N72-28045

FIRST QUARTERLY REPORT

(3 APRIL to 4 JULY, 1972)

CONTRACT NO. NAS 9-12696

MANNED SPACECRAFT CENTER

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

THE SCHOOL OF PUBLIC HEALTH AT HOUSTON

THE UNIVERSITY OF TEXAS

P.O. BOX 20186, HOUSTON TEXAS 77025

INTRODUCTION

The initial period was given over to organization, hiring of personnel, purchasing of equipment and supplies, location of field sites, development of techniques, and training of personnel. The bulk of our attention has been directed toward implementing the accumulation of ground truth data for Culex quinquefasciatus breeding sites.

The various categories listed in the budget portion of the statement of work are covered below, followed by a general review of progress, difficulties and plans for the next period.

PROGRESS

Personnel - All of the persons requested in the original statement of work were employed or contracted by the end of the first month of the contract. These include:

Assistant Research Biologist - Dr. Paul Rodriquez will be on site in Houston early in July and will begin work on Screwworm ecology. He will maintain a field office at Clear Lake for at least a six month period following his arrival. During this time he will undergo a training period in the technology of remote sensing. He will also work closely with NASA personnel implementing the joint screwworm study among personnel with NASA, the U.S. Department of Agriculture and appropriate agencies of the Government of Mexico as proposed in our Statement of Work.

Assistant Research Geographer - Mr. Cal Olsen is on board and maintains a field office at Clear Lake. He has been organizing the cartographic, photographic, and spectrographic data bank and support equipment for use on the contract. His attention during this quarter has been centered upon the 1971 anthrax outbreak in Louisiana and the Schistosomiasis problem in Puerto Rico. He has also been providing support to a fellow contractor, Miss Marjorie Rush.

Secretary II - Mrs. Genevie Lopez maintains a field office at Clear Lake and assists various investigators on the contract who have occasion to examine films or documents or consult with NASA or contractor colleagues. She also will provide regular secretarial support to Dr. Rodriquez and Mr. Olsen.

Research Statistical Aides - Six one-half time students have been employed to carry out the field studies on C. quinquefasciatus breeding sites. The students include: Mr. Matt Yates, Mr. Fred Miller, Miss Nancy Maier, Mr. Paul Sanner, Miss Jane Valentine, and Mrs. Lynane Eifler. These students are collecting samples, performing the physical, chemical and biological analyses and participating in the formatting of data for analysis. All of the students are located at the School of Public Health.

Clerk-Typist - Mrs. Carmen Bateman has been employed to assist with the preparation, processing and filing of data forms along with other clerical support for the contract. She maintains an office at the School in Houston.

In addition to the personnel listed, and the consultants cited in our original application, the School of Public Health has been supplying the part-time services of a Secretary III. Technical support has been provided for preparing glassware for use by the Research Statistical Aides, and replenishment of dilution bottles, extraction solutions, etc. Also, a number of faculty members and staff included in the original group have volunteered suggestions during the development of the ground truth study on Culex breeding sites.

Equipment - Several items of equipment have been purchased for use in the development of a ground-truth data bank on C. quinquefasciatus breeding sites. These include:

> Coleman Model 9-006 Nephocolorimeter; Test tube shaker; Corning magnetic-stirrer hotplate; Mettler analytical balance; Yellow Springs Instruments dissolved oxygen meter; Beckman portable pH meter; National Incubator; Weather-Measure meteorological instruments and data logger; Wang 720C Programmable calculator.

The bulk of the equipment has arrived and been placed into service. The remainder is scheduled for arrival by the first of July. The School is providing the use of an atomic absorption instrument for the metal ion analyses, a spectrophotometer, and a carbon analyzer along with several additional microscopes and other support equipment.

Travel - Travel in this period has included a number of trips to locate field sites in north Houston and to sample from these sites in north Houston. On 23-24 May 1972 Drs. Scanlon and Hacker attended a conference in Mission, Texas at the U.S. Department of Agriculture Screwworm Production Facility. The purpose of the conference was to discuss progress towards a joint NASA - U.S.DA field study in Mexico.

Collaborative Arrangements and Consultants - Dr. David Jameson, Graduate Dean of the University of Houston and Director of the Coastal Research Center at Camp Wallace has agreed to our using the Coastal Center during the contract period and to our setting up our meterological instrumentation at the Center. The University of Houston will install a slab foundation and bring in electrical power and water as well as cover the cost for the use of these utilities during the contract.

Dr. Theodore Crovello of the Department of Biology, University of Notre Dame has been contacted and will provide assistance with the identification of plant specimens that cannot be identified locally.

Supplies and Services - The principal expenditures thus far have been for initial stocks of reagents, glassware and samplers for the C. quinquefasciatus breeding study. A subscription to Current Contents has been ordered to use in the literature survey.

WORK PERFORMED

Orientation and Organization - The senior staff (Doctors Scanlon, Hacker and Gesell) gained during a previous contract sufficient experience with the technology of remote sensing and only a minimal period of orientation has been necessary. However, these individuals have had several sessions with the personnel at the Manned Spacecraft Center and will continue to maintain close liaison as the contract progresses. Of our new staff, Mr. Calvin Olsen is particularly conversant with the field of remote sensing and has immersed himself directly into several health applications of this technology. To date his task has been to organize a cartographic and photographic data bank for use with the various dieseases with which we are concerned. Dr. Paul Rodriquez will not be on site until July 1972 and will spend at least his early period in close contact with the personnel at MSC for orientation and training.

Field Studies - Much of the work accomplished during this quarter has been directed toward developing a ground truth data bank on *C. quinquefasciatus* breeding sites. These activities have required the location of breeding sites in north Houston, development of field sampling methods, and development of laboratory analysis. To date, the field study areas have been located, mapped and their physical characteristics recorded (See Appendix I). A sampling method for mosquito larvae has been adopted and is described in Appendix II. Several of the water analyses have been established; however, this activity has been hampered some by delays in receiving the necessary reagents and glassware. The methods adopted so far are documented in Appendix II.

Data collection has been standardized by using data forms on which the results of observations and analyses are recorded directly. These data then can be efficiently transferred to punched cards and magnetic computer tapes for analysis and incorporation into the data bank. For certain analyses direct recording of the data on coding sheets is not feasible and work sheets are used. The Wang 720C has been programmed to transform these raw data and output the results in a format suitable for key punching. Samples of the data forms are included in Appendix III.

Data analysis has been limited to developing the field and laboratory methods during this quarter. As more data are accumulated during the next quarter it will be possible to provide preliminary observations on the data.

Data collection for the Island Culex population at Camp Wallace has been standardized. The meteorological instrumentation for the Camp Wallace study should arrive shortly, and will be installed promptly. Captain Donald Roberts, who is studying the breeding habitats of upland mosquitoes at Camp Wallace, has been approached and he has agreed to allow us access to his data for evaluation within the context of remote sensing. In turn, we will be providing meteorological data and chemical analysis of breeding pool water samples on a limited scale.

Library Research - We have maintained most of our arrangements with libraries in the area and are searching the literature for additional references on the application of remote sensing to vector-borne diseases. Current Contents, a publication of Science Citation Index is being examined weekly by our staff for literature of potential

application. This activity will increase as we get the field studies underway.

Consultation - Mr. William Barrett, presently with the Harris County Mosquito Control District, has consulted on several occasions with the investigators on the contract concerning his activities with the U.S.D.A. in their early studies on Screwworm. He has very generously provided his time and copies of material he has on this topic at no cost to the contract.

Doctors Scanlon and Hacker conferred at Mission, Texas on 24 May 1972 with Dr. Barnes and several participants in the U.S.D.A. Screwworm eradication program. The purpose of the conference was to attempt and delineate the responsibilities of each concerned agency of the U.S. and Mexican governments in a joint screwworm study in Mexico. The outcome of this conference was of particular interest to us since we expect Dr. Rodriquez to work at the field station to be established by the U.S.D.A. in Mexico. From the discussions it appears to us that a joint program will not be possible until at least January 1973.

During the period 1 July 1972 and January 1973, Dr. Rodriquez will undergo a period of training in the technology of remote sensing and will work directly towards preparing for our field studies of this fly.

Considerable effort was expended preparing for the field study on malaria and migrant populations in Thailand as outlined in the Statement of Work. Representatives of several agencies in Thailand were contacted and arrangements were made for their cooperation. The outcome of these preparations will be discussed in the next quarterly report.

DIFFICULTIES ENCOUNTERED

The only difficulty we have had to date has been in a longer lag time than expected between ordering of equipment and supplies and their arrival. We expect that the remaining equipment and supplies will arrive early in the next quarter.

PLANS FOR THE SECOND QUARTER

During the next quarter we expect to have sufficient data collected to prepare a preliminary, but meaningful analysis, of the field data on C. quinquefasciatus breeding sites. Most methods for this study should be standardized early during the second quarter, and we will be able to direct more of our attention towards examining the literature on other diseases to which remote sensing technology may contribute an additional dimension.

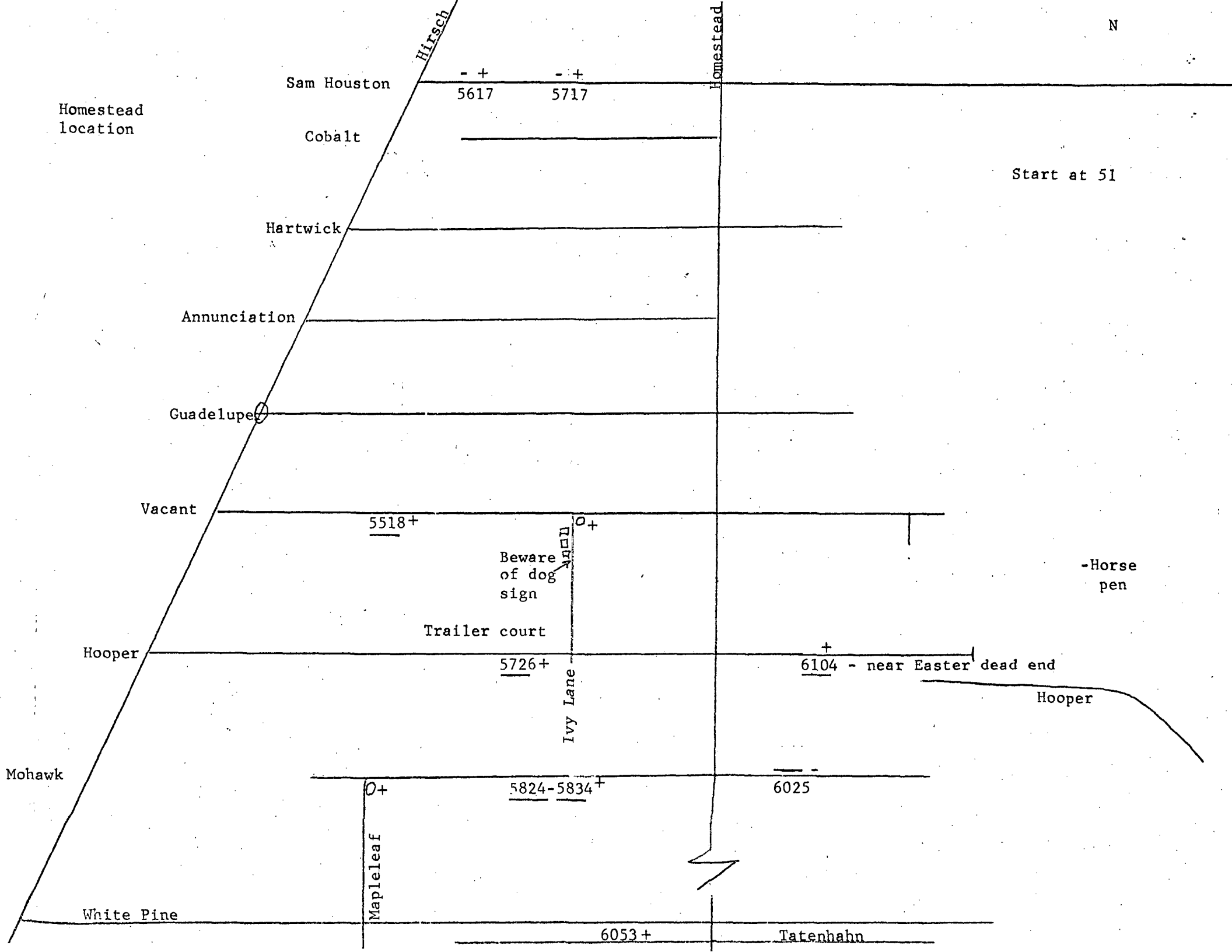
Carl S. Hacker

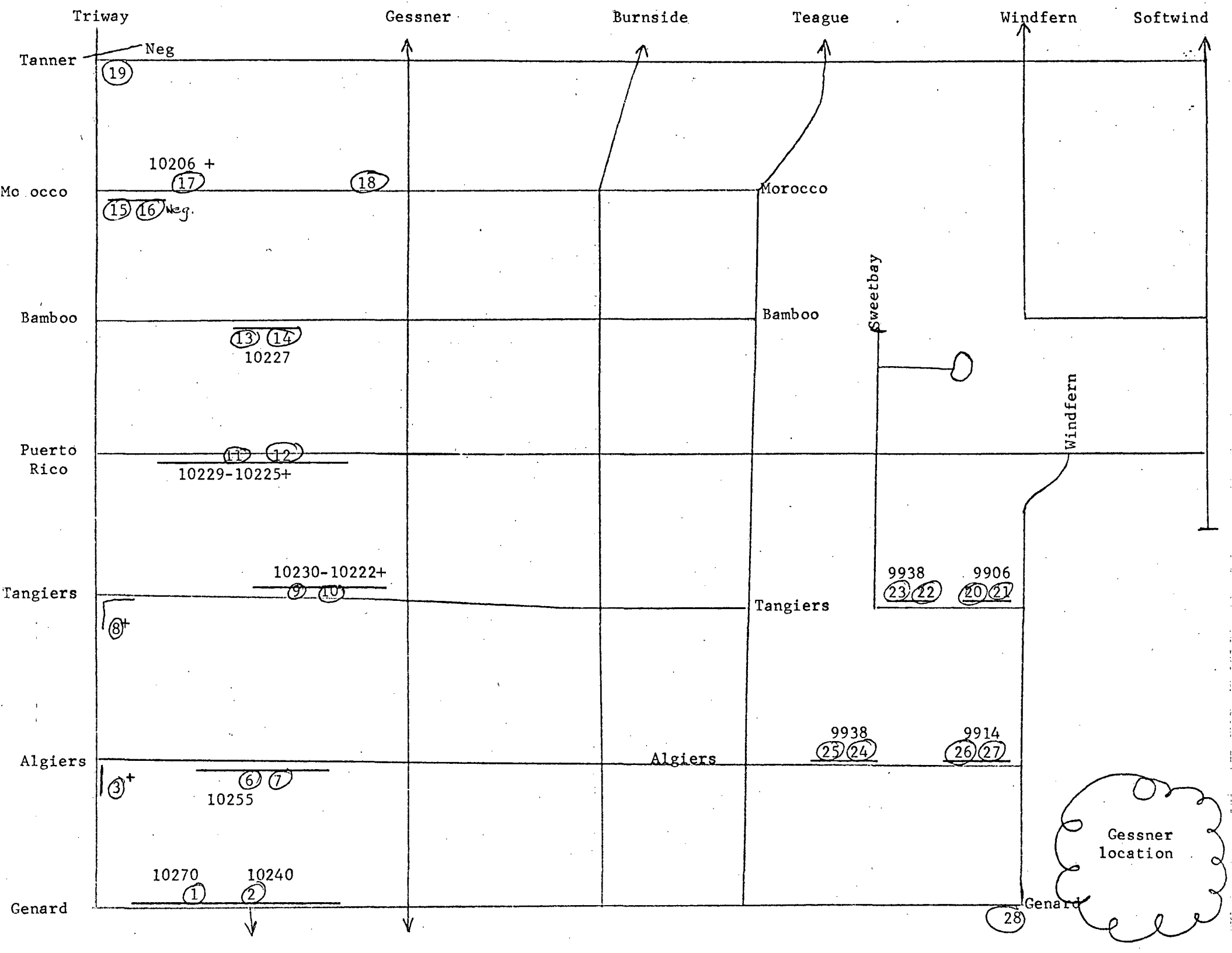
Carl S. Hacker, Ph.D.
Acting Principal Investigator

APPENDIX I

Two areas in north Houston are being used to obtain ground truth data on larval Culex quinquefasciatus breeding sites (see attached maps). In each area, up to 20 sites are sampled each week,

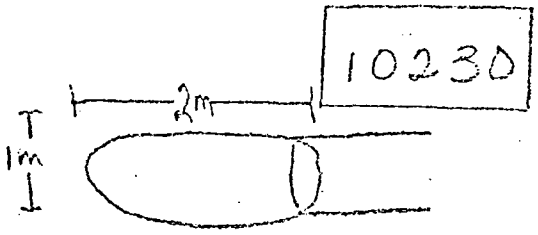
Generally, the sites are characterized as storm water drainage ditches which parallel the streets in the area. Although these ditches are dredged at intervals, the period between dredgings is sufficiently long enough to allow the sites to be altered by emergent vegetation and sedimentation which interfere with drainage. Additionally the homes in these areas have septic tanks which overflow into the ditches providing additional water and the necessary sewage conditions for development of C. quinquefasciatus larvae. Maps of the areas showing sites are attached. Typical descriptions of four sites on 25 May 1972 are included for illustration.


N
Hirsch
Homestead
Sam Houston
- +
5617
- +
5717
Homestead location
Cobalt
Start at 51
Hartwick
Annunciation
Guadelupe
Vacant
5518+
0+
Beware of dog sign
-Horse pen
Trailer court
Hooper
5726+
Ivy Lane
+
6104 - near Easter
dead end
Hooper
Mohawk
0+
5824-5834+
6025
Mapleleaf
White Pine
6053+
Tatenhahn


Triway
Gessner
Burnside
Teague
Windfern
Softwind
Tanner
Neg
19
10206 +
17
18
Morocco
Mo occo
15
16
Neg.
Bamboo
Bamboo
Sweetbay
13
14
10227
Windfern
Puerto Rico
11
12
10229-10225+
10230-10222+
9
10
9938
23
22
9906
20
21
Tangiers
Tangiers
8+
9938
25
24
9914
26
27
Algiers
Algiers
3+
6
7
10255
10270
1
10240
2
Genard
Genard
28
Gessner location

Sites No. 9 and 10. 5-25-72

No. 9. 10230 Tangiers, next door to vacant lot.



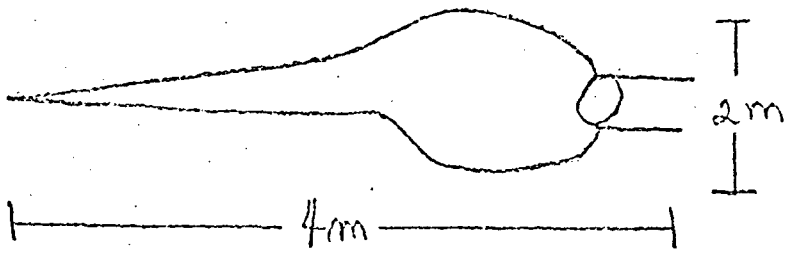
surrounding vegetation; fairly deep pool.

No. 10. East of No. 9. on same ditch.

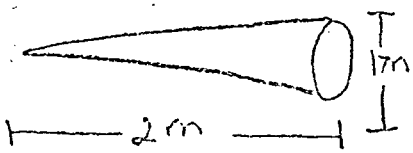
Tadpoles. No mosquitoes. Emergent grasses. Water apparently mostly from drainage from gardens.

Sites No. 11 and 12. 5-25-72

No. 11. 10229 Puerto Rico.
South side. 57 Ford out back. Drain



No. 12. 10225 Puerto Rico.
East across culvert from No. 11.



Water grass emergent. Mosquitoes.

APPENDIX II

The chronological sequence that a sample follows will be used to order the description of the analytical procedures. At a field site, temperature, dissolved oxygen and pH are measured with portable instruments and recorded on prepared data forms. If there have been any physical changes in the site, these are recorded and filed for later evaluation. A sample of water is taken for estimating the density of mosquito larvae by collecting several dips of water with an 8 oz. soup ladle at up to nine predetermined points in the ditch. Fewer than nine dips are taken if there are at least 200 mosquitoes (estimated) in the first four dips. The dips are combined and the sample of mosquitoes counted later in the laboratory. Then a water sample is taken and placed on ice for return to the laboratory.

When the 20 sites at which collections are to be made on a given day have been visited, the samples are returned to the laboratory.

In the laboratory, conductivities are determined on each sample using a Labline Conductivity Meter. The number of mosquito larvae are estimated by pouring the entire sample into a sampler divided into 25 equal compartments. The number of fourth instar larvae, larvae less than fourth instar and pupae in five of the compartments are then counted. On occasion it is necessary to dilute the samples when mosquito numbers are particularly high. On the other hand if the number of mosquitoes is low, the entire sample is counted.

A sample of water is filtered through a guaze pad to remove soil particles and large pieces of debris from a sample for carbon analysis. Total carbon and inorganic carbon is then determined on each sample

using a Beckman Carbon Analyzer. The procedure for this instrument is documented in the operation manual provided by the Beckman Instrument Company and needs not be documented here.

An aliquot of water is filtered through Whatman No. 2 filter paper and the concentrations of several metal ions are determined - using a Beckman Atom Absorption instrument. These ions include: sodium, copper, zinc, calcium, magnesium, and iron. The procedure for these analyses is also documented in a Beckman operational manual and needs not be outlined here.

A ten-milliliter aliquot of water is filtered through a 45 mu Millipore filter and extracted in acetone for determination of chlorophyll content after the method of Richards and Thompson (1952). A bacterial index is determined by diluting a sample 1:100 and using the Millipore Colicounter Method. All coliform colonies are recorded after 20 hours of incubation. A more detailed explanation of this procedure is available from the Millipore Corporation and is on file with us.

Several other analyses will be added as the supplies for these arrive. Laboratory worksheets and coding forms are being used to record the results of each analysis and for data handling prior to incorporation into our data bank.

APPENDIX III

SAMPLE DATA FORMS

LARVAL CULEX STUDY
FIELD DATA FORM

L	C	S		F	D	
1	2	3		4	5	6

AREA

8	9	10

SITE

11	12	13

YEAR		MONTH		DAY		HOUR(CST)	
15	16	17	18	19	20	21	22

TEMPERATURE

		^{o}C
24	25	

DISSOLVED OXYGEN

		.	
27	28		29

PH

		.		
30	31	32	33	34

CONDUCTIVITY

					E		
35	36	37	38	39	40	41	42

MOSQUITO SAMPLING

SAMPLER

45	46	47

APPARATUS

49	50	51

NUMBER OF SAMPLES

53	54

NOTES: (FIELD) If notes follow, ENTER 1.

55

COMMENTS: (FOR LAB USE)

LARVAL CULEX STUDY
LARVAL COUNTS

L	C	S
1	2	3

L	C	
4	5	6

YEAR		MONTH		DAY		CLASS
8	9	10	11	12	13	15

SITE

21	22	23	24	25	26	27	28	29	30	

31	32	33	34	35	36	37	38	39	40	

41	42	43	44	45	46	47	48	49	50	

51	52	53	54	55	56	57	58	59	60	

61	62	63	64	65	66	67	68	69	70	

71	72	73	74	75	76	77	78	79	80	

LARVAL CULEX STUDY
BIOLOGICAL DATA
BACTERIA DENSITIES

L	C	S		B	D		B	D	
1	2	3		4	5		6	7	8

YEAR		MONTH		DAY		READER		
10	11	12	13	14	15	17	18	19

INCUBATION TIME (HOURS)

21	22	23

SITE NO.			NO. OF COLONIES				
31	32	33	35	36	37	38	39
41	42	43	45	46	47	48	49
51	52	53	55	56	57	58	59
61	62	63	65	66	67	68	69
71	72	73	75	76	77	78	79

LARVAL CULEX STUDY
LARVAL COUNT WORKSHEET

SAMPLE DATE: _____

	CELL NO.	PUPAE	FOURTHS	LT. FOURTHS
SITE: _____	_____	_____	_____	_____
DILUTION: _____	_____	_____	_____	_____
	_____	_____	_____	_____
	_____	_____	_____	_____
	_____	_____	_____	_____
SUB TOTAL		_____	_____	_____
TOTAL		_____	_____	_____

SITE: _____	_____	_____	_____	_____
DILUTION: _____	_____	_____	_____	_____
	_____	_____	_____	_____
	_____	_____	_____	_____
	_____	_____	_____	_____
SUB TOTAL		_____	_____	_____
TOTAL		_____	_____	_____

SITE: _____	_____	_____	_____	_____
DILUTION: _____	_____	_____	_____	_____
	_____	_____	_____	_____
	_____	_____	_____	_____
	_____	_____	_____	_____
SUB TOTAL		_____	_____	_____
TOTAL		_____	_____	_____

LARVAL CULEX STUDY
CHEMISTRY WORK SHEET
SHEET I

ANALYSIS: _____

SAMPLE DATE _____ ANALYSIS DATE _____

STANDARDS

CONC.	READING

SAMPLE	SITE	DILUTION	READING
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

LARVAL CULEX STUDY
CHEMISTRY WORK SHEET
SHEET 2

ANALYSIS: _____

SAMPLE DATE _____ ANALYSIS DATE _____

SAMPLE	SITE	DILUTION	READING
11.			
12.			
13.			
14.			
15.			
16.			
17.			
18.			
19.			
20.			

ISLAND CULEX POPULATION
EGG PRODUCTION

I	C	P
1	2	3

E	P	
4	5	6

AREA

8	9	10

SITE

11	12	13

INITIAL DATE

YEAR		MONTH		DAY		HOUR (CST)	
15	16	17	18	19	20	22	23

COLLECTION DATE

YEAR		MONTH		DAY		HOUR (CST)	
25	26	27	28	29	30	32	33

NUMBER OF EGG RAFTS

41	42	43	44	45	46

ISLAND CULEX POPULATION
LARVAL DENSITIES

I	C	P
1	2	3

L	P	
4	5	6

AREA

8	9	10

SITE

11	12	13

DATE OF COLLECTION

YEAR

15	16

MONTH

17	18

DAY

19	20

HOUR (CST)

22	23

SAMPLING METHOD

25	26	27

ZONE

29

COUNTS

1st INSTAR

31	32	33	34	35	36	37	38	39	40

2nd INSTAR

41	42	43	44	45	46	47	48	49	50

3rd INSTAR

51	52	53	54	55	56	57	58	59	60

4th INSTAR

61	62	63	64	65	66	67	68	69	70

PUPAE

71	72	73	74	75	76	77	78	79	80

ISLAND CULEX POPULATION
ADULT EMERGENCE

I	C	P
1	2	3

A	E	
4	5	6

AREA

8	9	10

SITE

11	12	13

EMERGENCE TRAP SET UP

YEAR	MONTH	DAY	HOUR (CST)	
15 16	17 18	19 20	22 23	24 25

ADULTS REMOVED

YEAR	MONTH	DAY	HOUR (CST)	
31 32	33 34	35 36	38 39	40 41

NO. OF ADULTS COLLECTED

MALES

51	52	53	54	55	56	57	58	59	60

FEMALES

61	62	63	64	65	66	67	68	69	70