FBACONSULTING

PROVIDING ENVIRONMENTAL SOLUTIONS

YELLOW CRAZY ANT TREATMENT ON ATAFU ATOLL, TOKELAU

JULY 2015

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Client

Pacific Biosecurity

Prepared by

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1. INTRODUCTION

1.1 Tokelau archipelago

The three atolls of the Tokelau archipelago lie in the humid tropics, ~500 km north of Samoa. The atolls experience a wet tropical rainforest climate with a mean annual temperature of 28 °C, and mean annual rainfall of 3,000 mm (Wikipedia). Tokelau is made up of three atolls, Fakaofo, Nukunonu and Atafu, each with 31–58 low-lying coral islets encircling shallow lagoons.

Atafu is the northern-most atoll of the Tokelau archipelago. Atafu atoll is composed of 42 islets (or motu) and lies in lat. 8° 33' 30" S and long. 172° 30' W (Figure 1). Atafu is the smallest atoll in the group extending three miles north and south and 2.5 miles east and west, and having a land area of around 222 hectares. The highest land of Atafu atoll is approximately 4.5 metres above sea level. The present human population is around 400 and lives in Atafu Village on the north-western most islet of around 65ha.

Yellow crazy ant (*Anoplolepis gracilipes*, or YCA) is a species of invasive ant that has wreaked ecological damage in locations where it has been introduced. It is colloquially called "crazy" because of its erratic movements when disturbed. Its long legs and antennae make it one of the largest invasive ant species in the world. Like several other invasive ants, Yellow crazy ant is a "tramp ant", a species that easily becomes established and dominant in new habitat due to traits such as aggression toward other ant species, little aggression toward members of its own species, efficient recruitment, and large colony size. Yellow crazy ant has been present on Atafu since around 2008 (Pierce et al. 2011), and in that time has spread across the atoll and is having a significant effect on the local population.

FBA Consulting was contracted to Pacific Biosecurity (PB) to undertake Yellow crazy ant management on Atafu atoll in June and July 2015.

Figure 1: Aerial view of Atafu atoll, Tokelau. Atafu village is on the north-western islet at the top left.

1.2 Description of infestation

Yellow crazy ant was first studied on Tokelau in 2004 when it was observed on only two atolls: Nukunonu, where seven of about 42 islets were invaded, and Fakaofo, where two of about 51 islets were invaded (Abbott et al. 2006).

The Yellow crazy ant was first detected on Atafu in 2008, at the fuel depot on the northern side of the atoll. A survey carried out in October 2011 by Victoria University (Gruber et al. 2013) mapped a high density infestation covered approximately 37 hectares in mostly coconut and other vegetation (vao) along the northern span of the atoll. A low density infestation existed around a single house in the village.

By 2012, the ant was in high densities throughout the northern vao area, reaching across to the pig-pen, as well as swinging further south into the northern village area. The village infestation had spread outward, but remained in low density

A further assessment (February 2014) indicated the ant abundance was at high density in the vao area (and garden areas in the village), but overall lower than in 2012. The high ant density area covered approximately 40 hectares, and the remainder of the infestation covered approximately 30 hectares. By November 2014 Yellow crazy ants covered almost the entire islet, with only about 50m at the southern side of the village being apparently free (Pacific Biosecurity visual survey on November 2014).

1.2.1 Impact of Yellow crazy ant on Atafu

By late 2012 through to 2014 people were reporting that Yellow crazy ants were killing coconut crabs and hermit crabs. Villagers in the highly infested areas were reporting repeated invasions inside homes where ants were trailing and feeding on food stuffs left out on benches and in rubbish bins. Heavy infestations around the some village gardens were also causing a nuisance issue. Villagers had at times also expressed concern over the ant issue and what impacts it might have on birdlife, plant-life and living conditions on the atoll should the population continue to expand and increase in density.

1.3 Tokelau Yellow Crazy Ant management project.

Due to the impacts and concerns of the local population to this invasive ant species a management project for Yellow Crazy ant in Tokelau was drafted. This was done by Pacific Biosecurity (part of VicLink at Victoria University) and a funding proposal put through to the Ministry of Foreign Affairs and Trade in 2013. By August of 2014 the proposal was accepted and the 5 year joint management project was advanced to planning stages. The project is funded by the New Zealand Ministry of Foreign Affairs and Trade through the New Zealand Aid Programme and managed by Pacific Biosecurity. Field operations and training of local staff on Atafu in June/July 2015 were led by FBA Consulting, with the assistance of Pacific Biosecurity, local ENDRE staff and villagers.

The Team of 6 FBA staff and 3 PB staff arrived on Atafu on 22nd June 2015.

Figure 2: Distribution of the Yellow crazy ant on Atafu islet in February 2014. Red indicates high abundance, orange medium abundance and yellow sparse abundance.

2. MANAGEMENT APPROACH:

2.1 Local engagement.

Pacific Biosecurity and FBA staff held discussion and meetings about the programme with the local village council (Tapulega) and other community groups affected.

These meetings aimed to:

- Explain the proposed operation
- Discuss environmental concerns
- Secure local operational and logistical assistance
- Coordinate and deliver training and educational programmes
- Provide operational feedback as the programme was underway
- Develop the ant management tool box so Tokelauans could manage the ant infestation themselves.

2.2 Pre and post operation monitoring

Pre-operation delimiting was undertaken to determine the density of the infestation prior to treatment by PB staff. This survey confirmed the finding of previous surveillance (see above) and indicated the ant abundance was at highest density in the vao areas (and some garden areas in the village), but overall lower than seen in 2012.

Post-operation a similar exercise would be undertaken across the infested area as appropriate to show presence/absence and decline of the Yellow crazy ant population.

2.3 Method for treatment

The treatment method involved several techniques:

2.3.1 Granule baiting

Motorised and hand held granule spreaders (Figure 3 and 4) were used to spread AntOff yellow crazy ant granular ant bait (0.01g/kg Fipronil) across infested areas.

Hand-held granule spreaders were calibrated to release AntOff bait at 10kg/ha (the target rate) in a swath approximately 3 metres wide when operated at a normal walking pace. Treatment operators were typically assembled in small or large teams, depending on terrain and circumstances. Operators would line up approximately 2 metres apart (Figure 5) and walk in parallel transects across the terrain applying bait from spreaders. This meant that there was a small overlap of approximately half a metre on either side of each operator to ensure coverage was contiguous over the greater transect. Operators were trained to stay in line with other team members and to adjust application to deal with obstacles and dense vegetation. At the end of a treatment swath the team would wheel about and return the direction they came in a parallel swath offset to one side, with the operator at the end ensuring an overlap with the previous swath.

FBA staff accompanied and guided treatment teams with the assistance of maps and GPS systems. Areas that required further follow-up (e.g., dense vegetation, under-dosed or missed areas) were marked with GPS units for later follow-up.

Field teams were employed to systematically work from the western side of the infestation to the east applying an even distribution of granules to all habitat areas. Ants would find this granular bait through their natural foraging behaviour and would pick up the bait and return to their nest to feed it to nest mates and larvae. Mortality was expected to occur after 3-7 days.

Back-pack mounted motorised blowers were used to apply additional AntOff bait to areas of dense vegetation, tree canopies and to heavily infested vao areas that would benefit from additional treatment (Figure 4). The blowers use a petrol powered 2-stroke motor to blast air at a high rate through a wide nozzle (similar to a leaf blower). A hopper on the top of the unit could contain up to 7 kg of AntOff bait. The unit operator would adjust the RPM of the motor and use a control lever to open the hopper base valve to allow bait granules to flow through and be distributed at the required rate. The units were capable of distributing bait in a swath approximately 8-10 metres wide, allowing treatment coverage into thick vegetation and distribution up into the tree canopy.

Figure 3: **Hand held granule spreader.**

Figure 4: **Back-pack mounted motorised blower used for distributing AntOff.**

Figure 5: Operators line up approximately 2 metres apart and walk in parallel transects across the terrain applying bait from spreaders.

2.3.2 Village area bait stations

The infested area around the village homes is obviously a sensitive environment, inhabited by locals and pets. The ant populations were found to be typically in low to medium in density based on observations, except for occasional garden patches where high densities were seen.

Initially due to the sensitivities of this area it was intended to only use biodegradable bait stations to treat for ants. Ant bait stations were attached to coconut palm trees, woody vegetation and structures in and around the village area (Figure 6). These bait stations were be filled with approximately 15g of AntOff. Field teams systematically worked from the southern side of the infestation to the north attaching and filling stations on trees. Again ants would find and recruit to these bait stations through their natural foraging behaviour.

During the operation on Atafu discussions were held on the treatment underway and as a result the Tapulega later approved the use of hand-held spreaders to broadcast treat the village area. This was made possible due to the technical discussions by PB and FBA staff with the locals, and from the locals own observations of the low impact and precision of granule spreader operations elsewhere on the atoll and the ineffectiveness of low density bait stations.

Figure 6: Biodegradable bait station containing AntOff bait stapled to a coconut palm tree.

2.3.3 Pig-pen site

The large pig-pen area which covered just over 3 hectares, was situated in the high density infestation of the northern vao (Figure 7). This area was also considered to be sensitive due to the presence of pigs which are a diet staple of the islanders. As such this area was not permitted to be broadcast baited with AntOff. Instead two other products were used. Vanquish Pro paste bait (0.1 g/kg Fipronil) and Attrathor spray bait (0.26 g/L Fipronil) were applied to vegetation and concrete wall structures in and around the pens. Vanquish Pro is a greenish paste that is commonly used for general ant control and eradications in New Zealand. Attrathor is a novel product that is an ant bait in the form of a liquid spray. Attrathor contains micro-encapsulated food attractants and active ingredient that is sprayed in small patches on surfaces (i.e., not broadcast sprayed). The food attractant attracts ants and they walk over the sprayed patch picking up active ingredient through dermal contact and ingestion. The active is then distributed through the nest through horizontal transfer, trophyllaxis and dermal contact.

Both these products were applied in a manner so that pigs would not be able to come in contact with them (i.e., out of reach).

Figure 7: Pig-pen site showing trees and dividing barriers.

2.4 Data logger GPS tracking systems.

Each FBA field team member was supplied with a GPS unit to record treatment coverage tracks and identify problem areas and structures. The information collected has been used to produce coverage maps of the areas treated that are illustrated in sections below.

As the majority of the physical granule spreader baiting activity was done by local staff who did not have GPS, FBA staff accompanied these teams as they covered the terrain undertaking treatments. FBA staff ensured they traversed and therefore GPS tracked the start and finish points, perimeters, edges and centres of each treatment swath. Problem areas that required further follow-up (e.g., dense vegetation, under-dosed or missed areas) were waypoint marked with GPS units for later follow-up.

It was noted that in vao areas and under significant tree cover the GPS units occasionally lost signal or became inaccurate. This resulted in anomalous track artefacts that can be seen in some GPS plots below. Significant errors or issues with GPS positioning are explained in the text.

4. TREATMENT OPERATIONS

Outlined below are the details of each block of treatment work undertaken. Initial work focussed on the village area with the setting up of bait stations. Later work focussed on broadcast baiting of the vao areas to the north and specialised treatment of sensitive areas (i.e., the pig-pen). With the permission of the Tapulega, broadcast treatment of the village was allowed several days into the operation. Finally further infill work and retreatment of areas of vao and the pig-pens was done.

4.1 23 June. Village bait stations.

Biodegradable bait stations shown in Figure 6 above were stapled to trees at 10-15 metre intervals where possible throughout the village area starting from the southern tip and moving northwards to the school and hospital on the 23rd June 2015. Stations were intended to be stapled at least 1.5 metres above ground to prevent interference by small children and domestic fowl.

It was quickly found that in some areas there were few suitable locations for stations to be set up as there were no suitable trees of sufficient height. Figure 8 shows the GPS tracks of applicators and indicates the approximate geographic spread of bait stations deployed.

Approximately 450 bait stations were set up over an area of 11.5 ha. 6.5 kg of bait was used (~15 grams per station) which equates to 0.56 kg/ha. This was determined to be a significant under-dose given the size of the area. Observations were also made of yellow crazy ant recruitment to these bait stations, and is was noted to be generally inadequate. This initiated further discussions with the Tapulega to get permission to broadcast bait the village area.

4.2 24 June. North-western vao areas.

Teams of locals were assembled on the 24th June 2015 to undergo training and practice in granule spreader application. Small teams of 4-5 then moved and set-up to undertake treatments in the north western areas of the vao from the cemetery area south. Teams treated blocks of terrain in a west to east direction moving parallel to each other applying granules.

It was quickly found that coordinating several small teams was difficult as accurate direction finding was quickly lost in dense vao areas. Teams running parallel to each other had a tendency to veer off-course and criss-cross each other's paths.

Because of this it was determined that running a single large team in one long line approximately 60-70 metres wide was more effective. It meant that FBA staff could coordinate applicator spacing better and focus on ensuring edges of treatment swaths overlapped and that all areas were treated evenly. This method of using a single large team to apply in wide single swaths was used for most of the remainder of the broadcast applications on Atafu.

The team then treated in swaths further south from the cemetery area and also to the east to the edge of the pig-pen and all around the solar array perimeter.

Figure 9 shows the GPS tracks of applicators and shows the geographic spread of treatment swaths.

A total of 94 kg of bait was applied over an area of approximately 9ha which equates to 10.4 kg/ha. This was almost exactly the target application rate (10kg/ha). This information combined with observations of applicator behaviour gave good assurance that the areas were being treated correctly and that newly trained applicators were applying AntOff properly. Notwithstanding, small areas from the treatment sweeps were identified as requiring follow-up as they were suspected of being missed or under-dosed by FBA staff.

Figure 8: GPS tracks of bait station application, showing geographic spread of bait stations in village area, 23 June 2015.

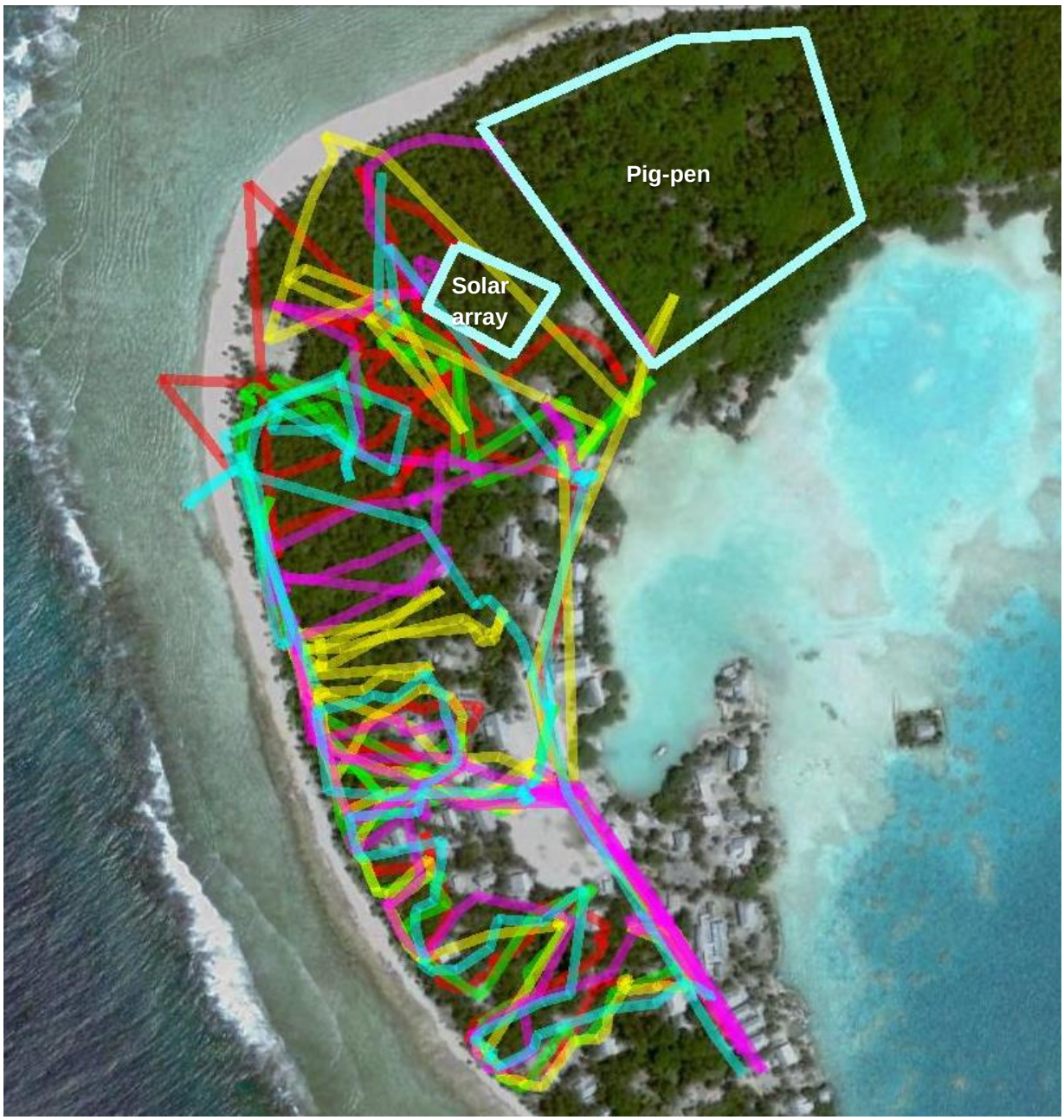

Figure 9: GPS tracks of granule spreader application swaths in north-western vao area, 24 June 2015. The perimeter of the solar array clearing and the pig-pen are outlined in light blue.

4.3 25 June. Northern and eastern vao areas.

On the 25th June 2015 teams were deployed to treat the northern vao areas to the east of the pig-pen right across to the far eastern edge of Atafu islet. The lesson from the previous day was learned and a single large team was used to treat the majority of the area. A small team was used to treat small specific areas, (e.g., the full outer pig-pen perimeter and some isolated vegetation patches). The large team treated blocks of terrain with granules in a north to south direction in parallel swaths starting adjacent the western edge of the pig-pen moving across to the far eastern edge of Atafu islet.

Figure 10 shows the GPS tracks of applicators and shows the geographic spread of treatment swaths.

A total of 119.5 kg of bait was applied over an area of approximately 12ha which equates to 9.56 kg/ha. This was slightly below the target application rate (10kg.ha). Observations of applicator behaviour showed that while overall coverage was good it appeared that applicators were in some instances moving much faster than the previous day, resulting in a slight under-dose. There were again small areas identified as requiring follow-up as they were suspected of being missed or under-dosed.

An additional issue was the nature of the terrain and vegetation which made estimates of treatment area difficult. There were zones, particularly along the southern edge, where the ground was evidently regularly inundated with sea-water during monthly king tide events. There were also three passages where sea-water obviously washed through from the northern to southern coasts on a frequent basis. As the treatment specification was that the bait application was not to occur with 5 metres of open water, these areas had to be excluded. This was done by observing type of vegetation growth, substrate, noting the debris strandline and then directing applicators to avoid these inundated zones. Areas excluded in this manner are highlighted in Figure 10 in orange shading. Note that teams did cross through these areas (as indicated by GPS tracks), but did not treat them.

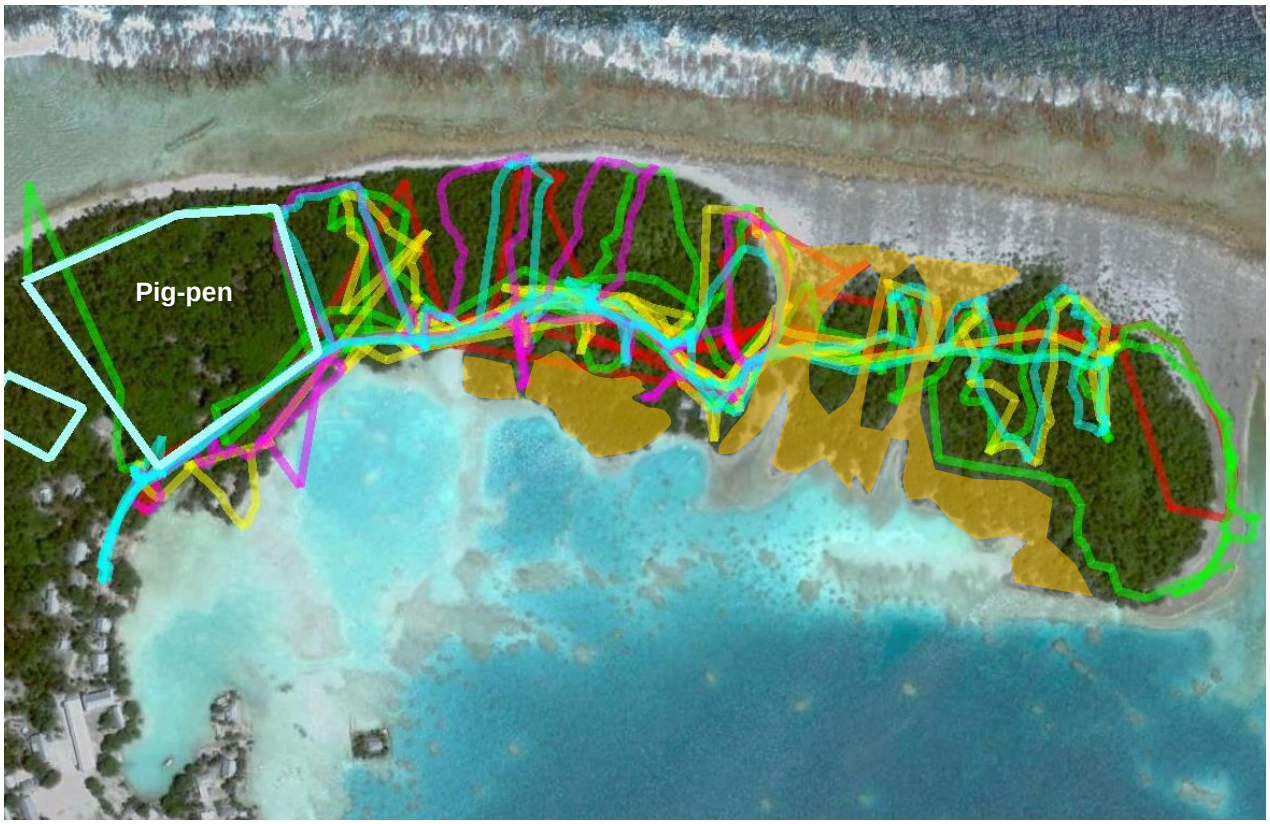

Figure 10: GPS tracks of granule spreader application swaths in northern and eastern vao areas, 25 June 2015. The perimeter of the solar array clearing and the pig-pen are outlined in light blue. Orange highlights indicates areas not treated due to tidal inundation.

4.4 26 June. Pig-pen and solar array areas.

On the 26th June 2015 FBA treated the pig-pen and solar array areas. No teams of locals were used in these areas due to the sensitivities and the specialist treatments required.

The solar array was treated via granule spreaders. A total of 3kg of bait was used over 0.29 ha (10.34 kg/ha).

The pig-pens were treated with a combination of methods. A total of 3.25 kg of Vanquish Pro paste was used around the outside of the perimeter wall. 10L of mixed Attrathor spray bait was used on vegetation and structures inside the pens themselves. These products were applied in a manner so that pigs would not be able to come in contact with them. It was noted that around two thirds of the total area of pens were not being used to house pigs. Most of the pens in use were on the southern and western sides of the overall structure.

Figure 11 shows the GPS tracks of FBA Consulting applicators as they applied bait in and around the pig-pens and solar array.

Figure 11: GPS tracks of application swaths in pig-pen and solar array areas, 26 June 2015. The perimeter of the solar array clearing and the pig-pen are outlined in light blue.

4.5 29 June. Northern and eastern vao areas.

On the 29th June 2015 teams were deployed to treat the village areas with broadcast granular bait (following permission from the Tapulega). A large team treated blocks of terrain in an east to west direction starting from just north of the school working southwards. These treatments were bordered by the central main road on the eastern side to begin with. Once treatment swaths had reached the southernmost tip of Atafu the team turned and undertook treatments in a north/south direction in a parallel direction to the central main road between this road and the inner lagoon shoreline back up to the hospital and school. A small second team was used to infill specific areas that had been missed.

Figure 12 shows the GPS tracks of applicators and shows the geographic spread of treatment swaths.

Figure 12: GPS tracks of granule spreader application swaths in village areas, 29 June 2015.

A total of 136.5 kg of bait was applied over an area of approximately 13.5ha which equates to 10.11 kg/ha. This was right on the target application rate (10kg/ha). Applicators had been instructed to walk more slowly and spin the granule spreaders faster to increase the application rate following observation of slight under-dosing during treatments on the 25th June.

4.6 27 June and 1 July. Infill blower treatments in northern and western vao.

On the 27th June and 1st July 2015 FBA undertook infill treatments using motorised blowers in areas of the northern and western vao. This was done in areas where infestations were noted to be heavy, and where previous treatments were noted to be under-dosed or had been missed.

On 27 June 50 kg of bait was applied over approximately 5.25 ha (9.52 kg/ha). This was done in the area to the west of the pig-pen, around the solar array and then to the south.

On 1 July further infill treatments were done of the vao to the east of the pig-pen along to the eastern tip of Atafu. This treatment mainly focussed on applying bait to thick vegetation, heavily infested areas and into tree canopies. 71 kg of bait was applied over approximately 8.5 ha (8.35 kg/ha).

Figure 13 shows the GPS tracks of blower applicators as they applied bait in and around the pig-pen and solar array. Note that weak GPS signals on both days have significantly reduced the accuracy of treatment tracks recorded. It was thought that GPS unit signal accuracy was reduced by interference from the blower units. Direct observations on the ground showed that applicators had covered significantly greater areas than shown (highlighted in yellow shading, Figure 13).

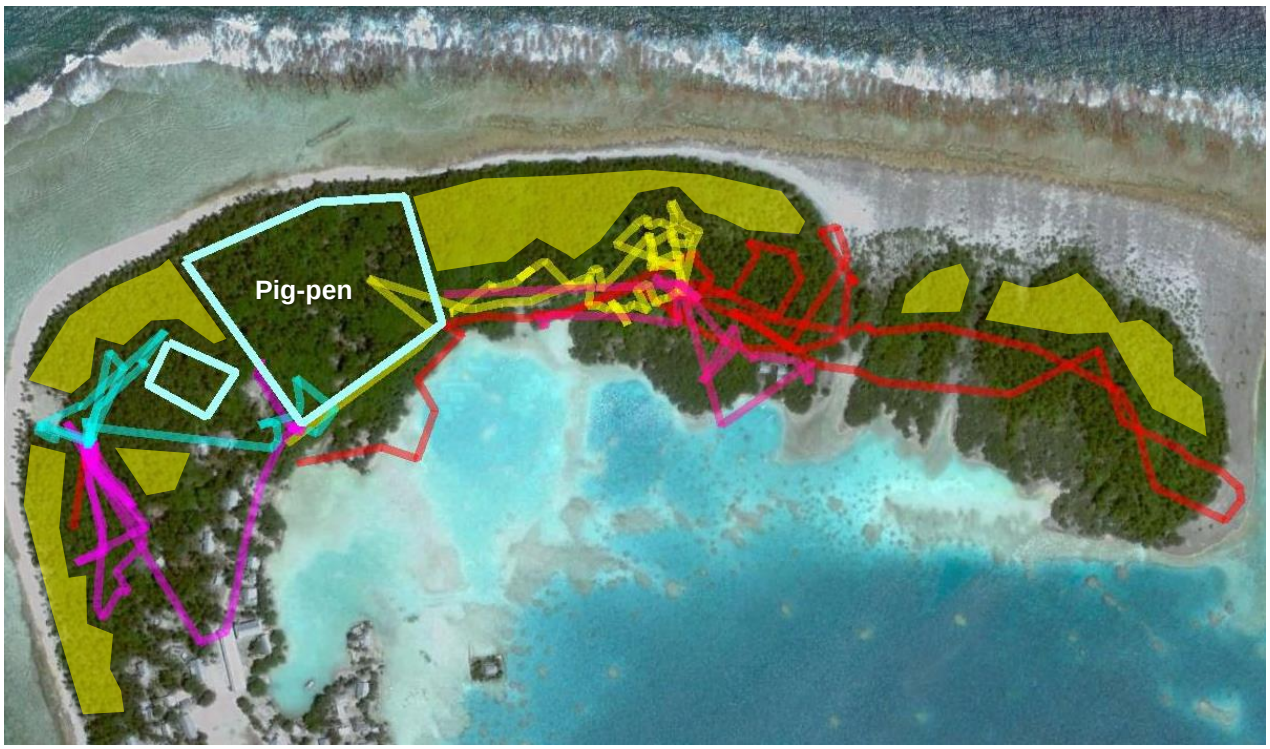

Figure 13: GPS tracks of infill blower bait application on 27th June and 1st July 2015. Additional areas treated are shown in yellow shading.

4.7 2 July. Retreatment of pig-pen and survey of other atoll motu.

On 2nd July it was determined that primary treatments were largely completed. All that was left was final follow-up retreatments of the pig-pen area. Also at the request of Pacific Biosecurity and the Atafu ENDRE officers, a check of several outer motu (islets) on the southern and eastern side of the atoll was requested for yellow crazy ant. There had been unconfirmed reports of yellow crazy ant presence at these locations in the past.

The internal pig-pen area was retreated with 8 L of mixed Attrathor spray bait on vegetation and structures inside the pens themselves. This was again applied in a manner so that pigs would not be able to come in contact with it.

Two boats were used to carry 3 FBA, one PB staff member and several local bait applicators to two motu on the south side of the atoll and a taro plantation on the eastern side of the atoll. The sites were thoroughly examined visually for yellow crazy ant populations. A range of local ant species were found, however no yellow crazy ant was found in any areas.

4.8 Final treatment coverage.

From data and observations it is apparent that 100% of the area on Atafu atoll that was specified to be treated was completed in one manner or another. A grand total of 480.5 kg of granular AntOff bait was applied to a treatable area of approximately 41.5ha (11.58 kg/ha). Note this figure includes retreats of heavily infested vao areas and bait stations set-up in village areas.

The 3.3 ha pig-pen was treated with a total of 3.25 kg of Vanquish Pro around the perimeter and 18L of mixed Attrathor through the middle.

The difference between the total area treated (approximately 44.75 ha) and the total size of the atoll (approximately 65ha) is largely explained by the removal of areas within 5 metres of water bodies. This means areas omitted from treatments included the entire perimeter of the atoll beach line from the mean high water mark inland. Treatments also left out many areas in the northern vao where tidal inundations occurred during king tide events (see section 4.3).

There was also some question over the accuracy of the total figure of 65ha for the atoll. Analysis of maps concluded the total land area might be less than 65ha. It is though this figure might inadvertently include shallow beach areas below the mean high water mark.

A combined plot of all granular bait application tracks (including infill blower treatments, but excluding bait station set-up tracks) is shown in Figure 14 below. This shows the expanse of treatment coverage across the atoll.

5. LOGISTICS AND OPERATIONAL ISSUES

There were a number of logistical and operational challenges that had to be over-come for the programme to be successfully completed.

FBA Consulting undertook extensive planning and preparation, and shipped to Atafu 3 pallets of equipment and 2 pallets of AntOff bait prior to arrival. This equipment contained everything that was considered essential, as well as a range of contingency equipment and supplies to deal with unexpected circumstances. As it transpired some of this contingency equipment was indeed used, while other equipment was not, despite its use being anticipated.

Other logistical and operational challenges that caused issues are briefly outlined below. This is done to highlight some of the lessons learnt so that future operations can be prepared.

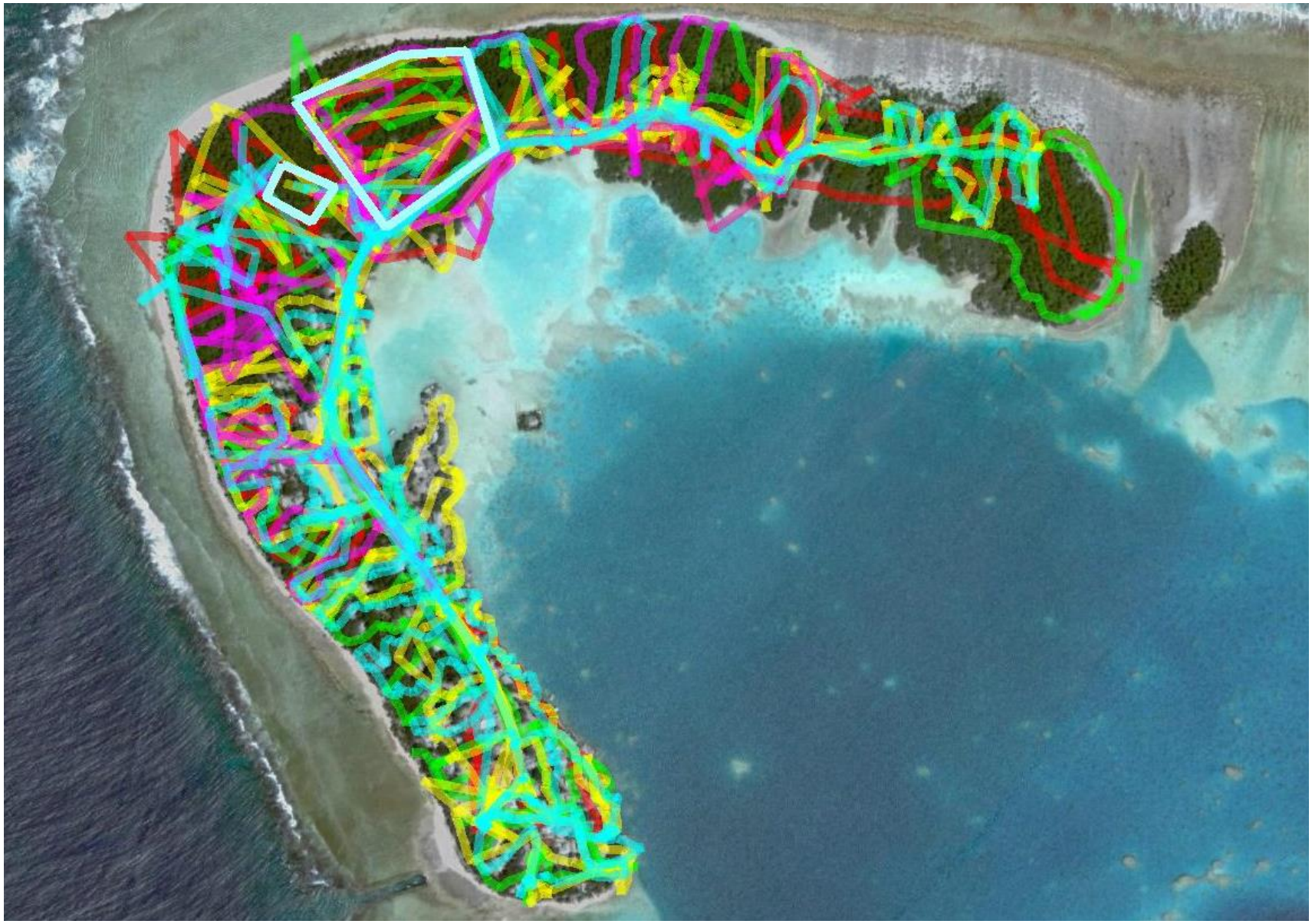

Figure 14: GPS tracks of all granular bait applications (including infill blower applications) on Atafu atoll 24th June to 2nd July 2015.

5.1 Transport issues:

The Ferry sailing schedules were prone to change. For example the initial departure date from Apia to Atafu was changed several times in the days prior to the departure from New Zealand and was again changed once the team had arrived in Apia. It was also noted it was essential to have a day in Apia for final preparations and logistical arrangements.

The ferry to Atafu itself (MV Lady Naomi) was noted to have very poor hygiene, with cockroaches present in bunk areas and elsewhere and the ablutions block in an appalling condition. This present a health & safety issues that needed management for staff.

Once on Atafu the return ferry dates were also subject to change, including at one point on the 29th June when there was notice that two or three team members would be required to depart Atafu the following day, and remaining team members would be left on Atafu for at least two more weeks. This put the programme at significant risk as field operations were not complete at that time. Further discussion by Pacific Biosecurity with the Tokelau Transport Office had this arrangement changed so that the entire team departed on the 4th July. This was acceptable as field operations were completed by then.

5.2 Accommodation and meals:

Accommodation was found to be reasonably basic and serviceable. Minor issues were typically with differences in standards of hygiene and availability and access to suitable cooking and clean refrigeration facilities. Mosquitoes and other biting insects were present in significant numbers, and due to the risk of arbo-viruses (e.g., chikungunya fever), mosquito nets were essential.

Internet access was found to be problematic at times, with drop-outs and loss of service common. This created some issues with mapping and other computer based administration. It was found there were certain times of the day when access was better and this was when work using the internet was done.

Meals were provided by locals by paid arrangement. Most of the team became ill one or more times with gastro-intestinal issues, most likely linked to poor food hygiene practices. Two team members also needed to visit the local hospital as a result. This produced some challenges with sick team members being unable to work. This was dealt by FBA having enough staff present to cover for them. Staff illness had been identified as a possible issue in prior planning and was one of the reasons that 6 team members were sent to Atafu. Three staff required further medical treatment for once back in New Zealand.

The lesson learnt was that it would likely have been better if FBA staff prepared and cooked their own meals while on the atoll to better control and address food hygiene. A clean fridge is also essential as food storage is compromised in such hot temperatures.

5.3 Climate:

The heat and humidity of Atafu caused operational issues as it made work difficult at the best of times with heat exhaustion needing careful management. Daytime temperatures in the shade were typically around 30°C to 32°C, with up to 45°C recorded in the open. Night-time temperatures rarely dropped below 28°C. Humidity typically ranged between 60% to 70% throughout the day and night. The use of several cooling fans was found to be essential in accommodation and living quarters.

The team would typically start field work at 7:00am and finish around 11:00am with a rest break until typically 2:00pm. A short afternoon stint of field work would be done between 2:00pm to 5:00pm. Planning, mapping, administration and preparation work took place between field-work stints and during the evenings.

5.4 Local support and training:

The team of locals used during the field operations were found to be enthusiastic and motivated to undertake treatments. Team leaders were quickly identified and these leaders were soon able to coordinate granular baiting operations themselves with less and less input from FBA as time progressed. This was ideal and was one of the aims of the overall programme (i.e., to train locals to undertake treatment's themselves un-aided).

It was noted that poor translation of technical information presented to the community caused some issues. For example the locals were under the initial misunderstanding that they would be "sprayed" for several hours during treatments of the village. Once it was explained and demonstrated that the bait was a granular insecticide to be applied outside only, objections to broadcast treatment of the village area disappeared. It was found that presentations of information to locals needed to be simple and straight-forward.

FBA Consulting also undertook to train locals in other basic biosecurity and pest control practices, including rodent proofing and cockroach control. This was done in an effort to foster awareness and co-operation among the local population to biosecurity issues, and underline the need for good quarantine practices as part of the wider biosecurity initiatives in the region funded by NZAID and others.

Another minor local issue was that of community events that took place during the operational phase. These events were typically not highlighted to FBA Consulting until the day before, and so flexibility was needed during planning for field operations using local staff. Typically FBA would undertake operations that did not require local staff on those days when locals were not available.

5.5 Freight storage and forwarding

It was specified that the AntOff bait shipped to Atafu prior to operations should be stored in a cool a place as possible (i.e., out of the sun in a shed or similar). When the team arrived it was disappointing to find the bait had been left out for several days under tarpaulins outside the storage shed. The bait was examined and found to still be in good condition, however ideally it should have been kept inside.

It was also disappointing to learn that the 100 litres of fuel that had been specified to be available for FBA use during blower operations was not present when FBA arrived. As it eventuated the ease of access to the majority of the terrain on Atafu meant that blower operations were significantly less than had been anticipated, and thus only 10 litres of fuel was needed, which was easily obtainable. Notwithstanding, this lack of fuel was a significant risk to the programme as it was entirely probable that more blower operations could have been needed.

Upon completion of operations the equipment belonging to FBA that was shipped to Atafu was repacked, labelled and wrapped for re-shipment back to Apia and then onto New Zealand. These three pallets remained in Atafu for an undesirably long period of time as there was discussion and confusion over ownership and shipping clearance on Atafu. It took until the 18th August 2015 for this freight to be returned to Apia.

6. SUMMARY

FBA Consulting considers the field operation treating Yellow crazy ant on Atafu atoll in June and July 2015 to be a success. Despite several logistical and operational issues, 100% baiting coverage was achieved in specified areas infested with yellow crazy ant. This result is often difficult to achieve for operations of this type and scale.

Observations by the end of the operation showed significant Yellow crazy ant mortality in treated areas. It was noted that mortality was slow (as expected), taking approximately 4 to 5 days for significant reductions to be seen.

Post-operation, a survey by Pacific Biosecurity is planned for November 2015 across the infested area to show presence/absence and decline of the Yellow crazy ant population. The results of this survey will inform and drive further control operations.

Local staff were successfully trained in basic yellow crazy ant treatment operations and we are confident that they would be able to successfully undertake straightforward follow-up treatments in the future.

Biosecurity awareness and understanding by the entire local population was improved during the operation, and we hope this awareness will lead to further improvements to biosecurity in Tokelau.

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