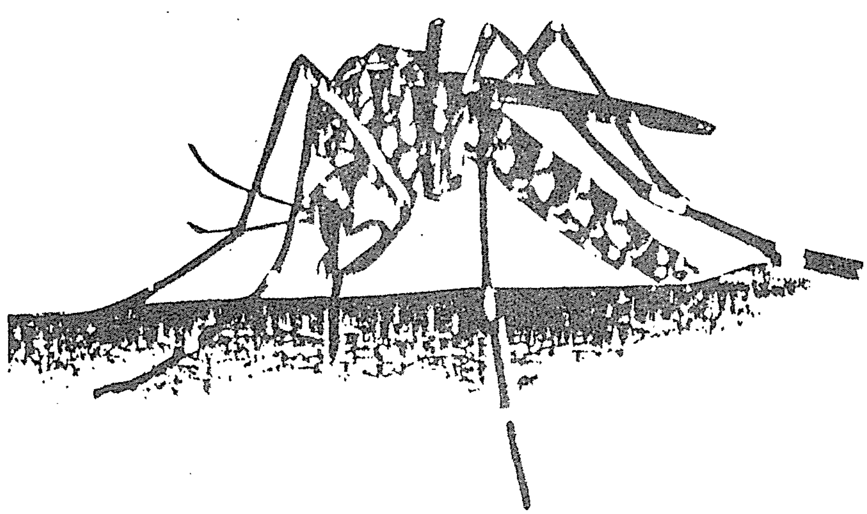
CITY OF NEW ORLEANS

SIDNEY J. BARTHELEMY
MAYOR

NEW ORLEANS MOSQUITO CONTROL BOARD

1986 ANNUAL REPORT



NEW ORLEANS MOSQUITO CONTROL BOARD / EDGAR S. BORDES, JR., ADMINISTRATOR
6601 Lakeshore Drive, New Orleans, La. 70126 (on Lakefront Airport) (504-241-2370)

"An Equal Opportunity Employer"

TO

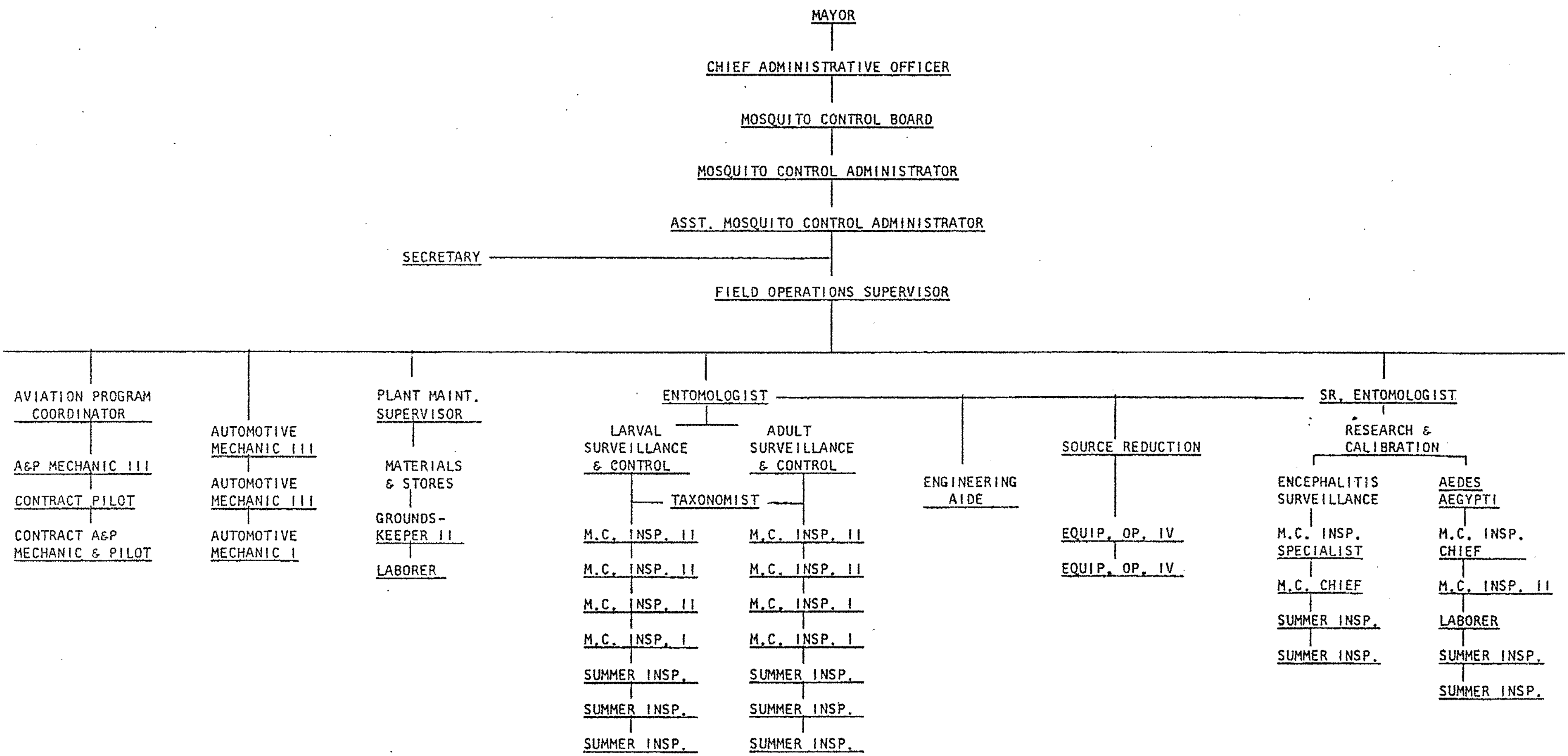
GEORGE T. CARMICHAEL

IN RECOGNITION OF HIS
LEADERSHIP AND SUCCESS IN PROMOTING
THE MOSQUITO CONTROL PROGRAM IN NEW ORLEANS

NEW ORLEANS MOSQUITO CONTROL BOARD

1986

ORGANIZATIONAL CHART



1986

TABLE OF PERSONNEL

1	Director
1	Assistant Director
1	Field Operations Supervisor
1	Aviation Program Coordinator
1	Sr. Entomologist
1	Entomologist
1	Engineering Aide
1	Plant Maintenance Supervisor
1	Source Reduction Supervisor
1	Mosquito Control Specialist
2	Mosquito Control Inspector Chief
6	Mosquito Control Inspector II
3	Mosquito Control Inspector I
1	Secretary
1	Taxonomist
1	A & P Mechanic III
1	Auto Mechanic I
2	Auto Mechanic III
2	Equipment Operator IV
1	Groundskeeper II
2	Laborers
10	Seasonal Part-time Workers

MOSQUITO CONTROL EQUIPMENT LIST

1	1982 4-dr. Ford Sedan
1	1979 4-dr. Chevrolet
1	Aircraft, Britten Norman BN2A-21
1	Aircraft, Grumman
2	Backhoes, John Deere 310
1	Crawler, Case 350
1	Dragline, Little Giant Amphibiou
1	Dump Truck, 1981 Ford - Diesel
1	1965 Ford F-250
2	1976 Chevy Luv Pickups
2	1975 GMC Pickups
6	1978 Ford F-100 Fog Trucks
13	1981 Chevy 1/2 Ton Pickups
1	1981 Ford F-100 Fog Truck
1	Forklift, Caterpillar
1	Forklift, Allis-Chalmers
1	Track Marsh Buggy with Ditcher
1	Tractor Mule
2	Utility Trailers
2	Boat Trailers
2	Outboard Motors - 5 & 25 hp
4	Aluminum Flat Boats
2	Electrical Power Plants
3	Lawn Care Mower
1	Ford Tractor with Grass Cutter

1986 ANNUAL REPORT

DIRECTOR'S REPORT

Mosquito control is changing very rapidly and we are always in the process of adjusting our operations to match these changes. Just when it seems that the mosquito problem in New Orleans is understood, *Aedes albopictus* (the Asian Tiger Mosquito) is imported into the metropolitan area and a new major pest mosquito has to be dealt with. Dr. Jerry Freier was assigned to New Orleans by the Centers for Disease Control to help combat the *Aedes albopictus* problem. Just as the *Aedes aegypti* problem is under control, we must redesign our urban mosquito surveillance and control techniques to combat a new vector mosquito. Prior pesticide exposure is our primary concern. Careless chemical pressure could create a mosquito species that we could not control with normal operational control procedures.

George T. Carmichael retired in June, 1986 after 22 years as director of the New Orleans Mosquito Control Board. His efforts and dedication have been instrumental in bringing the Program to the international acclaim it enjoys today.

New Orleans was the host city for the 1986 American Mosquito Control Association Annual Meeting. Hotel facilities in New Orleans are the most accommodating in the nation. An excellent and informative program was presented and a fine time was had by all who attended. We are looking forward to hosting the national mosquito control group again in 1991. Louisiana State University Medical Center, the New Orleans Mosquito Control Board and the Centers for Disease Control in Atlanta hosted a very successsful *Aedes albopictus* training program with over 100 persons in attendance.

Toxorhynchites, the cannibal mosquito, is still considered to be the most reliable container-breeding mosquito control agent available. The University of South Carolina through the International Center for Public Health Research is cooperating with the Mosquito Control Board to refine and develop mass-rearing procedures for the cannibal mosquito project. New, improved membrane-feeding techniques have streamlined the mass rearing process and a cost effective predator release program is near at hand. The approval of a bond issue by the voters of Orleans Parish will result in a new Biological Control Research Laboratory being constructed in New Orleans. This new facility will give us the necessary space to expand and make operational new and innovative biological control agents to protect the citizenry of New Orleans without the excessive use of pesticide applications.

Public education and the development of video training tapes continue to be an important part of our urban mosquito control effort. Mosquito Control educational tapes were distributed to all grade, middle and high schools in the City of New Orleans. The demand for our training tapes is expanding and the quality of their production is excellent. The future of urban mosquito control is dependent on an educated public. Every high school senior will have seen 10-12 mosquito control educational tapes during his tenure in the New Orleans school system. This is the foundation for the future of urban mosquito control.

Long, hot, dry summer conditions produced an outbreak of St. Louis Encephalitis in the Houston area. New Orleans has a lot in common with Houston and we must be aware of potential for an encephalitis outbreak during the coming mosquito season. The work that was done last year "Strategies for the Emergency Control of Arboviral Epidemics in New Orleans" is the foundation for preventing the spread of a mosquito borne disease in the metropolitan New Orleans area. We are prepared but yet hopeful that such emergency measures will not be necessary.

Source reduction activities were redirected to isolated mosquito breeding problems in the urban environment. Our marsh management equipment is aging quickly and we need to work on replacing our amphibious dragline. The Bayou Sauvage Refuge Project, a 19,000 acre urban wildlife refuge, will require most of our source reduction attention over the next several years as the project develops.

Mosquito susceptibility studies are expanding, our insectary has doubled in size and 12 to 15 species are being reared for insecticide susceptibility work. Our program is aware of exactly which insecticide works best on which species. This information allows us to maintain a susceptible mosquito population that can be controlled with a minimum of pesticide pressure.

The importation of <u>Aedes albopictus</u> was the most important event of the past year. With the help of CDC, the New Orleans Mosquito Control program will be looking at surveillance and control methods directed to this newly imported pest/vector mosquito species. We need to determine the biological parameters that will determine its propagation and future dissemination. We also have to determine vector potential, its relationship to endemic mosquito-borne diseases and, most important, its host preference. It seems as though the New Orleans Mosquito Control program accomplished a lot last year but we have even more to accomplish in the coming years. Preparing for future progress is an ongoing task and we must continue to strive for the success achieved in the past and expected in the future.

CDC REPORT

When the magnitude of the Aedes albopictus infestation first became apparent, the Division of Vector-Borne Viral Diseases of the Centers for Disease Control developed an action plan to deal with this situation. The plan calls for increased surveillance nationally, educational programs and training workshops, cooperative assistance to surveillance personnel in Latin America, studies concerning international and domestic tire movements, incresed surveillance for arboviral diseases in infested areas, development of control strategies, and studies on the biological aspects of Ae. albopictus.

For studying the biology of Ae. albopictus, New Orleans was selected as the principal site in which to initiate this work. The specific areas to be addressed include: (1) utilization of natural and artificial containers as breeding sites; (2) determination of optimal methods for detection and collection of each life stage; (3) patterns of interaction and competition between Ae. albopictus and other fauna inhabiting containers; (4) determination of flight range; (5) establishment of host preferences; and (6) evaluation of specific methods that may be employed for population suppression.

Since my arrival on August 11th, a laboratory has been set up and some field studies initiated. Unfortunately, too little time remained in the 1986 mosquito season for intensive field studies on population dynamics, flight ranges, and host preferences. Therefore, most of my work concentrated on becoming familiar with potential study sites, testing various collection methods, making observations on the habitat utilization, and performing a field test with a potential control agent.

A field test of permethrin was conducted to determine if this synthetic analog of pyrethrum, could be used on tires as a means of preventing colonization by container breeding mosquitoes, particularly Ae. albopictus.

For this evaluation, five tires were treated with either a 0.01%, 0.1%, or a 1.0% aqueous suspension of permethrin; five untreated tires served as controls. After chemical treatment, experimental and control tires were placed in a woodlot on Grant Road in northeastern New Orleans. Preliminary studies had shown an abundant population of Ae. albopictus at this site. After tires were systematically arranged within the woodlot, each casing was filled with water and an oviposition strip attached to the inside of all tires. Oviposition strips were replaced with new ones every four days and, during these exchanges, tires were examined for the presence of larvae. If larvae were found, they were collected and returned to the laboratory for identification.

Results of the permethrin test indicate that oviposition in tires could be completely prevented for at least 9 days by a 1.0% suspension. While some egg laying occurred in a few 1.0% permethrin treated tires after this time, the number of eggs oviposited in these tires was significantly less than the number layed in tires of the other treatment and control groups. The first observation of larvae in the 1.0% permethrin treated tires was approximately 14 days after application of the insecticide. In contrast, the first larvae detected in the other tire groups occurred about 5 days after treatment. Also, except for the 1.0% treatment group, the first species found in the experimental and control tires was Toxorhynchites rutilus septentrionalis. Approximately 9 days after the 0.01%, 0.1%, and control tires were placed in the woodlot, Ae. albopictus larvae were found developing in these casings. Results of collections from ovitraps placed in the permethrin study site showed that the relative occurrence of Ae. albopictus eggs in the ovitraps was similar to the pattern observed in the tires. However, throughout the 27 days of the study, Ae. triseriatus eggs, which were abundant on the ovistrips placed in the tires, appeared to be underrepresented in the ovitrap collections.

The problem of identifying container breeding Aedes larvae soon after hatching was studied in a series of comparisons of morphologic characteristics that might permit the three predominant species to be distinguished. A purpose of this study was to find characters detectable under low power magnification that surveillance personnel could observe without the need of a compound microscope. For this evaluation, Ae. aegypti, Ae. albopictus, and Ae. triseriatus were compared in terms of the lenghts of their anal papillae, saddle sclerite, and saddle seta. Although small differences were observed in these measurements, none of these differences was statistically significant. Thus, the characteristics that were measured do not offer a reliable method for distinguishing the species tested.

In November, a long-term project was begun to study the dynamics of the interaction between Ae. albopictus and other fauna occupying the treehole habitat. This study is being conducted in the 84 acre woodlot of the Louisiana Nature and Science Center in eastern New Orleans. Treeholes supporting larval development are being examined in terms of exongenous and endogenous processes that contribute to the regulation of population size. In addition, coexistence and competition will be studies to determine those factors affecting intra- and interspecific relations in this environment.

In preparation for this study, treeholes which might contain water for long periods were identified, marked, and characterized. Tree parameters measured included species, height, and girth. Treehole characteristics recorded included height of the treehole above ground, depth of water present, estimation of water holding capacity, and measurement of water pH. During the forthcoming mosquito season, additional aspects of the water quality in treeholes will be determined in an effort to correlate these factors with the rates of larval development.

Another goal of the *Ae. albopictus* project is to observe any interactions between this species and agents or organisms that might be infectious to humans and animals. Of major importance is the ability of *Ae. albopictus* to serve as a vector for several native and exotic arboviruses. The latter being potentially imported by travelers from other countries. The arboviruses of greatest interest include flaviviruses (dengue, yellow fever, St. Louis encephalitis, and Japanese encephalitis viruses), California group viruses (La Crosse encephalitis virus), and alphaviruses (eastern, western, and Venezuelan equine encephalitis viruses). Attempts to determine the history of arboviral diseases in Louisiana have been hampered because of difficulty in obtaining specific information about past cases, particularly those involving La Crosse encephalitis. Tentative plans for a retrospective serological survey are being made with the hope that this may show areas of Louisiana with elevated prevalence rates for infections with La Crosse encephalitis. This information can then be used to select field sites for attempts to isolate viruses from field populations of *Ae. albopictus*.

A bibliography on published literature dealing with *Ae. albopictus* has been completed. This bibliography contains more than 200 references and is being updated on a monthly basis. Copies of this bibliography are available to anyone upon request.

A detailed survey of tire piles in New Orleans was recently completed. Fifty-eight sites containing 10 or more tires were characterized in terms of the number of tires, tire type, presence of vegetation, and presence of *Ae. albopictus* larvae. Data from the survey has resulted in a directory of tire piles in New Orleans and a detailed map showing the location of each pile.

Since mosquito abundance is correlated closely with ambient temperature and patterns of rainfall, a computer database of specific information was created. Data on daily mean, maximum, and minimum temperatures for the New Orleans area for the past 93 years were obtained from NOAA. Also, data on the amount of rainfall in New Orleans for a 30 year interval (1951-1980) were obtained from the parish Sewerage and Water Board. This information should provide useful comparisons with data collected from the study sites.

ENTOMOLOGICAL REPORT

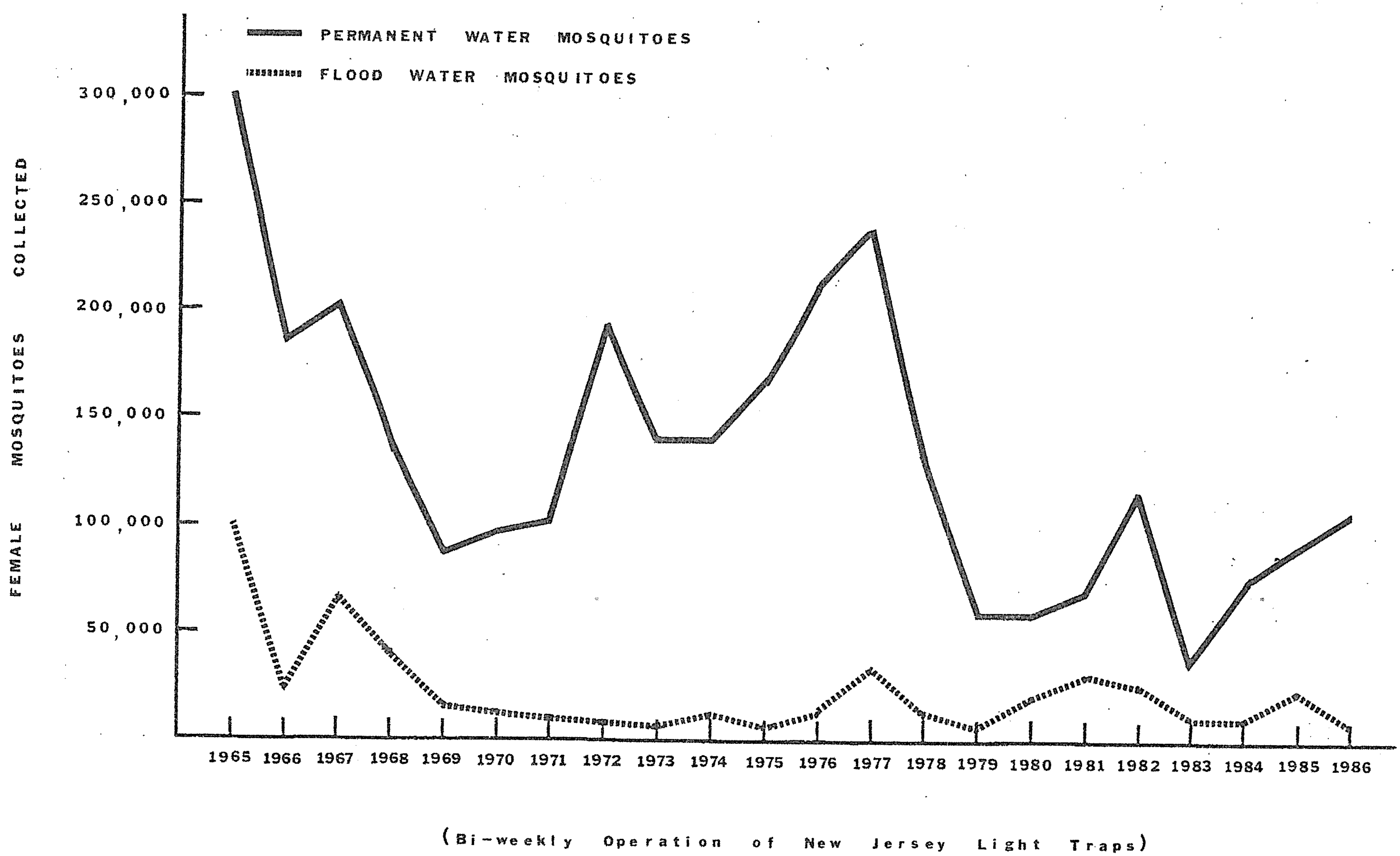
Adult mosquito populations respond to a lack of precipitation with an increase in permanent water species and a decrease in floodwater breeding species. This past year was a relatively dry period that ended with a 10 inch rainfall deficit. When compared to the average annual rainfall of 58.29", a ten inch deficit is very significant. In fact, this lack of precipitation was responsible for Culex salinarius accounting for 61.5% of all adult female mosquitoes captured in the 32 light traps located in Orleans Parish. The distribution and intensity of the Culex salinarius problem in New Orleans is very disturbing because this particular species is very difficult to control with current mosquito abatement technology. Extensive breeding habitat, limited activity cycle, tolerance to lower temperatures and its expanding range are responsible for making Culex salinarius one of our most prominent pest mosquito species.

The Aedes albopictus problem will be addressed in a separate report. The presence of Aedes albopictus in the Americas could be the most significant insect vector importation of this century. This situation will be addressed in greater detail in specific reports.

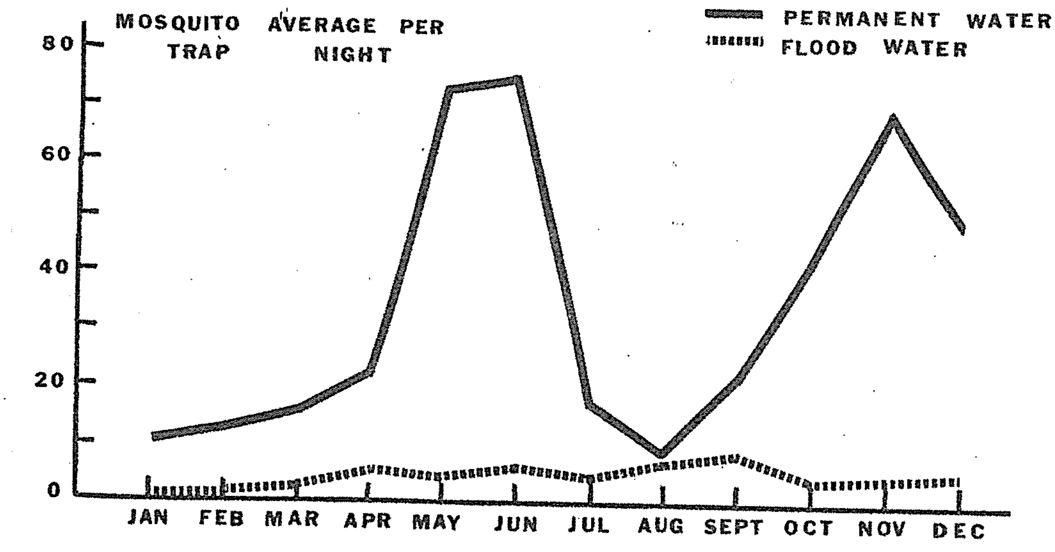
The first three months of 1986 were characterized by warmer than normal temperatures and a noticeable lack of rainfall. Culex quinquefasciatus (southern house mosquito) and Aedes sollicitans (saltmarsh mosquito) were collected in the February light traps and would have caused us real problems if Orleans Parish had received just near normal rainfall.

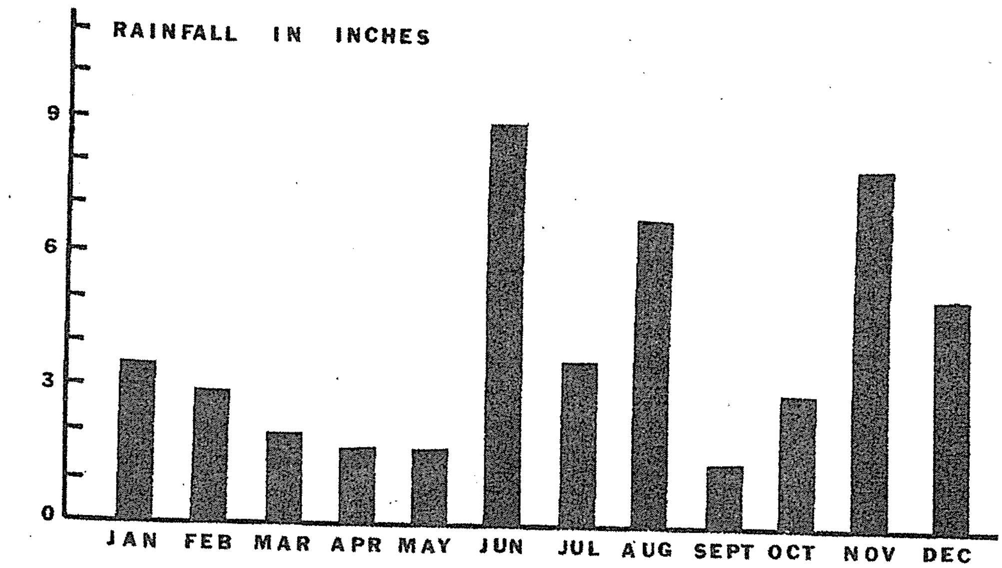
April, May and June continued the trend toward drought conditions, and by the end of the second quarter of 1987 Orleans Parish had received 8.7 fewer inches of precipitation than average for the first six months of the year. Adult mosquito populations increased during this period. Aedes albopictus was collected by the CO_2 enhanced landing rate method during the month of May. By June, it had expanded its range and was detected in ovitraps and CO_2 landing rates throughout the entire parish. It was during the second quarter of the year that we realized that the "Asian Tiger Mosquito" was a major pest problem as well as a potential serious vector species.

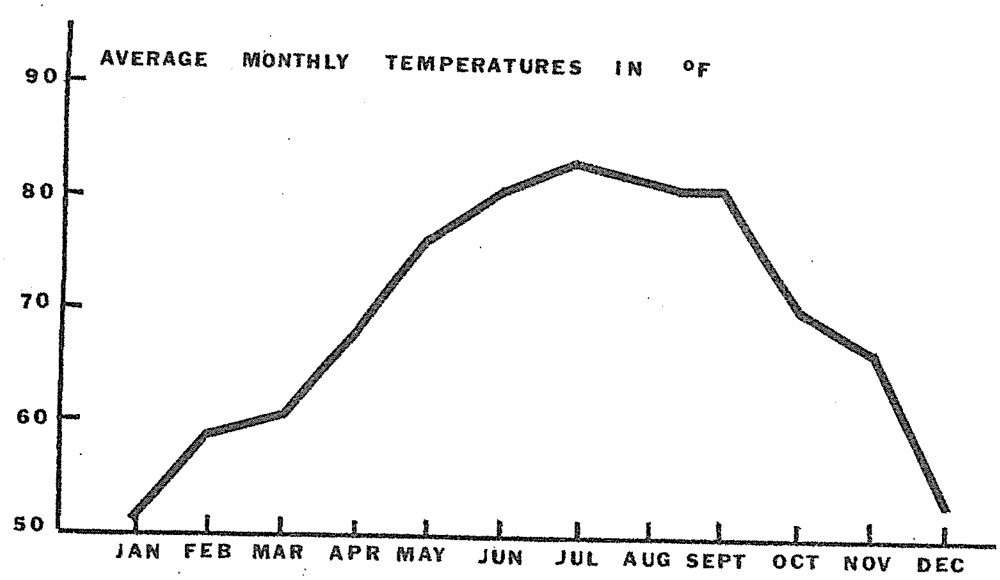
The third quarter of 1986 brought a decline in the Aedes albopictus numbers. This decrease was probably due to an increase in temperature and the continued drought conditions. A 12 inch deficit in rainfall is very significant to an insect whose larval stage is aquatic. Evapotranspiration increases during the heat of summer and many aquatic insects suffer declining numbers during this period of time. The heat of summer may well be a period when Aedes albopictus may be susceptible to chemical and biological control.


PERMANENT WATER MOSQUITOES
FLOOD WATER MOSQUITOES
FEMALE MOSQUITOES COLLECTED
300,000
250,000
200,000
150,000
100,000
50,000
1965
1966
1967
1968
1969
1970
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
(Bi-weekly Operation of New Jersey Light Traps)

MOSQUITO / ENVIRONMENTAL CORRELATION

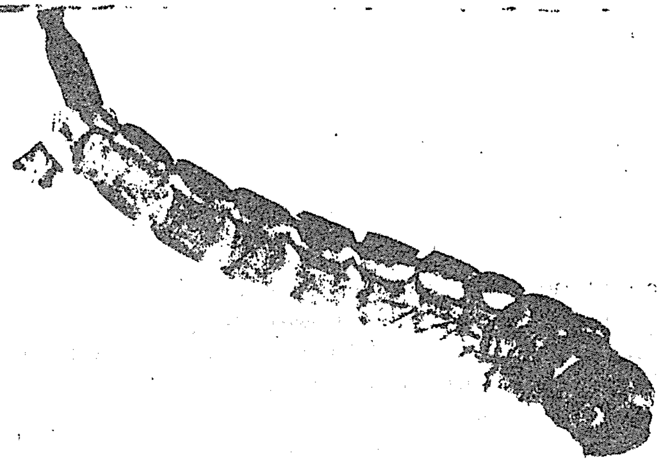






October, November and December answered several very important questions about *Aedes albopictus*. Lower temperatures of fall did not result in its resurgence. The "Asian Tiger Mosquito" responded to the shortened daylight period by going into diapause. It would seem now that the *Aedes albopictus* windows of possible control will be in the early spring when the diapausing eggs start to hatch. We may have another "control window" opening during the heat of summer.

A wet 1985 was followed by a very dry 1986 and pest mosquito species changed accordingly. Instead of a resurgence of *Aedes sollicitans*, *Culex salinarius* and *Aedes albopictus* required most of our control efforts during 1986. No matter how much experience and scientific knowledge we possess, it is obvious that climatic conditions will dictate which mosquito species will require our attention and control activities.



LARVAL SURVEILLANCE AND CONTROL

During 1986, 1625 larvae and 58 pupae were collected and identified, representing a 59% decrease from 1985.

Larval activity was impacted by low rainfall; a 13" deficit by November, and a 10" deficit by year's end.

A new larval species appeared in the spring with the introduction of the forest day (Asian) mosquito. In the quest to define breeding sites for this mosquito, the rarely seen larvae of _Orthopodomeyia signifera_ and _Toxorhynchites rutilus septentrionalis_ were uncovered in used tires.

Tree holes and exposed discarded tire casings were prime targets of larval surveys and surveillance from April to year's end. Data from these inspections appear elsewhere in this report.

	Total	No. Wet	No. Dry	No. Positive	% Wet Positive
Potential Breeding Sites Inspected	1040 (2307) [1]	559 (1216)	481 (1091)	100 (201)	18 (17)

	Total	Cost
Total man hours inspecting & Treating	1371 (2199) [1]	$ 8226 ($13194)
Total man hours supervising, office, misc.	218 (226)	3455 (2938)
Miles traveled	7261 (10978)	1089 (1647)
Gal. Altosid SR-10 Mix (4 oz./10 gal. water)	3 (0)	4 (0)
Gal. Diesel/Triton	8 (15)	8 (19)
No. Altosid briquets	65 (30)	16 (9)
Gal. BTi in water @ 0.1 pt./tech/ac	1 (19)	1 (15)
Total Cost:		$12799 ($17822)

1 1985 Data

1986

TRUCK TRAP TOTALS

	ALMONASTER
Aes	30/1297
Aev	55/1272
Aeae	4/0
Aealb	0/1
Anc	24/355
Anq	0/7
Cxq	0/132
Cxs	1881/5105
Cqp	0/2
Other	183/1001
Run I	1959/7659
Run II	218/1513
Total	2177/9172

CO_2 COUNTS

	OUTSIDE	ALGIERS
Aes	3587	309
Aev	451	366
Aet	250	23
Aeae	10/5	6/ 12
Aealb	7/23	52/ 83
Aetri	12	2/ 5
Anc	2623	45
Anq	12	2
Cxs	1076	1030
Csi	3	1
Psf	11	5
Cqp	2	-
Other	13	2
Total	17/8068	60/1883

LARVAE TOTALS

Aes	22
Aev	183
Aeae	56
Aealb	18
Cxq	396
Cxs	385
Cxr	342
Csi	108
Other	30
Pupae	58
Total	1598

1986 LIGHT TRAP COLLECTIONS

LIGHT TRAP COLLECTIONS — 1986 ANNUAL REPORT

	TOTAL		Aedes		Anopheles		Culex														
	Male	Female	Soll.	Vex.	Cruc.	Quad.	Quinks	Sals.	Uran	Csi	Cxr	Cxn	Aet	Ae ae	Ae alb	Aetri	Csm	Ps. sp.	Cqp		Trap Days
1. Low. Algiers	882	26178	0/49	17/333	19/382	2/23	0/10	823/25081	0/29	7/98	5/134	9/11	0/8	0/12			0/1	0/7			104
2. Tall Timbers	783	4509	10/83	22/497	4/59	0/2	0/8	731/3701	2/40	0/18	5/85	8/4						1/11	0/1		104
3. Mid-Algiers	100	490	0/2	8/63	3/27	1/3	0/1	74/330	3/27	0/9	8/22	2/4		1/1			0/1				103
4. Alg. Point	248	495	0/5	12/77	0/7	0/1	2/9	189/324	0/5	6/8	5/37	0/2		34/17			0/3				104
5. Bodenger Pk.	147	626	0/3	4/45	1/10		0/1	133/528	0/3	2/6	0/23	3/1	0/1		4/3	0/1		0/1			104
6. Benton	127	419	0/8	13/51	5/7		0/10	96/314	0/3	5/5	1/6		0/11	7/3			0/1				104
7. St. Roch Cem.	88	206		4/24	1/1		0/4	70/155	0/3	3/12	0/4	2/0		8/3							34
8. Irish Channel	219	411	0/1	17/104	2/18		15/25	140/179	4/25	3/10	19/41	11/1		8/7							104
9. S. Claiborne	329	646	0/1	13/158	1/21	1/0	17/20	263/358	0/11	1/5	21/67	3/0		9/5							104
10. Audubon Zoo	397	951	0/5	15/155	2/60	0/7	3/7	311/557	1/8	2/16	18/121	26/1		18/12		0/1		1/1			104
11. Audubon	521	2712	0/1	41/453	23/235	4/12	24/73	373/1676	5/45	4/16	19/177	23/16		1/6	0/2			4/0			104
12. DeSaix	1045	4857	0/14	23/544	4/188		4/22	970/3599	4/17	6/69	23/382	4/2		7/4				0/15	0/1		97
13. City Park	285	4170	0/75	21/708	15/357	0/6	0/2	225/2395	0/75	7/187	11/144	2/18	2/10	0/1			0/1	2/191			104
14. Lakewood	43	108	0/1	6/26	0/6	0/1	0/2	25/55	2/3	1/3	0/6	4/0		4/5				1/0			103
15. Longvue Gd.	495	3528	1/11	71/647	10/237	0/4	2/65	365/2079	1/94	8/44	32/327	1/18	2/2	2/0							104
16. Lake Terrace	681	2732	0/8	25/297	30/166	0/1	2/7	611/2024	3/131	1/35	2/52	5/4	0/2	2/2				0/3			104
17. Louisville	264	959	0/2	52/229	17/73	0/4	1/7	170/549	12/41	5/18	2/33	5/1		0/1				0/1			104
18. Pont. Park	383	3064	2/20	25/352	20/122	0/2	0/4	311/2317	4/191	5/30	0/14	13/4	2/1					1/7			101
19. Gentwood	78	289	0/2	8/83	2/15	0/1	0/1	54/138	0/5	1/12	1/25	2/0		10/5			0/2				104
20. Gentilly E.	655	1413	2/51	32/337	0/54	0/4	0/4	611/848	1/28	7/63	0/14	0/5		2/4			0/1				103
21. Lil. A'Corn	565	3427	0/39	26/478	4/147	0/4	0/8	504/2512	1/80	24/94	0/47	4/3	0/2	2/1		0/1		0/11			102
22. Vincent	705	5409	0/34	26/908	9/316	0/6	0/3	652/3862	4/153	9/91	0/30	4/2						1/4			99
23. Vil. DeL'Es.	70	568	2/48	6/90	3/50	0/3		54/302	0/11	3/28	0/10	2/12	0/10					0/2	0/2		104
24. Resthaven Mem.	152	4116	22/316	7/382	6/239	0/2		111/3014	0/15	4/61	0/24	0/13	2/31	0/1	0/2	0/1		0/15			103
25. Joe Madere's	937	12142	0/18	48/280	11/411	0/16	0/4	615/4447	26/6455	7/26	0/5	230/424	0/4				0/52				102
26. Lk. Barrington	280	834	0/8	10/129	1/24		0/1	241/573	0/54	21/12	2/21	3/11		1/0	0/1	1/0					95
27. Iris Bayou	285	3004	0/32	0/10	153/1183	0/1		128/1735	0/10	3/17		1/16									99
28. Venet. Isles	731	9129	5/251	21/89	41/2243			659/6382	0/87	1/23	0/1	2/4	2/49								102
29. Green Ditch	479	17215	15/978	5/281	129/6059			329/9661	0/80	2/60	0/2	0/8	0/50					0/36			101
30. Rigolets	375	11769	40/1076	8/173	135/5314			180/5021	0/40	12/104			0/29					0/12			72
31. Lake Forest	283	1070	0/5	16/208	4/35			238/728	1/31	12/30	0/15	12/12	0/2	0/1	0/1		0/1	0/1			104
32. Oak Island	267	6311	14/179	34/1006	36/1416	0/12		159/3383	6/156	16/53	0/14	2/77	0/1				0/4	0/10			100
Total	12899	133757	113/3326	636/9217	690/19482	8/115	70/298	10415/88827	80/7956	188/1263	174/1883	383/674	10/213	116/91	4/9	1/4	0/67	11/328	0/4		3180
%			2.5	6.9	14.6	0.1	0.2	66.4	5.9	0.9	1.4	0.5	0.2	0.1				0.2			

ADULT MOSQUITO SURVEILLANCE

During 1986, the New Jersey light traps ran on 3180 trap nights out of a maximum potential 3328 nights (96%). This is the same percentage as 1983-1985. Trap No. 7 St. Roch Cemetery, ran on only 34 trap nights due to electrical outage and was eventually relocated. Trap No. 30, Rigolets, was out of service the last quarter of the year due to the closing of the state operated fort. Thirty-two traps were in operation, with no additional sites added (10 traps were in operation in 1964).

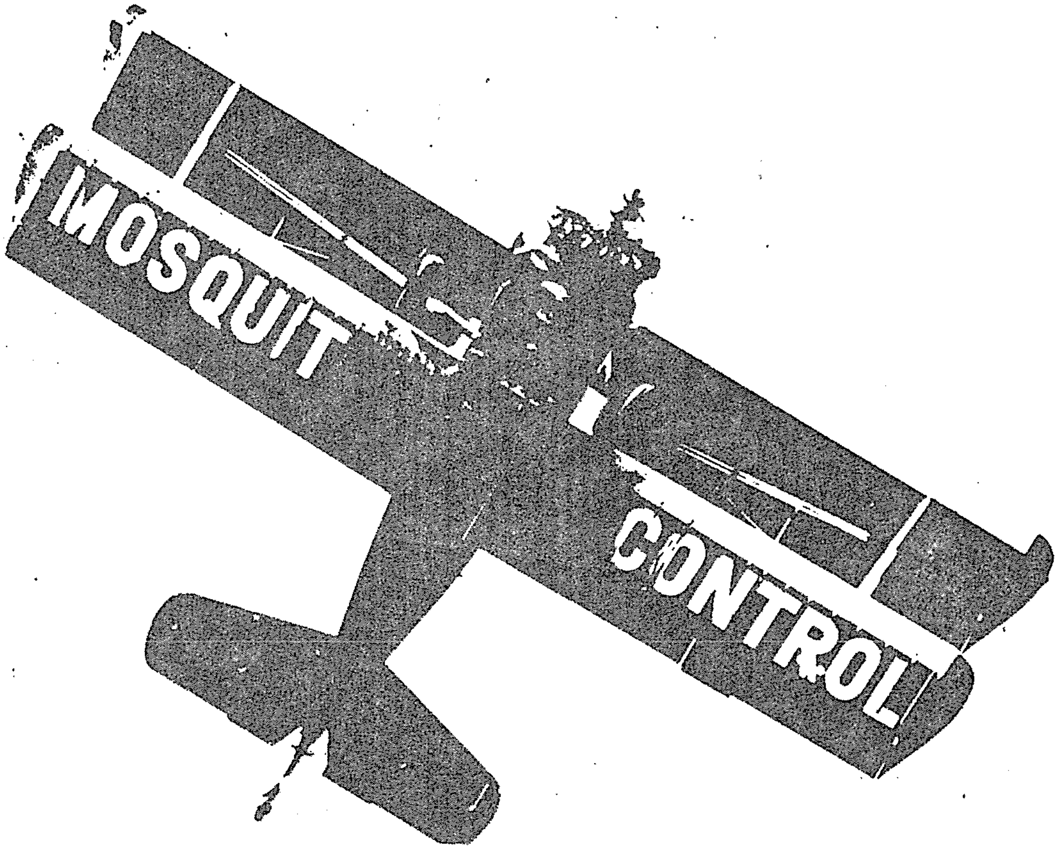
The most active trap was No. 1, Lower Coast Algiers, which collected 26,178 adult females. Of this total, 25081 were *Culex salinarius*. The second most active trap was No. 29, Green's Ditch, collecting 17215 adult females, 9661 being *Cx. salinarius* and 6059 being *Anopheles crucians*. The least active trap was No. 14, Lakewood, which collected 108 adult females, 55 being *Cx. salinarius* and 26 *Aedes vexans*.

The Outside CO_2 enhanced 3 minute landing rates were taken on 92 occasions (79 in 1985) and averaged 10.6 adult females/station-day. This is up from 8.9 in 1985 and 6.0 in 1984. The Algiers CO_2 enhanced 3 minute landing rates were taken 48 times (21 in 1985), averaging 4.7 females/station-day (4.8 in 1985 and 3.4 in 1984).

The truck mounted funnel trap ran 32 times (29) in 1985 and 15 in 1984), averaging 79 males and 265 females per run.

	Man hours		Cost		Miles		Cost
Light Traps	1419	(1807)1	$ 8514	($10842)	18648	(19555)	$ 2797
CO2 Landing Rates	596	(547)	3576	(3222)	9418	(7445)	1413
Truck Traps	123	(91)	1107	(546)	756	(728)	113
Miscellaneous	3443	(4258)	20658	(25548)	3899	(5237)	585
Supervisory & Office	237	(291)	3764	(3458)	2672	(1925)	401
Totals:	5818	(6994)	$37619	($41964)	3539	(34891)	$5309

1 1985 Data



ADULTICIDING

Ground adulticiding (ULV) decreased (-30%), compared with last year, with 115,065 acres sprayed in 1986. Aerial adulticiding (ULV) increased slightly over last year (+2%), with 105,830 acres sprayed in 1986. Of the aircraft acreage, 60,060 acres were sprayed with the twin Islander (57,423 acres at 2 oz./ac. 91% malathion and 2637 acres with Scourge/mineral oil at 0.0035 lb./ac. AI @ 1 oz./ac. of the 1:2.33 mix). A total of 45,770 acres were sprayed with the single engine Ag-Cat (naled tech. 85% at 0.75 oz./ac.)

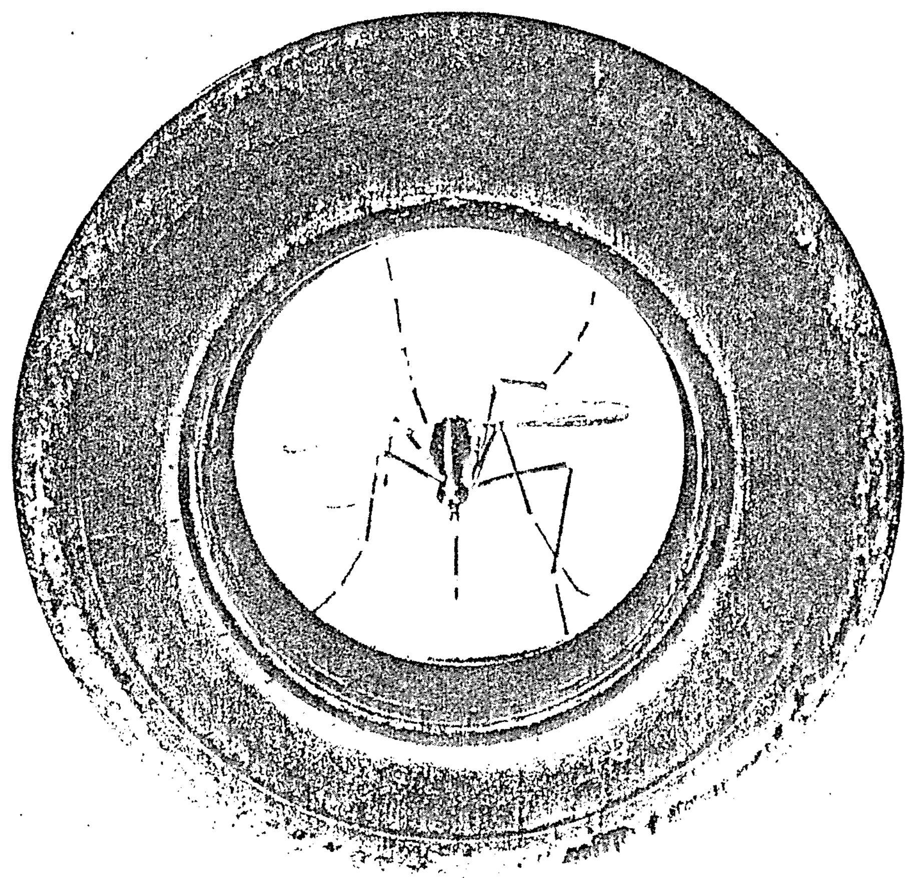
The truck-mounted ULV units (LECO-HD's) sprayed a mixture of Scourge/mineral oil (1:14 v/v) at 10 mph and 8 fl. oz./min. The amount of ground spraying in descending order was September (23%), June (17%), November (15%), October (14%), May (9%), August (7%), December (6%), April (5%), March (3%), July (1%), and January and February (0%).

The ground mixture of Scourge (Resmethrin & PBOT) and mineral oil worked well. However in 1987, we will continue to examine application methods and mixtures to improve the results of applying Scourge aerially.

VECTOR MOSQUITO MANAGEMENT

As in previous years, the New Orleans Mosquito Control Board (NOMCB) maintained a special vigilance in the area of vector mosquito surveillance and control during 1986. Cost benefit analyses of ovitrap and UV-Fay trap data from 1982-1985 indicated that the number of urban Ae. aegypti surveillance locations and the frequency of adult collections could be reduced without a loss in benefits. In conjunction with NOMCB's Ae. aegypti data base, these analyses enabled us to accurately predict population fluctuations city-wide and allowed the continued protection of the public from the threat of Ae. aegypti annoyance and virus transmission, at a reduced cost. Fortunately, these analyses enabled us to respond to the dynamic nature of our urban vector problems by incorporating other species into a comprehensive, yet economically efficient vector mosquito management program. It is obvious that a scientific approach and the ability to innovate are the reasons we have enjoyed a successful tenure, and the continuation of this program in the years to come will depend on progressive innovations and the maintenance of professional and scientific approaches to ever-changing problems.

For example, of extreme interest to the NOMCB vector mosquito management program was the initial discovery of breeding populations of Ae. albopictus in the New Orleans area in April 1986. The origin of this introduction may never be confirmed, but biological and epidemiological investigations conducted in cooperation with the University of Notre Dame



Aedes albopictus (Forest Day Mosquito)

1986 G R O U N D U L V

	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	TOTAL
TOT. MAN HRS./$	0 $ 0	0 $ 0	14 $126	26 $234	47 $423	94 $ 846	5.4 $ 49	46 $414	146 $1314	76 $456	84 $504	33 $198	571.4 $4564
HRS. SPRAYING	0	0	8.4	16.1	27	54	2.1	26	76.5	43.3	48.3	20.2	322.4
GAL. MIX./$ *	0 $ 0	0 $ 0	38.5 $437	61 $692	83 $942	172 $1952	6 $ 68	78 $885	232 $2633	125 $1419	169 $1918	73 $829	1037.5 $11775
TOT. MILES TRAV./$	0 $ 0	0 $ 0	166 $ 25	343 $ 52	537 $ 81	1126 $ 169	82 $ 12	570 $ 86	1729 $ 259	900 $ 135	1008 $ 151	376 $ 56	6837 $1026
TOT. COST SPRAYING	$ 0	$ 0	$588	$978	$1446	$2967	$ 129	$1385	$4606	$2010	$2573	$1083	$17366
TOT. ACRES SPRAYED	0	0	3054	5854	9817	19634	764	7564	27815	15744	17474	7345	115065
SPRAY COST PER ACRE	$ 0	$ 0	$0.19	$0.16	$0.15	$0.15	$0.17	$0.18	$0.15	$0.14	$0.14	$0.15	$0.15

* By volume: 1 part Scourge to 14 parts mineral oil @ 10 mph and 8 fl. oz./min.

Vector Biology Lab, CDC, and others lend credence to the hypothesis that discarded tire casings imported from Northern Asia were the probable source of our infestation. The establishment of Ae. albopictus in New Orleans has potentially serious public health and economic implications. Although no arbovirus transmission by Ae. albopictus has yet been recognized in the United States, laboratory studies and the biologic and behavioral features of this mosquito indicate a significant public health threat. A review of both experimental and natural transmission data clearly documents that this mosquito is a very efficient vector of epidemic dengue and its hemorrhagic complications. Dengue fever is usually a non-fatal form characterized by headache, severe muscle and joint pain, and rash. Very large epidemics occur at frequent intervals in nearly all tropical areas of the world including the Americas. New Orleans, being a major tourist center and port city, is at risk of importation and spread of the dengue fever virus. From 1979-1985, over 1,000 cases of imported dengue were introduced into the continental U.S. by viremic travelers. In the Caribbean, dengue epidemics have been common since the late 1960's. In Mexico, dengue cases have gone from no reported cases before 1977 to thousands reported annually in recent years. Indicative of the northward spread of dengue was the documentation of over 60 dengue fever cases in Texas during 1980.

The second clinical manifestation of the dengue virus, dengue hemorrhagic fever, causes severe disease with hemorrhage, shock, and occasional death. In Southeast Asia, 50 - 150,000 Ae. albopictus attributable cases of DHF occur annually. Approximately 3-5% of the cases are fatal. The economic implications of such epidemics are astounding. For example, a major epidemic of DHF struck Cuba in 1981. Over 344,000 cases were reported with more than 116,000 people hospitalized and 158 deaths. Hospital costs and control measures were estimated to have cost $100 million. No attempt was made to measure the impact on the tourist industry, but it is recognized that tourists go elsewhere when an epidemic is in progress.

Although one dengue vector, Ae. aegypti, already exists in New Orleans, the presence of Ae. albopictus increases the likelihood of the introduction and spread of dengue virus. In addition to being an efficient oral vector, laboratory studies have shown that Ae. albopictus can pass some disease causing viruses from infected females to their eggs (transovarial transmission). Female mosquitoes that develop from infected eggs can transmit the virus the first time they bite. The significance of this ability of Ae. albopictus to transovarially transmit dengue, as well as other viruses, is significant in that it could enable virus persistence from one year to the next in diapausing mosquito eggs.

The wide spectrum of other arboviruses to which Ae. albopictus has been shown to be susceptible suggests that this species also has the potential to serve as a vector for several endemic arboviruses in the Americas. The impact this introduction will have on the epidemiology of mosquito-borne diseases in our area is unknown, but we are, at best, at an increased risk of human involvement in disease transmission cycles due to the establishment of an additional vector.

As the season progressed, it became evident that Ae. albopictus had become firmly entrenched in New Orleans and surrounding parishes. Based on the number of service requests attributable to the obnoxious biting habits of the adult female Ae. albopictus, this species is rapidly replacing Ae. aegypti as the most important hematophagous insect pest in the urban environment of our city. Aedes albopictus must now be considered a pest and a potential public health problem in the urban and rural areas of New Orleans. Consequently, the majority of this year's efforts were concentrated on developing information on this species which will provide a rational basis for decision making on control of the infestation. Initial efforts dealt with the modification and implementation of an effective surveillance system for use in monitoring the population fluctuations of container-breeding mosquito vectors; establishing insecticide susceptibilities; determining the type and extent of habitat utilization; and improving our emergency control measures, including the development of criteria necessary to define an emergency situation.

A rapid survey protocol based on larval inspections and CO2 enhanced landing rates was implemented in March of this year to detect Ae. albopictus infestations. Initial surveys concentrated on areas of high risk with special emphasis on discarded tire casings, areas used as dump sites, ports, and older inner-city residential neighborhoods. To date, these surveys have revealed over 50 distinct breeding sites. The habitats are diverse and indicate the relative ecological adaptability of Ae. albopictus. Aedes aegypti appears to be largely restricted to breeding in and around human dwellings in urban environments. Although Ae. albopictus utilizes similar sites, it is also adapted to rural environments and a wider range of habitats to include tires, flower pots, cemetery urns, abandoned appliances, and tree holes.

Since at our present funding level it is not operationally feasible to eliminate all the positive or potential Ae albopictus breeding sites, we have resorted to routine surveillance to monitor the spread, seasonal changes, and the effect of control operations. Adequate surveillance information is essential to the most effective control techniques, to the development of new technologies, and to the integration of technologies into pest or disease management schemes. An intensive surveillance system for Ae. albopictus was immediately incorporated into our vector mosquito management program. Population fluctuations were monitored by weekly collections of egg, larval, and adult activity data from all known breeding habitats. Standard mosquito light traps were evaluated and, as of yet, have not proven to be useful in monitoring Ae. albopictus adults. Mammal baited traps may be a viable means of collecting host-seeking females and a gravid trap, designed by Dr. Kloter, University of Florida, to collect ovipositing females is currently being evaluated by NOMCB personnel. At present, the most reliable tool for monitoring population fluctuations appears to be the

Ae. aegypti oviposition trap The implementation of the ovitrap surveillance system allowed us to accurately evaluate our control efforts and thus ensure the continuation of an economically efficient, biologically effective, and environmentally acceptable vector control program.

Numerous investigations were conducted to develop standardized ovitrap methodologies for the surveillance of container breeding mosquitoes. Initially, a standard protocol for processing the ovitrap egg collections was implemented. Since the eggs of Ae. aegypti and Ae. albopictus are indistinguishable, they must be hatched and the resultant larvae reared to the fourth instar for identification based primarily on comb scale morphology. However, we determined that to obtain consistent and reliable data, the eggs require a 3 day conditioning period at high relative humidity and subsequent submersion of the egg paddles in a 1:1000 solution of commercial nutrient broth and deionized water at 80 degrees F. This protocol increased the average percent hatch by 30%, synchronized larval development, and provided consistent and reliable ovitrap data for both Ae. albopictus and Ae. aegypti.

Field trials were also conducted to determine the competitive effectiveness of three commonly used ovitrap paddle types to Ae. albopictus. Statistical comparisons indicated that red felt paper, tan felt paper, and fiberboard paddles were equally attractive substrates for Ae. albopictus egg deposition (Table 1). Although equally attractive, previous studies indicated that the use of fiberboard paddles provided more reliable data because felt paper paddles were occasionally destroyed by snails and cockroaches. Therefore, we continue to use the fiberboard paddles as oviposition substrates in the ovitraps.

With regard to the abundance of the container-breeding mosquito vectors, Figures 1 and 2 illustrate the magnitude and seasonal fluctuations in the ovipositional activity of Ae. aegypti and Ae. albopictus, respectively, in our routine surveillance areas. The significance of these graphs is that the data indicates that Ae. albopictus has successfully invaded the urban areas and that Ae. aegypti adult abundance and ovipositional activity was considerably less than that expected based on previous year's average. The ovipositional activity of Ae. aegypti commenced in late March when the mean daily temperatures reached the 70 degree threshold on an intermittent basis. In November, temperatures dropped below the life cycle completion threshold for Ae. aegypti and the population density of this mosquito subsequently decreased to a level where it was no longer a serious pest or potential vector (Figure 1). UV-Fay trap collections corroborate the ovitrap data in that average adult captures in 1986 (1.5 Ae. aegypti/trap night) decreased by 52% when compared with annual averages (Figure 3).

Ovipositional activity data for Ae albopictus indicates bimodal peaks in abundance occurred in June and September. However, it must be noted, that one year of surveillance data is insufficient to draw further conclusions. Although these data indicate that *Ae. albopictus* has successfully invaded high density urban neighborhoods of New Orleans, further data from selected tire dumps effectively illustrate the explosive nature of this vector and make us thankful that the dengue fever virus has not been introduced (Table 2). Ovitrap data confirmed the monospecific utilization of these habitats by *Ae. albopictus* during peak activity periods and the total number of eggs collected illustrates the potential magnitude of these infestations. It is clear that used tires casings must be systematically eliminated from premises to effectively diminish the breeding index of this vector in New Orleans. Disposal of the estimated 1 million discarded tires in our city is not only a local mosquito control problem, it is an international environmental problem that must be addressed in the near future. Obviously, solid wastes, including tires, cannot continue to be "donated to agriculture" without serious environmental and public health repercussions.

Also of utmost concern to us is the extent to which *Ae. albopictus* utilizes rot holes and fork hollows of trees as larval habitats. Initial studies indicated that *Ae. albopictus* would oviposit a decreasing number of eggs in ovitraps placed vertically up to 15' (Table 3). Further investigations suggest that this habitat may be utilized extensively, which would have a significant impact on present control tactics (Table 4).

One factor that must be considered when measuring the success of *Ae. aegypti* in any given year is its interspecific competition with other container-breeding mosquitoes. In previous years, *Culex quinquefasciatus* has been the principal competitor with *Ae. aegypti* in New Orleans because one of its larval habitats is also artificial containers. Although this species normally seeks blood meals from avian hosts, it will bite man, and it is this aspect of its behavior that makes it a vector of St. Louis encephalitis (see Encephalitis Report). Control operations are directed against *Cx. quinquefasciatus* because of its implication in virus transmission to humans, since its populations rarely approach annoyance levels. Previous year's data suggested that when *Cx. quinquefasciatus* prospers in containers in any particular year, *Ae. aegypti* will not and the corollary also appears to be true. However, in contrast to previous years, both *Cx. quinquefasciatus* and *Ae. aegypti* were observed in significantly lower levels of abundance. In 1986, *Cx quinquefasciatus* and *Ae. aegypti* captures in the UV-Fay traps decreased by 36 and 52%, respectively.

The interspecific effect of *Ae. albopictus* on the abundance of these two urban mosquito species is unknown, but it is plausible that the establishment of an additional vector in the same larval niche contributed, at least in part, to the decreased abundance of *Cx. quinquefasciatus* and *Ae. aegypti*. Interspecific competition may be a major factor limiting these populations within manageable limits. If so, one population established without the others could result in a substantial increase in abundance with a concomitant increase in the vector potential due solely to the sheer numbers of the dominant species.

Control efforts were also extensive during the past year with two major topics addressed: 1) the prevention of additional introductions of Ae albopictus and 2) the elimination/reduction of existing populations in already infested areas. Modern means of transportation, the mass shipments and haphazard disposal of used tires, and the increased availability of suitable mosquito habitats (i.e. tires) have greatly increased the potential for Ae. albopictus and other mosquito species to invade and establish in the New Orleans area. Further introductions of Ae. albopictus into New Orleans might seem unimportant since the mosquito already is established within the City. However, newly introduced mosquito strains could carry genes for insecticide resistance or a greater ability to transmit certain viruses and for other undesirable biological or behavioral characteristics. Since Ae. albopictus can transovarially transmit viruses, foreign viruses might be introduced with the incoming eggs or larvae. Finally, there are other vector species that could be introduced in the same manner as Ae. albopictus. This should be a major concern to us all and may require legislation and regulation.

Present approaches to control of container-breeding mosquitoes which are directed toward domestic and insecticide susceptible Ae. aegypti populations may have to be modified. Aedes albopictus not only inhabits a wide variety of inaccessible habitats but is also less susceptible to all the commonly available insecticides we have tested. Consequently, the immediate goal of this program is to rapidly delineate the most effective techniques for the control of all container-breeding mosquito vectors, develop new technologies for the management of Ae. albopictus, and to integrate the technologies into efficient pest/disease management schemes.

It has become obvious that the primary long term objective of a successful control program should be the elimination of breeding habitats. Mosquitoes that breed in artificial containers are among the most likely targets for the application of integrated management schemes. They have adapted themselves to habitats largely under the control of man and have become dependent upon man and his activities for their continued existence. In this awareness, a source reduction project was undertaken to suppress a rather large and annoying population of Ae. albopictus inhabiting the Lower Coast. Operational evaluations based on ovitrap data, landing rate collections, larval inspections, and citizen complaints support our expectations. An immediate reduction in the Ae. albopictus population indices was apparently attributable to this source reduction effort. However, despite public awareness in this area, the location continues to be used as an illegal dump site and thus we anticipate a resurgence in mosquito abundance. Property owners must make a conscientious effort to eliminate standing water on/near their premises. Flower pots, jars, cans, tires, wading pools, inactive fountains, clogged roof gutters, discarded trash, and ANYTHING that will hold water for 5 or more days will produce adult mosquitoes. In addition, a sincere effort should be made to develop tire recycling methods that will be rewarding enough to induce people to turn in old tires and profitable enough to persuade recyclers to take them.

The philosophy of NOMCB is that the control of mosquito populations should be based on the integrated management of total populations rather than the continual reduction of high density populations with insecticides at times when the insect becomes a problem. However, we do realize that chemical control operations may be the only practical means of suppressing massive mosquito populations or interrupting disease transmission cycles. Consequently, the relative insecticide susceptibility status of *Ae. albopictus*, *Ae. triseriatus*, and *Ae. aegypti* was established and is discussed in detail in the Insecticide Susceptibility Report. It is clear that chemical control efforts will have to be conducted judiciously and adequately monitored since the suppression of *Ae. aegypti* and/or *Ae. triseriatus* populations without a concurrent reduction in the *Ae. albopictus* population levels could feasibly result in an increase in the spread and abundance of *Ae. albopictus* due to decreased levels of interspecific competition. On the basis of laboratory susceptibility results, small scale field studies were undertaken to evaluate the effectiveness of aerial applications of Scourge for the control of *Ae. albopictus* in tire dumps. Unfortunately, no reduction in adult ovipositional activity or abundance was obtained due, at least in part, to the heavily wooded location of the tire dump under investigation.

In addition, weekly releases of *Toxorhynchites splendens* were evaluated to determine the feasibility of using *Tox* to control *Ae. albopictus* in discarded tire piles. The initial results were encouraging in that the *Tox* were able to locate and oviposit in >80% of the prey positive tires and that the presence of >1 *Tox* larvae/tire resulted in complete elimination of the prey. Another significant aspect of this investigation was that the *Tox* recycled for at least two months after release.

A lot of information is still required to design and implement the most effective *Ae. albopictus* control program. The NOMCB has cooperated to determine the susceptibility status of *Ae. albopictus*, the potential use of integrated methods employing predators, biological larvicides and insect growth regulators, and to characterize differences among geographic strains. We do not have enough knowledge to solve the *Ae. albopictus* problem, but we do know enough to be concerned about its presence in New Orleans. The effectiveness of this past year's NOMCB vector surveillance program and the success of our control activities is a dedication to the hard work which our inspectors performed. Since these individuals never receive proper recognition, I would like to say that Daniel Roussel, Chuck Spizale, Jimmy Loupe, Gerald Lee, Wayne Arceneaux, and Doug Guthrie deserve the credit for the people of our city being able to enjoy outdoor activities this year. Without their efforts, the citizens of New Orleans would have had much more to complain about.

GENERAL

The 1986 season gave us an opportunity to undertake and cooperate in several experimental investigations. All studies were structured to be practical and have distinct applied value. Tests conducted this year ironed out many problems and should lead to a better understanding of our local mosquito problems in future years.

HOST PREFERENCE OF AEDES AEGYPTI

The final results of a study initiated by Dr. Kirby Kloter to determine the host-feeding patterns of Ae. aegypti were obtained from the Imperial College in England and the University of Massachusetts Serological analyses indicated that dogs may be serving as the principal hosts of Ae. aegypti in New Orleans. No human bloodmeals were identified but, in my opinion, that does not mean Ae. aegypti was not feeding on humans. It is probable that the smaller unidentifiable bloodmeals (>50%) were of a human source. Human movement often causes interrupted feeding of Ae. aegypti and such bloodmeals would logically be small. Nevertheless, the amount of dog feeding observed in this study indicates zooprophylaxis may be a factor in reducing the potential for transmission of some Ae. aegypti transmitted diseases, i.e. dengue.

ANCILLARY STUDIES

New Orleans Mosquito Control Board personnel cooperated with the University of Notre Dame Vector Biology Lab in isozyme and mitodrondrial DNA analyses on the New Orleans strain of Ae. albopictus to identify the geographic origin of this species which aided in predicting the spread as well as the chance of success of control efforts. It was determined that exposure of Ae. albopictus pupae and young females to a short day photoperiod (12.5:11.5) resulted in eggs that failed to hatch due to diapause induction. This phenomena occurs in temperate strains, yet not in strains from the tropics. However, diapause in the New Orleans strain does not appear to be complete with ca. 20% of the eggs failing to undergo diapause. Nevertheless, it is clear that our infestation originated from Northern Asia and that the potential for the spread and establishment of Ae. albopictus to northern areas of the U.S. is quite likely.

NOMCB also provided specimens of Ae. aegypti and Ae. albopictus to the Georgia Cooperative Extension Service for training of county agents and to the Pan American Health Organization for a workshop on the taxonomy, biology, containment, and control of these species in Trinidad. Additionally, in response to an epidemic of yellow fever in Nigeria, we were contacted for technical assistance and responded by forwarding UV-Fay traps to CDC personnel for the surveillance of adult mosquito vector populations and the collection of adults for virus isolation studies.

Numerous papers and presentations were also solicited and thus prepared during the past year. Two papers on the surveillance and insecticide susceptibility status of Ae. albopictus were presented and laboratory materials were prepared for a two day workshop on Ae. albopictus which was conducted in cooperation with the CDC, LSU Medical School, and NOMCB. Special thanks to Daniel Roussel for his technical assistance. Credit must also be extended to our taxonomist, Linda McLean, for her help in developing our operationally practical dichotomous key to the fourth stage larvae inhabiting artificial and natural containers in the southeastern United States. Invitational papers were also prepared and presented to the Florida Anti-Mosquito Control Association, the American Mosquito Control Association, and the Louisiana Mosquito Control Association on the bionomics of mosquito larvae and the management of arboviral epidemics in New Orleans; all of which were well received and resulted in numerous inquiries. Further lectures were also presented to groups of international public health officials and scientists from the University of South Carolina Health Sciences Institute and Tulane University School of Public Health. A manuscript delineating emergency strategies for the control of arboviral epidemics in New Orleans was accepted for publication in the Journal of the American Mosquito Control Association. Grant support for an ancillary project with the University of Florida was also pursued through the Caribbean Basin Scientific Advisory Group. This proposed project deals with the development and implementation of an entomogenous fungus for the control of Ae. albopictus in tree holes.

	Hours		Cost	
Surveillance 1	2916.25	(4889.5) 2	$20,239	($33,933)
Miles Traveled & Cost	6634	(11939)	995	(1,791)
Total Cost			$21,234	($35.724)

1 Includes surveillance, operational evaluations, and insecticide susceptibility studies

2 Previous year's parameters

FIGURE 2. Yearly ovipositional activity of *Ae. albopictus* in routine urban surveillance areas of New Orleans.

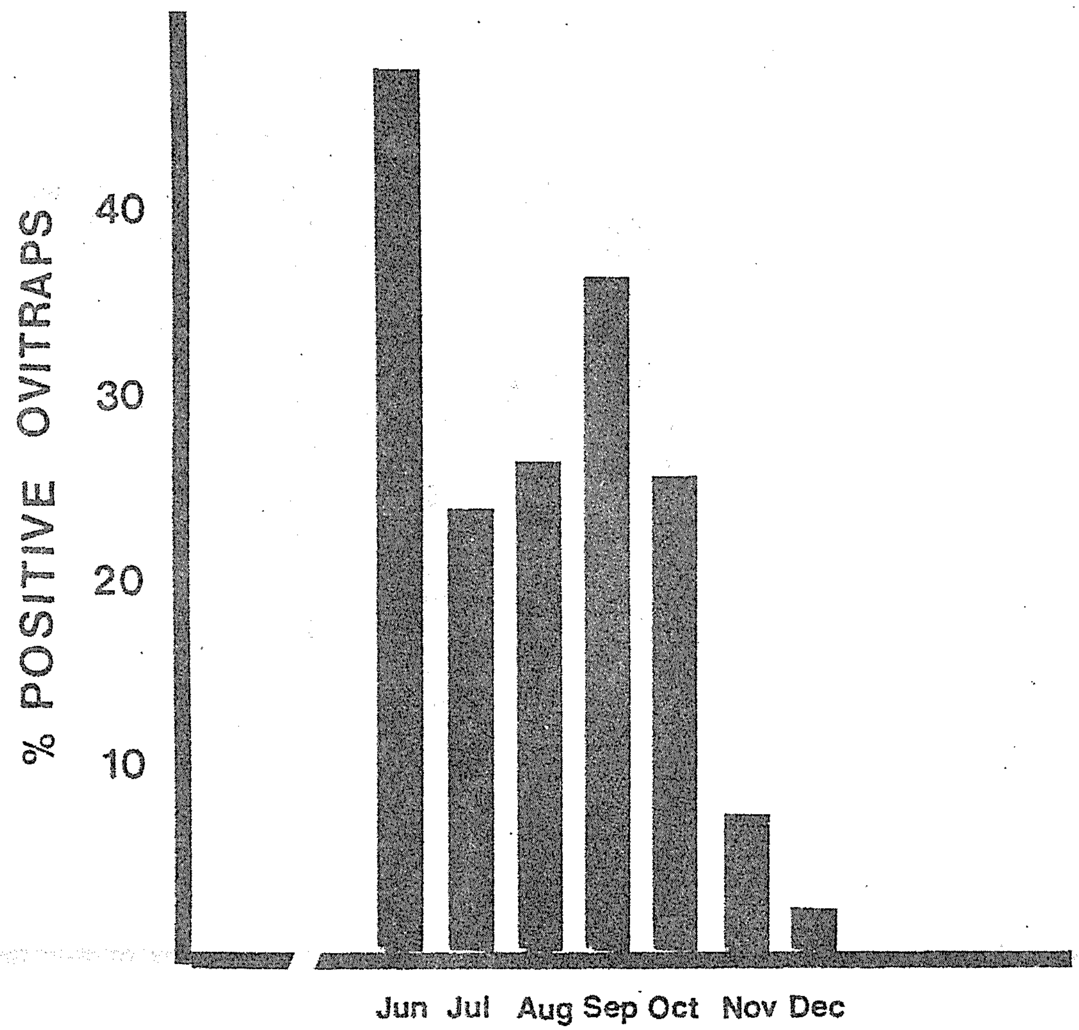


FIGURE 1. Yearly ovipositional activity of *Ae. aegypti* in routine urban surveillance areas of New Orleans.

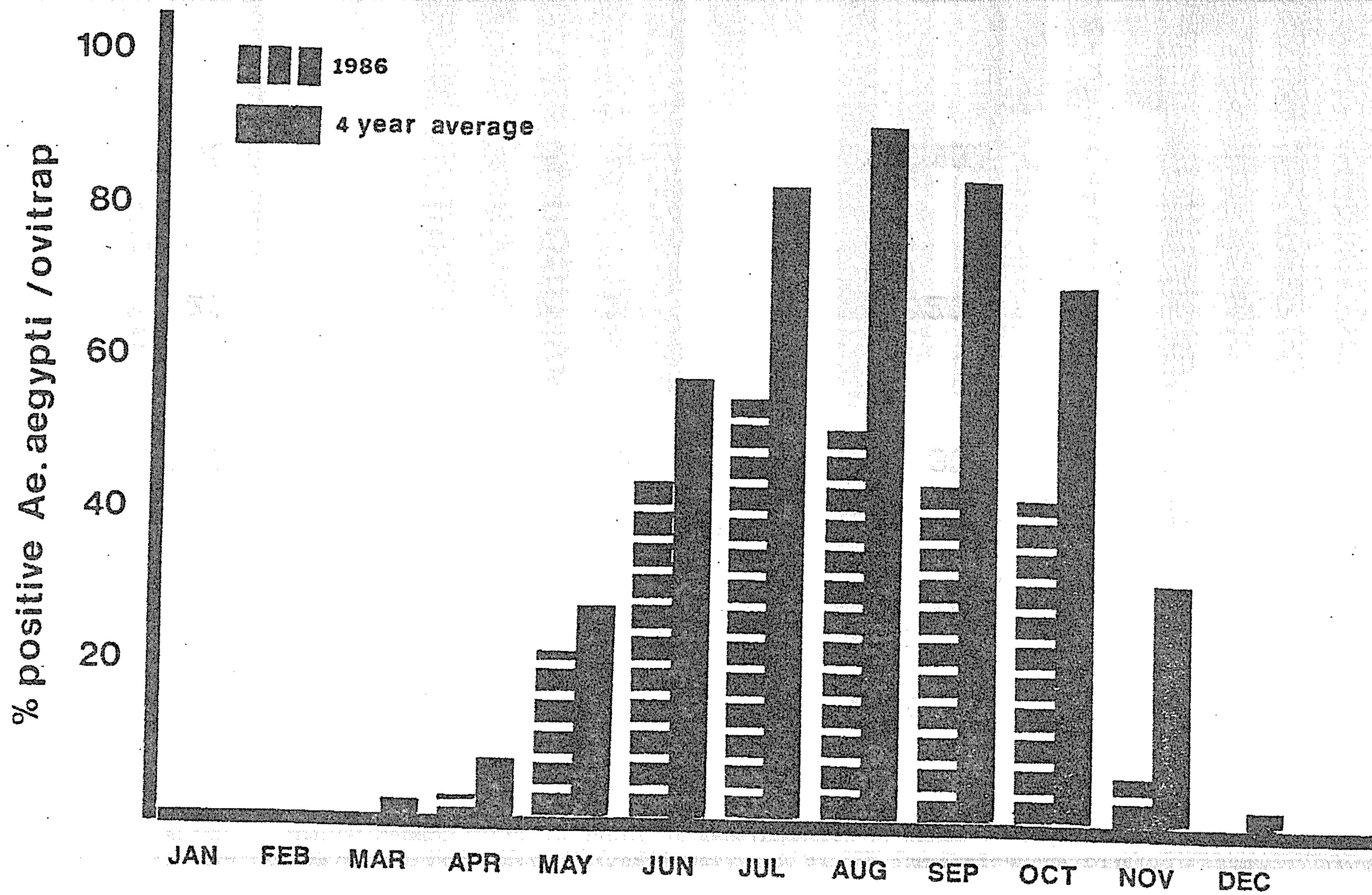


FIGURE 3. Expected and observed average numbers of *Ae. aegypti* adults collected in UV-Fay traps, New Orleans, Louisiana.

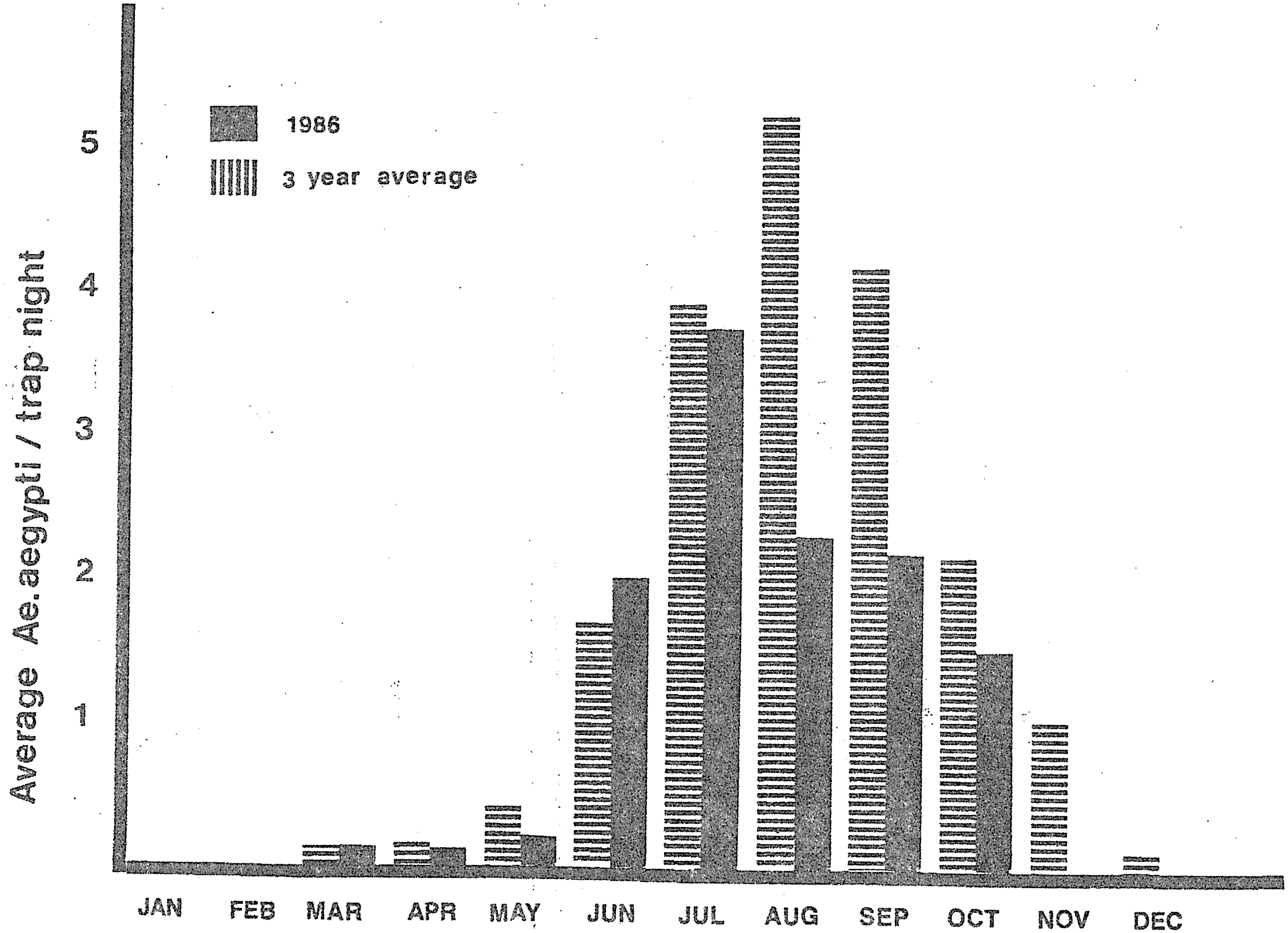


TABLE 1. Evaluation of ovitrap paddle types as *Ae. albopictus* egg deposition substrates

Paddle	Range	Mean No. Eggs 1
Fiberboard	0 - 62	12.0 (2.4) a
Red felt	0 - 90	8.9 (2.9) a
Tan felt	0 - 53	10.7 (1.7) a

1 Means followed by the same letter are not significantly different (P >0.05)

TABLE 2. Species composition and abundance of container breeding mosquitoes in tire dumps.

Site No.	Species	Mean No. Eggs 1
1	*Ae. albopictus*	174
2	*Ae. albopictus*	414
3	*Ae. albopictus*	313
4	*Ae. albopictus*	207

1 Expressed as mean number eggs collected/paddle/week

TABLE 3. The vertical distribution of *Ae. albopictus* oviposition

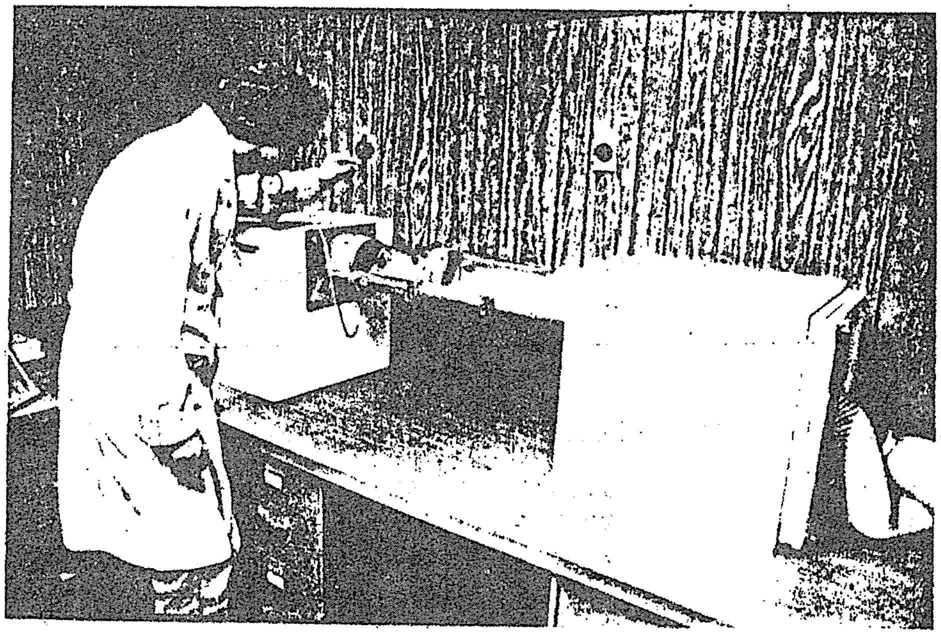
Height	Mean No. Eggs/Paddle (S.E.M.)[1]		Significance[2]
Ground	277.0	(51.4)	a
18"	20.5	(9.3)	b
3'	28.5	(11.0)	b
5'	41.0	(13.6)	b
7'	39.5	(12.8)	b
10'	4	(0.3)	c
15'	5	(1.0)	c

1 Standard error of the mean

2 Means followed by same letter are not significantly different ($P < 0.05$)

TABLE 4. Survey of treeholes in a woodlot at the Louisiana Nature Center (New Orleans, Louisiana)

Observation	Mosquito Species			
	Ae. triseriatus	*Ae. albopictus*	*Ortho.* sp.	*Tox.* sp.
% of treeholes positive	62.1%	72.9%	2.7%	16.2%
No. larvae collected	274	291	2	16
Mean no. larvae per wet treehole	7.4	7.9	0.05	0.40
No. treeholes containing only one species	0	4	0	0



INSECTICIDE SUSCEPTIBILITY STUDIES

Our comprehensive mosquito control program is a carefully planned and executed management operation aimed at insuring effective and continuous control of mosquitoes in New Orleans. After 22 years of active mosquito management, there has been no decrease in the susceptibility of the resident mosquito populations to the insecticides used, or those available for use, in the NOMCB program (Tables 1 and 2). However, faced with the fact that the number of really useful and economical insecticides is limited and new compounds do not appear to be forthcoming in quantity or quality, the appearance of more and more cases of resistance poses serious problems. Since the application of insecticides may be the only practical measure that can be taken to suppress massive mosquito populations as well as epidemics of mosquito transmitted diseases, chemical control methodologies must incorporate strategies to minimize resistance development and preserve the utility of the insecticides. The most promising approach, integrated mosquito management, includes the use of insecticides in combination with improved cultural and biologically based techniques. Although integrated management strategies have been successfully implemented, the chemical control of adult mosquitoes continues to play a major integral role in our program.

However, we are aware that whenever an organic insecticide is repeatedly applied for mosquito control, resistance usually supervenes after a period of 2-10 years of its uninterrupted use. The reason is that in any area sprayed, there are always a few of the mosquitoes that are, by genetic accident, naturally resistant to the chemical used. Most of the others die, of course, but the survivors, thanks to their reproductive ability, soon repopulate the area with descendants that are unaffected by the chemical. Mosquitoes will continue to develop resistance to future insecticides as long as present application techniques and use patterns prevail. In this awareness, insecticide susceptibility tests are routinely conducted in a continuing effort to monitor, refine, and improve the chemical aspect of our mosquito control program. Such tests are essential for routine surveillance of control operations, even when resistance is not yet expected. A reduction in susceptibility to an insecticide can be determined before resistance is prevalent, and thereby provide time to develop new tools to control tolerant species.

A new era of environmental consciousness and application technology became a reality in 1986. Prior to this year, malathion had been applied by ground ULV at the rate of 0.049 lb. a.i./acre (4 oz./min). Based on laboratory susceptibility tests, resmethrin synergized with piperonyl butoxide at the ratio of 1:3 (Scourge) was 6 times more toxic to *Aedes aegypti* adults than malathion (Table 1). Consequently, it follows that 1/6 the amount of Scourge could be applied to provide a "malathion equivalent mortality". Field cage tests verified the minimum application rates calculated from the laboratory susceptibility tests and Scourge has proven to be equally effective as malathion when applied by ground ULV at the rate of 0.0013 lb. a.i./A and 8 oz./min. (Table 3). Applications of Scourge at this rate resulted in a 10% increase in the cost of ground adulticiding but we feel the advantages of Scourge (i.e. lower mammalian toxicity, less noxious, and greater environmental compatability) outweigh the slight increase in cost. It was further determined that the successful use of Scourge as an aerial ULV adulticide was dependent on precise application technology. At a treatment rate of 0.0035 lb. a.i./A, applied at 1 oz./min., optimum control was obtained at a droplet size of 70 um, irregardless of altitude (Table 4). These data aided in the efficient application of minimum doses which decreased operating costs, prevented environmental contamination, and provided effective control of the target mosquito species.

It is obvious that a scientific approach and the ability to innovate are the reasons we have enjoyed a very successful tenure and the continuation of this program in the years to come will depend on progressive innovations and the maintenance of professional and scientific approaches to everchanging problems.

The detection of breeding populations of *Aedes albopictus* in several New Orleans area locations during 1986 posed particular problems for the NOMCB program. The establishment of this species in our city has potentially serious public health and economic implications. Clearly, the highest priority for responsible public health authorities was to develop information which would provide a rational basis for decision making on control of this infestation. Due to budgetary constraints and the urgency of the problem, efforts were immediately directed toward procuring extramural funds to assist in the development of effective, economical, and environmentally acceptable chemical control strategies for the management of Ae. albopictus populations. Consequently, considerable energy was expended enlarging and renovating our insectary to accommodate colonies of Ae. aegypti and Ae. albopictus from New Orleans, Houston, and Memphis as well as the insecticide susceptible OAHU strain of Ae. albopictus. These 7 additional colonies and a modern "state of the art" insectary allowed us to satisfy the objectives of insecticide susceptibility grant proposals, develop and implement operationally feasible integrated management schemes, allowed CDC and other research personnel access to controlled environmental facilities, and improved our ability to compete for future extramural funding. The "oldest egg colony concept" was also adopted as a standard procedure for maintaining these colonies. Rather than using the most recently deposited eggs for colony stock, we now hatch the oldest viable eggs in an attempt to maintain a high degree of genetic diversity. This should aid in the prevention of a true "laboratory" strain of a species which no longer exhibits realistic "field" characteristics/responses.

A grant was successfully obtained from the Centers for Disease Control to establish the relative insecticide susceptibility status of Ae. aegypti and Ae. albopictus. F1 progeny of each of the 2 species from 3 different geographic locations (Memphis, New Orleans, and Houston) were subjected to insecticide exposure and the responses of these field populations were then compared to those exhibited by colonized insecticide susceptible strains of both species (Table 5). Initially, the dosage mortality responses of the NOMCB and OAHU strain of Ae. aegypti and Ae. albopictus, respectively, verified that these strains remain homogeneously susceptible to the insecticides tested, and, therefore, represent the baseline state, which is modified upon insecticide exposure. With regard to Ae. aegypti, interpretation of the results suggest that the responses of the geographic strains from Memphis, Houston, and New Orleans were not significantly different; that the responses of each geographic strain are approximately equal to that of the susceptible NOMCB strain and thus that each of the strains is homogeneously susceptible to the compounds tested. Further interpretation indicates that permethrin was the most toxic potential larvicide to Ae. aegypti, followed in decreasing order of toxicity by temephos, fenthion, chlorpyrifos, methoprene, and dimilin. The results of the the Ae. albopictus larval assays indicated that no significant intraspecific variation existed in the responses of the 3 geographic strains to insecticide exposure. However, in contrast to Ae. aegypti, all 3 geographic strains of Ae. albopictus exhibited significantly different responses to permethrin, temephos, fenthion and chlorpyrifos than the susceptible OAHU strain which suggests that tolerance to these compounds was inherent in the recently introduced parent stock. Field collected specimens of Ae. albopictus was equally susceptible to methoprene and dimilin as the OAHU strain. The differences in insecticide susceptibility between the 2 species are of operational importance. Methoprene and dimilin were ca. equally effective against Ae. albopictus as Ae. aegypti. Chlorpyrifos, permethrin, fenthion, and temephos were 2.1, 2.3, 2.9 and 5.5 times less toxic to Ae. albopictus than to Ae. aegypti, respectively.

Due to the habitat utilization investigations conducted during 1986, and discussed in the Vector Mosquito Management section, NOMCB personnel felt that comparing the relative insecticide susceptibility status of resident populations of _Ae. aegypti_ (Table 6), _Ae. triseriatus_ (Table 7), and _Ae. albopictus_ (Table 8) was essential to the implementation of successful integrated strategies directed towards the management of artificial and natural container inhabiting mosquito species. Preliminary results indicate that Scourge is the most toxic adulticide to all 3 of the container species tested. On the basis of the slopes, we can conclude with confidence that all 3 species are homogeneously suceptible to Scourge, Ficam and Dursban although _Ae. albopictus_ consistently required 2 times higher concentrations to reach the LC90 level. With regard to malathion, _Ae. aegypti_ and _Ae. triseriatus_ were equally susceptible. However, the assessment of the _Ae. albopictus_ response to malathion proved difficult, probit of mortality being nonlinear on the chosen dose metameter (log 10 concentration). In the laboratory test data, a break in the regression line appears at about 0.29 ug/ml, with a leveling off over the 0.3 - 1.0 ug/ml range (Figure 1). It is clear from a graphical inspection of the data that fitting a single line to the dose-mortality response would give misleading LC50 or LC90 estimates. Due to this systematic departure from linearity, the curve was divided into 2 sections, the response in each being practically linear over the range of observations. Use of transformations other than probit and log 10 to convert the regression to linear form, or fitting the data to a polynomial might allow more precise estimation of the LC values, but a "break" in the regression line appears adequate for purposes of this study. At the LC90 level, it required 8 times more malathion to kill _Ae. albopictus_ than _Ae. aegypti_ and the slope associated with this line above the inflection point is basically flat, which is undeniably due to the presence of a proportion of heterozygous resistant individuals in the population tested. However, application of any criterion derived from susceptibility tests alone should be used with caution in deciding on the use of the buzzword "resistance". For example, temephos, with a recommended application rate (0.005 lb./a) fully one-fifth that of the recommended rate for malathion (0.025 lb./a), have LC 50 levels less than one-fiftieth that of malathion. Thus there is room for a considerable increase in the target population's LC50 for temephos before the recommended application rate is confronted with a control failure. In addition, resistance may be anticipated on the basis of susceptibility test results but a control failure is not expected unless the resistant gene frequency within the population is >10%. It is a combination of laboratory test results and field observations of control failure which add up to what can be called a true case for resistance, i.e. to the recommended application rate of the insecticide.

Clearly, the highest priority at NOMCB is to correlate laboratory susceptibility results with field efficacy data. A rational basis for decision making on control of _Ae. albopictus_ is imperative and will require cooperative efforts among government agencies, the public sector, and industry. For example, field tests to evaluate the effectiveness of ULV applications of malathion in suppressing target mosquito abundance and/or altering the populations age structure are in preparation. In conjunction with these objectives, we will be collaborating with the University of California at Riverside on biochemical assays of insecticide resistance to determine the frequency of the resistant gene within populations of the New Orleans strain. If these investigations indicate that a significant portion of the population is malathion resistant (>10%), further evaluations will follow. Synergists which inhibit enzymes involved in organophosphate detoxification will be evaluated against the test material alone and in combination with malathion. The effectiveness of adding penetration adjuvants to the malathion formulation will also be assessed. These additions may provide less time for detoxification of the incoming dose and thus counteract any physiological resistance. Data collected to date suggest that present approaches to control which are directed toward insecticide susceptible and domestic Ae. aegypti populations may no longer be effective or efficient and must be modified. Consequently, the immediate goal of this program is to rapidly delineate the most effective techniques for the control of all container inhabiting mosquito vectors, develop new technologies for the management of Ae. albopictus, and integrate the technologies into efficient pest or disease management schemes.

In this awareness, screening and evaluating candidate insecticides became an important aspect of our chemical control program. Due to the continued development of resistance and increased environmental concerns, it is anticipated that conventional insecticides will be used less frequently in the future. NOMCB personnel foresee a continuing decline in the use of synthetic insecticides and oils to an increase in bioagents, juvenile hormone mimics, and similar materials selective to mosquitoes and environmentally safe. Therefore, our evaluations are directing more energy toward the implementation of "mosquitocides" that cause the smallest perturbations in other components of the environment. This program screened 13 formulations of Bacillus thuringiensis var. israelensis (Bti) in the laboratory against Ae. albopictus larvae. Promising formulations were then evaluated in the field for initial as well as long-term effectiveness. Bti is a naturally occurring bacterium which has a highly specific mode of action against a narrow host spectrum. Figure 1 depicts the sequence of events associated with using Bti for control of mosquito larvae. Larvicidal activity is dependent upon ingestion of the spores and delta-endotoxin crystals. Upon ingestion, PH conditions and enzymes in the gut of the larva rapidly hydrolyze the toxin into active subunits which attack the midgut. General gut paralysis occurs and cells of the larval midgut become excessively damaged. Disruption of the ionic regulatory capacity of the midgut and the subsequent flow of toxic substances into the larval hemocoel causes death within 24 hours. This rapid mortality is compatible with our inspection and evaluation methods and offers a sensible and effective alternative to conventional chemical control. In addition, Bti is particularly well suited for use in environmentally sensitive areas because of its excellent safety profile.

The lethal concentrations of several liquid and granular Bti forms tested against Ae. albopictus are presented in Tables 9 and 10, respectively. Residual activity data are presented in Tables 11 and 12. Of particular interest was the long-term effectiveness of a fenoxycarb/Bti combination when applied by hand to used tire casings. The larvicidal and pupacidal activity of this combination shows promise and offers hope for the control of mosquito larvae in stable environments.

The feasibility of aerial applications of Vectobac 12AS against natural populations of container breeding mosquito vectors was also evaluated. Treatments were made using the NOMCB's Britten Norman Islander twin-engine aircraft equipped with 2 self-contained Micronair spray pod systems utilizing rotary atomizers. Dosages of 4 and 8 oz./A were applied at 115 mph and at an altitude of 50 ft. The mortality of sentinel larvae and larvae in used tire casings was assessed 24 and 48 hour postexposure. Table 13 indicates that both treatment rates provided acceptable control of larvae that were exposed to the Bti. However, the larval mortality rates in tires laying flat on the ground were variable and resulted in low average mortality rates. These tests affirm the potential of the Micronair system as an effective means of treating inaccessible larval habitats with Vectobac 12AS for the control of Ae. albopictus.

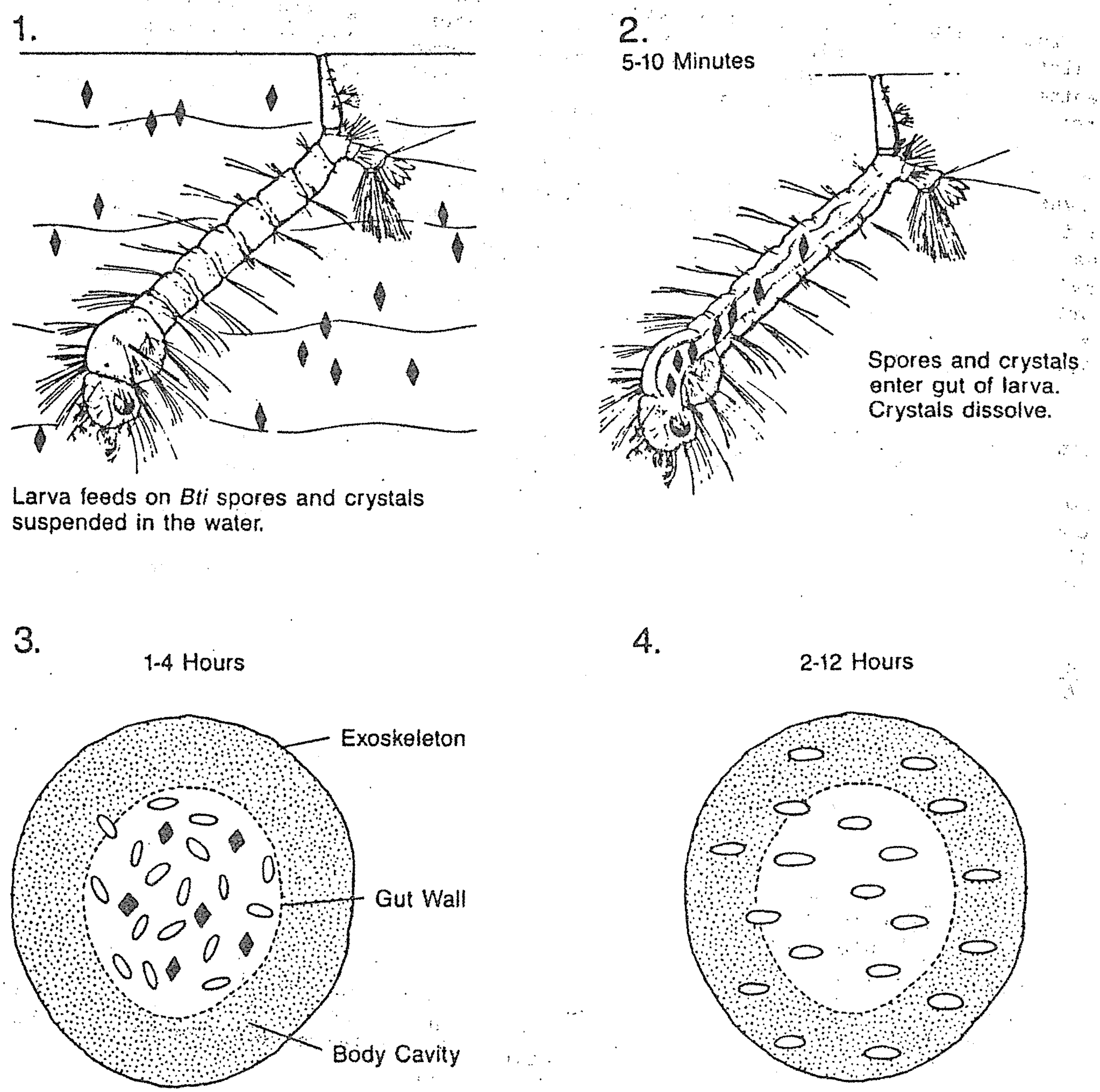
NOMCB also evaluated the efficacy of a novel carbamate insecticide, fenoxycarb, against Ae. albopictus. In contrast to the well known N-methyl carbamates Baygon and Sevin, which inhibit cholinesterase, fenoxycarb does not inhibit that enzyme but behaves more like juvenile hormone type compounds. When mosquito larvae are exposed to effective concentrations of this compound, they die as pupae or as abnormal adults unable to leave the water's surface.

Fenoxycarb has an extremely low LC50 of ca. 0.0007 ug/ml against Ae. albopictus larvae and 4th stage larvae appear to be more sensitive to the A.I. than earlier instars. As previously mentioned, hand application of a granular fenoxycarb/Bti form against Ae. albopictus larvae in used tire casings provided complete control initially and indicated the relative stability of this compound in used tires. In summary, fenoxycarb offers considerable promise for the control of mosquito larvae as well as other insect pests. Although it appears that the market potential is sufficient to justify commercial development, EPA regulation is pending.

In the final analysis, the elimination of mosquito breeding sites through sanitation and source reduction, coupled with the judicious use of chemical and biological control agents by environmentally conscious mosquito control districts still offers the only long term solution to the maintenance of mosquito populations below annoyance or disease transmission thresholds. The NOMCB surveillance system has established the present susceptibility status of the predominate mosquito species and will allow the chemical aspect of our program to continue its decisive contribution to the integrated control of mosquitoes in New Orleans.

FIGURE 1.

The sequence of events associated with using *Bacillus thuringiensis israelensis (Bti)* for control of mosquito larvae.



Larva feeds on *Bti* spores and crystals suspended in the water.

Cross section-larval mid-gut. Gut wall breaks down from action of toxic crystals.

Crystals completely dissolve. Spores escape into body cavity. Larva dies.

TABLE 1. Toxicity of selected adulticides to colonized insecticide-susceptible and field collected mosquito adults.

		Lethal concentrations in % a.i.						Reciprocal LD_{90} ratio to malathion		LD_{90} ratio of Culex to Aedes
		Ae. aegypti			*Cx. quinquefasciatus*					
Insecticide	Strain	LD_{50} (95% C.L.)	LD_{90} (95% C.L.)	Slope	LD_{50} (95% C.L.)	LD_{90} (95% C.L.)	Slope	Aedes	Culex	
Malathion	Colony	0.032 (0.0300-0.035)	0.053(0.051-0.056)	2.7	0.29 (0.2740-0.3060)	0.72 (0.670-0.779)	3.3	---	---	13.6
	Field	0 054 (0.0310-0.062)	0.110(0.054-0.125)	4.2	0.57 (0.2970-0.6140)	1.39 (0.765-1.610)	3.7	---	---	12.6
Scourge [a]	Colony	0.0034(0.0021-0.007)	0.009(0.007-0.015)	2.7	0.0056(0.0053-0.0059)	0.013(0.012-0.014)	3.4	5.9	55.4	1.4
	Field	0.0076(0.0055-0.008)	0.025(0.010-0.027)	3.9	0.0095(0.0047-0.0132)	0.014(0.011-0.017)	4.3	4.5	99.3	0.6
Naled	Colony	0.0960(0.0800-0.140)	0.188(0.140-0.220)	4.4	0.1360(0.1290-0.1430)	0.393(0.364-0.427)	2.8	0.3	1.8	2.1
	Field	0.1240(0.0900-0.160)	0.247(0.190-0.290)	3.1	0.3600(0.1390-0.4160)	0.730(0.400-0.860)	3.4	0.4	1.9	3.0
Chlorpyrifos	Colony	0.0214(0.0150-0.023)	0.071(0.053-0.091)	2.9	0.1840(0.1670-0.2110)	0.277(0.224-0.319)	3.7	0.7	2.6	4.0
Bendiocarb	Colony	0.022 (0.0210-0.023)	0.051(0.047-0.054)	3.6	0.019 (0.0182-0.0198)	0.04 (0.038-0.042)	4.0	1.0	18.0	0.8
	Field	0.027 (0.0210-0.030)	0.057(0.051-0.063)	4.0	0.023 (0.0186-0.0280)	0.035(0.031-0.039)	4.2	1.9	39.7	0.6

TABLE 2. **Toxicity of selected adulticides to colonized insecticide-susceptible and field collected mosquito larvae.**

		Lethal concentrations in ug/ml						Reciprocal LC_{90} ratio to malathion		
		Ae. aegypti			*Cx. quinquefasciatus*					
Insecticide	Strain	LC_{50} (95% C.L.)	LC_{90} (95% C.L.)	Slope	LC_{50} (95% C.L.)	LC_{90} (95% C.L.)	Slope	Aedes	Culex	LC_{90} ratio of Culex to Aedes
Malathion	Colony	0.097(0.090-0.104)	0.193(0.184-0.204)	4.2	0.31 (0.224-0.340)	0.60 (0.510-0.720)	4.0	-	-	3.1
	Field	0.160(0.110-0.203)	0.330(0.279-0.353)	4.4	0.75 (0.684-0.830)	1.62 (1.390-1.970)	3.8	-	-	4.9
Scourge [a]	Colony	0.009(0.007-0.013)	0.021(0.019-0.037)	3.5	0.011(0.009-0.025)	0.019(0.016-0.024)	4.1	9.2	20.7	0.9
	Field	0.012(0.009-0.019)	0.035(0.033-0.039)	4.0	0.022(0.018-0.027)	0.044(0.022-0.057)	3.7	9.4	36.6	0.8
Naled	Colony	0.110(0.071-0.117)	0.214(0.119-0.249)	4.4	0.095(0.075-0.110)	0.144(0.099-0.210)	7.1	0.9	4.2	0.6
	Field	0.115(0.111-0.120)	0.246(0.234-0.252)	3.9	0.104(0.092-0.117)	0.163(0.125-0.231)	6.6	1.3	3.7	0.7
Chlorpyrifos	Colony	0.024(0.017-0.031)	0.048(0.041-0.055)	4.1	0.119(0.116-0.122)	0.231(0.206-0.261)	4.0	4.0	2.6	4.8
Bendiocarb	Colony	0.405(0.360-0.520)	0.613(0.581-0.866)	7.1	0.229(0.210-0.341)	0.331(0.272-0.451)	8.0	0.3	1.8	0.5
	Field	0.513(0.465-0.537)	0.827(0.777-0.912)	6.6	0.314(0.277-0.361)	0.445(0.411-0.467)	7.2	0.4	0.7	0.5

[a] Based on amount of resmethrin only

TABLE 3. Comparative mortalities of Scourge and malathion against *Ae. aegypti* and *Cx. quinquefasciatus*.

	% Mortality			
	Malathion a		Scourge b	
Distance	*Ae. ae.*	*Cx. q*	*Ae. ae.*	*Cx. q*
50'	100	100	100	100
150'	93.5	87	96	90.9
200'	78.5	76	82.2	75
300'	69.5	63	72.5	61.5
Average	85.4	81.5	87.7	81.9

a applied at 0.049 lb. a.i./A and 4 oz./min.

b applied at 0.0013 lb. a.i./A and 8 oz./min.

TABLE 4. Mortality (%) of caged *Aedes aegypti* attributable to aerial ULV application of Scourge.

	Droplet Size		
Altitude	50 um	70 um	80 um
50'	97.3	100	96.0
100'	78.1	100	79.4
200'	25.7	55.5	43.5

TABLE 5. Relative toxicities of selected compounds to insecticide susceptible and field collected strains of <u>Ae. aegypti</u> and <u>Ae. albopictus</u> larvae.

		Lethal concentrations in ug A.I./ml										
		Ae. aegypti					Ae. albopictus					
Insecticide	Strain	LC_{50}	(95% C.L.)	LC_{90}	(95% C.L.)	Slope	LC_{50}	(95% C.L.)	LC_{90}	(95% C.L.)	Slope	LC_{90} Ratio of Ae. albopictus to Ae. aegypti
Permethrin	Oahu [a]	-		-		-	0.00031	(0.00025-0.00037)	0.00101	(0.0008-0.00121)	4.1	-
	NOMCB [b]	0.00027	(0.00024-0.00033)	0.00058	(0.00055-0.00067)	4.2	-		-		-	-
	Memphis	0.00028	(0.00021-0.00035)	0.00060	(0.00049-0.00065)	3.9	0.00050	(0.00045-0.00054)	0.00139	(0.0012-0.00166)	2.8	2.3
	Houston	0.00029	(0.00019-0.00037)	0.00061	(0.00051-0.00074)	4.0	0.00061	(0.00057-0.00067)	0.00138	(0.00117-0.00159)	3.0	2.3
	New Orleans	0.00031	(0.00026-0.00039)	0.00065	(0.00054-0.00072)	4.1	0.00068	(0.00061-0.00075)	0.00143	(0.00130-0.00156)	2.1	2.2
Temephos	Oahu	-		-		-	0.00093	(0.00066-0.00125)	0.00147	(0.00121-0.00171)	5.0	-
	NOMCB	0.000740	(0.000670-0.000850)	0.00120	(0.00114-0.00127)	4.7	-		-		-	-
	Memphis	0.000790	(0.00071-0.00088)	0.00123	(0.00111-0.00135)	4.5	0.00414	(0.00379-0.00521)	0.00686	(0.00644-0.00706)	4.1	5.6
	Houston	0.000830	(0.00076-0.00089)	0.00131	(0.00120-0.00141)	4.0	0.00407	(0.00372-0.00511)	0.00703	(0.00683-0.00727)	4.3	5.4
	New Orleans	0.000810	(0.00075-0.00087)	0.00125	(0.00119-0.00132)	3.7	0.00381	(0.00363-0.00499)	0.00697	(0.00667-0.00727)	4.7	5.6
Fenthion	Oahu	-		-		-	0.00390	(0.00374-0.00410)	0.00850	(0.0063 -0.0107)	4.2	-
	NOMCB	0.0018	(0.0009 -0.0031)	0.0044	(0.0022 -0.0075)	5.0	-		-		-	-
	Memphis	0.0027	(0.0011 -0.0042)	0.0061	(0.0047 -0.0093)	3.9	0.0075	(0.0068 -0.0082)	0.0197	(0.0155 -0.0239)	4.0	3.2
	Houston	0.0025	(0.0007 -0.0039)	0.0074	(0.0049 -0.0097)	4.2	0.0081	(0.0061 -0.0093)	0.0201	(0.0181 -0.0220)	3.7	2.7
	New Orleans	0.0029	(0.0015 -0.0043)	0.0067	(0.0053 -0.0091)	4.1	0.0073	(0.0065 -0.0083)	0.0193	(0.0158 -0.0228)	4.0	2.9
Chlorpyrifos	Oahu	-		-		-	0.0576	(0.0556 -0.0593)	0.0734	(0.0721 -0.0745)	4.1	-
	NOMCB	0.0240	(0.017 -0.031)	0.048	(0.041 -0.055)	4.1	-		-		-	-
	Memphis	0.0271	(0.021 -0.0340)	0.0543	(0.047 -0.0613)	3.4	0.0899	(0.0877 -0.0921)	0.1087	(0.1027 -0.1147)	3.9	2.0
	Houston	0.0290	(0.027 -0.0310)	0.0536	(0.044 -0.0661)	3.2	0.0907	(0.0899 -0.0915)	0.1101	(0.1073 -0.1129)	4.0	2.1
	New Orleans	0.0275	(0.022 -0.0330)	0.0527	(0.043 -0.0617)	3.7	0.0909	(0.0891 -0.0927)	0.1119	(0.1084 -0.1154)	4.2	2.1
Methoprene	Oahu	-		-		-	0.0031	(0.0022 -0.0041)	0.0797	(0.0763 -0.0831)	2.4	-
	NOMCB	0.0024	(0.0009 -0.0039)	0.0610	(0.0400 -0.0900)	2.1	-		-		-	-
	Memphis	0.0035	(0.0020 -0.0050)	0.0743	(0.0501 -0.0962)	3.1	0.0037	(0.0026 -0.0046)	0.0815	(0.0799 -0.0829)	2.6	1.1
	Houston	0.0031	(0.0018 -0.0044)	0.0716	(0.0497 -0.0915)	2.6	0.0040	(0.0029 -0.0048)	0.0826	(0.0812 -0.0840)	2.6	1.2
	New Orleans	0.0029	(0.0017 -0.0041)	0.0637	(0.0410 -0.0927)	2.4	0.0035	(0.0022 -0.0045)	0.0817	(0.0809 -0.0830)	3.1	1.3
Dimilin	Oahu	-		-		-	0.00031	(0.00015-0.00047)	0.00094	(0.00067-0.00121)	2.3	-
	NOMCB	0.00027	(0.00019-0.00036)	0.00080	(0.00051-0.00100)	1.7	-		-		-	-
	Memphis	0.00031	(0.00022-0.00040)	0.00091	(0.00062-0.00120)	1.8	0.00041	(0.00025-0.00059)	0.00112	(0.00094-0.00124)	2.4	1.2
	Houston	0.00029	(0.00018-0.00037)	0.00085	(0.00056-0.00109)	2.3	0.00039	(0.00022-0.00056)	0.00097	(0.00081-0.00118)	1.8	1.1
	New Orleans	0.00031	(0.00024-0.00038)	0.00089	(0.00059-0.00111)	2.0	0.00043	(0.00028-0.00061)	0.00109	(0.00097-0.00121)	2.1	1.2

[a] Insecticide susceptible colony strain of <u>Ae. albopictus</u>

[b] Insecticide susceptible colony strain of <u>Ae. aegypti</u>

Table 6. Toxicity of selected adulticides to colonized insecticide susceptible and field collected *Aedes aegypti* adults and larvae

Parameter	Strain	Stage [a]	Insecticide: Malathion	Chlorpyrifos	Bendiocarb	Resmethrin/PBO [b]
LC_{50} (95% C.L.)	Colony	Adult	0.032 (0.030-0.035)	0.021 (0.015-0.023)	0.022 (0.019-0.025)	0.0034 (0.0021-0.0047)
	Colony	Larval	0.097 (0.090-0.104)	0.024 (0.017-0.031)	0.405 (0.360-0.520)	0.009 (0.007-0.013)
	Field	Adult	0.054 (0.031-0.062)	0.029 (0.017-0.033)	0.027 (0.021-0.030)	0.0056 (0.0036-0.008)
	Field	Larval	0.110 (0.099-0.119)	0.031 (0.025-0.035)	0.513 (0.465-0.537)	0.012 (0.009-0.019)
LC_{90} (95% C.L.)	Colony	Adult	0.053 (0.051-0.056)	0.071 (0.053-0.091)	0.051 (0.047-0.054)	0.009 (0.007-0.011)
	Colony	Larval	0.193 (0.187-0.201)	0.048 (0.041-0.055)	0.613 (0.581-0.866)	0.021 (0.016-0.026)
	Field	Adult	0.110 (0.074-0.125)	0.083 (0.069-0.097)	0.057 (0.051-0.063)	0.015 (0.010-0.027)
	Field	Larval	0.220 (0.199-0.243)	0.052 (0.047-0.059)	0.827 (0.777-0.912)	0.025 (0.023-0.027)
Slope ±S.E.	Colony	Adult	2.7±0.2	2.9±0.1	3.6±0.2	2.7±0.1
	Colony	Larval	4.2±0.3	4.1±0.5	7.1±0.6	3.5±0.3
	Field	Adult	4.2±0.5	3.5±0.3	4.0±0.2	3.9±0.2
	Field	Larval	4.4±0.4	3.7±0.1	6.6±0.3	4.0±0.2

[a] lethal concentrations for adults and larvae expressed as % A.I. and ug A.I./ml of diluent, respectively.

[b] based on amount of resmethrin only.

Table 7. Toxicity of selected adulticides to colonized insecticide susceptible and field collected *Ae. triseriatus* adults and larvae.

Parameter	Stage [a]	Malathion	Chlorpyrifos	Bendiocarb	Resmethrin/PBO [b]
LC_{50} (95% C.L.)	Adult	0.047 (0.029-0.061)	0.023 (0.016-0.030)	0.019 (0.007-0.033)	0.0058 (0.0031-0.0091)
	Larval	0.145 (0.099-0.177)	0.027 (0.020-0.036)	0.476 (0.430-0.535)	0.009 (0.004 -0.013)
LC_{90} (95% C.L.)	Adult	0.093 (0.076-0.117)	0.060 (0.041-0.091)	0.040 (0.029-0.056)	0.013 (0.011 -0.017)
	Larval	0.259 (0.217-0.299)	0.053 (0.046-0.061)	0.799 (0.776-0.821)	0.023 (0.021 -0.026)
Slope ± S.E.	Adult	4.1±0.1	5.1±0.2	7.1±0.4	6.7 ±0.3
	Larval	4.6±0.4	3.9±0.3	6.8±0.2	4.1 ±0.3
LC_{90} ratio to *Ae. aegypti* [c]	Adult	0.9	0.7	0.7	0.9
	Larval	0.8	1.0	0.7	0.7

[a] lethal concentrations for adults and larvae expressed as % AI and ug AI/ml diluent, respectively

[b] based on amount of resmethrin only

[c] based on values of field collected populations

Table 8. Toxicity of selected adulticides to colonized insecticide susceptible and field collected *Ae. albopictus* adults and larvae.

Parameter	Stage [a]	Malathion [b] Line below inflection point	Malathion [b] Line above inflection point	Chlorpyrifos	Bendiocarb	Resmethrin/PBO [c]
LC_{50} (95% C.I.)	Adult	0.108 (0.097-0.123)	-	0.049 (0.044-0.054)	0.051 (0.041-0.060)	0.0147 (0.0139-0.0155)
	Larval	0.29 (0.21 -0.37)	-	0.046 (0.039-0.053)	0.710 (0.675-0.732)	0.016 (0.013 -0.019)
LC_{90} (95% C.I.)	Adult	-	0.939 (0.921-0.957)	0.241 (0.209-0.270)	0.125 (0.119-0.132)	0.041 (0.037 -0.045)
	Larval	-	1.44 (1.23 -1.63)	0.101 (0.091-0.113)	0.973 (0.965-1.110)	0.037 (0.029 -0.043)
Slope ± S.E.	Adult	5.1 ± 0.5	1.8 ± 0.3	4.2 ± 0.2	5.3 ± 0.4	4.9 ± 0.2
	Larval	4.5 ± 0.7	1.2 ± 0.2	5.1 ± 0.4	6.4 ± 0.2	4.1 ± 0.3
LC_{90} ratio to *Ae. aegypti* [d]	Adult	-	8.5	2.9	2.2	2.5
	Larval	-	6.5	1.9	1.2	1.5

[a] lethal concentrations for adults and larvae expressed as % A.I. and ug A.I./ml of diluent, respectively

[b] due to a systematic departure from linearity, the responses were fitted to 2 separate lines to obtain more accurate estimates of the lethal concentration

[c] based on amount of resmethrin only

[d] based on values of field collected populations

TABLE 9. Toxicity of selected liquid *B.t.i.* formulations to *Aedes albopictus* larvae. Laboratory tests - NOMCB

Treatment	Formulation	Lethal concentrations in ITU/l: LC_{50} (95% C.L.)[a]	Lethal concentrations in ITU/l: LC_{90} (95% C.L.)[a]	Slope	r^2	Reciprocal LC_{90} ratio to Vectobac
VECTOBAC AS	(75-018-BA)	121 (114-125)	275 (269-278)	6.3	0.99	-
ABG 6193	12AS(88-033-BR)	25 (21- 27)	128 (119-137)	4.9	0.91	5.4
ABG 6193	12AS(84-920-BD)	85 (79-105)	196 (181-210)	5.0	0.99	1.40
ABG 6193	12AS(88-043-BA)	97 (86-109)	201 (189-213)	5.6	0.92	1.40
ABG 6182	12F	107 (89-119)	202 (193-211)	6.9	0.95	1.3
ABG 6188	6AS	119 (107-128)	272 (265-280)	6.1	0.97	1.14

[a] Lower and upper 95% confidence limits

TABLE 10. Toxicity of selected granular B.t.i. formulations to *Aedes albopictus* larvae. PRELIMINARY Laboratory Tests - NOMCB.

Treatment	Formulation	Rate (lbs.)/A	Mean % Mortality (S.E.M.)[a]
VECTOBAC G	G-200 ITU	5.0	97 (2.0)
ABG 6197	G-400 ITU (10/14 mesh)	5.0	100 (0)
		2.5	80 (3.4)
ABG 6199	G-400 ITU (5/8 mesh)	5.0	100 (0)
		2.5	92 (4.1)
ABG 6214	Fenoxycarb G-1%	5.0	100 (0)
		2.5	100 (0)
ABG 6215	Fenoxycarb/B.t.i. 1% + 200 ITU	5.0	100 (0)
		2.5	100 (0)
B. Sphaericus	6/8 mesh	5.0	77 (8.3)
B. Sphaericus	10/14 mesh	5.0	82 (7.6)

a Standard error of the mean

TABLE 11. **Mortality of *Aedes albopictus* larvae exposed to selected liquid *B.t.i.* formulations. Field tests - NOMCB. b**

Treatment	Formulation	Rate/A	N	Mean % Mortality - Days Posttreatment							
				24h	48h	4d	6d	8d	10d	14d	18d
ABG 6188	6AS	0.25 pt.	6	100	100	100	60	40	10	0	-
ABG 6193	12AS (84-920-BD)	0.25	6	100	100	100	100	90	70	10	0
ABG 6193	12AS (88-033-BR)	0.25	6	100	100	100	100	100	100	60	10

a Twenty larvae were placed in each of 6 tires/chemical evaluation on each post-treatment sample date.

TABLE 12. Mortality of *Ae. albopictus* exposed to selected granular *B.t.i.* formulations. Field tests - NOMCB. a

Treatment	Formulation	Rate (lbs.)/A	N	Posttreatment % Mortality								
				24h	48h	4d	6d	8d	10d	12d	16d	23d
Vectobac G	G-200 ITU	5	6	85	60	10	10	0	-	-	-	-
ABG 6197	G-400 ITU (10/14 mesh)	5	6	100	100	90	80	80	40	10	0	-
		2.5	6	90	80	80	50	20	10	0	-	-
ABG 6199	G-400 ITU (5/8 mesh)	5	6	100	100	80	80	70	30	0	-	-
		2.5	6	100	100	70	60	20	0	-	-	-
ABG 6215	Fenoxycarb/B.t.i.	5	6	100	100	100	100	100	80	80	60	0
		2.5	6	100	100	100	100	70	40	30	10	0
B. Sphaericus	10/14 mesh	5.0	6	80	60	30	10	0	-	-	-	-

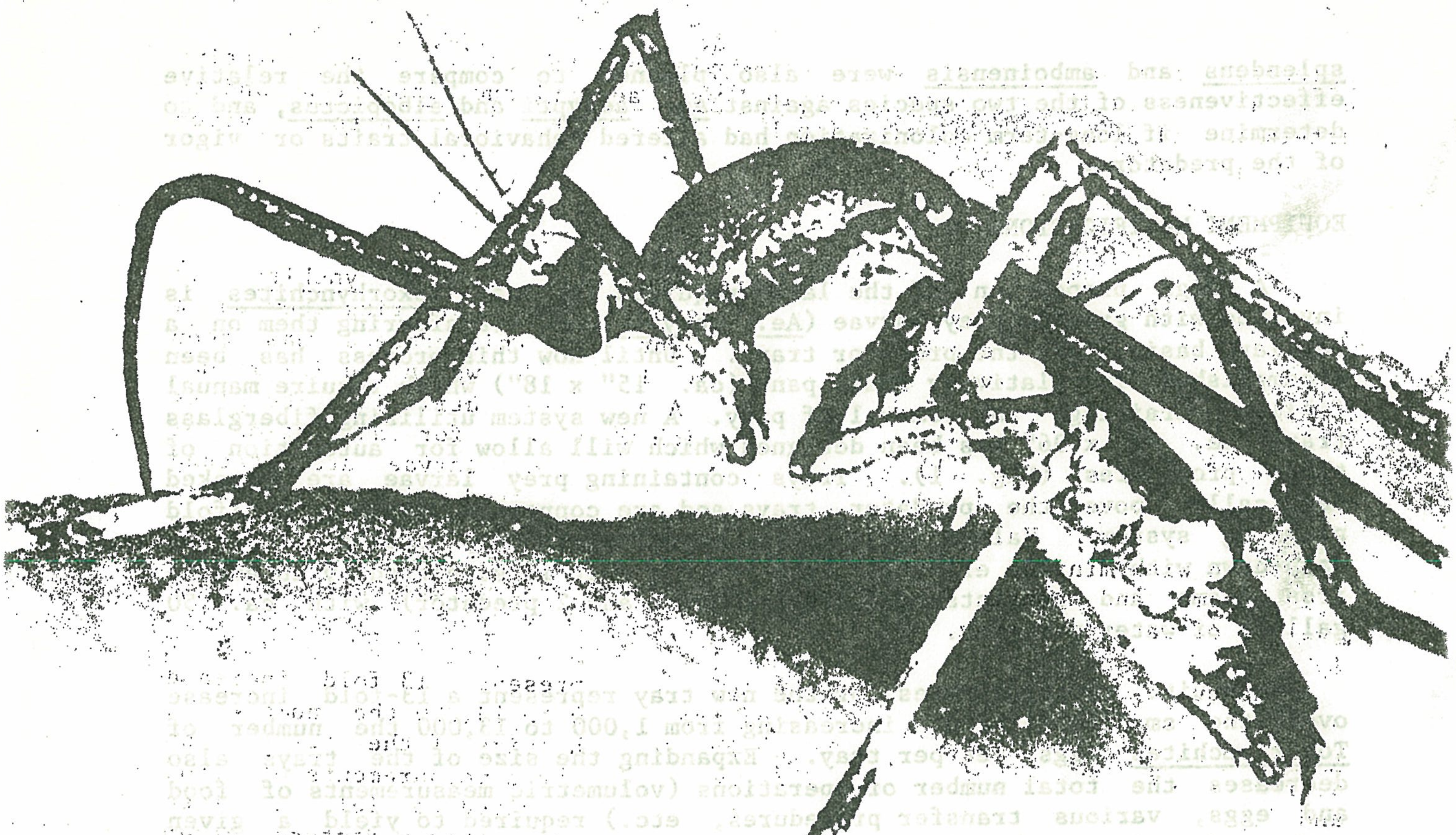
a Twenty larvae were placed in each of 6 tires/evaluation. Long term effectiveness was determined by replacing larvae on each posttreatment sample period.

TABLE 13. Mortality of *Aedes albopictus* larvae attributable to aerial applications of *Bti*.

Treatment	Rate/A	Sentinel larvae 1	Tires (Vertical/horizontal) 2
Vectobac 12AS	8 oz.	100	97/56
	4 oz.	100	91/42

1 Sentinels were placed in open enamel pans

2 Vertical - tires placed in an upright position.
Horizontal - tires laying flat on ground.



TOXORHYNCHITES

In the early stages of Toxorhynchites research in New Orleans, the majority of our efforts were directed towards determining the efficacy of this predacious insect in reducing populations of container-breeding mosquitoes. It was demonstrated through field and laboratory trials that the liberation of gravid females, primarily Tx. amboinensis, could have a substantial impact upon Ae. aegypti levels, especially if releases were integrated with standard adulticiding methods. Although the use of Toxorhynchites shows potential as a bio-control agent for several mosquito species, it is obvious that in order for this control system to be practical, several criteria must be met. First, the cost of laboratory-reared insects must be substantially reduced; standard techniques for Toxorhynchites production are labor intensive with a high cost-per-effort. In addition, it is essential that a better system of quality control be maintained which would detect rearing problems before they reach crisis stage and provide remedies which will return programs to normal.

The primary goal for 1986, therefore, was to develop new rearing methodologies which would reduce production costs. Field releases of Tx.

splendens and amboinensis were also planned to compare the relative effectiveness of the two species against Ae. aegypti and albopictus, and to determine if long-term colonization had altered behavioral traits or vigor of the predators.

EQUIPMENT MODIFICATIONS

A high proportion of the labor required to rear Toxorhynchites is involved with growing prey larvae (Ae. aegypti) and transferring them on a regular basis into the predator trays. Until now this process has been accomplished in relatively small pans (ca. 15" x 18") which require manual filling, draining, and removal of prey. A new system utilizing fiberglass trays ca. 48" x 96" has been designed which will allow for automation of these procedures (Fig. 1). Trays containing prey larvae are stacked vertically above the predator trays and are connected with a manifold plumbing system. Valves and overflow pipes permit easy feeding and tray wash-down with minimum effort. Each rearing unit is supported by an angle-iron frame and consists of 8 trays (6 prey and 2 predator) with ca. 50 gallons of water per tray.

Mosquito stocking rates for the new tray represent a 13-fold increase over the smaller version, increasing from 1,000 to 13,000 the number of Toxorhynchites eggs set per tray. Expanding the size of the trays also decreases the total number of operations (volumetric measurements of food and eggs, various transfer procedures, etc.) required to yield a given number of predators. Preliminary rearing trials using this prototype system indicate that it should be successful with some minor modifications, and that labor and costs of mosquito manufacture may be substantially lowered.

MOSQUITO REARING

Some unusual rearing problems were experienced this year for which no solid explanations could be established. Beginning in late spring, various degrees of mortality were observed in Ae. aegypti larvae. The percent of dead and moribund ranged from less than 1% to over 90% in some cases, with most affected individuals exibiting characteristic black spots. Specimens were shipped to several laboratories for disease identification and it appeared to be a bacterial infection. Hygiene was improved, larval feeding rates were reduced, and a limited test of antibiotics was used in an attempt to alleviate the problem. No immediate results were observed, but larval mortality gradually disappeared over time. Similar mortalities occurred briefly on two other occasions.

Daily survival of aegypti adults used for egg production was also observed to be abnormally low during several periods from late spring through winter. This was reflected in a 36% reduction in the average number of eggs collected per cage per month.

Toxorhynchites egg hatch for 1986 demonstrated the greatest variability from week to week and the lowest average of the 4 years for which we have data (Fig. 2). Although the percentage of viable eggs percolated from high to low levels, the insemination rate of females, as indicated by spermatheca dissections, appeared normal (80-100%). Daily survival and fecundity also remained high during most periods throughout the year.

Several factors, including chemical contamination, disease, diets, the size of the gene pools, and poor hygiene, were explored as possible causes for the maladies, but none of the lab tests accurately identified the conditions which created the problems in either predator or prey species.

FIELD TRIALS

In spite of the difficulties encountered, several small releases of Tx. splendens were performed in early spring before hatch success became erratic. In one test, ca. 200 gravid females per block were released in a residential area of the city and evaluated for their ability to locate and oviposit into water-holding containers. Fifteen hours after release, 100% of the containers positive for indigenous mosquito larvae were also positive for predator eggs. Subsequent examination of containers in the area revealed that all mosquito emergence had been eliminated within 2 weeks. Although the number of females released was relatively high (Tx. amboinensis were typically released at ca. 100 females/block in 1982-83), the degree of predator/prey overlap indicates that splendens could possibly replace amboinensis as the species of choice. Laboratory tests indicate that splendens is slightly favored in terms of fecundity and ease of production. In May, splendens adults were also liberated in a wooded tire dump in eastern New Orleans which was infested with Ae. aegypti, albopictus, and triseriatus. Approximately 200 females were released on 2 occasions, and oviposition into tires appeared promising. Pre-release surveys did not indicate the presence of indigenous Tx. rutilus septentrianalis at the study site, but later examinations indicated co-habitation of the two predator species in the tires, confounding the data. Even though Toxorhynchites were observed in a high proportion of these containers, the target species continued to thrive in the area. Recycling of Tx. splendens was observed at the site for at least 4 months after the last release. This phenomenon has not been seen in urban New Orleans situations.

DOMINICAN REPUBLIC

At the request of the International Center for Public Health Research, University of South Carolina, a trip was made to Santo Domingo, Dominican Republic, to consider the feasibility of an integrated program for the control of Ae. aegypti. Dengue has become a major health concern in the area and the potential for DHF is threatening. A 3-year project funded by AID will evaluate the use of ground and aerial adulticides, larvivorous fishes, and Toxorhynchites as possible methods to reduce disease transmission.

PAPERS AND PUBLICATIONS

Operational Use of Ovitraps for Aedes aegypti Surveillance in New Orleans, Louisiana. American Mosquito Control Association meeting, April, 1986, by S. Sackett.

Impact of Six Potential Methods of Aedes aegypti Control in New Orleans, Louisiana. American Mosquito Control Association meeting, April, 1986, by S. Sackett.

Andis, M.D., S.R. Sackett, M.K.Carroll and E.S. Bordes. 1987. Strategies for the Emergency Control of Arboviral Epidemics in New Orleans. J. Am. Mosq. Control Assoc. (in press).

	Hours	Cost
Mosquito Rearing	2296	$18149
Field & Lab Evaluations	2444	19367
Equipment Construction & Maintenance	1564	12415
Other	1252	9632
Total Man Hours & Cost	7556	$59563
Miles Traveled & Cost	22098	3314
Total Cost:		$62877

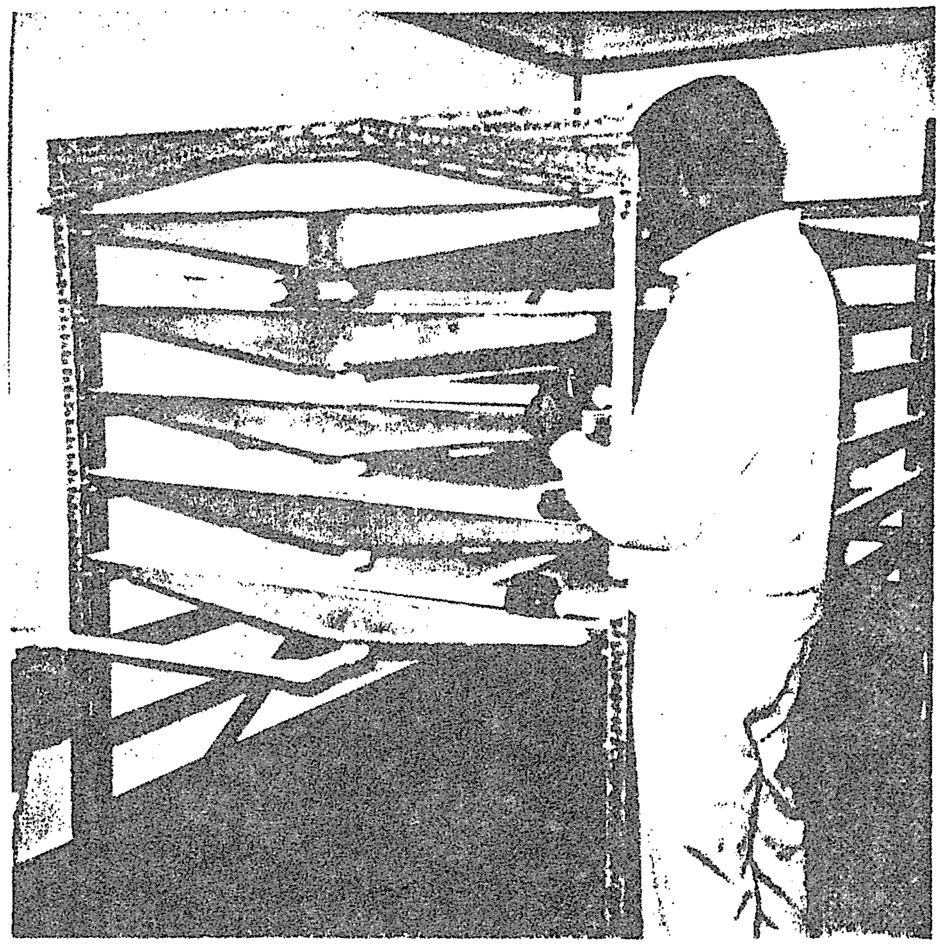
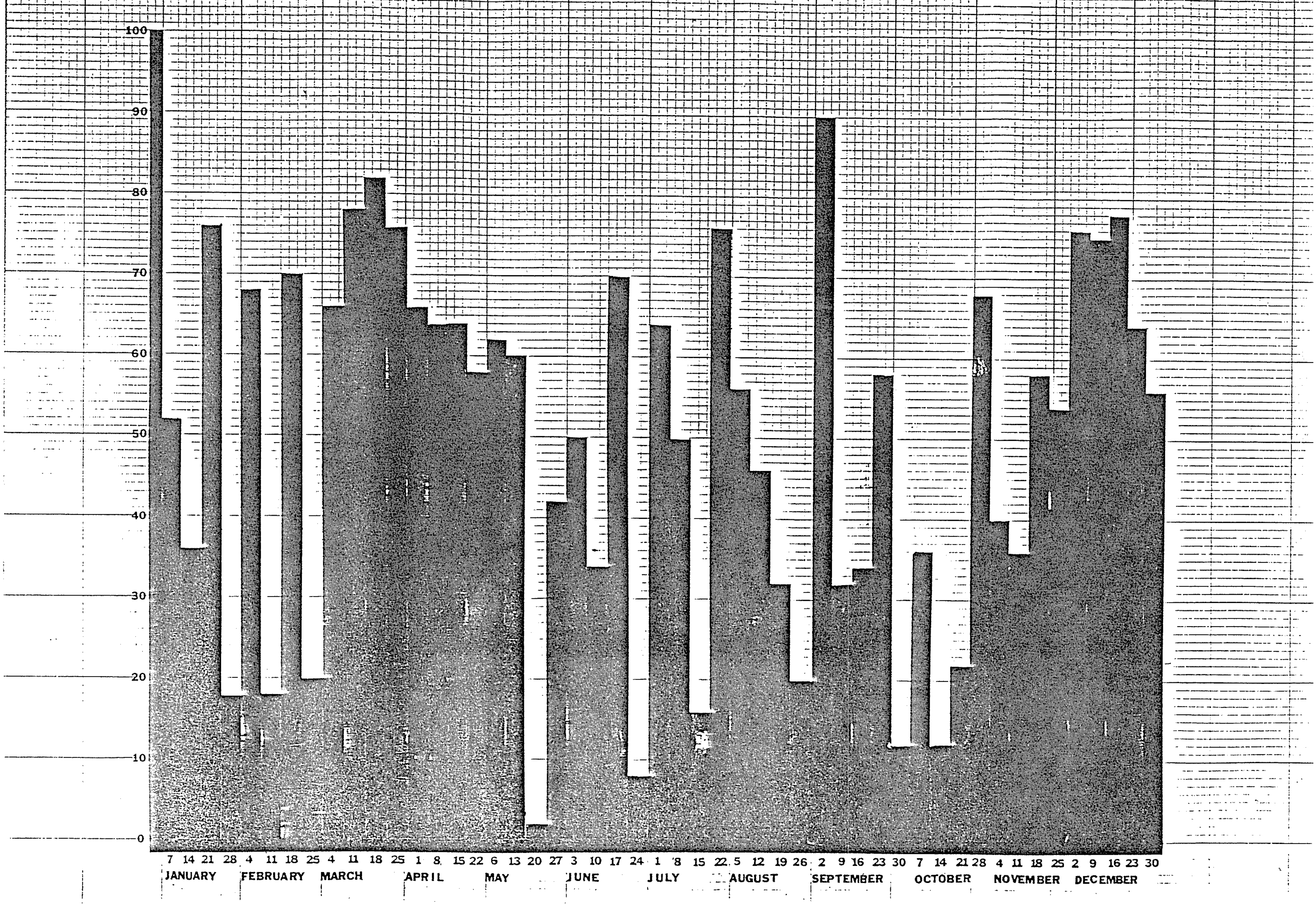
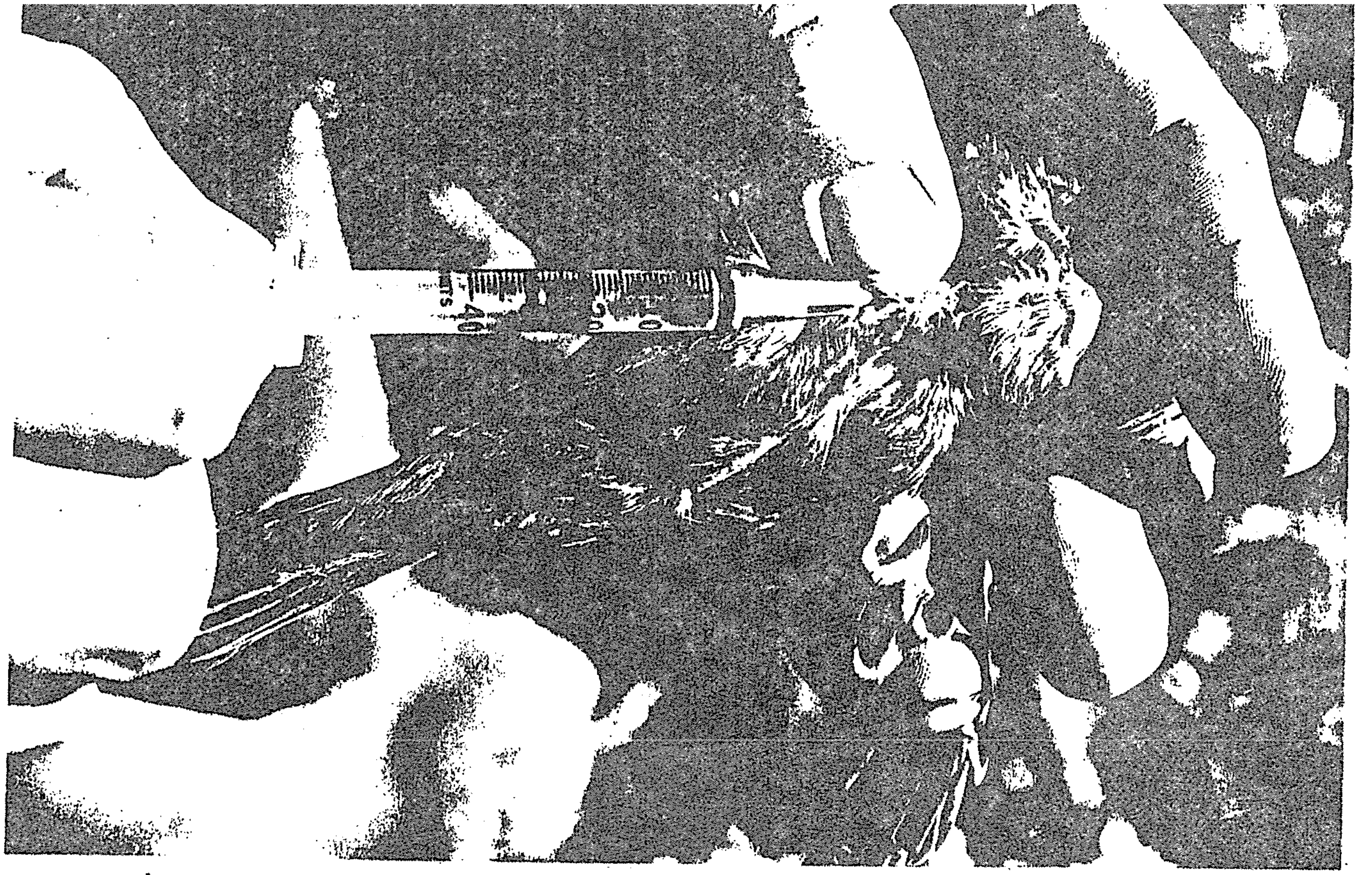


FIGURE 1. New mosquito rearing system for Toxorhynchites and Aedes aegypti immatures

FIGURE 2. TOXORHYNCHITES SPLENDENS % EGG HATCH 1986





ENCEPHALITIS SURVEILLANCE

The encephalitis virus is harbored in wild and domestic birds. The disease is transmitted to man by mosquitoes. By testing bird blood for the presence of antibodies, virus activity can be detected in time to break the cycle of disease transmission by eliminating the mosquito vector.

Birds are captured in walk-in traps and mist nets. One half cc of blood is taken from a vein in the neck, the birds are then banded and released.

One thousand thirty-two birds were sampled during 1986. Common sparrows (Passer domesticus) accounted for 73% of the total, and 69% were immature. No positive birds were found this year.

Trapping began in April with the deployment of 20 walk-in traps in Orleans Parish. These traps were operated 5 days per week from April through September, and 7 days per week during July and August which are usually months of high virus, and mosquito activity.

Mist nets were used in areas where walk-in traps could not be used.

Although our survey showed no virus activity in Orleans Parish. St. Louis Encephalitis was active in Louisiana and Texas. Houston experienced a large outbreak with many human cases; there was also a human case in Baton Rouge.

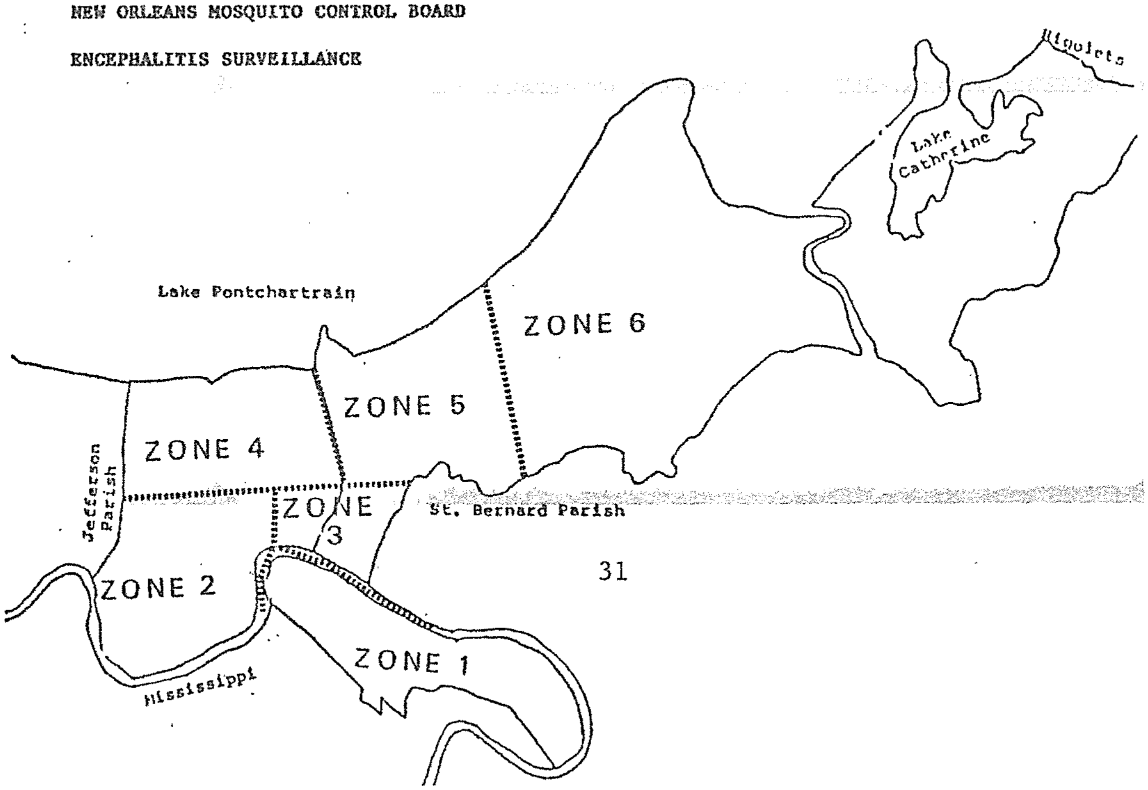
In retrospect although there was virus activity in Louisiana in September of this year, our surveillance program was discontinued because we were unaware of any positive birds or human cases. In the future, the encephalitis surveillance program will be continued through October regardless of apparent lack of virus activity.

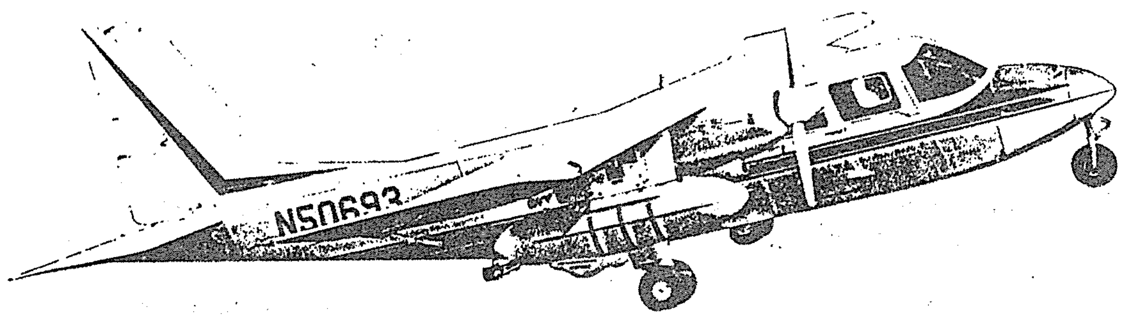
	Man Hours	Cost	Miles	Cost
Netting	128	$ 936	1052	$ 162
Trapping	641	4087	9478	1421
Migratory Bird Sampling	34	352	242	36
Blood Processing	88	514	25	4
Administration	57	649		
TOTAL	948	$6538	10827	$1623

		SPARROWS		OTHERS	
	TOTAL	ADULTS	IMMATURE	ADULTS	IMMATURE
ZONE-1	162	29	71	48	14
ZONE-2	253	48	188	9	8
ZONE-3	165	33	97	19	16
ZONE-4	122	17	78	9	18
ZONE-5	69	5	57	3	4
ZONE-6	261	32	103	60	66
TOTAL	1032	164	594	148	126
# POS/ % POS	0/0%	0/0%	0/0%	0/0%	0/0%

NEW ORLEANS MOSQUITO CONTROL BOARD

ENCEPHALITIS SURVEILLANCE





AVIATION OPERATIONS

The Annual Inspection of the single and twin-engine aircraft were performed during January and February as required by the FAA for certified aircraft.

After civil certification of the Beech aircraft, it was sold and delivery was taken by a buyer in February.

The aircraft hangar project has been delayed by site location problems. After meetings with the Capital Projects Office, architects, and the Orleans Levee Board, we hope to move the hangar project to completion during the coming year.

A chemical tank dolly for off-loading the spray packs from the Islander aircraft for storage/maintenance was designed and fabricated in our Aviation Department Shop. In addition to the above, a portable loading dolly for chemicals was also designed and fabricated. The chemical loader can be powered by electricity or gasoline engine.

The chemical delivery system in the Grumman Ag-Cat was overhauled. All of the avionics in the Islander twin-engine aircraft were removed and relocated for the addition of a LORAN Navigation Receiver installed by our Aviation Department.

Both aircraft were on display for the AMCA Convention as well as Aviation Awareness Day at Lakefront Airport.

Six flights were made to evaluate "Scourge" and three flights were made to evaluate Vectobac Bti. These flights were made with the Britten-Norman Aircraft utilizing the Micronair Rotary Atomizer Spray Packs.

Contracts were prepared and submitted to City Hall for our two back-up aviation people.

Cholinesterase tests were performed on all aircraft pilots and maintenance personnel.

Twenty-eight flights were made with the Britten-Norman twin-engine aircraft, twenty-two of which were for spray operations, the other six were for mapping, survey of areas, and maintenance.

Twenty-seven flights were made with the Grumman single-engine aircraft, twenty-three were for spray operations, the other four were for survey of areas, proficiency, and maintenance. A total of 120 hours were flown for the year.

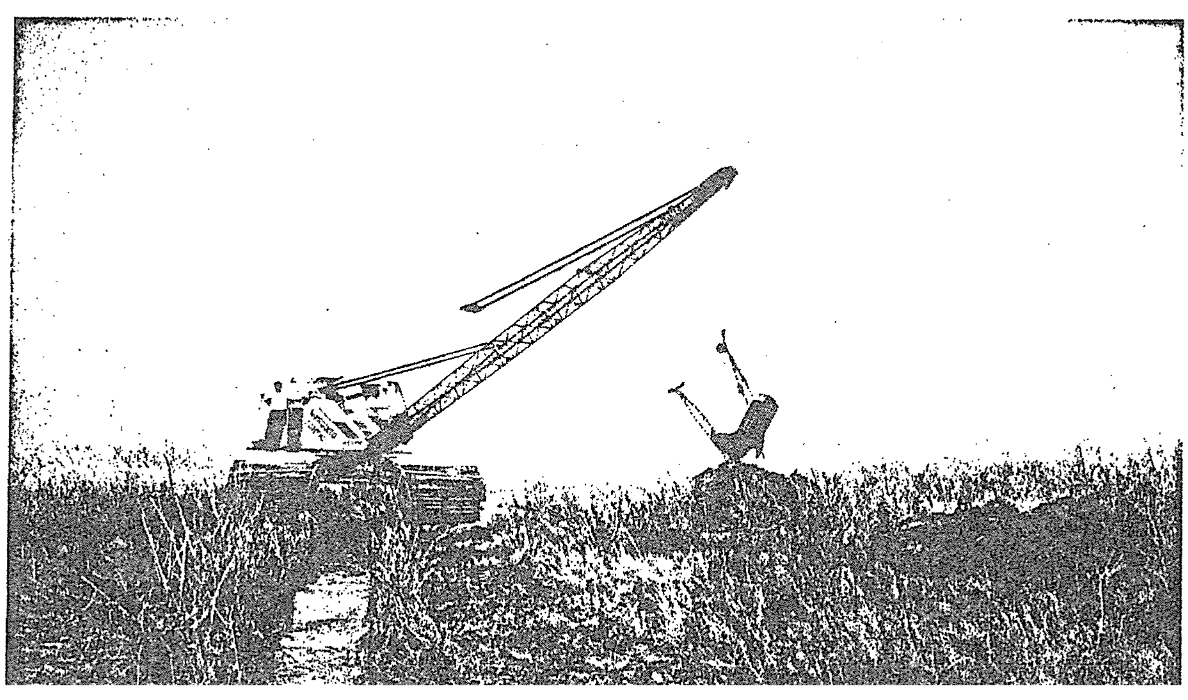
SOURCE REDUCTION

During 1986, the Source Reduction Program was active for most of the year with inner city projects, new ditch construction within City Park, along with old ditch maintenance combined for added adult mosquito reduction for residents of the surrounding residential areas.

Obstructions and dense vegetation were removed from storm drains in the Ponchartrain Blvd., West End, Harrison Avenue, Robert E. Lee Blvd. areas. Drainage on the Pontchartrain Drive neutral ground was improved, thus greatly reducing mosquito populations within the West End area of the City.

The Intercoastal Waterway, Bayou Bienvenue area was ditched and mosquito populations were greatly reduced around the Industrial Canal and Ninth Ward areas. Other areas in New Orleans East (T-5, S-15) received routine maintenance during the year to insure proper drainage.

Source Reduction equipment was utilized across the river in the Lower Coast of Algiers, where Aedes albopictus mosquitoes were discovered in very large numbers. Monitoring of the Lower Coast will be on-going throughout the year.



The W-2 Wetlands Project has been on hold pending establishment of the Bayou Sauvage National Wildlife Refuge. Amphibious ditching of the W-areas east of Paris Road has been halted until further notice. Although we have current Corps permits for this area, we are waiting for the land transfer to the National Conservancy at which time we will solicit from them a letter of permission to continue our water management efforts in the W-areas.

	Backhoe I & II	DL-1	Ditcher	Crawler
Total hours	260	178	45	118
Digging hours	128	103		
% Digging time				
Linear feet ditch	3500	3750		
Cubic yards dug	2886	2499		
Salary	$4096	$3878		$ 152
Cost of fuel, oil, maintenance	$ 502	$3127	$ 37	$1424
Total Cost	$4598	$7005	$ 37	$1576
Cost/Ft.	$1.31	$1.86		
Cost/yd.3	$1.59	$2.80		

Service Support Vehicles	Miles Traveled	Cost
S-89	8461	$ 1269
S-90	2051	308
DT-95	1057	159
S-19	1119	168

PUBLIC INFORMATION

Distribution of videotapes to Orleans Parish schools continued in 1986. Public school presentations were completed last year, so in January distribution was begun to private middle and high schools. These were completed and the tapes retrieved by the end of March.

The school program entitled "THE MOSQUITO PROBLEM" was entirely revised and updated in time for the new school year beginning in September.

A training tape on Aedes albopictus identification and control was completed in time for a meeting organized by the Centers for Disease Control, and held in New Orleans in August. Media coverage was extensive and all three local network affiliates used video footage provided by this office.

Pest Control magazine visited our facility to do a story on mosquito control. Several slides provided by this office were used in the article.

Photography (35mm) of several mosquito species, pupal ecdysis, and new report covers were completed this year.

A letter was sent to teachers at the beginning of the school year to allow them to schedule showings of our tapes at their convenience. After a response of only 17%, it was decided to return to the previous method of hand delivery.

Videotape programs were delivered to 61 schools in Orleans Parish during 1986. It is estimated that the programs were viewed by 8,000 to 12,000 students. This reduction of almost 40% from last year is attributed to our attempt to deliver tapes by mail.

Work began in December on scripts for a program on used tires, and a revision of our chemical safety tape.

NEWSPAPER ARTICLES	4
RADIO AND TV INTERVIEWS	12
PRESENTATION	10
ATTENDANCE	410

	Man Hours	Cost	Miles	Cost
Public Information	427	$3014	2543	$381
Photography & Processing	600	6232	1209	181
Equipment Maintenance	30	316		
TOTAL	1057	$9562	3752	$562

1986 MONTHLY ACCUMULATIVE RAINFALL

	92 YEAR AVERAGE RAINFALL	ACCUMULATIVE AVERAGE	1986	TOTAL TO DATE	DEVIATION FROM NORMAL
JANUARY	4.22	4.22	3.57	3.57	- 0.65
FEBRUARY	4.66	8.88	4.33	7.90	- 0.98
MARCH	5.01	13.89	3.00	10.90	- 2.99
APRIL	4.92	18.81	1.38	12.28	- 6.53
MAY	4.72	23.53	1.83	14.11	- 9.42
JUNE	5.14	28.67	5.81	19.92	- 8.75
JULY	6.59	35.26	5.67	25.59	- 9.67
AUGUST	5.98	41.24	5.94	31.53	- 9.71
SEPTEMBER	5.56	46.80	3.43	34.96	- 11.84
OCTOBER	3.28	50.08	2.25	37.21	- 12.87
NOVEMBER	3.38	53.46	6.56	43.77	- 9.69
DECEMBER	4.83	58.29	4.79	48.56	- 9.73