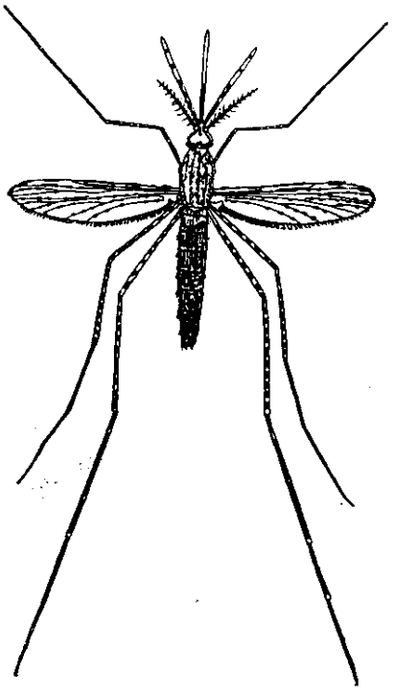
BULLETIN
OF THE
MOSQUITO CONTROL ASSOCIATION OF AUSTRALIA



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was completed and circulated to all organisations and personnel involved in the State programme in October 1983.

The plan specifies what control procedures should be carried out during emergency control operations and highlights the need to plan and act now so as to be prepared should emergency action be necessary.

Whilst the State Government may provide support assistance in field control operations during an emergency, it is anticipated that Local Government will carry out much of the work.

Education/Awareness

South Australian supports the Vector Control Course at Mildura with delegates being sent from the South Australian Health Commission and River Murray Local Boards of Health.

The South Australian Health Commission conducts one day, biannual Arbovirus Control Information Meetings for all persons involved in the State programme.

The South Australian Riverland Health Surveyors have formed a Mosquito Advisory Committee and actively promote arbovirus education programmes in the area.

Public awareness is achieved by:

: personal contact during field operations
: a public display used in local airs and exhibitions
: articles published in local newspapers
: TV coverage of Arbovirus program on 'State Wide'
: TV commercials in Riverland areas
: brochure distribution Riverland area

MOSQUITO VECTOR CONTROL IN THE NORTHERN TERRITORY

by

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1.0 BACKGROUND

In 1972 the Northern Territory Department of Health established a small Medical Entomology Section to investigate and organise control of insects of medical importance in the Northern Territory, with an emphasis on the mosquito vectors of malaria. The Northern Territory was one of the first States or Territories to set up such a unit devoted solely to the above purpose and included a full-time entomologist with State-wide responsibility.

As a result of the 1974 Australian encephalitis outbreak, the need for research and control of mosquito borne diseases on an Australia-wide basis became apparent. The Commonwealth Department of Health established financial assistance to the State and Territories in late 1974, under the Australian Encephalitis Control Program. This early assistance contributed towards the equipment and operational needs of the Medical Entomology Section and aided the establishment of mosquito control programs in Alice Springs, Darwin, Nhulunbuy and Alyangula. The control programs in the various towns were carried out with assistance from the various local councils, corporations or mining companies, in co-operation with the local departmental health surveyors or with direct assistance from the Medical Entomology Section. The guidance of vector control operations by the various operational bodies was undertaken by the Medical Entomology Section and the process of gathering medical entomology data on a Territory-wide basis was started, in order to establish vector control operations on a more scientific basis.

From the beginning, with a single entomologist and a part-time tearoom laboratory, the Entomology Unit evolved into a distinct Branch of the Northern Territory Department of Health, with a well equipped laboratory, four permanent staff and a comprehensive vector research and control program. The activities of the Branch have been reported regularly in the Annual Reports of the Northern Territory Department of Health.

The Medical Entomology Branch activities are integral components of the Northern Territory's contribution to the National Disease Control Program. The Branch is responsible for the organisation and activities of the program in the Northern Territory. This report has been prepared for a workshop on Vector Control organised by the National Disease Control Program in Canberra in May 1987. It summarises the main elements of the Northern Territory Vector Control Program and highlights some of the results and achievements of this program.

2.0 VECTOR CONTROL PROBLEMS PECULIAR TO THE NORTHERN TERRITORY

2.1 Different Geographic Areas

The Northern Territory has a range of geographic areas, from the tropical monsoonal north to the semi-arid desert areas of Central Australia. In the northern area, the timing of vector surveillance and control operations can be scheduled with some degree of certainty, depending on the arrival and the end of the monsoon season and tidal predictions. Vehicle access to many of the areas during the wet season can be very limited posing particular problems. In the semi-arid areas, the timing of surveillance and control operations is variable and dependent on seasonal conditions. After widespread rains, vast areas can be covered with water and become inaccessible. Even within one geographic area in the Northern Territory, differing land forms and swamp systems produce different peaks of abundance of mosquitoes due to variable vegetation and water characteristics. The differing habitats within the one region mean that many habitats require individual assessment for vector prevalence and vector control requirements.

2.2A Widespread and Small Population

Major towns in the Northern Territory are widely dispersed, and stretch the time and available resources of the Branch to the limit. With recent homelands movements by Aborigines, there are now many small settlements, frequently in housing styles or at locations that expose people to relatively high numbers of biting insects. Mosquito surveys of small communities must necessarily be on a long return cycle in the Northern Territory, and even the major towns pose problems with vector surveillance and control operations. Much of the assistance with vector control and surveillance operations is carried out by people whose main job does not necessarily involve mosquitoes.

2.3A Wide Range of Mosquito Species

The pest and vector mosquitoes of the Northern Territory are similar to those of Queensland in their number and variability, and include all the major potential and actual mosquito borne disease vectors with the exception of Aedes aegypti. The habitats of the mosquitoes range from freshwater swamps, brackish water lagoons, salt marshes and temporary flood waters to artificial mosquito breeding sites. Each mosquito species has particular periods of prevalence and particular control problems.

2.4 Numerous Potential Mosquito Borne Diseases

Unlike some of the southern States, the Northern Territory has to contend with the threat of malaria reintroduction, the actual transmission of arbovirus diseases such as epidemic polyarthritis and other viruses, as well as the potential reintroduction of Aedes aegypti and other exotic mosquito species.

These diverse problems, together with the relatively small resources available in the Northern Territory, have required a somewhat different approach to vector control than in other States. In the Northern Territory, the program includes a mosquito borne disease surveillance program, regular mosquito monitoring at major population centres, planning inputs in urban areas, adult and larval vector control operations at major towns, and source reduction and major engineering projects in those towns where cost benefits are maximized. All of these various components of the program are linked with a widespread mosquito awareness program, which is aimed to raise the public awareness of mosquito borne disease and to encourage self protection and avoidance measures.

3.0 MOSQUITO BORNE DISEASE SURVEILLANCE

3.1 Malaria

The Northern Territory is both vulnerable and receptive to malaria with:

(a) A history of malaria up until 1962
(b) The presence of all the major vectors of malaria
(c) The receptivity of many population centres, with large numbers of mosquitoes in close proximity to urban areas
(d) The proximity of malarious countries in South-East Asia and the Pacific, and regular tourist traffic.

Malaria prevention in the Northern Territory relies largely on the health services detecting any malaria cases. Once a case is detected and confirmed by blood examination, the Communicable Diseases Branch of the Northern Territory Department of Health and Community Services has the responsibility to co-ordinate the gathering of information and to organise any necessary response. Entomological investigations are carried out for each malaria case detected. This investigation involves examination of vector control maps or other mosquito distribution data, the review of the epidemiological data, the inspection of residences and places visited by the patient, the setting up of carbon dioxide baited mosquito traps, the location of nearby and significant mosquito breeding and harbouring areas, and the assessment of responses necessary, including adult mosquito fogging. An important component of the malaria control program is the reduction of receptivity in the Darwin urban area. The Darwin urban area is home for nearly 50% of the Territory population and a reduction in receptivity by source reduction measures such as draining and filling mosquito breeding areas has a maximum cost benefit.

3.2 Dengue

At present the Northern Territory remains free of Aedes aegypti, the vector of dengue fever. The Medical Entomology Branch is spending considerable effort to maintain this status. The Northern Territory has a history of dengue and Aedes aegypti was present at least until 1956. By 1969 Darwin was regarded as being free of Aedes aegypti and from 1973 to the present, the Medical Entomology Branch has confirmed that this species has not become re-established. The Dengue Surveillance Program consists of a number of elements including those set out below:

3.2.1 Aedes aegypti Ovitrap Surveillance DARWIN

This program uses special Aedes ovitraps which are placed in each suburb in Darwin and at vulnerable points of introduction such as the vicinity of caravan parks and interstate transport terminals. The ovitraps are inspected fortnightly for any mosquito larvae. This program enables the rapid detection of any introduction of Aedes aegypti.

3.2.2 Ovitrap Surveillance at the Airport and Wharf

An ovitrap surveillance program has been set up at the wharf and airport under the operation of the Commonwealth Quarantine Service. The Commonwealth officers regularly submit any mosquito larvae to the Medical Entomology Branch for identification. This program is aimed at intercepting any introductions of Aedes aegypti at the most vulnerable points of likely introduction.

3.2.3 Quarantine Inspections

All incoming overseas boats are inspected by the Quarantine Service for the presence of mosquito larvae and all overseas planes are routinely sprayed for exotic insects. The Quarantine Service, in co-operation with the Entomology Branch also conducts coastal surveillance operations where visiting yachts or possible illegal landings could introduce exotic mosquito vectors. Adult mosquito traps and ovitraps are run at certain vulnerable points around the coast in order to check the Aedes aegypti free status.

3.2.4 Northern Territory-Wide Aedes aegypti Surveys

Regular surveys are conducted in communities and stations between Katherine and the Queensland border to detect the possible introduction of Aedes aegypti. As opportunity permits, other towns and settlements throughout the Northern Territory are surveyed. Aedes aegypti has been intercepted on a number of occasions very soon after introduction, in both towns and on board visiting boats. In each case the mosquitoes have been eradicated and their continued absence has been confirmed.

The reintroduction of Aedes aegypti as eggs in such articles as used pot plant drip trays or old tyres remains a possibility. A major point of a public awareness program has been to stress that the reduction in available domestic mosquito breeding sites will reduce the probability of a successful reintroduction of exotic Aedes species.

3.3 Arbovirus Surveillance

Evidence suggests that a number of arboviruses are present in the Northern Territory including Murray Valley Encephalitis Virus, Ross River Virus, Sindbis Virus, Kunjin Virus and Kokobera Virus.

3.3.1 Epidemic Polyarthritis Surveillance (Ross River Virus)

Epidemic polyarthritis (causative agent Ross River Virus), appears to be the most common arboviral disease in the Northern Territory. The Branch maintains a register of all laboratory confirmed epidemic polyarthritis cases in co-operation with local pathology laboratories and doctors. All serologically confirmed cases are investigated and the likely points of infection are determined. This program has established some of the most vulnerable areas for the transmission of this disease.

3.3.2 Arbovirus Research

The Medical Entomology Branch has been establishing the presence of the various arboviruses in the Northern Territory by the isolation of virus from wild caught mosquitoes. This program has involved the collection and processing of over 180,000 mosquitoes between 1982-1985. The result of this program has been the isolation of at least 30 Alpha and Flavi viruses. The viruses isolated have included 15 isolations of Ross River Virus, 11 of Sindbis Virus and 3 of Kunjin Virus. Aedes normanensis from the semi-arid areas has been indicated as an important potential vector of Ross River Virus with 10 isolates from this species. Culex annulirostris yielded 10 isolates of Sindbis, 1 of Ross River and 3 of Kunjin. This work confirms the potential disease risks posed by the various mosquito species in the Northern Territory. When this is correlated with the prevalence and distribution of the various species of mosquitoes, it allows some degree of assessment of the potential diseases in the various areas. Those areas with high numbers of vectors, or where transmission has been demonstrated can then be given a higher priority for vector control.

4.0 MOSQUITO MONITORING

Mosquito monitoring operations are carried out over as much of the Northern Territory as possible, with emphasis on the major towns. This program has built up an information base of the species and prevalence of mosquitoes over a wide area of the Northern Territory. A comprehensive reference collection of the mosquitoes from the Northern Territory has been assembled and new species and new Australian and NT records have been established.

4.1 Mosquito Monitoring DARWIN

Mosquito monitoring using carbon dioxide baited light traps has been conducted continuously in Darwin for over 7 years. Eleven trap sites are currently utilized and these traps are set weekly at the various sites, adjacent to major swamps near urban areas. This program allows a rapid assessment of any mosquito problems in the Darwin area and is used to determine the need and assess the success of larvicide operations and the mosquito engineering works. The monitoring also allows assessment of risks for malaria transmission as part of the Malaria Surveillance Program. Additional traps are set for actual or potential mosquito problems associated with development projects and mosquito complaints. The graphs of mosquito monitoring at Leanyer Swamp are shown in Appendix 1 to demonstrate the dramatic reduction in mosquito numbers from 1983 to 1986 as a direct result of the Mosquito Engineering Program and the Helicopter applied B.t.i. vector control program.

4.2 Mosquito Monitoring NORTHERN TERRITORY-WIDE

A comprehensive picture of the prevalence and distribution of mosquito species in the Northern Territory has been built up by a program of mosquito surveys throughout the Territory at settlements, cattle stations and in non-populated areas. These surveys include collections along the Victoria Highway to the West Australian border and collections throughout the Barkly Region, to establish, among other things, the distribution of Anopheles farauti. For tourist development areas or urban areas, detailed monitoring surveys for 12 months or over are undertaken to provide detailed information on the potential mosquito problems.

4.3 Mosquito Monitoring MAJOR COMMUNITIES

Regular adult and larval mosquito monitoring is carried out at the major centres of Darwin, Katherine, Nhulunbuy, Jabiru and Alice Springs, with all of these towns except Nhulunbuy receiving direct assistance from the National Disease Control Program. In most of these towns, CO2 traps are set either once per week or once per month, by either health surveyors, mining personnel, town council or town corporation employees. Catches of mosquitoes are forwarded to the Medical Entomology Branch for identification and comment. The monitoring data for mosquitoes from these communities is used to determine the need and timing of vector control operations.

5.0 PLANNING AND MOSQUITOES

The Department places a large emphasis on planning as a means to reduce people-mosquito contact. There has been a large input of

information to the Department of Lands and the Environment Unit of the Conservation Commission, on a diverse range of proposed project developments, semi-rural developments, urban residential developments and recreation developments.

5.1 Project Development

The Branch comments on preliminary environmental reports or environmental impact statements on many development projects including new airports (Darwin and Katherine), proposed mines (Pine Creek, Jabiru), proposed dams (Alice Springs, Tennant Creek, Elizabeth River), industrial developments (rendering plants, intensive animal areas, railways, roads, airports), and many others. The aims of these comments are to prevent the creation of new mosquito breeding areas and to ameliorate or rectify any existing mosquito breeding areas.

5.2 Rural Development

In Darwin, the Branch has had major inputs into the Rural Area Strategy Plan formulated by the Department of Lands. The input includes comments on certain activities (sand mining in low lying areas), population densities (blocks below 2 hectares in size for rural residential development adjacent to large mosquito breeding areas are discouraged), and access (for maintenance reasons). The result of these inputs is to encourage planning which minimizes people-mosquito contact, thus hopefully avoiding expensive rectifications at a later date when mosquito problems become obvious.

5.3 Residential Urban Development

Creation of new towns (such as Jabiru and Palmerston), and the expansion of existing towns (such as Darwin and Alice Springs) may place people near existing mosquito breeding areas or create additional mosquito breeding sites. The mosquito breeding area can be inadvertently created by activities such as the construction of road embankments, storm water drain construction and disposal, sewerage pond construction and disposal of excess effluents, and soil borrowing and sand mining operations. The Branch has an input in the planning stages and assists the planners to consider biting insects when making detailed plans for urban and other developments. The new satellite town of Palmerston is a model of a well planned tropical urban area with minimal mosquito problems. The storm water drainage system has been designed as wide grassed open floodways with subsoil low flow drains. This has minimised mosquito breeding in the actual drains. The drain end points are directed to the daily flushed tidal areas, thus avoiding ecological changes and subsequent mosquito breeding that has been a feature of the older residential areas in Darwin. Mosquito breeding areas have been drained, filled, recontoured or reconstructed and in one instance a large shallow reed lagoon was excavated and formalised to create an aesthetic water feature that does not produce mosquitoes. An important feature of the Branch's inputs has been the acceptance that residential developments should be excluded from within 1 kilometre of large expanses of mangroves and within 1.6 kilometres of large and uncontrollable mosquito breeding areas.

5.4 Recreational Developments

Mosquito surveys are undertaken in recreation areas to determine

the species and relative numbers of mosquitoes, to assist park management in the siting of camping and other developments, and assess the need for public awareness information on mosquitoes. A survey has been undertaken in the Kakadu National Park and the results have highlighted the need for public education on personal protection against mosquitoes in particular camping areas. Another survey has been completed on the proposed Litchfield Recreation Area southwest of Darwin and other surveys are being carried out in the Finnis River area where new developments are planned.

6.0 VECTOR CONTROL

Vector Control in the Northern Territory is conducted under three linked programs, with each program aimed at specific mosquito stages, species or breeding areas. The underlying philosophy of vector control operations in the Northern Territory is to aim for the long-term source reduction of mosquito breeding areas around population centres. Insecticide treatment near suburban areas is regarded as a stopgap measure until some source reduction measure can be achieved. For most urban centres, larval control measures are carried out within urban areas, while adult control measures are limited to mosquito breeding and harbouring areas outside urban areas.

6.1 The National Disease Control Program Operations

The National Disease Control Program is the major ongoing vector control program covering the principal population centres. Darwin, Alice Springs and Jabiru receive direct assistance under the program while Nhulunbuy, Tennant Creek, Alyangula and Katherine receive indirect assistance with mosquito monitoring operations. The approach to vector control is different to each town, due to the particular type and location of the mosquito breeding areas and the local resources available. In Darwin, the Darwin City Council carries out larval control operations at specific sites, on direct advice from the Medical Entomology Branch. B.t.i. is the principal insecticide used and is applied by motorized backpack units. No regular adult mosquito control operations are carried out in Darwin except directly by the Health Department around potentially transmissible malaria cases.

In Alice Springs the Alice Springs Council carries out a regular larval monitoring and control program within the municipality. An Adult Mosquito Control Program is carried out around a particular swamp outside the city limits. The Council is assisted in its operations by the local health surveyors. All larvae and adult mosquito monitoring samples are identified by the Medical Entomology Branch in Darwin and advice is given on the frequency and timing of mosquito control operations.

Jabiru, with its enormous pest and vector mosquito numbers (sometimes in excess of 30,000 mosquitoes per trap night), has little opportunity for any significant source reduction. In Jabiru the Adult Vector Control Program is aimed at reducing the number of mosquitoes around the outskirts of the town to provide some measure of relief inside the urban area.

Many other smaller settlements are visited by the Branch under this program and particular mosquito breeding areas ae located and advice is given on the control of specific mosquito problems.

6.2 Major Engineering Program

Apart from Engineering developments conducted by other Departments and authorities which may be modified on advice from the Department of Health, the Medical Entomology Branch supervises a large Mosquito Source Reduction Program in Darwin. This program is funded jointly by the Northern Territory Government and the Darwin City Council on a 2 to 1 basis with a direct annual expenditure in the region of $180,000. This program aims to physically remove mosquito breeding areas affecting the urban areas of Darwin. Over the last 3 years this program has successfully reduced the number of mosquitoes in those swamps adjacent to the suburban areas of Darwin. The attached graphs in Appendix 1 illustrate this reduction in numbers for a particular swamp that has been a major source of mosquitoes.

6.3 Helicopter Applied Larvicide Program

Darwin is the most populous city in the Northern Territory and its proximity to very large coastal swamps that cannot be drained has meant that many people in residential areas bordering these swamps are exposed to unacceptably high mosquito numbers. Apart from the severe pest problems, these mosquitoes pose a potential health risk from mosquito borne disease. The principal problem from these coastal swamps has been plagues of Aedes vigilax (the salt marsh mosquito).

The Northern Territory Government has recognized this problem and the Department has organised a specific Salt Marsh Mosquito Control Program aimed at preventing plagues of the salt marsh mosquito. Predictions of potential plagues are made from an examination of tide charts and rainfall data. Specific breeding places have been detected and mapped on a vector control map. A comprehensive larval control program using helicopters has been organised to apply liquid B.t.i. onto the breeding areas, after breeding has been detected. This program enables large areas to be covered rapidly before the larvae reach the late 4th instar growth stage (last growth stage) and has been extremely successful in reducing the number of the salt marsh mosquitoes in the residential areas. Technical details of these programs are attached as Appendix 2 and 3.

7.0 MOSQUITO AWARENESS PROGRAM

The Mosquito Awareness Program initiated by the Medical Entomology Branch receives direct assistance under the National Disease Control Program. The program utilises TV and radio advertisements, public mosquito displays, bumper stickers, newspaper stories and visits to schools, to enhance public awareness of mosquitoes and mosquito borne disease. Coloured pamphlets have been prepared to explain the principle mosquito breeding areas, the methods available to reduce mosquito breeding around the home, and recommended self protection measures. This year the slogan has been "Make a Mossie Miserable", and has received wide media coverage. Entomological evaluations and public questionnaires have indicated that the program has raised the public's awareness of mosquitoes and mosquito borne diseases. This program is very necessary in the Northern Territory, where many people visit areas of high mosquito activity for recreation, and when self protection measures are the only practical method of reducing person-mosquito contact.

APPENDIX 1: MOSQUITO CONTROL IN LEANYER SWAMP

THE PROBLEM MOSQUITOES

Although there are up to fifteen (15) different species of biting mosquitoes in the northern suburbs of Darwin, five (5) species are of most concern, either due to their pest levels, or for their potential to cause disease. The greatest number of public complaints occur from the suburbs bordering Leanyer Swamp, after hatches of the salt marsh mosquito, Aedes vigilax. This mosquito breeds in the tidally affected areas of coastal marshes and can fly relatively long distances. Three of the five species are Anopheles mosquitoes that can breed in a variety of habitats ranging from fresh to salt water. The remaining species, Culex annulirostris, the common banded mosquito, breeds in fresh water swamps, grassy flooded areas and storm water drains. The common banded mosquito and the salt marsh mosquito can transmit virus diseases including epidemic polyarthritis, while the Anopheles mosquitoes are potential malaria carriers.

MOSQUITO CONTROL BY DRAINAGE

There has been a continuing mosquito control drainage program throughout the Darwin area starting in 1983. This has been a joint Northern Territory Government and Darwin City Council program with the Northern Territory Department of Health having a co-ordinating role. Under this program, Leanyer Swamp has been progressively drained by a network of channels and drains. Most of the major drainage works in the western Leanyer Swamp, which is the closest to the northern residential suburbs, were completed in 1986 and are now in a continuing maintenance phase. As a result the western Leanyer Swamp has been altered dramatically and it is no longer the major mosquito breeding area affecting a residential area in Darwin.

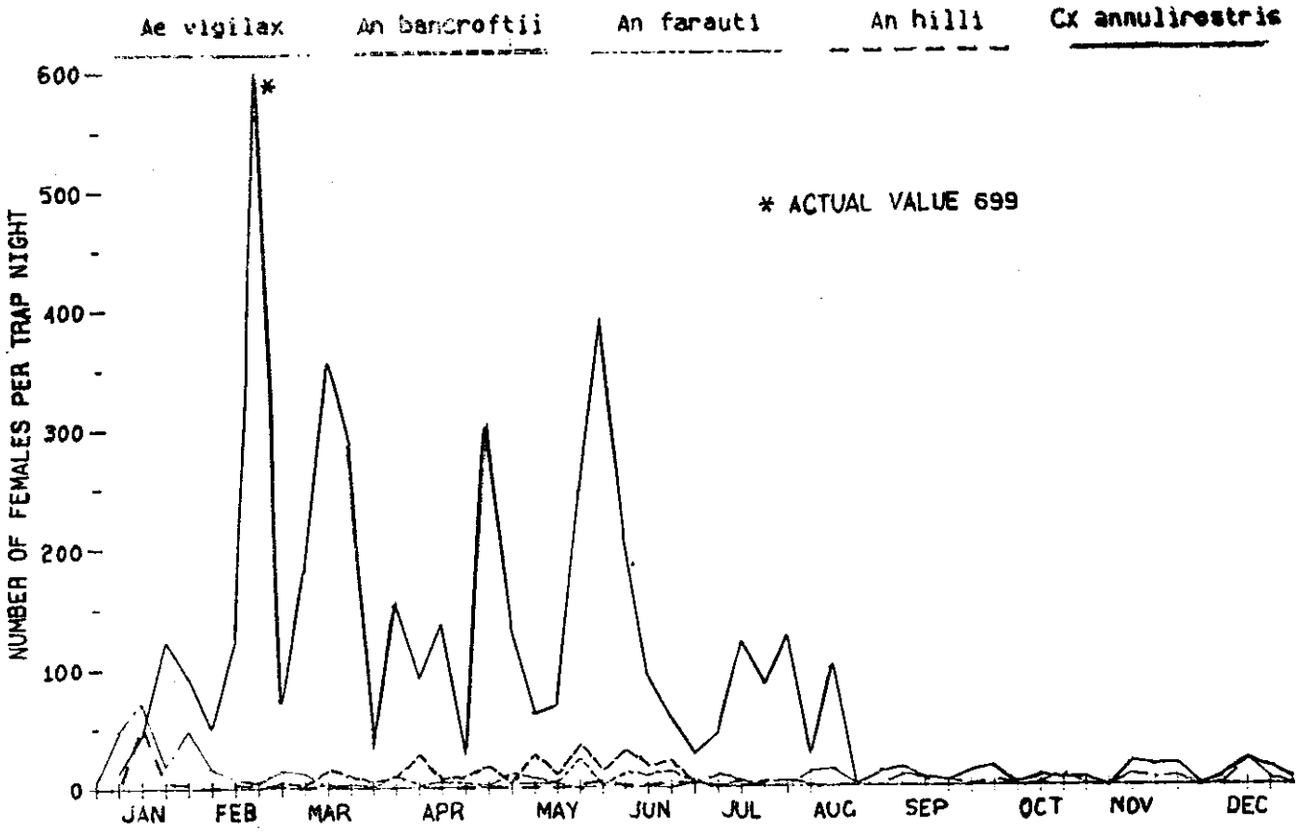
Other areas of the coastal swamps, such as the former RAAF bombing range in eastern Leanyer Swamp, and the Holmes Jungle Swamp, cannot be drained due to environmental or physical reasons. These areas can still produce mosquito problems due to the longer flying mosquito species.

MOSQUITO CONTROL BY HELICOPTER

The helicopter application of the relatively new biological compound, B.t.i. (Bacillus thuringiensis var. israelensis), was trialled for the first time in 1986. Large areas of Leanyer Swamp that could not be drained were treated by applying the B.t.i. to early stage larvae in the marsh areas. The helicopter spraying program began in October 1986, with 30ha of salt marsh breeding sites of Aedes vigilax being successfully controlled, after a large tide created suitable breeding sites. In November, the combination of a large tide and heavy rain created over 220ha of mosquito breeding, and all of this area was successfully treated over a two day period. Areas of breeding included Leanyer Swamp, RAAF bomb craters, Holmes Jungle Swamp and Micketts Swamp. Other spray operations were

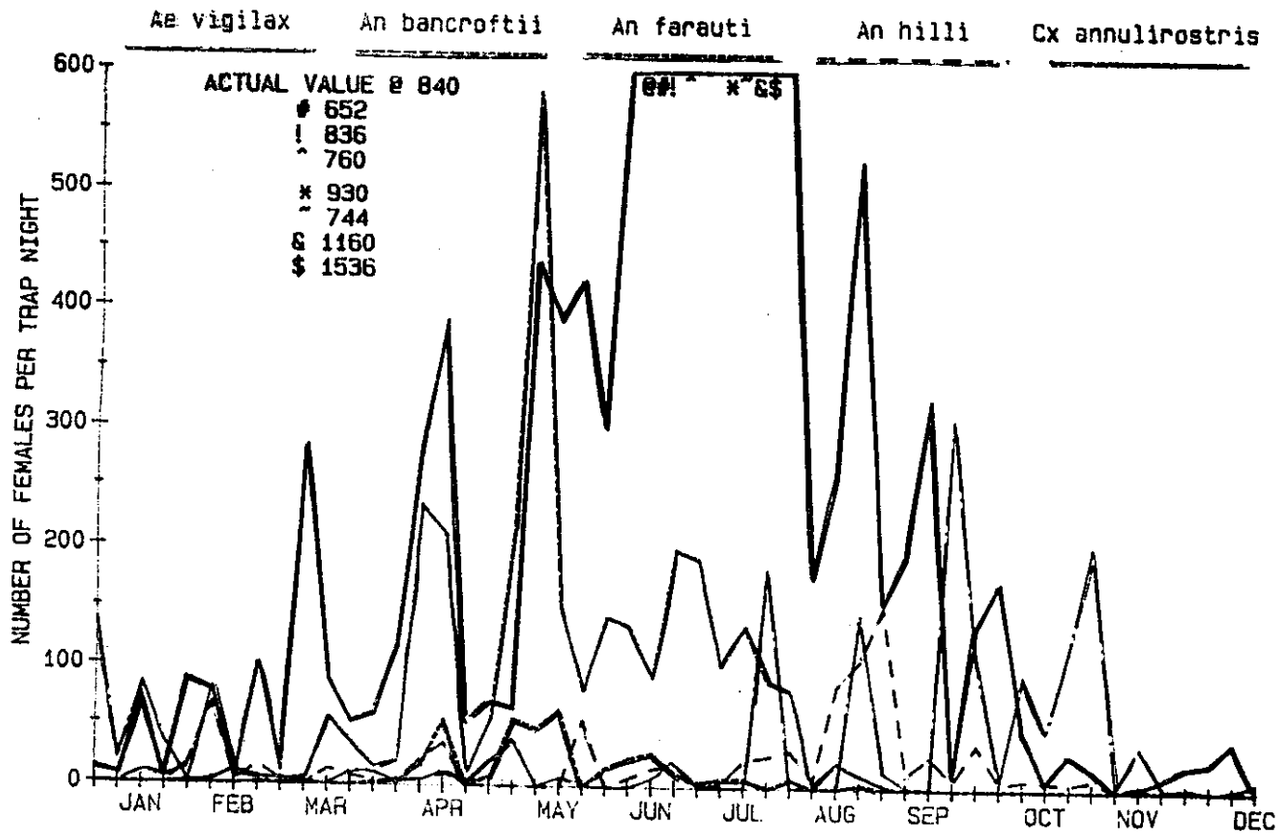
MOSQUITO MONITORING - CO2 TRAP

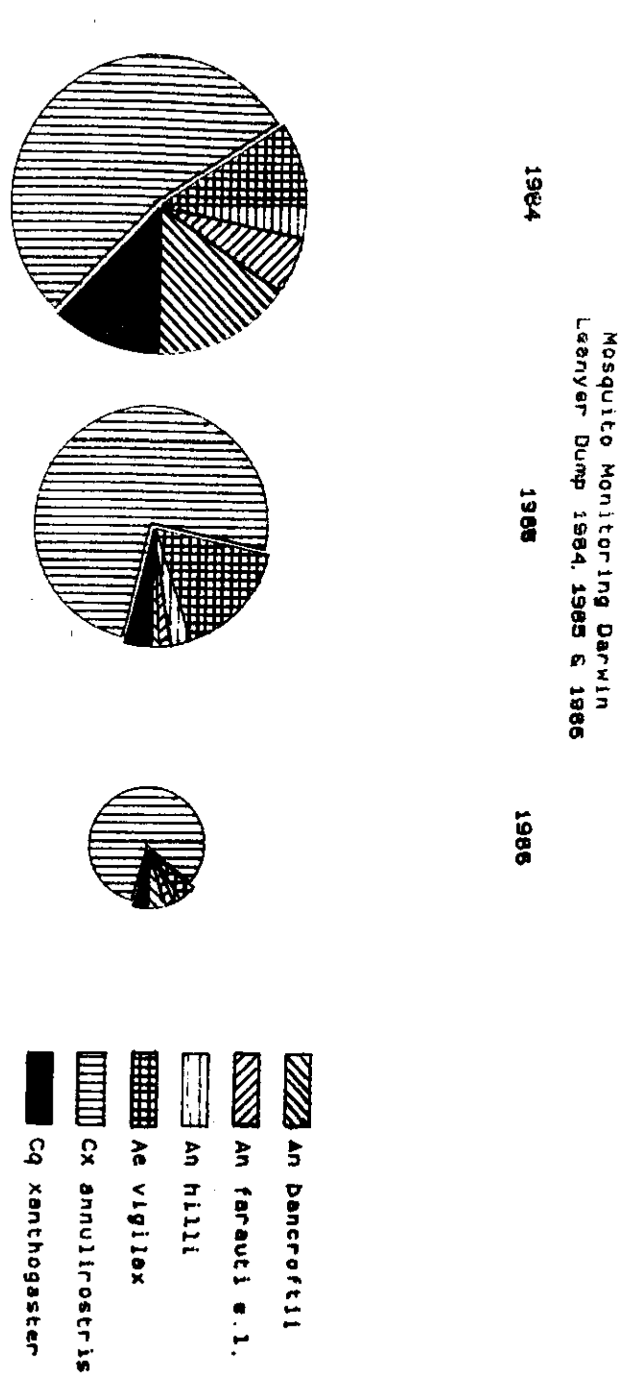
LEANYER DUMP 1986



MOSQUITO MONITORING - CO2 TRAP

LEANYER DUMP 1983





The diameter of the pies is proportional to the number of mosquitoes trapped.

carried out in December and January against further hatches of the salt marsh mosquito. This program has proved a very efficient and practical method of salt marsh mosquito control, when there may be only two days available to treat large areas before the mosquitoes are on the wing.

EFFECTIVENESS OF BOTH PROGRAMS

The Medical Entomology Branch of the Department has a continuing mosquito monitoring program around Darwin and the assessment of the Leanyer Swamp mosquito control programs indicate a resounding success. The special mosquito traps set weekly around Leanyer Swamp have verified that the programs prevented large plagues of the salt marsh mosquitoes invading the northern suburbs. This is the first year since mosquito monitoring began in 1976 that there has been no large plague of these mosquitoes in this area.

Since 1983, the mosquito numbers have shown a steady drop in the Leanyer area. In 1986, there was a 70% decrease in the numbers of all mosquito species near Leanyer Swamp compared with the 1983 figures. This includes an 80% reduction in the numbers of salt marsh mosquitoes. There has been a 90% decrease in the numbers of the big black Anopheles bancroftii, falling from 2926 mosquitoes in the traps in 1983, to 294 in the traps for 1986. For the five most important mosquito species found around Leanyer Swamp, the numbers of four of them have now fallen below pest levels in the adjoining suburbs. This has meant a significant increase in the quality of life for northern suburbs residents, and a large decrease in the potential for mosquito borne disease. These successful and ongoing programs demonstrate the great benefits of preventative health measures, and illustrates a successful interdepartmental and local government co-operative effort.

APPENDIX 2: AERIAL SPRAYING BY HELICOPTER USING BTI LARVICIDE SALT MARSH AREAS OF LEANYER SWAMP 1986/87

During the period of high tides from October 1986 to January 1987 the Entomology Section of the Northern Territory Department of Health carried out a Program of Mosquito Control using B.t.i. Larvicide delivered by helicopter spraying to Aedes vigilax breeding sites.

Details of equipment and delivery as follows:

1. Helicopter Type:- Bell 47
2. Spray Equipment:- 35 Boom equipped with 28 'T' Spray Jets with 45 Swirl D8 Disc (Jets mounted at 90 to air flow).
3. Loading:- 250-300 litres with full fuel tanks.
4. Larvicide:- Teknar. B.t.i. mixed at 10 litres per 250 litres of water.
5. Delivery Rate:- 50 litres per hectare (5 hectares per load).
6. Swathe Width:- 14 metres

7. Spraying MT.:- ± 3 metres

8. Speed:- 35 knots I.A.S. (Indicated Air Speed).

9. Droplet Size:- ± 500 Microns

It is not practical to spray at times of:

1) Low humidity if the temperature is above 25 C.

2) Winds over 15km per hour - accuracy of delivery is difficult and insecticide is wasted.

3) Rain. It is inaccurate and dangerous to apply during rain.

4) Low Speed - air and spray is recirculated by the rotors. Translational life (i.e. minimum spraying speed) is ± 10 knots.

Because of the large areas it covered, it was found to be more efficient to carry out larval surveys in co-operation with the helicopter. The helicopter is used to drop the surveyor into a potential breeding area and then proceeds to a previously surveyed area to spray. When the helicopter is empty, it picks up the Surveyor who can then point out areas to be sprayed in the area just surveyed. The helicopter then drops the Surveyor into the next area and returns to reload. This method allows for small, discrete areas to be identified and treated. A Surveyor can spot small areas from above which would possibly be missed or inaccessible by ground survey methods.

Rapid verification of kills can be done in the same way. Dead larvae appear to sink within 2 hours of spraying, so verification should be done 2 hours after spraying.

APPENDIX 3: AERIAL SPRAYING OF LEANYER SWAMP - FEBRUARY 1987

INTRODUCTION

During the Wet Season of 1987 the numbers of Culex annulirostris reached relatively high levels of 190 female mosquitoes per trap per night in the Leanyer area. Although this has reduced from the higher numbers in recent years, public complaints were received and a request was received from the Minister of Health to carry out control measures. A helicopter spray programme of the Wet Season flooded areas of Leanyer Swamp was organized and the spraying was carried out on Saturday, 28 February 1987 using B.t.i. Larvicide. The particulars of this operation are listed below.

1. Helicopter Type: Jet Ranger

2. Helicopter Contractor: Rotor Services, Manager, Karl Timm, ph: 818604, Pilot, Doug Trossan, ph: 813522.

3. Spray Equipment: Boom length 30 feet total, Nozzle type, D6-45 Swirl Plate Nozzle, there were 50 nozzles on the boom. The pressure of the sprayer was 360 kilo pascals (45 lb per square inch). Helicopter speed was 44 knots (50 mile per hour). Spray height ranged from 2 to 3 metres

in height and the swath width was 50 feet.

4. Loading: Each load as 350 litres and water was supplied by a Council tanker.

5. Larvicide: Teknar B.t.i. was mixed at 28 litres per 700 litres in a 800 litre capacity mixing tank. The B.t.i. was applied at 2 litres per hectare.

6. Usage: 180 litres of Teknar was used, making 12 helicopter loads.

7. Area Treated: Approximately 100 hectares either side of the Bombing Range causeway on Leanyer Swamp was treated with the limits being the tidally affected mud flats on three sides and the elevated ground near the new dump to the south. There was also a 5 hectare lot between the Leanyer suburb and the old dump that was treated.

8. Time: Starting spraying time was 8.00 a.m. and the spray operations were finished by 10.00 a.m. with a total time of 2 hours 31 minutes.

9. Conditions: After approximately 70 hectares had been sprayed, occasional rainstorms set in and were frequent. This had the effect of washing any B.t.i. off grass into the water and if anything, made the operation more efficient.

10. Breeding Areas: The highest concentrations of larvae were found prior to the spraying in the brackish water nearest to the bomb craters, but above the 7.9 Admiralty Chart Datum (ACD). There was approximately 70 hectares of this type of breeding area.

11. Cost: The helicopter hire cost was $527 per hour and this included 2 off-siders. This operation was covered by Order No: 181664.

12. Assessment: Three days after spraying, a larval assessment indicated total larval control. There were no instars above second instar in the whole of the treated area. Egg-rafts and first instars were present, indicating that breeding had resumed. This compared with a pre-spray presence of the whole range of instars and pupae.

PERSONAL INSECT REPELLENTS

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For many years, repellents containing di-ethyl-toluamide (DEET) were the products of choice for protection against mosquito attack. There were no known adverse reactions, and the general recommendation was that the higher the concentration of DEET, the greater the protection provided. However, a recent review[1] of the biodistribution and toxicity of DEET highlighted

several adverse effects in man. Six cases of encephalopathy (including three deaths) were reported in young girls exposed to varying quantities of DEET. The etiology was purely presumptive, and was thought to be a hypersensitivity reaction to DEET, possibly complicated by enzyme deficiencies.

The authors also report cases of confusion and other neurological signs following prolonged dermal exposure (4.25gm per week), and some instances of skin sensitivity to high concentrations (75%) of DEET.

As a result of these findings, the NH&MRC have issued a statement on the use of products containing DEET, warning of possile toxic reaction. The full text of the NH&MRC Statement appears in Table 1.

A recent article has also drawn attention to the severe toxic reactions and death following injestion of large amounts of repellents containing a high concentration of DEET[2]

REPELLENTS AVAILABLE IN AUSTRALIA

There are a large number of repellents available in Australia, and the list is constantly changing as (a) formulations are altered, (b) new products are marketed and (c) as new manufacturers enter the market with a similar range of products.

Table 2 presents a list of repellents available in Australia at April 1987 and is adapted from the Victorian Department of Agriculture and Rural Affairs pesticide listing. Other products may be available elsewhere. Note that products with a very high concentration of DEET (greater than 25% have been removed from the market by the manufacturers.

CURRENT RECOMMENDATIONS FOR REPELLENTS

DEET remains the most effective repellent for use against mosquitoes. Notwithstanding the toxicity as detailed above, and the warning issued by the NH&MRC, repellents containing DEET, when used in accordance with manufacturers instructions, can be considered to be safe. Recommendations for repellents for use by children should refer to products containing a moderate (up to 20%) concentration of DEET, and make reference to avoidance of prolonged exposure. If any skin sensitivity or other reactions are seen, then an alternative repellent containing pyrethroids and/or ethyl-hexanediol and/or dimethyl phthalate should be used.

REFERENCES

1. Robbins, P.J. and Cherniack M.G. (1986) Review of the biodistribution and toxicity of the insect repellent N,N-Diethyl-M-Toluamide (DEET). J. Toxic. Env. Hlth. 18:503-525.

2. Tenenbein, M. (1987) Severe toxic reactions and death following the ingestion of diethyltoluamide-containing insect repellents. JAMA 258:1509-1511.

TABLE 1:

news releas

NH&MRC WARNS ON IN

The National Health and Medical Re
concerns about the use of insect r
N,N-Diethyl Toluamide, otherwise k

DEET is found in some aerosol pers
also in roll-on sticks of insect r
Poisons Schedule Committee of the
scheduling of DEET following a stu
reported cases of central nervous
following exposures to DEET.

Six young girls developed brain da
though the cause of their deaths
thought that the girls may have h
deficiency condition.

The report notes that there was n
effects were shown with products
volume of DEET and for formulatio
by volume.

The Drugs and Poisons Schedule Co
safe and effective product with n
the Drugs and Poisons Schedule Co
rescheduled all formulations cont
by volume to Schedule 5 and place
products containing DEET that rea

'Warning: May be dangero
or for long periods.'

Schedule 5 of the Drugs and Poiso

'Poisons of a hazardous
available to the public
handling, storage and us

The Council noted that the acute
available data indicates that the
teratogenic, carcinogenic or muta
is enough evidence of central ner
concern.

A DEET Industry Task Force has be
NH&MRC will review the findings o
available.

For further information contact A

CANBERRA.
3 June, 1987.