ARTICLES

AEDES AEGYPTI ABOARD BOATS AT PORT-OF-SPAIN, TRINIDAD, WEST INDIES (1972–82)

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ABSTRACT. *Aedes aegypti* were collected and identified from boats arriving at Port-of-Spain, Trinidad, West Indies. A total of 46,895 boats was inspected, of which 31 had *Ae. aegypti* breeding in containers (0.07%). The containers which supported breeding aboard boats were water drums (54%), plastic containers (22%), water tanks (18%), lifeboats (4%) and tubs (2%). Boats coming from South America and the Caribbean may have been responsible for re-introducing *Ae. aegypti* into Trinidad. The need for more effective port health surveillance measures is recommended.

INTRODUCTION

Careful surveillance of airports and seaports is important because disease vectors sometime represent a significant element of the environment. The collection of arthropods from aboard ships has been reported by various authors, including Eads et al. (1965) and Hughes and Porter (1956).

The prevention of imported diseases and arthropods of medical and agricultural importance into Trinidad, West Indies was relatively simple 49 years ago. In 1934, the total number of boats visited and inspected by Port Health Officers was 727, of which 389 were steamers and 338 were sailing vessels (Surgeon General Report 1935). The boats of those days were rather small and the number visiting Trinidad were also rather small. As a result most of the boats were met on arrival, inspected and treated to eliminate any live mosquitoes.

During the period 1972–82, a survey was conducted to determine the number of *Aedes aegypti* (Linn.) imported into Trinidad and the type of containers supporting breeding aboard boats entering the harbor of Port-of-Spain, Trinidad, W.I.

MATERIALS AND METHODS

All boats entering the harbor, whether in the roadstead or docked at the wharf during 1972–82, were inspected by Port Health Officers attached to the Insect Vector Control Division, Ministry of Health and Environment, Trinidad and Tobago.

An attempt was made to capture all mosquitoes using flashlights, nets, forceps and killing jars, in a manner similar to that used for aircraft disinsection studies (Le Maitre and Chadee 1983). An inspection of all water-holding containers in the cabins, hull and on deck was also undertaken to determine the presence of immature stages of *Ae. aegypti*. Any adult or larval specimens found were collected and placed into pill boxes or vials which were labelled and sent to the Insect Vector Control Division Laboratory for identification. Relevant information was recorded on standard mimeographed forms.

RESULTS

During 1972–82, 46,895 boats were inspected, of which 66% (31,240) came from South America and the Caribbean region. Of these 31,240 boats 31 were found with waterholding containers breeding *Ae. aegypti*.

The adult mosquitoes collected included 429 adult *Ae. aegypti* and 1,876 *Culex quinquefasciatus* Say resting on the sides of the breeding containers. Twelve *Ae. taeniorhynchus* (Wied.) were collected from life boats.

Table 1 shows the 10-year accumulated monthly frequency of *Ae. aegypti* arriving via boats at Port-of-Spain. October was the month with the greatest number of mosquito collections (22%), followed by 16% in May, and 9% in June, August and December. It was only in April and September that no positive boats were found. The results indicate that during any month of the year boats with *Ae. aegypti* could be detected.

Aedes aegypti were collected from a number of different types of containers aboard boats in Port-of-Spain. Steel drums filled with water were found to be the primary breeding site for *Ae. aegypti* and represented approximately 54%

Table 1. Monthly incidence of *Aedes aegypti* arriving via boats at Port-of-Spain, Trinidad, West Indies (1972–82).

Month	No. of positive boats	Total no. boats
January	2	1,772
February	2	1,808
March	2	1,820
April	0	1,834
May	5	2,696
June	3	2,816
July	2	2,828
August	3	2,768
September	0	3,308
October	7	3,476
November	2	2,794
December	3	3,320
Total	31	31,240

(24) of all positive foci. Plastic containers accounted for 22% (10) of the breeding, water tanks 18% (8) while lifeboats and tubs represented 4% (2) and 2% (1) of positive containers.

Many Caribbean and South American countries are infested with *Ae. aegypti* mosquitoes (Knudsen 1983). As a result most of the boats involved in the interisland trade established by the Caribbean Community (CARICOM) arrived at Port-of-Spain with *Ae. aegypti* mosquitoes. Grenada proved to be the most frequent last port of call of *Ae. aegypti* positive boats in the Caribbean region (26%), followed by Carriacou (23%), St. Vincent (19%) and Barbados, St. Lucia and Guadeloupe (5%), respectively. From South America, Venezuelan boats were most frequently encountered with mosquitoes (60%), while the boats from Guyana and French Guiana constituted 30% and 10%, respectively.

DISCUSSION

The introduction of arthropods of medical importance into Trinidad aboard boats and aircraft is controlled by quarantine laws and the International Health Regulations (WHO 1974). At Port-of-Spain, boats which are not disinfected prior to their arrival, must therefore be inspected and if necessary treated. Disinfection procedures for aircraft at Piarco International Airport, Trinidad have been outlined by Le Maitre and Chadee (1983).

Eads et al. (1965) reported a collection of 767 dead mosquitoes of at least 41 species from tankers in 1963. Among the mosquitoes collected were the vectors of malaria and St. Louis encephalitis. A similar collection was conducted by Le Maitre and Chadee (1983) when the vectors of malaria, dengue and urban yellow fever were collected aboard aircraft arriving in Trinidad. However, during the present study the main disease vector recovered was *Ae. aegypti*. Other vectors may have been imported but were not detected.

Christophers (1960) reported *Ae. aegypti* breeding to be particularly common in stored water in barrels and tanks in boats and dhows. In the present study, similar results were found with 54% of the *Ae. aegypti* larvae being collected from steel drums aboard boats.

Aedes aegypti occurs in most countries of the Caribbean region. However, during 1982 *Ae. aegypti* reinfestation of the Cayman Islands and Bermuda in the North Atlantic occurred (Knudsen 1983). The finding of 31 boats carrying *Ae. aegypti* into Trinidad further emphasizes the importance of reinfestation and movement of *Ae. aegypti* among islands and countries within the Caribbean. For example, Trinidad eradicated *Ae. aegypti* in 1960, but as early as 1961 reinfestation was observed at the Port-of-Spain and San Fernando wharves.[1]

This study reemphasizes the point that because many countries of South America and the Caribbean are infested with *Ae. aegypti* and, due to established trading links within the Caribbean Community (CARICOM), the transportation of *Ae. aegypti* via boats is a continuing problem. As a result more stringent port health regulations should be enacted involving fines on offending boat captains or shipping companies. For without any control measures the *Ae. aegypti* mosquito, the vector of dengue and urban yellow fever, would again strike the Caribbean region. In 1977–78, an extensive epidemic of dengue type I occurred in the Caribbean (Pan American Health Organization 1979). Later in 1981 Cuba experienced an outbreak of dengue haemorrhagic fever and 158 deaths were reported (Pan American Health Organization 1982).

The threat of dengue haemorrhagic fever and shock syndrome is apparent since dengue type 4 virus has been isolated from various countries within the Caribbean region, where the disease vector *Ae. aegypti* is present. Potential threats of yellow fever must not be underestimated for as recent as 1979–80 isolates of the yellow fever virus were recovered, resulting in 7 deaths in Trinidad. (Laurent, per. comm.) As a result better port health surveillance should be instituted within the Caribbean-South American region to lessen the possibility of importation and exportation of *Ae. aegypti* mosquitoes.

[1] Annual Report of the Malaria Division, Ministry of Health, Trinidad (1962). (typewritten document), p. 40.

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COMPUTERS IN THE ALAMEDA COUNTY (CALIFORNIA) MOSQUITO ABATEMENT DISTRICT—A CASE HISTORY

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ABSTRACT. The Alameda County Mosquito Abatement District currently uses microcomputers to process operational data, to transmit data by telephone and to do word processing. The computer hardware consists of a Model I (48K RAM) and two Model II (64K RAM) Radio Shack microcomputers. An 8 megabyte hard disk system provides the primary on-line storage. The programs have been written in BASIC programming language by district employees. Each workday the district processes operational data to update various direct access files. The files, in turn are accessed to create inspection and treatment schedules and to generate a variety of reports. The automated system has proven to be relatively inexpensive, processing greater quantities of data more rapidly than the manual system that it replaced.

The operation of an effective mosquito control program in Alameda County, California depends heavily upon an effective information processing system. The system must provide accurate, appropriate and timely information for the various decision makers in the organization. Decisions to treat mosquito sources, to purchase equipment, to hire employees or to build support facilities all require reliable information.

In the past two decades, forces have acted upon the District to require increasing efficiency and effectiveness in the information processing system. Regulatory agencies have placed increasing demands to maintain records and report pesticide applications. More recently, regulatory agencies concerned with the environmental changes affecting the San Francisco Bay have required reports of physical control activities. Financial considerations have also forced the District to look to methods for increasing the volume of information that can be processed while reducing costs.

The District began the search for a cost/effective automated data processing system in 1976 when a manual punch card system was used for processing operational data. A computer based system was desired to reduce the man-hours required to process the operational data and to increase the amount of data that could be stored. After a number of consultants had been contacted, it was apparent that the cost of the required systems analysis, computer hardware and software development would be prohibitive.

RESEARCH AND PURCHASING OF HARDWARE. In 1978 the author purchased a TRS-80 Model I microcomputer made by Radio Shack. By the