalence and season of malaria;
- parasite prevalence, and
- distribution and seasonal prevalence of the vector species.

b. Investigations on:

- the habits of the vector species, particularly in regard to resting and feeding; and
- the mortality of vector species, achieved by different insecticides., and

c. Checking the duration of residual insecticide deposits.

For the assessment of the local facilities existing and for the general information needed for the preparation of the plan of operation, a detailed questionnaire has been prepared and forwarded to the Provincial Malaria Services (Annex I), reports on which are under study.

4. PLAN OF ACTION - TECHNICAL METHODS

The following plan of action and technical methods have been adopted for the field work in collecting data on the above mentioned subjects:

a. On Malaria and parasite prevalence:

i. Regular (monthly) infant parasite rate, made by house-to-house visits to all the houses of a statistically significant number of villages, selected at random;

ii. Regular (monthly) detection of malaria cases occurring in the same villages, made simultaneously with the infant parasite rate, during which blood-smears are taken from each person with fever at the time of visit, and from each person with history of any fever within a one-month period; and

iii. Spleen and parasite indices among persons 2-15 years old of a statistically significant population, made twice a year, during and shortly after the transmission season.

b. On anopheline vector prevalence

i. Regular (fortnightly) anopheline adult captures, made in such a way as to give adequate and comparable data, in a sufficient

number of villages and shelters;

ii. Regular (fortnightly) anopheline larvae collections, made in such a way as to give adequate and comparable data, in a sufficient number of areas and breeding places.

c. On anopheline vector habits:

Periodical investigations on the ecology of the vector species, particularly in regard to resting and feeding, in important areas.

d. On mortality of vector species by insecticides:

Periodical susceptibility tests of the vector species to insecticides, in as many important areas as possible.

e. On duration of residual insecticide deposits:

Periodical bio-assay tests, in as many areas and types of walls as possible.

Discussions:

a. i. The infant parasite rate, termed by Barber as "transmission index", has been shown to have value as an index of liability to contract infection in a given locality, and is of great use in malaria eradication programmes.

a.ii. The house-to-house search for malaria cases was necessary for collecting comparable data on malaria prevalence, as the data obtained by the routine work in the Malaria Stations cannot give the real picture.

These data represent the number of visits paid to the Malaria Stations, for examination and treatment, by persons found with parasitaemia among an unknown number of patients and population, but do not give the malaria cases occurring in a given community in a certain period of time.

On the other hand, as the aim of these visits paid to the Malaria Stations for examination and treatment is the granting of medicaments, the same patient may visit the Malaria Station many times in a period, while patients living far from the Stations refuse to visit them even once.

However, methods of malaria detection, such as "active surveillance", have been found far superior to malariometric surveys, and can successfully replace other methods in measuring degrees of malaria prevalence (1)

(1) WHO/Mal/229 (1959).

a. iii. Malariometric surveys are still the best tool for evaluation in the phase of pre-eradication surveys and during the first years of the attack phase, for the purpose of establishing base lines and measuring degrees of malaria prevalence.

The spleen-rate, although not in large use in malaria eradication projects, is an extremely valuable measurement of endemic malaria, since it is not so liable as the parasite rate to rapid seasonal changes and involves very little expenditure of labour.

Especially in Egypt, perhaps, doubts can be expressed about the value of the "spleen rate" in areas where Schistosomiasis cases (S. mansoni) have occurred, although it is believed that splenomegaly in Schistosomiasis is observed mainly among patients over 14 years of age and, generally, in a low percentage(1), while our interest in malariometry is limited to the age-group 2-14 years, and mainly to the age-group 2-9 years.

The more delicate "parasite rate among infants" is of great value not only in measuring the rapidly changing volume of transmission, but also in discovering evidence of any continuation of transmission and hence its wider use in eradication programmes.

The malariometric survey, already started in September, in Lower Egypt will be made twice a year i.e. during the transmission season and shortly after it (during the month following the transmission season), as described in Table I below, separately for each part of the country, while a quarterly infant parasite rate will be carried out for the rest of the year.

TABLE I

Malaria transmission season in Egypt

Province	A. vectors species	Transmission season (months) starts	peak	ends
Lower Egypt	A. pharoensis	VII	*hIX - hX	XI
Upper Egypt	" "	VII	hX - hXI	XII
Fayoum	A. phar. & sergenti	VII	hX - hXI	XII
Dakhla oa.	" " " "	VIII	X	XII
Kharga oa.	" " " "	VIII	X	XII
Baharyia oa.	" " "	IX	X	XII
Siwa oa.	A. sergenti	?	X	?

(1) Bilharzia Section, MPH. (Dr. A.Antably)- Personal information. Craig C.F., and Faust E.C. "Clinical Parasitology", London.

*hIX = middle of September.

b. i. The data on seasonal anopheline prevalence will be of value, not only for the preparation of the ME Plan of operations, but, also, for comparison in the evaluation operations.

Fortnightly adult captures, made by the same method in about five selected villages in each District, representative of a bigger area (Province), will give data on the distribution and seasonal prevalence of the vector species.

It was found preferable not to change the method used up to now in the routine of the control work carried out in catching mosquitoes (flitting), but only to make the work regular.

b. ii. Apart from the adult captures, it was found necessary also to use larvae collections every fortnight, in a sufficient number of areas and breeding places, because of the special habits of the vector species, particularly in resting (indoors time 20.30 h. - 5.00 h.).

c. Investigations on the ecology of the vector species, particularly in regard to resting and feeding, are of importance as the whole plan of operations can be affected.

Although the possibilities of our Team are limited, efforts have been made to cover this demand, at least in some important areas.

d. A rather limited programme has been prepared for periodical susceptibility tests on larvae and adults of the vector species, in seven scattered areas (Damietta, Tanta, Qualiubia, Fayoum, Kharga oasis Asyut and Luxor).

However, a larger programme for susceptibility tests, prepared by Dr. A. Zahar, WHO Senior Adviser of Regional ME Training Centre in Cairo, was accepted and recently started, in which two members of our Team (Dr. A.Gad, Entomologist, and one Technician) are working.

The results of this effort, we are sure, will be of utmost importance for the whole plan of operations of the future malaria eradication campaign.

e. Bio-assay tests, started in few selected areas, had recently to be abandoned, when our Entomologist was engaged with the above-mentioned susceptibility tests.

5. EXTENSION OF THE SURVEY

According to the agreement signed, the survey should be extended to the whole territory of the Egyptian Province, and should take approximately one year.

The total land area of the country is 386,200 sq. miles, of which only 13,000 sq. miles are accessible to irrigation from the Nile (3.3 %), representing the most populated area.

Divided into three large areas, with clearly different geological and meteorological conditions (i.e., the Nile Valley, the Delta and the Desert), it has a total population of 18,966,767 inhabitants (1947 Census) which in 1961, when eradication is expected to start, is estimated to increase to 26,878,000, with about 78,000 of Arab Nomads.

For administrative purposes, the whole country has been divided into 21 Provinces and 133 Districts (3-9 in each Province), with an average population of about 150,000 in each District.

TABLE II

Population by Provinces, Egypt (1947 Census)

Province	Population	Province	Population
Lower Egypt		Upper Egypt	
Cairo	2,090,654	Asswan	290,842
Alexandria	919,024	Assiut	1,374,454
Canal	245,932	Beni Suef	612,027
Suez	107,244	Fayoum	669,696
Damietta	53,631	Sohag	1,283,468
Beheira	1,244,495	Giza	818,168
Dakahliya	1,413,905	Minya	1,044,201
Gharbiya	2,327,031	Quena	1,106,302
Menoufia	1,165,015		7,199,158
Kalyoubiya	693,908	Frontier Districts	
Sharkiya	1,345,829		
	11,606,668		
	7,199,158	Western Desert	74,839
	160,941	Red Sea	15,929
Grand Total	18,966,767	Sinai	37,670
		Southern Desert	32,503
			160,941

There are some 4,484 towns and villages in the country, mainly in the cultivated area of the Delta and the Nile Valley, the distribution of which by number of inhabitants is shown in the following Table No.III.

TABLE III

Towns and villages by population (estimate for 1961)

Department	Number of Towns and villages by population							
	a	b	c	d	e	f	Total	Population
Delta & Cairo	2298	117	75	2	5	2	2499	15,772,000
Nile Valley	1522	141	72	8	3		1746	10,208,000
Desert	226	4	6	2	1		239	898,000
	4046	262	153	12	9	2	4484	26,878,000
%	90.2	5.8	3.5	.3	.2			

a= less than 10,000, b=10-15,000, c= 15-50,000
d= 50-100,000, e= 100-500,000, f= over 500,000

With this geographical expanse of the country and the short malaria season, it is clear that the only way to extend the survey to the whole territory was the use of the Malaria Services established all over the country (40 Malaria Stations and 63 sub-Stations), for the regular observations on malaria prevalence and the Anopheline vector distribution and density.

On the other hand, the existence of rather big areas (Provinces) with the same malaria epidemiological characteristics (homogeneous areas) offered the opportunity to select one District in each Province as "Indicator District", considered as representative of the whole Province.

No case of biassed selection was confronted in fixing these "Indicator Districts", as no different attention has been given to them in the past, in connection with malaria control activities.

In each "Indicator District" about five scattered villages were selected at random for regular observations and for malariometric surveys, while two-three villages were selected in each of the remaining Districts of each Province for malariometric surveys only (infant parasite rate, Spleen and Parasite Indices among children and adults).

The following Table IV, and Maps A and B, give some details on the village selected in each Province.

For susceptibility and bio-assay tests, seven places have been chosen in different areas of the country with different climatological conditions, as shown in Maps A and B[1].

6. MALARIA IN EGYPT[2]

The presence of malaria in Egypt has been noted since ancient times, when a description of intermittent fever, presumably malaria, was recorded at the Dandara Temple in Upper Egypt.

From the 15th century malaria cases have been periodically reported by several writers in different parts of the country, and the first anti-malaria campaign was organized by Ross in 1903 for the Canal Zone, where one-third of the population suffered from malaria in 1900.

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(1) Damietta, Tanta, Qualiubia, Fayoum, Assiut, Luxor and Khorga oasis.

(2) Halawani A. and Shawarby A.A., Malaria in Egypt., J. Eg.M.Ass., V. 40, No II, (1957).
Sobky M.F., Administrative Organization in ME Programme.,(1959).
Corradetti A., Report on basic lines for ME in Egypt., (1957).

TABLE IV

Villages selected in "Indicator Districts".

Province	Population	District	Popul.	%	Villages selected No.	Popul.	%
Lower Egypt							
Canal	245938	Ismailia	118066	48.0	6	2549	2.2
Suez	107244	Suez	107244	100	3	6689	6.2
W. Desert	74839	Siwa	3799	5.1	2	205	5.4
Beheira	1244495	Damanhour	198701	16.0	5	4392	2.2
Gharbia	2327031	K.Sheikh	159971	6.9	5	9195	5.7
"		Tanta	305851	13.1	5	3658	1.2
Dakahlia	1413995	Faraskour	155052	11.0	5	7575	4.9
"		Mansoura	260635	18.4	5	11001	4.2
Menoufia	1165015	Shebin-el-Kom	197189	16.9	5	13882	7.0
Sharkia	1345829	Zagazig	255689	19.0	5	10751	4.2
Qualiubia	693908	Benha	171719	24.7	5	7169	4.2
	8618288	11	1933916	22.5	51	77066	4.0
Upper Egypt							
Giza	818168	Giza	213311	26.1	5	7526	3.5
Fayoum	669696	Fayoum	183309	27.2	5	10776	5.9
Beni-Suef	612027	Beni-Suef	146031	23.9	5	5837	4.0
Minya	1044201	Minya	209150	20.0	5	10031	4.8
Assiut	1374454	Assiut	203791	14.8	5	8827	4.3
S. Desert	32503	Kharga	11155	34.3	3	2910	26.1
Sohag	1283468	Sohag	180164	14.0	5	10490	5.8
Quena	1106302	Quena	118336	10.7	5	16771	14.2
Asswan	290842	Asswan	26833	9.9	3	5201	18.0
Asswan		Ballana	4050	1.4	5	948	23.4
	7231661	10	1297130	17.9	46	79317	6.1
TOTALS	15849949	21	3231046	20.4	97	156383	4.8

In 1930 the first Malaria Control and Research Station was established in a malarious area near Cairo, and in 1936 - a year with an unusual increase of malaria cases - the Malaria Section was established in the Ministry of Public Health.

In 1942 an outbreak of malaria epidemic in Upper Egypt (Nubia) with a high mortality, caused by invasion of A. gambiae from the South, led to the establishment of a new Section, the Insect Control Section, and to the further growth of the Malaria Section.

The data obtained by the remarkable work done by the personnel of those two Sections and other workers, with the figures to be available at the end of the survey, will be used as bases for the preparation of a sound ME Plan of operations.

The three common species of malaria parasite are existing in the Country, with a relative frequency approximately expressed by the ratio of thirty-one for Pl. vivax, eighteen for Pl. falciparum, and one for Pl. malariae (350,000 slides examined, period 1936-1952).

Although a low frequency of Pl. falciparum has been also found in the examination of about 1,000,000 slides during the period 1953-1956 (Table V), there are zones where this species was repeatedly found.

The presence of Pl. malariae is limited and almost restricted to the oases and Fayoum, with a few cases in the Suez Canal Zone and the Eastern Delta.

TABLE V

Parasite species found during 1953-56

	General survey*					Out-patients				
	ex/ed	pos.	v.	f.	m.	ex/ed	pos.	v.	f.	m.
1953	288220	466	422	30	14	47425	2275	2169	105	1
1954	239285	177	155	22		40046	2232	2208	24	
1955	168784	302	195	107		35381	1853	1829	24	
1956	290641	535	521	14		37577	1798	1785	15	
	986930	1480	1293	173	14	160429	8158	7991	166	1
		%	87.3	11.6	.9		%	97.9	2.0	

From the eight anopheline species found in the country(**), A. pharoensis and A. sergenti are proved malaria vectors, while A. multicolor is considered a malaria vector on epidemiological grounds only, and has never been shown as a natural vector.

A. pharoensis is widely spread all over Upper and Lower Egypt, except Siwa oasis, and is chiefly responsible for the transmission of malaria in Egypt, while A. sergenti is a desert species occurring in Fayoum, Sinai and all the oases, but rarely met in Suez Canal Zone and in the Delta, being absent in the Nile Valley. It is the main vector in the areas where it occurs.

From 1936 periodical studies on malaria incidence have been made, by various workers in the most important parts of the country.

In 1936, the examination of about 1500 children under 15 years of age, by Barber and Rice, showed a parasite index of 40.0 % and spleen index of 31.0 % in the Delta, near rice fields (615 examined), and lower parasite indices in other localities of the Delta (7.0 %), in the suburbs of large cities (2.0 %), and in Giza Province, near Cairo (0.4 %).

Although a gradual general decline in malaria incidence has been shown in the following years, small irregular epidemic

(*) (covering all ages and all year round).

(**) A.pharoensis, A.sergenti, A.multicolor, A.coustani (mauritianus), A.d'thali, A.algeriensis, A.susperpictus, A.ropicolus.

Occurances take place every few years in different parts of the country, which, apart from other causes, are probably related to special climatological and hydrological conditions (high flood of the Nile) and to higher density of the vector species.

For instance, an unexpected increase of malaria cases occurred in 1957 and 1958 after a high flood of the Nile, with 4899 malaria cases confirmed by laboratory examination in 1957, and 32517 in 1958 (slides examined: 48255 and 118279 respectively).

7. ACHIEVEMENTS OF THE SURVEY

As the survey has not yet been completed, and moreover we are still in the middle of the transmission season, after which more important data will be obtained, it is obvious that the figures which we are able to present to this meeting do not cover the whole extent of the subjects under discussion.

The survey started in May i.e. just before the commencement of the transmission season, with regular investigations on malaria prevalence and anopheline vectors distribution and density, in about ninety-five villages selected in twenty-one "Indicator Districts".

Monthly and fortnightly reports submitted to our Office by the Malaria Stations in the field provided the figures, with which separate tables have been prepared for each Indicator District and Infant Parasite Rates, Malaria cases detected (Tables VI and VII) as well as Anopheline adult captures and Anopheline larvae collections.

TABLE VI

Monthly Infant Parasite Rates in 21 "Indicator Districts"
(97 Villages, popul. approx. 150,000)

ID(*)	May		June		July		August		September	
	a	b	a	b	a	b	a	b	a	b
1.	105	0	121	0	135	0.0	126	2.1	125	4.0
2.	198	0	203	0	233	0.0	212	0.5	254	0.0
3.										
4.	213	0	139	0	111	0.0	105	14.0	107	12.0
5.	340	0	315	0	321	0.6	332	7.1	323	8.0
6.	140	0	152	0	247	1.2	273	9.9		
7.	123	0	240	0	263	0.0	263	0.0		
8.	387	0			264	0.7	79	6.3		
9.	276	0	330	0	307	0.0	306	0.0	289	0.0
10.	421	0	414	0	393	0.5	380	1.3	361	1.9
11.	256	0	288	0	299	0.0	256	0.0		
12.			110	0	178	0.0	216	0.0	197	1.5
13.	373	0	362	0	350	0.0	336	0.3	352	1.1
14.	52	0	214	0	192	0.0	191	0.0	193	0.0
15.	65	0	234	0	242	0.0	235	0.0	228	0.0
16.	259	0			283	0.0	258	0.0	269	0.0
17.	66	0	127	0	118	0.0	119	0.0		
18.	224	0	180	0	219	0.0	162	0.6		
19.	200	0	230	0	211	0.0	370	0.0	328	0.0
20.	102	0	141	0	145	0.0	142	0.0	143	0.0
21.			5	0	24	0.0	15	0.0	28	0.0
Tot.	3800	0	3805	0	4535	0.2	4376	1.8	3189	1.8
L.E.	2459	0	2202	0	2573	0.2	2332	3.3	1459	3.4
U.E.	1341	0	1603	0	1962	0.0	2044	0.04	1730	0.4

ID = Indicator District, (*) as in Table IV.
a = Infants examined, b = Infant Parasite Rate.

TABLE VII

Malaria cases detected by house-to-house visits, in 21 Indicator Districts (97 Villages, popul.: approx.150,000)

ID (*)	May aI	May bI	June aI	June bI	July aI	July bI	Aug. aI	Aug. bI	Sept. aI	Sept. bI
1.			25	8.0	29	3.4	24	12.5	37	18.0
2.	46	0.0	30	0.0	17	0.0	40	8.0	25	77.0
3.										
4.					7	100.0	2	100.0	9	88.0
5.	130	1.5	25	12.0	38	5.2	91	14.0	606	7.0
6.	32	0.0	85	7.0	47	19.0	145	30.0		
7.	23	0.0	113	1.7	173	1.1	173	1.1		
8.							5	100.0		
9.	33	0.0	12	8.3	61	3.2	36	8.3	44	11.0
10.	175	0.5	259	5.4	196	8.0	174	12.5	120	15.0
11.			35	2.8	78	3.7	39	7.7		
12.			137	0.7	53	9.4	26	15.0	47	4.0
13.	21	0.0	43	0.0	64	0.0	61	0.0	56	0.0
14.					1	100.0	21	100.0	18	0.0
15.							1	0.0	2	0.0
16.										
17.	17	0.0	27	0.0	11	0.0				
18.	232	0.0	95	0.0	76	0.0	41	0.0		
19.	1	0.0							8	0.0
20.							1	0.0	1	0.0
21.			2	0.0	3	0.0				
Tot.	710	0.4	888	3.3	854	5.6	880	12.5	973	10.3
L.E.	439	0.4	584	4.9	646	6.6	729	17.5	841	11.7
U.E.	271	0.0	304	0.3	131	3.8	151	1.9	132	1.5

Periodical investigations on the ecology of the vector species, particularly in regard to resting and feeding, as well as, periodical susceptibility and bio-assay tests were carried out in certain areas of the country.

On the other hand, malariometric survey started in September in Lower Egypt and will be continued in about ninety-five villages of the twenty-one "Indicator Districts" and in about 300 villages of the remaining 112 Administrative Districts.

ID = Indicator District, (*) as in Table IV.
aI = Persons with fever and history of fever, bI = Positive %.

According to the figures available, the data obtained up to now can be described as follows:

1. On malaria prevalence:

a. Infant Parasite Rates:

About 4000 Infants (average 3941) have been examined every month in the villages selected in the Indicator Districts, from a population of about 150,000 (85.5 % of the existing infants).

The first positive blood-smears appeared in July in Lower Egypt (Kafr-el-Sheikh, Tanta, Mansoura and Zagazig), with IPR from 0.5 to 1.2.

The maximum rates were shown in August and September as follows:

	August	September
In Ismailia		4.0
" Behcira	14.0	12.0
" Kafr Sheikh	7.7	8.0
" Tanta	9.9	
" Mansoura	6.3	
" Zagazig	1.3	1.9

In Upper Egypt, only the Provinces of Giza and Fayoum gave positive IPR, the first in September (1.5 %) and Fayoum in August (0.3%) and in September (1.1 %).

The earliest infections have been shown in infants as follows:

	age in months		
	1	2	3
In July:			
In Tanta on Infant:			1
In August:			
In Kafr Sheikh on Infants:		2	2
In Behcira on Infant:			1
In Gharbia on Infants:		2	1

Only one Infant was found infected with Pl. falciparum, in Fayoum during August, while all the rest (187) were infected with Pl. vivax.

b. House-to-House search for malaria cases:

An average of seventy-eight villages of the Indicator Districts have been visited each month, with an average population 159,115, 89 % of which has been seen and questioned for malaria cases.

Among a total number of 4351 persons found with fever at the time of visit (57.1 %), or with history of fever (42.9 %), 304 persons were found with parasitaemia (6.9 %), from May to September.

Most of the positive cases were confirmed in Lower Egypt, mainly in the Provinces of Kafr-el-Sheikh, Gharbia, Suez and Behaira, while in Upper Egypt positive slides (12) were found only in Giza.

All the cases were caused by Plasmodium vivax.

The distribution of the cases found by month was as follows:

	M	J	J	A	S	Total
Lower Egypt	3	29	43	106	111	292
Upper Egypt	0	1	5	4	2	12
	3	30	48	110	113	304

The distribution of the same cases, together with the cases found during the search for the Infant Parasite Rates, made in the same villages at the same time, by age-groups, was as follows:

	0-1	2-9	10-14	15+	Total
	164	161	70	73	468
%	35.0	34.4	14.9	15.7	

c. Malariometric survey:

Malariometric surveys, to be carried out in the ninety-five villages of the Indicator Districts and in about 300 villages in the remaining Districts, started in the middle of September and have not yet been completed.

Only few data are available up to now, which are shown in the following Table:

Ind. District	Villages	Popul.	ex/ed	Mx. SI %	Mx. AES	Parasite Index
Upper Egypt						
GIZA	5	7606	461	10.3	2.1	Not available
QUENA	2	2560	375	2.8	1.1	" "
Lower Egypt						
QUALIUBIA	5	8590	1066	50.4	1.9	" "
DAMIETTA	2	3793	444	12.4	1.7	" "
MENOUFIA	2	7207	374	17.9	1.7	" "
KAFR SHEIKH	4	4798	798	40.8	1.7	" "

2. On anopheline vector prevalence:

a. Regular anopheline adult captures:

Fortnightly anopheline adult captures made by the personnel of the Malaria Stations in the villages selected in the Indicator Districts, gave the following results:

The first A. pharoensis adults were caught during the second fortnight of May, in certain Provinces of Lower and Upper Egypt (Kafr-el-Sheikh, Dakahlia, Beni Suef, Fayoum and Kharga oasis), with Indices between 1.0 and 3.2, while A. sergenti was first caught in Kharga oasis (Index I.I), and A. multicolor adults were, first, caught in Fayoum and Kharga oasis (Index 0.4). A.coustani was, first, found in Kafr-el-Sheikh at a low Index (I.4), in May also.

The main vector species, A. pharoensis continued to be caught in the following fortnights, in Lower and Upper Egypt, with a peak in August for Lower Egypt and in September for Upper Egypt.

A. sergenti captures gave too small figures in Fayoum and Kharga oasis.

b. Regular anopheline larvae collections:

Larvae of A. pharoensis were collected in Lower and Upper Egypt from the beginning (May), with a peak in August for Lower and in September for Upper Egypt.

A. sergenti larvae were found from May, in Fayoum and Kharga oasis, while A. multicolor larvae were collected in Lower Egypt from June and from May in Fayoum and the oases in lower numbers (mainly in Kharga oasis).

A. coustani larvae were collected in Lower Egypt, with a peak in July and August.

3. Investigations on the anopheline vector habits:

Biological observations on the vector species made by Dr. A. Gad, the Entomologist of the Team, particularly in regard to the resting and feeding, gave the following results:

- A. pharoensis adults have a strong preference for entering bell-shaped tents, with a peak of abundance at about 2 a.m.

- Similarly, they frequent houses in the evening, rest on the walls, furniture and ceilings, but leave premises early in the morning.

- Adults of both sexes were found during the day, resting on rice plants irrigated with water.

- No adults were found in bedrooms or stables in the afternoon, before 8.30 p.m. (summer time).

- It has been repeatedly observed that female mosquitoes in all the different gonotrophic stages could be found in tents.

More detailed data in night catches (gonotrophic stages) would provide more important information on resting and feeding.

- A swarm of males A. pharoensis was observed in Fayoum, after sunset, at a height of about two meters, near rice fields.

- For food preference of the same species, blood-meals have been collected and sent to the Laster Institute, London, for precipitin tests.

4. Susceptibility tests on A. larvae and adults:

a. On larvae:

For A. pharoensis larvae, collected from a swamp in Kafr Soliman Awad, near Tanta (Gharbia Province), a place with no previous history of malaria control but not far from cotton cultivation, usually dusted or sprayed with cotton-dust and toxophane, four susceptibility tests were carried out with the following results:

DDT conc. p.p.m.	Alive	Dead	Total	Mortality %
0.1	0	21	21	100.0
0.02	1	96	97	98.9
0.004	25	163	188	86.7
0.003	24	24	48	50.0
0.002	56	41	97	42.3
0.0008	46	29	75	38.6
Control	185	11	196	5.6

(Temp.: 26-29° C)

The LC 50, plotted graphically is about 0.003 ppm. DDT. Larval susceptibility tests, carried out in other areas, showed more or less similar mortalities.

For A. sergenti larvae collected in Fayoum Province from an area with a long history of malaria control operations by residual insecticides, susceptibility tests carried out showed that:

the 0.004 ppm. DDT gave mortality of 56.8 % (51 larvae, 2 replicates) and the 0.02 ppm. DDT gave mortality of 87.0 % (23 larvae, 1 replicate) while no mortality occurred in the control.

b. On adults:

A. pharoensis

Previous adult susceptibility tests, carried out in 1956, 1957, and 1958, by Dr. A.Gad and Dr. Kamel, using the Busvine-Nasr technique in the first two years and the WHO standard method in 1958, gave LC 50 values between 0.5 % and 0.7 %, in Marg (Qualiubia Province).

The same area, tested again in 1959, showed a higher LC 50 of about 1.2 % in July and 1.7 % in August.

This area is not under any malaria control operations, but cotton cultivation is extensive around the places from which the mosquitoes were captured.

- The lowest LC 50 figure obtained this year was about 1.0 % DDT, in Ras-el-Bar, an area of very little cotton cultivation.

Three series of tests have been performed, i.e., in July, at the middle and at the end of September, with LC 50 between 0.8% and 1.2 %.

The following Table summarises the results:

DDT %	July (2 Tests)		Sept.(mid) (2 Tests)		Sept. (end) (10 Tests)	
	No	Mort. %	No.	Mort. %	No	Mort. %
0.5	37	16.2	27	18.5	132	22.7
1.0	49	46.9	68	52.9	236	37.7
2.0	63	82.5	71	88.7	261	82.3
4.0	64	100.0	56	100.0	246	99.1
Control	120	4.2	103	1.9	244	2.4

- Adult susceptibility tests on A. pharoensis in other areas gave LC 50 of 1.9 % DDT in Fayoum and Tanta, and 2.5 % in Mit-Ghamr.

- According to these results, a certain amount of DDT tolerance by A. pharoensis exists in many parts of the country and complete mortality is not obtained on the 4 % impregnated papers.

- Results with Dieldrin gave a high degree of resistance of A. pharoensis to this insecticide, in Marg, Fayoum, Ras-el-Bar and Tanta.

In some areas (viz. Tanta), no mortality occurred with 1.6 % for one hour, while in another area (Ras-el-Bar) a mortality of 48.6 % occurred with the 1.6 %, for an exposure of 24 hours.

The results of a larger programme for susceptibility tests in areas scattered all over the country, undertaken by Dr. A. Zahar of the WHO Training Centre, with the data to be obtained from the ME Pilot Project, proposed by the ME Technical Board, for Qualiubia Province (population 693, 908) in 1960, will provide basic information for the country-wide ME Campaign to be started in 1961.

5. Duration of residual insecticide deposits:

Bio-assays, carried out with A. pharoensis blood-fed adults on mud walls, treated with 2.0 gr. DDT w/p per sq. meter, in Marg, gave complete kill for two months after spraying, followed by a drop in the third month to only 30 %.

It was only on the protected parts of the wall (e.g., behind an open door) that high mortalities continued until about 100 days after spraying.

In other areas, however, results on the mud walls were very poor, even after less than one month from spraying. In Tanta, for instance, 22.2 % mortality occurred after twenty-four days, and in Damietta 67.0% after twenty-seven days.

Results on the lime-washed walls were higher. In Tanta, for instance, mortality was 76.0 % and in Damietta 100.0, after 25 and 28 days respectively.

These are the results, obtained up to now by the work of the Pre-eradication survey, at the end of which, we believe that complete picture of the malaria problem in the country will be given, for the preparation of the sound Plan of operations of the Malaria Eradication Campaign to be started in 1961.

ACKNOWLEDGEMENTS:

I would like to express my grateful thanks to HE The Minister of Public Health, for his interest in the success of the survey, and to the personnel of the same Ministry for their great assistance and prompt collaboration.

Special thanks are due to the national personnel of the Pre-eradication Survey Team, and the personnel of the Malaria Stations in the field, for their contribution to the work done up to now.

MEP-Egypt 23/Pre-eradication survey.

PROVINCE OF .....

1. BOUNDARIES:

North .....
South .....
East .....
West .....

2. Area and Altitude:

Total area in sq. miles .....
Altitude (a) in meters .....
Cultivated area, sq. miles .....

3. Climatology: (b)

Name and place of the Meteorological Station from which data were taken .....
Temperature in C°, Mx, Mn, and Mean by month.
Relative Humidity (as above).
Rainfall in inches, by month
Winds, Direction and Velocity, by month.

4. Communications:

Ports (from, to, how often)
Airports (as above)
Railway (as above), also number of miles inside the Province and names of the main Stations.
Bus Service (as above)
Roads (miles by class, condition).
Post offices.

5. Housing:

Types of houses
Material of construction
Material of inside walls
Average area of inside walls, sq. m.
Average number of persons per house
Any housing scheme ? (description, progress)

6. Population:

Last Census: Date ..... Population .....
Previous Census: Date ..... Population .....
Last Census Annual increasing rate % .....
Estimated population for each year from 1960 to 1965.

(a) elevation from sea level, (b) Data for five last years taken from the Meteorological Station established in the Province, otherwise from the nearest one.

Density of the population by District (area in sq. miles, population - last Census - persons per sq. mile)
Vital Rates (for each last five years; Birth R., Death R., Infant Mortality R.)
Principal causes of death (last five years)
Deaths from malaria (last ten years, by month).

7. Prevalence of malaria:

Routine blood-smears examination (last five years) by year and District, examined, positive %, parasite species %, Gametocytes %. Parasite species by month.
Malariometric Indices: by year, District and age groups
Register of patients
Other information
General view

8. Transmission period:

9. Anopheline vector distribution and density:

Anopheline species existing (caught): by District, year, month.
Period of higher density: species, District, month.
Kind of breeding places for each species, period.
Breeding places existing, permanent, temporary, period, extension.

10. Spraying operations:

Number of villages existing, Number of villages sprayed each year, by month, Houses sprayed, population protected, insecticide used, its formulation, wall dosage.
Number of houses sprayed per man-day.
Number of houses sprayed once, and more than once!

11. Breeding control operations:

Number of squads used, type of control (Larviciding, clearing), population affected, larvicide used-amount, Houses also sprayed. Period of work.

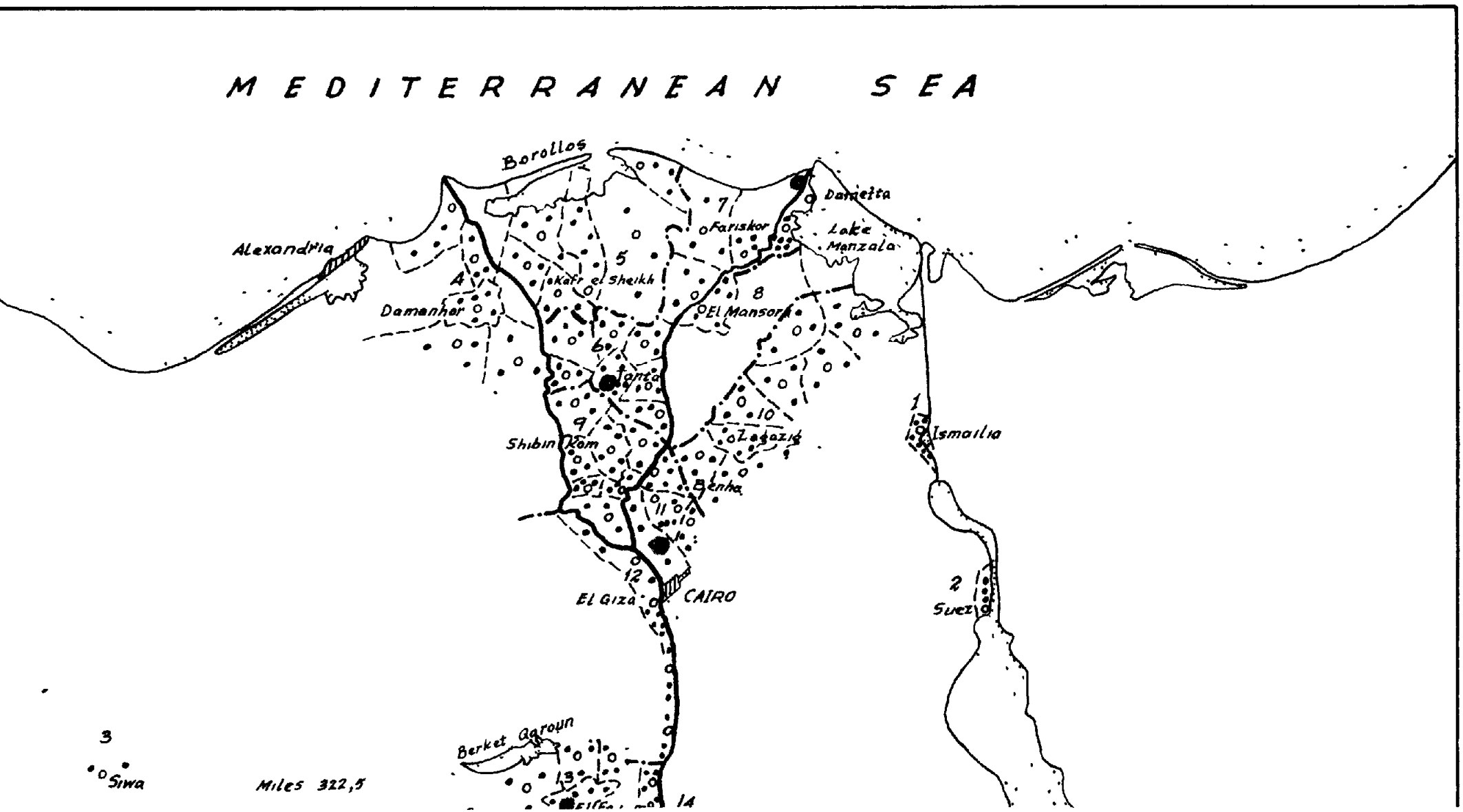
12. Malaria Service in the Province:

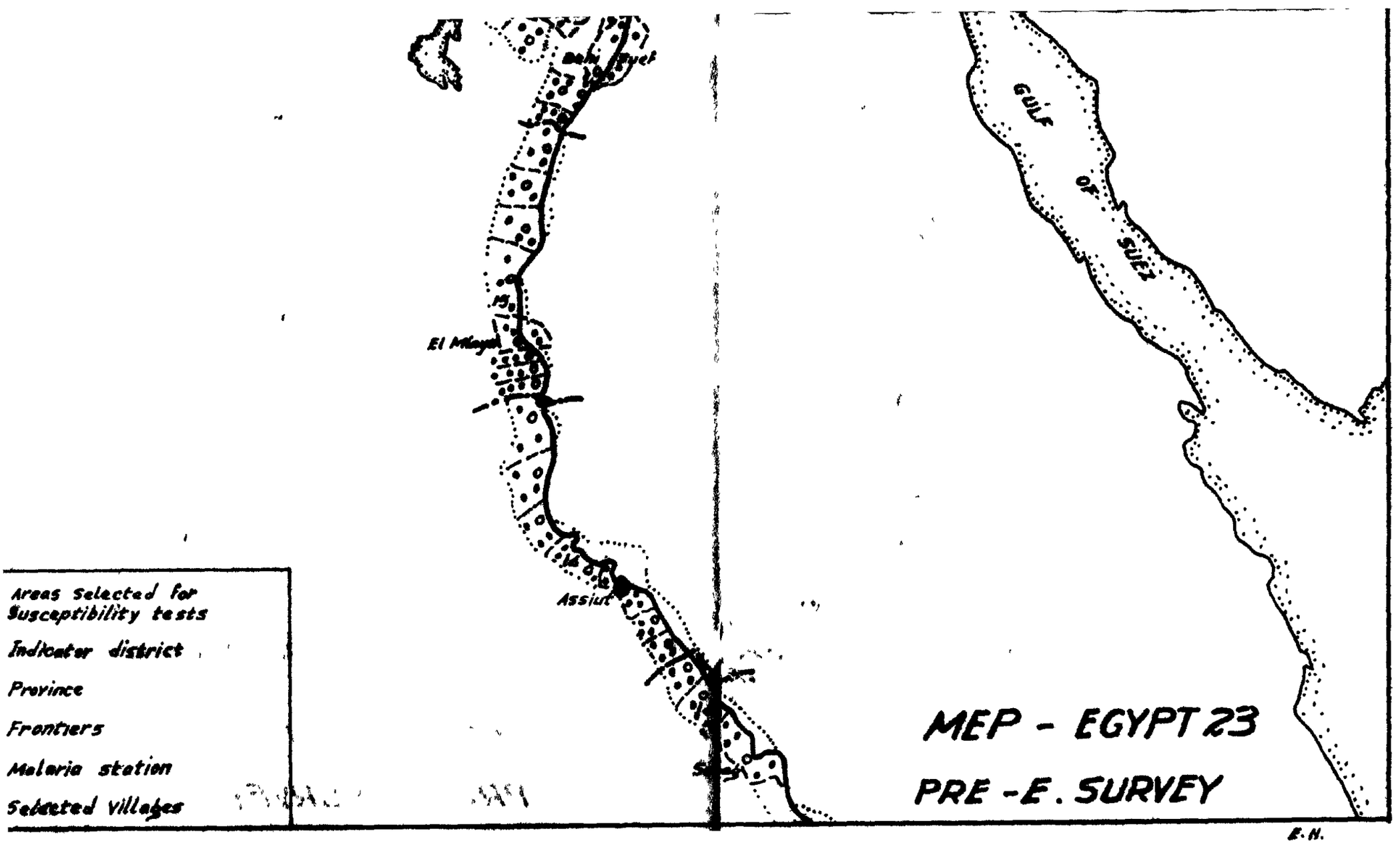
Malaria Stations established: when and where, personnel: numbers by Station and position.
List of the personnel: name, age training: when, where, how long in the Service, efficiency.
Laboratory facilities: Technician, microscope, slides etc.
Equipment and supplies: Sprayers: number, types, condition. Insecticides: type, formulation, quantity, condition. Storehouse.
Transportation facilities: Type, number, condition, spareparts.

13. Health Services in the Province:

Hospitals, Dispensaries, Clinics, Other: place, name, activities, co-operation with the Malaria services.

VILLAGES SELECTED IN IND. DISTRICTS

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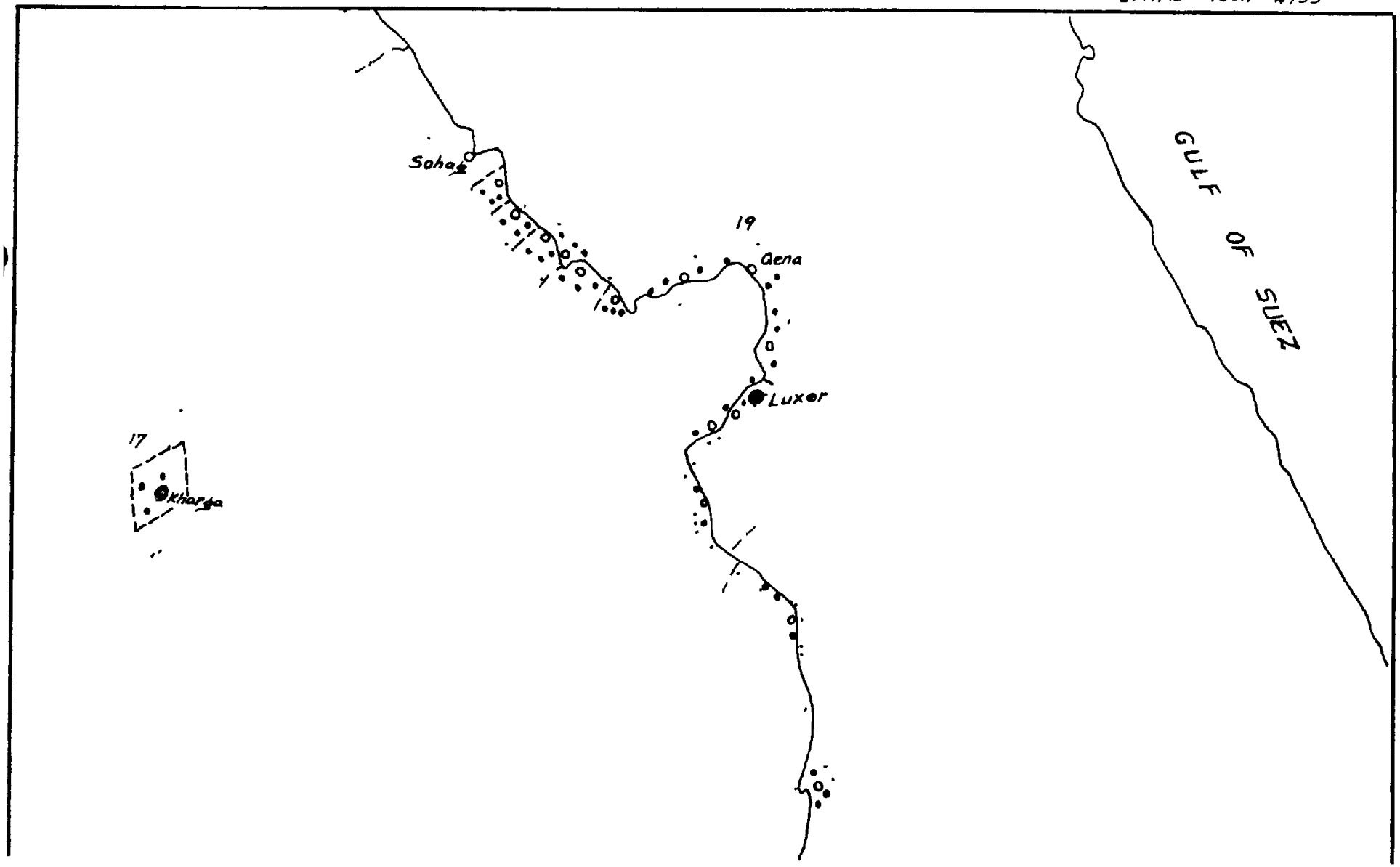
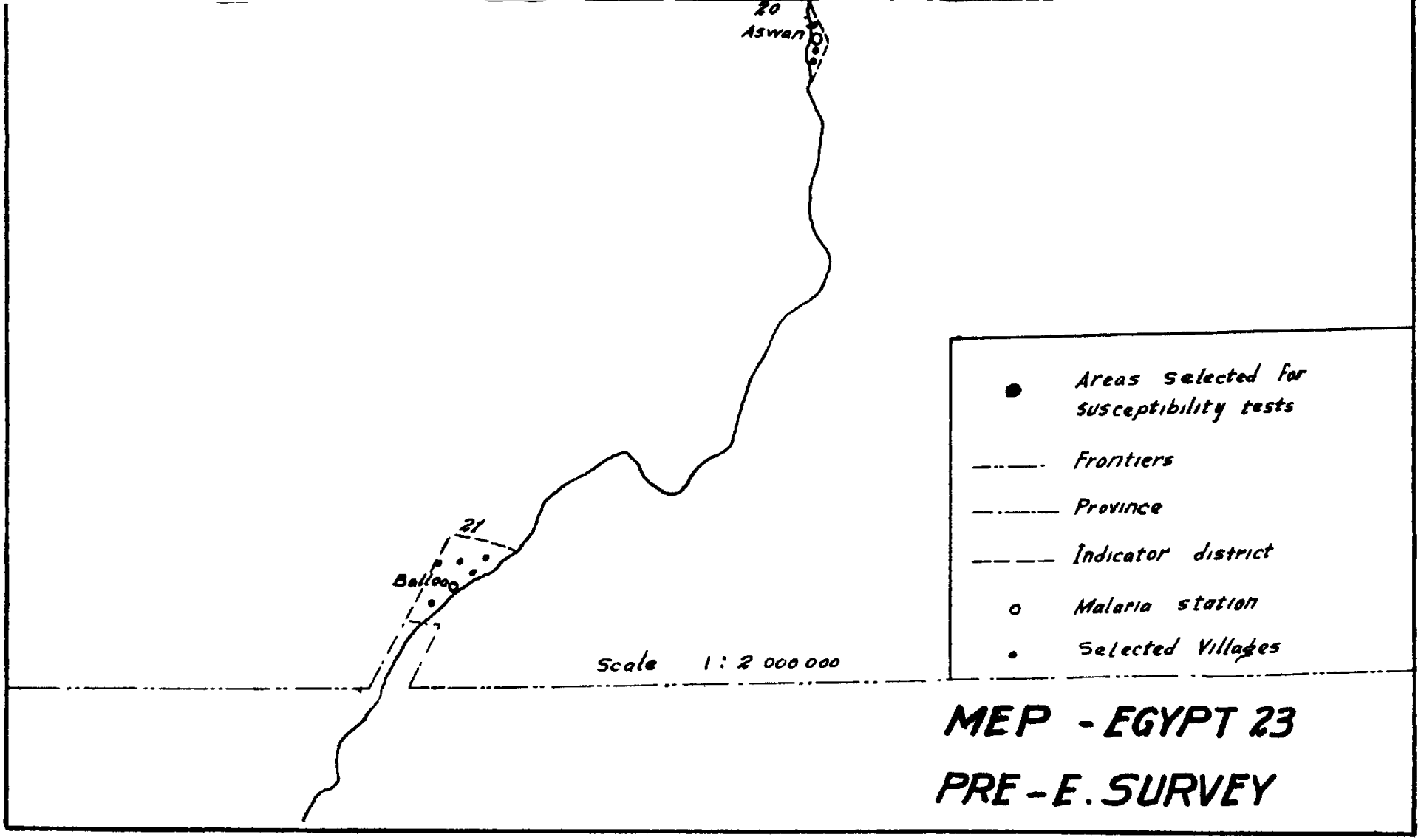
Areas Selected for Susceptibility tests
Indicator district
Province
Frontiers
Malaria station
Selected villages
MEP - EGYPT 23
PRE - E. SURVEY
E.M.

MAP B, VILLAGES SELECTED IN IND. DISTRICTS

EM/ME - Tech 2/33

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Aswan
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Areas selected for susceptibility tests
Frontiers
Province
Indicator district
Malaria station
Selected Villages
MEP - EGYPT 23
PRE-E. SURVEY

EM/ME-Tech.2/33

CHART I

MEP - EGYPT 23
Pre-eradication Survey

INFANT PARASITE RATE

Province or Governorate	Indicator District	Population of Villages Selected	Village		Infants		Positives			
			Sel.	Vis.	exis.	exam.	No.	%	1	2

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Pre-eradication Survey

HOUSE-TO-HOUSE FEVER

Province or Governorate	Indicator District	Villages		Houses		Persons		No. of Slides		
		Sel	Vis	exis.	seen	exis.	seen	a.	b.	Total

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Pre-eradication Survey

ANOPHELES ADULT CAPTU

No.	Province	Indicator District	No. of Villages		No. of Port night.	No of places exam.								
			sel.	exa.		Positive				A. phar.				
						Total	Bed Rooms	Stables	Tents	Total	B	S	T	B

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Pre-eradication Survey

AN. LARVAE COLLECTI

No.	Province	Indicator District	No. of Areas of Villages		No. of fortnight	Breeding Places exam.		Dips Taken		An. Larvae coll				
			Sel	exam.		No.	M^2	Total	Dip/M^2	Total	Phar.	Sergt.	Mult.	Cust

Month.....

(MONTHLY (SUMMARY MONTHLY REPORT)

Year.....

Positive (Age per month)										Parasite species				0 %
3	4	5	6	7	8	9	10	11	12	v.	f.	m.	Mx.	

Month.....

SURVEY (Summary monthly Report)

Year .....

Positives		% Positive by age grps.			% Parasite species				0 %
No.	%	2-9	10-14	15-	v.	f.	m.	Mx.	

Month.....

RES (SUMMARY MONTHLY REPORT)

Year.....

Anophelines caught												Anophelines Imps. (MX).				
A. serg.			A. mult.			A. cost.			Others							
B	S	T	B	S	T	B	S	T	B	S	T	Phar.	Serg.	Mult.	Cost.	Others

Month .....

Year .....

ONS (SUMMARY MONTHLY REPORT).

ected		An. Index. (Mx.)						Remarks
	Others	Phar.	Sergt.	Mult.	Cost.	Others	An. pupae	