MOSQUITO CONTROL

ANNUAL REPORT

1968

to the City of New Orleans
Department of Health

Orleans Parish Mosquito Control

1968

D E D I C A T I O N

The Division of Mosquito Control is particularly grateful to its Advisory Committee, and it is to their sincere interest and support that we dedicate this annual narrative of our efforts in the field of Public Health. The admiration we feel for this Committee cannot be overstated, as is our gratitude for all such civic minded public servants whose reward is measured only in the words of sincere appreciation from their constituents.

Mr. Donald F. Rowland, Chairman
Vice President, New Orleans East, Inc.
Mr. William E. Wunderlich, Vice Chairman
Corps of Engineers, Ret.
Mr. Harry Batt, Sr.
Pres., Pontchartrain Beach Amusement Park
Mr. Philip C. Ciaccio,
Councilman District E
Dr. Rodney C. Jung,
Director of Health
Mr. Lester J. Lautenschlaeger,
Director of Recreation
Mr. Edward F. LeBreton, Jr.,
Representative, House District 27

FOREWORD

The year 1968 witnessed the fourth year of operation of the Orleans Parish Mosquito Control Program, and was marked by several noteworthy accomplishments. Early in the year the District played host to the Convention of the American Mosquito Control Association, one of the largest held since the formation of the Association. In attendance were representatives of districts from throughout the United States and from several foreign countries. It was at this Convention that the Association members named George T. Carmichael as President-Elect.

Progress was noted in every phase of the operational program in 1968. It was the first full year of dragline operations in a program designed to eliminate mosquito breeding habitats. Ground larviciding tasks were accomplished with newly designed portable low volume larviciding units. Encephalitis surveillance was expanded into a program requiring less man-hours to yield an increased amount of data. In the field of aerial activities, the Division's DC-3 advanced the technique of ultra low volume adulticiding to operational status in Orleans Parish. The Piper Pawnee, which served as the first line of defense in our control activities for the past three years, was retired and replaced by a Grumman Ag-Cat.

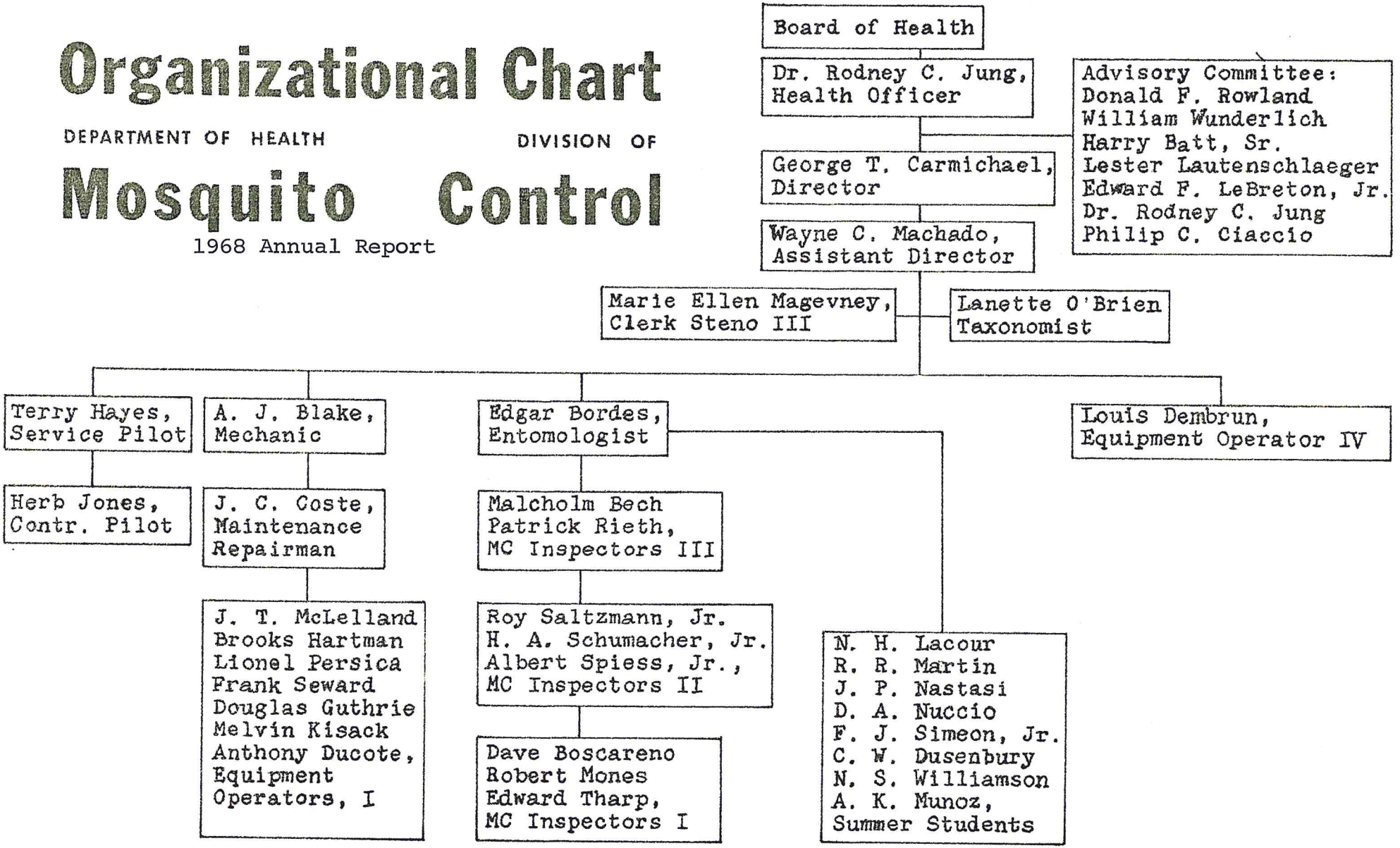
In retrospect, the most important fact realized in 1968 was the over-all reduction in mosquito annoyance. Average mosquito density recorded during the year was far below that in the previous three years. The reason for this cannot be accounted for by any single factor, but rather is a result of many forces acting and interacting. More importantly, it is a result of efforts by many employees, constituents, and technical representatives. To these people we extend a sincere vote of appreciation.

Organizational Chart

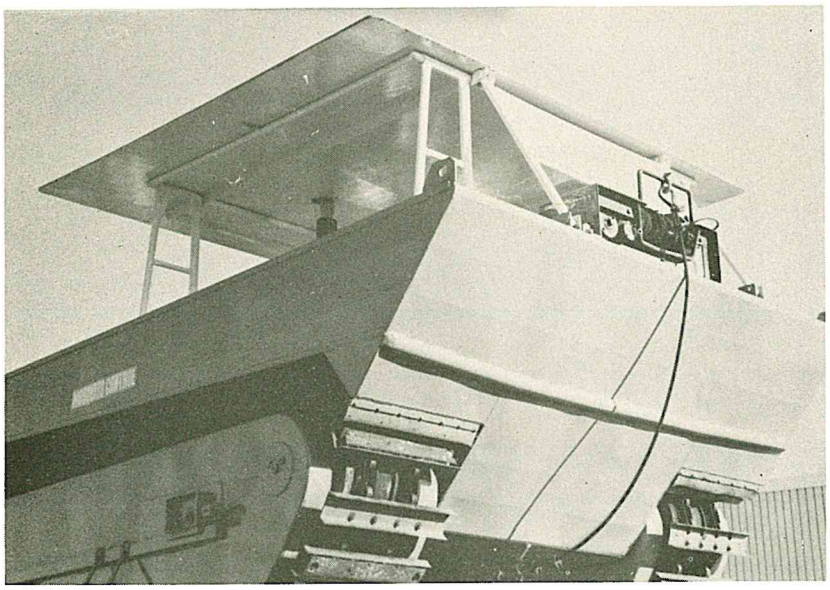
DEPARTMENT OF HEALTH DIVISION OF

Mosquito Control

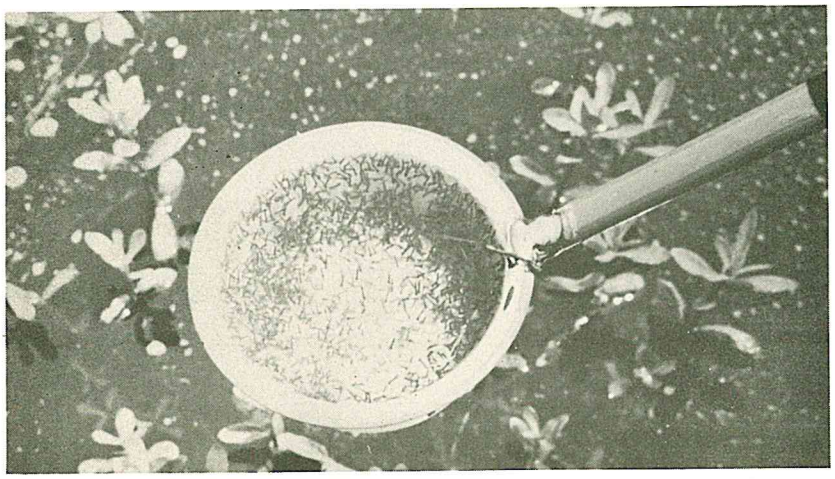
1968 Annual Report



Inspectors view the marsh from a wheel buggy in search of the various grasses that indicate potential mosquito breeding sites.



Difficult terrain is easily traversed with this amphibious marsh buggy.



The mobility offered by both land and aerial equipment allow inspectors to locate mosquito larvae in a minimum of time.

ENTOMOLOGICAL

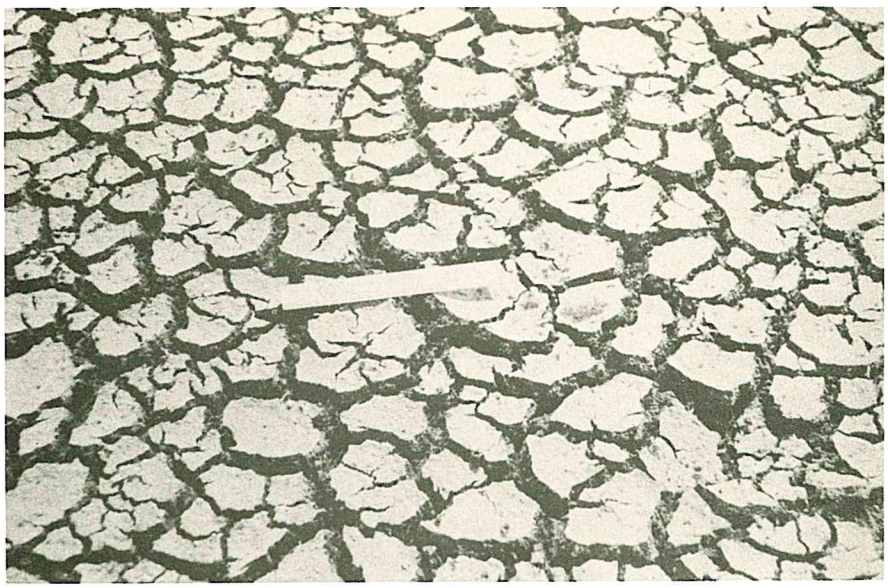
The most important principle in mosquito control is inspection. Guided by inspection data, the control of mosquitoes becomes a co-ordinated effort; without such data, control efforts become guess work. The location and density determination of larval as well as adult mosquitoes requires many man-hours and includes ground as well as aerial work. More than 4,500 man-hours were spent in 1968 searching for mosquito larvae, and the subsequent mapping of their breeding sites. The time required to inspect marshland and breeding sites has been reduced from days to a matter of hours. The inspection of thousands of acres of marsh required 57 hours of reconnaissance from fixed-wing aircraft and 50 hours of inspection from helicopter. The more than 1,500 acres visited during 1968 were found to be positive for mosquito breeding 43% of the time. The size of the breeding sites within these areas ranged from small potholes to several hundred acres.

Although much of the time spent in inspection is devoted to the location of prolific flood water species, an important phase of larval surveillance is concerned with the domestic mosquito, Culex quinquefasciatus. This mosquito presents a particularly challenging problem to control since conditions favorable for its breeding can be created within a few days in any ditch, swale, depression, or artificial container. The problem is attacked on the theory that breeding radiates from central foci. The locating and treating of these central foci will then provide control for the untold numbers of smaller breeding areas by denying these areas a source of infestation.

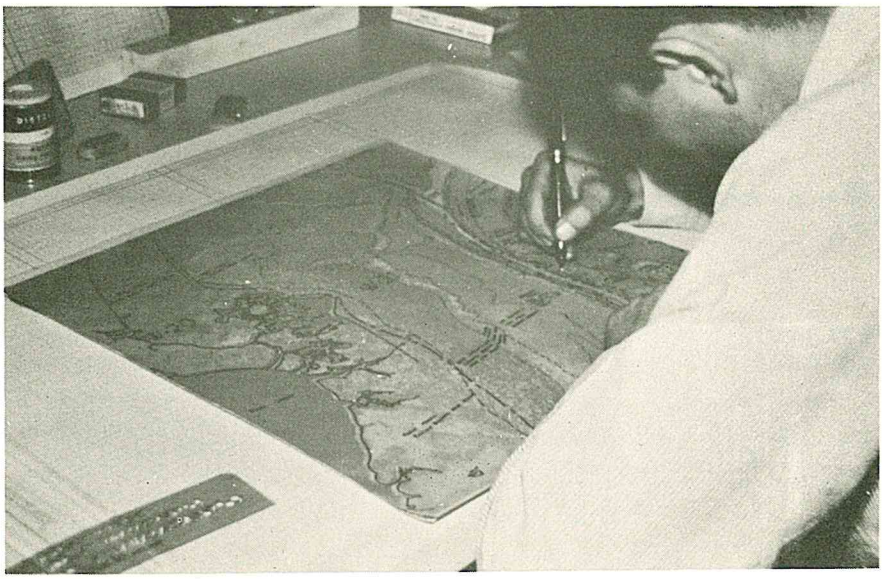
Inspection has defined the area of heaviest domestic mosquito breeding as being that portion of the City bounded by the Jefferson Parish line on the west, St. Bernard Parish line on the east, the Mississippi River on the south, and Tulane and Florida Avenues on the north.

The locating of mosquito larvae is only the first step in control. Once the broods have been located, density determined, and identification made, suitable treatment techniques must be employed. Within the urban areas of the Parish, treatment is accomplished with six self-contained portable larviciding units and two specialized larviciding trucks. A formulation of diesel fuel and surfactant (Triton X-45 or TeeDet) is dispersed on the water at the rate of two gallons per acre. More than 2,500 acres of mosquito breeding waters were treated in this manner in 1968. This figure does not include the thousands of acres assigned to aerial treatment during the year.

For the most part, the search for mosquito broods is guided by rainfall patterns. Abnormally high tides are responsible for



Drought conditions often dry out the marshland affording oviposition sites to mosquitoes. Subsequent flooding will hatch eggs in as little as 30 seconds. More than 2,000 eggs per square foot have been recorded from such sites.



All known and suspected breeding sites are sketched atop an overlay on aerial photographs. Such sites are given a code letter and are inspected after each rain or tidal flood. Areas shown to be prolific breeding sites are slated for permanent control measures.

some flooding of breeding areas, but the greater part of breeding is influenced by rain. Therefore, consideration must be made of the amount of rainfall, especially cumulative, as it affects water table level, season of the year, the time interval between rainfalls. In the marsh drought conditions lower water tables and dry many ponds. This not only affords oviposition sites to flood water mosquito species but also destroys their natural enemy, the top water minnow.

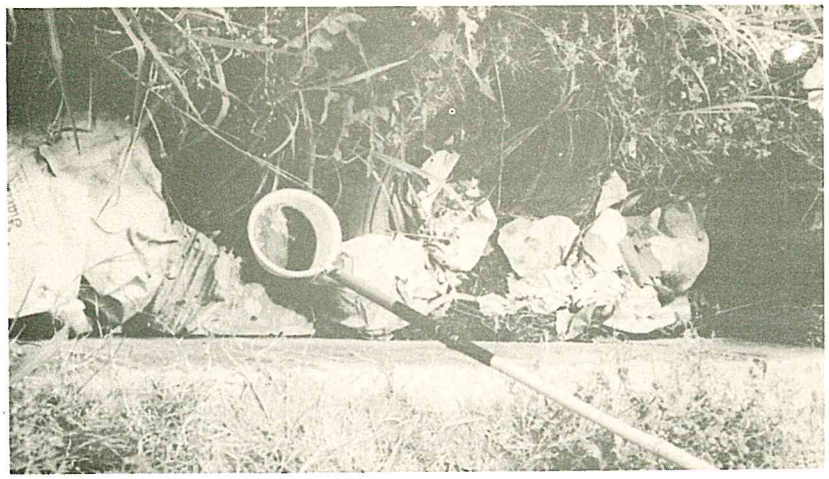
Rainfall during the spring season is of particular importance as it may dictate the magnitude of the mosquito problem throughout the balance of the year. Frequent heavy rains deny egg-laying sites to flood water species; whereas rainfall patterns that alternately inundate and allow breeding areas to dry are ideal for such species.

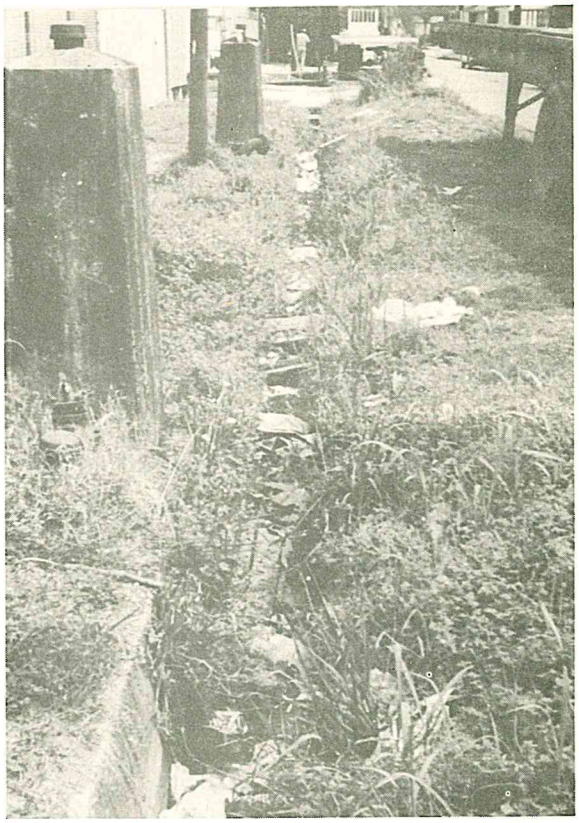
The year 1968 was marked by extremely low rainfall. Monthly accumulative rainfall began the year with a deficit in January of 3.2 inches and continued throughout the remaining months in similar fashion. The month of September was noted as 12.1 inches below normal. As explained, this situation compounds mosquito problems. The drying marshland affords thousands of acres of breeding without the balancing force of predatory fish, and since the water table is low, inundated areas soon dry again and become available for oviposition.

Drought conditions not only set the stage for flood water mosquito breeding, but likewise produce an optimum situation for domestic mosquito breeding. Within the urban sections of the Parish, those sites that remain flooded through a drought have a high breeding potential for C. quinquefasciatus, since this mosquito prefers stagnant water of high organic content. This gives witness to the fact that 82% of all known or suspected domestic breeding sites within the City were found to be positive during 1968.

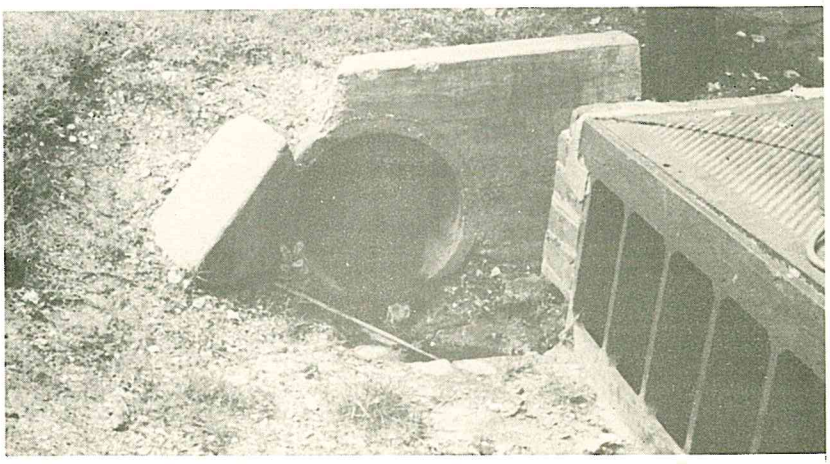
Because of the importance of this species in the transmission of St. Louis Encephalitis, a special effort has been made for their control. Any breeding foci that have produced C. quinquefasciatus larvae more than once during the year are classified as "suspected 'quink' breeding areas," and are inspected on a monthly basis to determine if they are indeed breeding foci or just occasional producers. Over 30 of these suspected breeding areas were surveyed during the past year, and half of these were eliminated. With the addition of 20 new suspected breeding areas, there are now a total of 38 areas to be observed during the coming year. This technique allows for the inspection and treatment of every known or suspected "quink" breeding area within a minimum of time. As a test to the reliability of this system, a complete block to block survey of the entire City was undertaken in August with the help of summer student employees. After this project was completed, it was noted that the number of suspected C. quinquefasciatus breeding sites was not significantly increased.

Regardless of the amount of control pressure applied to the mosquito in its larval state, a portion of each brood will survive

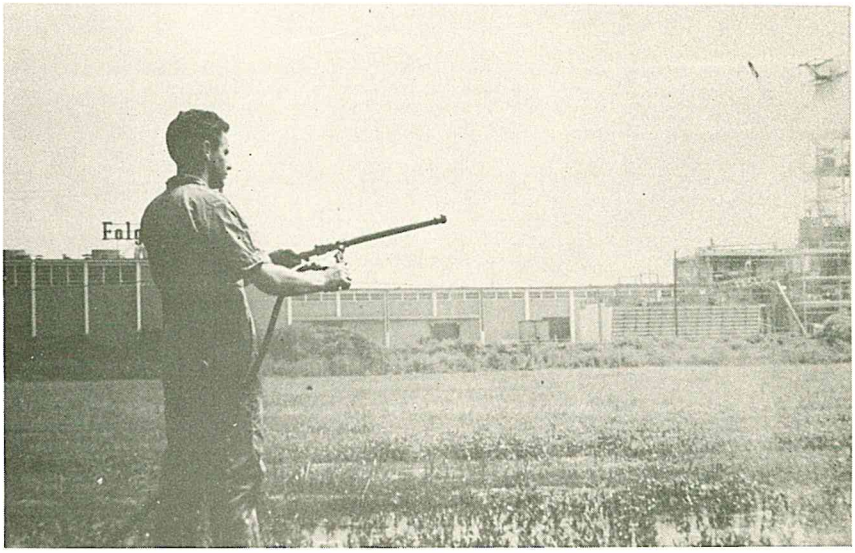




Littered ditches, discarded auto tires, and improperly placed culverts provide ideal breeding sites for domestic mosquitoes such as Culex Quinquefasciatus.



Larviciding represents the most economical form of temporary control. Attacks against mosquito larvae are conducted both with aerial and ground equipment. In these instances, oil is used to cover the surface of breeding sites, thereby suffocating the larvae.



and emerge as adults. The adult mosquito population then becomes the concern of the second phase, or category, of inspection. It is its task to locate adult mosquito concentrations; determine the species involved and density of each; and, based on the biology of the species in question, attempt to predict their likely movements and recommend the best control techniques applicable.

New Jersey light traps and landing rate counts provide the main tools in inspection for adult mosquitoes other than domestic species. During 1968 traps located throughout the Parish operated 2,392 trap-nights, collecting approximately 188,500 adult female mosquitoes of various species. This represents an average of 79 per trap-night, which compares favorably to the 1967 average of 118 per trap-night. A breakdown of species collected during the year is shown in Table I. As has been the case in the past, Culex salinarius accounted for the greatest percentage of species noted. This fact is contributed to heavily by the nature of the species, which is easily attracted to the sampling device used.

As was previously mentioned, rainfall plays a major part in initiating mosquito breeding in this Parish. Figure I illustrates the peaks and ebbs of the adult mosquito population in relation to monthly rainfall. Flood water species represented by Aedes sollicitans and A. vexans began increasing in April and continued in relatively high numbers through September. As illustrated, rainfall was greatest during these months, with the exception of July. Adult flood water mosquitoes were noted in greatest numbers during July; however, rainfall showed a deficit of more than one inch below normal. Throughout that month all known and suspected breeding areas within Orleans Parish were either dry or, if flooded, negative for mosquito breeding. It is assumed, therefore, that these were migratory adults and did not originate from within the Parish. This assumption is strengthened by the fact that for approximately four days the area was under the influence of a rather strong prevailing southeast wind, also very high tides were reported in the area southeast of those light traps recording the highest number of adult mosquitoes. The month of September likewise showed a rather high number of flood water mosquitoes, yet rainfall was below normal. Precipitation was, however, heavy during the last week of August, accounting for the adult mosquitoes in September.

Permanent water species, represented in Figure I by C. salinarius and Anopheles crucians, showed two distinct peaks in density. The first peak occurring in early spring is rather unusual, since this species usually reaches peak production in the fall. These early broods are a result of relatively warm temperatures occurring during the time of high tides, which kept breeding areas flooded.

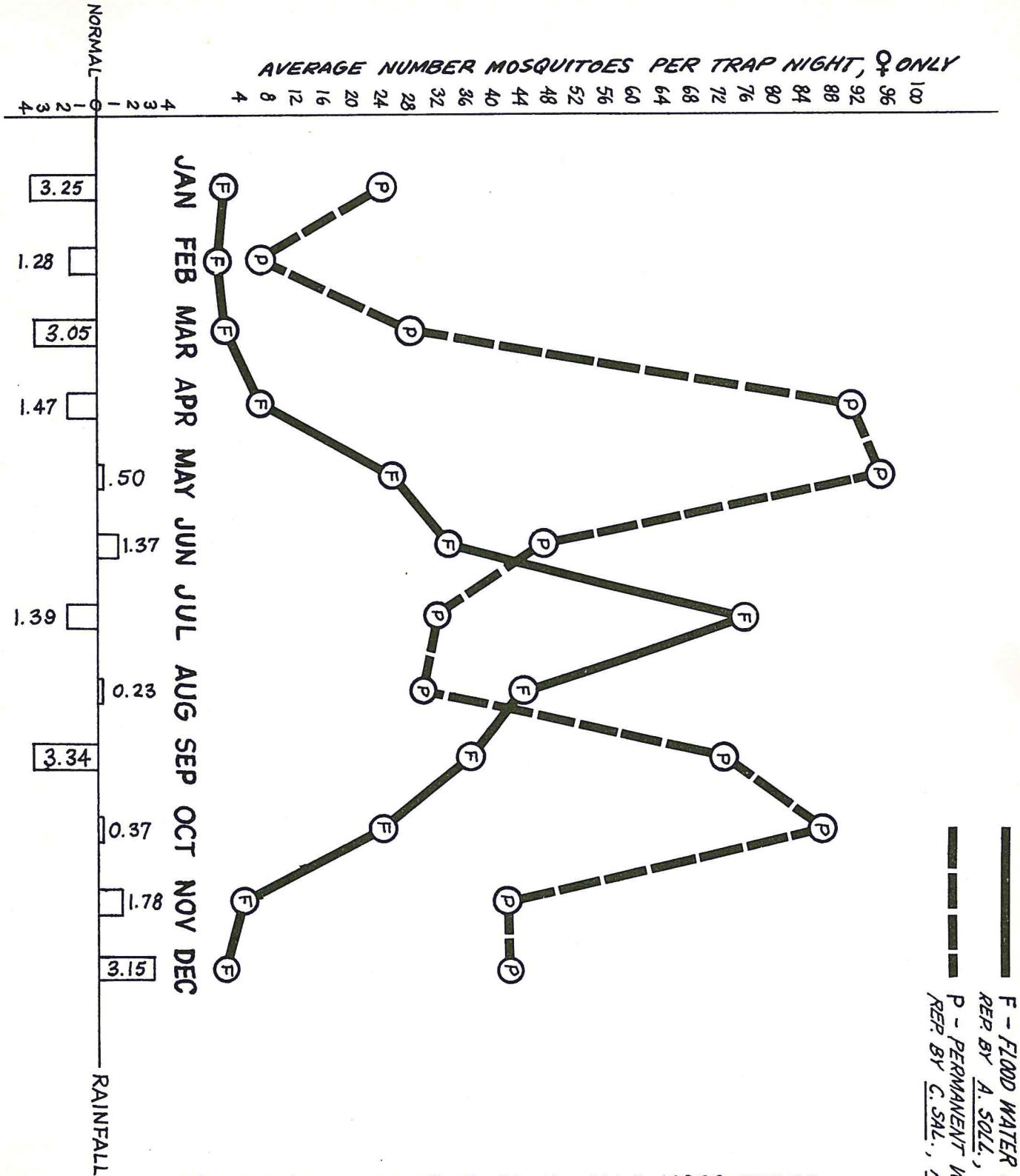
In general, control efforts were successful in reducing the number of mosquitoes reaching the adult stage. Figure II gives a

ZONES ALGIERS - S. CENTRAL - N. CENTRAL - EASTERN - SO. SHORE, MICHOUD - CHEF, L. ST. CATHERINE -

19[illegible]

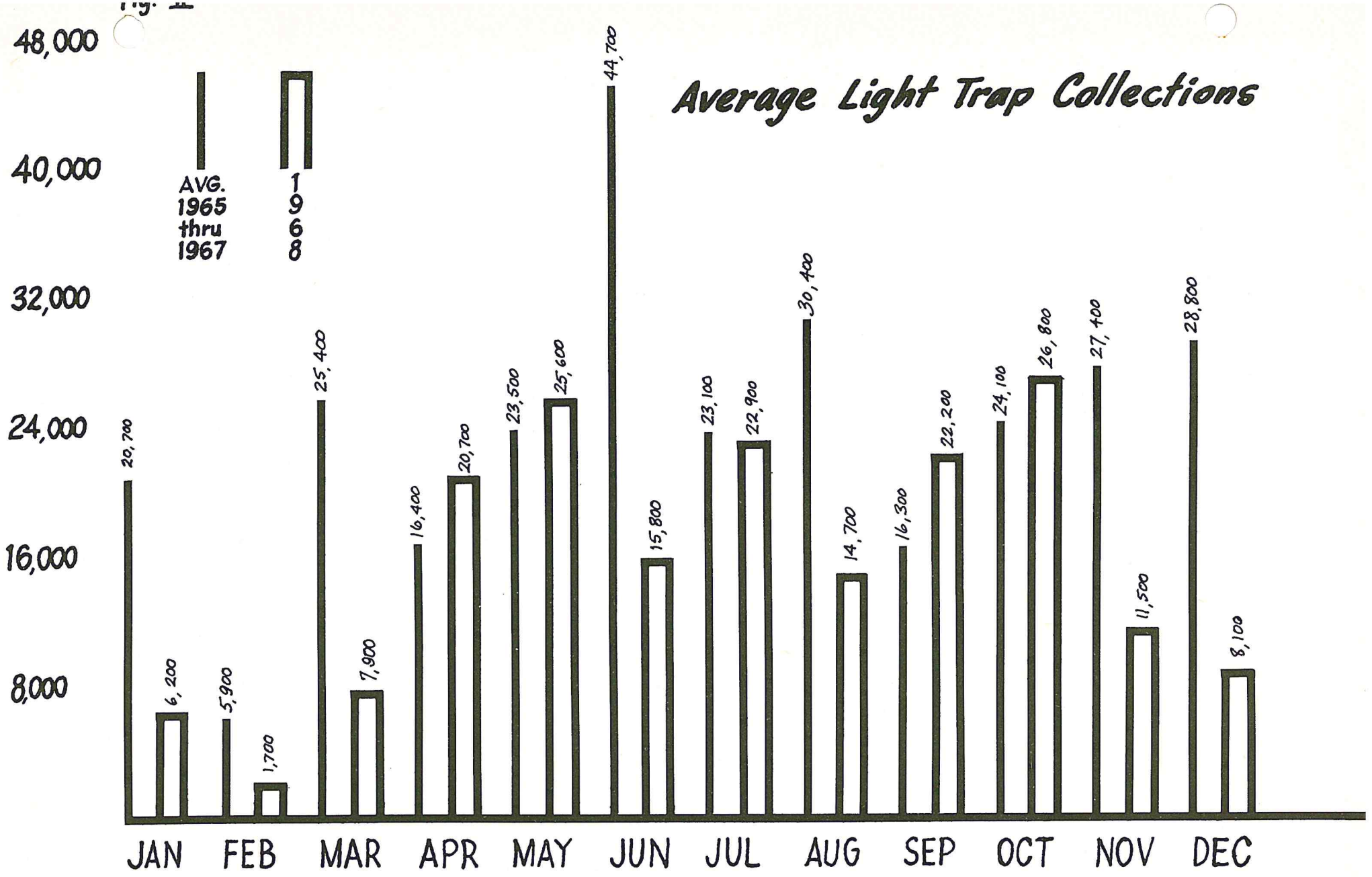
LOCATION	TOTAL		AEDES		ANOPHELES			CULEX		CULIS.	MANS.	PSOR.	ANa OTHER	Ate OTHER	NC.
	MALE	FEMALE	SOLL.	VEX.	CRUC.	QUAD	QUINQ	SAL.	INOR.	PERT.	CONF.	SPP.	SPP.	COLL.
1. LOWER ALGIERS	1842	23,447	185/4626	39/2107	85/2485	17/359		1488/12203	28/1344	0/77	0/58	0/9	0/179	100
2. MIDDLE ALGIERS	625	4,679	15/196	138/918	5/194	0/20	1/5	441/2996	25/311	0/8	0/4	0/1	0/26	98
3. UPPER ALGIERS	71	679	1/104	23/225	1/18		1/0	40/237	5/82	0/6	0/2		0/5	98
4. CAFFIN AVE.	173	807	3/29	32/121	1/11	0/1	0/2	130/575	6/66	1/0	0/2			101
5. VIEUX CARRE	233	687	5/82	20/115	0/8	0/1	0/4	206/431	2/40	0/1	0/1		0/4	100
6. IRISH CHANNEL	137	547	1/13	39/205	2/20	0/1	16/33	66/230	11/38	2/7				95
7. NAPOLEON	321	1,621	4/98	112/960	3/15		2/2	195/410	5/94	0/38	0/2		0/2	98
8. AUDUBON	116	370	0/32	19/123	1/23	0/4	3/1	87/143	6/32	0/9	0/2	0/1		99
9. CITY PARK	184	1,212	3/55	93/427	1/17		7/16	72/594	7/95	1/6	0/2			76
10 LAKEWOOD	80	473	8/63	42/294	2/10		0/1	26/91	2/6	0/6	0/1			80
11. WEST END	54	350	18/125	16/90	0/4	0/1	0/2	14/81	6/44	0/3				97
12. LSUNO	254	1,004	1/59	110/494	6/33		0/4	131/453	6/55	0/2			0/4	98
13. PEOPLES AVE.	629	5,676	16/348	135/1049	4/150	0/7	0/4	440/3145	34/925	0/37	0/6	0/1	0/4	96
14. EADS	116	401	1/61	19/106	0/5	4/10	0/2	88/150	4/67					73
15. GENTILLY E	373	3,408	56/1377	181/1107	7/168	0/19	0/5	126/611	3/84	0/17	0/4	0/4	0/12	96
16 LAKEFRONT AIRP	408	1,986	11/134	102/742	15/69	0/3	0/5	240/775	40/244	0/12			0/2	101
17. LITTLE WOODS	726	7,147	61/451	101/1017	54/700	0/35	0/4	472/3957	38/867	0/82	0/10	0/1	0/23	89
18. VILLAGE DE L'EST	179	4,329	37/539	46/1589	1/60	3/13		72/1673	19/402	0/29	0/6	0/10	1/8	78
19. BIENVENUE	545	7,152	42/935	54/975	25/488	0/33	3/8	390/3918	29/741	0/40	0/1	2/2	0/16	97
20. MICHOUD	660	13,577	96/1821	184/1250	56/2414	3/335	1/5	275/6276	32/595	12/736	0/3	0/72	1/70	97
21. POWERS JCT.	3046	35,038	130/2854	37/862	150/6004	4/114	0/1	2674/21523	47/727	4/2588		9/289	0/76	85
22 SOUTH SHORE	791	9,546	99/1312	12/86	95/1084	8/63		511/6109	66/751	0/89	0/4	0/23	0/25	83
23. CHEF MENTEUR	2552	33,065	345/6116	61/725	247/6427	32/810		1828/17599	34/575	3/824	0/6	9/232	2/251	96
24. GREENS DITCH	1384	17,257	182/5513	80/484	298/1942	0/2	0/8	771/7539	43/883	6/57	0/28	0/676	4/125	81
25. RIGOLETS	1459	10,704	1224/5731	22/208	35/1135		0/1	163/2763	12/579	0/78		3/190	0/19	73
4-B	30	300	1/36	10/94	1/4		0/2	17/157	0/6			1/0	0/1	31
12-B	501	2,267	5/73	168/999	14/86	0/3	8/7	286/822	14/256	1/16	3/2		2/3	89
TOTAL	17,489	187,729	2550/32,783	1895/17,372	1109/23,574	71/1334	42/122	11249/95,356	524/9909	30/4768	3/144	6/1511	10/856	
PERCENT ♀			17%	9%	13%	1%		51%	5%	2%		1%		1241 240

fig. I



THE AVERAGE NUMBER OF FEMALE MOSQUITOES OF VARIOUS SPECIES COLLECTED PER TRAP NIGHT IN RELATION TO AVERAGE RAINFALL IN INCHES ABOVE AND BELOW NORMAL. ORLEANS PARISH, LA.

1968


Average Light Trap Collections
48,000
40,000
32,000
24,000
16,000
8,000
AVG. 1965 thru 1967
1968
20,700
6,200
5,900
1,700
25,400
7,900
16,400
20,700
23,500
25,600
44,700
15,800
23,100
22,900
30,400
14,700
16,300
22,200
24,100
26,800
27,400
11,500
28,800
8,100
JAN
FEB
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JUL
AUG
SEP
OCT
NOV
DEC

comparison of light trap collections on a monthly basis from 1965 to present. Collections made in 1968 indicate less adult mosquitoes than the three previous years.

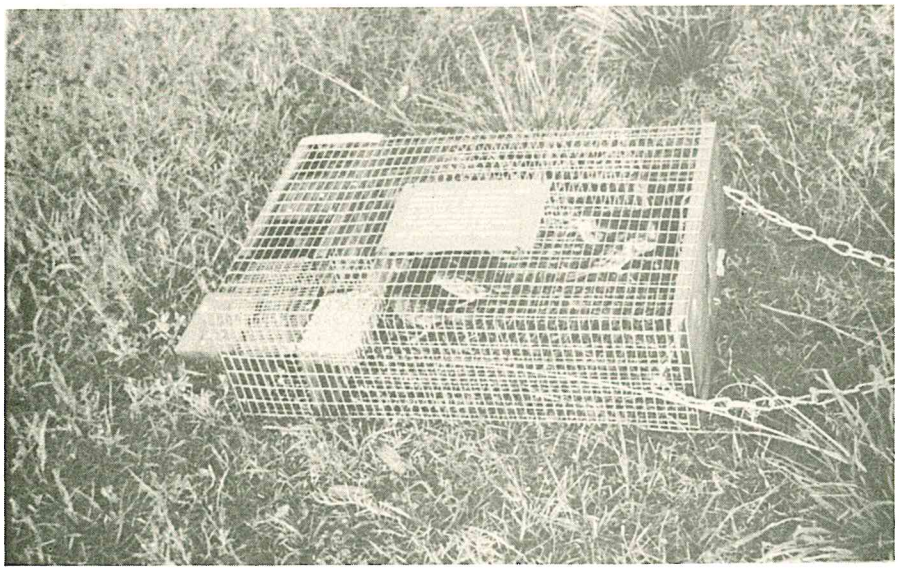
The determination of adult densities of C. quinquefasciatus is seldom undertaken since this species is not attracted to light traps or any other routine adult surveillance techniques. This species is not a strong flier and prefers to remain rather close to its particular breeding site. Therefore, determination of their adult density may be accomplished by inspecting likely mosquito resting sites. Such sites have been located in association with each of the major breeding foci of the species. Inspection of these "resting stations" verify the effectiveness of control techniques.

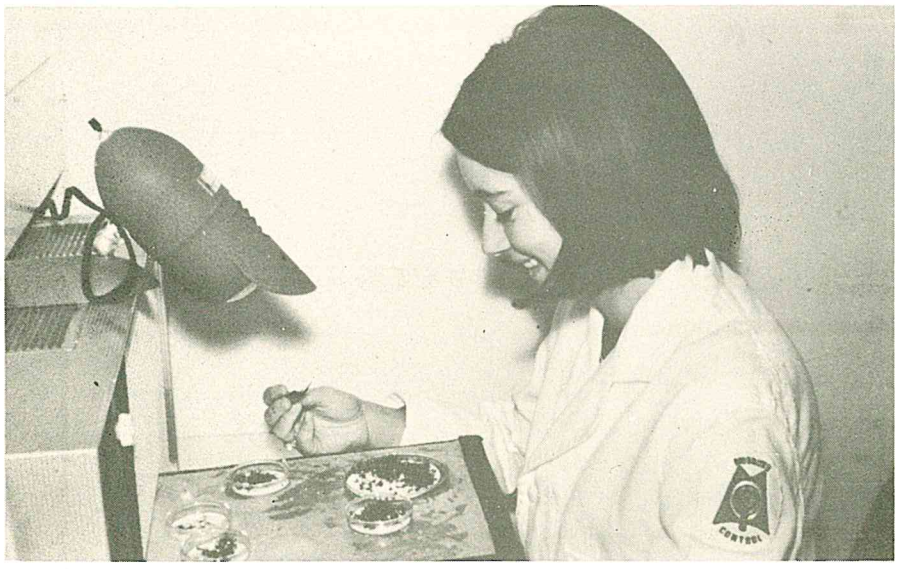
In general, control efforts were successful in reducing the number of mosquitoes reaching the adult stage. Figure II is a comparison of light trap collections on a monthly basis from 1965 to present. Collections made in 1968 indicate less adult mosquitoes than the three previous years.

ENCEPHALITIS SURVEILLANCE

In addition to its obvious duties of control of the insect pest, the Mosquito Control Division has for the past several years taken upon itself the surveillance of encephalitis. This program, in cooperation with State health authorities, has been termed one of the most positive examples of preventive medicine the City could have. In an editorial in the New Orleans Times-Picayune, the statement was made that "In terms of epidemic effect, as demonstrated in less fortunate cities, it must also be considered one of the most valuable examples....."

The term "encephalitis" is a general one indicating the inflammation of the central nervous system. It may be caused by any one of a number of micro-organisms, including viruses. It is that form of encephalitis caused by viruses and transmitted by mosquitoes that is of concern to this Division. In nature, many species of birds serve as a natural reservoir for a virus, with the various species of mosquitoes serving as the vectors. The typical life cycle of a mosquito-borne virus is bird - mosquito - bird. An infected bird circulates active virus within its bloodstream for several days. It is during this time that mosquitoes may become infected by biting an infected bird and, in turn, may infect other birds. It is possible for the number of infected birds to reach a magnitude that increases the probability of the virus spilling over into the human population. The surveillance program is designed to detect viral activity in Orleans Parish before it reaches this point, and to break the cycle by intense mosquito control.





Surveillance for arthropod borne encephalitis is carried on throughout the mosquito breeding season. surveillance techniques include the collecting and testing of blood from maintained sentinel flocks and wild birds as well as the capture and processing of live mosquitoes. All field work is carried on by Mosquito Control personnel while laboratory testing is conducted thru the cooperation of the State Board of Health.

The surveillance program uses three basic sampling techniques to determine the presence of the virus. The first technique concerns itself with the collection of live mosquitoes which are processed by the Louisiana State Board of Health Division of Laboratories. Since some species of mosquitoes are more capable of virus transmission than others, only known or suspected vectors are sampled for viruses. These potential vectors are collected with CDC miniature light traps and chemical attractant. C. quinquefasciatus, a species not attracted to light traps, is collected with aspirators from resting stations associated with known breeding foci. All mosquitoes are identified to species, and separated into pools for virus study. During the year, 116 such pools were assembled, comprised of several genera: Aedes, Culex, and Mansonia. These pools were processed in an attempt to isolate an encephalitis virus. No such isolations were recorded during the entire 1968 surveillance period.

The second technique involved in the surveillance program is the use of sentinel chicken flocks. These flocks are positioned throughout the Paris at strategic points to help determine the location of virus activity in the bird population. Three of the five flocks were placed in the highly urbanized areas of the City, primarily for the detection of St. Louis Encephalitis activity. The remaining two were stationed in rural sections of the Parish for the detection of Eastern and Western Equine Encephalitis. This technique involves the rearing of chickens in a mosquito-free environment and their screening for the presence of encephalitis antibodies prior to their selection as sentinel birds. Each bird is banded to maintain individual records. Approximately ten birds were maintained in each cage and bled on two-week intervals. All blood samples underwent hemaglutination inhibition (HI) tests for the detection of virus antibodies. Results indicated no significant virus activity within Orleans Parish.

The third technique employed in the surveillance program is that of HI tests performed on blood samples obtained from the wild bird population. Since this provides the earliest detection of encephalitis within an area, the greatest emphasis is placed on this phase of the program. Throughout the mosquito breeding season, three days out of every other week are devoted to the sampling of the bird population. Sampling devices include mist nets, Havahart sparrow traps, and baited walk-in traps. Sampling areas are prebaited with grain for several days prior to trapping to increase bird activity and make possible the capturing of sufficient birds within the minimum of time.

A total of 2,656 samples were collected from 57 species of birds. The common house sparrow, which has been incriminated as a host for SLE epidemics in other parts of the country, accounted for 76% of the collections. This species is banded prior to release in order to obtain possible conversion information. Recapture of

Table I

VIRUS & TITER

Month	Species	SLE	EEE	WEE	Total birds/ % Positive
March	Sparrow			1:20	336 / 4.76%
	2 Cowbirds			1:80	
	Cowbird			1:40	
	2 Cowbirds			1:20	
	Myrtle warbler		1:40		
	Cardinal		1:20		
	7 Sparrows	1:20			
	Mockingbird	1:20			
	Pigeon	1:20			
April	Sparrow			1:40	582 / 1.89%
	2 Sparrows			1:20	
	Sparrow	1:80			
	3 Sparrows	1:40			
	Sparrow	1:20			
	Carolina chickadee	1:320			
	Orchard oriole			1:40	
	Sparrow		1:20		
May	Sparrow	1:160			467 / 4.71%
	Sparrow	1:80			
	Sparrow	1:40			
	13 Sparrows	1:20			
	Sparrow			1:20	
	Starling	1:40			
	Mockingbird	1:80			
	Mockingbird	1:20			
	Hairy woodpecker	1:160			
	Blue jay		1:20		
June	2 Sparrows	1:20			533 / 0.56%
	Orchard oriole	1:160			
July	None				478 / 0.00%
August	Blue jay	1:20			223 / 0.89%
	Sparrow	1:20			
Sept.	Sparrow	1:40			32 / 3.10%

banded birds for 1968 was 7% of the 2,021 house sparrows bled during the program. This percentage of recaptures is an acceptable figure for surveillance purposes. All species were aged and sexed when bled in light that immature birds might expose recent virus activity.

Since large populations of birds are important in supporting epidemics, a bird survey was initiated in 1968. This survey determined increases or decreases in bird populations, and will be continued in the future.

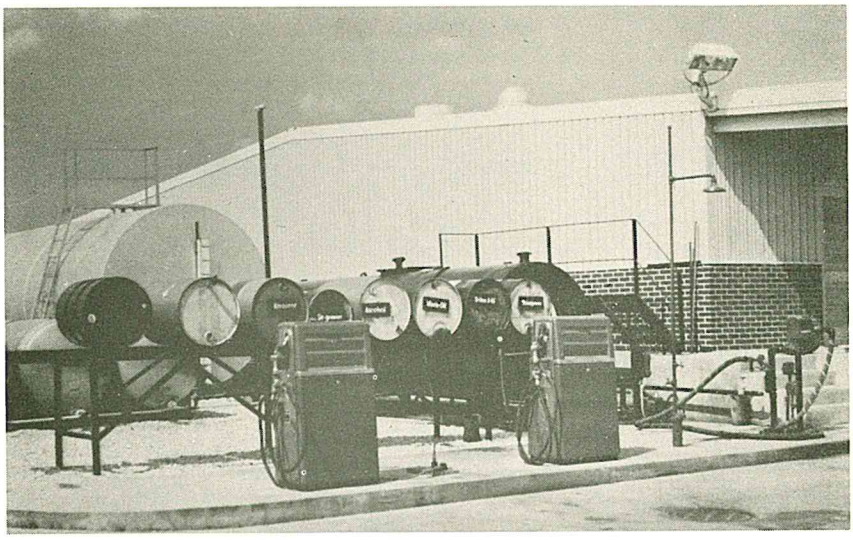
The screening for virus antibodies by the State Laboratories was accomplished by HI tests. Positive results were plotted to show the per cent positive for given time and area of the Parish. Table I shows all positive birds, total birds, and per cent positive on a monthly basis. When positive results ranged from 4% to 5%, additional surveillance was employed for confirmation. This additional surveillance proved in all cases that virus activity was within the safe range. All phases of encephalitis surveillance showed virus activity to be low during 1968.

FOGGING

The facet of mosquito control to which the public is most familiar is that of adulticiding, in particular ground fogging. The Division operates seven fog trucks and has the capacity to cover the entire Parish within two nights should the need arise. Each vehicle is equipped with an instrument panel which allows the driver to monitor the entire operation. A recording tachograph furnishes a permanent record of each fogging assignment.

Fogging assignments are determined from entomological data obtained in the adult density surveys. In 1968 fogging operations were conducted for a total of 450 fog nights, during which each of the City's 26 fogging areas was covered at least once. This operation required a total of 103,335 gallons of insecticide.

Throughout most of the mosquito breeding season, fogging operations were conducted between the hours of midnight and seven A.M. This time was chosen for several reasons: mosquito activity is at a peak; since these hours are among the coolest of the day, the fog tends to remain close to the ground where it is most effective; also, vehicular and pedestrian traffic is at a minimum. When fogging operations are conducted during the early spring or late fall, low temperatures force the operation to reschedule its activities to the period between sundown and midnight.



The phase of mosquito control most familiar to the public is its fogging program. An oil formulation of Malathion or Dibrom is prepared in the division's mixing plant and dispersed by one of seven thermo fog devices.

The insecticide formulation most commonly used during the year was a 4% mixture of Malathion and #2 diesel fuel; a 1% mixture of Dibrom and diesel fuel was used to a lesser extent. The change from Lalathion to Dibrom and back to Malathion was most advantageous since one tends to reduce sludge formation produced by the other. It is expected that in the coming year, alternation of formulations will be conducted on a routine basis.

The following table shows the total number of nights each zone in the Parish was fogged and the percent of total received by each:

Zone	Total nights fogged	Per cent of total
Algiers	82	18
South Central	77	17
North Central	78	17
Eastern	101	22
Lake St. Catherine-Chef Menteur	78	17
South Shore-Michoud	14	3
Parks-Lakefront	21	6

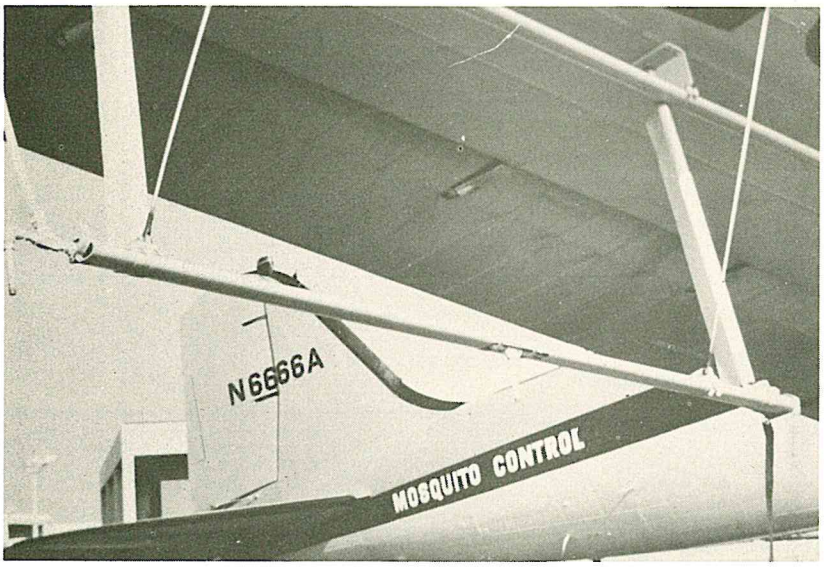
AERIAL

Although mosquitoes have been known to breed in almost every conceivable situation, the crux of the insect problem in Orleans Parish is conceived within the confines of the marshland. Pressure applied to larval populations here provide the most economical as well as efficient means of control. This requires, of course, the use of aerial equipment guided by precise entomological data. During 1968 a total of 114,650 pounds of Paris green was dispersed by air at the rate of 15 pounds per acre. In addition to this, nearly 30,000 gallons of larviciding oil was likewise dispensed at a 5 gallons per acre rate. Because Paris green is not effective on the late stages of the fourth instar larvae, larviciding oil and Paris green were often used on the same brood, the oil being used as the larvae progressed into the fourth instar.

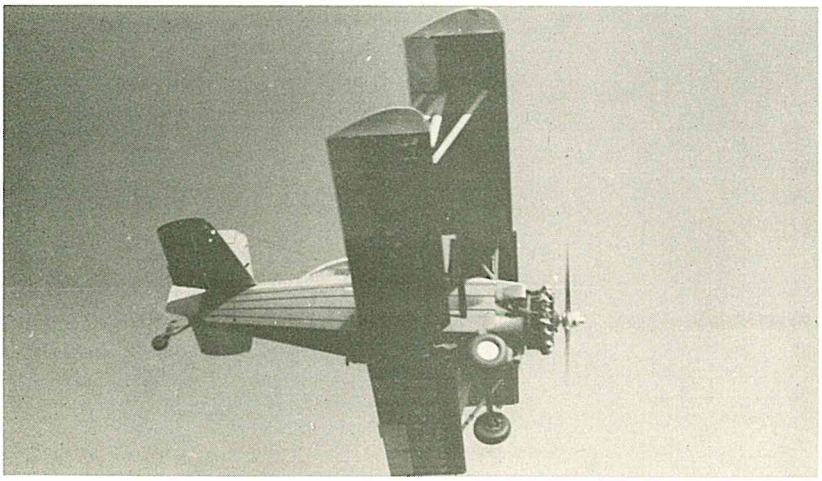
A 4% formulation of Malathion and diesel fuel, such as used in ground fogging operations, was used also in aerial adulticiding. More than 68,000 gallons of this formulation was used at the rate of 3 quarts per acre during 1968, with the major portion of this being dispersed over the eastern sections of the Parish.

Residents in eastern New Orleans saw the last of a familiar sight during 1968 - the Division's Piper Pawnee had served its usefulness and was replaced by a Grumman Ag-Cat. This new craft has

The use of the helicopter in inspection has become increasingly important. An inspector-pilot team furnishes data as to location and density of mosquito broods so that control measures can be applied.



The DC-3 is used in controlling adult mosquitoes by dispensing Dibrom in ultra low volume dosages. This system is used only over very large areas and is capable of treating up to 150 acres per minute.



The brunt of aerial control is carried on by the Ag-Cat. In addition to aerial adulticiding, this craft conducts larviciding operations with both oil and Paris Green pellets. The Division's Ag-Cat is the only one of its kind working in an organized mosquito control program.

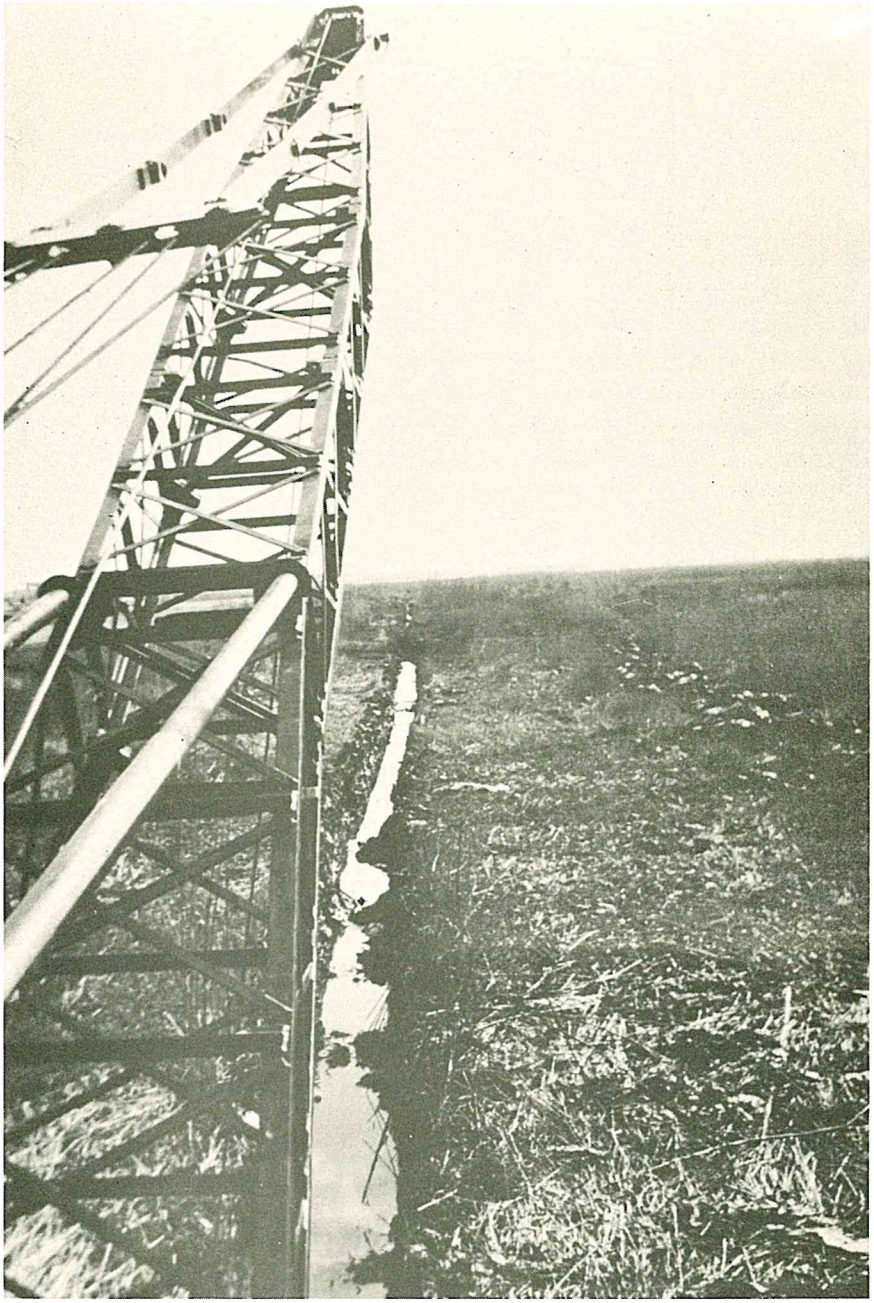
more than doubled the work capacity of the Pawnee. The most significant aspect of the operation is the fact that ferrying time has been cut in half by virtue of the Ag-Cat's ability to carry twice as much chemical as the Pawnee. Both craft during the year logged a total of nearly 500 hours in performing aerial adulticiding and larviciding operations.

The Division made a significant inroad in the field of aerial activities with the promotion to operation status of the ultra low volume technique with the DC-3. Work on this technique has progressed for more than a year now, and it is felt that it is reliable, efficient, and, above all, safe. This is a new field and much has to be learned; indeed, the equipment being used in this technique is still going through a process of metamorphosis, and each experience gained in past efforts has been most valuable. While the success of this operation is the result of efforts of many, the Division is particularly indebted to the effort of A. J. (Junior) Blake, its Engineering Aide. It was through his skill and untiring efforts that the City of New Orleans has the potential to control mosquitoes on an almost inconceivable scale. During the year, more than 33,900 acres were treated using the DC-3 and the ultra low volume technique. The average spray assignment was in excess of 7,000 acres and required approximately 30 minutes to complete, with an average cost of less than 10 cents per acre.

PERMANENT CONTROL

The techniques of mosquito control discussed so far are termed Temporary Control, since they are ephemeral in nature. The most desirable method of control and the end to which all accumulated data are used is that of Permanent Control, in which the mosquito breeding areas are altered in such a way as to make them unavailable for mosquito production. The system of alteration is determined by the bionomics of the mosquito species involved, as well as the area of the breeding site. Since the oviposition site selected by some species requires the presence of permanent water, while others require only damp soil, the permanent control procedure must vary accordingly. Basically, there are two techniques by which this may be accomplished: One is to keep the area completely dry, the second is to keep the area permanently flooded and stocked with predatory fish. There are no hard and fast rules as to which method is to be used in each individual project, therefore, experience and a working knowledge of the ecology of the area are the best guidelines for permanent control procedures.

To date all permanent control projects in Orleans Parish have been accomplished with the Division's amphibious dragline. This piece of equipment consists of a Little Giant dragline mounted atop a completely amphibious track unit. Although relatively large, this



Permanent control operations are carried on with this amphibious dragline. This photo shows the one-half yard bucket installation for work in the marsh. Areas known to have prolific mosquito breeding sites are ditched for quick drainage. Gambusia minnows are maintained in these ditches to feed on any larvae which hatch out.

unit applies a ground pressure of only 1½ psi, making it ideally suited for use in floating marshes, swales, ponds, and canals, which make up the mosquito breeding sites of the Parish.

To date approximately 466 acres of what was formerly the heaviest breeding areas in the Parish are under permanent control of one type or another. Of these 466 acres, 156 have been controlled by utilizing the reservoir or holding ditch method. In this method a central ditch provides a holding area for predacious minnows, smaller connecting ditches drain the area, bringing any mosquito larvae which may have hatched into the main ditch. This technique is used in areas where neither complete drainage nor permanent flooding may be employed. The remaining 310 acres of permanent control sites have been thoroughly drained and remain in a permanently dry condition. At this time, no breeding areas have been permanently flooded for control; however, plans are now in progress for the construction of such a project within the near future.

The year 1968 witnessed many changes and advancements in mosquito control. The results speak for themselves. Credit must be given to the individuals whose efforts form the nucleus of a working team. Credit also must be given to the residents of Orleans Parish for their cooperation and to industry's technical representatives for the same reasons.