

THE USE OF HELICOPTERS IN FLORIDA FOR RAPID INSPECTION FOR SALT MARSH *Aedes* LARVAE

PAUL J. HUNT

Executive Director, East Volusia Mosquito Control District, P. O. Box 1855, Daytona Beach, Florida

Salt marsh mosquitoes, *Aedes taeniorhynchus* and *A. sollicitans*, have been a continuing problem in Florida since the beginning of its recorded history. For the past 18 years, throughout Florida emphasis has been on the elimination of the sources of salt marsh mosquito breeding through such methods as drainage, construction of minnow access canals, filling, diking and impounding, and other water management techniques. Great progress

has been made. In several of the districts, however, the magnitude of the salt marsh mosquito problem is such that it will take many years to reduce it effectively, and dependence must continue to be placed on temporary methods while the source reduction work is progressing.

Several years ago, in an effort to provide Florida's salt marsh mosquito control district with a safe larvicide the use of which would result in reducing the number of

adult mosquitoes to be killed later on the wing, the Florida State Board of Health, through the efforts of A. J. Rogers, developed a granular formulation of paris green as a mosquito larvicide.

This formulation has been the larvicide of choice in Florida marshes because it poses no apparent threat of building up resistance, nor is it noticeably harmful to marsh life, except mosquito larvae. In districts where this material has been applied, it has been highly successful in reducing potentially large broods of salt marsh mosquitoes.

In order to use this formulation effectively it is necessary first to know when the marsh is flooded by tide or rainfall, inspect the marsh for newly hatched salt marsh *Aedes* larvae, and make aerial application of the granular paris green larvicide on highest priority breeding areas, all within a period of 3 to 5 days, or by the time the larvae are halfway through the 4th instar. The reason for this haste is obvious: the larvae stop eating when they begin to pupate, and paris green is a stomach poison.

The large areas which must be inspected for an effective larviciding program in some of the districts make conventional methods of inspection impractical. Expansive grass marshes and impenetrable mangrove growth on islands isolated beyond shallow water make it impossible for inspectors equipped only with trucks, motorboats or even air boats to gather complete enough information in these problem districts to permit effective large scale larviciding. The helicopter proved to be the answer.

BREVARD COUNTY. Although helicopters have been used in various types of mosquito control work in other areas of the United States and elsewhere, Jack Salmela, Director of the Brevard Mosquito Control District, pioneered the use of a helicopter for inspections for salt marsh *Aedes* larvae in Florida, beginning in 1963. His use of a helicopter for inspection purposes in

Brevard County was made necessary by a responsibility assumed by the district through a cooperative mosquito control agreement involving the U. S. Air Force, the National Aeronautics and Space Administration, the Florida State Board of Health, and the Brevard Mosquito Control District. Under the agreement, the district assumed the responsibility for controlling all large broods of mosquitoes emanating from more than 14,000 acres of marshes within 5 miles of human population. Plans of NASA and the Air Force in the construction of the Apollo facilities required hundreds of men to be working day and night throughout the area adjacent to and in the middle of some of the most productive mosquito marshes.

The use of a helicopter each year for the past 5 years as an inspection vehicle has been very successful, and because of the relatively low number of hours the machine is used each year (150 to 200 hours), the district has found it more economical to lease rather than own its helicopter. For the past two seasons, a Hughes-300 has been used in Brevard County. The lease rate was \$59.00 per airborne hour and the aircraft remains at the disposal of the district in their hangar throughout the year. Beginning with the 1968 season, plans were made to equip the leased helicopter with distribution equipment for the spot application of granular paris green larvicide. It is anticipated that the lease rate will increase approximately \$10.00 per airborne hour with the addition of the distribution equipment.

From the beginning, the pilot of the helicopter or his companion inspector has also served as pilot of the fixed wing aircraft which applied the larvicide. This has, by experience, been a good arrangement because it has eliminated the exchange of information and the lost motion in the use of explanatory maps. The pilot knows first hand the locations in the marsh where the larvae must be

treated with granular paris green larvicide.

Spot application versus large scale application is an important consideration in Florida marshes, because of the small percentage of the total marsh area inspected actually found to be breeding. Small depressions and potholes usually supply the "seed" broods which start the population buildup in early spring. Experience in Brevard County in 1963 and 1964 pointed to the possibility of preventing larger broods later in the season by wiping out these small "seed" broods early in the spring. Therefore, to treat very small areas by helicopter with a minimum amount of larvicide, where larvae are found to be confined to such areas, makes possible a saving of many thousands of pounds of larvicide over application made solely by fixed wing aircraft. Fixed wing aircraft are used extensively for the application of granular paris green larvicide where large marsh areas are found broadly infested with larvae.

EAST VOLUSIA. The second area in Florida to become interested in a helicopter was the East Volusia Mosquito Control District, Daytona Beach. The decision was made in the fall of 1964 to work toward a full scale larviciding program for the control of salt marsh mosquitoes based on the use of a helicopter for rapid inspection of the marshes. The District's 18 to 20 square miles of mangrove islands in the Indian River Lagoon and approximately 15 square miles of grassy salt marshes and coastal swales present an inspection problem which can be solved only by the use of a helicopter.

Parts and components of a Bell Model 47-G2 helicopter were obtained in January, 1965, and the aircraft was assembled during that spring by William S. Durkee, Chief of Aircraft Operations, at great savings to the district. The aircraft was named and licensed as a "Durkee Skeetercopter." During the winter of 1965-1966, several hundred helicopter landing areas

were cleared and otherwise made ready in mangrove growth and in other salt marsh areas in preparation for rapid larval inspections of all suspected salt marsh breeding areas of the district during the 1966 season. The helicopter was equipped with hoppers and slingers for the application of paris green larvicide.

One major advantage of helicopter application is that when loading from a van, the base of operation is portable and can be established near the breeding areas to be treated. Under these circumstances, loads can be applied in as little as 6 minutes from take-off to take-off including loading time, and treatment can be applied to larvae in localized depressions over several thousand acres of salt marsh in a day's operation. With attention focused on destroying the pothole breeding throughout each season, the large broods which occur with general floodings of the marsh are for the most part prevented, and the typical mid-season peak of salt marsh *Aedes* population is reduced drastically.

After two seasons with the use of the helicopter, the many thousands of acres of marshes throughout the District are catalogued and breeding data recorded. The information obtained from numerous inspections by helicopter over these marshes during the 1966 and 1967 mosquito-producing seasons has increased our knowledge of these marshes, and continued observations will enable a more accurate priority to be set for source reduction work.

LEE COUNTY. On the lower west coast of the state, Lee County Mosquito Control District (T. W. Miller, Jr., Director) is faced with a severe salt marsh *Aedes* problem in the vast mangrove marshes along shorelines and on off-shore islands, as well as in swales and savannahs found on both the mainland and on the islands. The largest single light trap catch of *Aedes taeniorhyncus* on record from any place in the world was made on one of

these off-shore islands in Lee County a number of years ago. The total salt marsh *Aedes* breeding potential is tremendous in Lee County, and this fact led, several years ago, to an unparalleled aerial adulticiding program designed to control the large broods of *Aedes taeniorhynchus* which migrated into populated areas of the county. The effectiveness of this program was somewhat curtailed by the development of resistance to malathion.

In order to support the adulticiding program so greatly needed in Lee County, plans were initiated in the spring of 1966 to move toward a full scale paris green larviciding program using a helicopter as a rapid inspection vehicle. A Bell 47G2 helicopter was leased and was equipped for distribution of granular paris green larvicide. From April through October, 1966, approximately 700 hours were placed on the helicopter and more than 250,000 pounds of granular paris green larvicide were applied to the marshes in Lee County, at a lease cost of \$60.00 per hour including pilot.

In October, 1966, a new Bell 47G-4A helicopter was leased under an agreement which extended through the calendar year 1967. During the lease period, 1003 hours were flown and more than 387,000 pounds of paris green larvicide were dispensed at the approximate lease cost of \$50.00 per hour.

Under the lease agreement, Lee County Mosquito Control District requires a new helicopter to be provided each year. The new machine for the 1968 season was also a Bell 47G-4A. It was equipped with larger hoppers and slingers for a greater capacity of 650 pounds pay load of larvicide, with improved coverage. The Lee County program is also leasing a second helicopter as a reserve ship for times when two helicopters are needed or when one of the machines is being repaired.

OTHER DISTRICTS. On the upper east

coast of the state, the Northeast Duval Mosquito Control District at Jacksonville, under the direction of Paul Patterson, is a relatively new district which is also faced with a severe salt marsh *Aedes* problem. In this district, covering 125 square miles, approximately one half or 75 square miles are salt marshes or freshwater marshes on the fringe. The salt marsh mosquito breeding potential of these vast marshes is not yet fully known.

With the purpose of surveying their marshes, in November, 1967 the district purchased a Hughes-300 helicopter. This aircraft has been fitted with hoppers and slingers for application of granular paris green larvicide and has also been equipped for ultra-low volume application of insecticide concentrate for the control of adult mosquitoes by aerial application.

With the use of this rapid inspection vehicle, the district hopes to locate all of the most important potential salt marsh *Aedes* breeding areas in these marshes for future source reduction work, and it will have a larviciding program to support its control efforts against adult mosquitoes.

SUMMARY. Some of the districts in Florida cannot conduct an effective large scale larviciding program against salt marsh *Aedes* mosquitoes without the use of helicopters to provide rapid and thorough inspection of the marshes. Some of these districts have demonstrated that larviciding confined to pothole depressions during spring and early summer greatly reduces the egg build-up of salt marsh *Aedes* in the marshes, and prevents the production of larger broods later in the season.

There is a valuable bonus too. These districts are learning more about their salt marshes than they have been able to observe before. This knowledge enables accurate determinations of permanent control priorities and the application of more efficient and effective control measures in the meantime.