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Little Fire Ant (*Wasmannia auropunctata*) in Port Vila: Report to Secretariat of the Pacific Community on activities 5-14th October 2007, and recommendations for future management

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Executive Summary

1. *Wasmannia auropunctata* (Little Fire Ants) were detected in Port Vila on 31 August 2007. In September 2007, Vanuatu Department of Livestock and Quarantine Services (DLQS) conducted extensive local delimiting and determined the boundaries of the outbreaks.
2. Two sites, 450 metres apart along the northern shore of Lagoon Number 2 were infested. These have been designated “Starfish Cove” (1.8 ha gross area) and “Hippique Junction” (6.7 ha gross area).
3. Both sites were treated between 8 and 12 October with a combination of Maxforce Fire Ant Granules™ and Xstinguish™ ant bait.
4. A dramatic reduction in ant numbers was observed in as little as 48 hours after treatment and the Little Fire Ant population has now been dramatically reduced.
5. Recommendations for future management are as follows:
 - a. The current eradication strategy as outlined in the work programme attached be followed until eradication has been achieved.
 - b. That a public engagement strategy be regarded as an integral part of the eradication programme and that funding be provided for qualified personnel to develop and execute an appropriate awareness programme.
 - c. That resources be made available to allow DLQS officers with knowledge of Little Fire Ant biology and taxonomy to follow-up reports of additional outbreaks.
 - d. Trace-forward activities be conducted especially for major movements of risk items in the past 24 months
 - e. Conduct site hygiene activities in infested areas with the co-operation of residents in infested areas.

Background

Wasmannia auropunctata (Little Fire Ant) is an invasive ant species with substantial economic, social and ecological impacts. Its preferred habitat includes shady moist sites and this co-occides with large portions of residential, rural and agricultural land on Pacific Islands. In the past few decades it has spread throughout the Pacific region and in the past few years, the true impact of this species is becoming apparent to people living in infested areas.

This species is largely arboreal, living in and on vegetation commonly found around residential buildings and in food gardens. People tending their gardens often accidentally dislodge large numbers of foragers which then fall on the workers and sting them as they work. Ants often venture into houses where they will spoil food, nest in electrical items and clothing and sting people and children as they sleep.

Approximately 10 years ago, Little Fire Ants were reported in the Banks and Torres groups of islands of Vanuatu. However, in August 2007 it was also identified in Port Vila. After the initial detection on August 31 2007, DLQS officers in collaboration with Dr Herve Jourdan of New

Caledonia, thoroughly surveyed the area around the detection in September. Two outbreaks were identified and their boundaries determined by systematic monitoring using bait cards placed at 10 metre intervals. Both outbreaks are located along the northern shoreline of Number 2 Lagoon and are 450 metres apart (Figure 1). Both outbreaks are bisected by the ring road that follows the shore-line of the lagoon. GPS points taken along the boundaries of these outbreaks are appended.

The smaller outbreak is located near Starfish Cove and covers approximately 1.8 hectares. This will be referred to as “Starfish Cove”. The southern boundary adjoins the lagoon and the northern boundary runs through a mixture of forest, fallow ground and food gardens. The eastern and western boundaries are well-defined.

The larger outbreak is located at the junction of the ring road and the road that leads to Hippique resort and covers an area approximately 6.7 hectares. This outbreak will be referred to as “Hippique Junction”. The southern boundary adjoins the lagoon and the northern boundary runs between a well developed food garden and a forest area. The eastern and western boundaries are well-defined and run through open pasture on the east and a soccer field on the west.

This report outlines the response to this discovery, provides some early results of treatment and lists recommendations for future activities that will contribute to eradication of this species from Port Vila.

Project Scope and objectives

The objectives of this study were as follows:

1. Assess the feasibility of eradicating the delimited Little Fire Ant infestations
2. Provide technical assistance to DLQS staff and management including training in current treatment methodologies.
3. Supervise the treatment of known outbreaks and monitor results
4. Brief the Vanuatu minister for Agriculture Quarantine Forestry and Fisheries
5. Develop an operational plan for eradication
6. Recommend management strategies to deal with Little Fire Ants in Port Vila

Assessment of feasibility

Invasive ants in general, and Little Fire Ants in particular, are notoriously difficult to control. There are a number of reasons for this. although this study does not attempt to provide a comprehensive review of the biology of this species or report in detail of previous control attempts, there are several points worth noting.

Most invasive ants nest in soil and their preferred habitat are open areas with a high degree of insolation. Little Fire Ants and Yellow Crazy Ants (*Anoplolepis gracilipes*) differ in this regard and these species prefer shady moist habitats. Little Fire Ants in particular forage and nest in soil as well as in vegetation and other structures. Indeed, they prefer to nest and forage in and on vegetation, building small nests in any available crack crevice or hollow. Typical residential areas in the Pacific region offer a host of suitable habitats: in food gardens, crop areas, in buildings and other structures.

Baits (an attractive food matrix laced with a toxin) are regarded as best practice for control of ants. However, most commercial ant baits are manufactured in granular form and designed for easy distribution over the soil surface. Among these baits there are several formulations that have been used against Little Fire Ants nesting in soil with varying degrees of success. These baits all take a similar form: comprised of pre-gel defatted corn grit mixed with ~20% (by weight), vegetable oil that has been pre-mixed with a toxin. In the Galapagos Islands, a small infestation of Little Fire Ants was successfully eradicated using granular baits. The site contained a simple vegetation structure and was devoid of lush vegetation or dwellings. However, this work demonstrates that granular baits are effective at controlling ants on the soil surface. A thorough review of bait types available worldwide has been prepared by Stanley (2004).

In Pacific environments, Little Fire Ants appear to nest predominantly in and on vegetation. Here, they gain much of the energy needed for rapid colony growth and dispersal by tending hemiptera which provide them with an abundant supply of carbohydrates. Protein is also needed for colony growth for brood development and queen maintenance.

Therefore, a bait made from a protein attractant and manufactured in a form suitable for distribution on trees and foliage will logically be a good candidate for control of Little Fire Ants. Maxforce Ant Granules™ is made from a base of silkworm pupae (protein), however, it is only available in granular form making it unsuitable for arboreal distribution. A New Zealand manufactured product, Xstinguish™ is a paste bait manufactured on a lipid and protein base. It is marketed primarily for control of Argentine Ants (*Linepithema humile*) but is effective for a broad range of ants.

A combination of treatment of the ground layer with granular baits (Maforce Fire Ant Granules™ or similar, containing hydramethylnon as the active ingredient), and treatment of vegetation with a paste bait (Xstinguish™ containing fipronil as the active ingredient) was hypothesized by Vanderwoude *et al.* (2007) to be an effective control method for Little Fire Ants. This was tested on a small (6 hectare) infestation in East Sepik province of Papua New Guinea and early results indicate this is an effective technique.

Using combination treatments of granular and paste baits therefore, has a good probability of being a feasible eradication method, and this is the recommended treatment method for this project. The total infested area does not exceed 10 hectares and this is a manageable size. Provided treatment is applied thoroughly and a sufficient number of times, it is technically feasible to eradicate this species from known infested areas in Port Vila.

Provision of technical assistance and training

Meetings with the Director and Chief Plant Protection Officer of Vanuatu DLQS were held on 6, 9, and 13 October. During the week of 8-12 October, two technical officers of DLQS were trained in calibration and distribution of bait.

Treatment activities

The DLQS officers supervised three casual labourers from 8-12 October. During this period, the entire infested area was treated. Approximately 12 kg of Maxforce Fire Ant Granules and 18kg Xstinguish were used. All vegetation and open areas were treated. Grassed areas were treated with Maxforce (Figure 2). Application of baits to vegetation required that larger trees be climbed in order for baits to be distributed. This was done in a systematic and thorough fashion (Figure 3). Vegetation too low to be climbed were treated in two ways: first, all leaf axils, hollows, cracks and crevices were treated. Second, a method developed during the project was used to spread additional bait over foliage. This method (the KiluKilu technique) was named after the person who developed it. Essentially, the operator swings the caulking gun while simultaneously squeezing the trigger (Figure 4). The result is a shower of small amounts of Xstinguish which land on the vegetation requiring treatment.

Ministerial briefing

On 11th October 2007, the Vanuatu minister for Agriculture Quarantine Forestry and Fisheries, the honourable Donna Brown, was provided a comprehensive briefing on the impacts of Little Fire Ants, treatment activities and preliminary results. A Powerpoint presentation and a written briefing note (appended) were provided during a 90 minute meeting in the minister's office. Mr Brown expressed great concern at the potential impacts of this species on the people, economy and environment of Port Vila and verbally committed to seek funding of 11 million vatu over two years through the council of ministers.

Operational plan

An operational plan for future treatment and monitoring activities has been prepared and is attached to this report.



Figure 2. DLQS officer spreading Maxforce Fire Ant Granules with closeup of spreader (inset).



Figure 3. Casual labourer applying Xstinguish to trees



Figure 4. DLQS officer spreading Xstinguish bait using the KiluKilu method with resulting bait distribution on leaf (inset)

Discussion and recommendations for future management

Preliminary results

After treatment had been applied, there were dramatic changes to the ant community visible on the site. Twenty four hours after treatment, a substantial reduction in foraging by Little Fire Ants was observed. As early as two days after treatment, other ant species (*Pheidole spp*, *Tapinoma melanocephalum*, *Monomorium spp* were observed foraging where previously only Little Fire Ants could be found. After four days, in some locations, *Pheidole spp* had taken over the task of tending the Hemiptera on trees where previously only Little Fire Ants were undertaking this task (Figure 5).

Recommendation 1: That the current eradication strategy as outlined in the work programme attached be followed until eradication has been achieved.

Public Awareness

A well designed public awareness programme is a crucial component of the management strategy of this species at Port Vila. Three key messages should be conveyed by this programme.

First, there are undoubtedly additional outbreaks in Port Vila that have not yet been reported. It is important to determine at an early stage, the extent of this problem because if there are many other outbreaks in Port Vila, eradication of the Starfish Cove and Hippique Junction outbreaks may not be a wise use of resources. The cost of controlling an invasive species is substantially less than the cost of eradicating the same species. Eradication by definition requires that the population is reduced to zero. This requires careful and thorough treatment, often repeated a number of times and careful monitoring of the remaining population. In contrast, a well executed population management programme has similar benefits at a much lower cost.

Second, the public need to be informed of the potential impacts of this species to their daily lives. This information will influence all potentially affected people to assist DLQS in a co-operative manner to find further outbreaks and report them promptly. Also, society has a right to make its own decision on the importance of this invasive species in relation to other issues that are of importance to them.

Finally, it is almost impossible to prevent the risk of further spread of this species by enforcement of movement controls and other quarantine actions. The risks associated with spread from known loci are largely if not entirely due to accidental human-mediated dispersal. Little Fire Ants have spread throughout the world with human commerce – the movement of people and commodities from one place to another. Little Fire Ants can be accidentally moved from one location to another through vectors as common as produce, woven baskets and other personal effects. It is traditional in Melanesian society (and other societies) to bring gifts of food when visiting friends and family. This pathway is probably responsible for the initial introduction of this species to Port Vila. The public needs to be made aware of the risks they themselves might inadvertently present to further spread of this species. This could be presented to them in a form that encourages them to carefully check personal effects before transporting them to ensure they do not bring this problem to the homes of friends and family.

Recommendation 2: That a public engagement strategy be regarded as an integral part of the eradication programme and that funding be provided for qualified personnel to develop and execute an appropriate awareness programme.

National delimiting survey

It is essential that as other possible introductions of this species be identified and delimited. A key to this is the co-operation of the public in reporting suspected outbreaks elsewhere in Port Vila (see above). Resources need to be made available to allow DLQS officers with knowledge of Little Fire Ant biology and taxonomy to follow-up reports of additional outbreaks. This should be conducted in a systematic fashion, with all reports checked by appropriately trained DLQS officers. All data resulting from these reports need to be documented: both positive and negative. The ratio of positive to negative public reports can be used to estimate the probability of additional unknown outbreaks being present in Port Vila.

Recommendation 3: That resources be made available to allow DLQS officers with knowledge of Little Fire Ant biology and taxonomy to follow-up reports of additional outbreaks.

Trace-forward activities

Little Fire Ant population density was very high at both the Hippique Junction and Starfish Cove sites, and as a result, the possibility of ants having been accidentally transported from these sites to new locations is high. Tracing past movement of high-risk vectors should therefore be undertaken as a matter of priority. While there would be too many movements of small quantities of produce to investigate, major pathways exist that need to be followed up. Included in these are the following:

1. Movement of household waste to land fill sites
2. Major movements of soil, gravel etc from either site in the past 24 months
3. Movements of earthmoving machinery onto and off either site
4. Status of nursery near Starfish Cove. There is a nursery west of the Starfish Cove outbreak. This nursery should be surveyed to ensure it is not infested and inadvertently moving Little Fire Ants with sale of plants and landscaping materials.

Recommendation 4: That trace-forward activities be conducted especially for major movements of risk items in the past 24 months

Site hygiene

By their nature, residential areas in the Pacific region generally offer abundant opportunities for Little Fire Ants to establish nests. Treatment activities would be made less costly and more effective if the habitat was made more hostile to establishment of nests in the infested areas and available nesting sites reduced. This could be accomplished through general site hygiene including cutting grass, gathering trash and debris, and burning these on-site. Reducing places that Little Fire Ants can establish nests will reduce the amount of treatment needed and further reduce the Little Fire Ant population. This is especially important before the second round of treatment.

Recommendation 5: Conduct site hygiene activities in infested areas with the co-operation of residents in infested areas.

References

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Figure 5. Hemiptera being tended by endemic ant species four days after treatment. Inset shows same location with *Wasmannia auropunctata* dominating 4 days earlier

Appendix 1. GPS co-ordinates of Starfish Cove and Hippique Junction outbreaks

Grid Datum	Lat/Lon hddd°mm.mmm'		
Header	Name	Position	Altitude
Waypoint	4	S17 44.941 E168 21.762	1 m
Waypoint	5	S17 44.919 E168 21.817	9 m
Waypoint	6	S17 44.902 E168 21.833	19 m
Waypoint	7	S17 44.890 E168 21.819	13 m
Waypoint	8	S17 44.797 E168 21.816	8 m
Waypoint	9	S17 44.766 E168 21.771	-2 m
Waypoint	10	S17 44.826 E168 21.721	3 m
Waypoint	12	S17 44.828 E168 21.697	17 m
Waypoint	13	S17 44.870 E168 21.686	7 m
Waypoint	14	S17 44.886 E168 21.701	5 m
Waypoint	15	S17 44.715 E168 21.426	-22 m
Waypoint	16	S17 44.714 E168 21.445	-12 m
Waypoint	17	S17 44.715 E168 21.457	-6 m
Waypoint	18	S17 44.672 E168 21.488	4 m
Waypoint	19	S17 44.637 E168 21.409	7 m
Waypoint	20	S17 44.672 E168 21.384	8 m
Waypoint	21	S17 44.698 E168 21.373	9 m

**Attachment 1: MSDS and labels for Maxforce Fire Ant granules and
Xstinguish Ant Bait**

Attachment 2: Briefing note to Minister of Agriculture

Attachment 3: Proposed work plan



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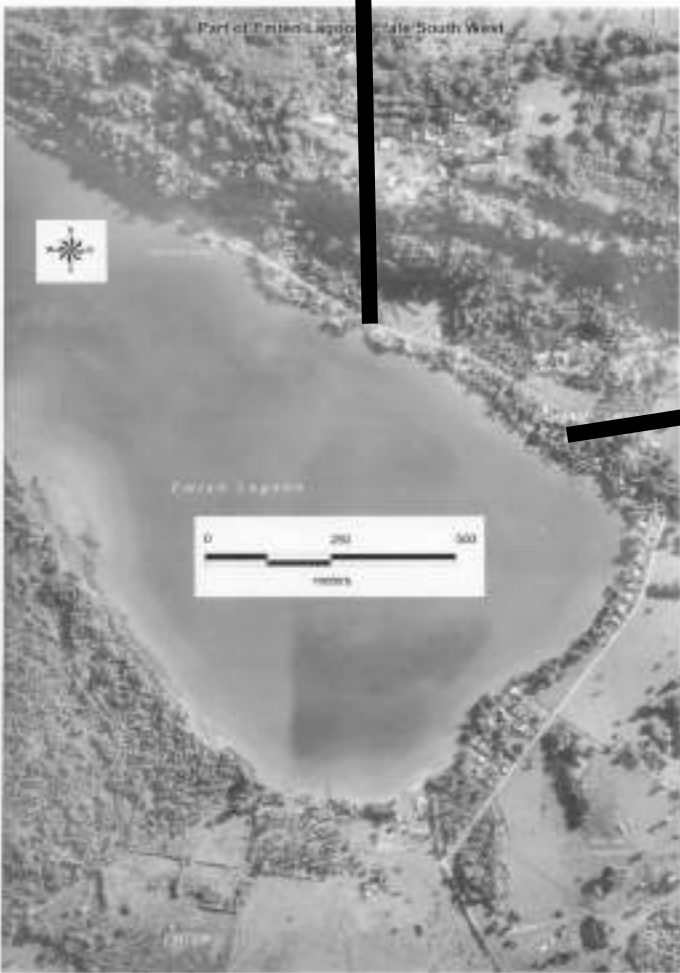
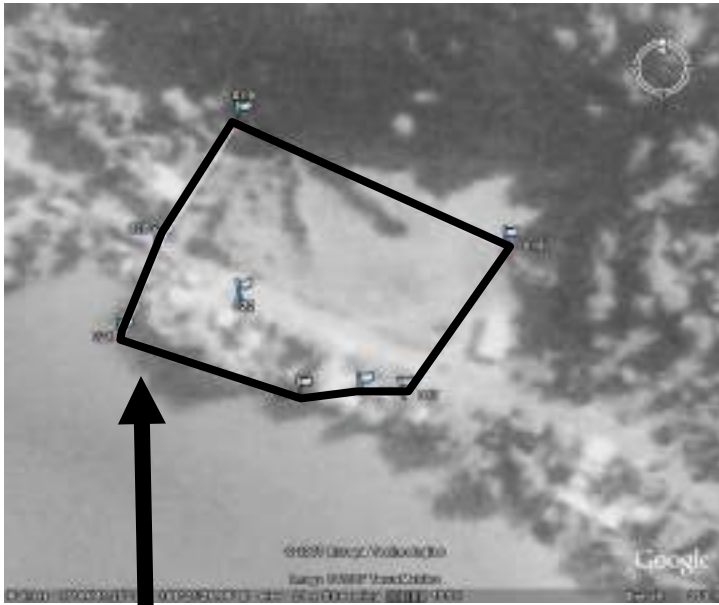
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Little Fire Ant (*Wasmannia auropunctata*) in Port Vila

Briefing note to the honourable Donna Brownly, Minister for Agriculture, Quarantine, Forestry and Fisheries

1. In the last two decades, Little Fire Ants (*Wasmannia auropunctata*) have spread rapidly through the Pacific region as a consequence of human commerce. It is only in the past few years the impacts of this species have become apparent and it is now regarded as one of the world's worst invasive species.
2. This species has now been discovered beside Emden Lagoon in Port Vila by officers of VQIS. Two small infestations have been delimited, with a total infested area of 8.5 hectares (see attached map). It has also been found on several of Vanuatu's smaller islands.
3. Little Fire Ants prefer shady habitats such as those that cover much of Port Vila's residential areas. The ant causes painful stings and children are especially affected. In time, as this pest spreads, every child in Port Vila is likely to be stung at least once during their early years.
4. Most affected will be people tending food gardens and working in agriculture, habitats in which this species flourishes. In infested areas, people can expect to be stung daily. The tourism industry, the environment and livestock will also be impacted to varying degrees.
5. Currently there is an opportunity to eradicate this ant while known infestations are small. As infestations spread, eradication will become economically unfeasible.
6. VQIS staff have begun control operations in the known infested area and early results of this treatment show great promise for a successful outcome. However, without a commitment to future activities, this investment will be wasted. A detailed and funded eradication plan is needed at this time.
7. The eradication plan should contain provision for public awareness, treatment, monitoring habitat alteration, movement controls and further delimiting activities.



End of brief

Draft work programme for eradication of Little Fire Ant (*Wasmannia auropunctata*) in Port Vila

Report prepared for Secretariat of the Pacific Community and Vanuatu Department of Livestock and Quarantine Services

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Background

Wasmannia auropunctata (Little Fire Ant) is an invasive ant species with substantial economic, social and ecological impacts. Its preferred habitat includes shady moist sites and this co-occides with large portions of residential, rural and agricultural land on Pacific Islands. In the past few decades it has spread throughout the Pacific region and in the past few years, the true impact of this species is becoming apparent to people living in infested areas.

This species is largely arboreal, living in and on vegetation commonly found around residential buildings and in food gardens. People tending their gardens often accidentally dislodge large numbers of foragers which then fall on the workers and sting them as they work. Ants often venture into houses where they will spoil food, nest in electrical items and clothing and sting people and children as they sleep.

Approximately 10 years ago, Little Fire Ants were reported in the Banks and Torres groups of islands of Vanuatu. However, in August 2007 its presence in Port Vila was detected by officers from the Vanuatu Department of Livestock and Quarantine Services (DLQS). This report contains recommendations for managing this incursion, including treatment, containment and monitoring procedures. A workplan for tasks and standard operating procedures for each activity are appended.

Introduction

Initial delimiting of this outbreak was conducted by DLQS officers during September 2007. Two outbreaks were discovered and their boundaries determined by systematic monitoring using bait cards placed at 10 metre intervals. They are found along the northern shoreline of Number 2 Lagoon and are 450 metres apart (Figure 1). Both outbreaks are bisected by the ring road that follows the shore-line of the lagoon. GPS points taken along the boundaries of these outbreaks are appended.

The smaller outbreak is located near Starfish Cove and covers approximately 1.8 hectares. This will be referred to as “Starfish Cove”. The southern boundary adjoins the lagoon and the northern boundary runs through a mixture of forest, fallow ground and food gardens. The eastern and western boundaries are well-defined.

The larger outbreak is located at the junction of the ring road and the road that leads to Hippique resort and covers an area approximately 6.7 hectares. This outbreak will be referred to as “Hippique Junction. The southern boundary adjoins the lagoon and the northern boundary runs between a well developed food garden and a forest area. The eastern and western boundaries are well-defined and run through open pasture on the east and a soccer field on the west.

Proposed Operational Plan

This operational plan covers field activities related to eradication of Little Fire Ants from Starfish Cove and Hippique junction outbreaks. A timetable for activities is listed in Table 2. The operational plan does not encompass additional issues related to an eradication plan such as a

national delimiting programme, public awareness strategy, strategic planning, funding, movement controls or trace-forward work.

Future delimiting at Starfish Cove and Hippique Junction

Without going to extreme lengths in modifying the method used in the initial delimiting survey, nests just beyond the periphery of the designated infested area may remain undiscovered. These nests will spread beyond the treated area and jeopardize eradication. Future delimiting around these outbreaks should be conducted at 6 monthly intervals to ensure no ant nests have remained undiscovered beyond the area under treatment. Delimiting should occur in a 20 metre band immediately beyond the treated area on the northern, eastern and western boundaries of the two outbreaks.

Delimiting new outbreaks.

It is inevitable that other outbreaks will be discovered after public awareness programmes are conducted. Some DLQS staff are now able to readily identify this pest in the field and also have a detailed knowledge of preferred Little Fire Ant habitat. For each report, a sample should be collected from the site by an experienced DLQS officer and examined under a microscope using the key developed by Gunawardana & Sarnat (2007). Once confirmed, these new sites should be delimited using the existing method with several small modifications that are intended to save time and increase the quality of information gained.

Little Fire Ants spread by budding and therefore an outbreak commonly comprises a single supercolony radiating from the point of introduction. New outbreaks are the result of human assisted dispersal and these should each be treated as separate incursions. The colony therefore will consist of a single uninterrupted continuum of ants. The obviously infested area can be determined more easily by visual inspection of preferred habitat at regular intervals radiating outwards from the point of detection. Once the surveyor has difficulty in locating colonies or foraging trails, he or she should then employ the bait card technique to fine-tune the infested area. Within the core area, several bait cards can be placed at strategic points in order to gain information on ant abundance. For each bait card, ant abundance should be recorded in order to measure the density of ants. A simple scoring system is to be used as follows:

- 0= no ants
- 1= 1 ant
- 2= 2-10 ants
- 3= 10-25 ants
- 4= 26-50 ants
- 5= >50 ants

These data are to be recorded on a sketch of the site, or with GPS units for later download and mapping. It becomes very important at a later time when recording the result of treatment.

It is desirable to map the boundary of each outbreak using a GPS to record waypoints at strategic locations. This will allow accurate mapping to be conducted at a later time. Additionally, several samples of ants, males and queens should be taken and preserved in ethanol. The identity of these samples should be confirmed by DLQS officers under a microscope and a second confirmation sought from another entomologist. A representative sample of queens and alates from each sampled nest should be sent to Dr Jourdan of New Caledonia along with their GPS coordinates.

Containment

Containment is defined as any activity conducted in order to limit further spread of a known infestation. When a new outbreak is discovered, a band of granular bait 10-15 metres wide should be applied along the delimited perimeter of the outbreak at the earliest possible opportunity. This will serve as a barrier that prevents further natural spread until a decision on how to manage the entire area can be made by appropriate authorities.

During treatment, a containment band should be applied around each outbreak on a monthly basis to ensure no colonies cross into untreated areas to continue to spread. This can be accomplished using granular baits and optional strategic baiting of trees with paste baits.

Treatment

Initial treatment with a combination of paste bait for vegetation and structures; and granular bait for open areas is recommended. Treatments should be conducted on 2 occasions approximately 3 months apart. Before applying second or subsequent treatments, a small area should be test-baited to ensure the Little Fire Ants do not exhibit bait shyness. After the second treatment has been applied, monitoring data (see below) can be used to make a decision on future activities. If Little Fire Ant activity is still apparent and widespread, a third broad-acre treatment should be applied 3 months later. If ant activity has decreased to small discrete areas, these could be “spot” treated to save labour and bait.

A spot treatment regime relies heavily on the ability to detect all remaining colonies. This will require more careful searching by the operator. Wherever a colony has been detected an area with 10 metre radius around that colony should be deemed infested and treated. Spot treatments should be repeated at 3 month intervals until no ants are detected. At this point, “virtual eradication” has been achieved and follow-up monitoring should be conducted to demonstrate area freedom.

Monitoring

Repeated monitoring immediately before, and 2 weeks after each treatment is essential to the eradication as it allows the effect of treatment to be documented. This may demonstrate that treatment is effective or may reveal deficiencies in either the method or execution. Monitoring should be conducted systematically at 10 metre intervals and ant activity scored as for delimiting. Resulting data are to be recorded on a sketch map or by means of GPS waypoints which are downloaded and filed with activity data. The use of GPS is preferable as it will facilitate mapping and communication of resulting data.

Once treatment ceases and “virtual” eradication has been achieved, monitoring should continue for 2 years to demonstrate area freedom. The intervals between surveys can be lengthened to once every 6-9 months (3-4 surveys over a 24 month period). Again, results should be carefully documented in order to demonstrate success.

References

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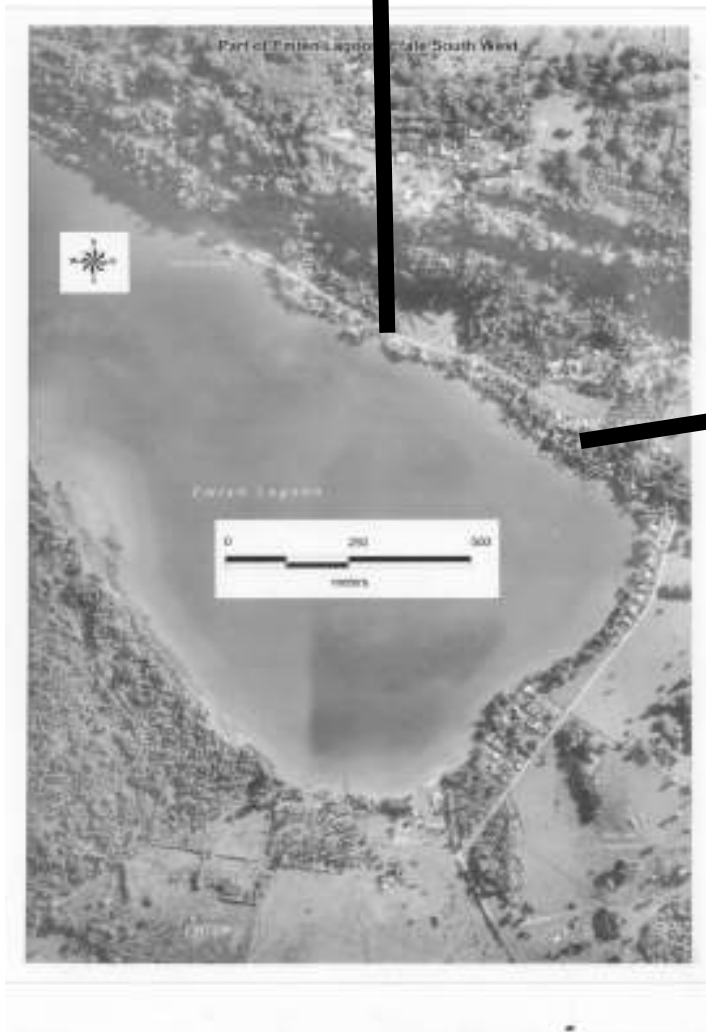
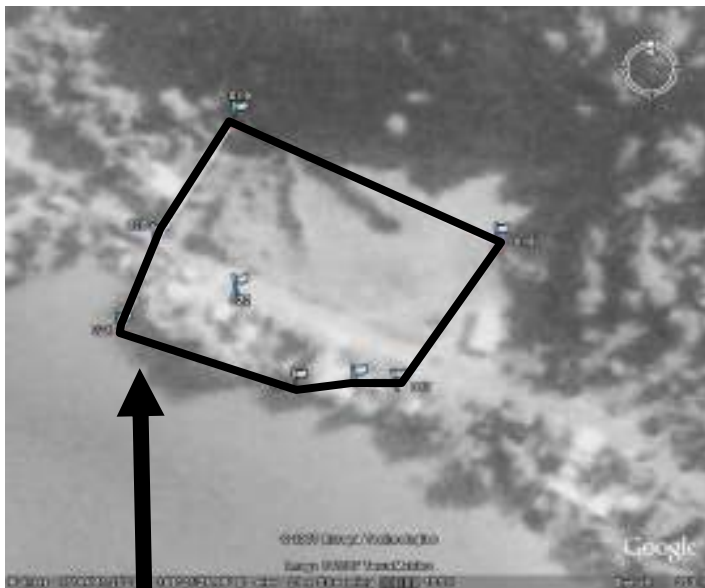


Figure 1. map of Lagoon Number 2 (bottom left), Starfish Cove outbreak (top) and Hippique junction outbreak (right)

Table 1. Workplan for eradication of Starfish Cove and Hippique Junction LFA outbreaks

date	Activity	Comment
8-12 Oct 2007	Broad acre treatment with granules and paste bait	Estimate 20 working days effort and 250,000vt chemicals
22-23 Oct 2007	Monitor both sites and record activity	2-3 working days
5-6 Nov 2007	Containment of perimeter with granule bait	1 working day, 10,000vt chemicals
13-14 Dec 2007	Monitor both sites and record activity	2-3 working days
17-21 Dec 2007	Broad acre treatment with granules and paste bait	Estimate 20 working days effort and 250,000vt chemicals
3-4 Jan 2008	Monitor both sites and record activity	2-3 working days
21-22 Jan 2008	Containment of perimeter with granule bait	1 working day, 10,000vt chemicals
18-19 Feb 2008	Containment of perimeter with granule bait	Repeat every 3 months until until no ants detected then every 6 months for 2 years
17-19 Mar 2008	Careful survey of infested area to identify needs for treatment	Repeat every 3 months until Oct 2009
24-28 Mar 2008	Either broadacre treatment of both sites, otherwise spot treatment of remaining nests	Repeat every 3 months until no ants detected
7-8 Apr 2008	Monitoring of entire area and record activity.	Repeat every 3 months until no ants detected
9-11 Apr 2008	Monitor 20 metre buffer zone beyond containment zone	3 working days, repeat April 2009

The above table does not allow for planning, data management and documentation which are all essential components of any operation.

STANDARD OPERATING PROCEDURE: DELIMITING SURVEY and MONITORING

Purpose and scope

This standard operating procedure describes recommended methods for delimiting a newly discovered outbreak of Little Fire Ant (*Wasmannia auropunctata*) and monitoring ant activity before and following treatment. Collection of data necessary for proper record keeping is also described.

Background

Little Fire Ants are spreading rapidly through the Pacific region and have recently been reported in Port Vila, Vanuatu. It is an invasive species with substantial economic, social and environmental impacts. Eradication of this pest requires that infested areas are accurately mapped prior to treatment or other management activities.

Materials

1. Smooth peanut butter
2. White cards (10cm x10cm) or similar
3. GPS unit with cables and software for downloading waypoints
4. Data sheet (Figure 2)

Method

An operator familiar with the biology and habitat preferences of Little Fire Ant should be present at all times during the survey and should be responsible for all visual surveillance. Starting from the point of detection, the operator should walk away from this point on several radii, visually inspecting locations where Little Fire Ants may be present. These locations include but are not limited to:

1. Leaf axils in banana suckers and palms
2. On or near leaves where hemiptera (scales, aphids etc) are apparent
3. In dead wood, hollows and branch junctions of trees and shrubs
4. In cracks or crevices under stones and debris
5. Immediately adjacent to structures such as houses, outbuildings, coral outcrops and stone walls
6. The stem, trunk and leaves of all scale-susceptible plants including papaya, soursop, mango, breadfruit, jakfruit, citrus and other fruiting or flowering trees.

Once the limits of detectability have been reached (when it becomes difficult to find LFA), white cards baited with a smear of peanut butter are to be placed in a 10m x 10m grid pattern following the method devised by Dr Jourdan. The cards are to be placed in the shade close to the habitats listed above. Where shade is not available, the cards should be covered with a section of banana

leaf or similar. The cards need to be exposed for 1-2 hours to allow ants the opportunity of finding the baits and recruiting to them. While waiting for sufficient time to elapse, the operator should place bait cards through the visually surveyed area at 20-25 metre spacing (approximately 4 cards per residential property). The period between 11.30am and 1.30 pm is generally too warm for adequate ant recruitment and this period should not be counted in the 1-2 hour waiting time.

After 1-2 hours exposure, the operator is to check each card, take a GPS reading, and assess the number of ants present. The waypoint numbers and activity scores are to be recorded on the delimiting survey data sheet (Figure 2). If a GPS is not available, the operator should sketch the approximate layout of surveyed properties and clearly mark the location and activity scores for each bait card.

When conducting a monitoring survey, bait cards are to be placed at 10 metre intervals throughout each infested property and this should be supplemented with a visual inspection of likely habitats.

During the survey, several ant samples should be taken and stored in ethanol. A GPS waypoint or sketch of the sample location is to be taken and this can be recorded on the datasheet in Figure 2. The words “*ant sample*” are to be written in the space where ant abundance is normally recorded. A sample of queens, alates and workers from a single nest is to be stored in a vial. Do not combine ants from different nests. The appropriate waypoint is to be recorded on the sample. On returning to the office, a trained DLQS officer is to confirm the identity of the samples and forward a portion of each sample along with collection details to a second entomologist for confirmation.

Collection of samples during monitoring surveys is not necessary unless the operator has some doubt over the identity of the specimen. In this case, collect only workers and do not disturb the nest as nest disturbance will compromise future treatment and may cause the colony to move to a new location or fragment and spread.

STANDARD OPERATING PROCEDURE: CONTAINMENT

Purpose and scope

This standard operating procedure describes recommended methods for containing a newly discovered outbreak of Little Fire Ant (*Wasmannia auropunctata*) and for ongoing prophylactic containment of existing outbreaks.

Background

Little Fire Ants are spreading rapidly through the Pacific region and have recently been reported in Port Vila, Vanuatu. It is an invasive species with substantial economic, social and environmental impacts. Eradication of this pest requires that ants are contained within infested areas and do not spread beyond treatment boundaries

Materials

1. Maxforce Fire Ant Granules, Amdro or similar product
2. “Scott” brand bait spreader

Method

The intent of treatment of a containment line is to create a treated buffer between areas known to be infested and areas believed to be free of Little Fire Ants. It may be thought of as a prophylactic treatment that provides an extra level of security. Maxforce™ Fire Ant Granules, Amdro™ or similar products are easily distributed using a “Scott” brand bait spreader. The aperture is set at “1” (Figure 3) and the operator winds the spreader handle at approximately 60 rpm while walking at 3 km/h (Figure 4). The swath width thus created is approximately 4 metres. Therefore three passes along the containment line should be sufficient to deliver a 10-15 metre treated zone.

It is important that the same zone is treated on successive operations as this provides a continuous barrier to spread by Little Fire Ant colonies. The path taken by the operator should be carefully selected and wherever possible, a track or open area should be chosen. The centre of the containment path should be as close as practically possible to the edge of the treatment area.



Figure 3. Image of a “Scott” bait spreader showing the winding handle (a), the aperture adjustment (b) and correct grip. Set the aperture at “1”.



Figure 4. Walk at a steady 3km/h pace while winding spreader handle at approximately 60rpm.

STANDARD OPERATING PROCEDURE: DISTRIBUTION OF ANT BAIT GRANULES

Purpose and scope

This standard operating procedure describes recommended methods for treating the ground within a designated outbreak of Little Fire Ant (*Wasmannia auropunctata*).

Background

Little Fire Ants are spreading rapidly through the Pacific region and have recently been reported in Port Vila, Vanuatu. It is an invasive species with substantial economic, social and environmental impacts. Eradication of this pest requires that ants are contained within infested areas and treated with products that will eradicate them.

Materials

1. Maxforce™ Fire Ant Granules, Amdro™ or similar product
2. “Scott” brand bait spreader

Method

The intent of treatment with granular baits is to deliver an even distribution of the bait over the soil surface at an approximate rate of 2kg product per hectare. Maxforce Fire Ant Granules, Amdro and similar products are easily distributed using a “Scott” brand bait spreader. The aperture is set at “1” and the operator winds the spreader handle at approximately 60 rpm while walking at 3 km/h (see standard operating procedure for containment). The swath width thus created is approximately 4 metres. An overlapping series of parallel swathes is recommended. This is accomplished by starting on one boundary of an infested site and proceeding 1 metre inside the boundary. Once the operator reaches the end of the treatment area, he or she takes 2-3 paces towards the untreated area and returns parallel to the original path (see Figure 5). Continuing this process, the designated area can be systematically covered. It is important that all ground is treated including spaces between buildings and corners of gardens. An additional sweep around buildings, garden edges and other structures is recommended.

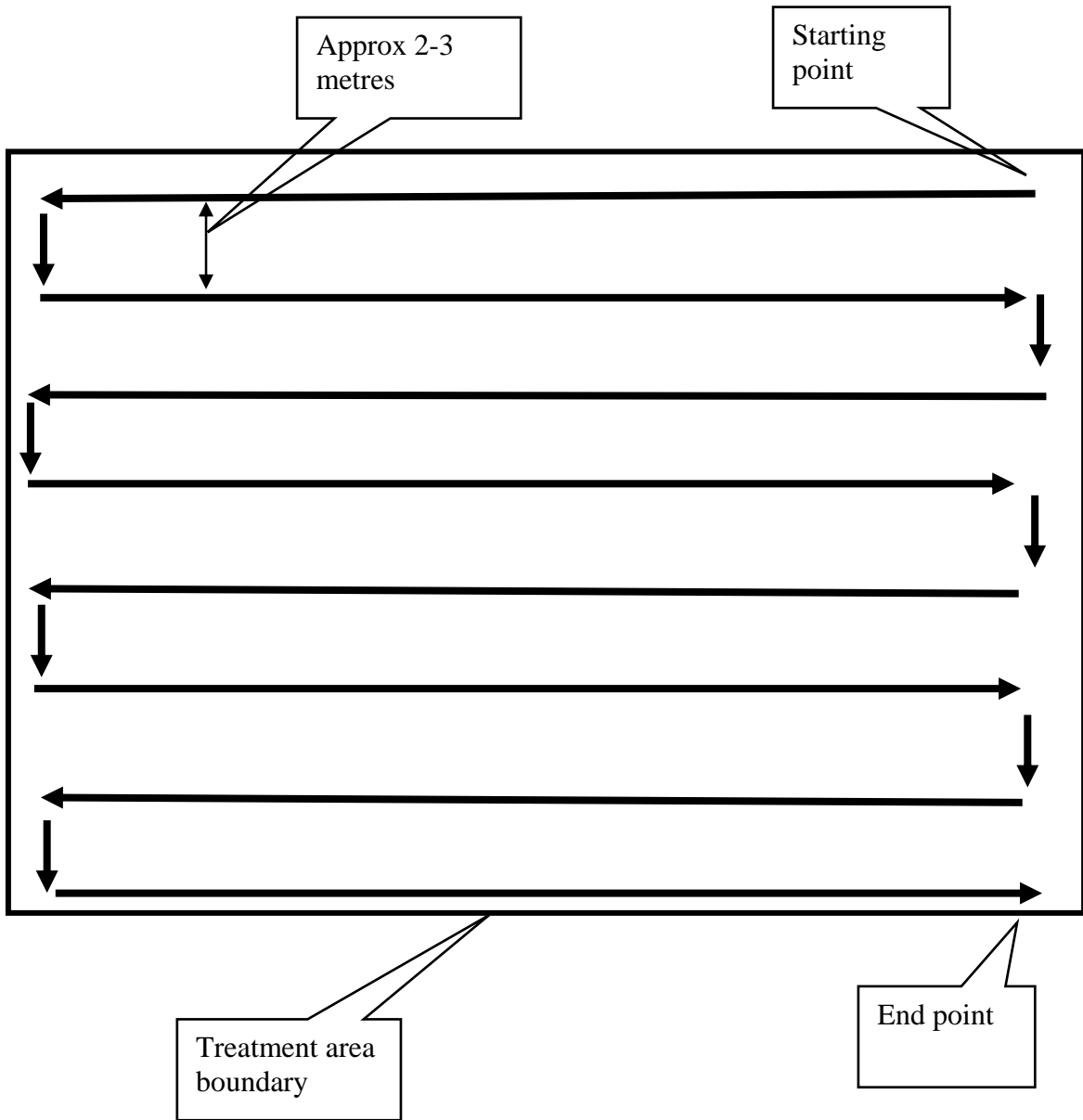


Figure 5. recommended method for distribution of ant bait granules

STANDARD OPERATING PROCEDURE: TREATMENT WITH XSTINGUISH BAIT

Purpose and scope

This standard operating procedure describes recommended methods for treating vegetation and structures within a designated outbreak of Little Fire Ant (*Wasmannia auropunctata*).

Background

Little Fire Ants are spreading rapidly through the Pacific region and have recently been reported in Port Vila, Vanuatu. It is an invasive species with substantial economic, social and environmental impacts. Eradication of this pest requires that ants are contained within infested areas and treated with products that will eradicate them.

Materials

1. Xstinguish™ Ant Bait
2. 250mm caulking gun
3. sharp knife or blade for opening bait.

Method

The intent of treatment with Xstinguish™ bait is to ensure areas not adequately covered by granular baits are also treated. Little Fire Ants are predominantly arboreal and most trees, shrubs, structures and buildings will harbor small ant colonies. Many such colonies do not forage great distances and therefore they may not always reach the ground-applied bait granules.

Xstinguish™ is a paste bait with fipronil as the active ingredient. It is supplied in 325 gram tubes and applied using caulking guns available at most hardware stores (Figure 6). The bait is easily applied to cracks, crevices, branches, vertical surfaces etc and it is therefore very suitable for use on trees, shrubs and buildings. The correct application rate is 3kg per hectare (approximately 9-10 tubes)

Every tree, shrub, structure building is to be treated as follows:

Trees

Large trees need to be climbed. Go as high as it is safe to do so and apply a small amount of bait (enough to cover your small fingernail) to suitable locations such as branch junctions, hollows, areas with dead wood, areas where debris has collected and along branches. If Little Fire Ants are seen, place additional amounts of bait along foraging trails. The bait should be placed at approximately 1 metre intervals. Always start from the top of the tree and work down. Stepping on bait may cause the operator to slip and fall. On palms and coconuts, several spots need to be placed in the crown, near dead or dying fronds, and in foot holds and hollows of the trunk.

Bananas

Banana clumps are regarded as perfect habitat for Little Fire Ants. In infested areas, almost all the spaces between leaf axils and the stem will house a small colony. It is important to place an amount of bait in each of these leaf axils. Also examine the trash around the banana clump and place some bait along fallen or cut trunks.

Shrubs and small trees

Flowering plants, fruit bearing trees and small shrubs are often used by Little Fire Ants for food gathering. These are generally too fragile to climb but place spots of bait in branch junctions, hollows, cracks and crevices. If a foraging trail is seen, follow it to the ground and/or to the nest and place some bait there also.

Buildings and structures

The bases of buildings and other structures are places where Little Fire Ants will be found. Work around each building, placing spots of bait at 1-2 metre intervals. The best spots to place baits are cracks crevices, hollows and places where foraging trails can be seen. If ants are seen foraging up walls or posts, place additional bait as high as can be safely reached. Always choose the shady side of posts to place bait as Little Fire Ants prefer to forage in shady locations.



Figure 6. A tube of Xstinguish™ housed in a caulking run and ready for use. The small amount of bait (coloured green) next to the nozzle is approximately the correct amount to apply in each spot.

Appendix I. GPS co-ordinates of Starfish Cove and Hippique Junction outbreaks

Grid Datum	Lat/Lon hddd°mm.mmm'		
Header	Name	Position	Altitude
Waypoint	4	S17 44.941 E168 21.762	1 m
Waypoint	5	S17 44.919 E168 21.817	9 m
Waypoint	6	S17 44.902 E168 21.833	19 m
Waypoint	7	S17 44.890 E168 21.819	13 m
Waypoint	8	S17 44.797 E168 21.816	8 m
Waypoint	9	S17 44.766 E168 21.771	-2 m
Waypoint	10	S17 44.826 E168 21.721	3 m
Waypoint	12	S17 44.828 E168 21.697	17 m
Waypoint	13	S17 44.870 E168 21.686	7 m
Waypoint	14	S17 44.886 E168 21.701	5 m
Waypoint	15	S17 44.715 E168 21.426	-22 m
Waypoint	16	S17 44.714 E168 21.445	-12 m
Waypoint	17	S17 44.715 E168 21.457	-6 m
Waypoint	18	S17 44.672 E168 21.488	4 m
Waypoint	19	S17 44.637 E168 21.409	7 m
Waypoint	20	S17 44.672 E168 21.384	8 m
Waypoint	21	S17 44.698 E168 21.373	9 m