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ENTOMOLOGICAL (BIOLOGICAL-ECOLOGICAL-TOXICOLOGICAL-CYTOGENETIC)--ETC(U)
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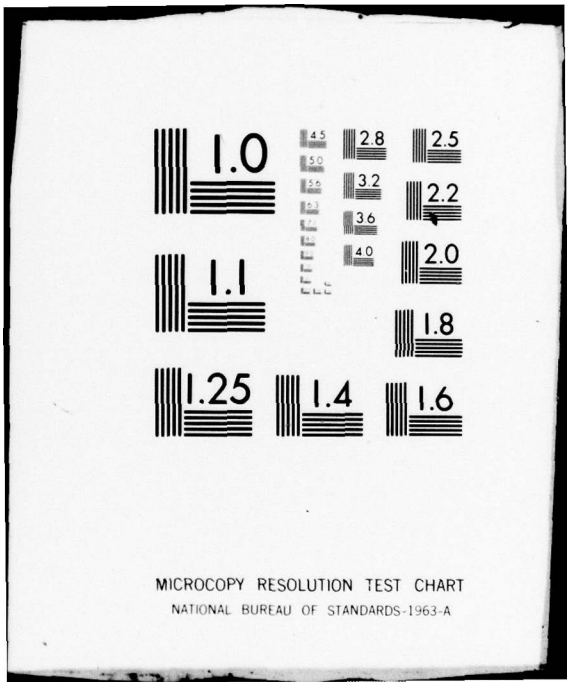
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1.6
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2.2
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MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

OFFICE OF NAVAL RESEARCH

Contract No (15) N00014-77-G-0044

Task No. NR204-667

(12) 170

(9) ANNUAL REPORT, NUMBER (no. 2)

(6) Entomological (Biological-Ecological-Toxicological-Cytogenetic) and Parasitological studies in relation to malaria and its responsible vectors in Egypt.

(10) By Dr. A. A. Soliman

(Principal Investigator)

× Malaria Research Unit

→ Faculty of Science

Ain Shams University, Abbassia

Cairo, Egypt

(11) 1 Jun[illegible]79

CONTENTS

Success All The Way

I. GEOGRAPHICAL AND SEASONAL SURVEYS FOR DIFFERENT ANOPHELES SPECIES IN RELATION TO THEIR EFFICIENCY IN TRANSMITTING MALARIA AND THEIR ATTRACTION TO HUMANS.

I. GEOGRAPHICAL AND SEASONAL SURVEYS FOR ANOPHELES SPP. IN RELATION TO THEIR EFFICIENCY IN TRANSMITTING MALARIA AND THEIR ATTRACTION TO HUMANS :

Entomological and parasitological teams from the Malaria and other Parasitic Diseases Research Unit, Entomology Department, Faculty of Science, Ain Shams University, in collaboration with the Malaria - Filaria Department and the Vector Control Section, Ministry of Public Health, continued their entomological and parasitological studies.

Surveys progressed in continuation to those reported in the second progress report (July-December 1978).

More villages in various Governorates were surveyed for entomological and parasitological data.

The bases for selecting the villages were the same as those mentioned in the First Annual Report (May, 1978).

1. Governorates and localities surveyed:

The sites surveyed during the period covered by the present report are listed in the table (Table 1).

The accompanied series of maps indicate the geographical situations of localities (Maps 1-13).

.Table (1) Governorates and Localities surveyed for Entomological studies during the period of this report (June 1978 to June 1979)

Governorate	Localities
Qalyubiya (Map 1)	El Alag, El Khanka, 23rd July village, El Khesous, El Marg, Ezbet El Nakhl, Kafr El Shurfa Menit Shebin, Arab El Heswa El Gaafra, El Salmania Balaks, Kom Ashfin, Sendium, Tersa.
Minufiya (Map 2)	Mit Khalaf El Bahariam, El Batanor Station village, Mit Khacan, Toukh El Bararta, El Kom El Akhdar, Menshet Nagaty, Selka, Mit El Moz, Kafr Guinedi Ezbet Zoid.
Gharbiya (Map 3)	Kafr Abu Daoud, Hanoun, El Hayatem, Mehalet Marhoum.
Sharqiya (Map 4)	Ezbet Zaki, El Moufatish, Basatin El Ismailiya, El Malha, El Khashaniah, Ezbet Soker, Ezbet Salama, El Qurin, Kafr El Azazi, El Tawahna, Ezbet Lahm, Ezbet Nigm.
Kafr El Sheikh (Map 5)	El Shawadfi, Ezbet Osman Maher, Ezbet Younis, El Hedoud, Ezbet Alam, EL Hamarawi, Abu Fis, Aum Sen Sharqiya, Ezbet El Ashraf, Kafr El Sheikh City, Belshasha, Kafr Abu Ziadah, Ezbet Heles, Ezbet Ibrahim, El Karada, Mehalet El Kasab, El Zaniah, Rwena, El Zakan.

Table (1) Cont.

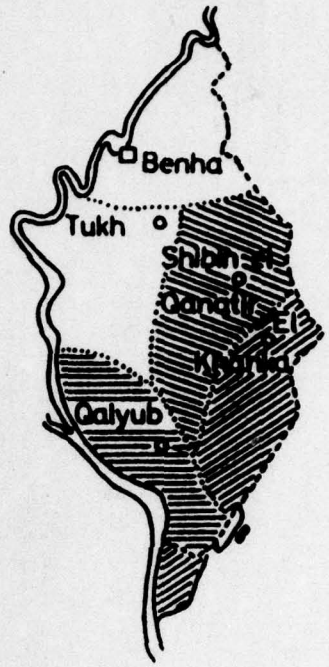
Governorate	Localities
Dagahliya (Map 6)	Menit Sandob, El Halawani, Salalant, Ezbet Ahmed Fouda, Ezbet Mohamed El Hag, Sorsok, Mit Badr Hamis, Mit Anter, Noketah, Ezbet Mohamed Nour.
Beheira (Map 7)	Ezbet Erfan, Ezbet El Masry, Kafr Saad, Abu Frash, El Kafr El Gedid, Ezbet Morkos, Menit Salam, Kafr Ghonem, Minshat El Wekil, Surnbay, Quracus, Ezbet Mazen, Ezbet El Seman, El Auga.
Damietta (Map 8)	Ezbet El Lahm, Ezbet El Khaiatah, Shat Herybah, El Sheikh Dergham, Kafr Hamedo, Ezbet El Saideen, Shataa, Ezbet El Ratmah.
Canal Zone (Ismailiya & Port Said) (Map 9)	Kafr El Sheikh Alaya, El Farabwa, El Dahriah, Ezbet El Mazaraa, Ezbet Hassan Effendi, Nefeshah, El Qantara West, El Hersh, El Raswa, Ganain El Raswa.
Faiyum (Map 10)	El Nazla, Mensheit Bagdad, El Zawiah El Khadra, Terssa, Abheit, Kafr Abu Saad, Ezbet Rahem, Biahmou, Ezbet El Sheikh Said, El Agamiyin, Ezbet El Hag Mohamed, El Seidi, Menshat Halfa Sinnuris.

Table (1) Cont.

Governorate	Localities
New Valley (Map 11)	Asmant, Tenada, Balat.
El Dakhla Oasis	El Sheikh Walley, Ezbet El Kasr, Bedakhlou, El Roshda, Mout, El Hendawi.
El Kharga Oasis	Bolaq, Hebis, Ber El Agoz, Ber El Maharig, El Gzaer, Sanaa.
Siwa Oasis (Map 12)	
Baharia Oasis	El Kasr, El Bawiti, El Gara.

QALYUBIYA GOVERNORATE

N.



----- Governorate
..... District
□ Capital of the governorate
o Capital of the district
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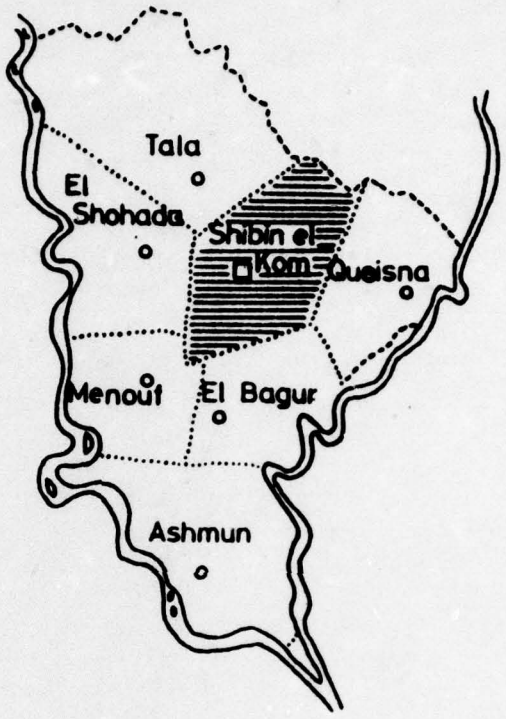
Scale : 1:500000

Map 1

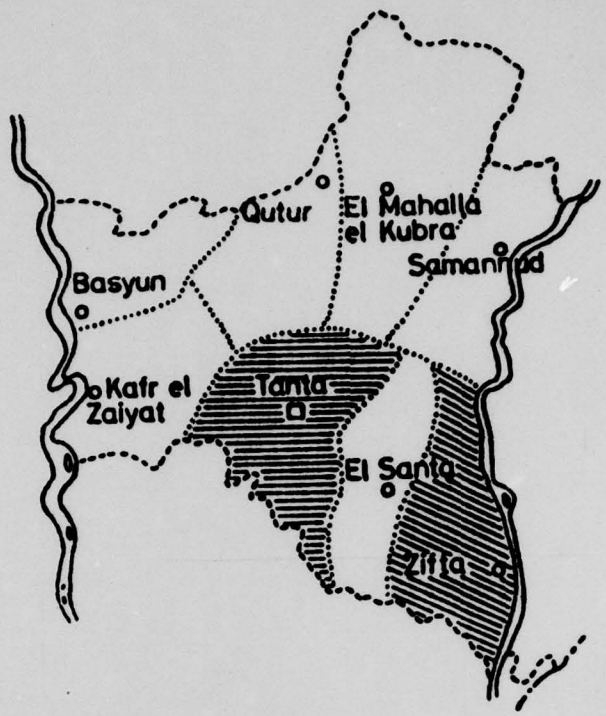
MINOUFIYA GOVERNORATE



---- Governorate
..... District
□ Capital of the governorate
o Capital of the district
//// Area of the work
Scale: 1:500000

Map 2

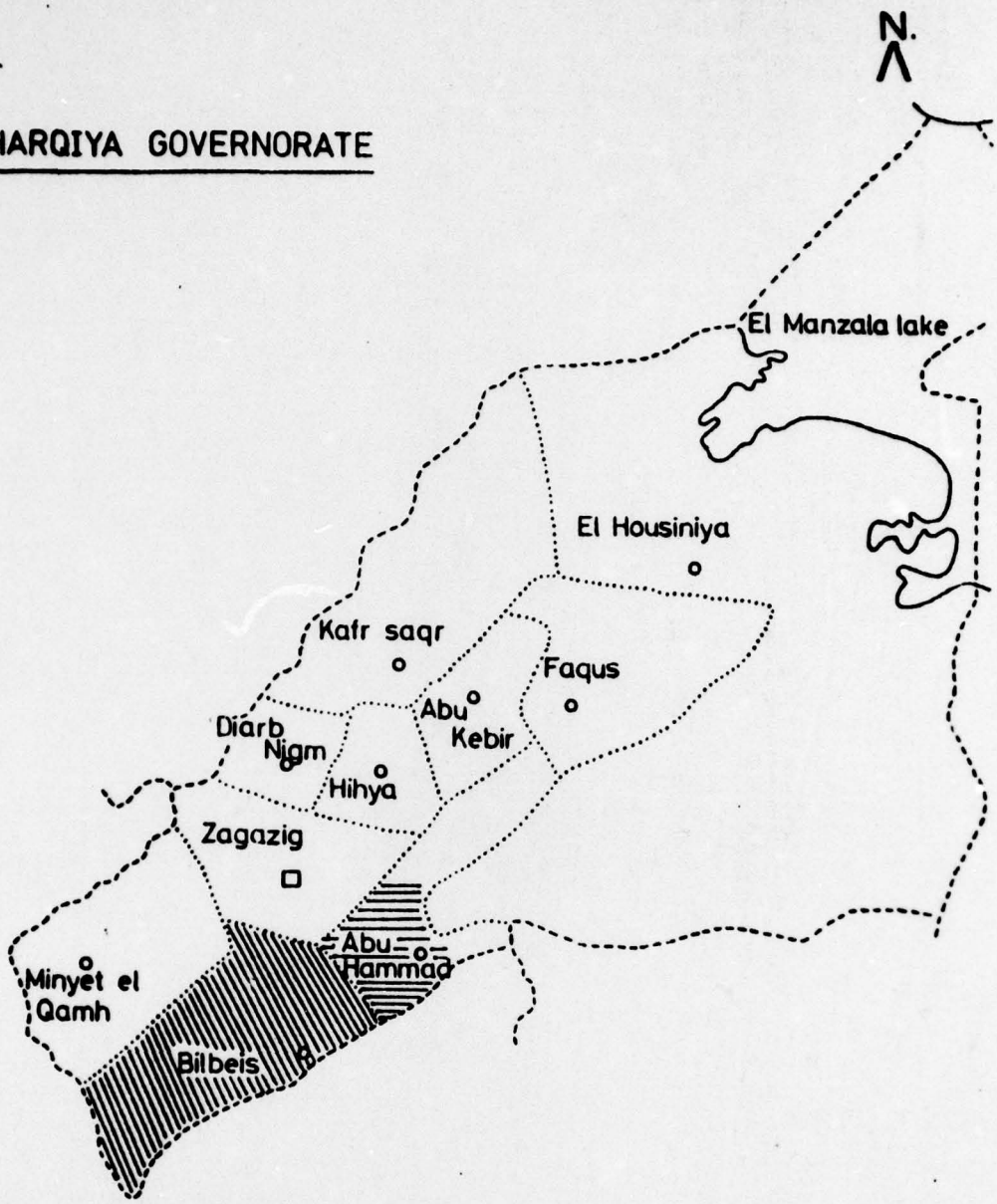
GHARBIYA GOVERNORATE



----- Governorate
..... District
□ Capital of the governorate
o Capital of the district
//// Area of the work
Scale : 1:500000

Map 3

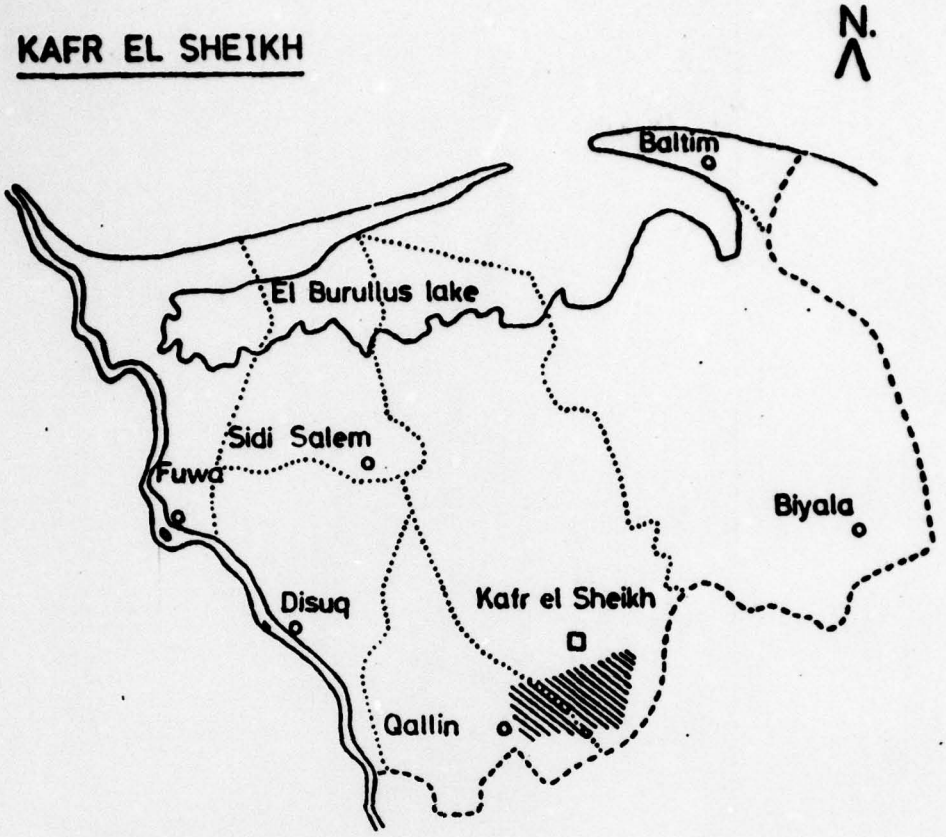
SHARQIYA GOVERNORATE



----- Governorate
..... District
□ Capital of the governorate
o Capital of the district
//// Area of the work
Scale : 1:500000

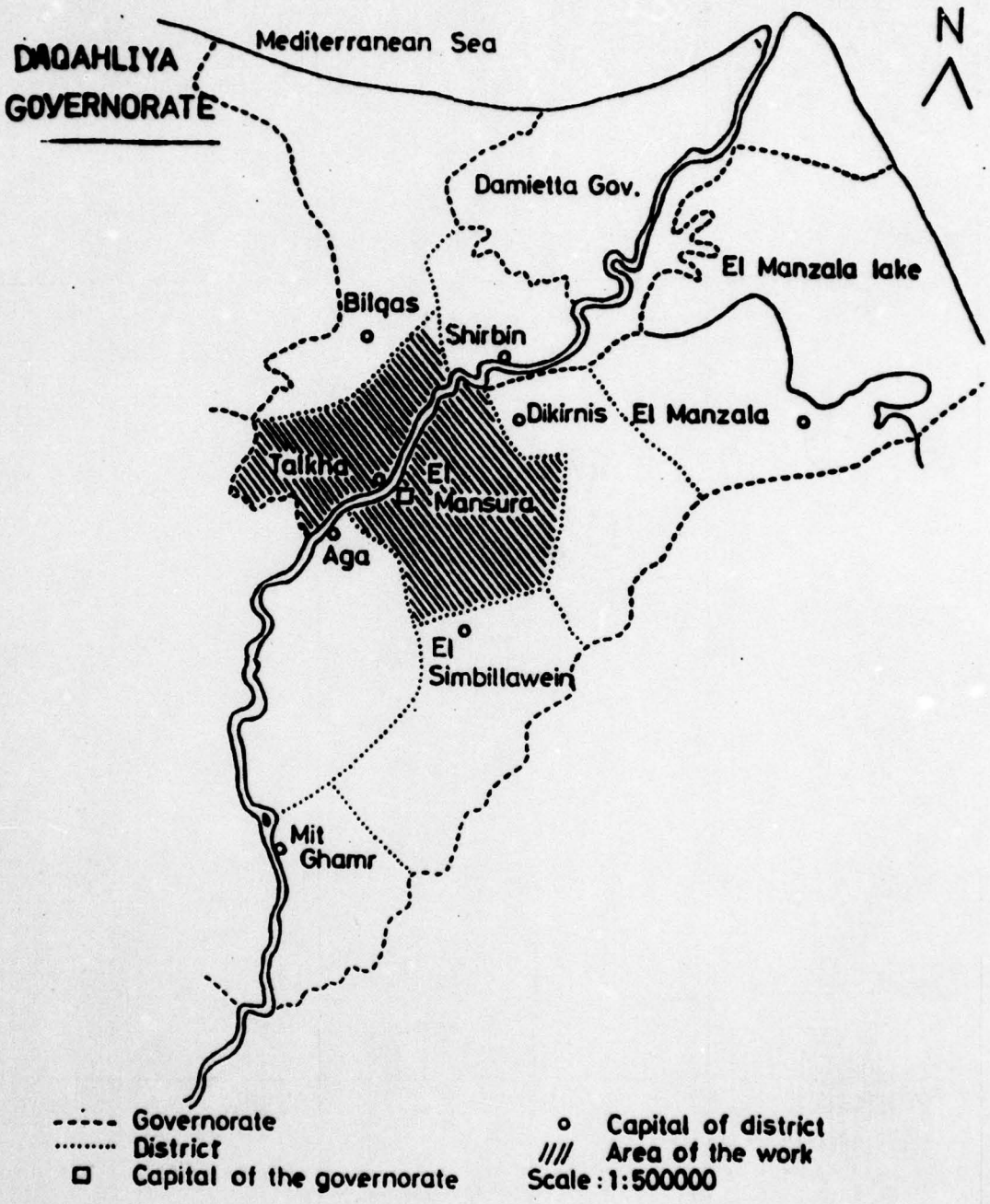
Map 4

KAFR EL SHEIKH



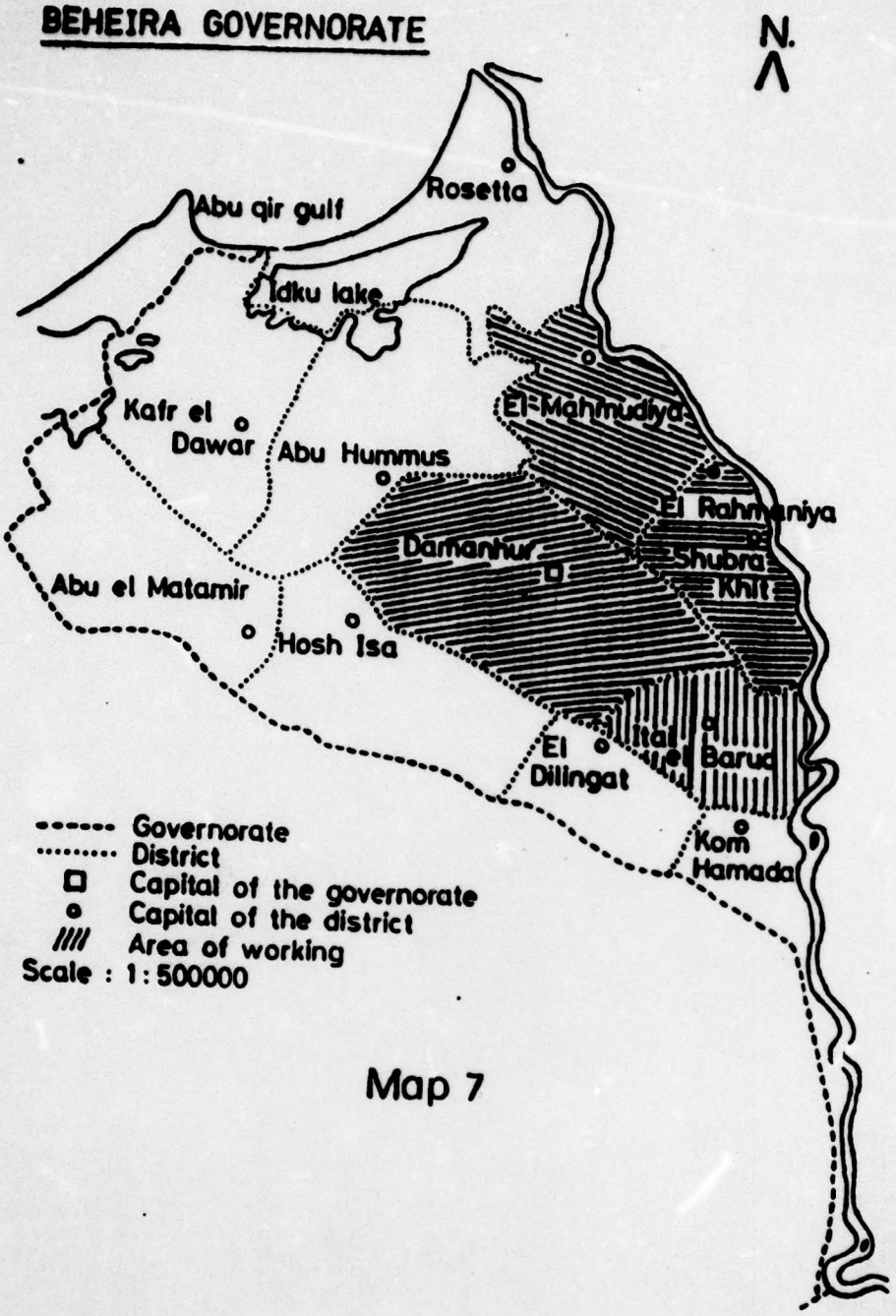
----- Governorate
..... District
□ Capital of the governorate
o Capital of the district
//// Area of the work
Scale : 1: 500000

Map 5

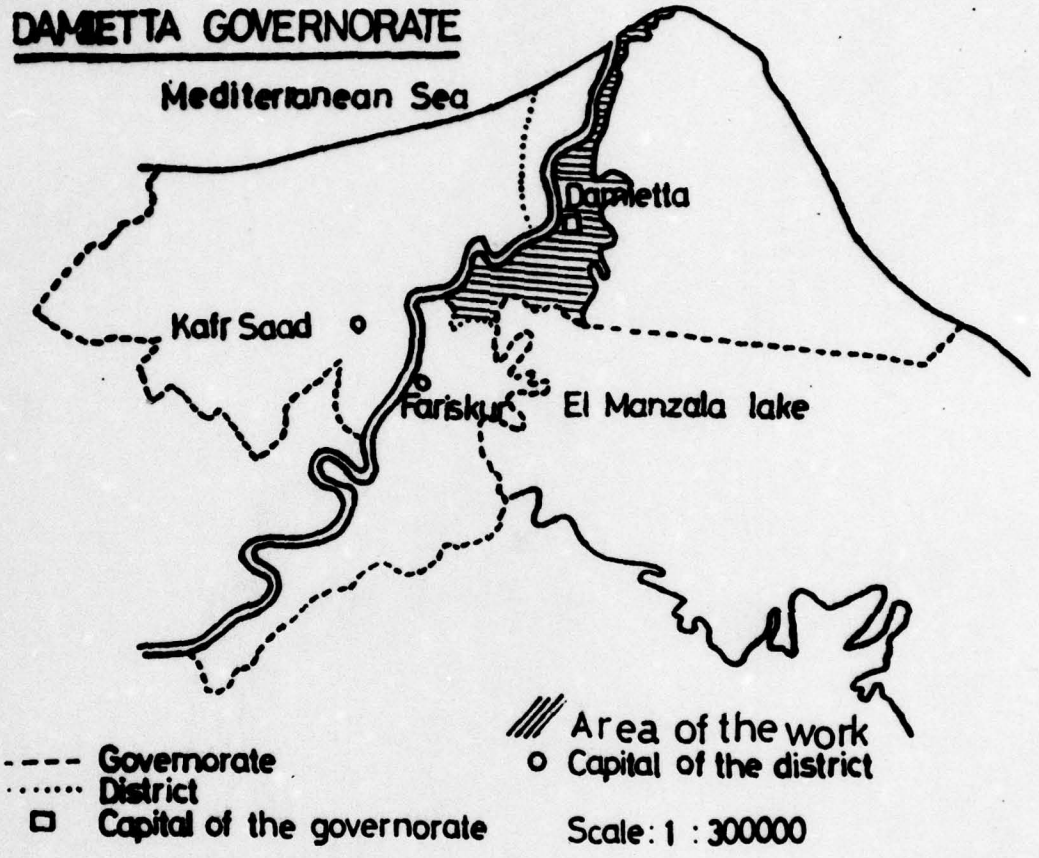

DAQAHLIYA
GOVERNORATE
Mediterranean Sea
N
Damietta Gov.
El Manzala lake
Bilqas
Shirbin
Dikirnis
El Manzala
Talkha
El Mansura
Aga
El Simbillawein
Mit Ghamr
Governorate
District
Capital of the governorate
Capital of district
Area of the work
Scale : 1:500000

Map 6

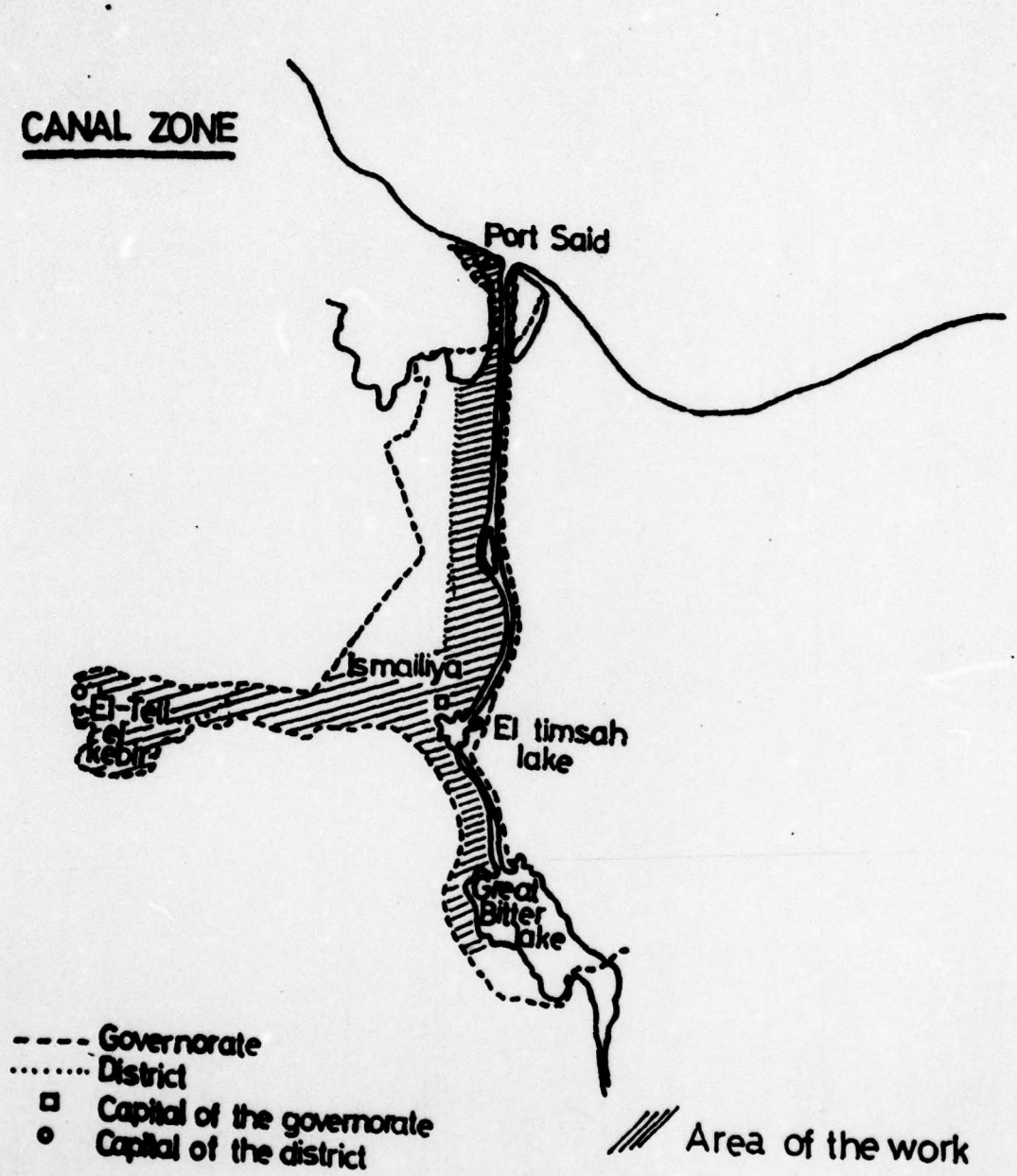
BEHEIRA GOVERNORATE



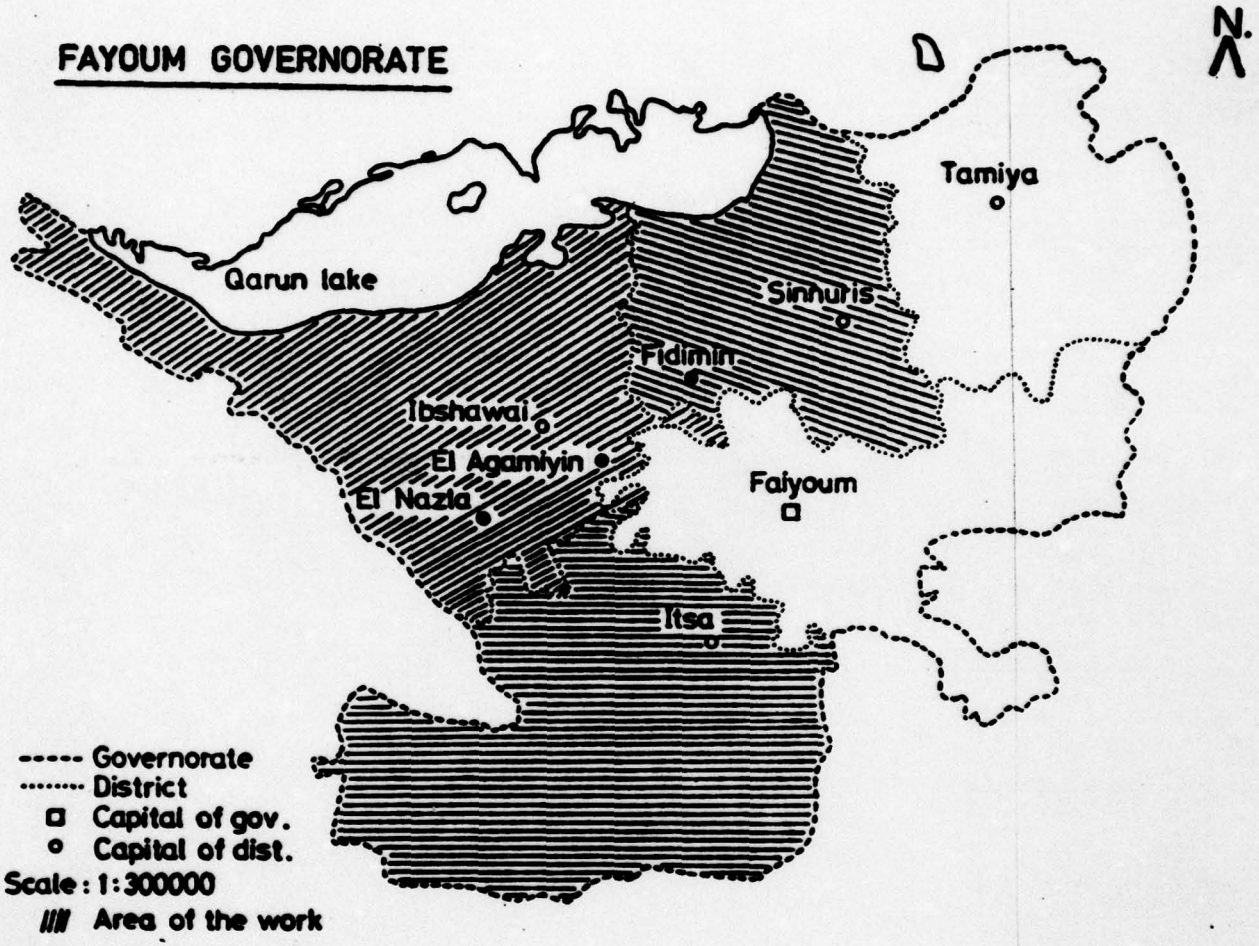
Map 7


DAMIETTA GOVERNORATE
Mediterranean Sea
Damietta
Kafr Saad
Fariskur
El Manzala lake
Area of the work
Governorate
District
Capital of the governorate
Capital of the district
Scale: 1 : 300000

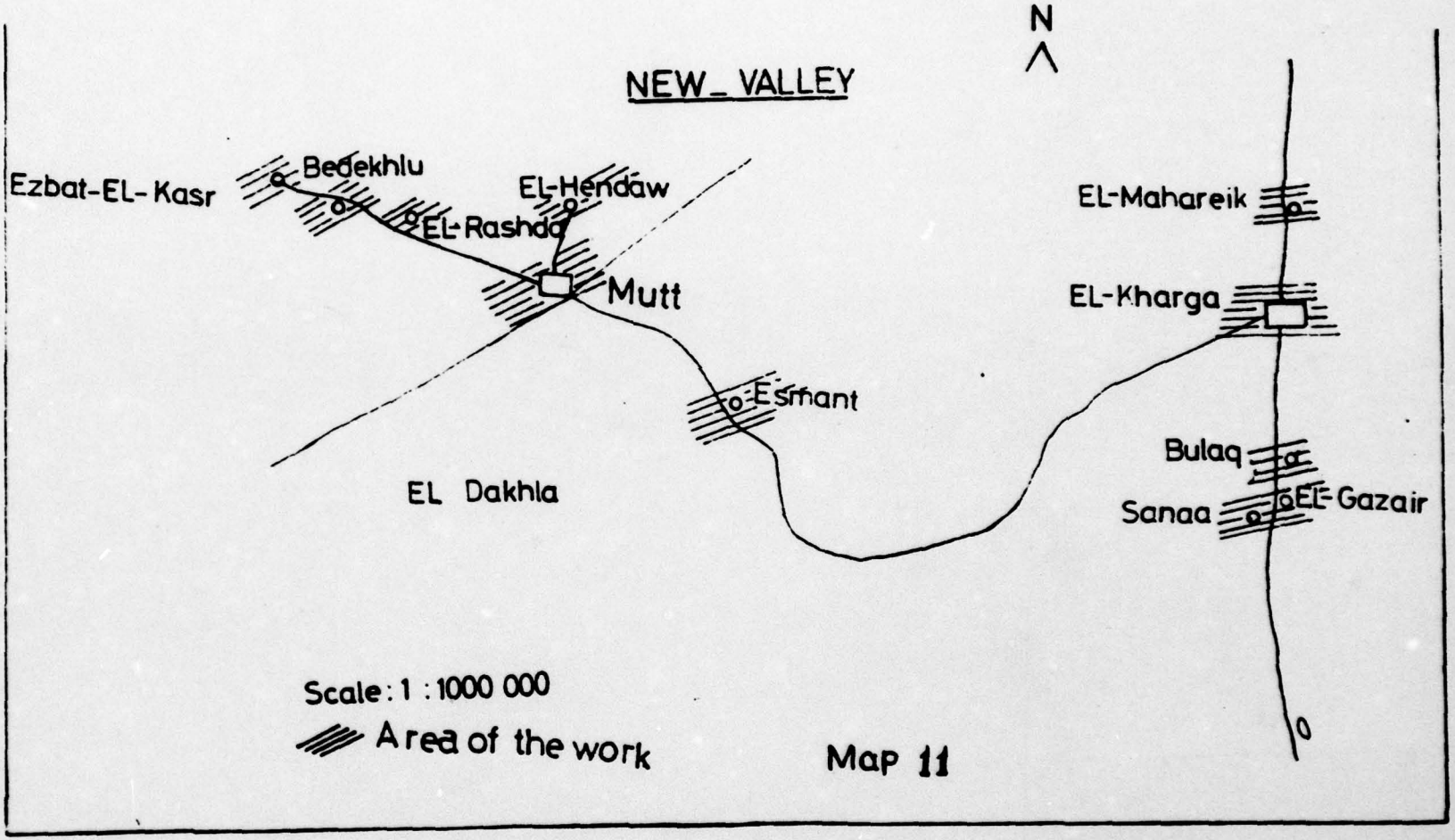
Map 8


CANAL ZONE
N.
Port Said
Ismailiya
El-Ferdan
El timsah
lake
Great
Bitter
lake
Governorate
District
Capital of the governorate
Capital of the district
Area of the work
scale : 1:750000

Map 9

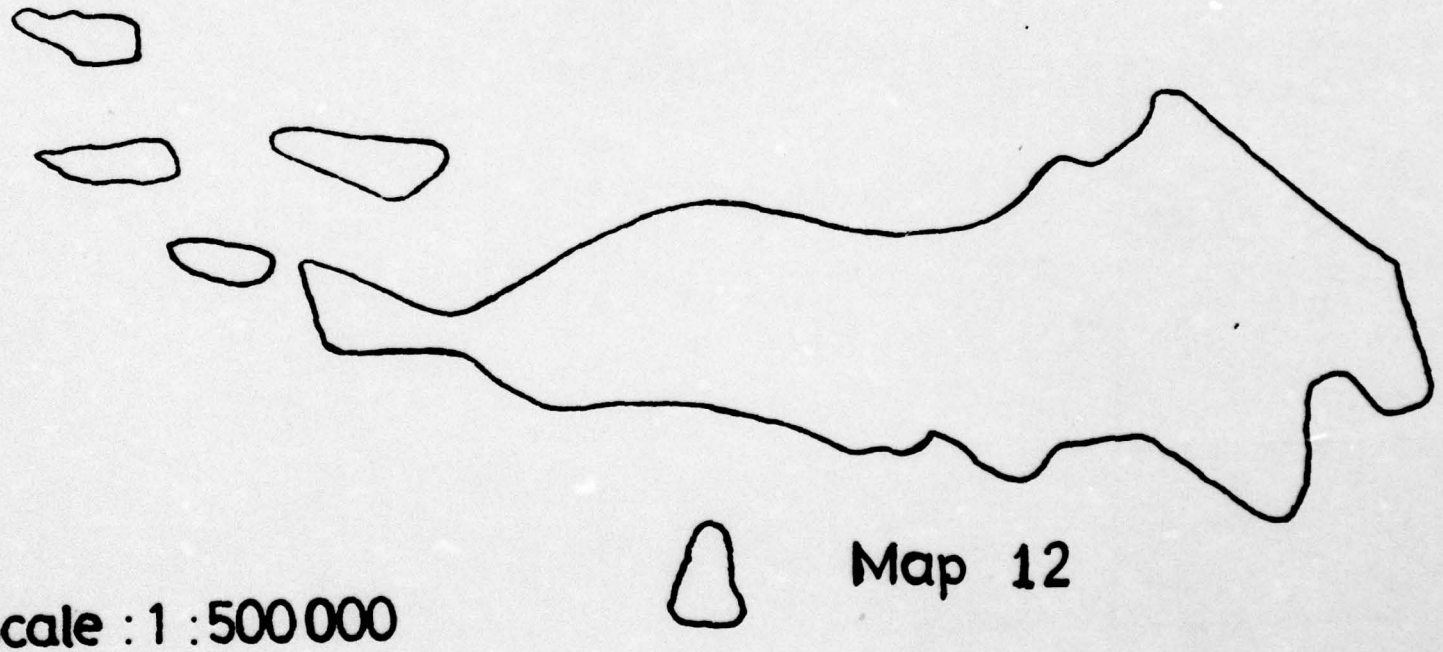

FAYOUM GOVERNORATE
N.
Tamiya
Qarun lake
Sinhuris
Fidimin
Ibshawai
El Agamiyin
El Nazla
Faiyoum
Itsa
----- Governorate
..... District
Capital of gov.
Capital of dist.
Scale : 1:300000
Area of the work

Map 10


NEW_ VALLEY
N
Ezbat-EL-Kasr
Bedekhlu
El-Hendaw
EL-Rashda
Mutt
EL-Maharеik
EL-Kharga
Esmant
EL Dakhla
Bulaq
Sanaa
EL-Gazair
Scale: 1 : 1000 000
Area of the work
Map 11

SIWA OASIS

N



Map 12

Scale : 1 : 500 000

2. Entomological studies carried out in different Governorates:

2.1. Geographical distribution of Anopheline species

Results of anopheline surveys carried out during the present study are included in the table (Table 2).

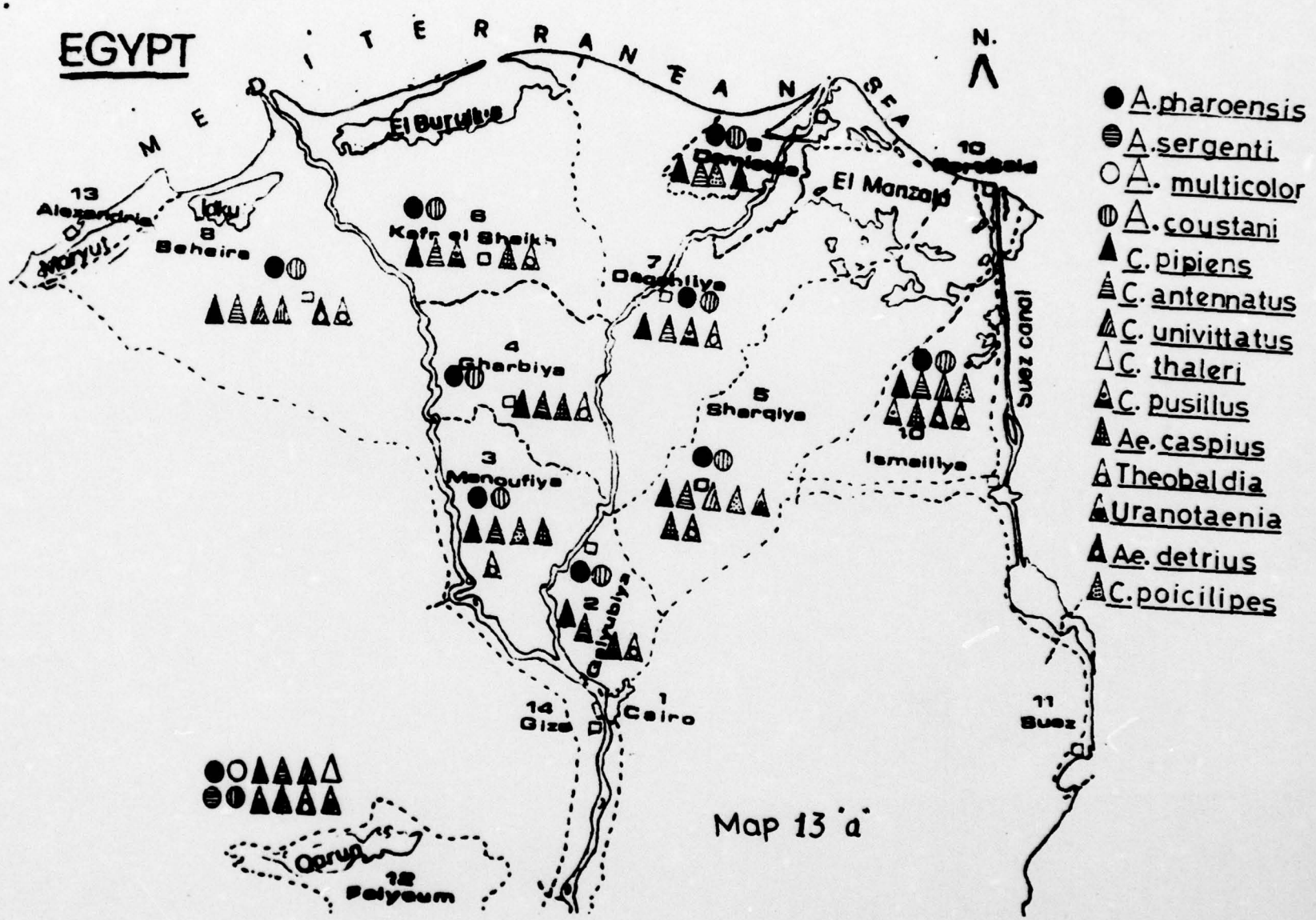
Geographical distribution of the encountered species appear on the accompanied maps (Maps 13a and 13b).

Table (2)

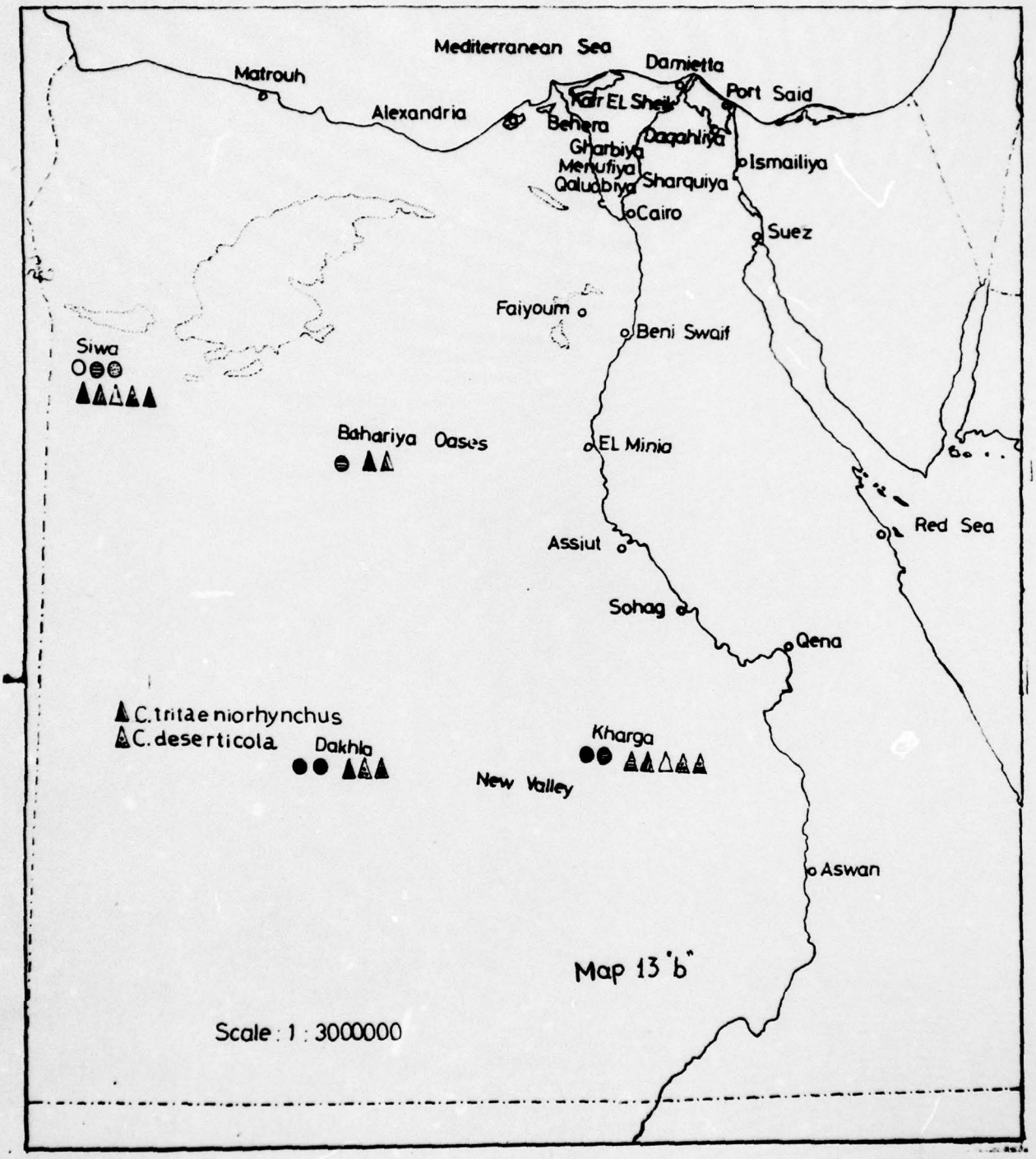
Mosquito Species Distribution

[IN SURVEYED GOVERNORATES OF EGYPT]

GOVERNORATE		ANOPHELINI										CULICINI											
		An. pharoensis	An. multicolor	An. sergenti	An. coustani	An. algeriensis	An. superpictus	An. d'thali	An. runicolus	An. stephensi	An. turkhudi	C. pipiens	C. antennatus	C. univittatus	C. theileri	C. poicilipes	C. tritaenio-rhynchus	C. deserticola	C. pusillus	Ae. caspius	Ae. detritus	Theobaldia	Uranotaenia
Qalyubiya		+			+							+	+						+	+		+	
Minufiya		+			+							+	+	+						+		+	
Gharbiya		+			+							+	+						+			+	
Sharqiya		+			+							+	+			+				+		+	
Kafr El Sheikh		+			+							+	+							+		+	
Dagahliya		+			+							+	+	+						+	+	+	
Beheira		+			+							+	+			+				+			
Damietta		+			+							+	+	+		+			+	+		+	
Canal Zone		+			+							+	+	+		+			+	+	+		+
Faiyum		+	+	+	+							+	+	+	+				+	+		+	+
New Valley	Dakhla	+		+								+						+		+			
	Kharga	+		+			+						+	+	+			+	+				
Siwa Oasis				+								+					+						
Baharia Oasis			+	+		+						+		+	+				+	+	+		


EGYPT
MEDITERRANEAN SEA
N.
El Burullus
El Manzala
Suez canal
13 Alexandria
Maryut
8 Behaira
6 Kafr el Sheikh
7 Dagahliya
4 Gharbiya
5 Sharqiya
10 Ismailiya
3 Menoufiya
2 Gharbiya
1 Cairo
14 Giza
11 Suez
Oprun
12 Fayoum
A. pharoensis
A. sergenti
A. multicolor
A. coustani
C. pipiens
C. antennatus
C. univittatus
C. thaleri
C. pusillus
Ae. caspius
Theobaldia
Uranotaenia
Ae. detrius
C. poicilipes

Map 13 'a'


Mediterranean Sea
Damietta
Matrouh
Port Said
Kafr EL Sheik
Alexandria
Behera
Dagahliya
Gharbiya
Ismailiya
Menufiya
Sharquiya
Qalubiya
Cairo
Suez
Faiyoum
Beni Swaif
Siwa
Bahariya Oases
EL Minia
Red Sea
Assiut
Sohag
Qena
C. tritaeniorhynchus
C. deserticola
Dakhla
Kharga
New Valley
Aswan
Map 13 "b"
Scale : 1 : 3000000

From the data included in this table (Table 2), the following facts can be noticed:

Anopheles pharoensis

This vector was encountered almost everywhere in the areas surveyed during the period of this report.

It was consistently found in all the Governorates of the Nile Delta, in the Canal Zone, Faiyum Governorate and the two main Oases, Dakhla and Kharga of the New Valley Governorate.

With the exception of the New Valley Governorate, An. pharoensis is usually associated with An. coustani.

In the New Valley and Faiyum, An. pharoensis is associated with another efficient vector, namely An.sergenti . The latter species was found to be the only vector in Baharia and Siwa Oases.

Anopheles multicolor

This vector was encountered in Siwa Oasis and in vast numbers in some areas of Faiyum. Other anophelines encountered less frequently were An. algeriensis from Siwa Oasis and An. superpictus from Kharga Oasis of the New Valley. Both species are considered non-vectors in Egypt.

2.2. Types of larval breeding places in various Governorates

Results of larval surveys in different Governorates are presented in the table (Table 3).

Table (3)

Types of breeding places in different governorates and abundance of Anopheline species in different governorates

Governorate	Type of breeding place	An.pharoensis		An.multicolor		An.sergenti		An.coustani		An.algeriensis		An.superpictus	
		Density of all Instars	Density of 4th Instar										
Qalyubiya	Irrigation Canals	0.12	0.12					3.6	1.6				
Minufiya	Irrigation Canals	0.8	0.12					4	2.9				
Gharbiya	Weeds (Halfa)	0	0					2	2				
	Pond	0	0					9	8				
	Drainage Water	0.5	0					3	2				
	Irrigation Canals	1	0					0	0				
Sharqiya	Irrigation Canals	8.6	4.8					0.22	0.22				
	Rice field	5.5	2.5					0	0				
	Seepage water	1	1					7	4				
	Weeds (Halfa)	7	1					2	0				
Kafr El Sheikh	Irrigation Canals	0	0					1.5	1.5				
	Drainage water	0	0					2	2				
	Weeds (Halfa)							3.4	1.2				
	Irrigation Canals	2.3	0.6					3.5	1.3				
	Seepage water							9.1	3.3				
	Rice field	1.4	0.6					6.6	3				

Table 3 Cont. Types of breeding places in different governorates and abundance of Anopheline species in different governorates

Governorate	Type of breeding place	An.pharoensis		An.multicolor		An.sergenti		An.coustani		An.algeriensis		An.superpictus	
		Density of all Instars	Density of 4th Instar										
Daqahliya	Rice plantation	1	1					0	0				
	Irrigation Canals	0	0					1	1				
	Bamboo plantation	0	0					2	0				
Beheira	Rice plantation	0.5	0.5					0.5	0.5				
Damietta	Rice plantation							7.5	3.3				
	Irrigation Canals in rice field	2.9	0.8					2.5	0				
	Irrigation Canals	0.6	0.3					10.9	0.9				
	Seepage water							12	5				
	Bamboo plantation							1	1				
Canal Zone	Rice plantation	1	0					0.5	0.5				
	Weeds (Halfa)	6.25	1.5					0	0				
	Irrigation canal	0.22	0					9	3.5				
	Drainage water	0	0					4	1				
	Seepage water	0	0					14.9	14.5				
	Swamp,pond	3.8	3.8					15.6	7.6				

Table 7

Types of breeding places in different governorates
and abundance of Anopheline species
in different governorates

Governorate	Type of breeding place	An.pharoensis		An.multicolor		An.sergenti		An.coustani		An.algeriensis		An.superpictus	
		Density of all Instars	Density of 4th Instar										
Faiyum	Drainage water	41	7	212	29	5.5	0.6	0	0				
	Irrigation canal	8	3	80.5	20	11	2	2	2				
	Pond	13	0.1	48	34	2	0						
	Seepage water	21.5	9.7	97.1	9.8	3.6	1.2						
	Weeds (Halfa)	15	1.4										
	Rice plantation	173	3										
	Irrigation canals	5	0										
	Pools of water					4	4						
New Valley	Drainage water	3.75	0.4			1.4	0.5					0.13	0
	Irrigation water	1.25	0			1.75	1						
	Irrigation canals	0.75	0.125			5	0.6						
	Rice plantation	0	0			8	1						
	Seepage water	12	1			0	0						
Siwa	Irrigation canals			4.6	1.8	1.59	0.22			0.04	0.04		
	Springs					4.32	1.07						
	Small water collections					26.7	6.7						

Table (3)

Types of breeding places in different governorates and abundance of Anopheline species in different governorates

Governorate	Type of breeding place	An.pharoensis		An.multicolor		An.sergenti		An..ccustani		An.algeriensis		An.superpictus	
		Density of all Instars	Density of 4th instar										
Cont.Siwa	Surface water Seepage water			10	6.7	7	2						
Baharia Oasis	Irrigation canals Surface water Rice plantation					51.6 256.2 2.9	23.7 73.1 9.6						

* Density = Average No of Larvae / 10 Dips

From these tables the following information about larval distribution can be obtained:

1) Cairo - El Marg (Suburb of North Cairo)

Anopheles pharoensis Theo.

Larvae were collected from vast areas of rice fields with moderate growth of plant, irrigation canals, seepage water, semi-stagnant drains, and large pools with moderate plant growth.

2) Nile Delta

Kafr El Sheikh (Northern Delta). Surrounded by vast areas of rice fields that are in the immediate vicinity of villages; thus there is direct contact between adult mosquitoes and the human inhabitants. An. pharoensis and An. coustani were associated together in rice fields. During September to October An. coustani outnumbers An. pharoensis in the breeding places.

Gharbiya Governorate (Middle Delta)

Anopheles pharoensis and An. coustani were encountered in great numbers in the extensive rice fields of this area.

Qalyubiya Governorate (Southern Delta)

Anopheles pharoensis larvae were collected in great numbers from irrigation canals, seepage water, and semistagnant pools. The breeding sites were restricted to the irrigation canals since rice fields were limited in this Governorate.

Sharqiya Governorate (Eastern Delta)

Larvae of An. pharoensis were encountered in great numbers in the extensive rice growing areas.

3) Canal Zone

A few Anopheles pharoensis larvae were encountered in open grass, misgas and shallow water.

4) Upper Egypt

Faiyum (West of Wasta) separated from the Nile Valley by a narrow strip of desert.

i. Anopheles pharoensis larvae were collected in vast numbers from: Sinnuris (mainly in rice fields with moderate growth surrounding the village). Menshiet Halfa (in drainage canals, small areas of rice field and seepage water). El Nazlah (in stagnant drains and misgas, especially those in or near rice fields), Selleen (in pools encroached by grass, borrow-pits, seepage water, and hoof prints), Zawiat El Karadsa (in irrigation canals, large pools with dense weed growth), Menshiet Rahmi (in pools with short grass covering the water surface), Faiyum City (in pools surrounding the city), Agamiyin and Tobhar (in vast areas of drainage water).

ii. Anopheles multicolor

Eggs and larvae of An. multicolor were encountered in vast numbers in the following localities:

El Nazlah, numerous numbers encountered mainly in small brackish pools with some weeds. The sides and bottoms of the pools were sometimes completely encrusted with salt crystals. They were also collected in stagnant and flowing drains, in small and large pools devoid of any vegetation exposed to direct sunlight, and in gutters and village cesspools.

Menshiet Halfa, in small brackish pools with moderate weed growth, in large brackish pools with vegetation and salt crystals around the edges.

Kasr El Gebali, in hoof prints, small and large pools devoid of vegetation and stagnant or flowing drains exposed to direct sunlight.

Sinnuris, in small pools, hoof prints and drainage water.

iii. Anopheles sergenti

Larvae were relatively scarce, but were found in the following villages:

Sinnuris (in springs, irrigation canals and seepage water)

El Nazlah (in small brackish pools associated with An. multicolor).

5) The Oases (New Valley)

New Valley

The main species found were: Anopheles sergenti, An. pharoensis, and An. superpictus.

Anopheles sergenti, the most predominant mosquito species and is the main malaria vector. Larvae of An. sergenti were found in large areas of shaded surface water, irrigation canals and drainage canals.

Anopheles pharoensis, usually encountered in irrigation canals, drainage canals and large bodies of surface water.

An. superpictus found in relatively few numbers in drainage water.

Siwa Oasis:

Life in Siwa Oasis is mainly dependent on wells and springs. The home of the inhabitants are in the immediate vicinity of the water source. The main types of larval breeding places are: wells, springs, drainage canals, surface water and irrigation canals, mainly for barley, olive plantations and palm trees.

The type of water is either that of the wells or brackish water. In addition, there are large bodies of highly brackish water.

i. Anopheles multicolor

Present in vast numbers in brackish drainage water, surface water, small puddles of brackish water. It was sometimes associated with Anopheles sergenti in drainage water with average salinity.

ii. Anopheles sergenti

Widely present in enormous numbers usually in wells, springs and drainage water.

iii. Anopheles algeriensis

Associated with An. multicolor and An. sergenti in drainage water near springs.

Baharia Oasis:

Only Anopheles sergenti was encountered in vast numbers in drainage water, surface water, rice plantations, irrigation canals. pH of water 7; salinity ranged between 0.05-1.5 gm cl/L.

2.3. Extensive larval studies

2.3.1. Characteristics of the larval habitats

2.3.1.1. Influence of salinity and pH on the density of breeding of the different Anopheles species.

During the frequent larval surveys, the breeding water was tested for salinity and pH.*

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*1. The pH was tested using either pH paper (range 1-14 graded in 0.5's) or a portable battery operated pH meter.

2. The salinity expressed in terms of chloride was determined by direct estimation of total chloride content by chemical reaction using $AgNO_3$ solution (WHO technique). The $AgNO_3$ was used either as a weak (9.58 g/L) or strong (47.9 gm/L) solution and a 5% potassium chromate solution.

3. The total chloride was determined by adding few drops of potassium chromate to 4 ml of breeding water in a graduated tube. $AgNO_3$ (either weak or strong) was poured drop by drop till the end point was reached (red precipitate). The chloride content was obtained by multiplying by 0.5 (for weak solution) or 2.5 (for strong solution).

Anopheles pharoensis

Various breeding sites of An.pharoensis were encountered in the different Governorates of the Nile Delta.

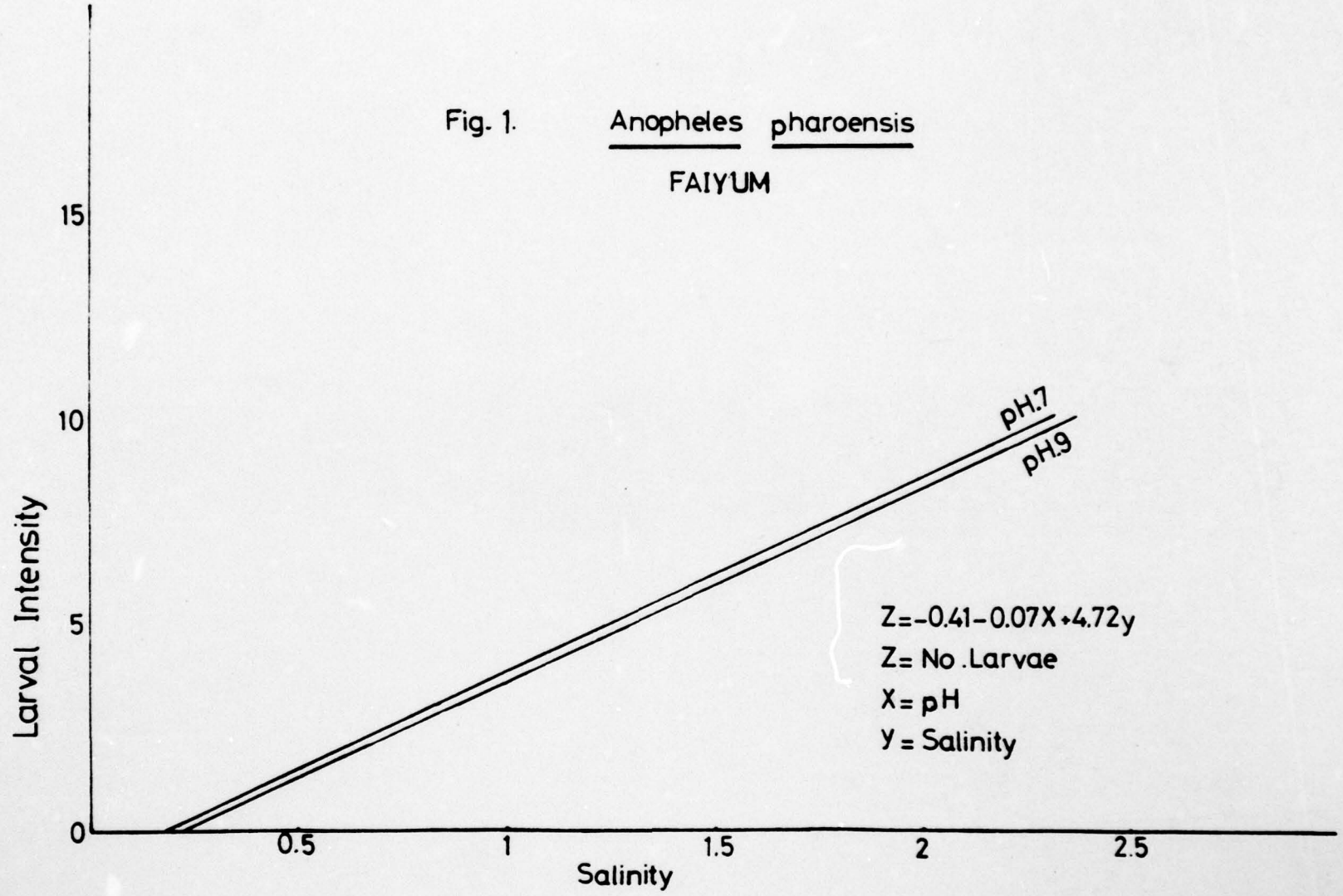
The results obtained are recorded in the table (Table 4) and are represented in the figure (Fig.1)

Table (4) Results of studies of pH, Salinity and Intensity of breeding of *Anopheles pharoensis*

AREA / pH	NILE DELTA		FAIYUM	
	SALINITY gm cl/L	INTENSITY No of Larvae/ 10 Dips	SALINITY gm cl/L	INTENSITY No of Larvae / 10 Dips
6.5	—	—	0.75	1
7	0.05 0.05 0.05 0.25 0.50 0.50 0.50 0.50 0.50 0.55 0.55 2.80 3.45 3.50	2 7.5 3 1 3 5 1 1 9 7 1 1 1	0.5 0.5	0.6 0.6
	—	—	—	—
7.5	0.1 0.2 0.2 0.75 1.25 1.9	1 1 2 17 5 1	0.25	1
	—	—	—	—
7.9	3.5	2	—	—
8	0.25	1	0.45 1.75 0.7	6 5.8 0.4
8.5	—	—	0.7 0.8	2.6 1.4
9	1.4 1.75	1 1	1.75	10.4
10	—	—	—	—
13	—	—	0.75 1.0	2.20 2.0

Fig. 1. Anopheles pharoensis

FAIYUM



From such data the following can be gathered:

Twenty-three An. pharoensis breeding sites in the different Governorates of the Nile Delta were examined. Their salinities ranged between 0.05 to 3.5 gms Nacl per liter of water and pH between 7.00 to 9.00. In addition, twelve other breeding sites mainly surface and seepage water were encountered in the Faiyum Governorate .

The salinity of the breeding sites ranged from 0.25 to 1.75 gms Nacl per liter and pH varied between 6.5 to 13.

It can be also concluded that Anopheles pharoensis obtained from both the Nile Delta and Faiyum has the same negative coefficient with value of pH. This indicates that the larval density is higher in breeding areas with higher acidity in both areas. However, the larval density in the Nile Delta showed that it is more affected by acidity than that of Faiyum.

As regards the influence of salinity on the larval density; it can be concluded that the larval density in the Nile Delta decreases in breeding sites with high salinity, while in Faiyum the larval density increases in the breeding sites with high salinity.

Such contradicting results of the effect of salinity on the density of mosquitoes may suggest that An. pharoensis of the Nile Delta is a different strain from that of Faiyum.

Statistical Analysis of the Data and their Indications:

The analysis of these data by the least squares method confirmed that there is a linear relationship between the larval density and both pH and salinity. These relationships are expressed by the following equations for An. pharoensis from both the Nile Delta and Faiyum, respectively :

$$Z = 10.43 - 0.87 x - 0.69 Y$$

$$Z = -0.41 - 0.07 + 4.72 Y$$

Z = is the larval density

x = is the pH

Y = is the salinity

Anopheles sergenti

The larval breeding places of An. sergenti encountered in Faiyum were mainly localized in Abheet village (eight breeding sites).

The range of pH of such breeding waters was between 7 and 7.5; while the salinity ranged between 0.2 to 3.75 Nacl gms per liter.

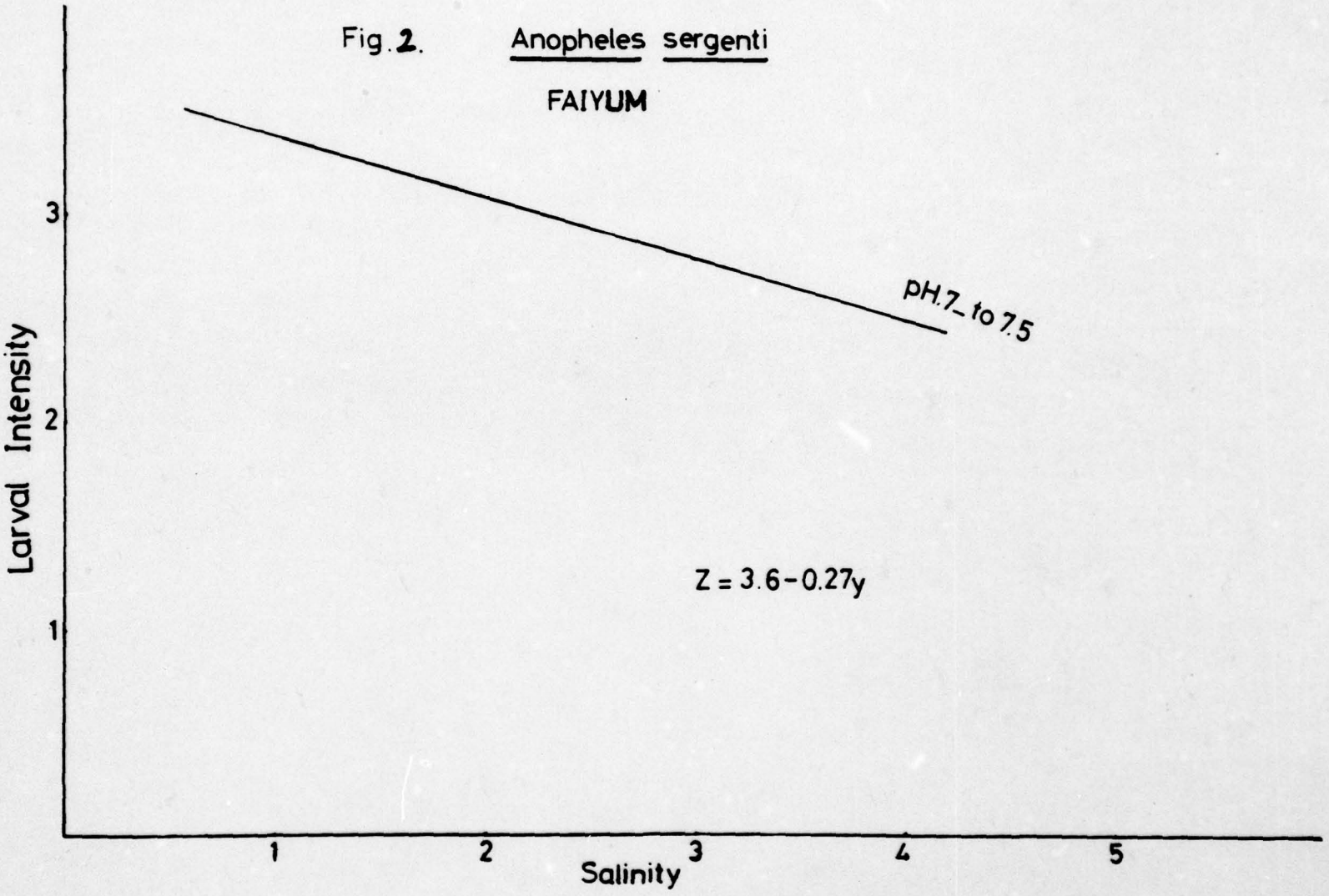
Analysis of the data are presented in table (Table 5) and Fig. 2.

Table (5) Results of studies of pH, Salinity and Intensity of breeding of *Anopheles sergenti* in Faiyum

pH	Salinity gm cl/L	Intensity No of Larvae / 10 Dips
7.80	1.00	2.00
7.80	0.20	2.00
7.25	0.55	8.00
7.50	3.75	0.28
7.00	2.40	0.50
7.00	0.50	5.00
7.00	13.75	0.80
9.00	1.30	4.00

Fig. 2. Anopheles sergenti

FAIYUM



Results from such data indicate that the narrow range of pH does not exhibit any pronounced effect while the salinity showed an inverse relationship.

Anopheles multicolor

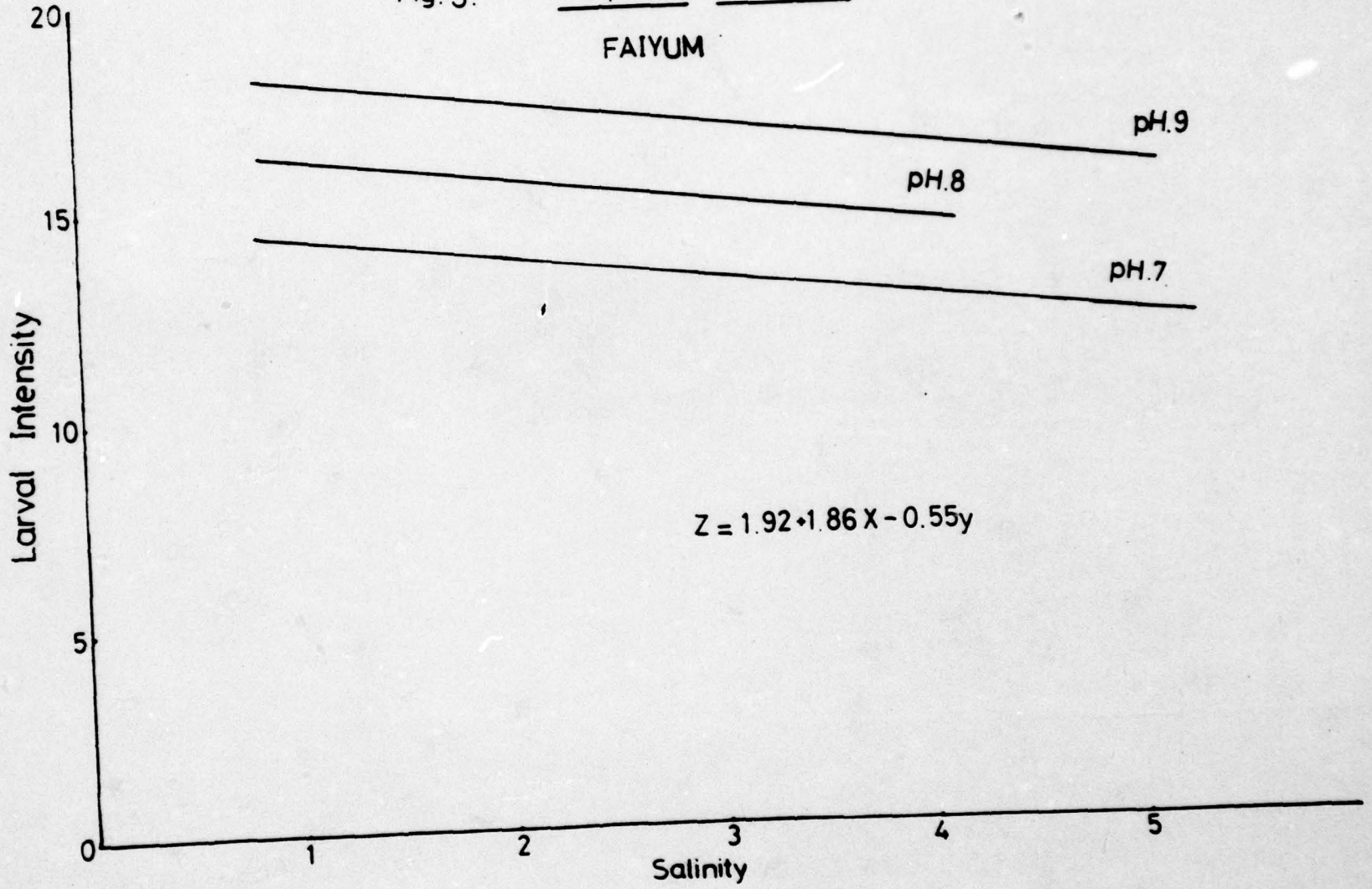
In Faiyum Governorate, An. multicolor is abundant in distribution and prevalence. Larvae were encountered in 39 breeding sites in Faiyum Governorate. Data are presented in table (Table 6) and figure (Fig. 3).

Table (6) Results of studies of pH, Salinity and Intensity of breeding of An. multicolor in Fayum

pH	SALINITY gm cl/L	INTENSITY of Larvae/ 10 Dips	pH	SALINITY gm cl/L	INTENSITY of Larvae/ 10 Dips
6.5	0.25 0.25 0.25	8.40 3.00 9.00	10	2.00	1.60
7.0	1.75 5.78 1.35 10.00 2.35 2.25 9.00 8.25 16.00 0.50 0.50 14.50 16.25 0.5 0.5 0.5 0.5 13.75 10.50 12.58	3.00 46.00 38.4 5.00 1.00 2.00 9.20 9.80 6.00 12.60 12.00 23.2 3.6 89.00 11.60 9.4 5.40 4.00 1.48 6.4	13	1.00	22.0
7.25	0.25	2.00			
7.20	9.00	3.40			
7.5	13.75 13.75 3.75 7.00 10.00 12.00 21.50	8.00 4.8 0.40 11.20 4.00 14.00 2.8			
7.8	7.5	5.2			
8	0.50	1.4			
8.30	0.70	0.20			
9	1.75	1.00			
9.30	2.50	85.00			

Fig. 3. Anopheles multicolour

FAIYUM



From these data the following can be gathered:

1. The range of pH varies between 6.5 to 13, and the salinity between 0.25 to 21.50 gms Nacl per liter.

2. This species can tolerate a wide range of pH and a wider range of salinity. However, the linear relationship derived from this set of data is expressed by the following equation:

$$Z = 1.92 + 1.86\ X - 0.55\ Y$$

3. It can be noticed that there is a positive relationship between the density and pH value. Such a relationship does not seem to be consistent when the results are split according to localities where the mean of pH differs but without statistically significant difference.

4. It can be concluded that although An. multicolor larvae can tolerate higher degrees of salinity than any of the common Egyptian Anophelines, its density decreases whenever the salinity becomes higher.

Anopheles coustani

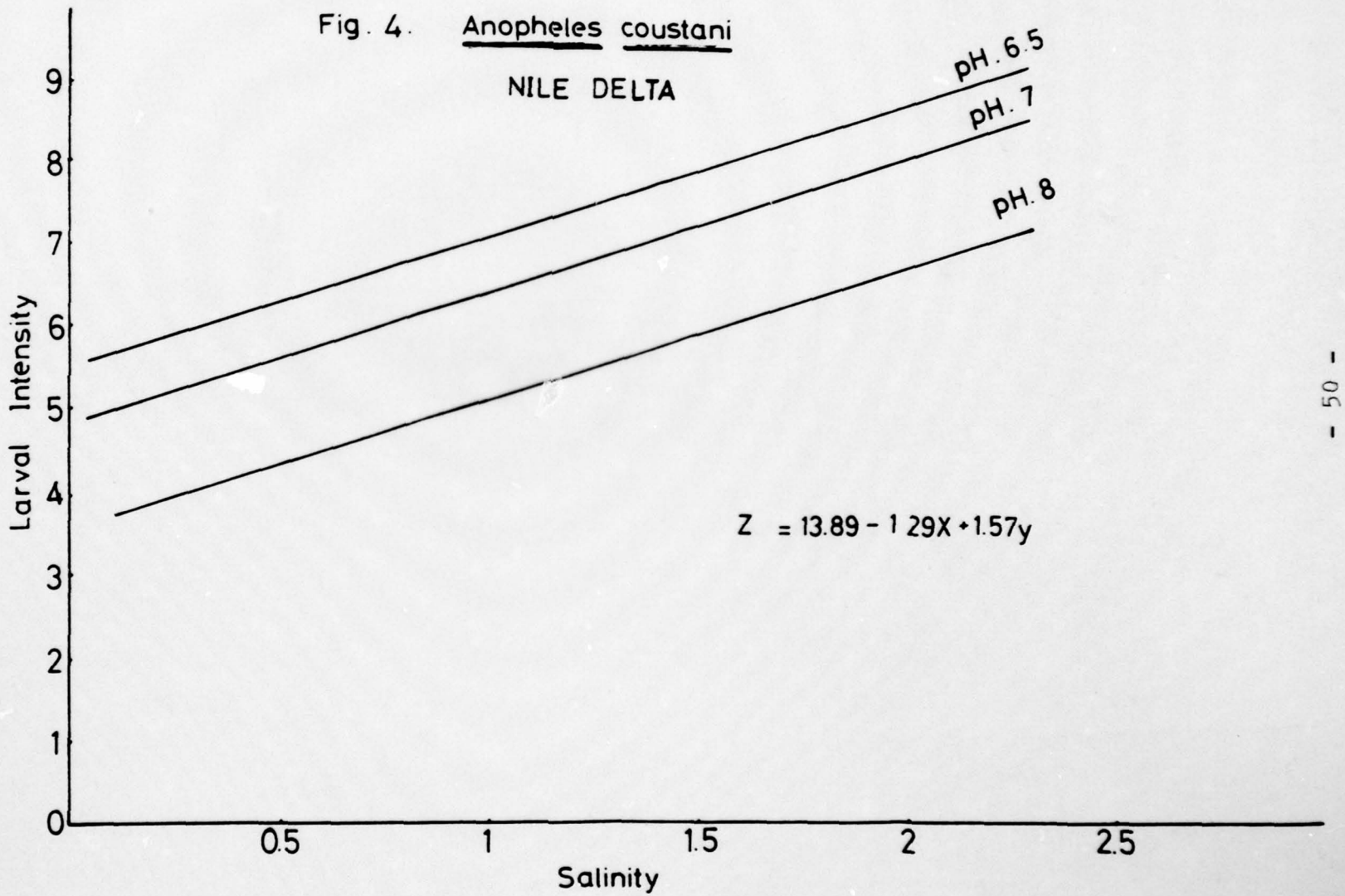
In the Nile Delta where this species is abundant a total of 45 positive breeding sites was examined. The results are shown in table (Table 7) and figure (Fig. 4).

Table (7): Results of studies of pH, Salinity and Intensity of breeding of An. coustani in Fayum

pH	Salinity gm cl/L	Intensity of Larvae / 10 Dips
6.5	1.25	16
	1.25	5
7	2.75	1
	1	5
	0.4	3
	0.75	2
	1.75	1
	1	12
	0.25	6
	0.25	1
	1.5	1
	0.25	2
	0.9	2
	0.1	28
	0.1	1
	0.1	1
	0.25	8
	0.25	30
	0.25	10
	0.25	1
	0.5	1
	0.5	5
	0.25	1
	0.75	4
	0.75	2
	0.25	6
	1.00	4
	1.25	5
7.5	0.5	1
	0.25	1
	0.5	1
	0.5	7
	0.5	3
	0.5	2
	0.5	2
	0.75	2
	0.35	12
	0.75	19
	0.9	2
	0.6	2
	0.2	2
7.6	3.5	25
8	0.25	7
	0.25	6
9	1.4	1

Fig. 4. Anopheles coustani

NILE DELTA



From such data the following can be gathered:

1. The pH of these breeding places was found to range between 6.5 to 9.0 and the salinity ranged between 0.2 to 1.75 gms of Nacl per liter.

2. The relationship between the larval density of this species and both the pH and the degree of salinity is expressed by the following equation:

$$Z = 13.89 - 1.29\ X + 1.57\ Y$$

3. It can be concluded from this equation that there was a negative relationship between the pH value and the larval density or the larval density was found directly proportional to the acidity. Likewise is the relationship between density and salinity.

4. It has to be pointed out that the values of the square of the multiple correlation coefficient of all the relationships of the different Anopheles species discussed previously are small. This may be due to the existence of other factor or factors as temperature that has a significant influence on the density of larvae.

2.3.1.2. Seasonal prevalence:

Anopheles multicolor

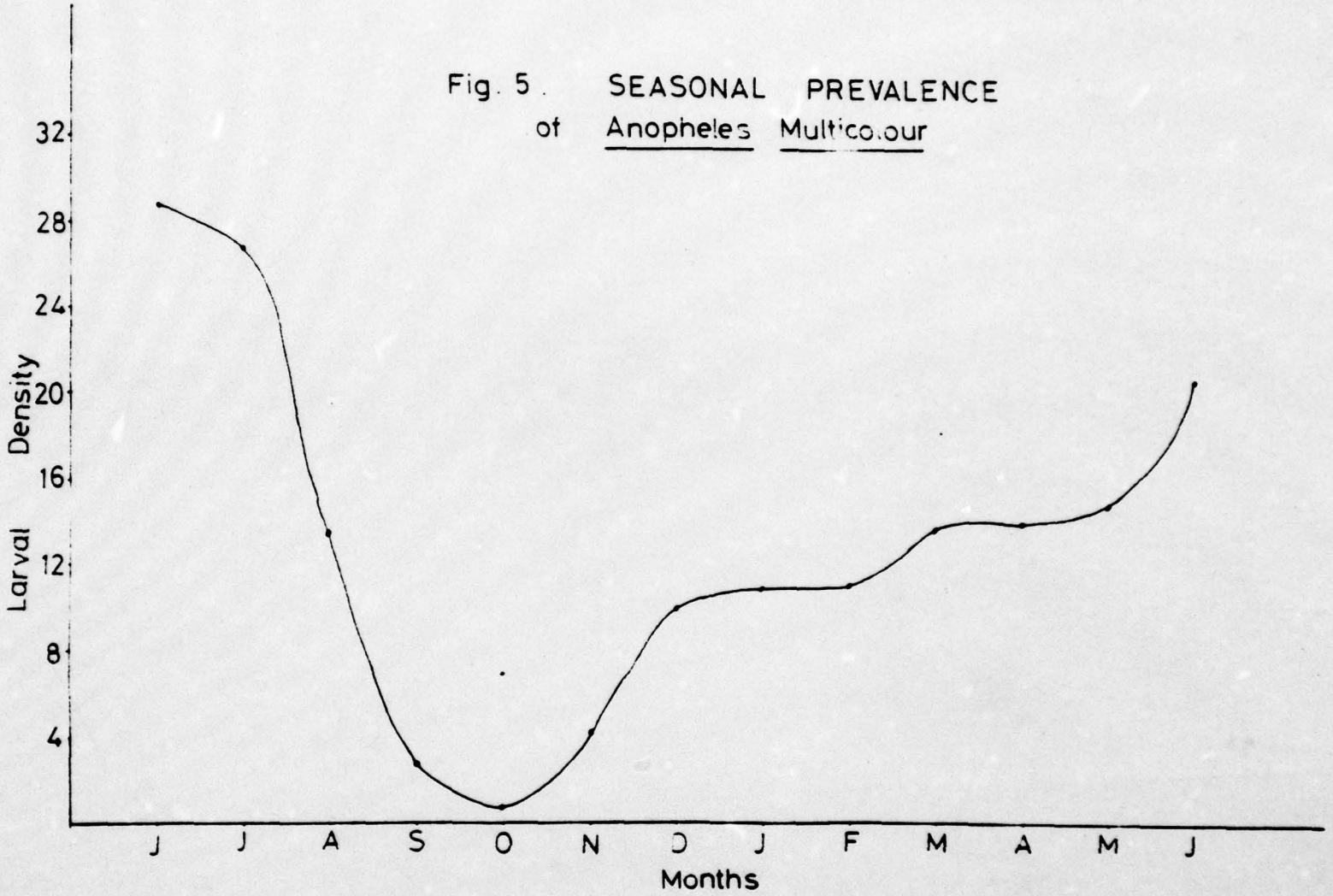
Results of the monthly larval density surveys carried out during the period from June 1978 - June 1979 in six villages in Faiyum Governorate are presented in table (Table 8) and Fig. 5.

Table (8) Larval Density of
Anopheles multicolor in Faiyum
During June 1978 to June 1979

Year	Month	Larval Density *
1978	June	23.9
	July	38.4
	August	6.5
	Sept	2.4
	Oct	0
	Nov	0.2
	Dec	16.3
1979	Jan	7.4
	Feb	12.9
	March	11.1
	April	19.5
	May	6.0
	June	28.0

* No of 4th Instar Larvae/10 Dips

Fig. 5. SEASONAL PREVALENCE of Anopheles Multicolour



From table 8 and Fig. 5 it appears that:

1. The highest density was consistently recorded during June and July 1978 and in June 1979. However, the lowest density was observed during October and November 1978.

2. It appeared that the An. multicolor population started its initial increase of population during December from a negligible level in October and a very low density in November.

3. During December, the population suddenly rose followed by a moderate and gradual increase until May.

4. A subsequent sharp increase in density was evident in June and July. This major peak was short lasting.

5. The density then showed an abrupt and fast decline during August-September, and October until the species became undetectable in October.

It can be concluded, that An. multicolor prevails in pronounced densities from December to July and establishes its major peak in June and July.

Anopheles pharoensis

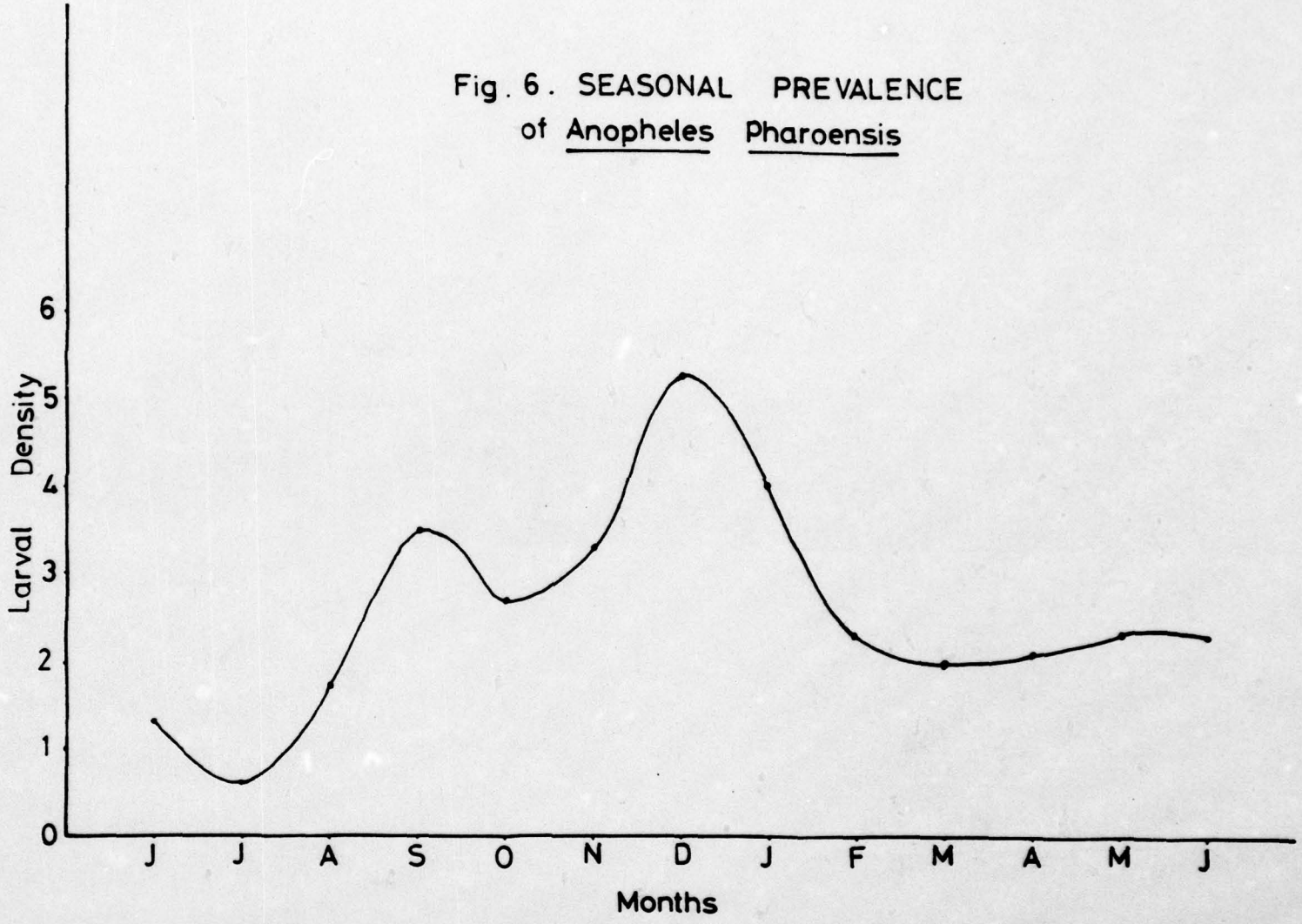
Results of monthly larval density surveys carried out during the period from June 1978 - May 1979 are presented in table (Table 9) and Fig. 6.

Table (9) Larval Density of
Anopheles pharoensis in Faiyum
(June 1978 - May 1979)

Month	Larval Density *
June	1.9
July	0
August	0.5
Sept	5.8
Oct	2
Nov	1
Dec	9.2
Jan	1.8
Feb	3.1
March	1.2
April	2.4
May	2.20
June	2.33

* No of 4th Instar Larvae/10 Dips

Fig. 6. SEASONAL PREVALENCE
of Anopheles Pharoensis



From the results indicated in the table and figure, it can be concluded that:

1. The lowest larval density is observed during July. This is followed by a slight increase or rise in August then a sudden moderate rise to about 6 larvae per 10 dips in September and declines again in October and November.

This moderate fluctuation in the larval density with its highest peak in September may represent a minor peak.

2. Another sudden rise in the larval density was observed in December when the density reaches the highest peak ever observed during the whole year (9.2 larvae per 10 dips). The density then declines during January. From February to June, the larval densities seem to level up but with slight fluctuation between 2 to 3 larvae/10 dips.

The highest larval density of December may be considered the highest or major peak.

2.4. Biting Behaviour

The biting behaviour of Anopheline mosquitoes was studied in two adjacent Governorates in the Eastern part of the Nile Delta namely Sharqiya and Ismailia of the Canal Zone.

1. Anopheles pharoensis

1.1. Biting site

The rate of biting estimated in terms of numbers of females biting per man hour both indoors and outdoors indicates that this mosquito is an endophagic species.

1.2. Biting cycle

Results of studying the biting cycle of Anopheles pharoensis are presented in table (Table 10) and are presented in the figure (Fig.7).

Table (10) BITING ACTIVITY OF

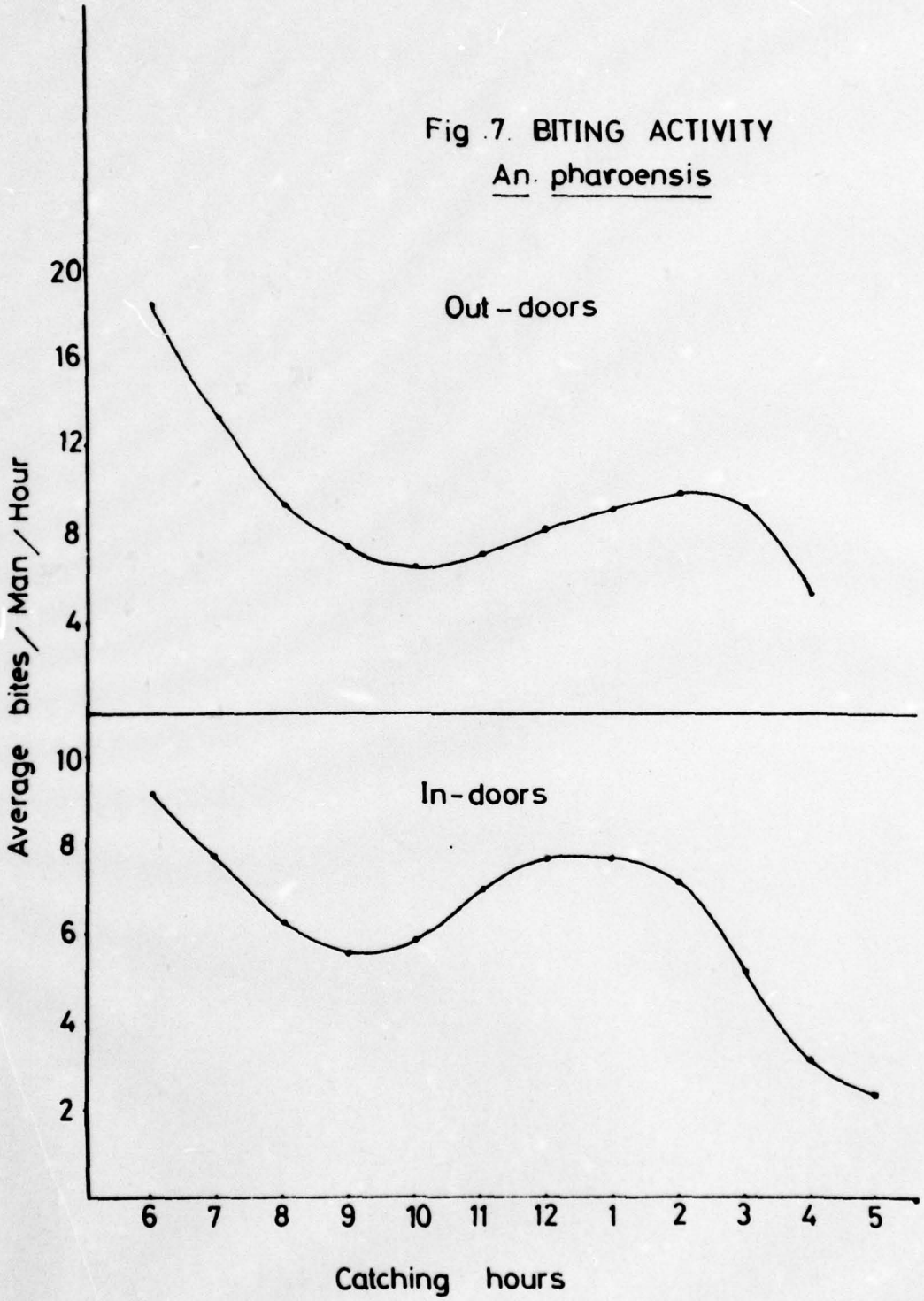
Anopheles pharoensis ADULT FEMALES

ON HUMAN BAITS

(Sharqiya + Ismailiya Gov's)

CATCHING HOUR	AVERAGE BITES/MAN/HOUR	
	OUT - DOORS	IN - DOORS
6 p.m.	10.10	22.38
7	7.21	10.78
8	6.80	9.58
9	4.47	7.73
10	6.48	5.28
11	6.31	8.03
12	8.77	7.58
1 a.m.	6.88	10.63
2	8.41	8.55
3	4.67	11.75
4	2.82	4.63
5	2.00	0

Fig .7. BITING ACTIVITY
An. pharoensis



These data show that: 1. this mosquito starts biting immediately after sunset at a high rate averaging 10.1 bites per man per hour for outdoors and 22.38 bites per man per hour for indoors during the first hour of catch.

2. This is followed by a steady decrease reaching an average of 4.47 bites per man per hour for outdoors (at 9.00 p.m.) and 5.28 bites per man per hour for indoors (at 10.00 p.m.).

3. The biting rate then increased till it reached its maximum two hours after midnight (outdoors) and three hours after midnight for indoors.

4. Starting from 2.00-4.00 a.m. a sudden decline was evident.

From such rhythm of biting, it could be seen that the small proportion of Anopheles pharoensis population feeds during the early hours of the evening. These are probably those individuals which were ready to feed late in the previous night but failed to do so. However, it is clear that the majority of the man biting population feeds between 1 to 2 a.m. (outdoor) and 1 to 3 a.m. (indoor).

2. Anopheles coustani

Results of studies of biting behaviour of Anopheles coustani are represented in table (Table 11) and fig. (Fig.8).

Table (11) BITING ACTIVITY OF

Anopheles coustani Adult FEMALES

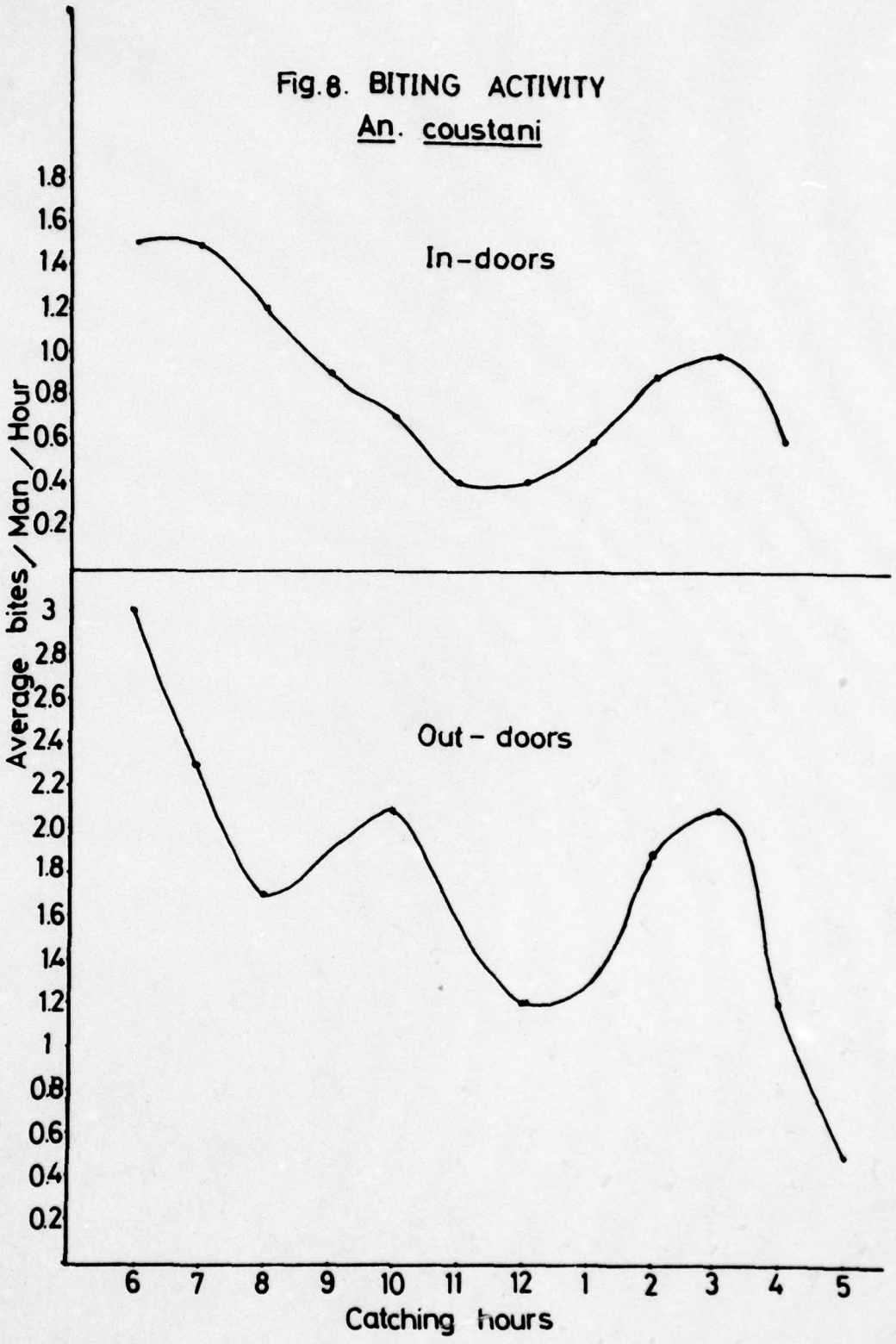
ON HUMAN BAITS

(Sharqiya + Ismailiya Gov's)

CATCHING HOUR	AVERAGE BITES/MAN/HOUR	
	OUT - DOORS	IN - DOORS
6 p.m.	3.54	1.38
7	1.99	1.65
8	1.59	1.13
9	1.74	0.93
10	2.55	0.65
11	1.51	0.40
12	0.82	0.20
1 a.m.	1.57	0.80
2	1.37	0.53
3	3.16	1.58
4	0.65	0.30
5	0.44	0

Fig.8. BITING ACTIVITY

An. coustani



From the results indicated in the table and figure, the following can be seen:

Biting site:

Under the same conditions, An. coustani proved to be almost equally endophagic and exophagic. About half the An. coustani population caught has the tendency to bite man outdoors. This phenomenon indicates that An. coustani has probably not yet been domesticated as An. pharoensis.

2.2. Biting cycle

It is evident that An. coustani has two biting patterns for outdoor and indoor biting.

The majority of An. coustani population biting outdoors feeds on man during the first two or three hours of the evening then the number declines gradually until before midnight.

The biting then reached its lowest level and continued with the same pace until one hour before sunrise. A slight increase occurred during the last hour. It is evident that the An. coustani population biting indoors had two peaks of biting. The minor one took place at about 20.00 hrs then decreased until it reached its lowest about midnight. Following midnight the major peak started by a sudden rise and reached its highest at about 03.00 hrs. The biting dropped in the following hours and then completely ceased during the last hour of the night. The major peak of biting was about twice as much as the minor one.

II - TOXICOLOGICAL STUDIES

II. TOXICOLOGICAL STUDIES

DETERMINATION OF THE INSECTICIDE RESISTANCE LEVEL OF EGYPTIAN ANOPHELINES AND THE FACTORS GOVERNING THIS PHENOMENON.

Field investigations.

A series of susceptibility tests were carried out on different anopheline mosquitoes (larvae and adults) collected from Ismailia and Faiyum Governorates.

The results of these tests are listed in the tables (Tables 1, 2, 3, 4, 5 and 6) and illustrated in the figures (Figs. 1-6).

The data were statistically analysed. The LC_{50} or LT_{50} and its confidence limit and the slope function were determined for all tests.

Data included in these tables show the following information concerning the susceptibility levels of different anopheline larvae and adults.

1. Ismailia Governorate

Anopheles coustani

Results of susceptibility studies carried out in this Governorate indicate that the Anopheles coustani population is still susceptible to malathion, fenitrothion, temefos, chloropyrifos and propoxur.

Table 1. Statistical analysis of results of susceptibility tests of A. coustani larvae to three insecticides in Ismailia Governorate (Tal el Kebir)

Insecticide conc. (ppm)	LC_{50} (ppm)	Confidence Limits		Slope function
		Lower	Upper	
Malathion	0.2	0.16	0.25	2.00
Temefos	0.01	0.008	0.013	3.415
Chloropyrifos	0.025	-	-	-

Table 2. Statistical analysis of results of susceptibility tests of A. coustani adults to four insecticides in Ismailia Governorate (Tal el Kebir)

Insecticide conc. (%)	Exposure time (minutes)	LT_{50} (minutes)	LC_{50} (%)	Confidence limits Lower	Confidence limits Upper	Slope function
DDT	60	-	2.7	2.33	3.13	2.19
DLD	60	-	0.8 (extrapolated)	-	-	-
Malathion (3.2%)	-	16	-	13.19	19.40	2.405
Malathion	30	-	2.2 (interpolated)	-	-	-
Fenitrothion (1%)	-	> 60	-	-	-	-
Fenitrothion (0.1%)	-	6	-	4.47	8.06	3.875

TABLE 3. Statistical analysis of results of susceptibility tests of A. pharoensis larvae to insecticides in Faiyum Governorate (Gabal Saad strain)

Insecticide conc. (ppm)	LC_{50} (ppm)	Confidence limits		Slope function
		Lower	Upper	
DDT	0.08	0.04	0.114	6.01
DLD	S.h.*	-	-	-
Malathion	0.057	0.045	0.072	2.915
Fenitrothion	0.015	0.01	0.022	8.575
Fenthion	0.013	0.01	0.0162	3.055
Chloropyrifos	S.h.*	-	-	-
Bromofos	S.h.*	-	-	-
Parathion	0.0025	0.0019	0.0033	2.8

*S.h. The data are significantly heterogeneous.

TABLE 4. Statistical analysis of results of susceptibility tests of A. pharoensis larvae to insecticides in Faiyum Governorate (El Shawashna strain)

Insecticide conc. (ppm)	LC_{50} (ppm)	Confidence limits		Slope function
		Lower	Upper	
Malathion	0.125	0.099	0.157	2.355

Table 5. Statistical analysis of results of susceptibility tests of A. multicolor larvae to insecticides (Nazla strain)

Insecticide conc. (ppm)	LC_{50} (ppm)	Confidence limits		Slope function
		Lower	Upper	
DDT	> 0.02	-	-	-
Malathion	> 0.115	0.09	0.146	2.39
Fenitrothion	0.025	-	-	-

Table 6. Statistical analysis of susceptibility tests of A. pharoensis adults to insecticides (Gabal saad strain)

Insecticide conc. (%)	Exposure time (minutes)	LT_{50} (minutes)	LC_{50} (%)	Confidence limits Lower	Confidence limits Upper	Slope function
DDT	60	-	4.6	3.717	5.693	2.55
DDT	120	-	2.6	2.22	3.04	2.87
DLD	60	-	5.8 (Extrapolated)	3.82	8.798	6.235
Malathion	60	-	> 0.5	-	-	-
Fenitrothion (0.1%)	-	86	-	74.43	99.36	1.91
Fenitrothion (1%)	-	5.4	-	4.30	6.77	3.235
Propoxur (0.01%)	-	68 (Extrapolated)	-	56.80	81.396	1.999
Propoxur (0.1%)	-	4.6	-	3.991	5.301	2.16
Propoxur	15	-	0.035 (Interpolated)	-	-	-

Fig.1. ISMAILIA GOVERNORATE
EL TAL EL KABIR
Tal Hamed
An. coustani larvae

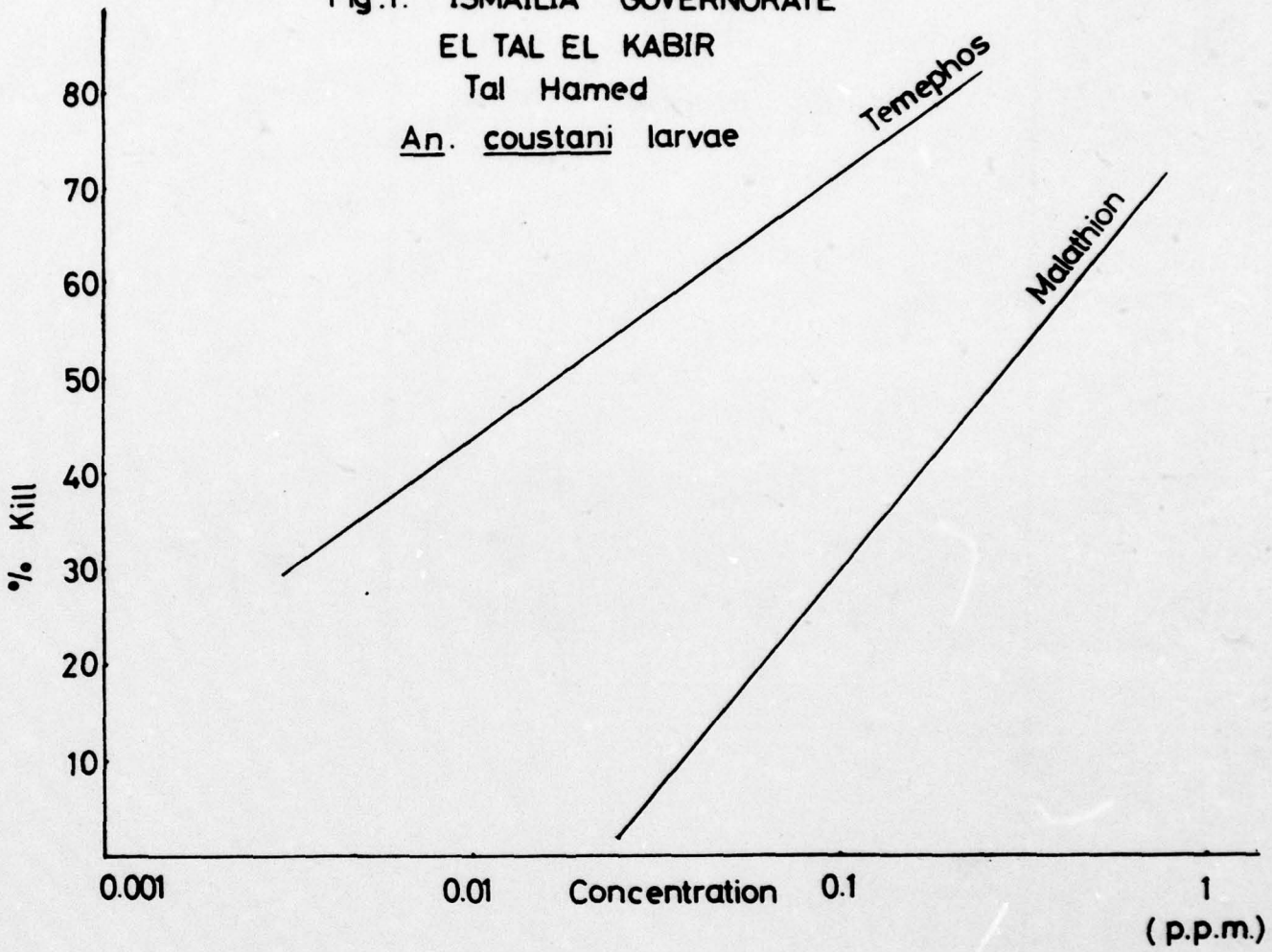


Fig.2. ISMAILIA GOVERNORATE
EL Tal El Kabir
Abou-Adroub
An. coustani Adults

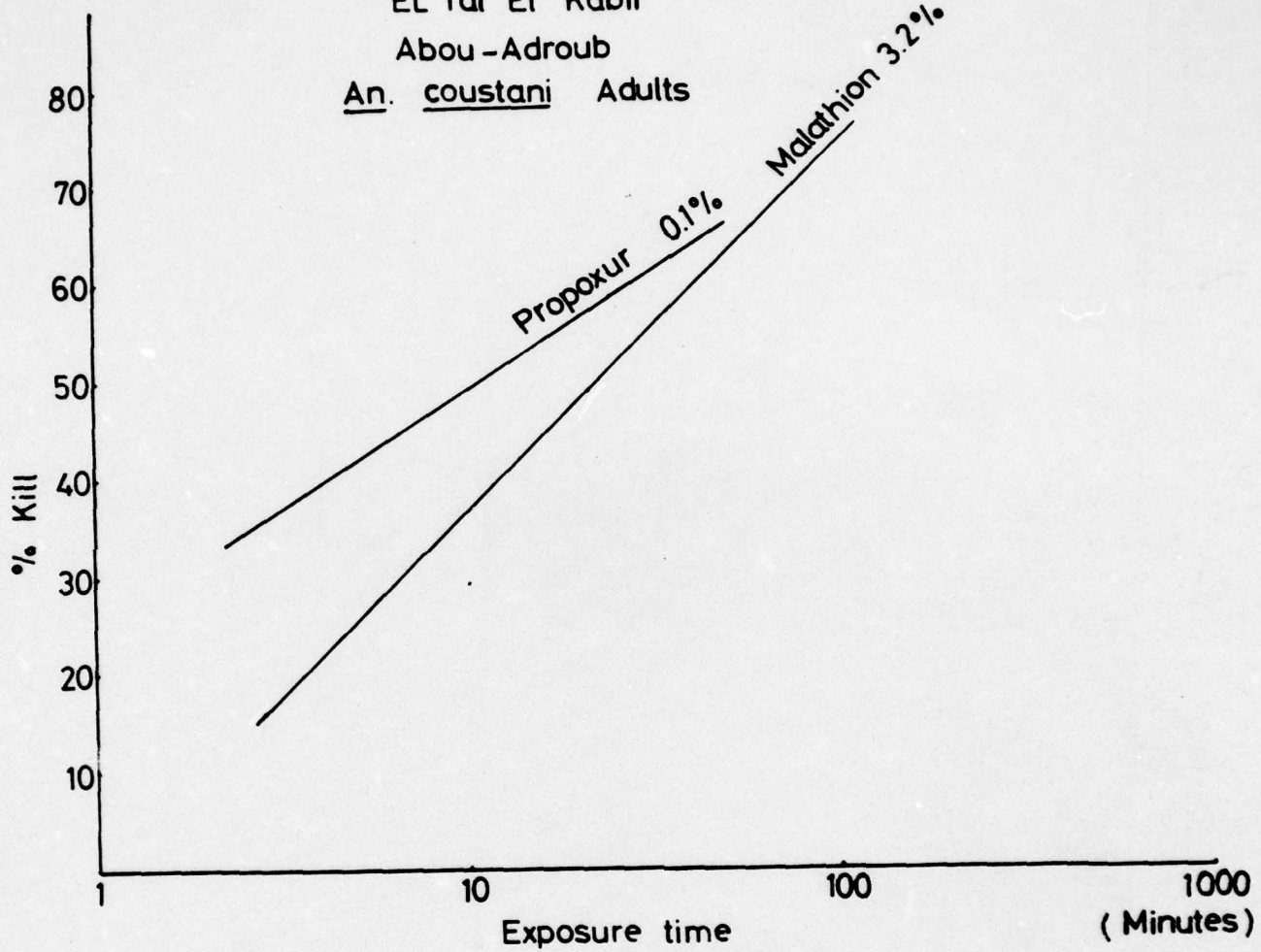


Fig. 3 ISMAILIA GOVERNORATE

El Tal El Kabir

Abou Abroub

An. coustani Adults

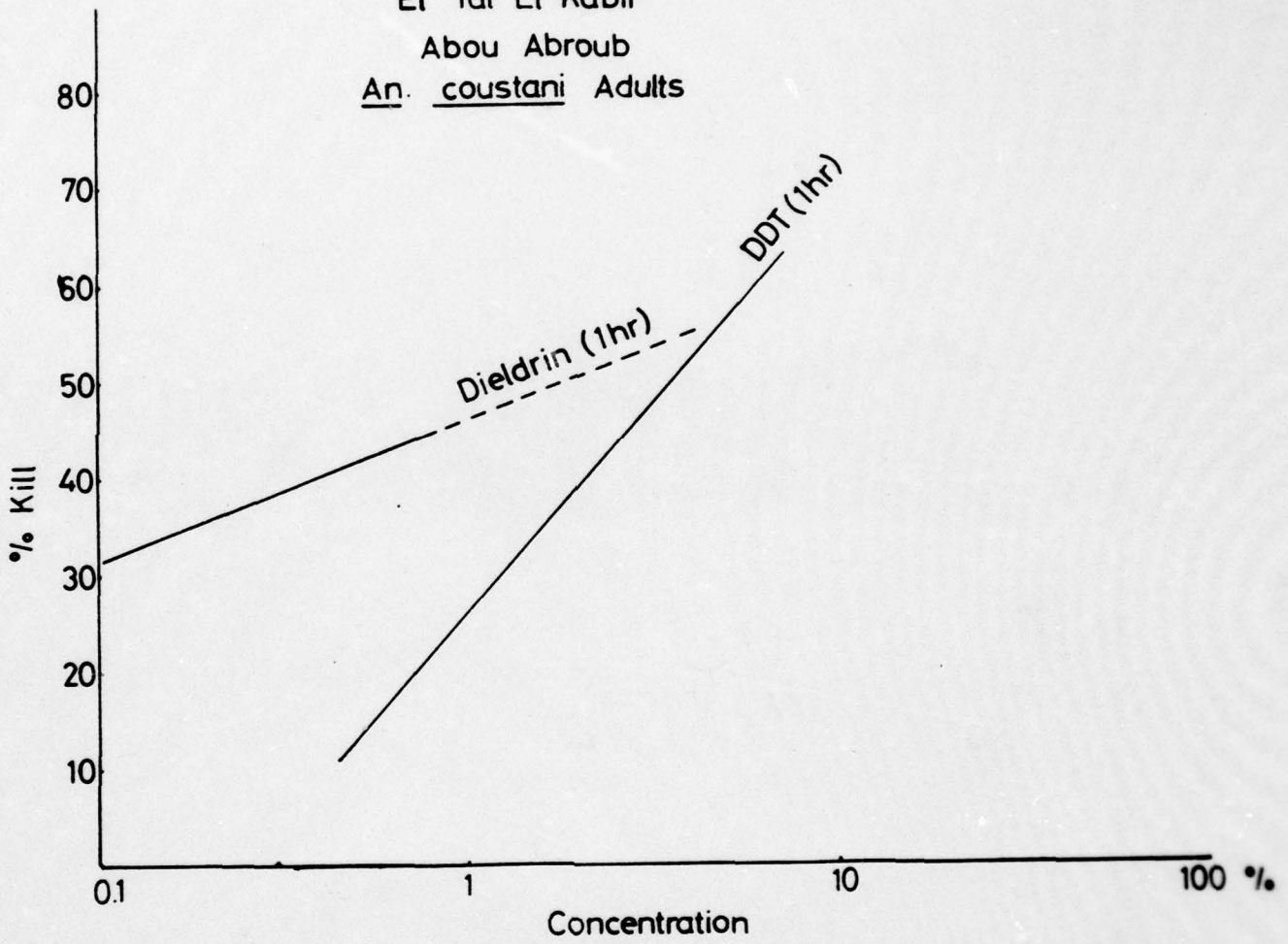


Fig.4. FAIYUM GOVERNORATE
Nazla Gabal saad and Shawashna
An.pharoensis and An.multicolor larvae

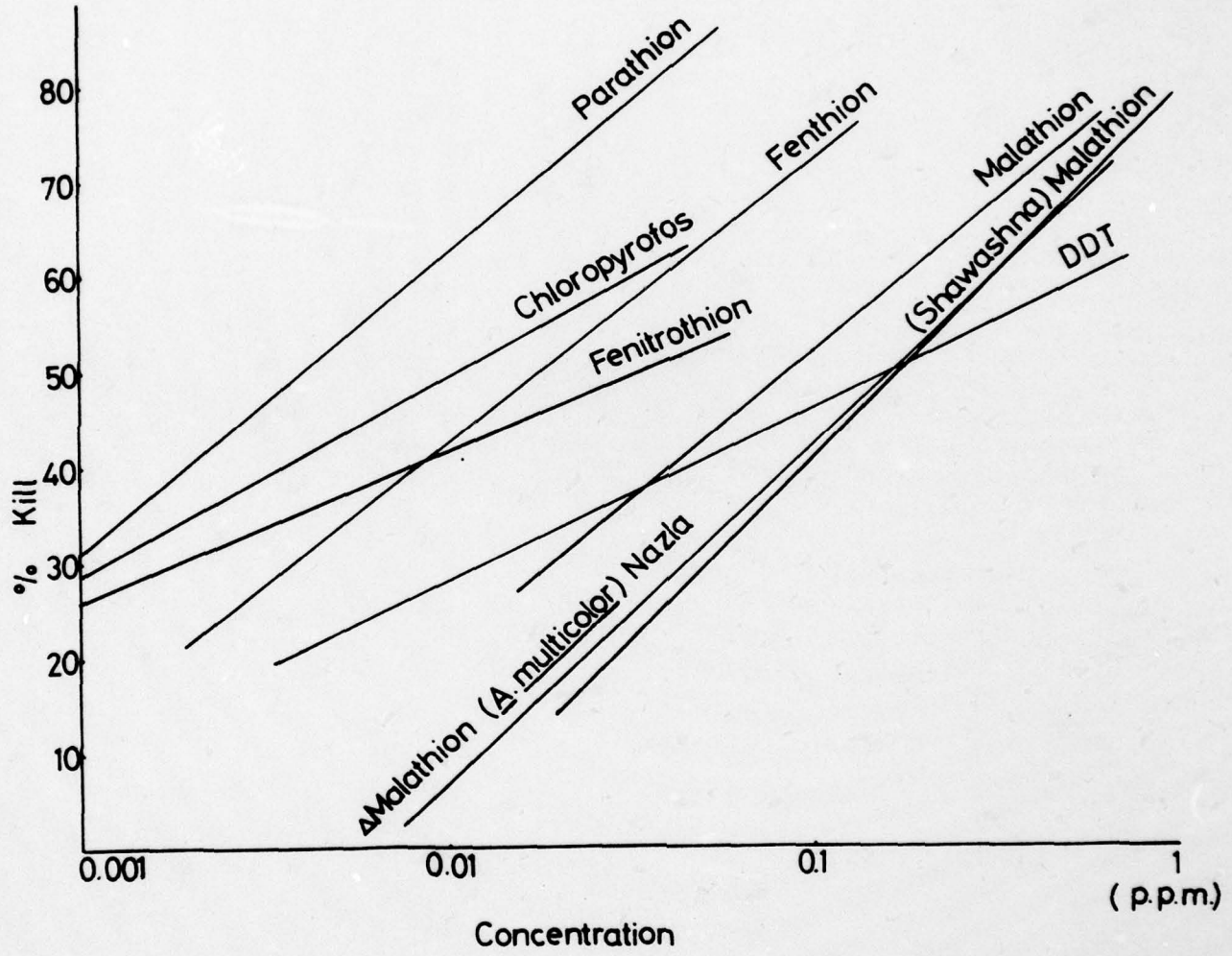


Fig.5. FAIYUM GOVERNORATE

Gobal saad

An. pharoensis Adults

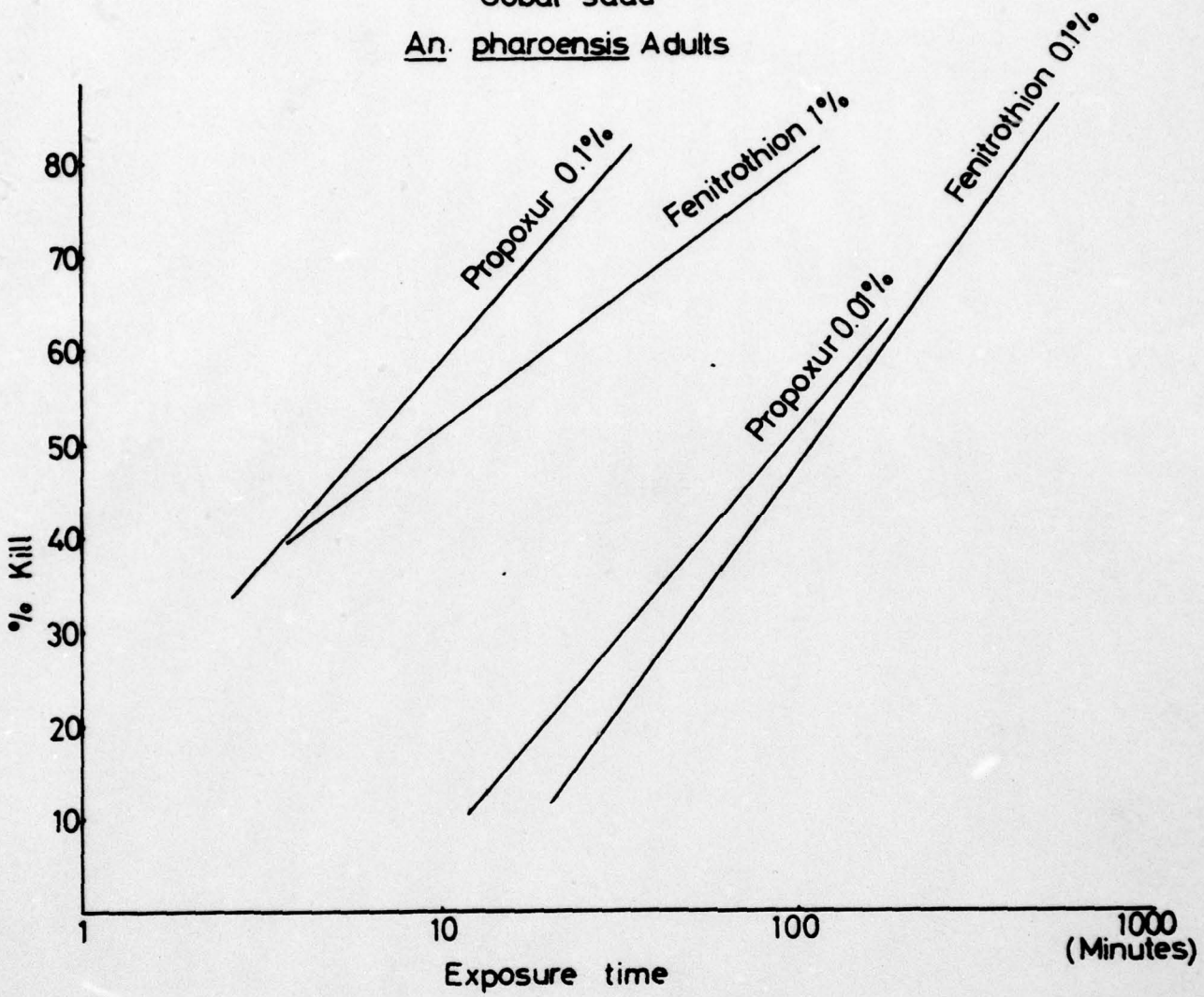
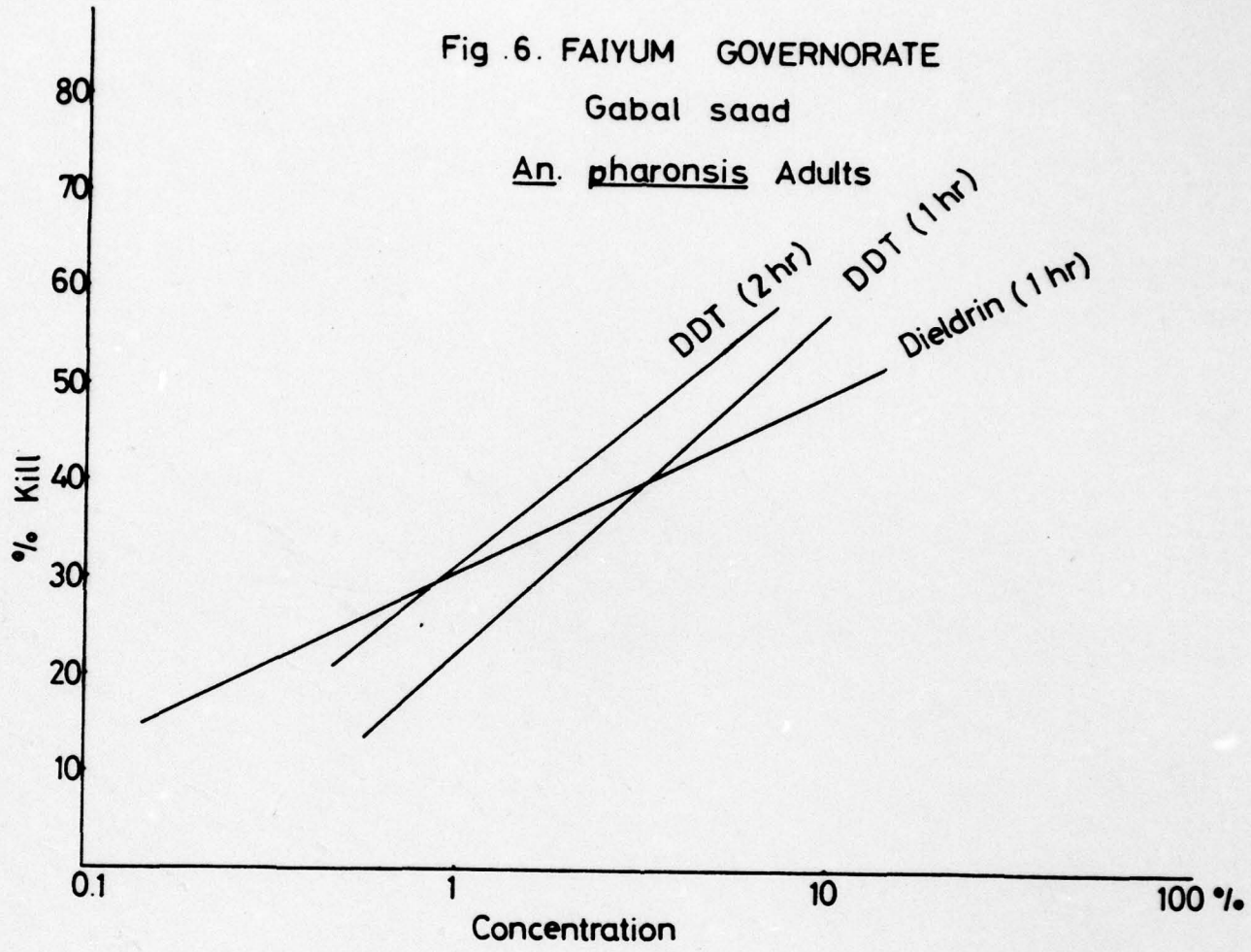


Fig .6. FAIYUM GOVERNORATE

Gabal saad

An. pharonsis Adults



1.1. DDT

Anopheles coustani proved to be quite susceptible to DDT. The median lethal concentration (LC_{50}) and the slope function were quite normal. Probably, this insecticide was not used in this area for a long time. Therefore, it is recommended to apply DDT for the control of this species if necessity arises.

1.2. Dieldrin

The results of the adult tests indicate that the population of An. coustani in this area has been under selection pressure of dieldrin, evidenced by the relatively high value of the slope.

1.3. Malathion

Results indicate that An. coustani is still quite susceptible to this insecticide. It would be recommended without any reservation for the control of both larval and adult stages.

1.4. Fenitrothion and propoxur

Tests with adults of An. coustani indicate that this strain is quite susceptible to both insecticides particularly propoxur.

To avoid mammalian toxicity, fenitrothion is preferably recommended for the control of this mosquito.

1.5. Temefos

The population is still highly susceptible to this insecticide. Therefore it is recommended as a larvicide against this species.

SUMMARY

In summary, the results of susceptibility tests carried out in Ismailia Governorate indicate that no severe selection occurred among the population to any of the insecticides used in the present study.

2. Faiyum Governorate

Anopheles pharoensis

A series of susceptibility tests were carried out in this area where A. pharoensis is widely distributed.

The results of tests performed using the various insecticides revealed the following facts:

2.1. DDT

The results of tests with adults indicate that this strain has become tolerant to DDT. The highest concentration used (4%) yielded about 50% mortality (standard exposure time of one hour). However, the concentration of 2.6% DDT yielded 50% mortality (two hours exposure time). These results indicate that selection to DDT among the population has taken place. New genotype population in terms of its tolerance to DDT has emerged with new level of resistance. Its tolerance was certainly increased to several times that of its parent population. However, the new individuals are not significantly heterogeneous and are narrowly distributed around its means (LC_{50}) evidenced by the relatively small value of the slope.

The results of tests performed on larvae of the same species confirm these findings.

From such results, it can be concluded that if application of DDT is to be performed again in this area, this has to be done at higher concentrations and at short intervals.

2.2. Dieldrin

The results of tests carried out on larvae, indicated beyond doubt that A. pharoensis has developed resistance to this insecticide. The sample tested proved to be significantly heterageneous. The population is separated into two genotypes, the first one representing about 59% from the population while the other is about 41%. The response of the two populations to DDT was different. The LC_{50} for the first one was 0.052 ppm and for the other it was 1.1 ppm. Moreover, the high slope function of adult test indicates that the use of this insecticide is not recommended. It can also be avoided due to the persistant nature of its resistance.

2.3. Malathion

The results of the tests carried out on larvae clearly indicate that A. pharoensis in this area is quite susceptible to this insecticide evidenced by the relatively low LC_{50} and the small value of the slope function. The tests performed on the adults indicate that

this species is highly susceptible to malathion. Accordingly malathion is strongly recommended for controlling this species in this area.

2.4. Fenitrothion

The results of tests performed on both larvae and adults of A. pharoensis showed that it is quite susceptible to this insecticide. Therefore, fenitrothion is recommended in case when malathion is not available.

2.5. Propoxur

Tests were carried out for the adult stage. Results indicated that A. pharoensis is quite susceptible to this insecticide.

Since only two concentrations of propoxur (0.01 and 0.1%) were available; the lethal time which produced 50% mortality (LT_{50}) as well as the slope function for each concentration were obtained.

The analysis of data of susceptibility of A. pharoensis to propoxur indicated that both samples for the two concentrations used were not significantly heterogeneous. The LT_{50} of this insecticide when compared with that of fenitrothion at the same concentration (0.1%) indicates that propoxur is quite superior to fenitrothion. The latter insecticide produced 50% kill after an exposure time as long as 19 folds of the former one.

Again, the two values of the slope function of the two concentrations of propoxur used in the tests were almost identical.

It can be concluded that propoxur has the highest insecticidal potency beside the fact that the vector population is very narrowly distributed around the LC_{50}. Therefore, it can be recommended with special precautions.

2.6. Parathion

The results of tests on larvae indicate that it is very toxic to A. pharoensis larvae. Due to its high mammalian toxicity, it cannot be considered as an alternative choice.

2.7. Fenthion

The results in case of larvae indicate that this insecticide is more effective against A. pharoensis than fenitrothion.

2.8. Temefos

The results of tests in case of larvae showed that this insecticide is even more toxic to A. pharoensis larvae than Fenthion.

2.9. Chloropyrifos and Bromofos

The analysis of the test carried out on larvae showed that A. pharoensis has developed resistance to both insecticides. Their data are significantly heterogeneous. The population was sorted into two groups for Bromofos insecticide. These two genotypes represent 20% and 20%. The LC_{50}'s for such are 0.0054 ppm

and 0.06 ppm. The two genotypes of chloropyrifos insecticide represent 36% and 52% from the population. The LC_{50}'s for such insecticides are 0.0013 and 0.011, respectively.

ii. A. multicolor

Tests were carried out only on larvae of this species to DDT, malathion and fenitrothion insecticides. The results indicate that this strain of A. multicolor is quite susceptible to the three insecticides used.

In summary Anopheles sp. larvae and adult in Faiyum Governorate are still susceptible to malathion. It is also quite susceptible to Fenithothion, Fenthion, Temefos and propoxur insecticides. Thus these insecticides are recommended for controlling both stages of the vector population in Faiyum Governorate.

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July 14,1979

SUMMARY

Results of susceptibility tests of various mosquitoes(larvae and adults) to different insecticides carried out in Ismailia,Cairo and Faiyum Govs.

1. Ismailia Governorate (Abou Adroub- Tal El Kebir) *Culex* sp.

INSECTICIDE USED	ADULTS			LARVAE		RECOMMENDATIONS AND CONCLUSIONS
	LC_{50} %	LT_{50} min.	REMARKS	LC_{50} ppm	REMARKS	
DDT	S.H.	-	Two genotypes.	0.33		Not to be recommended. It is probable that the population had developed resistance to DDT.
DLD	1.6 1 hr.	-	The line was extrapolated.	0.036		Only larvae proved to be susceptible to DLD
MALATHION	4.7% 1 hr	52 105	5% 3.2%	0.24		Both larval and adult stages still susceptible to Malathion.
FENITROTHION	-	100 min.		0.04	Two genotypes started to separate	It can be effectively applied against both larvae and adults.
FENTHION	-	-		0.09		Can be considered susceptible despite the fact that no tests were carried out on the adults.
TEMEFOS	-	-	Adult test was not carried .	0.022		Larvae susceptible to Temefos.
PROPOXUR		5.4 min.		-	Larval test was not carried out.	Population susceptible.
CHLORPYRIPOS	-	-		0.12	Extrapolated	Not recommended. Population highly resistant.

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SUMMARY

Results of susceptibility tests of various mosquitoes(larvae and adults) to different insecticides carried out in Ismailia,Cairo and Faiyum Govs.

1, Ismailia Governorate (Kantara) *Culex* sp.

INSECTICIDE USED	ADULTS			LARVAE		RECOMMENDATIONS AND CONCLUSIONS
	LC_{50} %	LT_{50} min.	REMARKS	LC_{50} ppm	REMARKS	
DDT	-	-	-	0.2		Not recommended
MALATHION	-	-	-	0.23		Susceptible Recommended
TEMEFOS	-	-	-	0.014		Susceptible Recommended
CHLOROPYRIFOS	-	-	-	0.026		Not recommended

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Results of susceptibility tests of various mosquitoes(larvae and adults) to different insecticides carried out in Ismailia,Cairo and Faiyum Govs.

1. Ismailia Governorate 1.1- Abou Adroub-Tal El Kebir (An.coustani adults)
1.2- Tal Hamed -Tal El Kebir " " larvae)

INSECTICIDE USED	ADULTS			LARVAE		RECOMMENDATIONS AND CONCLUSIONS
	LC_{50} %	LT_{50} min.	REMARKS	LC_{50} ppm	REMARKS	
DDT	2.7 1 hr.	-	Less tolerant than Culex sp.	-		Not recommended
DLD	0.5 1 hr.	-	Extrapolated.			Not recommended
MALATHION	-	16 min.	3.2%	0.2		Recommended for both larvae and adults.
PROPOXUR	-	6 min.	(0.1%)	-	Larval test was not carried out.	Recommended for adults
FENITROTHION		>60 min.	(1%)	-		Recommended
TEMEFOS	-	-		0.01		Recommended for larvae
CHLOROPYRIFOS	-	-		0.025		Recommended for larvae

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2. Cairo- El Marg — *Culex* sp.

INSECTICIDE USED	ADULTS			LARVAE		RECOMMENDATIONS AND CONCLUSIONS
	LC_{50} %	LT_{50} min.	REMARKS	LC_{50} ppm	REMARKS	
DDT	<4%	-	(1 hr)	0.45		Not recommended Tolerant to DDT.
DLD	1.7% (1hr)	-	(1 hr)	0.048		Not recommended. Selection in the populatic
MALATHION	≥ 2.5 (1hr)	-	(1 hr)	0.3		Not recommended Selection in the popula-. tion.
FENITROTHION	-	120 45	(0.1) (1%)	<0.125		Not recommended for both larval and adult stages
PROPOXUR	-	3 min 7.5"	(0.1%) (0.0%)	-	Larval test was not carried out.	Recommended for adults
TEMEFOS	-	-		0.025		Recommended for larvae. Suscentible.
FENTHION	-	-		0.076		Not recommended.

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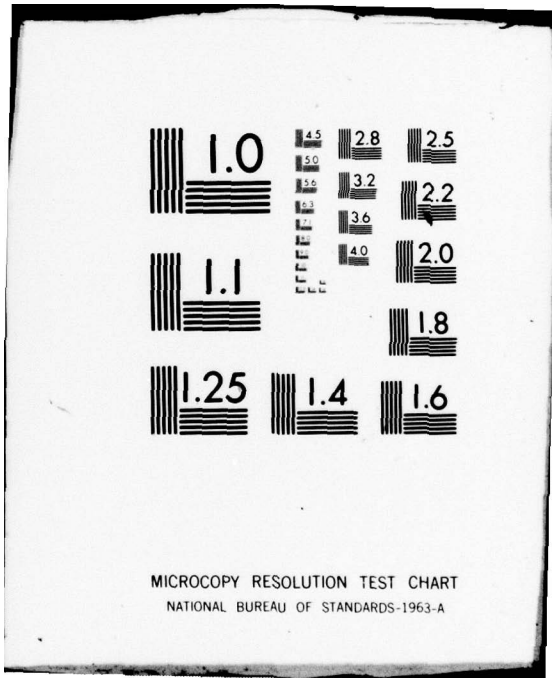
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SUMMARY

Results of susceptibility tests of various mosquitoes(larvae and adult) to different insecticides carried out in Ismailia,Cairo and Faiyum Govs.

9, Faiyoum Governorate - 3.1-Gabal Saad 3.2-El Nazla 3.3- Shawashna Culex

INSECTICIDE USED	ADULTS			LARVAE		RECOMMENDATIONS AND CONCLUSIONS
	LC_{50} %	LT_{50} min.	REMARKS	LC_{50} ppm	REMARKS	
DDT	3.5% 1 hr	→ - -	3.1-	0.09 0.5 0.018	3-1 3-2 3-3	Not recommended Tolerant(3.1 and 3.2) Recommended (3.3) Susceptible
DLD	2.1% 1 hr -	-	3.1- 3.2-	S.H. S.H.	Significantly Heterogeneous	Not recommended (3.1) Not recommended (3.2)
MALATHION	2.4 2.2	- -	3.1- Mensheit Bagdad	>0.125 >0.125 0.045	3.1 3.2 3.3	Recommended (Susceptible) Recommended (Susceptible)
FENITROTHION	-	17	3.1-(1%) 3.2	>0.025 0.01	3.1 3.2	Susceptible (Recommended) Susceptible (Recommended)
PROPOXUR	-	5.3	3.1(0.1%)	-	-	Susceptible (Recommended)
TEMEPOS	-	-		≤0.005 >0.025 0.01	3.1 3.2 3.3	Susceptible (Recommended) Susceptible (Recommended) " "
FENTHION	-	-		0.016 0.0054	3.1 3.2	Susceptible (Recommended) Susceptilbe (Recommended)
BROMOPOS	-	-		S.H. S.H.	3.1 3.2	Not recommended " "
CHLOROPYRIPOS	-	-		0.035 0.0056	3.1 3.2	Not Recommended.Populatio segragated for different genotypes.
PARATHION	-	-	-	>0.125 >0.025	3.1 3.2	Susceptible.However,not to be recommended due to its high mammalian toxi

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SUMMARY

Results of susceptibility tests of various mosquitoes(larvae and adults) to different insecticides carried out in Ismailia,Cairo and Faiyum Govs.

3, Faiyoum Governorate 3.2- El Nazlah An.multicolor.

INSECTICIDE USED	ADULTS			LARVAE		RECOMMENDATIONS AND CONCLUSIONS
	LC_{50} %	LT_{50} min.	REMARKS	LC_{50} ppm	REMARKS	
DDT				0.005	Slope function high.	Not recommended
DLD				0.007		Recommended (Susceptible)
Malathion				0.225	Slope function high.	Not recommended
BROMOFOS				0.03	Slope function high	Not recommended

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SUMMARY

Results of susceptibility tests of various mosquitoes(larvae and adults) to different insecticides carried out in Ismailia,Cairo and Faiyum Govs.

3. Faiyoum Governorate 3.4-Gabal Saad An.pharoensis

INSECTICIDE USED	ADULTS			LARVAE		RECOMMENDATIONS AND CONCLUSIONS
	LC_{50} %	LT_{50} min.	REMARKS	LC_{50} ppm	REMARKS	
DDT	4.6 (1hr) 2.6 (24hrs)	-	Extrapol-ated(1hr)	0.08	Two genotypes separated.	Not recommended. (Tolerant)
DLD	5.8 (1hr)	-	Extrapol-ated	S.H.		Not recommended.
MALATHION	0.5 (1hr)	-		0.057 0.125	(Shawashna)	Recommended (Susceptible)
FENITROTHION	-	86 5.4	(0.1%) (1%) Extrapol-ated	0.015		Recommended (Susceptible)
PROPOXUR	-	58 4,6	0.01% 0.1%	-		Recommended (Susceptible) for adults
TEMEPOS	-	-		0.009		Recommended(Susceptible)
FENTHION	-	-		0.013		Recommended (Susceptible)
BROMOPOS	-	-		S.H.		Selection started Not recommended
CHLOROPYROPOS	-	-		S.H.		Selection started Not recommended
PARATHION	-	-		0.0025		Susceptible.Not recommend due to its high mammalian Toxicity.

III- CYTOLOGICAL STUDIES

III. CYTOLOGICAL STUDIES

A follow up of the cytogenetic of Anopheles pharoensis from different localities in Faiyum Governorate was carried out. Samples for chromosomal mapping were collected from El-Sheikh Sayed village, Sennouris and Ebheit El-Haggar.

No major deviations in the salivery gland chromosomal map were recorded for any of these populations from that of Faiyum city. No convincing evidence can support the assumption of the existence of Anopheles pharoensis variants in different localities of this Governorate.

At present, collections are practiced at Beheira Governorate, where the conditions are presumed to be different from Faiyum Governorate. At Beheira Governorate, the fluctuations of temperature are comparatively moderate, humidity is rather high, and rice fields are flooded with water for about four months a year. An. pharoensis population prevailing in this Governorate is not supposed to be an efficient malaria vector since no infections (stomach or salivary gland) were recorded in the last two years, in addition no malaria cases during the same period.

The following cytological studies are being tried at present:

1) Giant chromosome analysis through the salivary glands.

2) Chromosomal mapping through the use of ovarian chromosome preparations.

3) The following crosses are being attempted:

a. Beheira males x Faiyum females.

b. Beheira females x Faiyum males.

IV- PARASITOLOGICAL AND SEROLOGICAL STUDIES

INTRODUCTION

During the period (1977-1978) malariometric surveys were carried out in some localities of seven governorates. These localities were selected on geographical and epidemiological basis.

The results of the blood surveys provided base line data.

The blood surveys were divided into :

1- Spot surveys :

Carried out in the Delta governorates, the Oasis and Aswan.

2- Longitudinal surveys :

Carried out in the areas where malaria prevails during the four seasons of the year. However, from the epidemiological point of view, it is the incidence of malaria that is of particular importance since it indicated the continuty of local transmission.

During the spot surveys in 1977 that were carried out in the Delta region, a small malaria outbreak was detected in Qalubiya Governorate. The Ministry of Health was notified and advised to take action regarding control.

Based on the observations and results of the extensive blood surveys that were carried out during 1977-1978 in various localities of the Delta and Nile Valley : the plan of work for 1978-1979 was modified regarding the priority areas and the age groups. One of the main objectives of the plan of work was to demonstrate the existence of any especially exposed population or community.

The results of the 1978-1979 survey indicated that there were areas that required special attention namely : Faiyoum, Aswan and Qalubiya Governorates.

The strategy of the annual plan remained unchanged i.e. spot surveys in areas of the previously selected governorates and longitudinal surveys in areas that required attention.

The Faiyoum Governorate was chosen for the longitudinal study since malaria prevails during the whole year. This detailed study will definitely help the MOH in its antimalaria compaigns.

On the other hand, Qalubiya Governorate represents the unstability of malaria in certain areas of the Delta. The longitudinal study in such an area will probably yield detailed information regarding the parasite behaviour and the antibody response in the population during and following an outbreak. It will also indicate :

1- The duration of the so-called disappearing malaria in a locality.
2- The study of the possible causes that have led to successful control measures and the measures required to maintain such a situation.

The third area that is similar to Faiyoum and Qalubiya Governorates is Aswan. It is the first defence line against the invasion of the most dangerous African malaria vector, namely Anopheles gambiae. However, this mosquito has succeeded in advancing northwards and in establishing itself twice. It first invaded Upper Egypt in 1941-1942 and then in 1948 causing the death of 200,000 inhabitants. Successful vector erradication of this species was accomplised.

It is now considered that the northern limit of Anopheles gambiae is at Dal, 150 km South of Halfa in Sudan (Gillies, 1972). Active Antimosquito control measure are going on regularly by the Sudanese authorities (Protocol between Sudanese & Egyptian Governorates), otherwise this highly efficient vector would have advanced northwards reaching the southern shore of the lake near Halfa. The ecological feature of this region and increased perennial irrigation most

probably would permit the colonization and spread of An. gambiae.

This species could also be introduced via other routes ; by ships and boats working between Sudan and the High Dam and by desert routes of camel caravanes from neigbouring countries. Moreover, An. gambiae would be introduced into Egypt at any time.

Owing to this situation, the population of the villages surrounding the High Dam harbour should be surveyed twice per year. A sero-epidemiological study was started by our field research teams but on a limited scale.

Concerning the personnel of the teams, the method of recording names or age classification and blood collection for parasitological or serological sampling remained the same. The parasitological examination and immunofluorescent test also remained the same.

The immunofluorescent antibodies were detected using antigen preparations of shizont forms of Plasmodium fieldi obtained from infected blood film of Aotus monkeys prepared by two of our research workers at the Ross institute under the supervision of Dr. C.C. Draper.

The continuous cultivation of P. falciparum was carried out successfuly at the Malaria and other Parasitic Diseases Research Unit under the supervision of Dr. Ray Beach NIAID. Their aim was to prepare antigen slides and to be self sufficient.

A continuous supply with homologous human sera and RPMI : 1640 was successfuly achieved in the laboratory.

Our sincere hope is to prepare P. falciparum antigen slides in the immediate future. Up to the present time we are using in our blood surveys P. fieldi antigen (thick film) slides and to a lesser extent P. falciparum.

The *fieldi* antigen slides were supplied by Dr. C.C. Draper since he did not produce *P. falciparum* antigen slides at that time. The *P. fieldi* antigen merely indicates the presence of antibodies to malaria in the population but without determining the actual distribution of the species. On the contrary the *P. falciparum* antigen has a high cross-reactivity i.e. more sensitive (Bill Collins I 1977).

IV - PARASITOLOGICAL AND SEROLOGICAL STUDIES

The points studied during the period of this report were :

1) Longitudinal study of malaria in Faiyum Governorate.

2) Longitudinal study of malaria in Qalyubiya Governorate.

3) Spot surveys in the selected Governorates.

4) Spot surveys in Aswan (the malaria serodiagnostic profile of a sample in Aswan).

1. Assessment of malaria spleenometric survey in Egypt

1.1. Objective of the present study :

To permit optimal use of available malariometric methods, a comparative study was carried out using three different techniques :

1. Parasitological.
2. Serological.
3. Measurement of spleen rate.

1.2. Procedure adopted for case examination :

For this purpose, 1,400 children of school age group were examined in seven Governorates over a period of 3 months.

From each of the seven Governorates, 200 children were examined.

1.3. Materials and Methods :

The classification of endemic malaria adopted by the WHO (1950) was classified according to Hackett's method.

Spleen rate (S.R.)	Degree of endemicity
Less than 10%	Hypo-endemic malaria
11-50%	Mesoendemic malaria
Constantly over 50%	
1. Adult spleen rate high, constantly over 75%.	Hyper-endemic
2. Adult spleen rate low	Holo-endemic

The average enlarged spleen was not calculated, since its value is to differentiate between hyper-endemic and epidemic malaria and that is not our objective.

A team composed of a single physician and two assistants carried out the spleen measurements.

The name and age of each child was recorded; but data of previous malaria history, malaria treatment and malaria of family members are usually not reliable.

The spleen was palpated in the recumbent position. The abdomen was bare, muscles relaxed and knees flexed. A thick blood film sample for parasitological examination and a parallel one on a filter paper for IFAT were collected from each child. In view of the rate of spleen regression, it was decided to re-examine three months later a number of children with palpable spleen. The age of eight years old was selected since some authors (McGregor et al. 1965, Bill Collins 1972) suggest that the magnitude of antibody response to infection may be lower in young children than in older ones. To avoid bilharzial spleenomegaly, the age groups above 8 years old were not selected.

/.4. Results:

The total results of this examination appear in Table 1 .

/.4./. Parasitological results :

Results of the parasitological examination appear in Table 2.

From the data represented in the table, it appears that twelve positive slides were found in Abheet village (Faiyum Governorate). However, the other governorates were found negative.

/.4.2. Serological results :

Results of the serological tests appear in Table 3.

From the data represented in Table 3, it was found that by comparing the results by descriminative titre from 1/16 to 1/4096, it was found that:

The total sero-positives were 183 among 1,400 children examined.

75 were found positive at 1/16

71 were found positive at 1/64

22 were found positive at 1/256

11 were found positive at 1/1024

4 were found positive at 1/4096

/.4.3. Measurement of spleen rate :

Results of 1,400 children examined in 7 Governorates for spleen enlargement appear in Table 4.

From the data presented in the table 4, it appears that :

Table (1) **Serological tests, Spleen rate and Parasitological examination of blood samples collected from seven governorates**

Governorate	Locality	Parasitological Examination			Serological Test						% Spleen			
		% TOT+ve	% P.F.	% P.V.	% TOT+ve	% 16	% 64	% 256	% 1024	% 4096	% TOT+ve	% I	% II	% III
Faiyum	Abheet	12%	7%	5%	59%	9	20	17	9	4	10	6	4	0
	El Z.El Khadra	0	0%	0%	10%	3	3	2	2	0	5	5	0	0
	TOTAL	6	3.5%	2.5%	34.5%	6	11.5	9.5	5.5	2	7.5	5.5	2	0
Qalyubiya	El Alag	0	0	0	48	18	27	3	0	0	17	15	2	0
	El Marg	0	0	0	6	4	2	0	0	0	1	1	0	0
	TOTAL	0	0	0	27	11	14.5	1.5	0	0	9	8	1	0
Kafr El Sheikh	Hamarawi (1)	0	0	0	0	0	0	0	0	0	1	1	0	0
	(2)	0	0	0	0	2	0	0	0	0	2	2	0	0
	TOTAL	0	0	0	1%	1%	0	0	0	0	1.5	1.5	0	0
Gharbiya	Hanoun (1)	0	0	0	3	3	0	0	0	0	1	1	0	0
	(2)	0	0	0	5	5	0	0	0	0	1	1	0	0
	TOTAL	0	0	0	4	4	0	0	0	0	1	1	0	0

Table (1) Cont.

Governorate	Locality	Parasitological Examination			Serological Test						% Spleen			
		% TOT+ve	% P.F.	% P.V.	% TOT+ve	% 16	% 64	% 256	% 1024	% 4096	% TOT+ve	% I	% II	% III
Sharqiya	Basatin El Ismailiya	0	0	0	6	5	1	0	0	0	0	0	0	0
	Abassa	0	0	0	8	7	1	0	0	0	0	0	0	0
	TOTAL	0	0	0	7	6	1	0	0	0	0	0	0	0
Ismailiya	Tal El Kebir 1	0	0	0	4	3	1	0	0	0	0	0	0	0
	2	0	0	0	7	6	1	0	0	0	0	0	0	0
	TOTAL	0	0	0	5.5	4.5	1	0	0	0	0	0	0	0
Beheira	Kafr Masood 1	0	0	0	11	8	3	0	0	0	0	0	0	0
	2	0	0	0	14	2	12	0	0	0	0	0	0	0
	TOTAL	0	0	0	12.5	5	7.5	0	0	0	0	0	0	0
	Grand Total	0.86	0.5	0.36	13.1	5.4	5.1	1.6	0.8	0.3	2.7	2.3	0.4	0

Table (2) Correlation between Parasitological examination, Serological Diagnosis and Spleen Enlargement in certain Governorates

Parasitological Examination

Governorate	Locality	Month	TOT Slides Collected	TOT Slides Ex.	TOT Slides -ve	TOT Slides Positive					
						TOT NO.		P. falciparum		P. vivax	
						NO.	%	NO.	%	NO.	%
Faiyum	Abheet	Jan	100	100	88	12	12%	7	7%	5	5%
	El Zawiah El Khadra	Jan	100	100	100	0	0	0	0	0	0
	TOTAL		200	200	188	12	6%	7	3.5%	5	2.5%
Qalyubiya	El Alag	Jan	100	100	100	0	0	0	0	0	0
	El Marg	Jan	100	100	100	0	0	0	0	0	0
	TOTAL		200	200	200	0	0	0	0	0	0
Kafr El Sheikh	Hamrawi (1)	Jan	100	100	100	0	0	0	0	0	0
	(2)	Jan	100	100	100	0	0	0	0	0	0
	TOTAL		200	200	200	0	0	0	0	0	0
Gharbiya	Hanoun (1)	Feb	100	100	100	0	0	0	0	0	0
	(2)	Feb	100	100	100	0	0	0	0	0	0
	TOTAL		200	200	200	0	0	0	0	0	0

Table (2) Cont.

Governorate	Locality	Month	TOT Slides Collected	TOT Slides Ex.	TOT Slides -ve	TOT Slides Positive					
						TOT NO.		P. falciparum		P. vivax	
						NO.	%	NO.	%	NO.	%
Sharqiya	Basatin El Ismailiya	Feb	100	100	100	0	0	0	0	0	0
	Abassa	March	100	100	100	0	0	0	0	0	0
	TOTAL		200	200	200	0	0	0	0	0	0
Ismailiya	Tal El Kebir (1)	March	100	100	100	0	0	0	0	0	0
	(2)	March	100	100	100	0	0	0	0	0	0
	TOTAL		200	200	200	0	0	0	0	0	0
Beheira	Kafr Masood (1)	Feb	100	100	100	0	0	0	0	0	0
	(2)	Feb	100	100	100	0	0	0	0	0	0
	TOTAL		200	200	200	0	0	0	0	0	0
	Grand Total		1400	1400	1388	12	0.86%	7	0.50%	5	0.36%

Table(3) Correlation Between Parasitological Examination, Serological Diagnosis and Spleen Enlargement in certain Governorates

Serological Test

Governorate	Locality	Month	TOT Samples Collected	TOT Samples Ex.	TOT Samples -ve	Total Samples Positive						
						TOT Samples		% Titres				
						NO	%	16	64	256	1024	4096
Faiyum	Abheet	Jan	100	100	41	59	59%	9	20	17	9	4
	El Z. El Khadra	Jan	100	100	90	10	10%	3	3	2	2	0
	TOTAL		200	200	131	69	34.5%	6	11.5	9.5	5.5	2
Qalyubiya	El Alag	Jan	100	100	52	48	48%	18	27	3	0	0
	El Marg	Jan	100	100	94	6	6%	4	2	0	0	0
	TOTAL		200	200	146	54	27%	11	14.5	1.5	0	0
Kafr El Sheikh	Hamrawi (1)	Jan	100	100	100	0	0%	0	0	0	0	0
	(2)	Jan	100	100	98	2	2%	2	0	0	0	0
	TOTAL		200	200	198	2	1%	1%	0	0	0	0
Gharbiya	Hanoun (1)	Feb	100	100	97	3	3%	3	0	0	0	0
	(2)	Feb	100	100	95	5	5%	5	0	0	0	0
	TOTAL		200	200	192	8	4%	4%	0	0	0	0
Sharqiya	Basatin El Ismailiya	Feb	100	100	94	6	6%	5	1	0	0	0
	Abassa	March	100	100	92	8	8%	7	1	0	0	0
	TOTAL		200	200	186	14	7%	6	1	0	0	0

Table (3) Cont.

Governorate	Locality	Month	TOT Samples Collec-ted	TOT Samples Ex.	TOT Samples -ve	Total Samples Positive						
						TOT Samples		% Titres				
						NO	%	16	64	256	1024	4096
Ismailiya	Tal El Kebir(1)	March	100	100	96	4	4%	3	1	0	0	0
	(2)	March	100	100	93	7	7%	6	1	0	0	0
	TOTAL		200	200	189	11	5.5%	4.5	1	0	0	0
Beheira	Kafr Masood(1)	Feb	100	100	89	11	11%	8	3	0	0	0
	(2)	Feb	100	100	86	14	14%	2	12	0	0	0
	TOTAL		200	200	175	25	12.5%	5	2.5	0	0	0
	Grand Total		1400	1400	1217	183	13.1	5.4	5.1	1.6	0.8	0.3

Table (4) Correlation Between Parasitological Examination, Serological Diagnosis and Spleen Enlargement in certain Governorates

Spleen

Governorate	Locality	Month	TOT Cases Ex.	TOT Cases -ve	Total Cases Positive				
					Total Positive		% Degree		
					NO.	%	I	II	III
Faiyum	Abheet	Jan	100	90	10	10%	6	4	0
	El Zawiah El Khadra	Jan	100	95	5	5%	5	0	0
	TOTAL		200	185	15	7.5%	5.5	2	0
Qalyubiya	El Alar	Jan	100	83	17	17%	15	2	0
	El Marg	Jan	100	99	1	1%	1	0	0
	TOTAL		200	182	18	9%	8	1	0
Kafr El Sheikh	Hamrawi (1)	Jan	100	99	1	1%	1	0	0
	(2)	Jan	100	98	2	2%	2	0	0
	TOTAL		200	197	3	1.5%	1.5	0	0
Gharbiya	Hanoun (1)	Feb	100	99	1	1%	1	0	0
	(2)	Feb	100	99	1	1%	1	0	0
	TOTAL		200	198	2	1%	1	0	0
Sharqiya	Basatin El Ismailiya	Feb	100	100	0	0	0	0	0
	Abassa	March	100	100	0	0	0	0	0
	TOTAL		200	200	0	0	0	0	0

Table (4) Cont. Correlation Between Parasitological Examination, Serological Diagnosis and Spleen Enlargement in certain Governorates

Spleen

Governorate	Locality	Month	TOT Cases Ex.	TOT Cases -ve	Total Cases Positive				
					Total Positive		% Degree		
					NO.	%	I	II	III
Ismailiya	Tal El Kebir (1)	March	100	100	0	0	0	0	0
	(2)	March	100	100	0	0	0	0	0
	TOTAL		200	200	0	0	0	0	0
Beheira	Kafr Masood (1)	Feb	100	100	0	0	0	0	0
	(2)	Feb	100	100	0	0	0	0	0
	TOTAL		200	200	0	0	0	0	0
	Grand Total		1400	1362	38	2.7	2.3	0.4	0

1. Thirty-eight children were found having palpable spleen of grade I & II distributed in only four Governorates.

2. The degree of splenic enlargement did not exceed grade II in any of the children examined.

3. Abheet village (Faiyum Governorate) and El-Alag village (Qualyubiya) showed the highest percentage, 10% and 17%, respectively.

4. The least percentage was in Hamrawi (Kafr El Sheikh) and Hamon (Gharbiya Governorate) 1.5% and 1%, respectively, while the enlarged spleen did not exceed grade I.

5. The enlargement of the spleen to grade II in Abheet village and El Alag amounted to 4 out of 10 subjects and 2 out of 17 subjects.

Results of the re-examination of the 27 children with enlarged spleen in Abheet and Al Alag are shown in Tables 5 & 6.

1. In Abheet village during April, the results were similar except one subject with enlarged spleen grade II. His spleen regressed to grade I three months later, i.e., in the January examination.

2. In Al-Alag, during April, the spleen regressed in all subjects.

Regarding the sero-positive examination during January in Abheet village, the results were as follows :

1. Three children were found at a titre of 1/64, one titre remained unchanged, whilst 2 tires declined from 1/64 to 1/16 in the April examination.

Table (5)

Comparison between parasitology, serology and splenic enlargement in Abheet village (Faiyum Governorate) during January and April 1979

Case			January 1979						April 1979					
			Parasitology				Serology	Degree of	Parasitology				Serology	Degree of
				P. Count/100 F.						P.Count/100 F				
NO	Age	Sex	+/-	R.	Tr.	G.	Titre	Spleen	+/-	R.	Tr.	G.	Titre	Spleen
1	7	M	-ve	-	-	-	256	I	-ve	-	-	-	64	-ve
2	7	M	P.F.	-	-	14	256	I	P.F.	-	-	6	64	-ve
3	7	M	-ve	-	-	-	64	I	-ve	-	-	-	16	-ve
4	7	M	-ve	-	-	-	4096	I	-	-	-	-	1024	-ve
5	7	F	P.F.	-	-	21	64	I	P.F.	-	-	9	64	-ve
6	7	M	-ve	-	-	-	4096	I	-	-	-	-	256	-ve
7	7	M	-ve	-	-	-	1024	II	-	-	-	-	256	-ve
8	7	M	P.F.	-	-	17	1024	II	-	-	-	-	1024	I
9	7	M	P.F.	18	5	36	256	II	-	-	-	-	64	-ve
10	7	M	-ve	-	-	-	64	II	Absent					

Table (6)

Comparison between parasitology, serology and splenic enlargement in El Alag village (Qalyubia Governorate) during January and April 1979

Case			January 1979			April 1979		
NO	Age	Sex	Parasitology +/-	Serology Titre	Degree of Spleen	Parasitology +/-	Serology Titre	Degree of Spleen
1	8	M	-ve	16	I	-	16	-
2	8	M	-ve	64	I	-	64	-
3	8	M	-ve	-	I	-	-	-
4	8	F	-ve	-	I	-	-	-
5	8	F	-ve	256	I	-	256	-
6	8	F	-ve	-	I	-	-	-
7	8	M	-ve	-	I	-	-	-
8	8	M	-ve	-	I	-	-	-
9	8	M	-ve	-	I	-	-	-
10	8	M	-ve	64	I	-	64	-
11	8	M	-ve	64	II	-	64	-
12	8	M	-ve	-	I	-	-	-
13	8	M	-ve	16	I	-	-	-
14	8	M	-ve	-	II	-	-	-
15	8	F	-ve	-	I	-	-	-
16	8	F	-ve	16	I	-	Absent	
17	8	F	-ve	64	I	-	64	-

2. The tires of the three children 1/256 found in the January examination declined to 1/64 to 1/16 in the April examination.

3. Two subjects were found at a titre of 1/1024 in the January examination. One of the two remained unchanged, while the other declined to 1/256.

4. Lastly, two subjects were found at the highest titre in the January examination. The titre of one remained unchanged, whilst the titre of the other declined from 1/4096 to 1/256.

Detailed analysis between the relationship of the palpable spleen and slide positivity in Abheet village appears in Table 5.

From the figures presented in the Table, it appears that :

1. From the four slides that were found positive and with palpable spleen during the January examination (Parasitic count shown in Table 5). The degree of reduction in gametocyte count is the same in both cases. Two of them became negative and the other two remained positive till April. However, the spleen of three of them could not be palpated and one regressed from grade II to grade I.

From the figures presented in Table 6, it appears that:

1. Although in Al Alag village, no positive slide could be detected, the number of sero-positives detected were 8 subjects during the January examination.

2. Three subjects were found at a titre of 1/16, four at a titre of 1/64 and one at a titre of 1/256.

The results of the April examination of the same group of children in Al-Alag indicated that while all the spleens became unpalpable, the titre remained constant except two cases. The titre of one case declined from 1/16 to negative and the other was absent during the re-examination survey.

1.5. Discussion

From the results obtained from El-Alag and Abheet villages and by comparing the spleen rate obtained shortly before and late after the transmission season [and according to the classification of endemic malaria adopted by the WHO conference, Kampala (Uganda) 1950], it can be realized that malaria in Al Alag is mesoendemic (S.R. 17%), while in Abheet it is hypoendemic (S.R. 10%). It is evident that the value of the spleen palpation is very limited in the hypoendemic area. It may be of value shortly after the transmission season. However, it cannot be used as an index of recent transmission, besides a single malaria infection may not infrequently cause a degree of splenic enlargement which is insufficient to result in a palpable spleen. However, the serological method remains sensitive shortly and late after the transmission season. This was verified by the fact that all cases with enlarged spleen during January were found seropositives and remained positive even after the regression of the spleen was more rapid than the decline of antibody titre. In fact this decline was by two or three dilutions but remained within the threshold of specificity, i.e., 1/64 or higher except one case which was originally at 1/64 and declined to 1/16.

Table (7)

Results of Parasitological Examination

in governorates

Locality	TOTALS							May 78			June 78			July 78			August 78			Sept.78			Oct. 78		
	NO. Coll-	NO. Ex.	NO. +ve	Total +ve				NO. Coll	NO. Ex.	NO. +ve	NO. Coll	NO. Ex.	NO. +ve	NO. Coll	NO. Ex.	NO. +ve	NO. Coll	NO. Ex.	NO. +ve	NO. Coll	NO. Ex.	NO. +ve	NO. Coll	NO. Ex.	NO +ve
				NO.	P.V.	P.F.	D.																		
Qalyubiya	2244	2244	2244	0				136	136	0	79	79		-	-	-	100	100	0	121	121	0	185	185	0
Minufiya	200	200	200	0																			88	88	0
Sharqiya	1895	1895	1895	0																					
Dagahliya	385	385	385	0																			185	185	0
Beheira	1968	1968	1968	0																			166	166	0
Gharbiya	400	400	400	0																			200	200	0
Kafr El Sheikh	2005	2005	2005	0																			200	200	0
Damietta	200	200	200	0																					
Ismailiya	1665	1665	1665	0																			199	199	0
Port Said	55	55	55	0																			55	55	0
Faiyum	3611	3611	3400	211	105	104	2	104	104	12	230	230	11	389	389	26	86	86	11	362	362	11	200	200	12
Baharia Oasis	2285	2285	2285	0																			2285	2285	0
Siwa Oasis	701	701	700	1	1	0	0							701	701	1									
New Valley	2236	2236	2236	0																					
TOTAL	19850	19850	19638	212	106	104	2	240	240	12	309	309	11	1090	1090	27	186	186	11	483	483	11	3763	3763	12

Table (7) Cont.

Results of Parasitolorical Examination

in governorates

Locality	TOTALS							Nov. 78			Dec. 78			Jan. 79			Feb. 79			March 79			April 79		
	NO. Collected	NO. Ex.	NO. +ve	Total +ve				NO. Coll	NO. Ex.	NO. +ve	NO. Coll	NO. Ex.	NO. +ve	NO. Coll	NO. Ex.	NO. +ve	NO. Coll	NO. Ex.	NO. +ve	NO. Coll	NO. Ex.	NO. +ve	NO. Coll	NO. Ex.	NO +ve
				NO.	P.V.	P.F.	D.																		
Qalyubiya	2244	2244	2244	0				400	400	0	827	827	0	245	245	0	46	46	0	105	105	0			
Minufiya	200	200	200	0				112	112	0															
Sharqiya	1895	1895	1895	0				300	300	0	1395	1395	0	-	-	-	100	100	0	100	100	0			
Daqahliya	385	385	385	0																			200	200	0
Beheira	1968	1968	1968	0				238	238	0	1164	1164	0				200	200	0				200	200	0
Gharbiya	400	400	400	0													200	200	0						
Kafr El Sheikh	2005	2005	2005	0				377	377	0	1128	1128	0	200	200	0			0				100	100	0
Damietta	200	200	200	0				200	200	0															
Ismailiya	1665	1665	1665	0				399	399	0	867	867	0							200	200	0			
Port Said	55	55	55	0																					
Faiyum	3611	3611	3400	211	105	104	2	225	255	28	758	758	53	489	489	19	149	149	7	330	330	11	286	286	10
Baharia Oasis	2285	2285	2285	0																					
Siwa Oasis	701	701	700	1	1	0	0																		
New Valley	2236	2236	2236	0				707	707	0	1529	1529	0												
TOTAL	19850	19850	19638	212	106	104	2	2958	2958	28	7668	7668	53	934	934	19	695	695	7	735	735	11	786	786	10

Table (8)

Results of Parasitological Examination
in Faiyum Governorate

Locality	TOTALS							May 78			June 78			July 78			August 78			Sept. 78			Oct. 78		
	NO. Collected	NO. Ex.	NO. -ve	Total +ve				NO. Coll	NO. Ex.	NO. +ve	NO. Coll	NO. Ex.	NO. +ve	NO. Coll	NO. Ex.	NO. +ve	NO. Coll	NO. Ex.	NO. +ve	NO. Coll	NO. Ex.	NO. +ve	NO. Coll	NO. Ex.	NO. +ve
				NO.	P.V.	P.F.	D																		
Abheet	1291	1291	1129	162	83	77	2	63	63	12	20	20	6	31	31	13	34	34	8	36	36	3	100	100	11
Tersa	293	293	288	5	1	4	0	41	41	0	30	30	0	46	46	1	24	24	0	26	26	2	40	40	0
El.Z.EL Khadra	824	824	799	25	16	9	0	-	-	-	35	35	4	85	85	5	28	28	3	40	40	2	60	60	1
Mensheit Bagdad	142	142	140	2	2	0	0	-	-	-	18	18	1	29	29	0	-	-	-	40	40	1	-	-	-
El Sheikh Said	73	73	72	1	1	0	0	-	-	-	23	23	0	-	-	-	-	-	-	7	7	1	-	-	-
El Nazlah	344	344	343	1	1	0	0	-	-	-	26	26	0	81	81	0	-	-	-	33	33	0	-	-	-
Rahim	108	108	107	1	1	0	0	-	-	-	28	28	0	11	11	1	-	-	-	28	28	0	-	-	-
Kafr Saad	100	100	100	0	0	0	0	-	-	-	13	13	0	20	20	0	-	-	-	18	18	0	-	-	-
Biahmo	178	178	178	0	0	0	0	-	-	-	37	37	0	31	31	0	-	-	-	64	64	0	-	-	-
Ezbet Gergeis	226	226	212	14	0	14	0	-	-	-	-	-	-	55	55	6	-	-	-	41	41	2	-	-	-
Ezbet Henes	32	32	32	0	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	32	32	0	-	-	-
TOTAL	3611	3611	3400	212	105	104	2	104	104	12	230	230	11	389	389	26	86	86	11	365	365	11	200	200	12

Table (8) con.

Results of Parasitological Examination
in Faiyum Governorate

Locality	TOTALS							Nov. 78			Dec. 78			Jan. 79			Feb. 79			March 79			April 79		
	NO. Coll-	NO. Ex.	NO. -ve	Total +ve				NO. Coll	NO. Ex.	NO. +ve	NO. Coll	NO. Ex.	NO. +ve	NO. Coll	NO. Ex.	NO. +ve	NO. Coll	NO. Ex.	NO. +ve	NO. Coll	NO. Ex.	NO. +ve	NO. Coll	NO. Ex.	NO. +ve
				NO.	P.V.	P.F.	D.																		
Abheet	1291	1291	1129	162	83	77	2	151	151	22	358	358	42	154	154	18	27	27	6	131	131	11	186	186	10
Tersa	293	293	288	5	1	4	0	-	-	-	-	-	-	27	27	1	15	15	1	44	44	0	-	-	-
El Z. El Khadra	824	824	799	25	16	9	0	-	-	-	300	300	10	125	125	0	17	17	0	34	34	0	100	100	0
Mensheit Bagdad	142	142	140	2	2	0	0	-	-	-	-	-	-	24	24	0	20	20	0	11	11	0	-	-	-
El Sheikh Said	73	73	72	1	1	0	0	-	-	-	-	-	-	26	26	0	10	10	0	7	7	0	-	-	-
El Nazlah	344	344	343	1	1	0	0	-	-	-	100	100	1	29	29	0	27	27	0	48	48	0	-	-	-
Rahim	108	108	107	1	1	0	0	-	-	-	-	-	-	25	25	0	8	8	0	8	8	0	-	-	-
Kafr Saad	100	100	100	0	0	0	0	-	-	-	-	-	-	26	26	0	6	6	0	17	17	0	-	-	-
Biahmo	178	178	178	0	0	0	0	-	-	-	-	-	-	25	25	0	9	9	0	12	12	0	-	-	-
Ezbet Gergeis	226	226	212	14	0	14	0	74	74	6	-	-	-	28	28	0	10	10	0	18	18	0	-	-	-
Ezbet Henes	32	32	32	0	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL	3611	3611	3400	212	105	104	2	225	225	28	558	558	53	489	489	19	149	149	7	330	330	11	286	286	10

Comparing the degree of regression of the spleen with the slide positivity, it was found that it was more rapid as shown in three cases with enlarged spleen, seropositive and slide positive in Abheet during January. In April, the three cases remained seropositive, two of them remained slide positive but all the spleen could not be palpable. This indicated that while this tool detected ten cases shortly after the season, it failed to detect nine of them late in the season. Two of them remained with patent parasitaemia.

Negative parasitological results in presence of positive spleen and/or serology may indicate the administration of suppressive antimalarial treatment.

2. Parasitological Results

A total of 19,850 blood samples were collected from 11 Governorates during the period from May 1978 to April 1979.

2.1. Parasitological results in various Governorates

Results of the Parasitological examinations of eleven Governorates appear in Table 7.

From the data represented in the table, it appears that 212 cases out of a total of 19,850 individuals examined were found positive (106 P. vivax, 104 P. falciparum, and 2 double infection).

All the positive cases were recorded from Faiyum Governorate, except one case from Siwa Oasis.

Data of the Annual Report I (1977-1978) indicate that both the Faiyum and Qalyubiya Governorates were the areas of choice for a longitudinal study for the surveys of 1978-1979.

2.2. Parasitological results in Faiyum Governorate

2.2.1. Longitudinal study in Faiyum

Results of the longitudinal study carried out in Faiyum Governorate appear in Table 8.

From the data represented in Table 8, it can be noticed that :

1. A total of eleven villages were examined during the period from May 1978 - April 1979.

2. A total of 74 visits were conducted for blood collection.

3. Abheet village was surveyed on a four weekly schedule and proved positive for malaria in all the visits.

2.2.2. Distribution of positive malaria cases

Results of the eight villages that proved positive for malaria in one or more visits during the whole year appear in Table 9.

From the data presented in Table 9, it appears that the villages that proved positive were found in the following months.

May 1978 : 12 positive cases from Abheet, 1 village out of two villages were examined during May.

June : 11 positive cases, 6 from Abheet, 4 from El Zawia El Khadra and one from Mensheit Bagdad. Three villages proved positive out of 9 villages examined.

Table (9)

Distribution of Positive Malaria Cases according to months and localities in Faiyum Governorate

Locality	May 78		June 78		July 78		Aug 78		Sept 78		Oct 78		Nov 78		Dec 78		Jan 79		Feb 79		Mar 79		Apr. 79		Total	
	Visit	NO +ve	Visit	NO +ve	Visit	NO +ve	Visit	NO +ve	Visit	NO +ve	Visit	NO +ve	Visit	NO +ve	Visit	NO +ve	Visit	NO +ve	Visit	NO +ve	Visit	NO +ve	Visit	NO +ve	Visit	NO +ve
Abheet	●	12	●	6	●	13	●	8	●	3	●	11	●	22	●	42	●	18	●	6	●	11	●	10	12	162
Tersa	●	0	●	0	●	1	●	0	●	2	●	0					●	1	●	1	●	0			9	5
El Z. El Khadra			●	4	●	5	●	3	●	2	●	1			●	10	●	0	●	0	●	0	●	0	10	25
Mensheit Bagdad			●	1	●	0			●	1							●	0	●	0	●	0			6	2
El Sheikh Said			●	0					●	1							●	0	●	0	●	0			5	1
El Nazlah			●	0	●	0			●	0					●	1	●	0	●	0	●	0			7	1
Rahin			●	0	●	1			●	0							●	0	●	0	●	0			6	1
Kafr Saad			●	0	●	0			●	0							●	0	●	0	●	0			6	0
Biahmu			●	0	●	0			●	0							●	0	●	0	●	0			6	0
Ezbet Gergeis					●	6			●	2			●	6			●	0	●	0	●	0			6	14
Ezbet Hennes									●	0															1	0
TOTAL	2	12	9	11	9	26	3	11	11	11	3	12	2	28	3	53	10	19	10	7	10	11	2	10	74	211

July : 26 positive cases from Abheet, Tersa, El Zawiah El Khadra, Rahim and Ezbet Gergis.

August : 11 positive cases from Abheet and El Zawiah El Khadra, two villages were found positive out of 3 villages examined.

September : 11 positive cases were found in Abheet, Tersa, El Zawiah El Khadra, Mensheit Bagdad and Gergis.

October : 12 malaria cases were found in El Zawia El Khadra. Two villages out of 3 villages examined proved positive.

November : 28 malaria cases were found in Ezbet Gergis. Only two of the examined villages proved positive.

December : 53 malaria cases from Abheet, El Zawia El Khadra and El Nazlah. Three villages were examined in December and proved positive.

January 1979: 19 malaria cases from Abheet and Tersa. Out of 10 villages examined two proved positive.

February : 7 positive cases were found in Abheet and Tersa. Two villages were found positive out of 10 villages examined during February.

March : 11 positive cases were found in Abheet. It was the only positive village out of 10 villages examined.

April : 10 positive cases were found in Abheet. Two villages were examined during this month.

2.2.3. Seasonal distribution of P. vivax and P. falciparum infections in Abheet.

During this longitudinal survey, 1,291 blood samples were collected from Abheet village. Data presented in Table 10.

- 162 blood samples were found positive.
- 83 P. vivax and 77 P. falciparum and two double infection.

The parasite rates for P. vivax and P. falciparum in Abheet during the various months of the year are shown in Figure 1.

From the Figure 1, it can be seen that the P. vivax parasite rate climbs sharply in July and February and is at its lowest point during September-November and April, but does not fall to the baseline at any time of the year.

It can also be seen that the P. falciparum parasite rate reaches its highest point rapidly during June and November and the lowest point during March, April, and May.

From these observations and findings it is evident that :

There were two separate curves that of P. vivax preceeding the P. falciparum.

This could be explained since :

1. The incubation interval is longer in P. falciparum than in P. vivax due to a longer extrinsic incubation period in respect of P. falciparum and henceforth the infective gametocytes appear much later in this species than in case of P. vivax. This difference greatly influences the timing of the prevalence of the two diseases.

Table (10)

Seasonal Distribution of
P.vivax and *P.falciparum*
infections in Abheet village
(Faiyum Governorate)

Month	No Coll.	No Ex.	No -ve	TOT No	POSITIVE CASES					
					P.V.		P.F.		D.I.	
					No	%	No	%	No	%
May 78	63	63	51	12	9	14.29	2	3.17	1	1.59
June	20	20	14	6	4	20	2	10	-	-
July	31	31	18	13	9	29.03	3	9.68	1	3.23
Aug	34	34	26	8	5	14.71	3	8.82	-	-
Sept	36	36	33	3	1	2.78	2	5.56	-	-
Oct	100	100	89	11	5	5	6	6	-	-
Nov	151	151	129	22	4	2.65	18	11.92	-	-
Dec	358	358	316	42	21	5.87	21	5.87	-	-
Jan 79	154	154	136	18	8	5.19	10	6.49	-	-
Feb	27	27	21	6	5	18.52	1	3.70	-	-
Mar.	131	131	120	11	7	5.34	4	3.05	-	-
Apr.	186	186	176	10	5	2.69	5	2.69	-	-

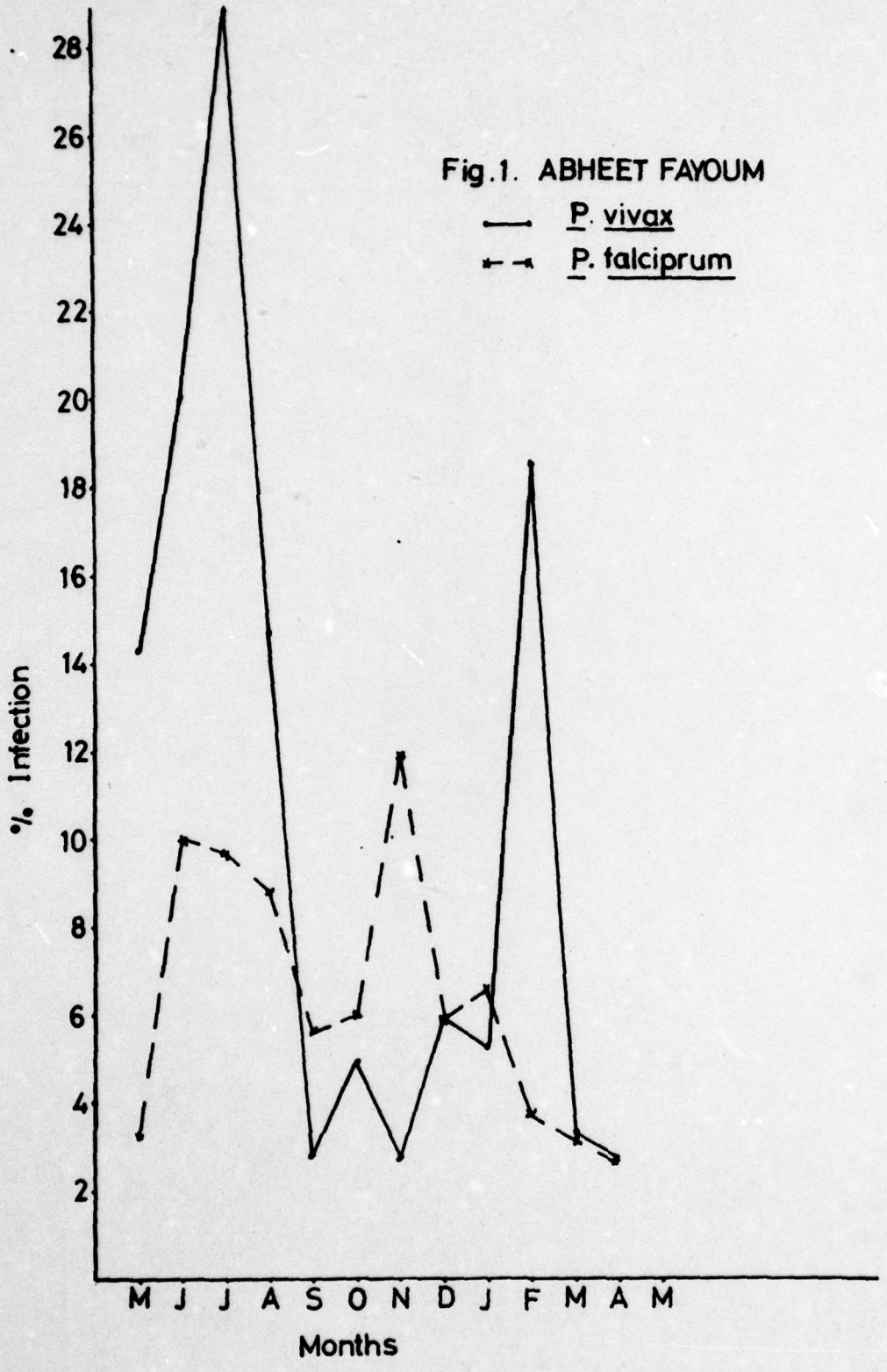
Fig.1. ABHEET FAYOUM
P. vivax
P. falciprum
% Infection
28
26
24
22
20
18
16
14
12
10
8
6
4
2
M J J A S O N D J F M A M
Months

2. It was also evident that the parasite rate in P. falciparum infection is nearly equal to the parasite rate in the P. vivax infection. This finding indicates the high survival rate of the mosquito vector in Abheet. It is hoped that the Entomological survey of 1979 are planned for verifying this observation.

However, Abheet village which is endemic for malaria is not surrounded by rice field but the whole area is composed of low lands and springs where permanent collection of water constitutes the main breeding place.

The question whether transmission goes on the whole year round in Abheet may be verified by epidemiological investigation of the positive cases and by taking monthly the infant parasite rate the whole year round.

2.3. Correlation between age groups and parasitic count for positive malaria cases in Faiyum

Results of parasitic count (number of parasite/100 fields) in relation to age groups in different months and different localities in Faiyum appear in Tables 11-18.

From these tables, it appears that apart from the positivity of slides and species identifications of the malaria parasites, the following information was recorded.

1. The density of trophozoites (rings, trophozoites, and schizonts) and gametocytes in persons found positive.

Table (11)

Correlation Between Age Grouns
And Mean Parasitic Count (100 field)
For Positive Malaria Cases in
Abheet (Faiyum Governorate)

Month & Year	TOT +ve Samples	P. Species			Parasitic Count according to Age Grouping													
					0-4		5-9		10-14		15-19		20-29		30-39		40	
		P.V.	P.F.	D.I.	Tr.	G.	Tr.	G.	Tr.	G.	Tr.	G.	Tr.	G.	Tr.	G.	Tr.	G.
May 78	12	9	2	1	4	29	32 -	14 4	18				-	13			- -	21 6
June	6	4	2	- -	-	10	9	3	6	8		8			3	1	-	5
July	13	9	3	1	42	6	24 23	11 12				28 14		16	69			2
Aug	8	5	3	- -			16	16 28	60	-			140 36	7 17	35 -	18 -		
Sept	3	1	2	- -	- -	2	35	6 3										
Oct	11	5	6	- -			12 10	12 11	20 3									
Nov	22	4	18	- -	- 246	38	119	23	93						52	12		

Table (11) Cont.

Month & Year	TOT +ve Samples	P. Species			Parasitic Count according to Age Grouping													
					0-4		5-9		10-14		15-19		20.29		30-39		40	
		P.V.	P.F.	D.I.	Tr.	G.	Tr.	G.	Tr.	G.	Tr.	G.	Tr.	G.	Tr.	G.	Tr.	G.
Dec	42	21	21	-	20	23	$17\frac{1}{2}$ 18	20 21	$17\frac{1}{2}$ 15			9	6 -	9 6	-	-	-	4
Jan 79	18	8	10	-	17 -	17 -	13 21	16 13	-	12	-	-	-	8		9 6	- -	7 -
Feb	6	5	1	-	21	34	17	20	21	8	3	6	-	4				
March	11	7	4	-	14 15	21 23	12 -	23 -	15	9			12	11				
April	10	5	5		4 16	12 20	- 2	5 10										

Table (12)

Correlation Between Age Groups
And Mean Parasitic Count (100 Field)
For Positive Malaria Cases in El Zawiah El Khadra (Faiyum Governorate)

Month & Year	TOT +ve Samples	Plasmodium Species			Parasitic Count according to Age Grouping													
					0-4		5-9		10-14		15-19		20-29		30-39		>40	
		P.V.	P.F.	D.I.	Tr.	G.	Tr.	G.	Tr.	G.	Tr.	G.	Tr.	G.	Tr.	G.	Tr.	G.
May 78	-	-	-	-														
June	4	4	-	-	13	28							-	8	5	4	7	-
July	5	5	-	-	11	20					15	7						
August	3	3	-	-	8	20												
Sept	2	2	-	-					40	2							5	-
Oct	1	-	1	-					-	5								
Nov	-	-	-	-														
Dec	10	2	- 8	- -	-	-	18 52	14 13										
Jan 79	-	-	-	-														
Feb	-	-	-	-														
March	-	-	-	-														
April	-	-	-	-														

P.V.= P.vivax
P.F.= P.falciparum
D.I.= Double infection
Tr.= Trophozoite
G = Gamete

Table (13)

Correlation Between Age Groups
And Mean Parasitic Count (100 Field)
For Positive Malaria Cases in Mensheit Bagdad (Faiyum Governorate)

Month & Year	TOT +ve Samples	Plasmodium Species			Parasitic Count according to Age Grouping													
					0-4		5-9		10-14		15-19		20-29		30-39		>40	
		P.V.	P.F.	D.I.	Tr.	G.	Tr.	G.	Tr.	G.	Tr.	G.	Tr.	G.	Tr.	G.	Tr.	G.
May 78	-	-	-	-														
June	1	1	-	-									17	7				
July	-	-	-	-														
August	-	-	-	-														
Sept	1	1	-	-													17	-
Oct	-	-	-	-														
Nov	-	-	-	-														
Dec	-	-	-	-														
Jan 79	-	-	-	-														
Feb	-	-	-	-														
March	-	-	-	-														
April	-	-	-	-														

Table (14)

Correlation Between Age Groups
And Mean Parasitic Count (100 Field)
For Positive Malaria Cases in Tersa (Faiyum Governorate)

Month & Year	TOT +ve Samples	Plasmodium Species			Parasitic Count according to Age Grouping													
					0-4		5-9		10-14		15-19		20-29		30-39		>40	
		P.V.	P.F.	D.I.	Tr.	G.	Tr.	G.	Tr.	G.	Tr.	G.	Tr.	G.	Tr.	G.	Tr.	G.
May 78	-	-	-	-														
June	-	-	-	-														
July	1	-	1	-	-	-	4	3										
August	-	-	-	-														
Sept	2	-	2	-			5	12					9	14				
Oct	-	-	-	-														
Nov	-	-	-	-														
Dec	-	-	-	-														
Jan 79	1	-	1	-														
Feb	1	1	-	-	19	14												
March	-	-	-	-														
April	-	-	-	-														

Table (15)

Correlation Between Age Groups
And Mean Parasitic Count (100 field)
For Positive Malaria Cases in Ezbet Henein (Faiyum Governorate)

Month & Year	TOT +ve Samples	Plasmodium Sepecies			Parasitic Count according to Age Grouping													
					0-4		5-9		10-14		15-19		20-29		30-39		>40	
		P.V.	P.F.	D.I.	Tr.	G.	Tr.	G.	Tr.	G.	Tr.	G.	Tr.	G.	Tr.	G.	Tr.	G.
May	-	-	-	-														
June	-	-	-	-														
July	6	-	6	-	-	3	10	10	34	10								
August																		
Sept	2	-	2	-	-				50	75	42	10						
Oct																		
Nov	6	-	6	-	116	54	-	-	32	6	-	-	29	6	19	5		
Dec	-																	
Jan 79	1	-																
Feb	-																	
March	-																	
April	-																	

Table (16)

Correlation Between Age Groups
And Mean Parasitic Count (100 Field)For
Positive Malaria Cases in Rahim (Faiyum Governorate)

Month & Year	TOT +ve Samples	Plasmodium Species			Parasitic Count according to Age Grouping													
					0-4		5-9		10-14		15-19		20-29		30-39		>40	
		P.V.	P.F.	D.I.	Tr.	G.	Tr.	G.	Tr.	G.	Tr.	G.	Tr.	G.	Tr.	G.	Tr.	G.
May 78	-																	
June	-																	
July	1	1	-	-	-	-	14											
August	-																	
Sept	-																	
Oct	-																	
Nov	-																	
Dec	-																	
Jan 79	-																	
Feb	-																	
March	-																	
April	-																	

Table (17)

Correlation Between Age Groups
And Mean Parasitic Count (100 Field) For
Positive Malaria Cases in El Sheikh Said (Faiyum Governorate)

Month & Year	TOT +ve Samples	Plasmodium Species			Parasitic Count according to Age Grouping													
					0-4		5-9		10-14		15-19		20-29		30-39		>40	
		P.V.	P.F.	D.I.	Tr.	G.	Tr.	G.	Tr.	G.	Tr.	G.	Tr.	G.	Tr.	G.	Tr.	G.
May	-																	
June	-																	
July	-																	
August	-																	
Sept	1	1	-	-											28	15		
Oct	-																	
Nov	-																	
Dec	-																	
Jan 79	-																	
Feb	-																	
March	-																	
April	-																	

Table (18)

Correlation Between Age Groups
And Mean Parasitic Count (100 Field) For
Positive Malaria Cases in El Nazlah (Faiyum Governorate)

Month & Year	TOT +ve Samples	Plasmodium Species			Parasitic Count according to Age Grouping													
					0-4		5-9		10-14		15-19		20-29		30-39		>40	
		P.V.	P.F.	D.I	Tr.	G.	Tr.	G.	Tr.	G.	Tr.	G.	Tr.	G.	Tr.	G.	Tr.	G.
May 78																		
June																		
July																		
August																		
Sept																		
Oct																		
Nov																		
Dec	1	1	-	-	-	-	3	15										
Jan 79																		
Feb																		
March																		
April																		

2. The parasite rate decreases by age as a result of increasing immunity expressing itself as increasing recovery or decreasing detactability.

3. Both gametocyte rate and densities decrease more rapidly with age than do parasite rate and trophozoite density, suggesting that immunity reduces infectivity before increasing recovery.

2.4. Analysis of the longitudinal study in Qalyubiya

Malaria in the Delta region is mild but unstable. In December of 1977 there was an abrupt increase in the number of malaria cases in Al Alag in all the age groups, but mainly in school age group.

It is true that the village is always surrounded by vast areas of rice cultivation but usually the village does not show an outbreak. Epidemiological investigation showed in the last Annual report (1978) that all the cases were indogenous.

Lately the Public Health authorites and the Veterinary Department of the Ministry of Agriculture claimed an epizootic in the area followed by an epidemic of Rift Valley fever in 1977 through 1978. Accordingly one may assume that it is possible that this localized malaria outbreak had occurred after heavy mortality of cattle due to RVF leading to change of feeding opportunity of the partial zoophilic local vector Anopheles pharoensis.

An extensive insecticide arial spraying campaign was carried out from 1977 through 1978. Suppressive drugs were distributed for the most.

A four weekly blood collection from Al Alag was carried out during 1978-1979. The results of this follow-up examination indicated that all the blood samples were slide negative, but antibodies remained detactable until 1979 at a titre of 1/64 in some individuals.

2.5. Aswan Governorate

Recently a case of Plasmodium falciparum was notified from Aswan in an area which was presumably malaria free. After epidemiological investigation it was found to be imported. Thus a spot survey was carried out to detect or assess the prevailing situation.

Results :

Results of parasitological examinations appear in Table 19.

Parasitological examination of 207 blood samples collected from different age groups were negative. On the other hand, serological examination showed that 13 cases were positive; 5 at a titre of 1/16, 7 at a titre of 1/64 and one at a titre of 1/256.

Analysis of the data:

In order to satisfy the requirements of a high specificity in this area with low frequency of antibodies, the descriminating titre level at 1/16 does not suggest recent malaria infections in the population sample examined. Therefore these results indicate that there is transmission among the age group 10-14, but the younger age groups reaction seems to be non-specific. The seven cases at a titre of 1/64 and one at a titre of 1/256 can be considered to have recent infection or concurrent malaria infection. Although, protective antimalaria measures are being routinely carried out in the border area to prevent the reintroduction of malaria and the reinvasion of Anopheles gambiae. The inhabitants are also given suppressive drugs.

Table (19)

Parasitological and Serological examination in Zaklary (Aswan) in relation to age groups

Age Groups	Parasitological Results							Antibodies							
	NO. Coll.	NO. Ex.	-ve	+ve	P.V.	P.F.	P.V. + P.F.	NO. Ex.	-ve	+ve	16	84	256	1024	4096
0-4	50	50	50	-	-	-	-	50	49	1	1				
5-9	21	21	21					21	20	1	1				
10-14	21	21	21					21	19	2	1	1			
15-19	22	22	22					22	19	3		3			
20-29	36	36	36					36	34	2	1	1			
30-39	20	20	20					20	19	1		1			
>40	37	37	37					37	34	3	1	1	1		
TOTAL	207	207	207					207	194	13	5	7	1		

3. Serological examination :

Materials and methods.

Due to the inadequate number of antigen slides, the serum samples examined in this study were 1,471 samples from Faiyum Governorate and 723 samples from Qalyubiya Governorate. The samples represented all age groups. Approximately 30% of the total number examined were selected from school age groups.

In the Delta Governorate and Canal Zone, serological examination was restricted to 1,000 children of 5-9 years old, 200 children representing each Governorate. Blood samples were collected four to six weeks after the end of the transmission season.

3.1. Serological findings in Faiyum Governorate in all age groups.

The results of IFAT according to age in Faiyum were represented in Table 20

From the data presented in Table 20, it can be seen that the rise of seropositivity according to age is similar to the result obtained in the serological examination of 1977-1978. The highest titre was found in the age group 5-9. Of this age group, 524 children were serologically examined in this survey. The results indicate that 46 children have a titre of 1/64, 34 at 1/256, 20 at 1/1024 and 5 at 1/4096.

Table (20)

Malaria and Antibodies in Faiyum Governorate (From May 1978 to April 1979)

Age Groups	Parasites		Antibodies												
	NO. Ex.	P.R.	NO. Ex.	-ve	+ve	16	%	64	%	256	%	1024	%	4096	%
0-4	90	7.8	90	80	10	2	2.2%	1	1.1%	3	3.3%	4	4.4%	-	-
5-9	524	8.0	524	391	133	28	5.3%	46	9%	34	6.5%	20	4%	5	1%
10-14	188	7.4	188	168	20	2	1.1%	1	0.5%	11	6%	5	3%	1	0.5%
15-19	104	3.8	104	95	9	1	0.9%	-	-	6	5.9%	1	0.9%	1	0.9%
20-29	143	6.3	143	136	7	2	1.4%	-	-	1	0.7	4	2.8	-	-
30-39	145	2.7	145	138	7	-	-	2	1.4	1	0.7	3	2.1%	1	0.7
>40	277	3.6	277	263	14	-	-	-	-	3	1.1%	7	2.5%	4	1.4%
TOTAL	1471	6	1471	1271	200	35	2.4%	50	3.4%	59	4%	44	3%	12	0.8%

3. 2. Serological finding in Qalyubiya Governorate.

The results of IFAT according to different age groups in Qalyubiya Governorate appear in Table 21.

From the data presented in Table 21, it appears that the rise of seropositivity is according to age. However, the age group 5-9 showed maximum titre at 1/256 which is less than the maximum titre of the same age group in Faiyum Governorate. This indicates that the degree of malaria endemicity is less in Qalyubiya than in Faiyum.

The data of Qalyubiya in 1977-1978 cannot be compared with the data collected in 1978-1979 since the time of collection was not the same in both surveys and it is known that in areas where malaria is seasonal, antibody titre changes according to the time of collection.

3. 3. Serological findings in seven Governorates in school age groups.

The time of collecting blood samples from the examined areas were all during the period following the transmission season by 4-6 weeks (January-April). This was purposly carried out in order to compare the degree of endemicity in different Governorates at the same time. Results for the two surveys1977-1978 and 1978-1979 are presented in Table 22.

Data in 1977-1978 indicate that the highest titre was recorded in Faiyum and Qalyubiya which was 1/1024, but the percentage in Faiyum was 2.3% and in Qalyubiya 0.5%. In Kafr El Sheikh and Sharqiya Governorates, the highest titre was found 1/256 but the percentage in Sharqiya was 6.3, while it is 0.3% in Kafr El Sheikh.

Table (21)

Malaria and Antibodies
in Qalyubiya Governorate
(From May 1978 to April 1979)

Age Groups	Parasites		Antibodies												
	NO. Ex.	P.R.	NO. Ex.	-ve	+ve	16	%	64	%	256	%	1024	%	4096	%
0-4	31	-	25	21	4	4	16%	-	-	-	-	-	-	-	-
5-9	427	-	421	333	88	35	8.3	49	11.6%	4	1%	-	-	-	-
10-14	116	-	116	103	13	4	3%	7	6%	2	2%	-	-	-	-
15-19	27	-	27	25	2	-	-	1	4%	1	4%	-	-	-	-
20-29	36	-	36	34	2	1	3%	1	3%	-	-	-	-	-	-
30-39	33	-	33	28	5	-	-	3	9%	2	6%	-	-	-	-
>40	66	-	65	43	22	2	3%	15	23%	4	6%	1	2%		
TOTAL	736	-	723	587	136	46	6.4%	76	10.5	13	1.8	1	0.1%		

Table (22) Results of Serological in School Age Groups

Governorate	1977													1978 - 1979										
	NO. Ex.	NO. +ve	% +ve	Titres 16		64		256		1024		4096		NO. Ex.	NO. +ve	% +ve	Titres 16		64		256		1024		4096	
				NO.	%	NO.	%	NO.	%	NO.	%	NO.	%				NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
Faiyum	305	69	22.6	12	3.9	28	9.2	22	7.2	7	2.3	0	0	524	131	25	28	5.3	45	8.6	33	6.3	20	3.8	5	1
Qalyubiya	375	43	11.5	13	3.5	21	5.6	7	1.9	2	0.5	0	0	425	87	20.5	35	8.2	48	11.3	4	0.9	0	0	0	0
Kafr El Sheikh	309	11	3.6	2	0.6	8	2.6	1	0.3	0	0	0	0	200	2	1	2	1	0	0	0	0	0	0	0	0
Sharqiya	16	2	12.5	1	6.3	0	0	1	6.3	0	0	0	0	200	11	5.5	8	4	3	1.5	0	0	0	0	0	0
Beheira	114	3	2.6	2	1.8	1	0.3	0	0	0	0	0	0	200	26	13	11	5.5	15	7.5	0	0	0	0	0	0
Gharbiya	13	0	0	0	0	0	0	0	0	0	0	0	0	200	8	4	8	4	0	0	0	0	0	0	0	0
Canal Zone	29	4	13.8	3	10.3	1	3.4	0	0	0	0	0	0	200	11	5.5	9	5.5	2	1	0	0	0	0	0	0

In Beheira, 114 children were examined. Only one reached the titre of 1/64. Similar results were encountered in the Canal zone and only one reached the titre of 1/64. However, in Gharbiya Governorate, 125 children were examined and were all found negative.

Data of 1978-1979 indicated that the highest titre of positivity recorded was in Faiyum (1/4096); followed by Qalyubiya (1/256). In Kafr El Sheikh and Gharbiya Governorates, non of the blood samples have recorded the level of specificity which is 1/64.

3.4. Comments :

From the results of the serological survey in the Delta region, it is possible to indicate that the foci of malaria transmission could pass undetected. These foci are usually hidden or remain undetected due to irregular mass insecticide spraying directed to check agricultural crops . In addition, drug distribution makes parasitaemia at a submicroscopical level. This situation may also be attributed to variation of the vector density from year to year. This being due to alternating cultivation (crop rotation of rice field and cotton plantations) in the Delta and other crops every other year or every two years.

4. Discussion :

Preliminary results of the Parasitological examination of the last annual report (1977-1978) indicated that there is malaria transmission in some localities of the Governorates examined and that, this transmission is seasonal beginning in July and ending in December.

However, the results of this annual report (1978-1979) showed that the follow-up of the old positives and the examination of new individuals in Faiyum Governorates indicate the probability of perennial malaria transmission in Faiyum. To verify these observations, new born infants will be examined to exclude the probability of prolonged or delayed incubation period as well as relapses.

Direct parasitological examination becomes insufficiently sensitive and reliable once the parasite rate is about to descend below the level of 1-2 percent. Therefore case detection alone may not give a reliable picture of the epidemiological situation especially when malaria control measures are mainly directed to suppressive drugs. The application of serological studies, provide the indications of malaria transmission, when the results of the parasitological examination of the parallel samples were negative. The studies described in this Annual report have aimed at developing the serological picture in relation to the epidemiological features of malaria in Egypt.

The survey of the old age groups in the Delta region provided limited information concerning the malaria transmission. Under these circumstances one serological survey per year in elderchildren (5-9) will very well suffice in areas with seasonal malaria transmission.

It also may be suitably conducted some six to eight weeks after the end of the transmission season, so as to give the latest infected person the possibility to produce detectable antibodies. In areas with perennial malaria transmission (Faiyum), it may be necessary to assess the profile at a shorter interval. This might be indicated at the beginning of the transmission season to exclude the probability of prolonged incubation period interval.

In sampling, the regular follow-up of old positives showed that the age groups 2-4 and 5-9 years were the most accessible. However, most of the essential information can usually be gathered from these two age groups except that which can only be provided by observations on infants.

FUTURE PLAN

On the light of experience gained and information collected during the previous two years, a future plan with more defined objectives has been drawn.

The plan consists of three main sections as follows;

1. Comprehensive study

A comprehensive investigation directed to the assessment of the two main components of the malariogenic potential; namely the Entomological and Parasitological aspects in 10 different governorates:

Sharqiya
Ismailiya (Canal Zone)
Qalyubiya
Daqahliya
Kafr El Sheikh
Gharbiya
Beheira
El Faiyum
Asyut
Aswan
New Valley

1.1. Entomological surveys:

1) The relative receptivity will be assessed through monthly and fortnightly Entomological observations. The detailed objectives of these observations are to develop estimates for the dynamic parameters of the receptivity namely:

i- The average number of female vector contacting one man during one night. This will be achieved through a multi-stage sampling of the vector population contacting man.

ii- The average expectation of vector population.

iii- The feeding habits of the vector population. This will be assessed through the determination of the frequency of feeding of the vector as well as its host preference.

iv- Infection rate and infective rate of the vector.

2) Other sets of Entomological information are required for the development of the most economical control strategy of the diseases. The most suitable control method or combined methods will be determined including the choice of the insecticides and the required frequency of its application.

Such information will be achieved through the determination of the following:

i- The resting places throughout the gonographic cycle of the adult female vector.

ii- The duration of resting on each resting place.

iii- The propotion of the vector population resting on indoor sprayable surfaces as well as the preferable surfaces within the house. This is to justify the feasibility on indoor spraying.

iv- The characteristics of the preferable breeding places of the vector.

v- The susceptibility of both immature and adult stages to different insecticides.

3) Study area

This study will be carried out in two governorates namely Faiyum and Kafr El Sheikh. In each governorate a set of three villages will be selected.

4) Plan of work

The procedure as well as the Entomological methods and techniques which will be used are presented in the detailed table attached.

This plan will be implemented once every month in two of these villages and twice monthly in the third village.

1.2. Parasitological surveys

Monthly blood collection throughout the whole year round. Sixty per cent of the blood samples will be collected from children 6-9 years old and infant blood examination to determine the perennial or the seasonal malaria transmission, relapses and exoerythrocytic.

All positive cases will be epidemiologically investigated.*

1.3. Serological surveys

These surveys will be carried out seasonally to study the fluctuation of antibody titre in relation to the peaks of the prevalence of the two main malaria parasites namely P.vivax and P.falciparum. Accordingly, the time of blood collection for serology will be 4 to 6 weeks following the peak of transmission i.e. for P.falciparum mid July and early in August and mid February and early March. P.vivax it will be in mid August or early in September, mid of March or early in April.

The follow-up of the April examination will differentiate between relapses and long incubation period.

1.4. Personnel

A team consists of one physician and three bloos collectors for the Parasitological plan and another team of one Entomologist and 13 subprofessional personnel for the Entomological plan for each Governorate.

2. Longitudinal study

This study will cover a much greater territory with more depth compared to the plan of the previous section. The objectives of the study are to determine the seasonal prevalence and distribution of both parasite and vector species.

2.1. Entomological surveys:

i- Larval surveys

ii- Adult surveys in both human habitations and animal sheds.

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* Pending the project extension, the effect of immunity and treatment on gametocyte infectivity will be investigated.

These surveys will be carried out monthly by a supervisor and 5 mosquito collectors.

2.2. Parasitological and Serological surveys

Blood collection from children (primary school age) will be carried out every four months.

One supervisor and two blood collectors will under take these surveys.

3. Spot surveys

These surveys will be carried out in areas which are not included or represented in the previously mentioned surveys. These surveys will be carried out once a year. They will include a mass blood survey for both Parasitological examination and Serological tests. The Entomological surveys will include both larval and adult surveys.

The governorates which will be covered by the spot surveys are:

New Valley
Baharia Oases
Siwa Oasis
Red Sea Coast
Sinai

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