



*Work Plan to guide the
eradication of the African Big-
headed Ant (*Pheidole
megacephala*)
from Lord Howe Island.*

November 2013

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This work plan is intended to be reviewed at the commencement and end of each treatment season. This will allow lessons learnt to be incorporated as required.

SECTION 1

Introduction

Background

The African Big-headed Ant (*Pheidole megacephala*) (ABHA), has become widely established across the settlement area of Lord Howe Island (LHI) and has also been recorded within the LHI Permanent Park Preserve (North Bay & the Clear Place). This introduced ant species is considered to be one of the greatest threats to LHI's ecosystems (B. Hoffmann, G. Cassis, pers. comm.) and is recognised as one of the top 100 worst invasive species in the world by the UN Invasive Species Specialist Group (ISSG 2010 & Lowe *et al* 2000) with well known adverse environmental impacts, especially on islands (Holway *et al* 2002). Although currently largely confined to the settlement area of LHI, if left uncontrolled, it is capable of spreading into the Island's natural reserve areas, including the high conservation value southern mountains, as LHI provides suitable environmental conditions for the species.

The ABHA has been identified as one of six national priority tramp ant species that impact Australia's biodiversity by the Australian Government (Commonwealth of Australia 2006) and are considered a particular threat to the Island's terrestrial invertebrate biodiversity (Gerry Cassis pers. comm). Despite their small size, ABHAs are extremely aggressive and native invertebrate diversity and abundance has been shown to decline significantly in areas that they colonise (Hoffmann *et al*. 1999; Hoffmann & Parr 2008; Vanderwoude *et al*. 2000). On LHI, many of the invertebrates under threat from the ABHA are endemic and are likely to be important for ecosystem functioning such as decomposition, nutrient cycling, seed dispersal, pollination and predation.

The ABHA is thought to have been accidentally introduced to the Island in about 1993 (B. Hoffmann, pers. comm.), although the issue was only formally identified in 2003. The ant was most likely introduced through infested building material transported to the Island from the mainland and deposited somewhere in the Anderson Road complex (B. Hoffmann, pers. comm.). The infested material may then have then been transferred to the Waste Management Facility (WMF) and subsequently spread around the Island in mulch, soil and on vehicles. It is also likely that green waste from the settlement area is continually re-infesting the WMF site and other areas on the Island. It is also suspected that ABHA are being spread from the Lord Howe Island Board Nursery because they are known to colonise peat, the main propagation medium used. As a consequence, revegetation sites around the Island are thought to be exposed to the introduction of ABHAs from infested native seedlings.

Treatment history of ABHA on Lord Howe Island

In December 2005, Dr Ben Hoffmann (CSIRO) prepared a draft strategy for the control and eradication of ABHA on LHI (Appendix 1). The objectives of this strategy were to eradicate the ABHA from Lord Howe Island.

In 2005 Dr Hoffmann visited the Island to train Lord Howe Island Board (LHIB) staff and finalise the ABHA eradication strategy. Field assessments were conducted over two days to determine the approximate range and extent of ABHA infestations on LHI, resulting in a number of recommendations being made to control the current rate of spread and eradicate ABHA from the Island. On Dr Hoffmann's recommendation, the LHIB commenced trials under permits issued by the Australian Pesticides and Veterinary Medicines Authority (APVMA) (Per9232 and Per9277). The trials covered an area of approximately 50 hectares and were completed on the 15th May 2006.

In October 2006, the LHIB conducted a survey aimed at identifying all ABHA infestation areas on the Island. The survey was implemented over a 2 week period and identified a total area of approximately 120ha as being infested with

ABHA. However, it is not known whether the survey inspected all potential ABHA areas. Given the scale of the infestation, the Board chose to submit an application on 19 October 2006 to the APVMA for an emergency permit to use an unregistered ant bait (Campaign Ant Bait) as a cheaper alternative to Amdro®. After consideration, the APVMA did not support issuing an emergency permit given that a suitable registered bait alternative existed (Amdro®). The LHIB's permit application was subsequently withdrawn.

On 2 January 2007, the LHIB purchased sufficient Amdro® to treat the mapped infestation area. However, due to availability of supply, freight restrictions and seasonal weather patterns, the LHIB was unable to conduct the poisoning program until February 2008.

The February 2008 treatment program was conducted over a 2 week period and covered an area of approximately 120ha. A follow up ABHA survey was conducted a few days after the initial treatment, which did not detect any ants in the areas treated. Recent advice suggests follow-up surveys using visual searches and meat based lures should be conducted at least 3 months following treatment to allow any remaining ants to re-establish enough numbers to be detectable.

During 2008, small isolated ABHA infestations were being reported by LHIB staff and residents throughout the settlement, both in the treated areas and in areas where ABHAs had previously been undetected. These infestations were opportunistically searched, treated and recorded. The movement of material from known ABHA infestation sites, and emergence of new infestations, suggests that the ants were being transported around the Island in infested materials. In the 2008/2009 fiscal year the LHIB allocated a budget of \$10,000 for ABHA works which was not sufficient to complete a systematic survey or treatment.

ABHA sightings continued to be reported to the LHIB and it was suggested that the numbers of colonies had increased and were covering a broader area than recorded in the 2006 trials. In April 2010 opportunistic ABHA surveys were

conducted through the settlement area utilising flagged meat based lures. The infestation area was mapped at approximately 30ha (Map 2).

On 16 June 2010, an additional 10Kg of Amdro® was purchased to compliment 70Kg of Amdro® that still remained from the 2008 treatment to enable the 30 ha infestation area to be treated at the recommended rate. Treatment of the mapped ABHA infestation areas was conducted in November 2010. Post treatment surveys (systematic visual searches under rocks and logs) were again conducted a few days after the treatment and revealed that small infestations still persisted within the areas that were treated. Several residents also requested inspections of their properties in which ABHA infestations were suspected. ABHA's were positively identified on several leases not identified previously.

In January 2010 the LHIB undertook targeted surveys to identify the extent of ABHA infestations on LHI. Transects were established which extended in four directions from known areas of an infestation. Meat-based baits (one teaspoon of canned dog food) were laid out along transects at approximately 20m apart and marked with bright flags. The baits were left for a period of 20 to 40 minutes before being checked and the presence or absence of ABHA ants noted. The density and number of other ant species present on the bait were also noted. This survey mapped the infestation area at 220Ha, which covers almost all of the residential land on the island (Map 3). These surveys focused on surveying previously known sites and opportunistically inspected areas suspected or predicted to contain ABHA. Areas not previously surveyed have recently had rapid assessments undertaken to determine presence/absence of ABHA. These surveys detected a species of *Pheidole* which were initially thought to be significant range extensions of ABHA but have subsequently been identified by Dr Ben Hoffmann as a native species.

Most of the areas mapped as containing ABHA in 2010 were treated with Amdro in January 2011. Follow up surveys and treatments of outlier infestations and identified source points have been conducted twice since the January 2011 treatment. These treatments are likely to have also treated infestations containing the native *Pheidole*. The January 2011 treatments are thought to

have considerably reduced the distribution and density of ABHA throughout the settlement, with only residual infestations remaining.

In March 2012 Dr Hoffman delivered targeted training to LHIB environmental unit staff in ant identification (including how to distinguish between ABHA and a native species of *Pheidole*), how to map and treat infestations, post treatment monitoring methods and timeframes and provided a revised set of priorities for implementation in the preceding months. This training was extremely valuable in determining that the extent of the infestation is considerably less than initially anticipated due to the identification of a native species of *Pheidole* as ABHA. This has resulted in the 2011 & pre March 2012 infestation mapping being over estimated.

Areas previously mapped as containing ABHA or are known to currently contain ABHA are prioritised for surveying, mapping and treatment as soon as practicable. Ideally all known populations will be identified, accurately mapped and treated prior to the winter of 2012. Any areas not able to be surveyed, mapped and treated prior to the winter of 2012 will be prioritised as soon as possible in Spring 2012. Areas not previously surveyed (eg cleared grazing land at Old Settlement and between Capella and Soldiers Ck) will then be surveyed for ABHA. The infestation area will be estimated after these surveys to determine the amount of bait required to treat the infestation in the preceding year.

The reasons for not successfully eradicating ABHA from LHI between 2006 – 2010 are most likely due to a range of factors:

- Lack of expert advice and training in identification of ABHA from a native species of *Pheidole*, distribution mapping and post treatment survey methods;
- Inadequate planning;
- Deficiencies in systematic survey, monitoring & treatment methodology;
- Lack of skilled supervision;
- Missing seasonal treatment windows due to wet weather; and
- Insufficient long term funding to enable follow-up surveys and treatments to be undertaken until eradication is achieved.

Since these failed attempts, the LHIB have adopted an planned approach, focusing on mapping distribution, and undertaking control and containment of outlier infestations. In March 2012 Dr Ben Hoffmann (CSIRO) provided training to LHIB staff in ant identification (including how to distinguish between ABHA and a native species of Pheidole), how to map and treat infestations, post treatment monitoring methods and timeframes and provided a revised set of priorities for implementation in the proceeding months. Despite previous failures, staff have learnt to identify, treat and monitor infestations using best practice methods. Dr Hoffman is confident eradication is feasible and can be achieved with adequate planning, resourcing, training and follow-up monitoring and treatments within a 4–5 year timeframe.

SECTION 2

Proposed methodology for the eradication of the ABHA from LHI

To improve the probability of achieving eradication success it is proposed to split the eradication program into three phases;

- (i) pre-treatment surveys;
- (ii) treatments and
- (iii) post-treatment monitoring (and targeted treatment where ants are detected).

Each phase of the project must be carefully recorded to map the location and distribution of ABHA pre and post treatment and to monitor and evaluate the effectiveness and efficiency of the methodology employed each season. To assist in describing infestation locations the island has been mapped into 7 broad landscape zones (Table 1). These landscape zones must be recorded on a pro-forma (Appendix 2) when undertaking pre-treatment surveys, treatments and post-treatment monitoring. Within the Permanent Park Preserve (PPP), weed block ID codes must also be recorded. Within the settlement area, Portion and/or Lot/DP numbers must be recorded. Other descriptors such as leaseholder names, road names and landscape features can also be used providing the mandatory codes are recorded. Pro-forma templates for pre-treatment surveys and treatments are provided in Appendix 2. All areas surveyed and treated will be mapped using GIS software and be digitally recorded on a pro-forma (Appendix 2) using a MobileMapper (Magellan) or similar.

This process will provide a feedback mechanism to track expenditure, delineate areas monitored and treated, and identify where effort has been successful or

has failed. This is crucial to identify where and how improvements can be made so that the project can be adaptive and assist to identify resource requirements for the upcoming year.

Table 1.
Broad Landscape Zone Codes

Zone Number	Zone Name	Zone Code	Zone location description
1	SM	Southern mountains	PPP boundary in Southern Mountains from paddock edge south of Moseley Park Swamp, including Intermediate Hill, Mt Lidgbird and Mt Gower
2	SS	Southern settlement	Entire area south of Cobby's Corner - excluding PPP in Southern Mountains
3	AP	Airport precinct	Area between Cobby's Corner and Windy Point
4	MSS	Main settlement south	Area between Windy Point and Middle Beach Rd.
5	SC	Main settlement central	Area between Middle Beach Rd. and Ned's Beach Rd.
6	SN	Main settlement north	Area between Ned's Beach Rd. and NW to include all cleared area north of Old Settlement Beach
7	NH	Northern hills	All remaining areas to the north

Follow-up treatments will be required in areas identified during post-treatment monitoring as having persistent or new infestations of ABHA. A public awareness and education campaign is a fundamental component of the eradication program and will be undertaken prior to, and during, all three phases of eradication.

Ongoing external expertise will be required to review the implementation of methodologies to ensure they are based on global best practice for eradicating ABHA.

Pre-treatment Surveys

Rapid Assessment

To gauge the approximate distribution of ABHA across LHI, a coarse-scale rapid survey methodology will be employed across known and predicted ABHA locations on LHI. Predicted areas include all of the settlement area, boundaries and tracks of the PPP and 100 metres beyond sites that were mapped as containing a known infestation at least 6 months previously. The aim of this method is to determine where to undertake finer scale surveys which then map the distribution of ABHA and provide the detailed information necessary to implement a treatment program. The rapid survey assessment will involve a systematic approach that ensures all the settlement is surveyed at a coarse scale by using visual searches and observations using flagged lure attractants to delineate the approximate infestation perimeter. Known infestations do not do not require coarse scale rapid survey providing they are recorded as supporting ABHA. However, boundaries of mapped known infestations need to be resurveyed if not treated within the previous 6 months to determine whether the population has expanded.

Visual searches for ABHA will involve shifting and looking beneath rocks, logs, pot plants, loose building materials, dried cow pats and other debris and will be targeted around buildings, sheds, gardens, paved areas, roadways, other human infrastructure and pastures, parks and the golf course.

To determine the perimeter of an infestation, coarse scale rapid assessments will use using flagged lure attractants with a small quantity (approx. 1 teaspoon canned fish) at 50m intervals from areas where ABHA have been detected using visual searches or from known infestations. Lure attractants will be clearly flagged and then checked carefully for the presence of ABHAs between 20 and 40 minutes after the lure is laid. If there is no lure remaining at the flagged station at the time of inspection, the lure will be replaced and re-inspected within a shorter period of time. If lures are being repeatedly taken by birds or dogs they should be covered with a container to prevent their access.

All ABHA surveys will be carried out in dry conditions during daylight hours but not during any part of the day that exceeds 30° Celsius (C). The ideal temperature range for undertaking ABHA surveys is between 24 and 30° C because this is when the ants are most active outside of their nest. Rapid assessments will be conducted when warmer weather increases ant activity (late October/early November depending on weather).

The rapid assessment surveys will be undertaken in a systematic manner to ensure all known or potential locations are surveyed and will inform where effort needs to be prioritised for finer scale infestation mapping.

Surveys will be prioritised to commence within the settlement at locations that have been mapped as previously supporting infestations and at known locations. Each site will undergo a rapid survey and if ABHA are detected will move to fine scale mapping and treatment as soon as possible after detection. Post treatment surveys will not be undertaken until at least 3 months after treatment. Once these areas have been surveyed areas not previously surveyed and all public walking tracks will be prioritised.

Rapid assessments must survey all areas immediately surrounding every built structure within the settlement area and along all roadways (including driveways). Roadway surveys will be undertaken along both sides of the road at 50m intervals (ideally offset).

Rapid assessment flagged lure attractants must be established 50 metres from sites where ants have been positively detected using visual detection methods.

Rapid assessment surveys of all public walking tracks will utilise visual search and flagged lure attractants placed at 50m intervals starting from the track entrance and continuing until no ABHA ants have been detected. Where ABHA are detected along tracks, surveys must be undertaken 50m either side of the track to 50m beyond the last known infestation.

All points surveyed during the rapid assessment will be recorded digitally on a pro-forma (Appendix 2) using a MobileMapper (Magellan) or similar. Presence or absence of ABHA at each of these survey points, along with the method of detection (visual or baited), location and person hours will be recorded digitally.

Fine-scale infestation mapping

Results of the rapid assessment will be used to inform finer scale mapping of ABHA infestation area boundaries. Areas surrounded by survey points at which ABHA were detected during the rapid assessment stage should be considered to be uniformly infested, with fine-scale surveys used for the purpose of defining infestation boundaries. Fine-scale mapping will inform the extent of the treatment area, which will be 20m beyond the infestation boundary.

Fine-scale surveys will be carried out using flagged lure attractants (as per rapid assessment) at 5–10m spacing along transects radiating outwards from known infestation areas. The area surveyed will continue in an outward direction until no ABHAs are detected.

All points surveyed during the fine-scale assessment will be recorded digitally on a pro-forma (Appendix 2) using a MobileMapper (Magellan) or similar. Presence or absence of ABHA at each of these survey points will be recorded and then mapped using GIS software to determine ABHA infestation areas (Map 3). Positive infestations will be mapped with a 20 m buffer applied.

Monitoring of known source points and outlier infestations

Table 2 below lists known source points and potential outlier infestations. These areas will be monitored every three months after initial treatment (where ABHA have been positively identified) and continue to be surveyed until eradication is achieved (which will be confirmed when no ABHA have been detected using the monitoring methodology outlined in this Work Plan for a period of 2 years). Potential outlier infestations need to be surveyed to determine whether they support ABHA or a native species of *Pheilode*. Outlier infestations that are found to support the native species of *Pheilode* will be mapped as uninfested and removed from the below table. Positive detections of ABHA must be surveyed to determine the treatment area and treated as soon as possible after detection.

<i>Known Source Points</i>	<i>Outlier Infestations</i>
Waste Management Facility (WMF)	The Clear Place
LHIB public BBQ's & bins	North Bay
LHIB stockpile depot (woodshed, fuel shed etc)	PPP boundary with Golf Course (2 nd - 5 th holes)
LHI Hospital	Settlement South
LHIB admin & depot	Transit Hill
LHIB nursery peat stockpile	
Golf course soil dump	
Airport terminal	
Jetty Area	

Treatment

Training

In March 2012 CSIRO ABHA expert Dr Ben Hoffmann delivered targeted training to LHIB environmental unit staff. Training covered identification of ABHA and similar species, survey, treatment and monitoring methodologies and eradication mentality. It is important that all staff and contractors involved in the project are adequately trained and have a strong commitment to the project and foster an eradication mentality. This requires an understanding that eradication requires the removal of all individuals. It is fundamental that survey, monitoring and treatment works are all conducted thoroughly and systematically, with no complacency, gaps or short cuts made. GPS units will be carried by field staff to map areas surveyed, monitored and treated. Staff and contractors need to assume that all areas may support ABHA until surveyed, treated and monitored up until the period when the eradication is deemed successful.

Application procedures

All mapped infestation areas will be treated using Amdro® (BASF, Australia), with the treatment area extending 20m beyond the known infestation boundary. Amdro® will be applied as per the manufacturers recommendations at a rate of 2.5kg/ha or 5g per 20m² using a hand-held rotary spreader or by hand where hand-held spreaders are not practicle. Appropriate PPE must be worn. Amdro® will be applied at slightly higher rates around the bases of trees, and around buildings and piles of debris to compensate for the increased foraging surface areas of these substrates.

Personnel applying the Amdro® granules will be aligned in a row, spaced 3m – 5m apart, and walk together in one group along parallel paths from one edge of an infestation area to another. To ensure uniform and complete coverage of infested areas, the two outer broadcasters will carry a GPS unit to track and map the treatment area and/or utilize a string-line. Where multiple passes are required, larger infestations may also be defined using landscape features such as tracks, roads, fences or distinct changes in vegetation so that they can be

systematically treated over multiple days. Labelled flagging tape must also be used to demarcate the end of each days treatment area to ensure that when the baiting recommences the previous days bait line can readily be found.

All treatment works will be undertaken in accordance with the Lord Howe Island Pesticide Notification Plan 2010.

All care must be taken to not disturb ABHA colonies prior to treatment.

Amdro® is toxic to fish and aquatic invertebrates, so care will be taken to avoid contaminating waterways, including ponds and dams, and will only be applied in dry conditions. Hand broadcasting may be applied near to water edges to reduce the possibility of contamination. Weather forecasts will be monitored and treatment of areas with Amdro® will not proceed if rainfall is predicted within 24 hours of application or if the temperature or conditions are such that ABHA are not active.

Cropping areas (fruit trees and vegetable gardens) will be treated with Distance® Plus Ant Bait in accordance with the product label.

Buildings

In addition to the broadcast application of Amdro® around buildings, all buildings within a known infestation area will also be treated internally using Advion® Ant Gel in accordance with its product label.

Treatment of known source points and outlier infestations

Known source points and potential outlier infestations listed in Table 2 will be treated as follows.

All known source points and potential outlier infestations must be surveyed to determine whether ABHA are present prior to each treatment. Identified infestations must be surveyed using fine scale survey methods and treated as

soon after delimitation of population extent or at least three months after a previous treatment. Treatment should extend at least 20 metres beyond the mapped extent of an infestation unless monitoring confirms the infestation is confined to a smaller area. Previously treated populations need to be allowed to recover for three months to a detectable level and to improve bait uptake. If no ants are detected within known source points or potential outlier areas, treatment is not required and is to be recorded as absent on the data sheet.

Potential outlier infestations need to be surveyed to determine whether they support ABHA or a native species of *Pheilode*. Outlier infestations that are found to support the native species of *Pheilode* will be mapped as uninfested and removed from Table 2.

Treatment notes

When spread at recommend rates, Amdro® is not considered hazardous to pets, livestock or children but when stored it should remain in its original container in a cool dry place away from food stuffs and out of the reach of children and animals. Amdro® granules should be used within 3 months once the container has been opened.

When broadcast outdoors, Amdro® breaks down within 1 day with exposure to the elements but when applied within bait stations or under shelter, Amdro® can remain effective for 12 weeks (Taniguchi *et al.* 2005).

Post-treatment monitoring

Post-treatment surveys

Post-treatment surveys will be carried out within all infestation areas between 3 and 4 months after any previous treatment. They will utilise a combination of rapid and fine scale survey methods, commencing with a visual search and if signs of ABHA are found a more intensive grid search method using using a tinned fish meat lure attractants placed in a 2 X 2 m grid array throughout the treatment area and left for a minimum of 15 minutes. This will allow sufficient time for any remaining ants to build up sufficient numbers to enable detection.

All points surveyed will be recorded digitally on a pro-forma (Appendix 2) using a MobileMapper (Magellan) or similar. Presence or absence of ABHA at each of these survey points will be recorded and then mapped using GIS software to determine ABHA post-treatment infestation areas (Map 3). Positive infestations will be mapped with a 20 m buffer applied.

Any areas found to have persistent infestations of ABHA 3 to 4 months after treatment will be treated as soon as practical following complete delimitation of the extent and when weather conditions are suitable, including internal treatment of buildings where applicable.

Repetition of the fine-scale assessment methodology will occur annually and continue until no ABHAs are found for 2 consecutive years. Targeted surveys may then be carried out annually at a few key ABHA infestation hot-spots, such as the waste management facility, airport terminal, palm nursery and public jetty or any locality reported as suspected of being infested with ABHA. Detection of ABHA at any location on the Island will trigger a community awareness campaign and a rapid assessment survey radiating out at 50 m intervals from any detection point until no ants are detected. Any positive detection will be treated as soon as practical following complete delimitation of the extent and when weather conditions are suitable.

Priority areas for Post Treatment Monitoring as of April 2012 include all residences and surrounding land within the settlement area that are located within areas previously mapped as infested or an area with a known infestation. All known infestations should be accurately mapped and then treated as soon as practicable.

Quarantine measures

To reduce the likelihood of ABHA re-invading LHI following their eradication requires stringent quarantine measures to be continually applied. Increased resourcing is likely to be required compared to what is currently allocated for quarantine. A range of quarantine measures will need to be developed and applied to cover all potential risks of entry. These include but are not limited to:

- Investigate the best ant detection methods available for implementation;
- Seek funding to obtain a sniffer dog specifically trained to detect ABHA;
- Identify all potential risk items and source points and label these as Quarantine Risk Items on manifest. These items will then require inspection prior to transport to LHI and from Jetty;
- Training of key stakeholders and transport/courier staff in conducting inspection of at risk cargo for signs of ABHA;
- Production and dissemination of targeted educational material (pamphlets, fact sheets) for stevedores, transport carriers and LHI community;
- Training personal to monitor and treat the Port Macquarie jetty area and in-transit cargo with Amdro® when ABHA infestations are identified;
- Conducting community meetings and displays at the community markets; and
- Conducting regular surveillance at points of entry where materials are unloaded or stored.

Community engagement

Public awareness of the issues surrounding the impacts of ABHA on LHI and acceptance of the need for their eradication is vital to the success of the program. Targeted ABHA educational materials, displays and presentations will be provided to inform and engage all Island residences and visiting tourists regarding the ABHA eradication project. Residents and the community will be kept informed of the project and any new information via articles in the Signal, LHIB Community Bulletin, LHIB Notice Boards, LHIB website and displays at community markets.

The LHIB will provide an information package to all residents, which will request access to leases to conduct eradication works and provide background information on the impact and identification of ABHA, eradication methods to be used, ways the community can assist to eradicate ABHA and whether leaseholders have any special requests.

Likelihood of success

ABHA are considered a relatively easy ant to eradicate with the use of Amdro® with follow-up treatments rarely required and, if necessary, only over a small area (Hoffmann et al. 2010, in press). Previous applications of Amdro® on LHI appear to have significantly reduced numbers of ABHA throughout the settlement (Hoffmann pers comm.. March 2012), but has not yet achieved eradication on LHI. Continued targeted surveys, mapping and treatments will be required to effect eradication. Adoption of the proposed methodology for systematic searches and complete treatment of all ABHA infestations, combined with thorough post-treatment monitoring, should lead to the complete eradication of ABHA from LHI resulting in rapid ecological recovery. Provision of adequate funding to implement on-going follow-up monitoring and treatment is fundamental to delivering eradication.

The ABHA has been successfully eradicated from areas within the World Heritage listed Kakadu National Park (Hoffmann & O'Connor 2004), within

bushland bordering the Daly River in northern Australia (Hoffmann 2010), and in numerous locations within northeast Arnhem Land (Hoffmann 2011). In all cases, similar methodologies were adopted as are proposed here and post-treatment assessments have confirmed rapid recovery of native invertebrate communities (Hoffmann 2010, 2011). Dr Ben Hoffmann, CSIRO ecologist, was instrumental in all of these successful eradications and his recommendations have guided the formulation of this Work Plan to eradicate ABHA from LHI. Dr Ben Hoffmann has delivered targeted training to LHIB environmental unit staff and will provide expert advice throughout the project.

Legislation

The eradication of ABHA from LHI will require access of all tenure where ABHA have been identified to survey, monitor and treat infestations. Any leases that refuse access to their lease or refuse the use of Amdro® jeopardize the likelihood of successfully eradicating ABHA from LHI. There are several leaseholders who have indicated they may not want ant bait distributed on their lease which will jeopardize the eradication effort. In the first instance the LHIB will endeavour to gain co-operation with all leaseholders to gain access to their leases and residences.

However, for leaseholders that refuse access or treatment using Amdro®, legislative power of entry provisions may need to be used to gain access to undertake survey, monitoring and treatment works. Such an approach will only be used where a leaseholder refuses access and places the eradication project at risk of failure.

The NSW Plant Diseases Act (PD Act) 1924 lists the ABHA as a declared pest for NSW under Schedule 1. Section 11 of the PD Act allows the Director General of NSW Industry and Investment (Department of Primary Industries – DPI) to appoint an Inspector for the purposes of the Act. An Inspector has, and may exercise, the functions conferred or imposed on the Inspector by this Act or the regulations (under that Act). Section 14 of the PD Act provides an Inspector with the power to serve a notice to an owner or occupier of land or premises to prevent the spread of a disease or pest listed under the Act. Section 15 of the PD Act provides powers for an Inspector to serve a notice to an owner or

occupier of land or premises to quarantine the land and premises for a period not exceeding twenty-one days, and to take such measures or do such acts as specified in the notice. In order to be able to enact these powers the LHIB will seek approval from the Director General of the DPI to have LHIB staff authorized as Inspectors under the PD Act.

Section 7 of the Board's leaseholder agreement states:

'The Lessee shall at all times take effective steps to keep the land hereby leased free from rats and other animals now or hereafter declared by the Board to be noxious animals'.

In order to achieve eradication of ABHA from LHI the Board may be required to exercise its powers under Section 107, Power of Entry (1) of the *Lord Howe Island Regulations 2004* where it states:

'For the purpose of enabling the Board to exercise its functions, a person authorised by the Board may enter any premises'.

Projected costs

A project plan will be developed to implement this Work Plan detailing milestones and projected budgets. The LHIB has received a grant through Caring For our Country (CfoC) totalling \$195,000 to undertake eradication works for ABHA from June 2011 – June 2013. These figures were based on infestation mapping prepared prior to training in ant identification by Dr Ben Hoffman in March 2012, which found that all the outlier infestations comprised a native species of Pheilode. This mapping was used to forecast bait requirements to treat the mapped area with an 80% bait reduction per annum till 30 June 2013. It is now considered that this much bait will not be required. The contract was finalised in February 2012, significantly reducing opportunities for treatment over the 2011/12 summer period. The LHIB have provided a budget of \$75,000 through the LHIB Operations Plan 2011/12. Additional funding will be sought through LHIB recurrent funds for the 2012/13

fiscal year to compliment CFoC funds to enable the systematic and thorough survey, monitor and treatment over the 2012/13 summer period.

Eradication will be declared when there are no more ABHA recorded after two years of monitoring. On-going resourcing will be required for consecutive years after initial treatment to continue monitoring and undertaking treatments as required. Annual budgets will be forecast each year based on mapping of infestation areas and predicted monitoring effort. These will be included in budget bids until eradication is deemed successful.

Costs for training staff to become authorised officers has not been included in this plan.

SECTION 3

African Big-headed Ant (*Pheidole megacephala*)

Biology and ecology

African Big-headed Ants, measuring 2mm to 4mm in length are a small light brown ant native to southern Africa and are now found throughout temperate and tropical zones around the world. Despite their name, most ABHAs do not actually have a big head. It is only the Major workers of this species that are characterized by disproportionately large heads with powerful mandibles (figure 1), but they are vastly outnumbered by the Minor workers which do not have enlarged heads. The first antennal segment (scape) of the Minor workers far exceeds the top of the head, and is covered in many long hairs (figure 2). There are two very small spines on the rear of the body (propodeum) facing almost directly up.



Figure 1. African Big-headed Ant (*Pheidole megacephala*) major worker.
Copyright Antweb.org



Figure 2. African Big-headed Ant (*Pheidole megacephala*) minor worker.
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At least two similar looking species to ABHA that occur on Lord Howe Island, including another species of *Pheidole* and *Tetramorium bicarinatum*. *T. bicarinatum* is also an introduced species but does not appear to have any discernable environmental impact. *T. bicarinatum* is larger than the ABHA and more uniformly brown. It is not known whether the other species of *Pheidole* is introduced or native. If it is native it is likely to be widely distributed and should therefore survive a baiting program. If it is introduced it will be controlled along with *P. megacephala*.

ABHA form nests in soil (either exposed or under cover) with a low mound of loose dirt deposited around the entrance. They rarely nest indoors, but may invade homes to forage for food, with a preference for meats, bread or other grain-based products.

ABHA workers are most active outside of their nest when temperatures are in the range of 24 to 30 degrees Celsius, so their daily activity varies throughout the year (Carnegie 1960).

African Big-headed Ants are true ‘tramp’ species (Passera 1994), which means that they have lost the ability to fly while in their reproductive form and are therefore dependent on people to disperse them any significant distance away from the parent colony (Hoffmann & O’Connor 2004). ABHAs most commonly spread via the transportation of infested soil, plant or building materials.

New colonies of ABHA are commonly founded by ‘budding’, where one or more fertile queens split off from the main colony along with a group of workers (Beardsley et al. 1982). However colonies may also be established by a single inseminated queen (Reimer & González-Hernández 1993).

Another trait of tramp ants, such as the ABHA, is that they can form super-colonies where there is no intra-specific territoriality and continuous multi-queen infestations are able to develop over areas covering tens to hundreds of hectares (Fournier *et al.* 2009; Hoffmann & O’Connor 2004). By contrast, interactions with other ant species invariably results in agonistic behaviour (Fournier *et al.* 2009; Dejean *et al.* 2007; Dejean *et al.* 2008; Holway 2002).

Threat to biodiversity

The African Big-headed Ant is listed amongst the world's 100 worst invasive species (Baskin 2002).

The ABHA is more aggressive than most native ant species and single scout ants have the ability to quickly trigger mass recruitment of nest mates to capture large prey items or to raid colonies of competing native ants (Dejean *et al.* 2007). Native ant species are usually displaced or eliminated from areas colonized by the ABHA through a combination of direct predation and competition for food resources (Dejean *et al.* 2007; Holway 2002). Moreover, native invertebrate diversity and abundance has been shown to decline significantly in areas colonized by the ABHA (Hoffmann *et al.* 1999; Hoffmann & Parr 2008; Hoffmann 2010; Holway *et al.* 2002; Vanderwoude *et al.* 2000).

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Appendices

Appendix 1: CSIRO recommendations



Recommendations for African big-headed ant eradication on Lord Howe Island – 2005

Priority work order

- Immediate stop to the spread of mulch from the recycling centre
- Immediate treatment of small infestations in recently spread mulch, the infestation around the wood supply piles, and within the Kentia palm nursery.
- Completion of infestation extent delimitations
- Continuation of survey for other infestations on all properties over LHI, especially where infrastructure is present (blue areas on map) – (estimated 200 locations)
- Communication of infestation locations to all LHI residents to prevent further spread

Eradication chronosequence

- Accurately re-survey infestations limits just prior to treatment
- Divide infestations into small treatment blocks (e.g. between roads, fences)
- Conduct treatments using as many people as possible spaced approx. 2.5m apart – possible use of string lines/measuring tape lines to align paths.
- Wait for at least two months prior to conducting post-treatment assessments
- Count the number of attractive baits used in post-treatment assessments and preferentially collect GPS data of each point.
- Re-apply ant bait if required.

Additional recommendations

- Potential to conduct research into effectiveness of Distance with Sumitomo Chemical Company (Garry Webb) at Wharf and Signal Point infestations
- DO NOT apply ant treatments if the ground is wet, or if rain is due within four hours.
- Keep separate data files for points indicating presence/absence of ants both prior to and after treatment.
- Record data of treatment dates, and assessment dates.
- Conduct extensive post-treatment assessments (recommended 10,000 points)
- Apply a 5–10 m buffer to the measured limits of all infestations.

The recycling centre – a unique case

Because the recycling centre will continue to be re-infested as long as other infestations remain on the island, this area requires unique considerations.

Recommendations:

- Treat the entire infestation around the recycling centre as soon as possible.
- As a precaution, always consider that the centre remains infested (regardless of whether it is or not)
- Re-assess and re-treat the centre as required after all other infestations have been treated – (It needs to be the last site treated).

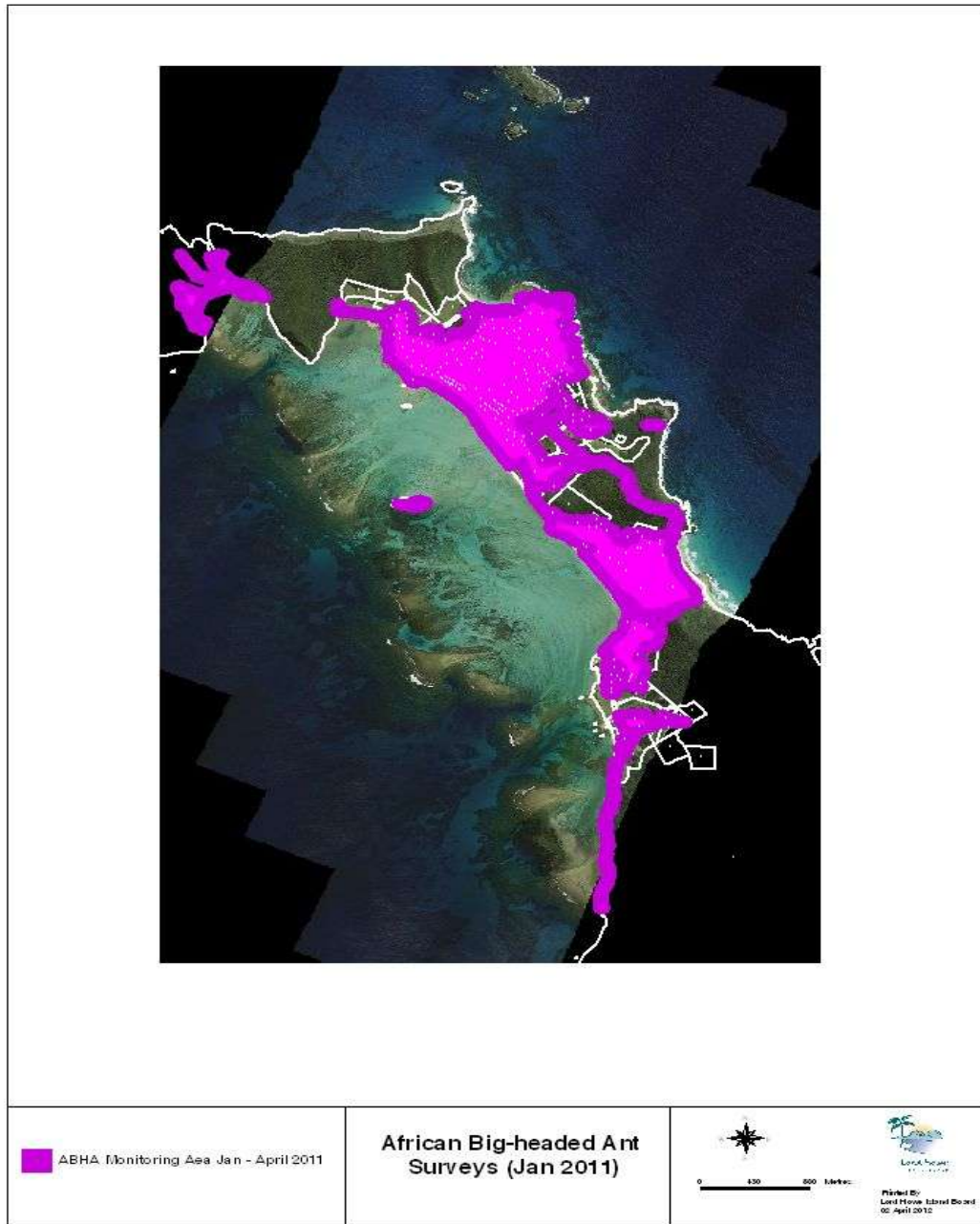
Project estimates based on incomplete survey

- Time to complete infestation detection surveys – 20 hours
- Time to complete delimitation surveys of infestations – 20 hours
- Infested area – up to 50 ha
- Treatment product cost – up to \$40,000
- Time to conduct treatments – 200 hours
- Time to conduct post-treatment assessments – 120 hours

Appendix 2: ABHA Treatment Spreadsheet

Date	Zone	Block ID	Infestation ID	Area treated (m2)	Bait used (g)	person hours	Comments

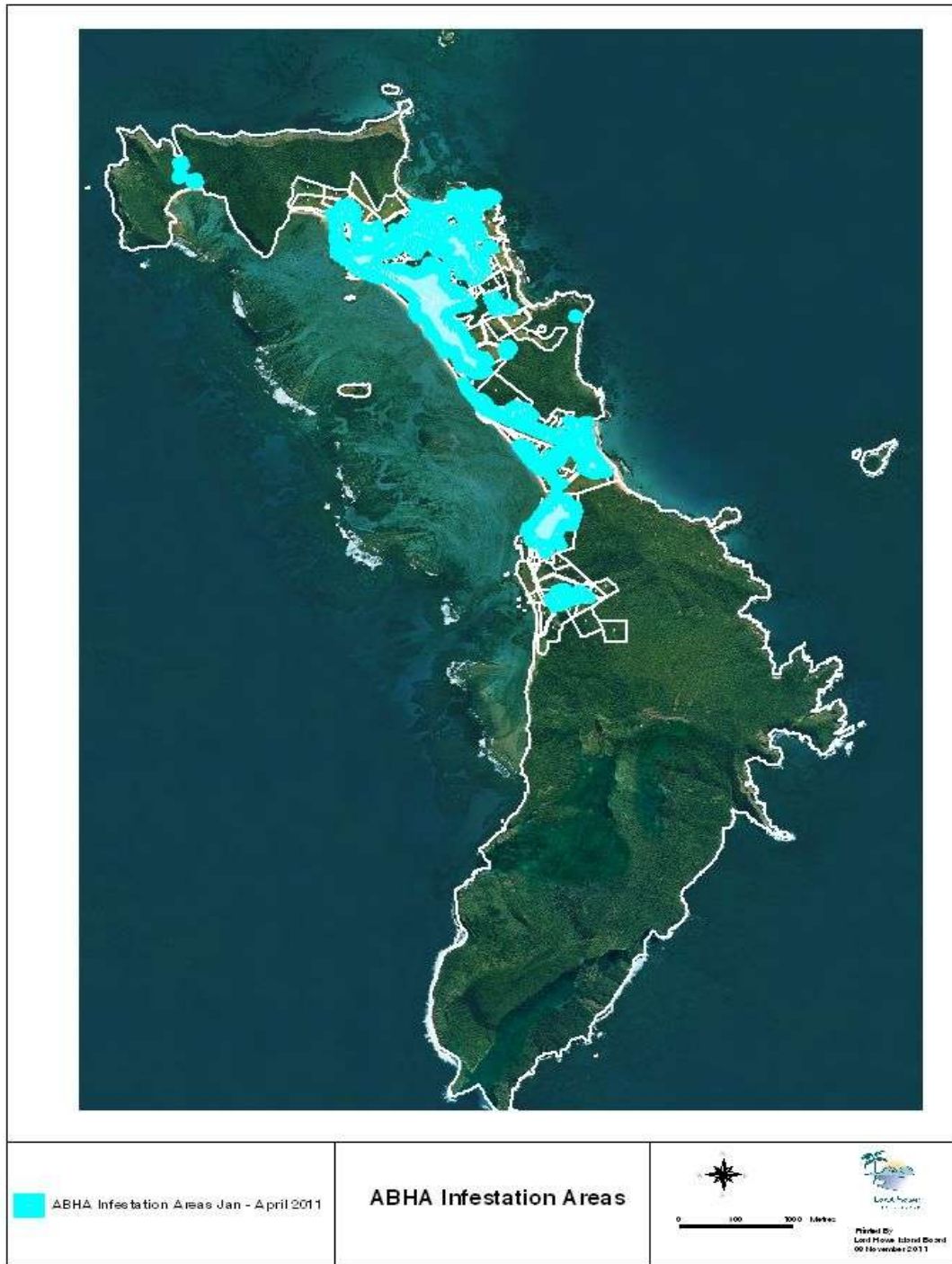
Map 1: Example map – ABHA Monitoring Area 2011



Map 2: Other Areas to be Surveyed in the Settlement 2011



Map 3: ABHA Infestation Areas 2011



Map 4: ABHA Infestation and Monitoring Areas 2012

