Dhimurru Yellow Crazy Ant Management Plan

A management plan aligning all work within Australia.

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Last drafted June 2009

A report prepared for Dhimurru Aboriginal Corporation

Australian Government
Department of the Environment and Heritage

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Yellow crazy ant management has been conducted in NE Arnhem Land since 2004, and has thus far quantified the successful eradication of 20 infestations. These outcomes exceed the combined number and area of all other ant eradications worldwide, and as such it is recognised as one of the most significant case study being watched by invasive species managers globally.

Unfortunately it is now clear that complete eradication of this species is not financially viable due to the great infested area of what is believed to be the original infestation point, however it can be easily regionally contained which will enhance the prevention of its spread throughout all of northern Australia.

YELLOW CRAZY ANT BACKGROUND

Name

Anoplolepis gracilipes, also called Crazy ant, Long-legged ant, Gramang ant (in Indonesia) and Maldive ant. Yellow crazy ant gets its name from its fast and frenetic behaviour displayed when a nest or collection of individuals is disturbed. Much of the literature of this species is written using its previous scientific name *Anoplolepis longipes*. Other prior scientific names are *Formica longipes* and *Plagiolepis longipes*.

Description

A medium sized (6 mm) ant, with very long legs and antennal scapes (first antennal segment attached to the head) that extend far past the top of the head (Plate 1). The body has a golden yellowish colour, and the abdomen is typically darker (brown to green). There is only a single waist segment (petiole), no spines or protrusions, and all workers are the same size (monomorphic). Yellow crazy ant does not bite or sting, and does not smell when crushed.

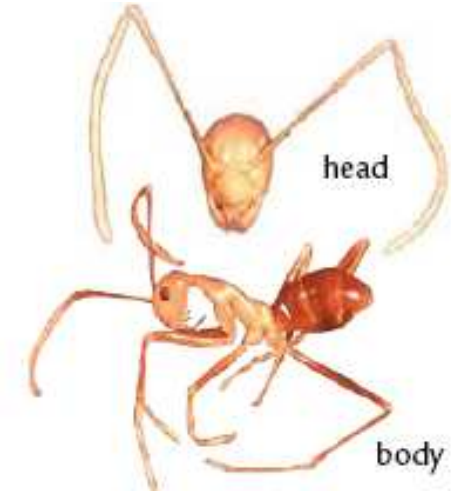

Plate 1. Yellow crazy ant

Origin

The native habitat of YCA is not clear, with the two most likely possibilities being Eastern Africa (Tanzania and Zanzibar) or India. The fact that YCA is the only member of the genus that is located outside of Africa, and that it has a devastating impact on the Indian ant fauna tends to suggest that it is native to Africa.

Nests

Yellow crazy ant has very general nesting requirements, and can be found within trees, in cracks and crevices, and under the ground. There is no piled soil or evidence of soil workings around the nest entrance. When in the ground, nests typically have a single entrance, and the hole is disproportionately large for the size of the ant, commonly having a diameter of 5 cm or more. Rocky outcrops and the bases of trees are favoured nest locations.

YCA forms multi-queened super colonies whereby individuals from separate colonies do not recognise that they are from different colonies, and therefore do not fight or compete. Instead there is no clear colony boundaries and they merge to form ever increasing "super colonies" (Fig. 1). The size of a supercolony (or can be considered an infestation) is only limited by the availability of suitable habitat and time for the ants to spread into new areas. As such, supercolonies can cover tens or hundreds to thousands of hectares.

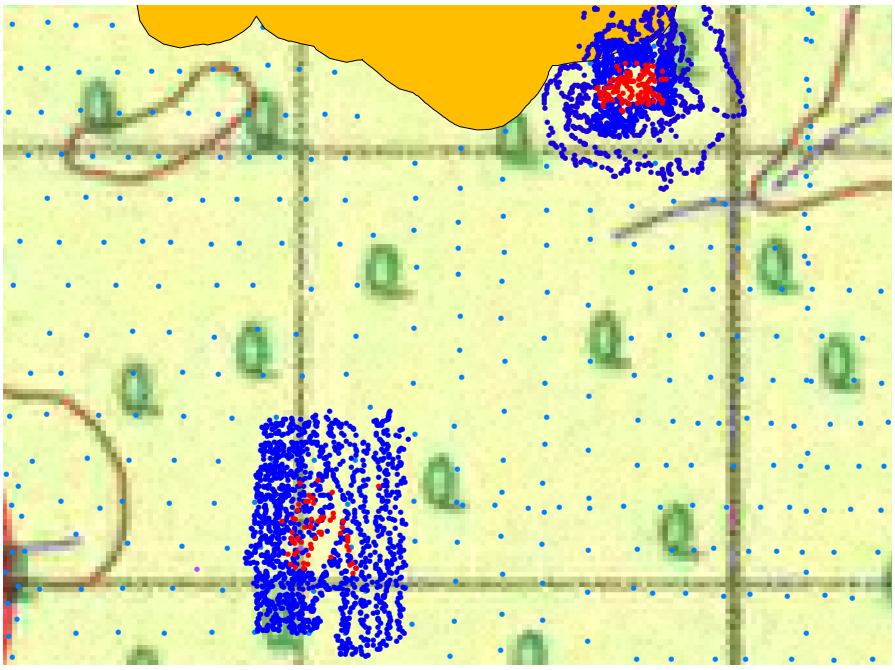

Figure 1 Detailed survey of two YCA infestations. Blue points indicate absence of YCA, red points indicate presence. The light blue points are locations searched in the systematic survey for infestations along bulldozed grids on the minesite. The orange polygon is the treatment area of another infestation. The dark lines indicate a one km^2 grid of a topographic map.

While not common, dispersal flights by newly mated queens have been reported, but it is not clear if they are able to found new independent colonies, or if they must rejoin an established colony for survival. There is, as yet, no evidence to suggest that mated queens can initiate new colonies independently. Formation of new nests is achieved by a queen(s) and workers walking to a new location (budding), probably within 100 m of the parent colony,

Biology

Despite its status as a significant pest species throughout the world, very little is known about the most basic biology of this ant.

Eggs hatch in 18-20 days and the larvae of workers develop in 16-20 days. Pupae or workers require about 20 days to develop while those of queens require 34 days. Worker production fluctuates, but is continuous throughout the year. Sexual offspring may occur throughout the year, but these are generally produced before the onset of the Wet Season.

The species is an omnivorous scavenging predator. YCA require proteinaceous foods for brood production, and will actively attack anything encountered, particularly invertebrates. Although they do not have a sting nor strong mandibles, YCA can kill by spraying formic acid onto the target. It also requires carbohydrates and will actively source carbohydrate-rich

nutrient sources such as plant nectar or honey-dew producing insects. It can also obtain nutrition from grain, seeds and decaying vegetation.

Habitat

This species has been reported from a wide range of areas, including agricultural areas containing many types of crops, disturbed areas, natural and planted forest, riparian and coastal areas, rangeland and grasslands. Being a tropical species, it favours moist, warm and shaded areas, but it is does tolerate very exposed and hot areas, including scree slopes and beach dunes. It also inhabits buildings and human-frequented areas such as industrial zones. The natural habitat of this ant is unknown.

Foraging

YCA forages over all surfaces within its territory, including the vegetation canopy. Its foraging is limited by high or low temperatures (> 44C and <25 C respectively) and low humidity. In ideal conditions, foraging takes place in all hours, with peak activity occurring throughout the night, early morning and late afternoons. The ants forage individually, but will actively recruit to a food source.

Impacts

YCA is ranked as one of the world's worst pests as it has adverse environmental, agricultural and social impacts. Environmental issues are evident as the ant is an active predator that is capable of achieving extremely high population densities (approximately 1000 per square metre or 79 million per hectare), and is efficient at killing or displacing much of the native invertebrate faunas. This is best demonstrated on Christmas island where it has killed or displaced millions of Red land crabs (O'Dowd et al. 1999). Red land crabs are a keystone species in the forest ecology of Christmas island and the flow on effects are so substantial that there has been a complete change in the structure of the forests where YCA has invaded.

Dramatic habitat change places ecological pressure on all other co-existing species resulting in further species losses. There is concern that endangered birds such as Abbott's booby *(Sula abbotti)*, which occur nowhere else in the world, could be driven to extinction through habitat alteration and direct attack (Department of Environment and Heritage 2005a). Other species at risk on Christmas Island include the Christmas Island frigatebird, gecko, hawk-owl, thrush, shrew, robber crabs and blue-tailed skink. Whilst adult seabirds are not at direct risk, YCA have a direct impact on chicks, and adults will move the breeding area if YCA are present.

Like many ant species, YCA forms close associations with phytophagous bugs as their diet is dependent on the honeydew produced by these insects. YCA protects the bugs in exchange for the carbohydrate rich exudate, and as a result the populations of the insects can rise to such levels that they become lethal to the host plant. The plants die either through a severe reduction in plant health due to copious loss of phloem sap, the possible spread of pathogens by the bugs, or by the growth of sooty mould promoted by excess honey dew and subsequent loss of ability to photosynthesise. This habit of harbouring bugs makes the ant a pest in crops throughout the tropics as they predominantly reduce plant productivity. Ironically, this ant had a history of being deliberately spread to crops in many regions as it was thought that their aggressive behaviour would eliminate crop pests. While some protection was provided, the damage caused by the phytophagous insects that the ants tended outweighed any benefits from reduction of target pests.

YCA is also reported to be a pest in households and other buildings (Lewis *et al.* 1976, Haines and Haines 1978a, Veeresh and Gubbaiah 1984). This nuisance aspect can also become a health issue when soft skin, particularly eyes, come into contact with the formic acid spray produced by the ants when agitated.

Distribution

Anoplolepis gracilipes has attained a global tropical and sub-tropical distribution due to human commerce (Fig. 2), and was recorded from virtually the full range of its current known distribution prior to 1900: from India (1851), Southeast Asia (1854), Chile (1859), Polynesia (1867), Melanesia (1876), Mexico (1893), East Africa (1893), and Indian Ocean islands (1895) (Wetterer 2005). It was apparently recorded in Darwin, Australia in 1894, but this record is believed to be a mis-identification, probably of the native *Iridomyrmex pallidus* or *Camponotus* sp., as YCA is not present in Darwin. YCA is extremely widespread on islands to the north of Australia and throughout the Pacific Ocean (Fig. 3).

The distribution of this ant continues to expand throughout all regions of the world. Recently reports of new incursions include Tokelau (Lester & Tavite 2004), New Zealand and the east coast of Australia.

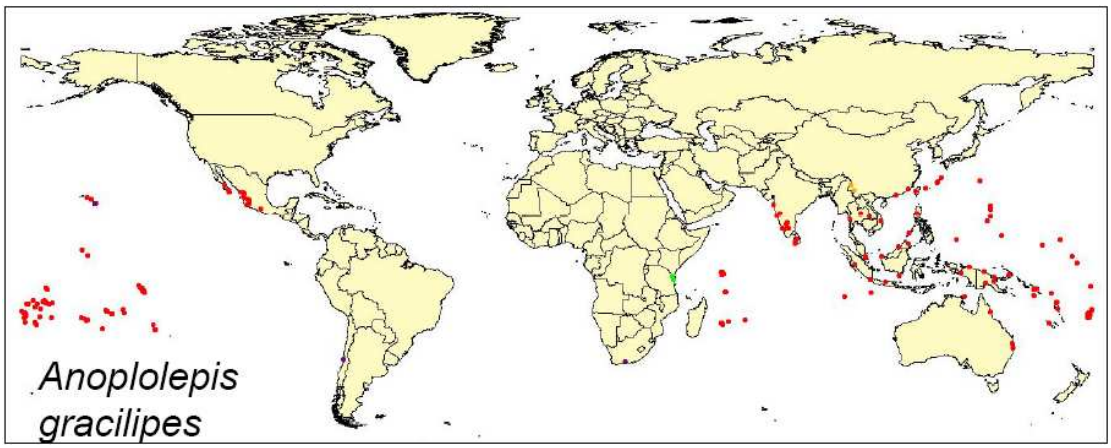

Figure 2 Current worldwide distribution of yellow crazy ants. Note: not all infestations in Australia are shown.

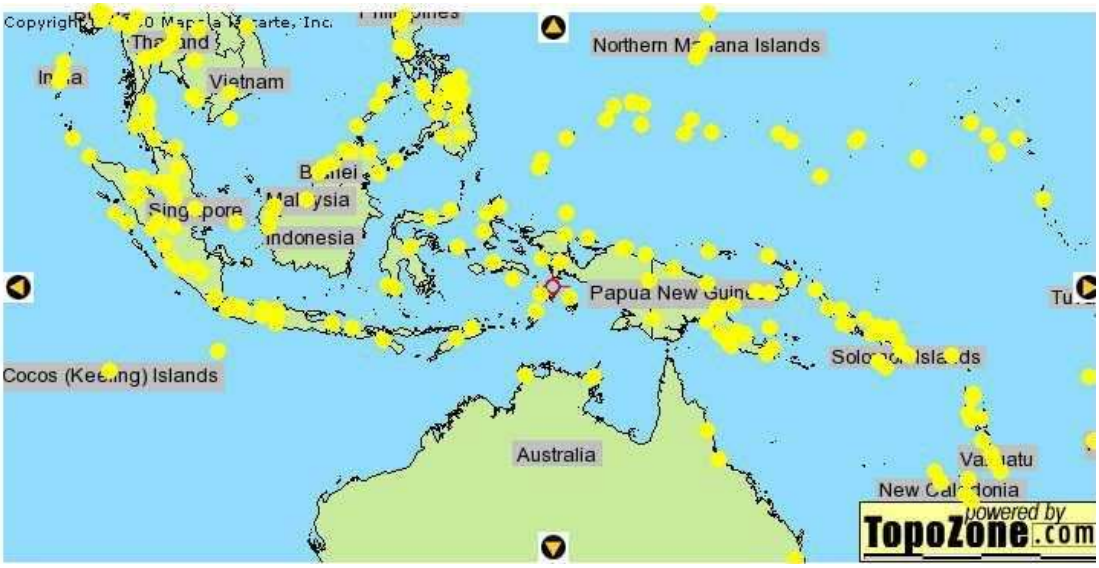

Figure 3 Occurrence of yellow crazy ants in southeast Asia and western pacific areas.

Ease of local eradication

Despite this ant being one of the world's worst invasive species, its biological attributes that contribute to its successfulness ironically also makes its eradication from local areas feasible.

Invasive species typically display two traits: copious reproductive output (seeds / young / alates) and an ability to rapidly spread (seed dispersal / flight). These two attributes make it incredibly difficult to prevent reproduction of more individuals and stop further spread. While the ant has an ability to rapidly attain high populations (most of which are sterile workers), range expansion occurs by individuals walking only a few metres (up to 100 m) from the parent colony, rather than flying to random locations up to 2 km like most other invasive ant species. This lack of a nuptial flight and a further lack of inter-colony aggression results in the formation of supercolonies. While the resulting supercolony is of great benefit to the success of the invader, its self-propagating dispersal method results in populations that are locally contained and easily mapped. Dispersal to new locations and throughout the wider landscape is only achieved by inadvertent assistance by people.

Providing that human mediated spread is prevented, an incursion of YCA can persist in an area for a substantial period and be not much harder to eradicate than when it first arrived – there is only a larger area that needs to be treated.

AUSTRALIAN INCURSIONS AND RESPONSES

The first reported infestation of YCA on an Australian territory was from Christmas Island in the Indian Ocean (Donisthorpe 1935). YCA was first found on the Australian mainland from a bauxite mine on the Gove Peninsula in 1975 (Majer 1984). In 1990 it was discovered at small rainforest patch beside a water point along the Central Arnhem Highway approximately 100 km from Nhulunbuy at a place called Balkpalkbuy. It has since been found to infest many other locations between Balkpalkbuy and Nhulunbuy throughout NE Arnhem Land. Most recently, it has been discovered to inhabit locations in New South Wales (Yamba, Port Botany and Mullimbimby) and Queensland, including areas within and around Brisbane, Townsville and Cairns. All locations are undergoing treatment measures.

The requirement for treatment of these infestations has only been made formal on Christmas island and in Queensland. This requirement stems from listings under various state and federal acts: the infestation on Christmas island has been listed as a key threatening process under the Environmental Protection and Biodiversity Conservation Act (the same consideration given to Red imported fire ant when found in Brisbane), and in Queensland, YCA is a Class 1 Declared Animal under the *Land Protection (Pest & Stock Route Management) Act 2002.*

The listing of this ant in the above mentioned jurisdictions means that it is illegal to keep, import, sell, release or feed these ants, and the declaration establishes responsibility with landholders as wells providing Biosecurity Queensland the power to take emergency control action, including the issuing of emergency quarantine notices.

Clearly, there is currently no national listing for this ant, let alone a coordinated national response. There is, however, a nation wide acceptance that it is a pest of significant concern, and as such all known infestations are undergoing treatment measures.

Christmas Island

Elevated populations of YCA and their obvious environmental consequences (dead crabs) were first observed on Christmas Island in 1989 by staff from Monash University. Subsequent observations and studies highlighted the dramatic impact that was occurring to the island's biodiversity (O'Dowd et al. 1999). Following a successful small-scale hand-dispersed trial of Presto ant bait in 2000, a large scale aerial baiting control program was established in 2002 targeting the areas of greatest ant abundance (referred to as super-colonies in related reports) jointly coordinated by Parks Australia North and Monash University. The baiting was an outstanding success, considerably reducing the ant populations where treatment had been applied (Green et al. 2004). However, YCA is present throughout the entire island, and recent data has identified the formation of additional elevated populations of the ant, as well as the re-infestation of treated areas (Fig. 4).

Christmas Island is of outstanding national and international conservation significance, and so the control of YCA is of paramount importance if the integrity of this system is to be maintained. However, the task of controlling YCA here is problematic, due to the inaccessibility of much of the terrain and the high risk of non-target impacts that would have a serious detrimental effect on the biodiversity of the island, particularly the various species of land crabs. Nonetheless, the recent listing of YCA as a Key Threatening Process on Christmas Island compels the federal government to continue action against this invader.

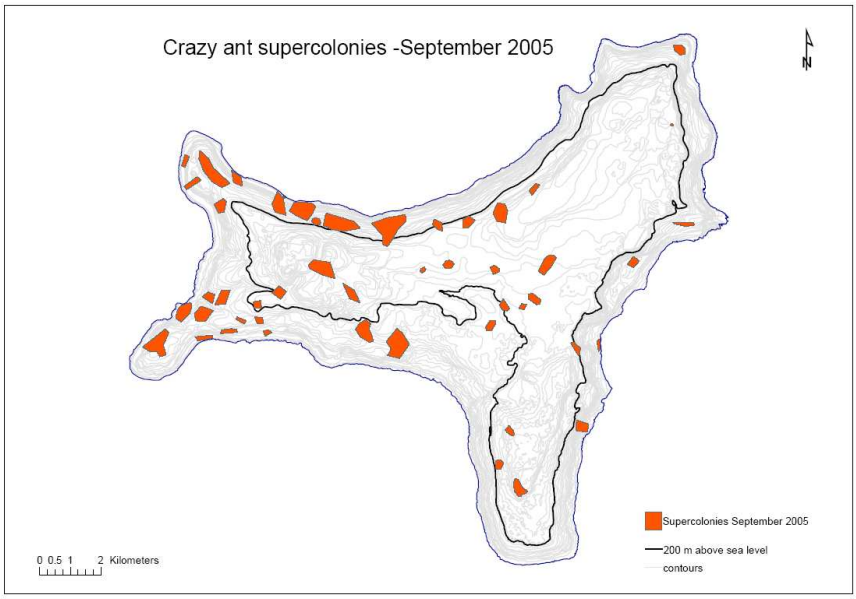

Figure 4 Locations of YCA infestations with abundances great enough to kill Red land crabs (termed supercolonies in related reports). Figure copied from Anonymous (2005).

Queensland and New South Wales

YCA was first detected on the east coast in 2001 in an industrial area of Portsmith, Cairns. Because there was no clear line of responsibility for dealing with the incursion, a multi-agency taskforce was established by the following Queensland state government agencies: NR&M (Land Protection CHQ, Public Affairs, SE and Nth Regions), Department of Primary Industries and Fisheries (Plant & Animal Health), and Environmental Protection Agency.

In 2004, an infestation was found in Brisbane in samples monitoring for Red imported fire ant in 2004, and since then nine more detections have been made throughout the east coast. An additional two detections involved accidental spread of the ants from known infestations. Of the three detections in New South Wales, two involved the collection of only a single ant, and it is not clear if they were from viable populations or not (Figs. 5 & 6).

All of these incursions are being treated to eradicate the ant, and are in various stages of accomplishment (Table 1). In Queensland, the work is coordinated by a new multi-agency Crazy Ant Taskforce. The state Department of Natural Resources and Mines is the lead agency, and receives collaboration from the Australian Quarantine Inspection Service, Department of Primary Industries & Fisheries and local Government representatives from Brisbane, Cairns, Caboolture, Logan and Hervey Bay City Councils. In New South Wales the responsibility of treatment has been given to the Department of Primary Industries.

The majority of incursions of the east coast are associated with timber yards, and are likely to result from the importation of timber from infested locations overseas. It is extremely likely that additional infestations exist that have not yet been detected, and a plan is being developed in Queensland to actively search for additional infestations in other likely locations (Scanlan & Davis in prep).

The incursions on the east coast differ from the other infestations throughout Australia in that they mostly occur in industrial areas that contain many buildings, people and movement of goods. As such they require increased need for effective quarantine to prevent further spread, as well as consideration of treatment methods in the presence of people. For example, aerial baiting is not likely to be considered acceptable or safe.

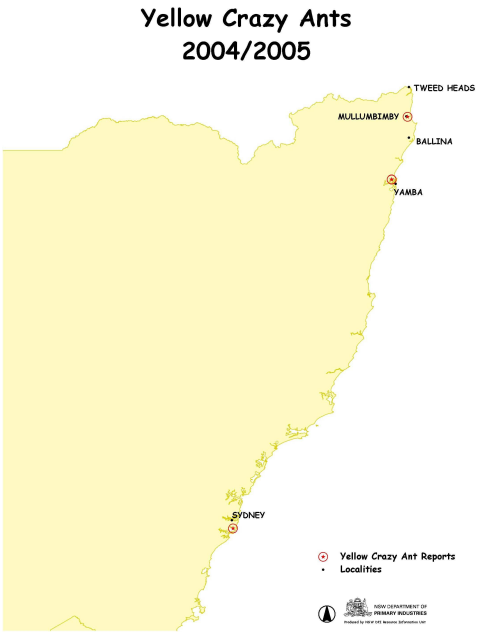

Figure 5 Locations of Detections in New South Wales. Figure copied from Scanlan & Davis in prep).

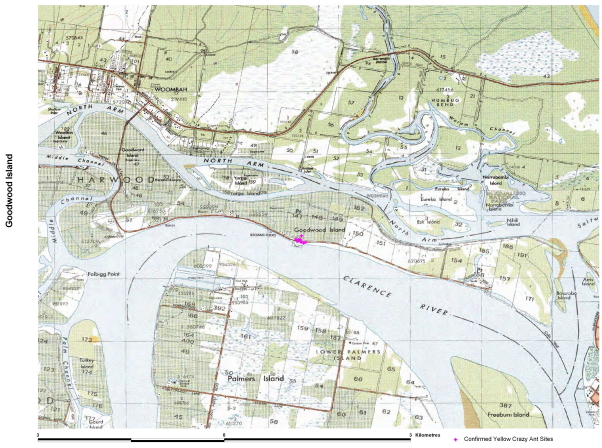

Figure 6 Locations of YCA nests found on Goodwood Island, New South Wales. Figure provided by NSW Department of Primary Industries.

Table 1. Known infestations of YCA in Qld and NSW as at 16 September 2005. Table copied from Scanlan & Davis (in prep).

Site	When found	Who found	Source	Situation	Treatment	Status
Portsmith, Cairns	2001			Industrial	Treated since 2001	Eradicated Provisional free
Edmonton	2004		From Portsmith	Riparian and forest	Continuing treatment Termidor, Presto and Methoprene	Still a problem but in decline Oct 2005
Gordonvale	July 2005	NR&M Project Officer	Unauthorised removal of demolition material from Edmonton site.	Rural residential ex cane land.	Treated (Termidor) and population eradicated July 2005.	The removal of this material is being investigated as a breach of the Emergency Quarantine Notice (EQN).
Townsville	recent	AQIS		caught in the port area by AQIS	Treated	Free
Hervey Bay	Mar 2005	FACC (via public)	unknown	Industrial	Presto, Methoprene and Termidor	In decline
Caboolture	Dec 2004	AQIS	Suspect saw logs from PNG 5-7 years	Industrial complex	Presto, Methoprene and Termidor	In decline
Rocklea	2004	FACC	unknown	Industrial and footpath	Treated by FACC	Provisional Free
Wacol goal	2005	FACC	Tracing from Caboolture infestation	a set of billets in pallet separating sheets of gyprock	Nil	Provisional Free
Banyo	July 2005	AQIS	Suspect imported timber	Industrial	Termidor and Presto	Being used as a trial site by Sumitomo
Slacks Creek	2005	FACC	Suspect imported timber from Solomon Islands.	timber yard	Termidor and Presto	Minimal activity present (January 2006)
Mullumbimby	August 2005	NSW Ag?	Timber from Qld		Destroyed (how?)	Free
Goodwood Island Wharf Clarence R at Yamba.			Suspected from timber		Behind rock retaining wall	Present
Hamilton (TBL Timber)	To be inspected in relation to Mullumbimby site	Traceback from Mull'y		Timber yard		None found

North east Arnhem Land

Background

Following the discovery of YCA at Balkpalkbuy in 1990, momentum to investigate the status of the ant grew from the concerns of a small number of people until a small-scale investigation was conducted in 1999 by the NT Conservation Commission. This first study found YCA in 12 sites throughout NE Arnhem Land. In 2001, Presto ant bait was obtained for a small trial at Balkpalkbuy from the new treatment project on Christmas Island which was showing encouraging results. This small trial was successful, and led to a more detailed scoping study in 2002 funded by the Indigenous Land Corporation and conducted by CSIRO to assess the possibility of an eradication program. This latter study found 63 locations infested with the ant, and estimated a total of 100 infestations probably existed. Three infestations were also accurately delineated and found to cover 2.4, 1.5 and 2.3 ha, giving rise to a total infested area estimate of up to 450ha. Eradication was also considered to be feasible, and a project was proposed.

Institutional responses

Decisions of who was most appropriate for managing the treatment program was difficult to ascertain as

1. the infestations were on Indigenous freehold land belonging to many clan groups, and no single Indigenous land management group covered the entire area;
2. the closest state or federal operated conservation reserve or National Park was more than 600 km away, and both the Territory and federal governments have no direct responsibility for land management over the infested area
3. there is almost no agriculture throughout the region so departments of Primary Industry were not interested; and
4. the Northern Territory government had very recently completed eradications of Papaya fruit fly and Black striped mussel which had overstretched its limited resources.

As such, no government department (state or federal) considered that they had primary responsibility, local infrastructure or the personnel to conduct the programme. Instead, a multi-agency collaboration was created, with the on-ground responsibilities given to the lead Indigenous Ranger group in the region (Dhimurru Land Management Aboriginal Corporation) and with coordination and on-ground support by CSIRO. Other key stakeholders in the group were Alcan Gove, Northern Land Council, NT Parks and Wildlife Commission, Indigenous Land Corporation and Department of Environment and Heritage. Many other local organisations also provide minor assistance, but they are not considered further.

The project plan was created using protocols and experience from the YCA work on Christmas Island, as well as prior eradication work on other invasive ant species conducted by CSIRO in Kakadu National Park. Once formulated, a three year budget was created and funding was sourced (Table 2). Initially only funding for one year was obtained (all but NHT Regional), but six months after project initiation, funding for three years was obtained with the successful funding bid for NHT Regional money, giving the project a 3.5 year lifespan.

Within the next 12 months it became clear that the project was significantly larger than anticipated, with much of the additional work being required on the Alcan Gove minesite. A request was made to Alcan for additional funding for work on the mining lease (predominantly purchase of more bait and helicopter time) which was approved. These

additional inputs by Alcan have created a possibly globally unprecedented situation whereby a public company rather than government organisations is the major provider to an eradication project. It should also be noted that the approval process by Alcan merely involved discussions, a small written summary of what was required, and a rapid (2-3 weeks) internal approval process with almost no formal reporting process as opposed to the rigorous and time consuming application, approval and reporting processes of government. Most of the remainder of the budget has been supplied by federal money through Department of Environment and Heritage reflecting the national significance of the project and the requirement for federal money.

Table 2. Contributions made to YCA project in NE Arnhem Land by the major contributors. Figures are cash contributions except for the final column which is the cumulative in-kind support of all contributors. Percentage figures indicate relative contribution for the respective row.

Expense	**NHT NT**	**NHT Regional**	**ILC**	**Alcan**	**NTG**	**In kind**
Wages	129,400	233,075		104,100		117,300
Equipment	28,000	8,400	110,000	30,000	26,000	394,000
Running costs	49,000	20,000		100,000	34,000	
Bait		91,000		490,000		
Helicopter		10,000		75,000		
Accommodation				20,000		
TOTAL to end 2005	206,400 13%	362,475 23%	110,000 7%	819,100 53%	60,000 4%	
3-year budget	206,400 9%	1,037,500 43%	110,000 5%	?1,000,000 41%	60,000 2%	

Note: A question mark is placed beside the overall Alcan contribution figure as money is spent internally by Alcan as required as opposed to an overall figure being provided to the project.

Institutional contributions

While most expenses of the project are divided between multiple funding providers, some items have been specific. These are:

- Two vehicles purchased by ILC
- Two project officers provided by Alcan for first year
- All other employed officers funded by National Heritage Trust
- Two quad bikes purchased by NTG
- Office and shed space and associated running costs provided by NTG
- Accommodation for CSIRO staff in Nhulunbuy provided by Alcan

Project status - Initial and current project estimates

The project in Arnhem Land has proved to be substantially larger than first envisaged, and as such all initial project projections have had to be modified. Reasons for the increased scale of the project are twofold. First, many more infestations have been detected than was estimated (predominantly on the minesite and Central Arnhem Road), although many of these now appear to be multiple detections of large infestations. Second, the average size of the infestations is much larger than those measured and used for initial project estimates in 2002.

Following are details of past and current estimates of the scale of the project, as provided in the December 2005 milestones report to the Joint Steering Committee and updated to include data collected up to January 2006.

Survey for infestations

2004 estimate	Around 10,000, but no formal estimate of number of locations needing to be inspected was made.
Current estimate	20,000

There was no initial estimate of the number of locations that would need to be inspected to detect crazy ant infestations, only the area involved. This has now been refined based on current knowledge, and particularly involves inspections every 50m along all roads and accessible areas within the project area. To date, the equivalent of 450 km of roads has been inspected for crazy ant.

Figure 7 indicates the effort required to locate new infestations throughout the project. The initial part of the curve was the 2002 scoping study where only the most likely locations were assessed providing a rapid rate of detections. Since the management program was established (point 780 on the x-axis) the rate of detection decreased but has remained steady as the searches are conducted systematically through the landscape. Short term increases in detection rate are obvious where the searching has moved to a new area. This graph provides a clear measure of progress as the curve will flatten when all infestations have been found.

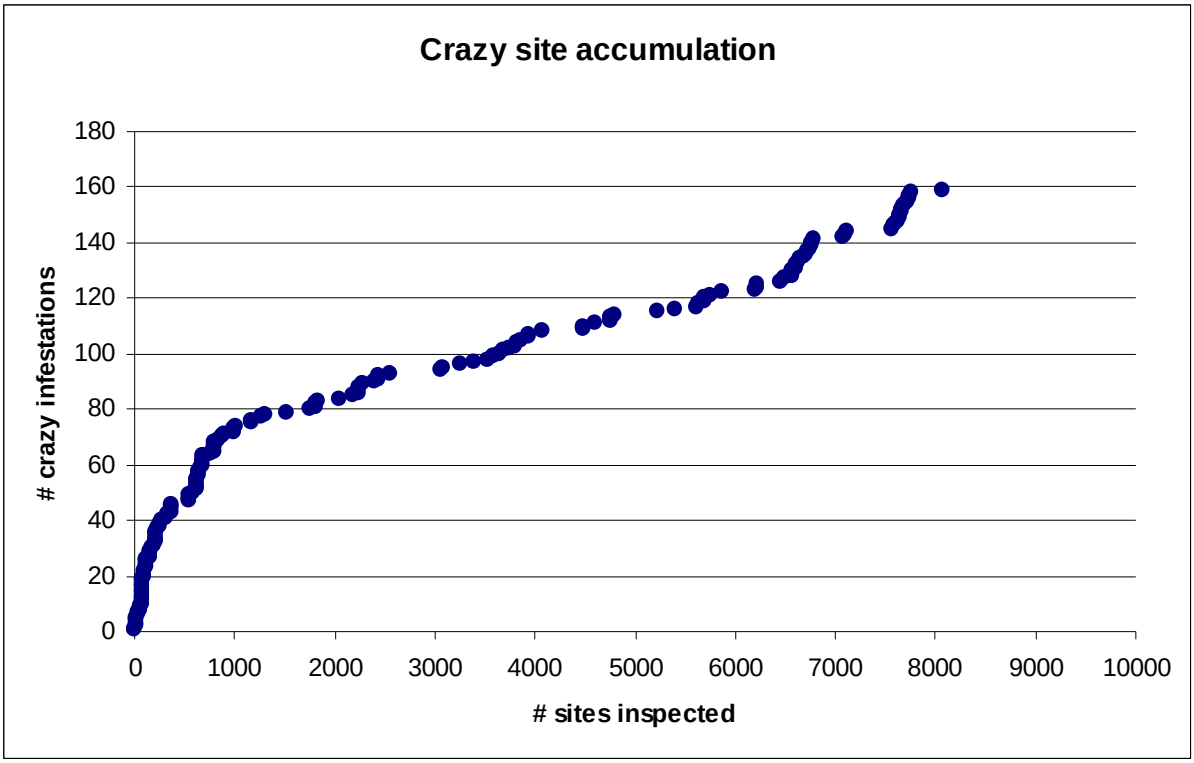

Figure 7 Number of YCA infestations detected against the number of locations searched as of December 2005.

Number of infestations

2004 estimate	100
Current estimate	200, but may still be only 100, as many points now appear to be multiple detections of a few very large infestations.

Initial estimates were based on a scoping study which looked only at the most likely places the ant would be found. Since project inception it has been found that the ant is able to persist in environmental conditions initially thought to be too harsh for its survival. In addition is has also been found that there are numerous and extensive infestations along major roadways far in excess of expectations. Crazy ants have now been found at 158 locations, with no less than 120 of these known to be discrete, as some of the remainder (38) may be multiple findings within individual infestations (Fig. 8).

In order to detect the infestations, a much more detailed survey has been required than initially thought, due to the presence of the ant in locations it was not expected to be found. In particular, is the requirement for surveys every 50m along roads, and surveys throughout the entire mining lease.

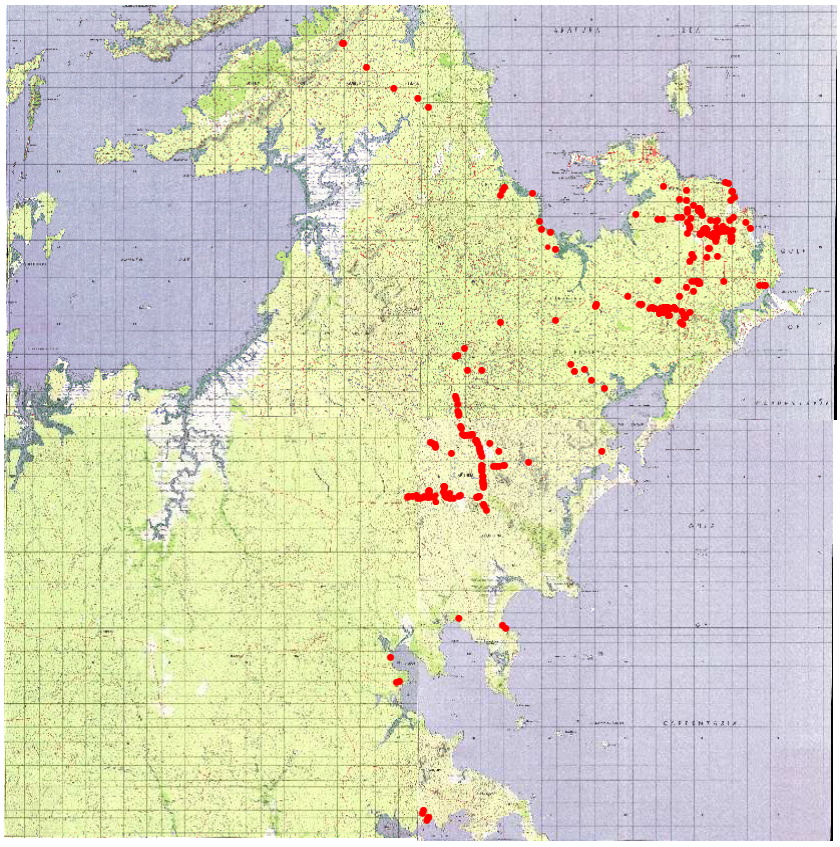

Figure 8 Locations of YCA infestations in NE Arnhem Land found up until December 2005.

Area infested

2004 estimate	450 ha
Current estimate	2000 ha

The much greater number of infestations found compared to the number initially expected has greatly increased the estimates of area infested. Of the infestations mapped to date, they are an average size of 6.5 ha (Fig. 9). One infestation located at Balkpalkbuy (100 km east of Nhulunbuy) has recently proved to be by far the largest infestations at 500 ha, being five times the size of the next largest mapped infestation to date. It is quite possible that this largest site to date is the initiation point of this ant in NE Arnhem Land, and that it is also the cumulative result of multiple infestations growing and merging into one very large infestation. The boundaries of this infestation have not yet been determined, and there is at least one more site known that might be of comparable size at Dhupuma which may further increase the estimated infested area.

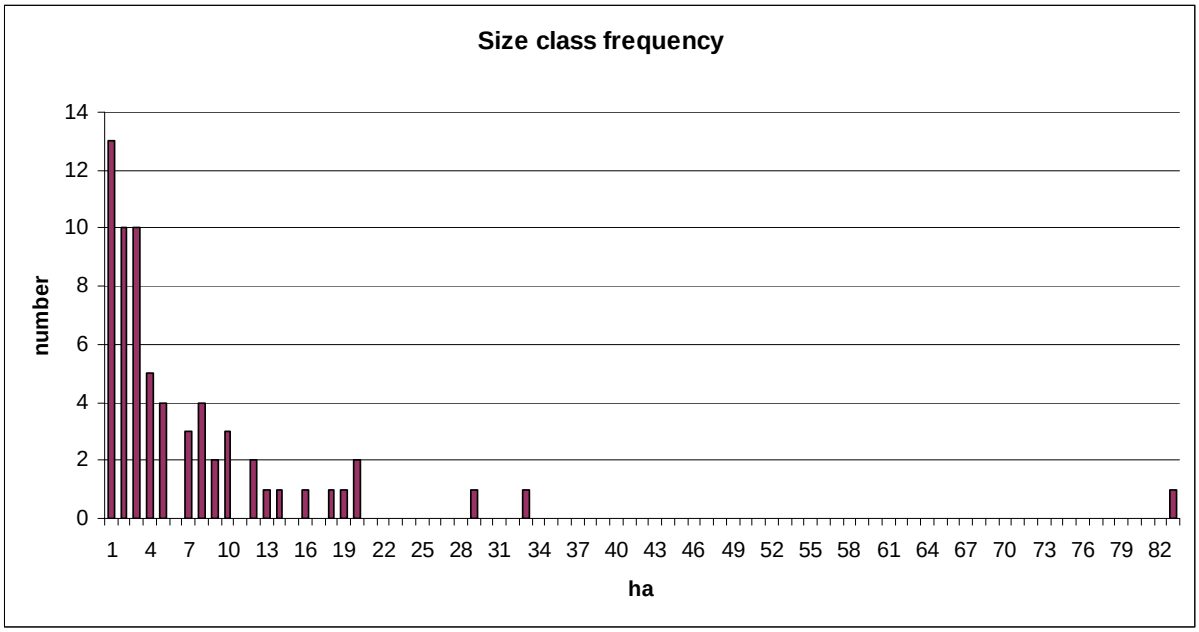

Figure 9 Size class frequency of YCA infestations mapped as of December 2005. Note: this graph does not include the two infestations at Balkpalkbuy and Dhupuma.

Treatment area

2004 estimate	450 ha
Current estimate	5000 ha

The treatment area is greatly increased by the need of a large buffer zone added to each mapped infestation. The 100m buffer zone was created in response to the finding that crazy ant supercolonies do not behave identically to that of African big-headed ant, which was used as a model for supercolony mapping. In particular, individual nests of Crazy ant were found to be more widely spaced than expected, separated (by eye) up to approximately 50m. Of the infestations mapped as of December 2005, treatment area was an average of 23ha.

Bait required

2004 estimate	4.5 tonnes	$111,000
Current estimate	50 tonnes	$1,150,000

The bait required is clearly linked to the number of infestations, the size of the infestations and the subsequent treatment area. The application rate of 10 kg per ha has proved to be overwhelmingly successful, and is achieving much better results than the 5kg/ha used in other projects.
Less than satisfactory treatment results have been achieved in the densest vegetation types by Presto, and a second bait has been collaboratively developed with Sumitomo Chemical Company to alleviate this problem. It is planned to conduct initial treatments using Presto over these densest areas, followed by a second treatment of the new product two months following the initial treatment when populations are at their lowest. However, the purchase of this new bait will require budget change approval by the Joint Steering Committee. To date, $511,000 (45%) of Presto has already been purchased, predominantly ($491,000; 96%) by Alcan Gove.

Helicopter costs

2004 estimate	$60,000
Current estimate	$600,000

The requirement for the helicopter has been greatly increased directly with the increased size of the treatment area. It was also initially thought that many infestations would be small enough to treat by hand. To date, only five infestations have been small enough to warrant treatment by hand. Estimated costs are based on average mapped infestation size, number of known infestations and the relationship between infestation size and helicopter treatment time (Fig. 10)

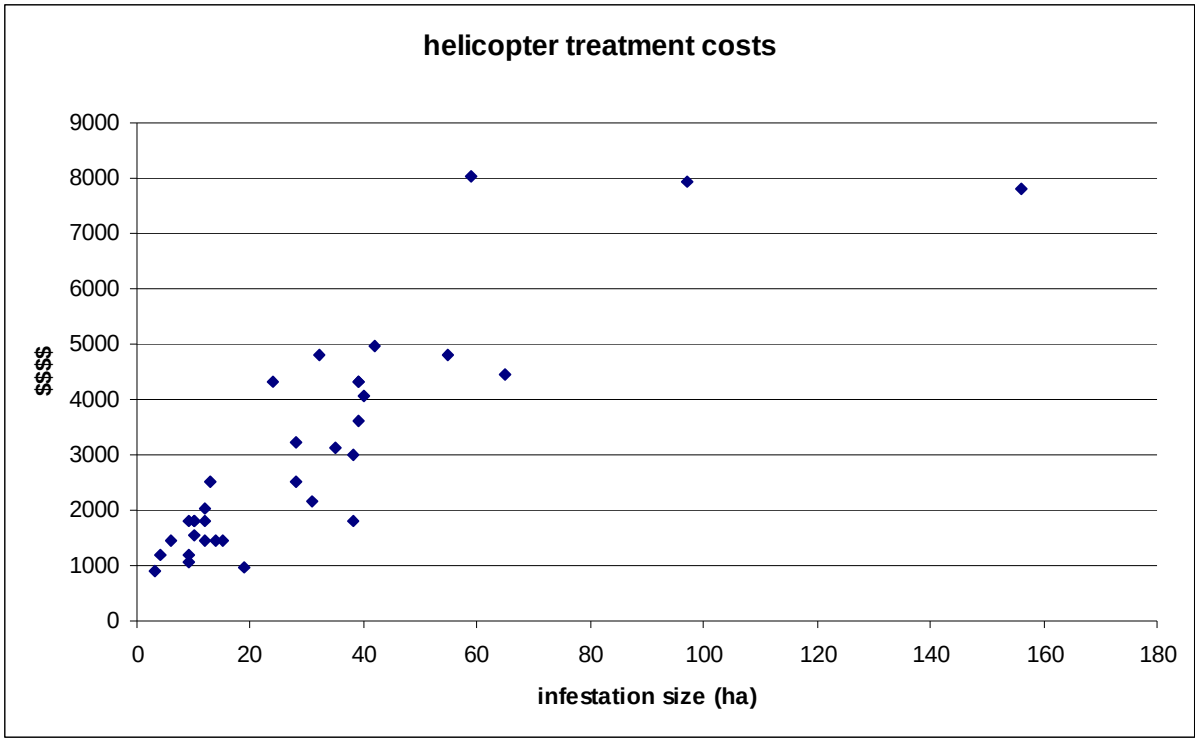

Figure 10 Cost of treatments by helicopter against size of infestations. Note: the cost is partly dependent upon shape of infestations, and distance from the staging area, giving a greater variation as the infestation size increases.

Post-treatment assessments

2004 estimate	No formal estimate of number of point inspections made. But around 900,000 points estimated in hindsight for 5x5m array for 450 ha.
Current estimate	Unachievable figure of 10,000,000 assessment points. Protocols are yet to be finalised that satisfactorily balance accuracy requirements and realistic resource availability.

This requirement ranks as the hardest, but most crucial part of the project as it is the project's true measure of success or failure. Much has been learned about the requirements for this stage by trial and error and observation in the first year. The first is that only the five treatments conducted by hand have achieved 100% eradication the first time, alleviating the need for further treatments. This is most likely due to the small size of the areas treated. Second is that post-treatment populations of this ant are so low that they are mostly undetectable by eye for many months and must be assessed by attractive tuna baits. Third, the attractive tuna baits (at least within the first few months post-treatment) must be spaced relatively close together to detect all infestations (maximum 5 m separation of baits). Fourth, it is not clear how long individual Crazy ants live for (originally estimated to be 2 months based on literature from around the world), thus is it not clear at what stage persistent populations post-treatment are deemed to be viable populations with new reproduction as opposed to the last surviving ants with no new reproduction. Trials are currently underway to provide answers to this question. Fifth, assessments require more detail in the most dense vegetation types.

As a result of these uncertainties and unrealistic requirements, it has been decided to delay the post-treatment assessments until at least 6 months after treatment to

1. allow dieing populations to die, leaving only viable populations, and
2. allow viable populations to build so that they are obvious, reducing the laborious need for intensive tuna baiting.

Project area

2004 estimate	All infestations contained within 100 km radius of Nhulunbuy
Current estimate	All infestations on the Gove Peninsula, and isolated infestations away from the main Balkpalkpuy infestation

The project has benefited greatly from indirect surveys by project collaborators and other organisations collecting ant specimens for unrelated projects throughout Australia. CSIRO Darwin receives and identifies ants from most ant surveys conducted within the NT, and no Crazy ants have been found in any sample. Particularly noteworthy are visual surveys conducted in western Arnhem Land, Ngukurr (south of the infested area) and Katherine (south east) by CSIRO staff. None of our project surveys have found infestations further than was found in the initial scoping study, and we expect that the limits of the incursion are currently where we have them delimited.

Lifespan of project

2004 estimate	3 years
Current estimate	8 years

It is clear that the project will need to run over a longer time frame to be successfully completed. It is not financially viable to treat all known infestations, but infestations can be prioritised and treated that greatly reduced the threat of the spread of this ant throughout the remainder of Australia. This plan requires an additional three years of funding to complete the containment of this ant.

Potential distribution in Australia

YCA potential distribution within Australia has been assessed by CSIRO using CLIMEX modelling. The model uses meteorological data of locations where YCA is known to occur throughout the world and compares these data with that of all locations throughout Australia. Probabilities of persistence are then calculated for each area expressed as a match index where 0-50 means that there is no probability of persistence, and 100 indicates best likelihood of persistence. Hence all values greater than 50 indicate potential distribution.

The earliest analysis (Fig 11a) was conducted around 2002 to aid the Christmas Island project when only the infestation in NE Arnhem Land was known to exist on the mainland. The latter analysis (Fig. 11b) was conducted for the Tramp Ant Threat Abatement Plan (Department of Environment and Heritage 2005b) and includes data of the latest detections along Australia's east coast. Both analyses show that much of tropical Australia is suitable for YCA (Fig. 11b) similar to that of many tropical invasive species, including a number of significant weeds (e.g. Mimosa, Siam weed and Rubbervine).

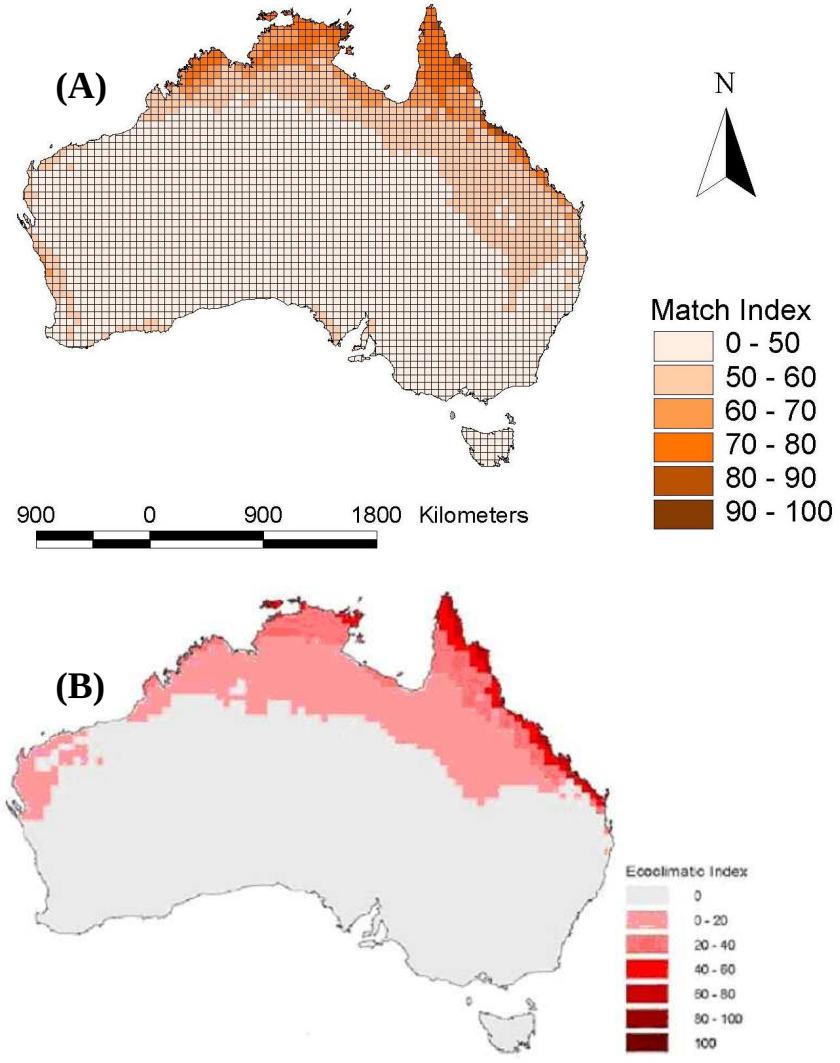

Figure 11 CLIMEX models of the suitability of climate within Australia for the establishment of viable populations of yellow crazy ant.

Recent intercepts of YCA by AQIS

The need for vigilance to prevent further incursions of this ant is clearly demonstrated by recent AQIS intercept data.

Intercept data at Australian ports is available from AQIS only up to 2002 due to changes in the way information is collected and stored by AQIS.

Interceptions of YCA at Australian ports made by AQIS have rapidly increased since 1996 (Fig. 12). It is not known if this is due to an increase in trade with countries that have YCA, an increase in the frequency of YCA being transported on imports for other unknown reasons, or just due to increased surveillance by AQIS for this ant.

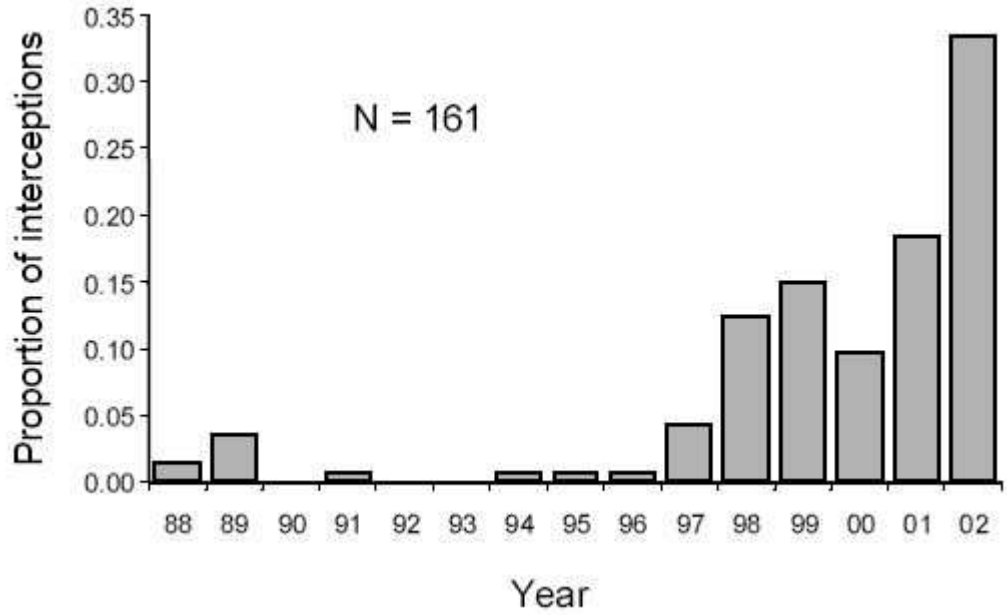

Figure 12 YCA interceptions as a proportion of all intercepts into Australia made by AQIS from 1988-2002. (no data are available for 2003 onwards due to changes in the way information is collected and stored by AQIS).

Sydney and Brisbane each accounted for 40% of all interceptions of YCA into Australia. Darwin, Cairns and Townsville made up another 10% of interceptions. We know that YCA is able to establish viable populations at all of these ports except Sydney.

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Of the 47 interceptions in Queensland in 2000-2003, there were 25 that were of sufficient size (medium or greater size) that could have resulted in establishment of a nest. This is a similar pattern as for all Australia (Fig. 13).

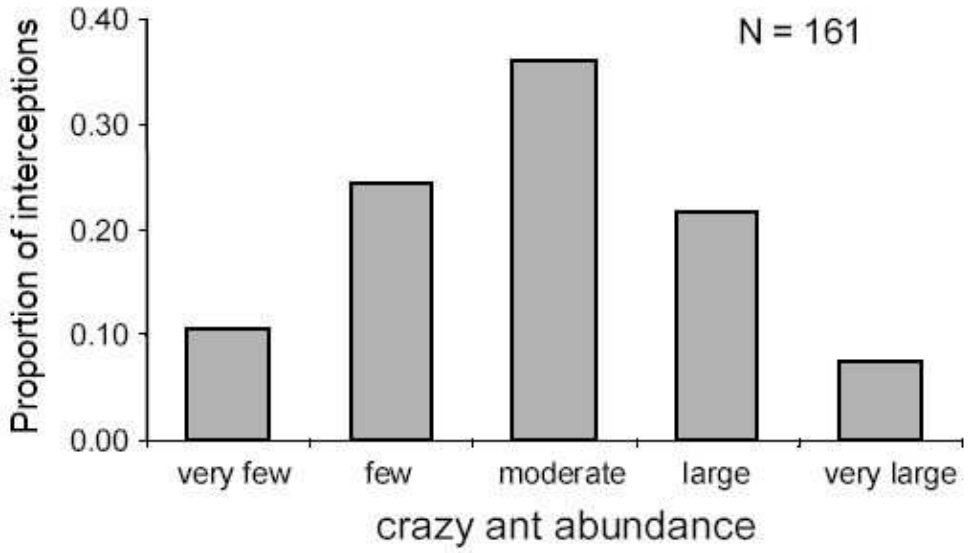

Figure 13 The relative abundance of interceptions of different sizes made by AQIS.

Southeast Asia and the Pacific Islands account for almost 80% of all interceptions (Fig. 14). Sri Lanka was also a significant contributor to the number of interceptions. The actual quantities of imports from these countries are not known, so it is not possible to estimate the 'per unit of import' rate of interceptions.

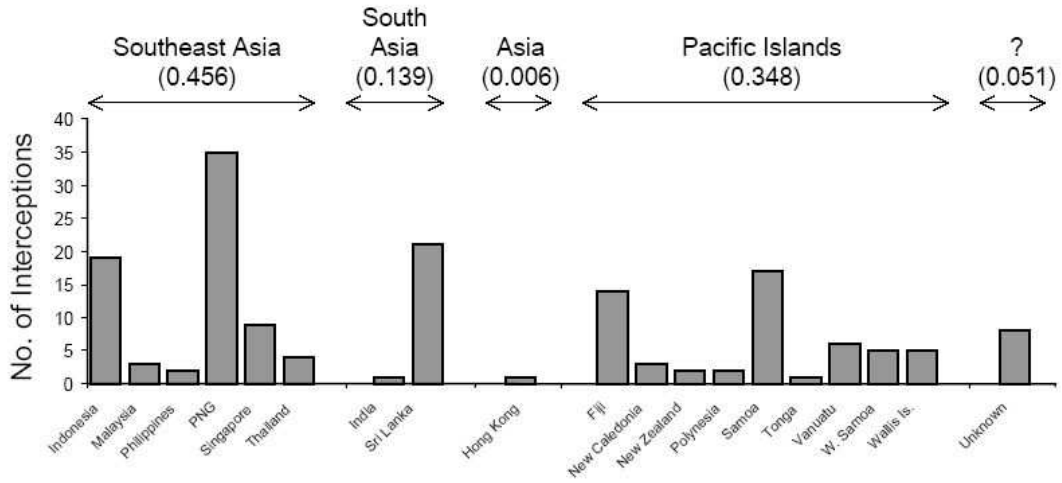

Figure 14 Origin of imports which were found to contain yellow crazy ants (interceptions made by AQIS).

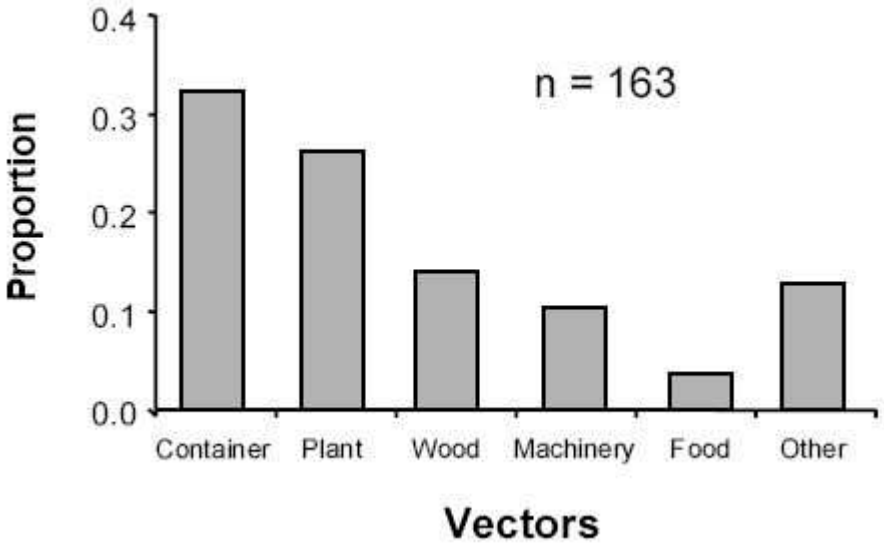

Figure 15 Imported products within which yellow crazy ants were found (interceptions made by AQIS).

A variety of products were found to have YCA in or on them (Fig. 15). Containers (both full and empty) were the largest contributor to the number of interceptions and represent a great threat due to their rapid movement to many destinations after importation.

Vectors of spread to Australia

There are many ways that YCA can be accidentally transported to Australia. Given our geological separation from the rest of the world, these pathways all involve some form of human-mediated air or sea transport. The likelihood of YCA arriving without human assistance (e.g. on driftwood) is so unlikely that it is not considered further. The following vectors could transport YCA into Australia.

Agricultural products: Translocated in produce, timber or other habitat material. YCA have been known to successfully colonise a variety of agricultural crops, including cinnamon, citrus, coffee and coconut plantations (Haines and Haines 1978b; O'Dowd 1999). This includes the movement of soil or sterile growth medium for the nursery trade.

Machinery: There is trade in second hand machinery, importation of new machinery, as well as international movement of much equipment (e.g. military and mining equipment). All of these could carry sufficient YCA to establish a new nest.

Packaging material and cargo containers: The likes of pallets and cargo containers provide sufficient gaps to house entire colonies of YCA, and are the most frequently carrier of YCA.

Other: YCA is able to obtain transport in any goods with sufficient space to carry ants placed within an infested area prior to transport to Australia. This includes all imported goods such as electrical items, furniture, etc.

Vectors of spread within Australia

Human mediated: all vectors described above are capable of dispersing YCA internally within Australia. The distance of dispersal is only limited by the distance the goods are transported. Therefore it is possible for infested goods to be translocated from one side of the continent to the other within two days.

Self-propelled (local): YCA rarely or never disperse via winged female reproductive forms, and instead rely on colony "budding" for colony dispersal whereby new reproductives walk up to 200 m from the parent colony. Few data exist that accurately measure rate of spread of this ant, but the figure of 100 metres per year is likely to be reliable at a national scale.

Approved treatments for YCA in Australia

Up until the initiation of the Christmas Island management program, no effective bait for the control of Yellow crazy ant existed in Australia. Chemical control of YCA can now be achieved with two groups of compounds: toxins and insect growth regulators. Toxins aim to kill the reproductive queens, or reduce populations to such a level that populations are no longer viable, and they are typically fast acting (1 day to 2 months). Insect Growth Regulators sterilise the ovaries of reproductive queens thereby ceasing population recruitment. Individuals live their lifespan and infestation are eliminated by the natural death of all individuals. As the use of these products are slower acting than that of toxicants (2-6 months) but there are fewer negative environmental issues. Products in use in Australia are:

1. Fipronil (by BASF) sold as Presto 001 (0.01% fipronil) in a bait matrix (made by Animal Control Technologies).
    - Toxin
    - broadcast bait (5 kg/ha in Qld, NSW and Christmas Island, up to 10 kg/ha NT)

2. Liquid fipronil (Termidor) 100g/l broken down to 25ml/100litres
    - Toxin
    - For treating nests and wood palettes etc
    - Used as a drench
    - This is the most recently approved product

3. S-methoprene (by Sumitomo)
    - Insect growth regulator
    - Broadcast bait (5g/kg and apply 5 kg/ha)
    - Can use up to and in water
    - Can be used in conjunction with Presto

4. Pyriproxyfen (by Sumitomo)
    - Insect growth regulator
    - Only for experimental use

5. Hydramethylnon (by Sumitomo)
    - Toxin
    - Broadcast bait (7.3 g/kg and apply 5 kg/ha)
    - To be used in conjunction with Presto

Prevention and management plans

Clearly the threat of spread and the accompanying potential impacts of YCA are of national importance, and the issues arising from the presence of YCA will only increase if no, or inefficient management is conducted. The same concerns and issues apply for all of the worst invasive ant species, and so any plan is just as applicable for YCA as it is to any invasive ant species.

In 2006, a Threat Abatement Plan for Reduction in Impacts of Tramp Ants on Biodiversity in Australia and its Territories (Dept. Environment and Heritage 2005b) is due to be released that aims to "set a national framework to guide and coordinate actions to provide for the research, management and other actions necessary to reduce the key threatening process concerned to an acceptable level". Two intended key outcomes of this plan are (i) the prevention of tramp ants from establishing in new areas where they are likely to pose a threat to nationally listed threatened species and ecological communities; and, (ii) the eradication or control of established tramp ants in high conservation value sites to mitigate their impacts on native biodiversity. Unfortunately, whilst the plan will go a long way towards collating information of the issues, and providing management steps to achieve better ant management, it does not oblige government at any level to undertake any preventative (pre-invasion) or management (post-invasion) activities.

Along a similar theme, a Pacific Ant Prevention Plan (Pacific Invasive Ant Group 2004) has been produced which is aimed at preventing the establishment and spread of Red imported fire ant (*Solenopsis invicta*) and other invasive ant species throughout the Pacific.

This document forms the management plan for YCA in NE Arnhem Land by Dhimurru Aboriginal Corporation.

CRAZY ANT MANAGEMENT

The substantial and national environmental, economic and social issues likely to result from the continuing presence of YCA within Australia justifies the need for complete eradication of this pest species to be the goal of management programs. The success of eradication programs is dependent upon a multitude of factors, but predominantly the prevention of further spread and availability of adequate resources. Australia has both the interest and resources available to achieve these positive outcomes.

Queensland and New South Wales

All east coast infestations are small and should be easily eradicated providing that treatment is adequate and further spread has been stopped. However, it is very likely that additional infestations exist, and there needs to be a concerted effort throughout the east coast to actively locate remaining incursions. Such work has been done to a limited extent as part of surveillance for Red imported fire ant, and proposals are currently in preparation to greatly expand this work to focus on YCA (Scanlan & Davis in prep.). This additional work would fall under the responsibility of the existing YCA managers in each state.

NE Arnhem Land

Capability of eradication

It has been initially impossible to accurately determine the extent of the project, but it is now clear that complete eradication is not an option. To put this in perspective, consider a comparison between establishing a project for this ant and for a weed. The area infested by a weed (e.g. *Mimosa pigra*) can easily be seen, accurately mapped, planned and costed prior to project initiation. But the area infested by YCA cannot be seen until detailed searches are conducted, and so projects can only be initiated using educated estimates. Indeed, the full scale of such projects wont be clear until they are completed.

Although complete eradication is not an option, effective management that prevents further dispersal of this ant throughout northern Australia is possible. The prevention of further spread of this species throughout northern Australia requires its eradication from smaller outlier areas where it interacts with people and the risk of its accidental dispersal is high, which leaves only two populations effectively regionally contained (Figure 16). This is possible as like most invasive ant species, this ant is unable to self-disperse further than a few metres from the parent colony - long distance dispersal is dependent upon accidental dispersal by people. In effect this ant naturally regionally contains itself in the absence of human-mediated dispersal.

Project priorities

This project has now determined that localised eradication is indeed possible, the best protocols to achieve eradication have been determined, ecological recovery post-treatment has been measured, the distribution of the ant is well known, and further priority sites for eradication have been determined. However, funding to conduct management of this ant is now exhausted, thus the single project priority is to obtain additional funding to complete the project objectives.

Daily management

Crazy ant management is now an embedded and on-going part of Dhimurru's work culture. Monitoring for the presence of YCA is part of everyday site inspections, and all new infestations are to be reported and added to the centralised database.

Project protocols

The specific ant management methodologies of this project have been developed over the past decade using an adaptive management approach from multiple ant management projects, particularly the successful eradication of African big headed ant and Tropical fire ant from Kakadu National Park (Hoffmann & O'Connor 2004), the Brisbane Red Imported Fire Ant eradication program, Yellow crazy ant management on Christmas Island, as well as within previous phases of this project. These protocols are recognised as best practice, and have been implemented in management programs for the most recently detected incursions of Yellow crazy ant within multiple locations in Queensland and Darwin, Northern Territory.

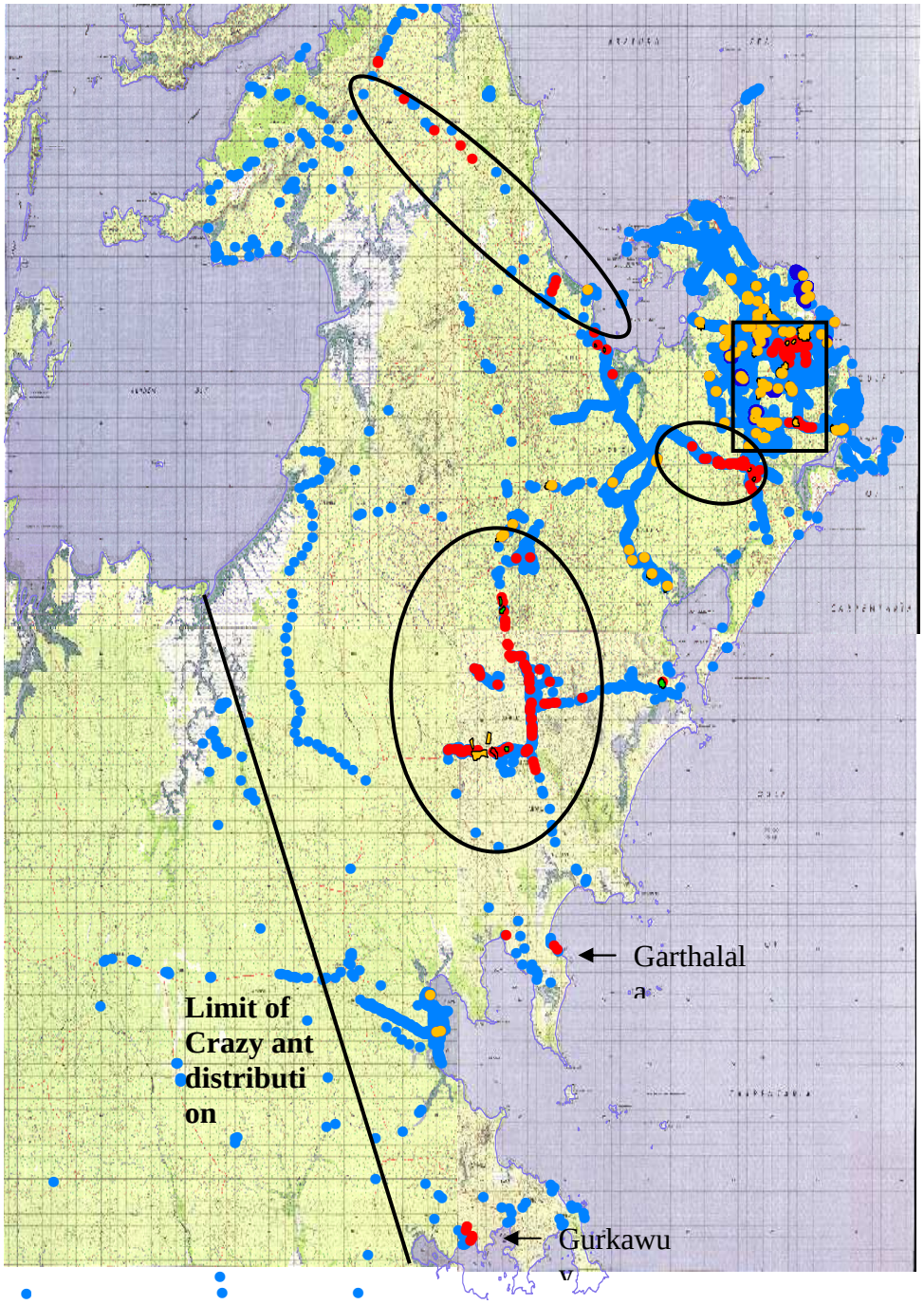

Figure 16. Map of Yellow crazy ant distribution in NE Arnhem Land. Red dots indicate crazy ant sites that remain untreated. Orange polygons are sites already treated. Blue dots indicate assessed sites without crazy ants. Areas A and B are where the ant is intended to be regionally contained. Area C remains to be fully assessed but all infestations are anticipated to be eradicated rather than contained. Sites within the square are on the mining leases; eradication of these sites will be financed by Rio-Tinto Alcan.

PROTOCOL – Last updated September 2006

INFESTATION DETECTION

Purpose

The purpose of this protocol is to describe the methods by which infestations of Yellow crazy ant (*Anoplolepis gracilipes*) will be detected.

Background

For successful eradication of Yellow crazy ant (*Anoplolepis gracilipes*) from north-east Arnhem Land, all infestations need to be found. This protocol describes the methods by which these infestations will be detected.

Protocols

Visual searches for infestations will be conducted in the following locations:

1. All point locations reported by the public as being suspected infestation sites, even if they have been inspected previously.
2. All point locations where vehicles are likely to have stopped in the past 70 years (e.g. camping areas, hunting areas, houses, scrapes, culverts, intersections, etc).
3. Externally of all infrastructure and machinery encountered.
4. Selected point locations at the edges of roads. Within the “hot spot” regions of Gove Peninsula, Central Arnhem Road from Nhulunbuy to Balkpalkbuy, Yaŋunbi, Yudu Yudu, Ganami, Cattle station, and the road to Bakira, inspections to be conducted at 50 m intervals. Remaining roads east of Gan Gan turn off to be inspected at 50-100 m intervals. The Central Arnhem Highway west of Gan Gan turn-off to be inspected at 1 km intervals to the Goyder River.
5. Entire road edges within the rehabilitation areas of the Gove mine site and any other locations considered to be of high probability of infestation that are safely accessible by foot.
6. Other locations opportunistically visited by project staff, project collaborators and interested people.

Visual searches for infestations will be conducted in the following ways:

- Searches will be restricted to early morning (6am-10am) and late afternoon (3pm – 6pm) when temperatures are relatively cool and favourable for ant foraging activity.

Search times can be extended on days when there is cloud cover and/or relatively cooler temperatures.

- Areas to be searched may be burnt at least 2 days prior to survey if it is considered beneficial for access, or safety.
- All locations inspected are to be recorded in GPS for download into the project GIS.
- Disturbance of the litter layer, soil or infrastructure at assessment points is considered beneficial to stimulate ant activity.
- A search of a point location consists of an assessment of a minimum of four microsites (e.g. tree base, rock, drum) within the general vicinity (approximately 15 m) for at least 5 seconds per microsite.
- A continuous survey conducted by walking (e.g. along a road or creek) will assess microsites (e.g. tree base, rock, drum) spaced no further than 15 m apart throughout the length of the assessment area, for at least 5 seconds per microsite.

PROTOCOL – Last updated September 2006

INFESTATION EXTENT

Purpose

The purpose of this protocol is to describe the methods by which the boundaries of Yellow crazy ant (*Anoplolepis gracilipes*) super-colony infestations will be delineated.

Background

Yellow crazy ant (*Anoplolepis gracilipes*) is unicolonial and forms interconnected super-colonies. Following detection of an infestation, the extent of the infestation (boundary of the supercolony) must be determined so that the entire infested area can be treated. Surveys have shown that individual colonies within a supercolony are not as tightly packed in open vegetation as they are in more dense vegetation, and that gaps of up to 100 m and sometimes greater may be present between colonies, making it harder to determine the supercolony boundaries in some locations. This protocol describes the methods by which the extent of each infestation will be determined.

Protocols

General protocols

- Assessments will be restricted to early morning (6am-10am) and late afternoon (3pm – 6pm) when temperatures are relatively cool and favourable for ant foraging activity. Work times can be extended on days when there is cloud cover and/or relatively cooler temperatures.
- Areas may be burnt at least two days prior to survey if it is considered beneficial for access, or safety.
- A team of no less than three people is required to assess infestation boundaries, unless there is clear demarcation of areas surveyed for less than three people to cover the area required..
- Disturbance of the litter layer, soil or infrastructure at assessment points is considered beneficial to stimulate ant activity.

Mapping protocols for infestations larger than 2 ha.

- Starting at a known infestation point, the team is to form a line, with people spaced at least 15 m apart.

- Walking together in any direction (preferably initially along a landmark (e.g. road edge) continuously surveying microsites until no Yellow crazy ants have been found by any member for at least 100 m.
- The continuous survey (e.g. along a road) will constantly assess microsites (e.g. tree base, rock, drum) spaced no further than 15 m apart, for at least 5 seconds per microsite.
- When the first boundary is believed to have been found, the team re-aligns in what is thought to be perpendicular to the infestation, such that at one person is within the infestation confirming the presence of the ants, and all others are outside confirming the absence of the ant.
- The team continues searching, constantly re-adjusting their direction based on the presence/absence of Yellow crazy ants. Ultimately, the team will walk in a circle to finish in the same location where they identified the first boundary.
- Flagging tape can be erected at detection points to visually aid estimating distances and direction . Flagging tape can also be erected as required to allow easy following of the infestation boundary (typically every 20 m).
- A GPS point indicating presence/absence of crazy ants is to be collected at every location inspection. The GPS data are to be entered into the project GIS to display the infestation extent and survey intensity.
- The survey where no crazy ants are found around the suspected limit of the infestation need to extend no less than 100m from all detection points.

Mapping protocols for infestations smaller than 2 ha.

- Starting at a known infestation point, the team is to form a line, with people spaced at least 15 m apart.
- Walking together in any direction (preferably initially along a landmark (e.g. road edge) continuously surveying microsites until no Yellow crazy ants have been found by any member for at least 100 m.
- The continuous survey (e.g. along a road) will constantly assess microsites (e.g. tree base, rock, drum) spaced no further than 15 m apart, for at least 5 seconds per microsite.
- Rather than attempting to walk around the infestation as for large sites, the team walks in parallel lines away from, or through the infestation on all sides, until at least 100m is surveyed with no detections from all detection points.
- Flagging tape can be erected at detection points to visually aid estimating distances and direction . Flagging tape can also be erected as required to allow easy following of the infestation boundary (typically every 20 m).
- A GPS point indicating presence/absence of crazy ants is to be collected at every location inspection. The GPS data are to be entered into the project GIS to display the infestation extent and survey intensity.

PROTOCOL – Last updated February 2009

INFESTATION TREATMENT

Purpose

The purpose of this protocol is to describe treatment methodology for eradicating Yellow crazy ant (*Anoplolepis gracilipes*) from northeastern Arnhem Land.

Background

Yellow crazy ant (*Anoplolepis gracilipes*) is known to occur in more than 100 discrete populations within a 100 km radius of Nhulunbuy in northeastern Arnhem Land. Initial surveys have shown that individual colonies within a supercolony are not as tightly packed in open vegetation as they are in more dense vegetation, and that gaps of up to 50 m may be present between colonies, making it harder to determine the supercolony boundaries in some locations. Treatment of these populations must involve broad-scale application of a control agent over the entire known infested area, as well as a surrounding buffer zone.

Protocols

An infestation is defined as the area that contains all populations of Yellow crazy ant initiating from a point source, or the combined area of multiple point sources where the spread of the colonies have merged to form a common boundary.

- In addition to every infestation, a 100 m buffer is also to be treated.
- Areas of exposed water are not to be treated.
- Where an infestation is located beside a river and the width of the exposed water is greater than 20 m, the area on the opposite side of the river need not be treated.
- Areas to be treated within 20 m of exposed water must be treated using hand-held applicators.
- Where possible, all areas are to be burnt at least one week prior to treatment, and records, and in addition where possible, records are to be kept of the date of burning and intensity of the burn (measured by scorch height of the leaves).
- Presto ant bait is to be applied over the entire treatment area at a rate of 10 kg per hectare.
- Helicopter flight paths are to be spaced at 12 m (assuming 12 m swath width).
- There may also be the opportunity to use Pyrifroxifen bait in the form of Distance at the rate of 4 kg per hectare in both areas beside permanent water and the greater treatment area.
- Bait application is not to occur less than four hours prior to rain, or 24 hours after rain, or if pooled water remains at any time following rain.
- Applications will be restricted to early morning (6am-10am) and late afternoon (3pm – 6pm) when temperatures are relatively cool and favourable for ant foraging activity. Search times can be extended on days when there is cloud cover and/or relatively

cooler temperatures. If it is found that applications conducted in the early morning are not as reliable as those in the late afternoon, all applications will be restricted to being conducted in the afternoons.

- Helicopter treatments are not to be attempted if the wind speed exceeds 10 knots.
- Helicopter operations are to fully comply with CASA specifications.
- Where helicopter treatment is to be conducted beside or over a road, road signs indicating that helicopter operations are in progress must be placed in clear view of traffic 0.5 km either side of the affected area.
- Within the Nhulunbuy/Yirrkala region, treatment times and locations are to be published in the Arafura Times and broadcast over Gove FM where possible.
- A record is to be kept of the actual volume of bait used, and the date of application at each infestation.
- All safety measures must be adhered to according to the descriptions provided in the Yellow Crazy Ant Treatment Operation Manual.
- All sites are to undergo a triple treatment of any combination of Presto 001, Distance or Campaign by the following means:
    a. Broadscale coverage of Presto ant bait at the rate of 10 kg per hectare.
    b. Broadscale coverage of Pyrifroxifen bait in the form of Distance at the rate of 5 kg per hectare (proposed in areas beside permanent water).
    c. Broadscale coverage of Hydramethylnon bait in the form of Campaign at the rate of 5 kg per hectare
- Following post-treatment assessments, small persistent populations can be re-treated by hand if applicable, and if survey confidence is high based on assessment density. If not, then re-treatment by helicopter will be necessary.

PROTOCOL – Last updated February 2009

POST-TREATMENT ASSESSMENT

Purpose

The purpose of this protocol is to describe the methods of post-treatment assessments of Yellow crazy ant (*Anoplolepis gracilipes*) eradication at each treated infestation.

Background

Yellow crazy ant (*Anoplolepis gracilipes*) is known to occur in more than 100 discrete populations within a 100 km radius of Nhulunbuy in northeastern Arnehm Land. The treatment of these infestations involves the application of Presto over the entire infested area, as well as the treatment of a 100 m buffer where possible. Post-treatment, intensive monitoring for two years must be conducted without finding any individuals of Yellow crazy ant before eradication can be stated to be achieved. This protocol describes the methods for assessing the success of the treatments.

Protocols

Eradication success will be assessed in three complementary ways:

1. Visual inspections. A visual inspection will assess microsites (e.g. tree base, rock, infrastructure) throughout an area, with each inspection spaced no further than 15 m apart. Each inspection should last for at least 5 seconds per microsite.
2. Attractive baits. An attractive bait will consist of a teaspoon sized amount of tuna or cat food, placed on the ground and marked by a flag. The bait is left for at least 15 minutes, and then inspected for the presence of ants.
3. Pitfall traps. The pitfall traps used in the assessments of non-target impacts will also be used indirectly to check for the presence of Yellow crazy ants.

The following protocols apply for visual inspections and attractive baits

- Searches will be restricted to early morning (6am-10am) and late afternoon (3pm – 6pm) when temperatures are relatively cool and favourable for ant foraging activity. Search times can be extended on days when there is cloud cover and/or relatively cooler temperatures (thermal tolerances of this ant are currently unreported).
- Areas to be searched may be burnt at least 2 days prior to survey if it is considered beneficial for access, or safety.
- All locations inspected are to be recorded in GPS for download into the project GIS.
- Disturbance of the litter layer, soil or infrastructure at assessment points is considered beneficial to stimulate ant activity.

- Baits must be distributed at a density greater than the measured nest density of Yellow crazy ant in each particular environment (preferably no less than one bait per four square metres.

PROTOCOL – Last updated February 2009

DECLARATION OF ERADICATION SUCCESS

Purpose

The purpose of this protocol is to describe the conditions to be met before infested areas may be declared fully eradicated of Yellow crazy ant (*Anoplolepis gracilipes*).

Background

Yellow crazy ant (*Anoplolepis gracilipes*) is known to occur in approximately 100 discrete populations within a 100 km radius of Nhulunbuy in north east Arnhem Land. The treatment of these infestations involves the application of Presto over the entire known infested area, as well (in most cases) as the treatment of a 100 m buffer zone. Post-treatment, intensive monitoring for two years must be conducted without finding any individuals of Yellow crazy ant before eradication can be stated to be achieved. This protocol describes the conditions to be met before any infestation can be declared to be free of Yellow crazy ant.

Protocols

Infestations may be declared free of Yellow crazy ants if both of the following conditions are met:

1. The area infested and the surrounding 100m buffer zone (where possible) have been undergone a triple treatment of any combination of Presto 001, Distance or Campaign by the following means:
    a. Broadscale coverage of Presto ant bait at the rate of 10 kg per hectare.
    b. Broadscale coverage of Pyrifroxifen bait in the form of Distance at the rate of 5 kg per hectare (proposed in areas beside permanent water).
    c. Broadscale coverage of Hydramethylnon bait in the form of Campaign at the rate of 5 kg per hectare
2. In areas that have not undergone a triple treatment, no Yellow crazy ants are found after a minimum of one systematic surveys of the infested area and surrounding buffer zone, post-treatment conducted at least 12 months following treatment. Surveys to comply with the Post Treatment Assessment protocols.

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