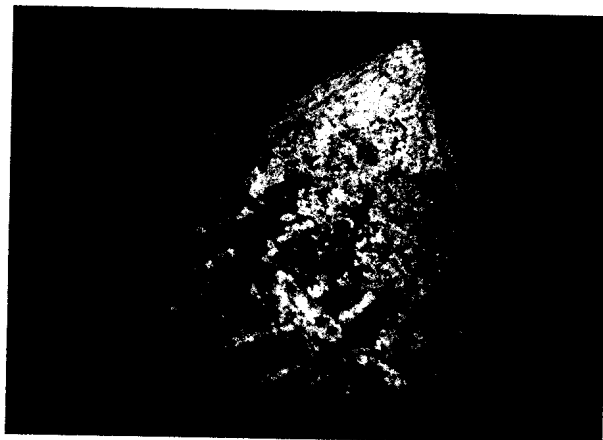


Integration of broodstock replenishment with community-based management to restore trochus fisheries



Executive Summary- National Project Report (Including Bislama Version)

PROJECT FUNDED BY



Australian Centre for International Agricultural Research

Completed For

The Department of Fisheries, the Collaborating Project Communities and Provincial
Authorities of SHEFA, MALAMPA and PENAMA Provinces

Robert A. Jimmy

February 2006

*Research & Aquaculture Division
Department of Fisheries, PMB 9045, Port Vila
Tel. 23621/23119, Fax 23641
Corresponding Email: robj@scientist.com*

Project Details

Project number:	FIS/2001/085
Period covered by this report:	July 2002 to June 2005
Commissioned organisation	Department of Fisheries
Project Leader:	Moses J. A. Tinapua, Director of Fisheries
Research Organisation & Lead researchers involved	Research & Aquaculture Section: Research Staffs: Robert Jimmy (Principal Fisheries Biologist), Sompert Rena (Fisheries Biologist)
Postal address:	PMB 9045, Port Vila, Vanuatu
Phone:	(678) 23621/ 23119
Fax:	(678) 23641
Email:	robj@scientist.com

List of Abbreviations Used

ACIAR	Australian Centre for International Agriculture Research
APC	Asian Pacific Chapter
CMT	Customary Marine Tenure
IWP	International Waters Programme
MPA	Marine Protected Area
SPC	Secretariat of the Pacific Community
SPREP	South Pacific Regional Environment Programme
WAS	World Aquaculture Society

ACKNOWLEDGEMENT

I wish to acknowledge the assistance and contribution of the many wonderful people who collaborated in conducting this research during the last three years: the Provincial Government Authorities, community leaders and resource owners of the communities involved.

My deep appreciation to: Mr Moses J.A. Tinapua (Director of Fisheries) for his leadership and direction towards this work, Kalo Pakoa (Senior Fisheries Biologist) for initiating the site selection work, Bruce Robertson (Fisheries Development Officer, PENAMA) and Andrew Firiam (Fisheries Development Officer, SHEFA) for their assistance in the community consultation work, and Kevin Morris (Fisheries Development Officer-MALAMPA) for his enormous support to the project team, and through his negotiation skills managed to secure Crab Bay area, perhaps the most culturally, ecologically, and socially diverse area used in this project.

Finally I am indebted to following people for their on-going assistance and involvement in conducting the field research activities even during severe weather conditions during the past 3 years: Sompert Rena (Acting Senior Fisheries Biologist), Donald Samuel (Research technician), Jason Raubani (Acting Principal Fisheries Officer), Tony Taleo (Compliance Officer), Felix N'gyuen (Assistant Biologist), George Amos (Trainee), Joby Sipa (Trainee) and Ms Andrea Ott (Swiss National) who spent six months with the Research Division as a Volunteer and was fully involved in the project.

TABLE OF CONTENTS

Project Details	2
List of Abbreviations Used.....	2
ACKNOWLEDGEMENT.....	3
TABLE OF CONTENTS	4
EXECUTIVE SUMMARY	6
PROJECT OBJECTIVES.....	7
PROJECT SUMMARY.....	7
OBJECTIVE 1:.....	7
OBJECTIVE 2: Stock enhancement on selected reefs.....	10
Activity 1: Verify success of broodstock seeding	10
Activity 2: Capacity building of participating staff.....	10
SUMMARY OF MAJOR FINDINGS	13
OBJECTIVE 1: Establish a framework for community consultation and involvement in enhancement activities.....	13
OBJECTIVE 2: Stock enhancement on selected reefs.....	14
Activity 1: Verify success of broodstock seeding	14
Assessment by Reefs	14
Assessment by Treatment.....	15
Activity 2: Capacity building of participating staff.....	16
OBJECTIVE 3: In country and regional dissemination of outcomes	19
MANAGEMENT PLAN.....	20
Crab Bay/ Amal	20
Moriu/ Mabuna.....	21
Lamalanga/ Laone	21
RECOMMENDATION.....	22
CONCLUSION	22
BISLAMA VERSION.....	24

LIST OF TABLES AND FIGURES

Table 1 Location of community MPAs in Vanuatu. 10
Table 2, Average adult trochus sizes seeded in the three treatment sites. 13

Figure 1 Study sites of the Trochus Enhancement Project..... 11
Figure 2 Change in trochus density in the juvenile habitat before and after seeding in the treatment and control reefs. 15
Figure 3 Change in trochus density in the adult habitat before and after seeding in the treatment and control reefs. 15
Figure 4 Mean trochus density in juvenile habitats located on seeding and control sites 17
Figure 5 Change in size of juvenile and adult trochus in juvenile habitats on treatment and control reefs 17
Figure 6 Mean trochus density in adult habitats located on seeding and control sites 18
Figure 7 Change in size of juvenile and adult trochus in adult habitats on treatment and control reefs 18

EXECUTIVE SUMMARY

Vanuatu's involvement in trochus research commenced in the early 1990s and its involvement in the Australian Centre for International Agriculture Research (ACIAR) trochus funded project spanned over 10 years. This encompassed 3 phases of the ACIAR trochus funded research project, with phase 1 of the project involving nutritional aspect of trochus, phase 2 concentrated on hatchery seed production and reef reseeded and the final phase concentrated on broodstock enhancement using a community-based management approach.

Constant involvement of Vanuatu in trochus research demonstrated the importance of this resource to the economic and social well being of the rural communities of the country. Emphasis has been placed not only in assisting communities to developing best community based management guidelines to promote its long-term benefits but also to use experiences gained in trochus to managing other commercially viable inshore resources such as green snails and giant clams in the country.

Establishment of taboo areas or marine protected areas (MPAs) was achieved in all project sites through establishment of local coordinators and active participation of the communities concerned which in turn greatly assisted in the management decision makings of the areas concerned. Involvement of the local coordinators in field aspects of the enhancement work as well as dissemination of information on project updates during the project phase was useful in giving the communities and their coordinators an insight on the importance in managing trochus as a valuable resource for their livelihood. Results revealed that MPAs and/ or closed areas were highly effective in protecting seeded stock and allowing recruitment to proceed. Enhancement was recorded to be more effective in the seeded area compared to the control (unseeded) areas. Towards the end of the project, adult density in the seeded sites has reached harvestable numbers.

Overall, the involvement of Vanuatu with partner countries (Australia and Samoa) in the recent study was useful in terms of information sharing and technology transfer. Vanuatu has assisted Samoa by shipping some 1000 adult trochus in 2003 to establish trochus population in Samoa. Likewise Vanuatu benefited from experimental designs, data analysis and sampling techniques from its Australian counterparts. This report outlines the achievements of the three year project since its implementation.

PROJECT OBJECTIVES

The project involved three broad development and research objectives:

1. Develop a framework for community consultation and participation in the project:
 - Meetings with respective communities to consult and negotiate with selected communities and reefs to be involved in the broodstock enhancement work
 - Appointment of community coordinators to oversee the field activities
 - Where appropriate, after full consultation with the communities, establish Marine Protected Areas (MPAs) in seeded sites.
2. Stock enhancement on selected reefs.
 - Conduct well planned experiments, with adequate monitoring and sufficient scientific rigor to ensure the outcomes of the enhancement process are conclusively documented
 - Provide opportunities for capacity building among project staffs and participating communities involved in the activities;
3. Disseminate the results of the project nationally in partner communities, to Fisheries Development Officers based in the participating provinces and regionally.
 - Enhance the capacity of participating staff and communities to continue and extend the seeding program
 - Encourage and assist the development and/or further refinement of sustainable management practices for the trochus fishery
 - Linkages to the SPC Regional Aquaculture project

PROJECT SUMMARY

OBJECTIVE 1:

Establish a framework for community consultation and involvement in enhancement activities

Method

The site selection work commenced in July 2002 by selecting communities to be involved in the project. An official request was lodged to the general public through a radio message for interested communities to present their application for consideration on the proposed project. A preliminary assessment was made on the requests received by the Project team. Interested communities were encouraged to

lodge their request (in writing) through their respective Provincial Governments to the National Government represented by the Fisheries Department.

At the preliminary assessment, 3 Provinces were short listed. Proposed sites within each of the 3 Provinces were surveyed to determine areas having ideal conditions for the experiment. Factors such as reef structure, reef ownership customary marine tenure (CMT), availability of trochus stock in certain areas so as to minimize movement of stock from one area to another, and the additional information received from Fisheries Development Officers who are based in the rural communities were all taken into account. Criteria to preliminary site selection work are illustrated in appendix 1.

The Project staff met with the community leaders in the areas visited to discuss the nature of the proposed study, and answer queries from the communities. Additional information obtained from Provincial Councillors based in the Provinces was also taken into account.

PLATE 1. Trochus broodstock preparation for caging.



a). Trochus tagging



b). Trochus cleaning before tagging



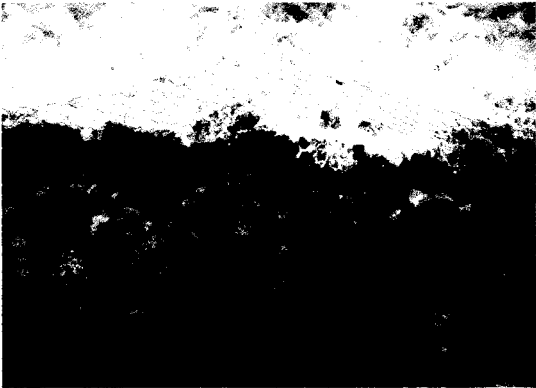
c). Tagged trochus ready for seeding



d). Constructed cage (50m²) for trochus seeding



e). Cage checked for wave damage



f). Seeded trochus in cage

After surveying various different sites, the Project team selected and used 6 areas spread over 3 Provinces as indicated in Table 1. In each area, a Local Coordinator, nominated by the Communities concerned was appointed by the Project team to oversee the establishment of the study.

OBJECTIVE 2: Stock enhancement on selected reefs

Activity 1: Verify success of broodstock seeding

Method:

Cages were constructed out of chicken mesh (105 x 3 x 100m) having a length of 7.5m x 7.5m and reinforced by 15mm diameter steel rods, of 1m in length with the edges sharpened and hammered around the square cage into the substrate.

In each of the seeding sites, a total of 400 trochus were collected, tagged and seeded into the cage. Collection of adult trochus was carried out by both the project team and divers from the Communities where the study is situated. After tagging, the 400 adult trochus were kept in the cage for 1 month till when the cage is removed. During this time, Local Coordinators monitored the sites, observed and replaced missing trochus or those that might escape from the cage, repaired the cage where necessary and kept records of their observations. Average size range of adult trochus seeded was more or less similar for Laone (Pentecost) and Mabuna (Epi) sites while smaller for Crab Bay (Table 2).

Table 1 Location of community MPAs in Vanuatu.

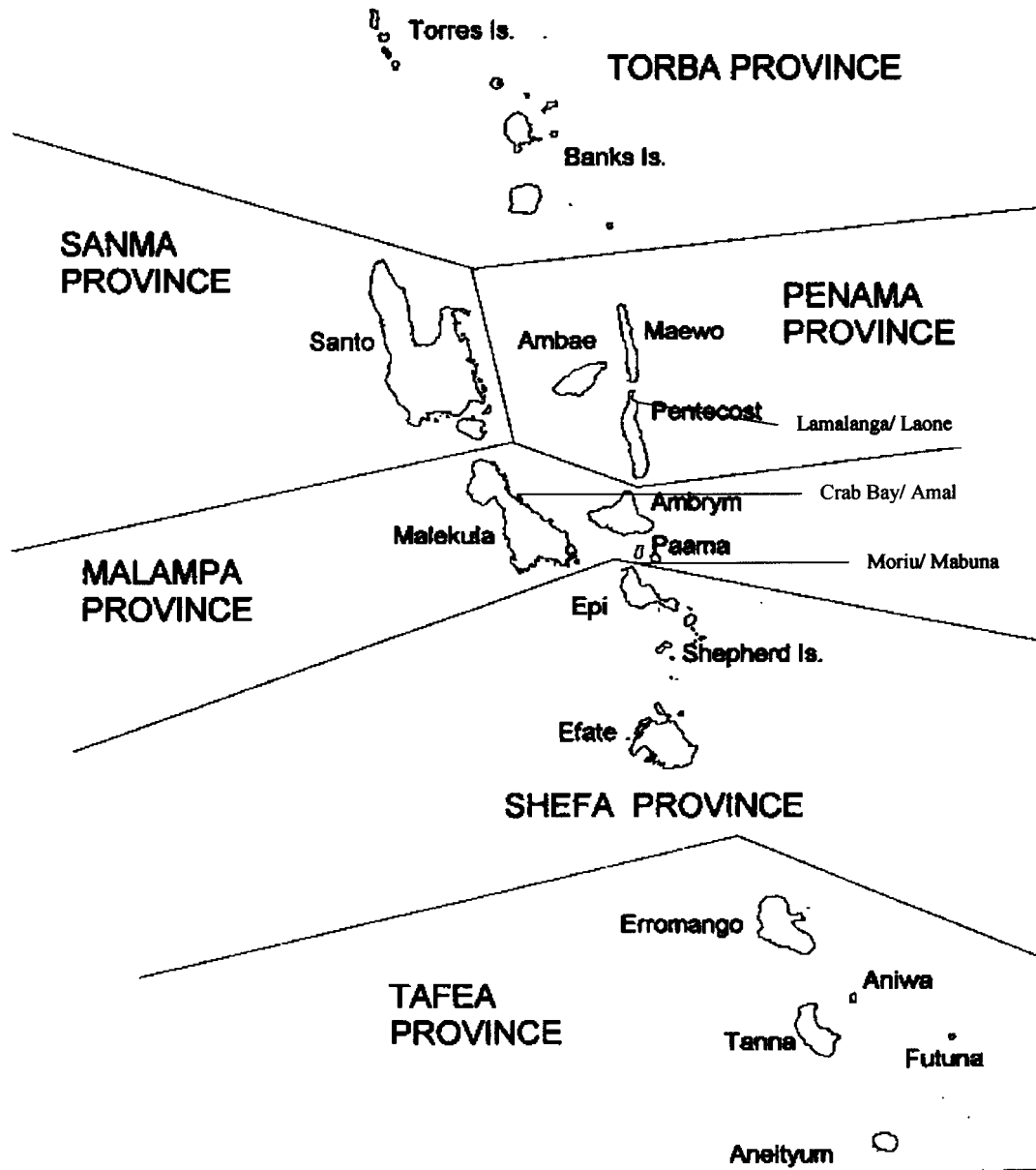
Province	Location	Reef Name	Status
MALAMPA	Malekula Is.	Crab Bay (seeding), Amal (control)	Community MPA
PENAMA	Pentecost Is.	Lamalanga (seeding), Laone (control)	Community MPA
SHEFA	Epi Is.	Moriu (seeding), Mapuna (control)	Community MPA

Activity 2: Capacity building of participating staff

Ongoing support has been provided, on request, to Vanuatu node of the project in field survey techniques, site selection, data analyses and interpretation. Additionally, the project also applied the concept of using Community Coordinators as the focal point for training (i.e. field survey) and interactions between project staff and

Figure 1 Study sites of the Trochus Enhancement Project

VANUATU ARCHIPELAGO



communities. The capacity of Community Coordinators was strengthened and their understanding of the project work enhanced through this interaction.

Except for on-going assistance on data collection, analysis and interpretation of field data, no site selection training was requested by Vanuatu, as the staffs have been associated with the previous two ACIAR Trochus projects. The community coordinators attached to the project received continuous support and training on the survey methods used in the study throughout the project phase. The coordinator also serves as the conduit for transmitting reseeding work to the communities in the study sites.

A number of high school students continued to show interest in the trochus enhancement work. In mid 2004, two female high school students, during their school holiday, took part in the trochus assessment work in the Epi Island sites (Moriu and Mabuna). Since January 2005, two year-13 high school students joined the Fisheries Department for six months for the purpose of gaining experience on trochus enhancement work. They have been involved with the Project Team in conducting the final assessment of the current trochus work.

SUMMARY OF MAJOR FINDINGS

OBJECTIVE 1: Establish a framework for community consultation and involvement in enhancement activities

The objective was completed in all the project sites and Marine Protected Areas (MPAs) were established in all seeding sites in the communities involved. The keys to the success achieved under this objective are:

- participation by communities in the decision making process prior to the commencement of the project and the concerted effort by project staff to carry out dialogues with the communities involved prior to finalising the sites for the seeding work, and;
- on-going close contacts during the three-year seeding work involving interaction, dissemination of information, communication, and negotiation with the communities involved to finalise the establishment of Marine Protected Areas (MPAs);

With the approval of the communities, all the selected seeding and control sites (Table 1) involved in the study have been established as community MPAs. This was only made possible through effective consultation with the local communities, Fisheries Department Field Extension Officers and Provincial Government Authorities.

Table 2, Average adult trochus sizes (mm) seeded in the three treatment sites (Crab Bay, Laone, and Mabuna).

Location	Size (mm ± sd)
Crab Bay	83.8 ± 18.5
Lamalanga	117.4 ± 14.6
Moriu	106.8 ± 13.7

Remarks:

Without exception, the objective was achieved by all the three Provinces involved in the project. The key to the success is the consultative approach taken by project staff and on-going survey training, negotiation, engagement and involvement of communities in the seeding and survey work. The major output of the objective is the establishment of MPAs or “taboos” in the project sites.

OBJECTIVE 2: Stock enhancement on selected reefs

Activity 1: Verify success of broodstock seeding

Six trochus density surveys (1 pre-enhancement and 5 post enhancement) were conducted, in juvenile and adult habitats in all reefs, between April 2003 and May 2005.

Assessment by Reefs

In the juvenile habitat the following results were shown in:

- ⇒ The treatment reefs (seeding sites), trochus density increased significantly from zero to 583 trochus per hectare (/ha) in Crab Bay (Malekula), Moriu (Epi) experienced an increase from 66 to 717 trochus/ ha (representing 83% increase) and Lamalanga from zero to 1083 trochus/ ha (Fig 2). Density of trochus in Lamalanga at the final assessment period (April 2005) was higher than in Crab Bay and Moriu.
- ⇒ Recruitment in the Control reefs (no trochus seeded) were happening but lower than in the treatment sites (Fig 2): Amal (Malekula) had an increase from 117 to 400 trochus/ ha (55% increase), Mabuna (Epi) with an increase of 115 to 116 trochus/ ha and Laone (Pentecost) from 50 to 1000 trochus/ ha (91% increase). Trochus density in Laone at the final assessment period (April 2005) was higher than in the other two control reefs (Amal and Mabuna).
- ⇒ Trochus recruitment in the juvenile habitat was obviously higher in both the treatment and control reefs of Pentecost compared to the tested reefs in Malekula and Epi.

In the adult habitat the following results were shown:

- ⇒ In the treatment reefs (seeded reefs), trochus density increased from 33 to 567 trochus per hectare (/ha) in Crab Bay (89% increase), Moriu experienced an increase from 167 to 583 trochus/ ha (representing 56% increase) and Lamalanga from 100 to 1033 trochus/ ha (representing 82% increase) (Fig 3).
- ⇒ For the Control reefs (no trochus seeded), recruitment also occurred (Fig 3): Amal (Malekula) had an increase from 17 to 567 trochus/ ha (94% increase), Mabuna (Epi) with an increase of 100 to 200 trochus/ ha (33% increase) and Laone (Pentecost) from 67 to 883 trochus/ ha (86% increase).
- ⇒ Trochus recruitment in the adult habitat was also higher in both the treatment and control reefs of Pentecost compared to the tested reefs in Malekula and Epi.

Figure 2 Change in trochus density in the juvenile habitat before (April 2003) and after seeding (April 2005) in the treatment (seeded reefs) and control reefs (no trochus added).

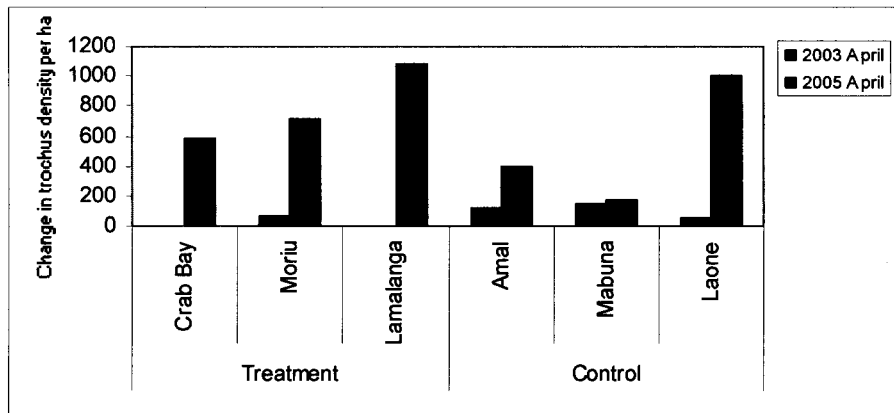
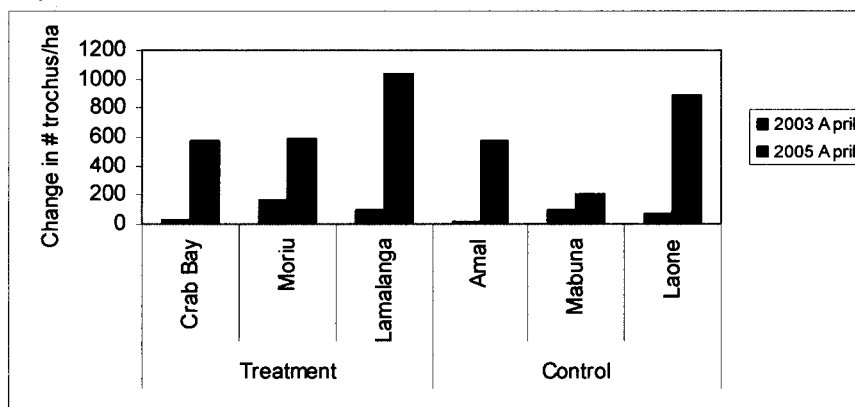


Figure 3 Change in trochus density in the adult habitat before (April 2003) and after seeding (April 2005) in the treatment (seeded reefs) and control reefs (no trochus added).



Assessment by Treatment

The following section assesses the effect of the seeding technique used by comparing treatment effects in the adult and juvenile trochus habitats in the treatment and control reefs.

In the juvenile habitat the following results were shown.

- In the treatment site trochus density increased ($P < 0.001$) from 22 trochus/ha at pre-enhancement to 794 trochus/ha 24 months after enhancement (Fig 4). The increase ($P < 0.01$) in trochus density was due to recruitment of both juvenile (< 50 mm BSW) and adult (> 50 mm BSW) trochus (Fig 5).
- Recruitment from 105 to 535 trochus/ha in the control sites was slightly lower than in the treatment sites and was not significant ($P = 0.99$). These changes have been largely driven by an increase in the number of adult (> 50 mm BSW)

trochus (Fig 5). It is possible that broodstock enhancement on these reefs would improve juvenile recruitment.

- The density of trochus was higher on treatment reefs than control reefs, especially at t_3 ($P < 0.001$).
- A decline ($P < 0.001$) in trochus density on treatment reefs at the t_4 survey was due to the bad cyclonic weather conditions affecting sightability.

In the adult habitat the following results were shown.

- An increase in density on both treatment (from 100 to 728 trochus/ha) and control sites (from 61 to 550 trochus/ha) (Fig. 6). On the treatment site, adult (>50 mm BSW) seeded broodstock accounts for some of the early increases (Fig. 7), however juvenile (<50 mm BSW) trochus numbers also increased (Fig. 7) contributing to the changes in overall density.
- There has been a gradual decline in density in the treatment sites between t_1 (October 2003) and t_5 (April 2005). This decline is due to emigration of adults and lower numbers of juvenile trochus (Fig. 7).
- A decline in trochus density at t_4 (November 2004) survey was due to cyclonic weather conditions (Fig. 7).

Remarks:

- MPAs are highly effective in protecting seeded broodstock and allowing recruitment to proceed
- Enhancements were recorded in all broodstock seeding compared to the control sites
- Towards the end of the project, adult density in seeded sites has reached harvestable number.

Activity 2: Capacity building of participating staff

- Capacity building involved both community members and high school students
- The capacity of community coordinators were enhanced and served as important linkage between project staff and communities.

Figure 4 Mean trochus density (\pm standard error) in juvenile habitats located on seeding and control sites (n = 180).

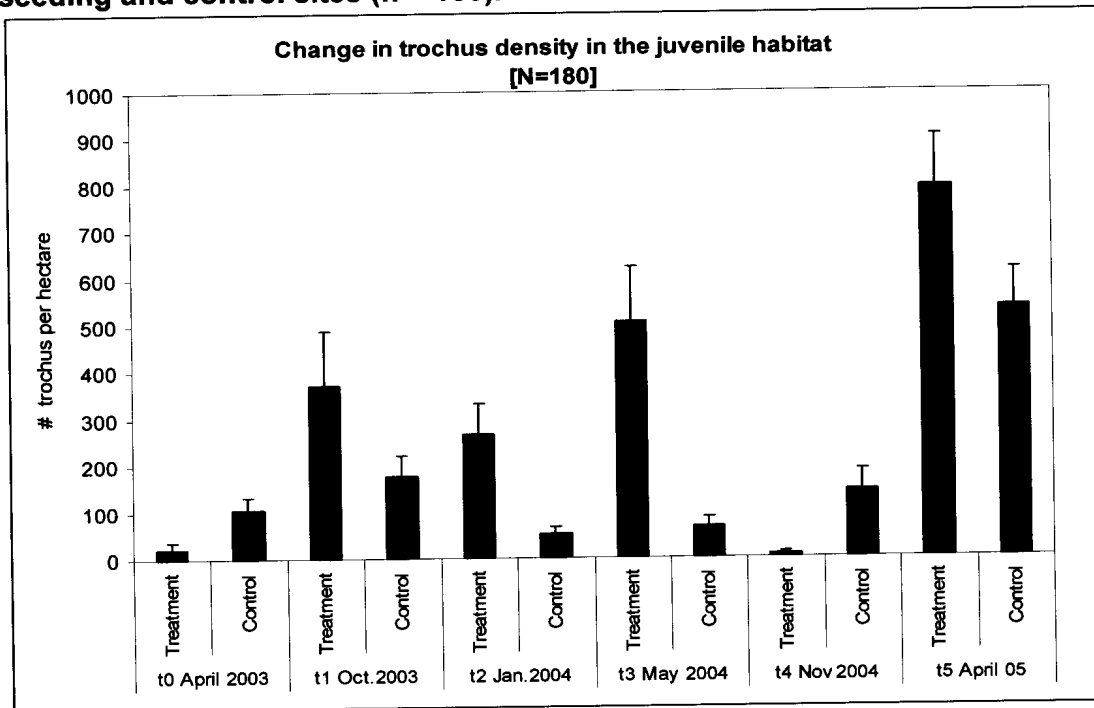


Figure 5 Change in size of juvenile (<50 mm BSW) and adult (\geq 50 mm BSW) trochus across time in juvenile habitats on treatment and control reefs (n = 180)

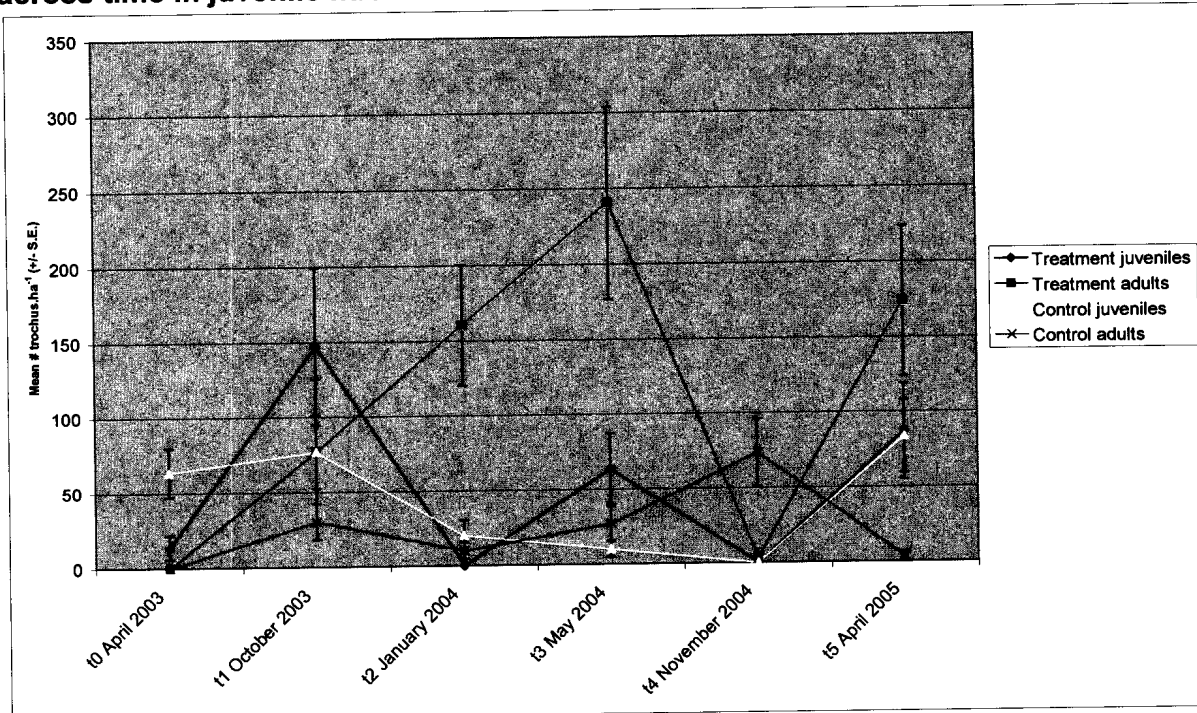


Figure 6 Mean trochus density (\pm standard error) in adult habitats located on seeding and control sites (n = 180).

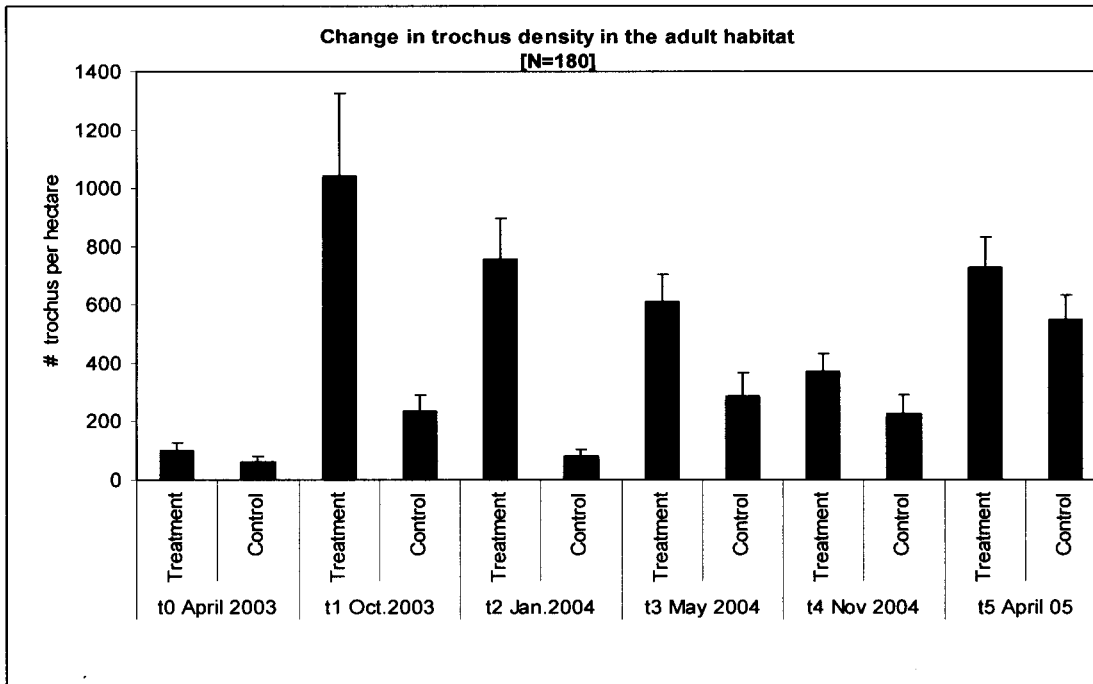
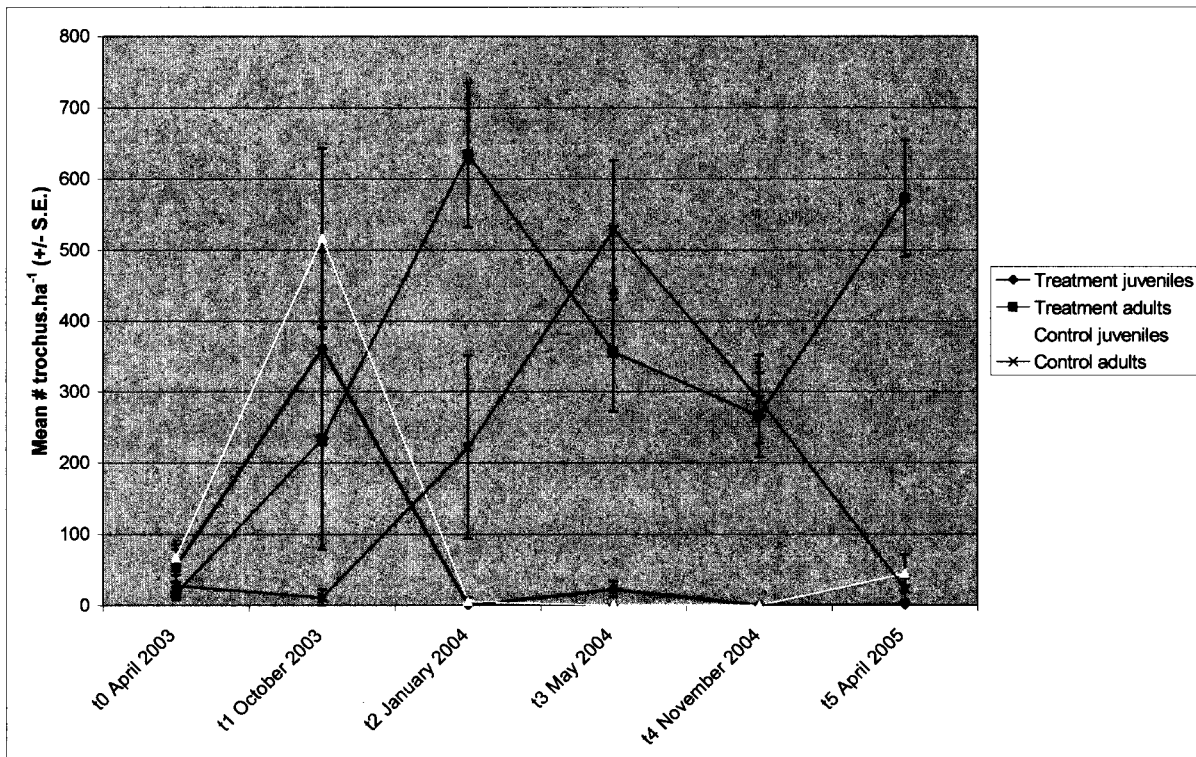


Figure 7 Change in size of juvenile (<50 mm BSW) and adult (\geq 50 mm BSW) trochus across time in adult habitats on treatment and control reefs (n = 180)



OBJECTIVE 3: In country and regional dissemination of outcomes

Ongoing in-country dissemination of results continued during the course of field work. The communities involved in the project work were continually briefed on the project activities through regular meetings and participation in the project field work.

Robert Jimmy attended the Asian-Pacific chapter (APC) of the World Aquaculture Society (WAS) conference in September 2004. The Project Member highlighted and disseminated information on the trochus project activities during the ACIAR/DAFF supported Indigenous and Pacific Island Aquaculture workshop session of the WAS conference.

The regional dissemination of project outcomes has been accelerated with the preliminary results from the project reported in the SPC Trochus Bulletin, interactions between project staff and staff from the SPC Aquaculture project. Over the past 18 months, two articles of project related trochus work have been reported in SPC Trochus Bulletins 10 & 11.

Additionally, preliminary results of the trochus work were also made available to the International Waters Programme (IWP) under the South Pacific Regional Environment Programme (SPREP); SPREP is also using the Crab Bay trochus seeding site as its pilot project for Vanuatu. Trochus information sheet and extension materials have been prepared for distribution to communities and extension staff of the Department of Fisheries.

Communication and dissemination of activities:

Extensive communication, consultation and negotiation between project staff and the communities involved in the project were conducted to ensure that the communities understand the concept of the establishment of MPA and its importance in ensuring a sustainable fishery. Additionally, project information is disseminated via: publication in the SPC Trochus Bulletin (Jimmy, R.A. & M. J. Amos: Integration of broodstock replenishment with community-based management to restore trochus fisheries-Vanuatu's experience. SPC Trochus Bulletin 11:2-4)

- community workshops
- Asia Pacific-World Aquaculture Society conference in Sydney in 2004
- Findings of the survey activities were disseminated to all the traditional reef owners through a series of 1 day community workshops throughout the project phase. In addition, summary reports on the progress of the present study have

also been disseminated to the Fisheries Field Extension Officers within the respective provinces where the study took place.

MANAGEMENT

Prior to commencement of the study, there were no effective management systems in place for all the study sites. Over harvesting of trochus was the major cause on the decline in trochus population in almost all the study sites and initiation of the trochus projects was seen as a positive step towards reviving the trochus population in the community areas. Development of a management plan for the study sites is vital to ensuring a wise use of the resources and encouraging natural recruitment to take place. This is to ensure that a “boom-bust” situation is prevented, which is often a common scenario in areas which have been closed off fishing for a certain period of time.

Crab Bay/ Amal

In the **Crab Bay/ Amal sites**, accesses to the sites by a large number of communities was at the initial stage an impossible task to get community agreement towards having a trochus taboo area. Much of this has now changed with communities becoming more actively involved in management of resources including trochus within their areas. The use of the site (Crab Bay) by IWP as a pilot study site for Vanuatu had contributed immensely to the management of resources in Crab Bay as well as creating a more community understanding and awareness towards their coastal resources. A management team being set up by the communities concerned in collaboration with the Department of Fisheries, IWP, Forestry Department and the MALAMPA Provincial authorities at the initial stages of development has been vital in guiding the communities towards the protection of their coastal resources and perhaps enabling communities to realizing that their targets towards resources protection and management is achievable. For instance, communities were already observing a natural recovery of other resources such as land crabs in the protected areas with spill-over to other open access areas.

During the 12th National Task Force Meeting (NTF) of IWP, a representative of the Crab Bay Management Committee had already indicated their community's intention to have the area closed for a further 3 years. During the project workshop held in Malekula in November 2005, where the results of the study was presented to the

communities concerned, an extension of the current closure system was further emphasized by the participating communities. Trochus recruitment in both Crab Bay and Amal at the end of the study has shown to be **high** for Crab Bay and **moderate** for Amal.

Moriu/ Mabuna

The Moriu/ Mabuna area were managed by one community of roughly 40 households governed by a community chief. The seeding site was right in front of the village so there were no problems faced with regards to poaching and policing the area. Prior to seeding, trochus stock has been over harvested in both the control and seeding sites. Other than fishing, there were no other resources by which community could generate revenue from. The intention of the community was to re-open the area to trochus fishery at the end of the project phase. The collaboration of the community throughout the entire project phase has been good in respecting the taboo system that was in place. Trochus recruitment and recovery in both Moriu and Mabuna at the end of the study has shown to be **Moderate** for Moriu and **low** for Mabuna. Both sites have patchy reefs which may have contributed to moderate to low recruitments observed. However, in a final 1 day workshop scheduled for mid July 2006 where the final project result would be presented, the community concerned would receive assistance in developing a trochus management plan to safe guard the community trochus stock.

Lamalanga/ Laone

The Lamalanga and Laone areas are managed by their area communities. There were no problems faced with regards to enforcing and closing the area off fishing throughout the entire project phase. The assistance and supports provided to the Project Team has also been very good. Like most other areas in Pentecost, kava is an alternative to marine resources for income generation, which helped in reducing the pressure on trochus and other vital coastal fisheries. Trochus recruitment in both Lamalanga and Laone at the end of the study has shown to be **high** for both seeding and control sites. A management plan for trochus in the two areas would be finalized once the results of the recent study have been presented to the communities concerned. At a workshop held in November 2006 in Lamalanga area where the final results of the study was presented, communities involved decided to extend their

closure for a further 12 months until a decision from the communities' council is reached.

BUDGET AQUITTAL

A total of VT 5,510,567 was allocated to Vanuatu to conduct this research for the entire 3 year period. The project spent VT 5,502,625 to cover its implemented activities in Malekula, Epi and Pentecost. Balance remaining from the fund is VT 7,942. A breakdown of project expenditure from January 2002 to June 2005 is shown in appendix 2

RECOMMENDATION

- The knowledge and know hows on the recently tested trochus enhancement to be passed on to the Fisheries Field Extension Officers to be applied to their respective areas, and included in their core programmes.
- Awareness information such as posters and pamphlets to be produced and disseminated to communities and general public.

CONCLUSION

- Communities in all sites of the project gained insight and observe the potential of using MPAs as a tool for enhancing and better managing the trochus fishery.
- Closure of reefs under MPA agreement has been demonstrated to be an important tool in enhancing stock. For Crab Bay and Amal, reefs will remain closed for the next 3 years and Lamalanga for another year
- A clear sign of enhancement has occurred in the reefs involved in the research project, although this is variable between reefs.
- The closure of Crab Bay under the MPA agreement with more than 12 communities involved has demonstrated to be successful. Stakeholders have observed a positive effect not only on trochus recruitment but also on other resources such as mangrove crabs, reef fish and turtles. In addition, communities of the Crab Bay area are also becoming more cooperative and organised in managing the resources in their area.
- Requests are already being received from three communities interested in applying the current trochus enhancement technique (i.e. trochus broodstock caging) in their coastal areas along Epi Island. They have requested financial assistance from their Provincial Governments to implement the project.

- The model of appointing and/or using Community Coordinators has strengthened interactions between project staff and communities. This model would have broader application in resource management projects in coastal communities.

BISLAMA VERSION

Summari blong risalt we I kam aot long wok blong troka we Fisheries Dipatmen I mekem long 2002 kasem 2005.

Long April 2003, Fisheries Department emi putum 400 big fala troka long ol eria blong Crab Bay (Malekula), Moriu (Epi) mo Lamalanga (Pentecost) each long hem insaet long cage blong wan manis blong allowem stok blong brid long solwota.

Sem taem long Amal (Malekula), Mabuna (Epi) mo Laone (Pentecost), I no bin kat eni troka we oli stokem long ol reef ia. Emia blong komperem effect blong niu idea blong restokem reef thru long caging blong troka long eria.

MALAMPA PROVINS

Crab Bay/ Amal (Malekula) –

Long reef flat we ol yang troka I liv long hem long Crab Bay, namba blong troka emi inkris bigwan from zero (no kat eni troka bifo study I tek ples) kasem 583 troka per hekta (/ha). Long Amal, populesen blong troka emi inkris from 117 troka/ha kasem 400 troka/ha. Inkris blong troka long Amal emi ripresentem wan estimate blong 54 percent (%) inkris long populesen blong troka long eria ia.

Long end blong reef, we ol big fala troka oli liv long hem, namba blong troka emi inkris from 33 troka/ha kasem 567 troka/ha long Crab Bay, we emi ripresentem wan overall inkris blong 89%. Long Amal, namba blong troka we oli finem long end blong reef tu emi inkris from 17 troka/ha kasem 567 troka/ ha.

SHEFA PROVINS

Moriu/ Mabuna (Epi Island) - Long reef flat we ol yang troka I liv long hem long Moriu, namba blong troka emi inkris from 66 kasem 717 troka/ ha. Long Mabuna, populesen blong troka emi inkris from 115 troka/ha kasem 116 troka/ha. Inkris blong troka long Mabuna emi ripresentem wan estimate blong 5% inkris long populesen blong troka long eria ia.

Long end blong reef, we ol big fala troka oli liv long hem, namba blong troka emi inkris from 167 troka/ha kasem 583 troka/ha long Moriu, we emi ripresentem wan overall inkris blong 56%. Long Mabuna, namba blong troka we oli finem long end blong reef tu emi inkris from 100 troka/ha kasem 200 troka/ ha (estimate blong 33% inkris).

PENAMA PROVINS

Lamalanga/ Laone (Pentecost Island) - Long reef flat we ol yang troka I liv long hem long Moriu, namba blong troka emi inkris from zero kasem 1083 troka/ ha. Long Laone, populesen blong troka emi inkris from 50 troka/ha kasem 1000 troka/ha. Inkris blong troka long Laone emi ripresentem wan estimate blong 91% inkris long populesen blong troka long eria ia.

Long end blong reef, we ol big fala troka oli liv long hem, namba blong troka emi inkris from 100 troka/ha kasem 1033 troka/ha long Lamalanga, we emi ripresentem wan overall inkris blong 82%. Long Laone, namba blong troka we oli finem long end blong reef tu emi inkris from 67 troka/ha kasem 883 troka/ ha (estimate blong 86% inkris).

Konklusion

- ⇒ Study emi soem se seeding blong ol bigfala troka long cage blong allowem stok blong brid emi wok. Ol eria blong Crab Bay, Moriu mo Lamalaga we oli cagem troka long em oli kat mo troka long reef ia taem yu komperem wetem ol reef we oli no bin cagem troka long hem (Amal, Mabuna mo Laone).
- ⇒ Kommuniti mo Province oli safe karem aot kaen teknik ia blong restokem troka long ol nara reef blong olgeta, be oli mas seekim supervision blong Department blong Fisheries.
- ⇒ Stok blong troka long wan reef oli safe rikava nomo sapos I kat wan gud kommuniti involvement mo paticipesen tu. Pawa blong chief blong safe enforcem taboo long reef emi important tumas blong mekem ol pipol oli safe rispektem taboo mo ol risoses we I stap.
- ⇒ Idea blong usum ol yang pipol long kommuniti long involvement blong olgeta long ol prokekt matter olsem survey long solwota mo long decision making emi impotant from se emi mekem olgeta blong safe feel involved long ol matter we I affektem livelihood blong olgeta long kommuniti level.
- ⇒ Niu teknik we study I usem blong replenishem troka long reef emi cheap mo emi transferable long community mo provincial level.

Appendix 1 Preliminary Site Selection Criteria

The followings are criteria set for by the Vanuatu Project team when inviting interested communities to submit application for inclusion in the current trochus seeding work. The conditions set:

1. that the reef must or have had trochus shell previously but has been depleted and the area to be a good trochus fishing ground;
2. that the reef owner or owners or community agree to allocate the area of reef to become a Marine Protected Area (MPA) or a No Take Zone, for any marine species and ONLY the Fisheries Department would permit any fishing in the area;
3. that the reef is in close proximity or nearby to a village, community, or a reef owner for effective surveillance and enforcement purposes;
4. that the reef owner, owners or community realize that the resources within the MPA, including transplanted trochus remain their sole property but is co-managed with the Fisheries Department and that it is the owner(s)'s and or community's responsibility to participate in the management of the area.

Appendix 2 Project expenditure by quarter from January 2002 to June 2005

Table 1 July 2002 to December 2002 acquittals (VT)

GRANT ALLOCATION	ACTIVITY	ALLOCATION	EXPENDITURE	BALANCE
1,196,925.84	35 Salary	391,050	266,753.19	124,296.81
	36(a) RESEARCH MAINTENANCE	453,618	681,945.06	(228,327.06)
	36(b) CONTRACTED EXPENDITURE	295,242.75	195,525	99,717.75
	38 INFRASTRUCTURE COSTS	57,015.09	-	57,015.09
	TOTAL	1,196,925.84	1,144,223.25	52,702.59

Table 2 January 2003 to June 2003 acquittals (VT)

GRANT ALLOCATION	ACTIVITY	ALLOCATION	EXPENDITURE (VT)	BALANCE
	35 Salary	375,000	208,599.75	166,400.25
1,006,830.00	36(a) RESEARCH MAINTENANCE	405,000	763,760.25	(358,760.25)
	36(b) CONTRACTED EXPENDITURE	172,155	30,000.00	142,155
	38 INFRASTRUCTURE COSTS	54,675	-	54,675
	TOTAL	1,006,830	1,002,360.00	4,470

Table 3 July 2003 to December 2003 acquittals (VT)

GRANT ALLOCATION	ACTIVITY	ALLOCATION	EXPENDITURE	BALANCE
	35 Salary	337,500	208,599.75	128,900.25
1,006,830	36(a) RESEARCH MAINTENANCE	367,500	773,760	(406,260)
	36(b) CONTRACTED EXPENDITURE	135,000	18,000	117,000
	38 INFRASTRUCTURE COSTS	54,675	-	54,675
	TOTAL	894,675	1,000,359.75	6,470.25

Table 4 January 2004 to June 2004 acquittals (VT)

GRANT ALLOCATION	ACTIVITY	ALLOCATION	EXPENDITURE	BALANCE
	35 Salary	150,000	-	150,000
854,250	36(a) RESEARCH MAINTENANCE	280,500	518,375.00	(237,875)
	36(b) CONTRACTED EXPENDITURE	225,000	70,000	155,000
	37 Travel	161,250	300,525	(139,275)
	38 INFRASTRUCTURE COSTS	37,500	-	37,500
	TOTAL	854,250	888,900	(34,650)

Table 5 July 2004 to December 2004 acquittals (VT)

GRANT ALLOCATION	ACTIVITY	ALLOCATION	EXPENDITURE	BALANCE
	35 Salary	152,000	-	152,000
859,182	36(a) RESEARCH MAINTENANCE	284,240	622,813	(338,573)
	36(b) CONTRACTED EXPENDITURE	228,000	160,000	68,000
	37 Travel	163,400	-	163,400
	38 INFRASTRUCTURE COSTS	38,000	-	38,000
	TOTAL	865,640	782,813	77,051

Table 5 January 2005 to June 2005 acquittals (VT)

GRANT ALLOCATION	ACTIVITY	ALLOCATION	EXPENDITURE	BALANCE
	35 Salary	60,000	48,998	11,002
692,246	36 RESEARCH MAINTENANCE	282,246	260,520	21,726
	37 Travel	300,000	374,450	(74,450)
	38 Infrastructure	50,000	-	50,000
	TOTAL	692,246	683,968	8,278