FINAL REPORT ON A CONSULTANCY ON SPC-PPS TARO BEETLE AND FRUIT FLY ACTIVITIES IN SOLOMON ISLANDS FOR THE PERIOD 1 AUGUST 2000 TO 30 SEPTEMBER 2001

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Introduction

Brian Thistleton started work on part-time contract with PPS on 31 July 2000. His duties were to co-ordinate the Solomon Island activities of the regional projects on fruit flies[1] and taro beetle managment. There were two contracts to this consultancy totalling fifteen months: August to December 2000 and January to October 2001 respectively. By agreement with the Secretariat of the Pacific Community the second contract was shortened to from ten to nine months and finished at the end of September 2001. The consultant therefore worked a total of fourteen of the original fifteen months. This final report covers these fourteen months: 1 August 2000 to 30 September 2001.

The period prior to the consultancy was marked by an increase in militancy in Guadalcanal leading to a coup on June 5 2000 and the declaration of war by the Malaita Eagle Force on the Isatambu Freedom Movement. Because of these problems staff from both the projects had left and only a technician (taro beetle) and labourer (fruit fly) remained. The cease fire was signed in early August 2000 followed by the Townsville Peace Agreement in mid October , but problems from the war still remain and have affected fieldwork particularly in Guadalcanal. From mid May 2000 to early August 2000 it was not possible to get to Dodo Creek Research Station because of road blocks set up by the militants, and even when these were removed it was not considered safe to go there until October. At that time it was confirmed that the whole research station including the taro beetle laboratory had been destroyed. In addition the economic problems that the country now faces have also had a significant impact on the ability of the Ministry of Agriculture and Primary Industries (MAPI) to collaborate with these projects.

This is the background against which this consultancy was carried out. The consultant was employed on a part-time (one day a week) basis to coordinate the activities of the two project staff. The level of activities had been dropped due to the insurgency and over the period these were maintained and re-established as the situation improved.

Project management

Laboratory and office space
Both projects were originally located at Dodo Creek Research Station, Honiara but, due to increasing ethnic tension in the area, both projects were relocated to the Malaria Centre of the Solomon Islands Medical Training and Research Institute (SIMTRI) in March 2000. The use of the laboratory at the Malaria Centre was a temporary solution to housing the two projects. It was very small but was adequate for the fruit fly work in the short term. It would not have been adequate if all of the taro beetle equipment had been moved, but this turned out not to be possible.

On his trip to SI in May 2000 Luc Leblanc (RMFFP Project co-ordinator) had discussed the possibility of moving the projects to the National Veterinary Laboratory (NVL) at MAPI . While Dr Israel Wore at the Veterinary Laboratory was in agreement, the final decision lay with the Director of Livestock and Under Secretary.

Discussions were therefore held by the consultant with Mr Ezekiel Walaodo (Under Secretary) who confirmed that the projects could move to this laboratory, but this should be delayed until later in year after some planned renovations have been made. In the meantime the Malaria Centre confirmed that the

[1] Until December 2000 these came under the Regional Management of Fruit Flies in the Pacific project and from January 2001 under the Fruit Fly Management component of the Pest Management in the Pacific Project. Both projects were implemented by SPC with various donor agencies.

projects could remain there until the end of 2000 at a rent of SBD 1,000 a month, and Mr Walaodo made provision for this to be paid by MAF.

The planned refurbishment of the NVL was subsequently delayed indefinitely. By November Dudley Wate (Director of Quarantine) said that he did not now expect funds to be available until 2001, although Ezekiel Waloado (Under Secretary) considered that this funding was no longer likely to be made available at all from the planned source. It was therefore decided to go ahead with the planned move and this took place in January.

One of the problems with the NVL was the absence of a water supply. This was initially brought about when the dam and pumping station supplying much of Honiara were blown up by militants. However following the restoration of the water supply to Honiara the supply to the NVL was still cut off for other reasons although this should eventually be rectified by the Ministry. However even at the Malaria Centre the project did not have a mains water supply, but had installed a rain water tank from Dodo Creek Research Station and pipes to bring the water to a sink inside. This water tank was therefore moved to the NVL.

After moving there was a problem with the electricity supply. Several power points were found to be not operating and an electrician was called to inspect them. He found that the main power board was faulty and reported the problem to SI Electricity Authority who demanded that the board be replaced as soon as possible as it was dangerous. The matter was raised with MAPI who were to follow it up.

Concern was expressed to MAPI that the veterinary laboratory was not secure and that attractive items such as the fruit fly and taro beetle computers might not be safe there. MAPI therefore allocated an office in their headquarters, which is close to the veterinary laboratory, for the projects' use. Security wire was installed on the outside of the office and a replacement desk was obtained as the existing one had been badly damaged by a recent flood. Flooding of the downstairs offices, to a depth of about 6 inches, occurred twice in 2000 so all items in the office were raised off the floor in case there was a reoccurrence.

There was a break-in to the MAPI building over a long weekend in June 2001 and access was gained internally to a number of offices including the SPC projects office, but nothing was stolen or disturbed. Entry was through an internal door as the window is protected with security mesh. A deadlock was therefore installed on this door. There was a second break-in to agriculture building in July and a computer in an adjacent office to SPC PPS was stolen. This time access was gained through the main door to the building and then into the office over a partition wall which does not reach ceiling.

The SPC PPS office was by this time fairly secure having a deadlock, security mesh on the window and walling which is complete to ceiling. However to avoid loss of valuable data should a theft of computers occur, a back-up of all files on the fruit fly computer was made to CD. Taro beetle files had already been backed-up to CD.

Taro beetle laboratory

There had also been the possibility that the projects could move back to Dodo Creek Research Station after the cease fire was signed in early August 2000. However, due to continuing militant action past the Alligator Creek roadblock (near Henderson Airport), MAPI staff considered it was not safe to visit the station at this time. A visit was eventually made to the Research Station in October 2000 and earlier reports that the taro beetle laboratory has been destroyed by fire, together with the rest of the station, were confirmed. The roofing had not been removed but had buckled from the heat and was now hanging loose and the building had been completely gutted. It appeared that most of the equipment had been removed before the building was burnt. All that remained were the charred remains of a laminar flow cabinet, a high speed centrifuge, a large autoclave and an ultra low temperature freezer.

One glass topped cabinet of taro beetle specimens was found lying in a garden of one of the houses suggesting that the collection had been removed before the fire was started. The specimens were still dry, although the sun had faded their colour from black to brown. All the other specimens were missing.

It had been assumed that since the destruction of the taro beetle project's facilities (laboratory, equipment, houses and furniture) had been caused by civil unrest the insurance company was unlikely

to approve a claim for this. However they advised that a claim should still be submitted. The relevant documentation was assembled. This included copies of the insurance policies, copies of receipts for the equipment which were obtained on a trip to PNG, and a police report. On 7 February 2001 the consultant met with Superintendent Johnson Taupa, Police Commander for Guadalcanal, who said that he would write a report for the damage claim for the taro beetle project's laboratories at Dodo Creek Research Station and this was received in April. All documentation for the claim was sent to SPC PPS in Suva.

Equipment
The fruit fly equipment and specimens had been moved from DCRS to the Malaria Centre by Mr Arnaud Jarlan (UNV) earlier in 2000. A small amount of taro beetle equipment had also been moved, but the bulk remained at DCRS after the roadblocks were established in May. Also all the taro beetle specimens were left there. When DCRS was visited in October all of these items had either been stolen or destroyed.

Computers
At the beginning of the consultancy the taro beetle project computer was fully functional and was being used by both projects. The fruit fly project computer was not working but it was later established that this was due to a problem with the monitor and, while this could not be repaired in Solomon Islands, the computer itself was still functioning.

Power surge problems were continually experienced in the Malaria Centre laboratory and this lead to the power supplies on both computers being burnt out, one in September and the other in October 2000, even though they were running through a UPS. These were easily fixed and a power surge protector was purchased to prevent further damage. A virus protection programme and updated virus data files were received from Suva and installed in October 2000.

In May and June 2001 the taro beetle computer repeatedly crashed and finally stopped working completely. All important files had already been backed-up on another computer. The modem card was therefore moved from this computer to the fruit fly one for use with the email. In the interim the consultant used his own computer to access email, but all messages sent and received were subsequently copied to MS Outlook on the fruit fly computer.

SPC PPS had asked the consultant to obtain quotes for a replacement computer. However due to a spate of break-ins to the MAPI building it was considered prudent to delay this purchase until the security situation improved.

Other equipment
The air conditioner in the National Veterinary Laboratory was not working in May 2001. Since this was important for the maintenance of the fruit fly colonies it was repaired at the fruit fly project's expense.

The project telephone has also experienced repeated faults which required several repairs to the line by Solomon Telekom. This affected the frequency of email communication which was therefore carried out from another non-project telephone line and computer.

Project vehicles
In August 2000 both the project vehicles were running but required minor repairs. During the first few months of the consultancy, government and private vehicles were being taken for use by the joint operation (MEF and Police Field Force). At this time there was also a lot of theft of vehicles. The fruit fly vehicle (Suzuki) was initially stolen in September from the from the house of Max Oliouou (OIC, DCRS) but was quickly recovered. It was then housed at house of an Anglican priest where it was considered by the Ministry that it would be safe from theft. This was intended to be a temporary arrangement. Max Oliouou wanted to arrange for the approved maintenance to be carried out on the vehicle prior to handing it over to the consultant to keep at the Malaria Centre. Unfortunately before this could happen the vehicle was requisitioned by a commander of the MEF. While it was a condition of the Peace Agreement that all such vehicles were to be returned negotiations by Max Oliouou with the MEF and police failed to secure its return. The vehicle was held by an armed group and the police advised that it was too dangerous for them to attempt to recover the vehicle.

The taro beetle vehicle (Toyota Hilux) was held at the Malaria Centre where the technician was also housed and fortunately was not taken. Subsequent to the loss of the fruit fly vehicle this Hilux was used for fruit fly trap runs. Routine maintenance, repairs and replacement of tyres for this vehicle were reported in the monthly reports.

Project files
Due to the ethnic tension in Honiara all project files and the main computer had been moved from Honiara to Lae by Roy Masamdu. During the trips to PNG in September 2000 and In February 2001 the consultant obtained copies of most of the computer files and photocopies of trial files for current Honiara trials. There were twenty eight boxes of paper files (admin, reports, data etc.) from Honiara held in Lae and the future of these needs to be decided. SPC PPS may like to move the administration and finance files (which include originals of receipts etc. for quarterly accounts).

Before he completed his contract in September 2001 the consultant backed up all the computer files onto CDs. The fruit fly CD back-ups were held by the project staff, by Daniel Wagatora (Plant Protection Officer) and by Jimi Saelea (Director of Research). The back-up of current taro beetle files were held by project staff and by Jimi Saelea (Director of Research). In addition to this a CD back-up was made of all the data on the computers in PNG. This included all the PNG work and most of the Solomon Island work as one of the computers had previously been the main one in SI. The current SI files were also added to this. This CD is held by Mr Roy Masamdu in NARI, PNG.

Administration and Finance
During the period covered by this report the consultant carried out routine administration and accounting for the two projects. In addition to those items already covered in other sections of this report, this included:

- Paying staff and keeping records of payments and deductions
- Remitting tax and NPF deductions to the relevant authorities
- Payment of all bills for project purchases
- Preparation of budgets for the taro beetle requirements
- Administration of the projects' imprest accounts on Excel Spreadsheets
- Forwarding of copies of these accounts and all original documentation (receipts, bank statements etc.) to SPC PPS on a monthly basis.

For the taro beetle project the total operating expenditure for the period 1 August 2000 to 30 September 2001 was SBD 69,923.37. For the fruit fly project for the period 1 September 2000[2] to 30 September 2001 the expenditure was SBD 24,301.09 (see Appendix 1 and 2).

Taro beetle technician
During the period covered by this report the taro beetle project was staffed by a full time technician, Mr Chris Wate. Mr Wate's contract had finished at the end of June 2000 when the European Union funding for the PRAP taro beetle project ended. He took leave at the end of the contract and returned to Honiara on 8 August. He continued to work with the project and, while he did not receive a contract renewal from SPC, he continued to receive his pay and entitlements as per his previous contract terms. A new contract should be issued and, to ensure continuity, it would be useful if this could be dated from July 1 2000.

Mr Wate had been with the project for a number of years and for a long time had been responsible for maintaining the laboratory cultures of beetles and assisting with laboratory experiments. Later his duties had been extended to monitoring virus and fungus release sites (2 sites) on Malaita and Ringi which were sampled every three months, and sending beetles from these sites overseas for testing.

Following the move from DCRS he no longer had cultures of taro beetles to maintain and, in between his trips to Malaita, he was under utilised. The possibility was considered of transferring him to Fote in Malaita where some of the project's trials are located on a Ministry of Agriculture Field Experiment Station. However a decision was taken not to transfer him. Not only was there no accommodation

[2] The consultant does not have the records for fruit fly expenditure for August 2000 but these are on file in Honiara and Suva.

available on either the FES or at the National Agricultural Training Institute which is located on the same site, but the results from the trials also indicated that taro beetle populations were low at Fote.

The technician was housed in the Malaria Centre's dormitory for the whole time of the consultancy. The Malaria Centre had asked him to move and a house was being sought in Honiara. However the rent on this, which was a project expense, would be much higher and it was also considered prudent to delay the move until the future plans for the project in Honiara were definite.

The technician took annual leave from 26 July to 10 September.

Fruit fly technician position
Prior to the period covered by this report the staff of the fruit fly project (a UNV, a Solomon Island entomologist and a techician) had all left because of the problems caused by the ethnic tension, and when the consultant commenced duties the project was staffed by a part time labourer, Mr Geoff Oliouou. Luc Leblanc (Co-ordinator of RMFFP) recommended (report of May 2000 visit) that Mr Oliouou be upgraded to full time technician. This was discussed with Ezekiel Walaodo (Under Secretary), who agreed and suggested that he be employed at level 3. The contract was to be awarded by SPC but, as was the case for the taro beetle technician and previous fruit fly project technicians, the conditions of service were to be the same as officers in the SI Public Service. Geoffrey Oliouou signed a contract as full-time fruit fly technician.on these conditions in November 2000.

Meetings with SI staff
The consultant held regular formal and informal discussions on issues relating to both projects with Ministry of Agriculture and Primary Industries staff including Mr Ezekiel Waloado (Under Secretary), Jimmy Saelea (Acting Director of Research), Cameron Eta (Director of Quarantine), Dudley Wate (Director of Livestock), Daniel Wagatora (Principal Plant Protection Officer) Michael Max Oliouou (OIC, Dodo Creek Research Station)

Handover
Prior to completing the consultancy steps were taken to ensure a smooth hand-over of activities. Meetings were held with the project staff to arrange handover and train on accounting procedures (how to complete salary and accounts spreadsheets, how to deal with receipts and bank statements, how to email accounts spreadsheet, and what to send and how to mail monthly accounts and documentation), email (how to write messages, how to connect and how to contact Gurd Mard who manages the email server at FFA) and how to write and email the weekly reports. A new email address (spchoniara@ffa.int) was set up for the project and an appropriate list of addresses entered. Letters were written to ANZ and Westpac banks to replace Brian Thistleton's signature with another Ministry one. Both accounts are now signed by any two of: Ezekiel Waloado, Jimi Saelea and Max Oliouou.

Discussions were also held with relevant MAPI staff on the future supervision on project activities. It was agree that Daniel Wagatora (Plant Protection Officer) would oversee the fruit fly work and he was briefed on all activities. Pending the possible resumption of duty of the MAPI entomologist, the taro beetle project would report directly to the Director of Research.

Taro Beetle Project

***Metarhizium anisopliae* trials**
In October and November 1998 releases had been made at two sites of the *Metarhizium anisopliae* strain PNG 101, which had originally been collected at Ramu Sugar in PNG and multiplied by BioCare in Australia. The release sites were at Ringi Field Experiment Station on Kolombangara and Fote Field Experiment Station on Malaita. The fungus had been applied to a range of breeding habitats and these sites marked for future sampling. Plots of taro were also planted for estimating populations of adults.

Ringi FES. The trial at Ringi had been terminated in 1999. Most of the taro plants had died due to heavy beetle attack and, despite the fact that the FES manager had replanted three times during the six months to harvest there had been no plants available for sampling of adults. This is consistent with previous experience at Ringi where in population monitoring plots most plants were usually damaged

and beetle populations were high, although there was usually not a 100% death of plants. Sampling of the breeding habitats had yielded no larvae for assessment of establishment of the *Metarhizium*.

The Assistant Insect Pathologist considered that there could have been two reasons for the lack of larvae. Firstly it could have been that the *Metarhizium* had not been applied to breeding habitats with a high enough number of larvae. This is a possibility as larval densities are usually low in natural situations but can be increased by providing artificial habitats in the form of plots with logs set up close to the gardens. This technique was not used in this experiment. Secondly he thought that any larvae that were in the breeding habitats may have already been killed by the *Metarhizium* prior to the sampling date. This is highly likely as the previous releases into log plots at Ringi had shown a dramatic decrease in larvae as compared to non-treated plots. This could have been tested in this experiment if non-treated larval habitats had also been sampled for larvae.

For these reasons the trial had been terminated about a year before the start of the current consultancy. This was perhaps a little premature. If the lack of larvae had been due to the effect of the *Metarhizium*, continued population monitoring of adults would have been beneficial to assess the long term affect. The high damage and loss of all plants in the first plot was to be expected. The adults live for many months and the effect of the *Metarhizium* kill of larvae would take some time to become apparent in adult populations.

There was therefore no further work carried out at Ringi on the *Metarhizium* during the current consultancy. During the first part of the consultancy the ethnic problems prevented all travel. Later when the situation eased the planning for the ACIAR project was well advanced. Since this had a large component of *Metarhizium* work, it was considered best to re-establish long term monitoring at Ringi when that project commenced.

Fote FES. The trial at Fote FES was still in progress at the start of this consultancy. As at Ringi no larvae had been found in the breeding habitats and the same arguments could be applied. However in this situation taro beetle (*Papuana uninodis*) populations are usually much lower. Prior to the consultancy two assessments of adults had been made, in June 1999 and in November 1999. Damage to corms had been very low with over 50% of the plants having no damage at all and the rest having only minor feeding.

Planting was continued and further assessments made during the course of the consultancy. Beetles were collected for assessment of disease in September and December 2000 and June 2001, and plots were harvested for taro beetle damage in December 2000 and June 2001. No evidence of *Metarhizium* infection was found, but this is not surprising as population levels of beetles and damage levels in the plots were very low.

The full results of these trials, including assessments made prior to this consultancy, are on file in Honiara.

***Oryctes* virus trials**

Taro beetles are closely related to coconut rhinoceros beetle (*Oryctes rhinoceros*). In the 1970s, following many years of research into and introductions of biocontrol agents (Waterhouse and Norris 1987), this insect had been successfully brought under control in several Pacific Island Countries using a baculovirus from Malaysia, the area of origin of the beetle (Bedford 1980, 1986; Young 1986).Tests with this virus in Fiji on *P. uninodis* had also given positive results (Zelazny *et al* 1988).

During PRAP phases I and II several different strains of *Oryctes* virus, obtained from various sources, had been tested in the laboratory. Zelazny's results on pathogenicity had been confirmed but transmission between beetles had been low. Field releases had been made once a suitable technique for population monitoring, based on sampling and mark/recapture of adults and sampling of larvae, had been developed and adequate baseline information on pre-release populations collected.

There had been however a difficulty in diagnosing infections in adults as not all of those which died showed typical gut symptoms. AgResearch, NZ, had therefore been contracted to develop a PCR technique for detection of the virus, and this turned out to be an effective diagnostic tool.

Trials to test releases of the virus using the PCR technique had been set up in Ringi (Kolomangara), Fote (Malaita) and Guadalcanal in late 1998. In both Kolombangara and Malaita two sites were used, one on the Field Experiment Station and one 8-10 kms from this. On Guadalcanal one site was used in a village where taro beetle populations were high, where the project had established good co-operation from the farmers and where several previous trials had been carried out.

Samples of adult beetles had been taken at intervals after the release and gut samples sent to AgResearch for analysis. The results of these studies have already been reported by the Assistant Insect Pathologist (Ionae Aloalii) and by AgResearch (Dr Trevor Jackson). Dr Jackson concluded that:

> "The results show that *Oryctes* virus was established among the *Papuana* populations at the release sites through the liberation of infected beetles. Persistence of infection was noted on the Malaita, Fote site, wjth a high proportion of adults infected after 3 months from release and even one positive beetle recovered one year from release.
>
> "However no PCR postitive larvae were found on any of the sites and the overall conclusion that the *Oryctes* virus is not readily transmissible between beetles (horizontal transmission) and does not sufficiently contaminate the breeding sites to lead to infection of larvae (vertical transmission).
>
> "The PCR detection system has worked well in demonstrating the inability of the virus to persist in the population, which could not have been accomplished using traditional pathology methods. It can be usefully applied to studies of rhinoceros beetle in coconut and oil palm to determine correct timing for introduction of *Oryctes* virus."

During the time of this consultancy further samples were taken from the sites in Malaita (Fote FES and Falake Village) and Kolombangara (Ringi FES and Ringi Airstrip) in September 2000 and sent to AgResearch for PCR tests. The release site in Guadalcanal was not accessible at this time due to the insurgency. No virus was found, confirming the previous results, and AgResearch considered that no further sampling was justified for this experiment.

The plots of taro at the two Malaita sites were harvested and assessed in December 2000 (and replanted and this time) and June 2001 at which stage the trial was terminated. As with the *Metarhizium* trial site at Fote the populations of beetles and damage levels in the taro were very low. At the start of this consultancy the trial plots of taro at Ringi had been concluded (in mid 1999 for the same reason as given for *Metarhizium*) so no assessment of populations and damage was possible there.

Taro beetle pheromones

In the PRAP phases of the taro beetle project beetles sent for study at Simon Fraser University, B.C., Canada had shown no evidence for the existence of a sex pheromone. However following the discovery of a pheromone in the closely related *Scapanes australis* from PNG (Rochat et al. 1999) there was renewed interest on searching for a pheromone in *Papuana* spp. using the same team in France. Both PNG and SI were involved with this work.

Accordingly the consultant established contact with Dr Jean-Paul Morin and Dr Didier Rochat (INRA/CIRAD) and supplied them with information on biology of taro beetles relevant to the proposal to search for pheromones. Information from previous trials, mainly the mark/recapture studies on *P. huebneri* at Ringi Field Experiment Station, on the distribution of male and female beetles within the gardens was analysed to assess if there is evidence for one sex being attracted to the other.

Dr Jean-Paul Morin and Dr Didier Rochat wanted to concentrate initially on looking for the pheromone in *P. huebneri* as they had already got some observations of this species from East New Britain in PNG. This species occurs both in PNG and SI and the consultant was therefore requested to make a collection of this species in SI, where it occurs on Kolombangara Island, for shipment to France. Arrangements were made in March with the Manager of Ringi Field Experiment Station to collect beetles and these were received in Honiara in early April and were sorted into sexes. A total of 208 beetles (127 males and 81 females) were dispatched by DHL on 17 April with the required export and import permits. The beetles were delivered to the INRA laboratories on 20 April in good condition.

Later INRA (France) was contacted regarding progress with the experiments to detect a taro beetle pheromone. Apparently secretions have been collected from the beetles sent earlier and are being analysed and it is hope to have material for field tests of fairly soon
Dr Didier Rochat at INRA indicated that he would like to receive another shipment of *P. huebneri* in mid-October. Detailed instructions were given to Chis Wate (Taro Beetle Technician on how to send these including how to: contact Didier Rochat (rochatd@versailles.inra.fr), organise for Jones Honiseu and/or Roy Vaketo at Ringi Field Experiment Station to collect at least 50 of each sex, send funds to their bank account (last time it cost $500), receive beetles in Honiara, arrange export permit, photocopy import permit, sort and pack in plastic boxes (purchase new ones, $24 last time) in soil as last time, get a cardboard carton from BJS (free if the beetles are shipping with them) and pack and ship (cost will be about $ 600) with all documentation. The shipping address is: Dr Didier ROCHAT, or Jean-Paul Morin, INRA, Unité de Phytopharmacie & Médiateurs Chimiques, Route de Saint-Cyr, 78026 Versailles cedex, France

Collections of beetles on Guadalcanal
While the ethnic tension was at its height it was not possible to obtain beetles from sites in Guadalcanal. However in March 2001 it became possible to organise for a collection to be made by farmers from Sali village in east Guadalcanal who brought the beetles to the project office. Before the ethnic tension these farmers had been assisting the project with collection of beetles and with land for off-station trials and, while only a small collection was made at this time, it re-established contact with these people who could be useful collaborators for the forthcoming ACIAR project.

Taro Beetle Meetings, Nari
The PNG National Agricultural Research Institute (NARI) held a meeting to discuss future taro beetle work in September 2000. SPC PPS, at the request of NARI, asked the consultant to attend this meeting. The trip was carried out from 19-26 September.

NARI meeting at Keravat**.** The meeting was held at the Lowlands Agricultural Experiment Station, Keravat, East New Britain, on 21 September. Brian Thistleton and Roy Masamdu presented a summary of the results of the taro beetle project to date and discussed possibilities for further work.

Staff from the Cocoa and Coconut Research Institute presented their work on the rhinoceros beetle *Scapanes australis* especially the discovery of an aggregation pheromone (probably a sex pheromone) for this species by a joint CCRI/INRA/CIRAD project. The meeting discussed similarities in *Scapanes* and *Papuana* behaviour and the possibility that the latter too has a sex pheromone.

NARI intends to transfer much of their taro beetle work to LAES. Dr John Moxon (Team Leader, LAES) proposed that NARI should, in the first instance investigate if *Papuana* has a sex pheromone, using the same techniques as used for *Scapanes.* He is in favour of proposing to ACIAR a project between NARI, CIRAD and INRA to carry out this work.

NARI meeting at Lae. A meeting was held at NARI headquarters Lae on 22 September to brief the Deputy Director General and the Chief Scientist on the outcomes of the meeting in Keravat. NARI is keen to colaborate with future regional initiatives by SPC on taro beetle and was aware that SPC is also seeking ACIAR funding. They do not want their application to affect the SPC application for funding and will therefore will not proceed until a decision has been made on the funding for the regional project.

A separate report of these meetings was submitted to SPC.

Proposal for ACIAR funding for taro beetle research
In December 2000 the consultant was invited to be part of a team to design a project involving partners in Australia, PNG, SI, Fiji, New Zealand and France for possible ACIAR funding. The project would involve a continuation of pathogen studies, a search for pheromones and evaluation of insecticides and repellent plants.

A meeting was held with the Under Secretary to brief him on the proposal. Since SI had hosted the regional project for so long, he was happy with the proposal to continue work under ACIAR funding and said that SI supported the initiative. He wanted the virus and *Metarhizium* work to continue at the

Ministry's Field Experiment Stations (Ringi, Fote etc.) and supported integration of the work with farming systems work. He also wanted SI to be involved in other aspects such as chemical control and pheromone. While the taro beetle project laboratory at DCRS had been destroyed, MAPI had made available the National Veterinary Laboratory in town and the project would still have access to the field experiment stations (FESs). He would like Chris Wate (Technician) and Brian Thistleton (SI Coordinator) to continue the work in SI. Ministry staff could also be involved but at present the entomologist is on leave without pay. He requested that the consultant prepared the SI part of the proposal on this basis and said he would like to make further input in January. Unfortunately he unable to do this as he was hospitalised for the whole of January.

The consultant participated in the preparation of the phase 1 documentation which was submitted to ACIAR on 22 January. In the Under Secretary's absence a meeting was also held to brief the Permanent Secretary of MAPI and he indicated the Ministry's support for the project in a letter to SPC and ACIAR.

Following ACIAR's approval of the phase 1 proposal the consultant continued to work as a member of the design team preparing the phase 2 proposal. ACIAR's initial response had been positive but they wanted the budget reduced and had suggested that this might be achieved by not including SI in the proposal. However the project design team decided that SI should still be included as it has different species of taro beetle to PNG. A case was therefore prepared for presentation to Dr Ferrar in the meeting in PNG. The Director of Research in Solomon Islands was briefed on ACIAR's response before the meeting in PNG and again on the outcomes of the meeting on the return of the consultant from PNG. The Papua New Guinea meetings involved Dr M. Lloyd (SPC), Dr Paul Ferrar (ACIAR), Geoff Wiles and Roy Masamdu (NARI) and the consultant. The meetings dealt with the details of what should be included in the phase 2 proposal including consideration of the budget and coordination issues. The consultant was involved with drafting parts of the phase 2 document relevant to Solomon Islands (methods, flow chart of activities, travel plans, budget, etc.) plus other sections such as the background and literature review.

During the August SPC PPS received reports from three reviewers of the proposal for an ACIAR funded taro beetle project. The consultant made comments on these reports and sent them to Suva for incorporation in the official SPC response.

Taro beetle project reports and publications
A CD of PRAP5 reports was prepared and sent to the SPC Agriculture Library in November 2000. The CD contains a document which list all reports prepared by the project and copies of those reports available in electronic form. Paper copies of all these reports had been previously sent to the PRAP archives

As supporting documentation for the ACIAR submission a summary of research carried out by the EU funded project was prepared. This was based on the technical reports on the pathogen studies prepared by Theunis and Aloali'I, and on the biology, ecology, and chemical and cultural control which was in preparation by Masamdu and Thistleton. The two documents were merged into one and formatted to allow a consistent table of contents to be developed and further additions were made. The report, which now runs to 180 plus pages, is now reasonably complete for use as a summary for the ACIAR proposal but there are still areas where extra data and text, plus appendices, need to be added before the report can be published as a technical report.

PRAP final evaluation
The team carrying out the final evaluation of the Pacific Regional Agricultural Programme visited Honiara on 24-28 October 2000 and held two meetings with the consultant on PRAP5 matters. In June 2001 comments were prepared on the Project 5 (taro beetles) section of draft report and submitted to SPC and Agrisystems. In August 2001 the consultant examined the taro beetle issues in second draft of the report. Most of the comments made by the consultant on the first draft have been taken note of by the evaluation team.

Fruit Fly Project

Monitoring in Guadalcanal
At the start of the consultancy there were nine sites in operation in Honiara which were checked monthly. Other sites to the west of Honiara and east of the airport (Dodo Creek Research Station etc.) were not accessible at that time due to the insurgency.

After discussions with Luc Leblanc (Co-ordinator, RFFMP) the frequency of trap checking was changed to fortnightly. Checking of these nine sites at this frequency continued throughout the time of the consultancy. All flies were identified and data entered into an Excel spreadsheet at regular intervals. The fruit fly technician had received training at SPC Suva on identification, and any specimens he could not determine were sent to SPC for assistance.

The lures used at present are cuelure and methyl euganol. There had been a proposal to also set up traps with trimedlure for *Ceratitis capitata* at the Honiara port. Daniel Wagatora had supplies of the lure but these were lost when the station had been destroyed.

Monitoring in Malaita
During a trip to Auki in December the consultant met with Phil Lawlor (Malaita Development Authority) who had previously maintained traps on Malaita. All his traps had been stolen so new supplies were sent in March 01. No samples had been received by the end of the consultancy.

Fruit fly trapping in western SI
From 21 May – 1 June 2001 Daniel Wagatora (Plant Protection Officer) and the consultant made a trip to the Western and Choiseul Provinces to re-establish trapping sites. These had previously been established earlier in the project but were no longer being maintained. Sites were re-established in Munda, Noro, Gizo, Choiseul Bay area and Shortlands (Alu Island). However due to the lack of agricultural staff and the distances involved sites were not established on Fauro Island, Ovau Island and Mono Island (all in Shortland Islands). These are priority areas and ways to service traps in these areas should be found. A major constraint at present is the lack of funds within the Ministry to pay for OBM fuel for regular visits to these sites. This is also a problem for the servicing of the sites already established on Alu Island. A full report on this trip has already been sent to SPC PPS by the consultant.

Following this trip twenty-eight samples were received from Gizo and Shortland on 19 July and were sorted and flies identified. No flies have yet been received from Munda and Noro, but a system of forwarding trap catches to Honiara by Solomon Airlines has now been established. Spreadsheets were set up for data from the sites in west SI and data entered. Two specimens were sent to Suva for identification.

The first issue of a newsletter on the trapping in the west was completed and printed for distribution. This included details of the trap catches received to date and information of the way to send future catches to Honiara (arrangements had been made with Solomon Airlines to bring the flies to Honiara and allow payment by the project in Honiara). The fruit fly technician was instructed on how to write future editions of this newsletter which will be given to Daniel Wagatora for checking and distribution. The fruit fly technician will also arrange for supplies of specimen boxes and other requirements to be sent to all trapping locations.

Trapping in the east
The PMP fruit fly management component have agreed to finance a trip to the east (Santa Cruz) to set up similar traps as those set up in the west. The trip will be made by Daniel Wagatora. He will organise the trip and send a budget to Suva for approval.

Trapping results
Results from all the sites were made available to the Directors and staff of Research and Quarantine and copies were emailed periodically to PMP-FFM, Suva. The most up to date versions were emailed to FFM by the consultant at the end of the consultancy.

Fruit fly colonies
At the start of the consultancy three cultures (*Bactrocera cucurbitae, B. frauenfeldi* and *Dacus solomonensis*) were being kept at the Malaria Centre Laboratory. At that time a new colony of *B. frauenfeldi* had just been established to replace one which had died out.

When the project moved to the National Veterinary Laboratory in January 2001 two colonies (*B. frauenfeldi* and *Dacus solomonensis)* were lost when the cages were eaten by rats. The rats were baited and killed. Due to problems with the environment in the laboratory the *B. cucurbitae* culture also did not do well. Because of this and since there were no immediate plans to use these colonies for tests the culture was terminated in July. These colonies will be re-established when required.

Melon fly in Guadalcanal
Maclean Vagalo (MAPI Entomologist) is growing water melons to the east of Honiara. He reported in August 2001 a 100% attack on young melons by *Bactrocera cucurbitae* which he has alleviated by destroying old crops and by covering the susceptible melons. He intends to use protein bait sprays and asked for details of the protein autolysate made by Royal Tonga Breweries. Information was obtained from the SPC fruit fly internet site. He was also made aware of the new product Bactrogel which contains the insecticide fipronil. This lead to a proposal for him to carry out trials on his land for PMP-FFM who provided the necessary materials.

Fruit fly taxomony
Drew and Romig's (2001) revision of fruit flies of Bougainville, Solomon Islands and Vanuatu was received in June 2001 and copies provided to Director of Quarantine and the Principal Plant Protection Officer in quarantine.

Fruit fly, PNG
During his visit to PNG in September 2000, the consultant held discussions with Ms Amanda Mararuai (RFFP, Keravat) and Sim Sar (RFFP, Lae) on fruit fly issues.

In his visit in February 2001 (mainly for taro beetle work) he attended the review of the ACIAR fruit fly project in PNG. This was useful as there were some issues (e.g the discovery and present status and control plans for *Bactrocera musae* in East New Britain and the current PNG distribution of *B. papayae*) which had relevance to Solomon Islands. On his return to Solomon Islands he briefed the SI Director of Quarantine and Plant Protection Officer on these issues

Fruit Fly Co-ordinating Committee
A meeting of the SI Fruit Fly Co-ordinating Committee Meeting was called by the Director of Research in June 2001 after a gap of about two years. The consultant presented details of the current trapping regime in Honiara, the report on the trip to west, details of SPC leaflets on SI fruit flies and on bagging, and details of the new fruit fly revision (Drew and Romig 2001). There was discussion on various issues related to that trip including the establishment of a newsletter to the officers carrying out trapping and the updating and reprinting of the SI fruit fly Extension and Quarantine Workers Handbook. While there was support for this, the Director of Quarantine was also keen to get some posters and leaflets showing important fruit flies that are present in the country and the important ones which are high risks for future establishment. The leaflets should have simple and appropriate quarantine messages suitable for farmers in Solomon Islands (the current SPC leaflets are too detailed for this). He would like these to be prepared by the Principal Plant Protection Officer and a Quarantine Officer who has been given the task of producing publications, but would welcome assistance from SPC in providing photographs and advice and/or training to the officers producing the materials. The minutes of this meeting were written and circulated for comments by the consultant and a copy sent to SPC PPS.. A copy of these minutes is attached.

Other

Plant Protection Training
The consultant met with Peter Walton (SPC Training Consultant) to discuss plant protection training issues in March 2001.

Recommendations

Taro beetle
At the conclusion of his contract the consultant was not aware of the outcome of the proposal for the ACIAR project. Recommendations for further work depend on whether this project is to go ahead and whether Solomon Islands is to be included.

The taro beetle project technician, Chris Wate, has worked for the project for many years and has much experience of project activities. It would be benefit the work if his employment was continued and if he was offered a contract renewal. His previous contract had ended in June 2000 and he had been awaiting a new one since then. If a contract is issued it should be back-dated to July 1 2000. Housing in Honiara will need to be found for the technician as he has to move out of the Malaria Centre Dormitory.

For the purpose of this report it is assumed that work in the Solomon Islands will continue either under ACIAR or SPC. Pending the start of trials under the new project the current work programme of the taro beetle technician is very light. Trial plots at Fote and Ringi have now been completed (see above). The best accessible area for taro beetle work is the Guadalcanal Plains, to the east of Dodo Creek, where the project previously had trials in several villages. While some of the villagers have indicated that they would be keen for more work to start, they are in areas previously held by Guadalcanal rebels and there are still odd incidences occurring, so I think it would be unwise to ask the technician (who is from Malaita) to resume work in these areas just yet.

Pending the start of the ACIAR project the following activities could be usefully carried out:

1. Trapping studies.
While SI was not included in the pheromone studies in the ACIAR project planning meeting in Lae in February, the project was requested to liaise with INRA on taro beetle biology and to send beetles to France. One shipment of *P. huebneri* from Ringi was successfully made in April. Jean-Paul Morin has suggested some field trapping experiments which could be carried out to complement the laboratory experiments in France. These would be best done in Ringi. Once the ACIAR field trials are underway it would not take much extra time to set up and monitor traps during a visit. However pending the start of the ACIAR project it might be worthwhile for Chris and/or the consultant to make a trip soon to carry out trapping. Arrangements could also be made at the same time for land preparation ready for the start of the ACIAR trials.

2. Collection of further beetles to send to France.
The initial shipment survived well and Didier Rochat at INRA has indicated that they will require more material shortly. Since the beetles come from Ringi this task could be combined with 1.

3. Collection of beetles from Ringi.
The trials at Ringi, where populations are much higher than at Fote, were terminated for some reason when the Assistant Insect Pathologist left the project. The *Oryctes* virus had already died out, but monitoring of *Metarhizium* in adult and larval populations should have continued. It would be useful to collect more larvae and adults to check if the fungus has persisted in the location. Larvae could easily be collected from breeding habitats but for adults it would be useful to set up some new monitoring plots of taro, preferably on the same site that the releases were made.

4. Reconstruction of reference collection. Since most of the specimens were lost at Dodo Creek it would be useful to start up a new reference collection. This is easily accomplished as we will be collecting some species from our field sites and can ask contacts in other islands to forward specimens. The main requirement will be some store boxes.

5. Assistance with fruit fly trapping. Since the fruit fly technician does not drive and since it is best to have two people for trapping (one for each lure type), the taro beetle technician has been assisting with the fortnightly trap clearance around Honiara.

Fruit fly project
These recommendations are made against the background of extreme economic problems for funding MAPI activities in Solomon Islands and the loss of staff morale which this has brought about. While

research activities on fruit flies have been reduced due to lack of funding and an entomologist, quarantine surveillance must be maintained.

SPC PPS should continue to support work on the fruit fly project. In the absence of the consultant and the MAPI entomologist the work is being carried out by the technician under the direction of the Plant Protection Officer, Daniel Wagatora, and is mainly of a quarantine nature. It would be beneficial if PMP-FFM could support the employment of another professional (UNV or SI national) to expand project activities and resume research studies.

The most critical area for surveillance is the western border with PNG. There are flies in PNG (e.g. *Bactrocera papayae* and *Bactrocera musae*) which pose a severe threat not just to Solomon Islands but also to other countries in the pacific. Entry of these flies into Solomon Islands would increase their chance of spreading further, and it is hoped that on this basis PMP-FFM can assist SI with surveillance on this border. PMP-FFM has already funded a trip to the west of Solomon Islands to re-establish trapping and have offered to fund a trip to the east (Santa Cruz) for a similar purpose. It is recommended that funding be made available for the Plant Protection Officer to re-visit these sites at least three times a year to maintain the impetus. Some sites in critical areas of Shortland Islands could not be re-established as the Ministry does not have funds for OBM fuel to access them. SPC PPS should consider assisting with this expense.

The Director of Quarantine is keen to get some posters and leaflets showing important fruit flies that are present in the country and the important ones which are high risks for future establishment. The leaflets should have simple and appropriate quarantine messages suitable for farmers in Solomon Islands (the current SPC leaflets are too detailed for this). He would like these to be prepared by the Principal Plant Protection Officer and a Quarantine Officer, but would welcome assistance from SPC in providing photographs and advice and/or training to the officers producing the materials.

In many locations officers no longer have copies of the "Fruit Flies (Family Tephritidae) in the Solomon Islands: Extension and Quarantine Workers Handbook" (Hollingsworth *et al.* 1998) although copies of these had been provided in the past. Since few copies remain in stock in Honiara it might be time for a reprint and at the same time some revision could be made to the text. Firstly addresses for sending flies would need to be changed as the previous address, Dodo Creek Research Station, no longer exists. Secondly in the section describing important fruit fly pests not yet found in Solomon Islands, neither *B. musae* or *B. papayae* are covered and these should be added. Thirdly with the recent publication of "The Fruit Fly Fauna (Diptera: Tephritidae: Dacinae) of Bougainville, the Solomon Islands and Vanuatu (Drew and Romig 2001) extra details from this publication could be added to the Handbook. PMP-FFM could assist with the production of this handbook.

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Appendix 1 Summary of taro beetle expenses for Aug 1 2000 to Sep 30 2001

Opening Balance		**3,698.04**
RECEIPTS		
Transfer from SPC 15 Sept 00	27,840.00	
Transfer from SPC 28 Nov 00	15,540.00	
Transfer from SPC 28 Mar 01	4,980.00	
Transfer from SPC 31 May 01	4,980.00	
Transfer from SPC 22 Jul 01	20,007.89	
Reimbursed from fruit fly project for joint expenditure	4,215.20	
Receipt from PNG for P5 reimbursement to European Union	1,784.20	
Reverse expired cheque	1,000.00	
Reimburse NPF payment	56.76	
Refund from Solair	10.00	
Total receipts		**80,414.05**
PAYMENTS		
Operating expenses	69,923.37	
Payment to European Union for P5 reimbursement	1,784.20	
Total payments		**71,707.57**
Balance at 30 Sept 2001		**12,404.52**

Appendix 2 Summary of fruit fly expenses for Sep 1 2000 to Sep 30 2001

Opening Balance		**248.92**
RECEIPTS		
Transfer from SPC 12 Sep 00 for taro beetle project	27,840.00	
Transfer from SPC 21 Sep 00	7,571.93	
Transfer from SPC 14 Dec 00	14,652.48	
Transfer from SPC 22 May 01	6,432.00	
Total receipts		**56,496.41**
PAYMENTS		
Operating expenses	24,301.09	
Payment to taro beetle project from SPC	27,840.00	
Total payments		**52,141.09**
Balance at 30 Sept 2001		**4,604.24**