**INSTITUTE OF APPLIED SCIENCES**

**THE UNIVERSITY OF THE SOUTH PACIFIC**

# Community-Based Biological Monitoring Training Guide (Application FLMMA Project Sites at Tagaqe Village, Tikina Korolevu-i-Wai, Nadroga.

IAS TECHNICAL REPORT NUMBER: 2004/07

By

Tawake, A., Meo, S., Cakacaka, A. and Aalbersberg, W.G.L.

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***APPLICATION: FIJI LOCALLY MANAGED MARINE AREA (FLMMA) NETWORK PROJECT SITES, TAGAQE VILLAGE, TIKINA KOROLEVUIWAI, NADROGA***

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**Alifereti Tawake**
Semisi Meo
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Bill Aalbersberg

DECEMBER, 2004

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## *MARCH 4-7, 2003*


***Prepared by:***

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7. Alifereti Tawake (USP)

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## INTRODUCTION:

The purpose of this paper is to document the process used by the Fiji Locally Managed Marine-Area (FLMMA) Network to train communities in simple biological monitoring and data presentation and to develop a biological monitoring plan for their projects. The contents of each session and tools used in this training manual have previously been trialed and tested in several other FLMMA sites and further refinement was applied in this community biological monitoring training for five FLMMA project sites at Tagaqe village on March 4-7, 2003.

Ideally, the first monitoring should be done before or as soon as possible after the declaration of the "*tabu*" area and start of implementation of other actions in the management plan. It is imperative also that the monitoring be directly related to the actions in the management plan so the clear link in the adaptive management cycle of plan, implement, monitor, communicate, analyze and then plan again is established.

You will note that this workshop can also provide the biological baseline for the community in which it is held. You will see that several villages and projects took part in this workshop. The workshop could be held for only members of one village or project area but as several projects needed this training the multi-site approach was taken. This also allowed for sharing of lessons learned among the project sites. Follow up visits were arranged by a team member for each of the villages to confirm their monitoring plans and assist in carrying out the initial biological survey.

The programme for the workshop is given in the appendix 2.0 at the back. All sessions were held in the Fijian language which have been translated into English to reach a wider audience. We hope that you find this document useful. We feel from our experience that having the communities taking the lead in the

monitoring is the critical element in maintaining community's long term commitment to their management plan and LMMA.

## BACKGROUND

This is a combined community biological monitoring training for FLMMA projects which include reps from Tikina Korolevu-i-Wai (host project site), Tikina Cuvu, Tikina Malolo, Tikina Wai in Nadroga Province and Yavusa Navukavu in Rewa. Participants from these FLMMA project sites are being trained in biological monitoring skills by conducting a baseline survey on marine species in the district of Korolevu-i-Wai particularly villages with marine protected area (MPAs). A one day follow-up visit within the next few months by IAS and partner organizations is expected to take place to assist communities to conduct biological surveys for the rest of the FLMMA sites.

## OVERALL GOALS AND OBJECTIVES:

The two main goals of this community based biological monitoring training were to:

1. To develop skills in biological monitoring, data analysis, and communicating results, and
2. To understand why monitoring and biological surveys are important and how best they fit into *Qoliqoli* Management Plans for each project.

The objectives of the training were to:

1. To make communities aware of why monitoring is important;
2. To review each project's marine resource management actions in order to develop their draft monitoring plans;
3. To identify the KEY RESOURCE MANAGEMENT OUTCOMES each community/project sites want to keep track of;

4. To prioritize what each community (project sites) wants to monitor;
5. To familiarize participants with some basic concepts of sampling design;
6. To train communities in the various simple biological survey methods for reef, mangrove and sea grass species that they can use (to test usefulness of FLMMA biological survey methods);
7. To field practice the appropriate biological methods and collect baseline data for the Korolevu-i-wai sites;
8. To share some basic concepts of analysis, results presentation and interpretation;
9. To develop a monitoring plan that should include systematic and periodic monitoring surveys specific to the site and area that they represent.

# *DAILY SUMMARY OF ACTIVITIES AND OUTPUTS*

## *Day one (Tuesday, 4th March)*

The general purpose of day one was to acquaint people with each other and the workshops goals and review progress and the actions in their management plans. The final session included identifying quantifiable, time-defined goals and priority actions in their management plan. This is a key step in moving from implementation to monitoring. For this particular workshop time was taken for each project team to review their progress to date and share that with other teams. Many of the project sites had had management plans for up to a year but for various reasons had not yet done biological monitoring.

For training with 'new' project(s) one might omit the review of progress on the action plan and just have a session on quantifiable, time defined goals for the individual management plan actions (can do all or 6 priority actions if you feel there are too many to cover).

### SESSION 1A: GETTING TO KNOW EACH OTHER AND WORKSHOP OVERVIEW.

In the first session, it is important to make sure that the participants are comfortable with each other, tradition is followed and to create an atmosphere that maximizes equal participation of participants. Setting some ground rules

before starting the formal part of the workshop is always effective in keeping the participants and facilitators together and focused on the workshop objectives.

In terms of process, this introductory session includes the following events:

- traditional protocols,
- opening and blessing of workshop,
- self introduction with one piece of good news from project,
- plenary with each participant writing down one thing they want to achieve from the workshop,
- these were read and collated on flip chart by facilitator,
- a butcher paper of workshop objectives of organizers was revealed and discussed,
- participants objectives were reviewed to ensure all were captured in original list; if not added to workshop objectives and
- ground rules were also agreed on.

Below are outputs from this session.

## 1A. 1 IDENTIFYING PARTICIPANTS EXPECTATIONS AND CORRELATING WITH OBJECTIVES

### 1A. 1.1 FACILITATORS' EXPECTATIONS ACCORDING TO WORKSHOP OBJECTIVES.

- Community members to be aware of the marine biodiversity in their area;
- To review other marine resources monitoring programs and put together a monitoring plan that would ensure proper policing of their resources;
- Biological monitoring surveys will determine whether marine resources in Korolevu-i-Wai are increasing or not;
- Community members will identify the marine species they would like studied or monitored from time to time;
- Community members to clearly understand the larger framework of carrying out biological monitoring of this kind;
- Community members to be aware of identifying marine species that are easy to monitor or studied on their reefs, mangrove and/or sea grass;
- Try out transect training on land so that community members will be able to familiarize themselves in transect monitoring;
- Community members to share overall objectives of biological monitoring, data collection and analysis and communicating data results to other members of the community;
- Community members to determine regular biological monitoring and develop a plan on how conservation of marine resources may be maintained.

### 1A.1.2 COMMUNITY PARTICIPANTS EXPECTATIONS.

- To fully understand the importance of marine resource conservation.

- To appreciate the difficulties and issues that might arise in carrying out biological monitoring.
- To enhance knowledge and skills on monitoring of marine resources.
- To meet the marine resource owners.
- To learn about the benefits of establishing marine reserves.
- To know what has been destroying their reefs and fishing.
- To know why marine resources have been declining in their fishing grounds.
- To realize the importance of conserving our natural resources.
- To understand the pros and cons of coral harvesting.
- To be aware of what is there on their reefs and fishing ground as a whole.
- To maintain a healthy marine environment for their future generations.
- To promote awareness of the importance of conserving their marine resources to other members of the communities.
- To know what and what is not being used on their reefs.
- To learn how to develop awareness programs for school children, tourists and community members about marine conservation methods and practices.
- To learn ways of re-stocking marine resources that have disappeared altogether.

While the rest of the expectations correlate with the prepared objectives of the workshop, the last three expectations were immediately recognized that they can not be met in this training. However, they were identified as topics to be addressed in future project activities.

## 1A.2 GROUND RULES

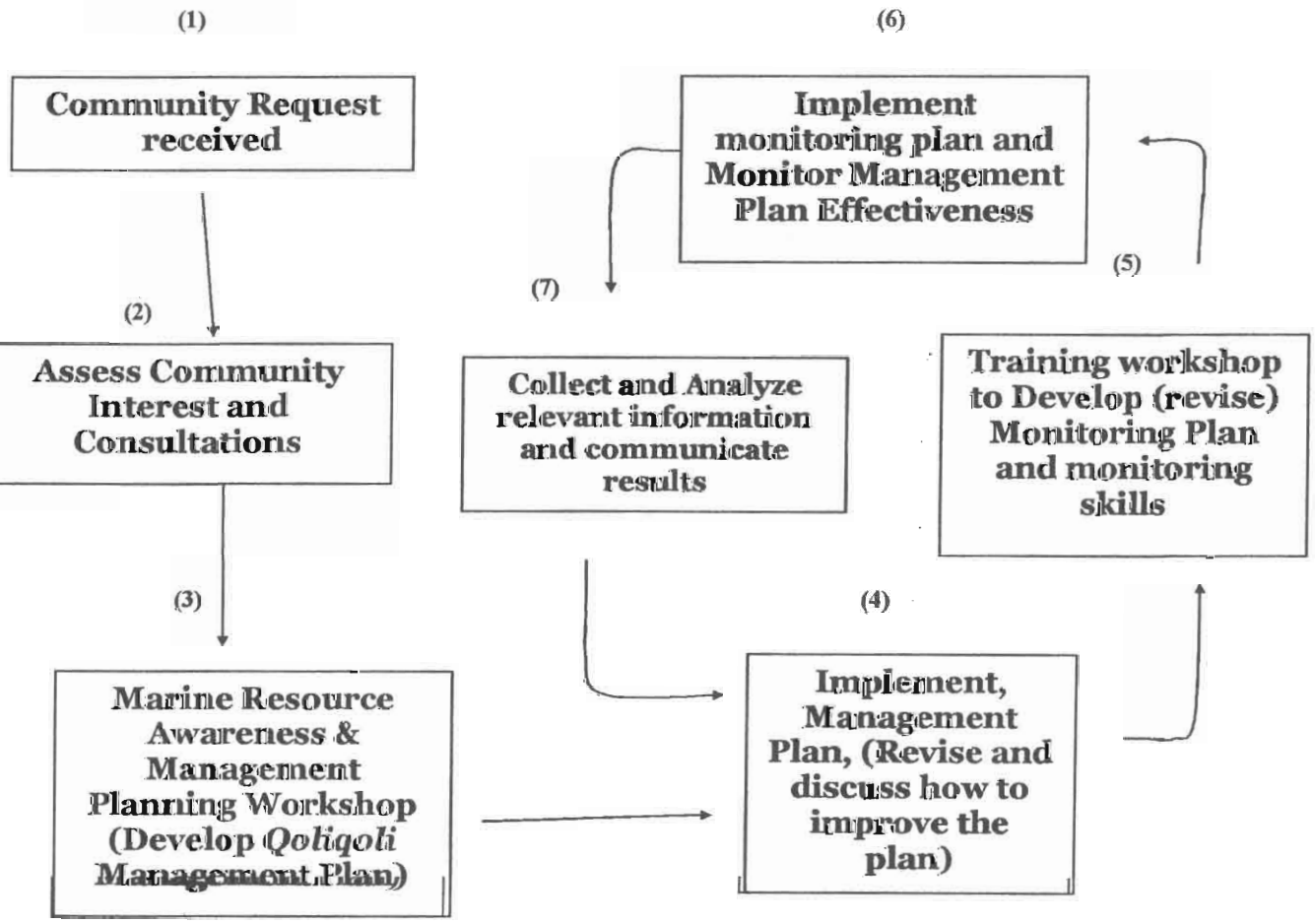
- No smoking inside the workshop venue during workshop, smoke outside;
- Kava not allowed during the training but after 5pm;
- Respect the village regulations: no more kava drinking after 12 midnight;
- Everyone to be on time to the start of every session, those that come late to be punished- sing a song, tell a story, joke or do something funny;
- Always give a chance for everyone to participate and voice their opinion on the topic to be discussed;
- Respect the ladies time who are catering: everyone to go and eat when the food is ready;
- Permission should first be sought from the session facilitator and the enforcer if you want to be excused from the training and go elsewhere;
- Both the facilitators and participants are to follow these ground rules;
- Tevita Nasorowale (Muaivuso) was appointed to police and enforce these agreed upon ground rules.

## SESSION 1B: OVERVIEW OF THE TRAINING.

In introducing this session, briefly discuss activities (with examples) the implementation of stages (4-7) of adaptive management cycle illustrated below.

**COMMUNITY ENGAGEMENT PROCESS CYCLE**

The process below has been used as a guide to engage communities in Fiji on *qoliqoli* management after requests have been received.




While the focus of the training is on skills development specifically on the monitoring stage (5), it is important to emphasize that it is only a tool to judge and improve the effectiveness of the management actions undertaken. Interpreting and communicating the results of monitoring surveys is just as important as collecting the data.

The training sessions that follow were designed to walk participants through this adaptive management stages (4-7), and impart the knowledge and the skills required to undertake those activities. It is also to enable participants to appreciate how they fits into their developed *qoliqoli* management plans and hence their daily socio-economic needs.

## SESSION 2: REVIEW OF MARINE RESOURCE MANAGEMENT PLANS

### OBJECTIVES

- To review what has already been done.
- To identify what needs to be done.
- To decide on three tasks to be implemented in 2003.

### INSTRUCTIONS

**PART I**

Divide into each project representative group to discuss and review their management plans and identify all actions taken to date for each problem using the example below as a guide. The projects were to fill out the table below a template for the exercise.

- Korolevu-i-Wai
- Cuvu
- Tikina o Wai
- Navukavu
- Votua

**Example from Votua in Ba.**

| PROBLEM | Management Action Plan | What has been done to date to resolve the problem |
|---|---|---|
| Too many fishing licenses issued out | Reduce number of fishing licenses from 70 to 35 | • Discussed at the District Council Meeting<br>• It was decided to only issue 35 to 40 fishing licenses per year |

**Part II**

Each project to select at least three priority problems and current actions from their action plan and to propose what quantifiable changes they expect in a certain time frame then allow them to do and list their expected outcomes.

**Example from Korolevu- i- Wai group**

| PROBLEM | Management Action Plan | What has been done to date to resolve the problem | Expected Outcomes/ Changes |
|---|---|---|---|
| Breaking off coral pieces | Awareness raising on ways coral is broken and negative impacts | Discussed at the village meeting | Twice as many octopus by the end of 2003 |
| Overfishing | Establish a marine reserve on Welu reef. | *Tabu* area established | In the next 5 years groupers/ rock cod and octopus on Welu reef will increase fivefold |

***See Appendix 1.0 for group results from other project sites.***

## *Day Two (Wednesday, 5th March)*

The general purpose of day two was to familiarize people with the concepts of monitoring, setting "SMART" objectives and best indicators and talk about representative sampling.

The last session for the day will introduce the various proposed biological survey methods that can be used to survey chosen indicators.

## SESSION 3A: WHY MONITORING IS IMPORTANT?

**AIM:**

- To introduce the concepts of monitoring and the idea of quantifying changes.
- To recognize the difference between belief vs fact (assumptions vs direct observation)
- To identify what information needs you have so that your resource questions can be answered

**CONCEPTS OF MONITORING:**

- Explain that monitoring is not a new concept and is not only done by scientists or government workers. It is part of what we do everyday.

Share some practical examples:

- The *turaga ni koro* monitors the activities in the village, the welfare of its people and who is coming in and going out of the village;
- When going out shopping we want to make sure that cost of the items we buy does not exceed the money we bring—this is a form of monitoring;
- In water stricken areas, water is rationed and efforts are made to ensure that we do not run out of water. At times, water is temporarily closed off to fill up water level in the reservoir to normal levels—these are examples of actions taken after problems are realized;
- As it relates to this work (protection and conservation of marine resources), we (resource owners and users) needs to **keep a watch over** the rate at which we are harvesting these resources and whether the actions we undertake (fishing activity, methods we use, our management interventions/actions) are helping replenish our fish/marine resource reservoir to be able to continue harvesting/fishing or not.

- There are several levels of monitoring which affect the methods of surveys and accuracy of information but they are dependent on the questions that needs to be answered, information needed and who needs it.

- The community may only need to know abundance of a highly targeted fish and income generated but scientists/NGOs may want to know BIODIVERSITY (abundance of different fish species) in addition to what the community wants to know.
- Monitoring surveys range from observation, interviews, and catch data to biological and socioeconomic surveys; information generated can be qualitative, quantitative or both.
- How **close the survey result** is to the **TRUTH- Actual situation** depends on how the survey is carried out (sampling and methods).

- There are two main monitoring methods/approaches that can be simplified or tailored for communities to carryout to answer their resource questions or confirm perceptions and test assumptions.
  - Biological monitoring----keeps track of biological changes
  - Socio-economic monitoring---keeps track of socio-economic changes, mostly the result of biological changes or benefits of actions implemented.

**BIOLOGICAL MONITORING SURVEYS CAN HELP US**

☑ To keep track of how many fish/marine resources we are extracting from our *qoliqoli* and how much stock is left in our *qoliqoli*,

☑ To know what is in our fishing ground (inventory of resources)

☑ To understand which resources have been threatened or highly targeted?

☑ Measure the benefits of *qoliqoli* management actions implemented such as *tabu*

☑ To determine whether measures put in place to better conserve marine resources are effective or not

☑ To determine whether the community needs and project objectives have been met or not

☑ To quantify the biological changes that have occurred and to determine whether or not there is an increase in population or not

☑ To affirm PERCEPTIONS AND ASSUMPTIONS (*Nanuma*) to be able to KNOW (*Kila*) the ecological and biological changes.

**BELIEF (*NANUMA*) VERSUS FACT (*KILA*):**

Differentiate between ***BELIEF*** (perceptions or assumptions) and knowing the ***FACTS*** of changes happening.

Discuss some examples before asking participants to also share some examples:

⇒ ***BELIEF: Changes that you want, perceive or assume can happen. Statements that may include "I believe, assume....."***

*Example: Tabu area will bring us more fish.*

⇒ ***FACT: Quantifiable changes with evidence or based on tested assumption. Statements that may include "I know....."***
*Example: The effect of the tabu area has increased our fish catches from 2kg/hr to 12kg/hr.*

**SHORT QUIZ**
Ask participants to classify statements as belief (perception or assumption) (A) vs knowing facts (F) and why their choice?

- We have experienced a big change in our *qoliqoli* in the last year _____A
- There are plenty *qari* (crabs) now compared to last year _____A
- A fisher can get on average 5 crabs within 1 hour of fishing _____F
- *Kaikoso* (clams) population have increased 10 times more in the tabu area and 3 time more in the harvest area in the last 6 years _____F

Quantifying the changes is really helpful in checking that we are doing the right thing to solve the problems impacting our resources and in making decision for further actions.

## SESSION 3B DEVELOPING SMART OBJECTIVES TO SELECT KEY BIOLOGICAL INDICATORS

**OBJECTIVE**
- To determine what biological organisms can be measured to indicate if the management plan is effective or not.
- To use Specific, Measurable, Achievable, Realistic and Time defined (SMART) criteria to confirm quantifiable, time defined objectives and to determine what might be a good indicator species.

| | |
|---|---|
| ***"SMART"*** | A-Achievable |
| S- Specific | R- Realistic |
| M- Measurable | T- Time defined |

- To identify and confirm indicator species to be monitored

**METHOD**
- For each management plan action (if there are more than the group or community can handle (usually 10), you might prioritize the list) ask working groups to determine a specific time defined objective that would likely to be affected by their action. E.g, setting up the number of clams will double the number of clams in one year. A few examples should be given before breaking into working groups. If several village representatives are present then each

village groups then present and discuss their ideas on the objectives of their identified actions. Different groups can do different actions or they can do all and compare.

- For the plan developed in session 2 note the following criteria were already met.
  - S – Specific.
  - T--Time defined.

- For the objectives of each activity and the expected changes from their management action plan, ask in plenary whether they meet the other criteria of being easily measured (Measurable, Achievable and Realistic). Record on flip chart.

- Based on the list of identified possible indicators for each planned actions determine which key indicators the community wants to choose. Point out that it is usually better to start with only 1 or 2 indicators and learn how to do them well. Ideally you should have a prioritized list of top 6-8 important marine resources but if not then see the following step to aloe the community or the group to get their list.

**Examples from Korolevu-i-Wai group.**

| MANAGEMENT ACTION FOR 2003 | SMARTI OBJECTIVES | BEST BIOLOGICAL INDICATOR |
|---|---|---|
| Establish a "marine reserve" on Welu Reef | In the next five years octopus and rock cod on Welu reef will increase fivefold. | Abundance of octopus and rock cod |
| Establish marine reserves within Korolevu-i-wai district *qoliqoli* (vatjuniga, korolevu, muahara, nadriuce) | Marine reserve (For Votua and Namada for five years, Tagaqe for 3 years and Vatu-o-Lalai for one year) will rehabilitate and improve marine resource health, increase the number of visitors and income to the village. | Votua: abundance of Ulavi & Coral health<br><br>Vatu-o-Lalai: Abundance of octopus & coral health<br><br>Tagaqe: Abundance of sea cucumber (Vula), grouper fish & coral health.<br>Namada: Abundance Giant clam, coral & Ulavi |

**In situations where the list of important species (the prioritized list are usually considered for potential key indicators when determining SMART objectives), follow the suggested steps below.**

- In order to list important species (economical, cultural and biological significance) and prioritize them through pair wise ranking:
  - Ask each participants to list on a card
    - 2 economically important species
    - 2 culturally/traditionally important species
    - 2 biological important resources/species
  - Collate them and pick out 6-10 commonly identified resources
  - Prioritize the top 10 most important species by pair wise ranking

***Example of pair wise ranking exercisefor their list of important species, habitatsand resources for Korolevu-i-wai site***

| Important Species | QARI | KANACE | DOGO | KAIKOSO | VASUA | SICI | LASE | KAWAKAWA | CAWAKI |
|---|---|---|---|---|---|---|---|---|---|
| QARI | | Kanace | Dogo | Qari | Vasua | Qari | lase | kawakawa | Cawaki |
| KANACE | | | dogo | Kanace | kanace | kanace | lase | kawakawa | Cawaki |
| DOGO | | | | dogo | dogo | dogo | lase | kawakawa | Cawaki |
| KAIKOSO | | | | | kaikoso | kaikoso | lase | kawakawa | Cawaki |
| VASUA | | | | | | vasua | lase | Kawakawa | Cawaki |
| Sici | | | | | | | lase | Kawakawa | Cawaki |
| LASE | | | | | | | | Lase | Cawaki |
| KAWAKAWA | | | | | | | | | Cawaki |
| Cawakii | | | | | | | | | |

| IMPORTANT RESOURCES | Number of Appearance | RANKING | 9 top most important resources |
|---|---|---|---|
| Qari | 2 | 7 | 1 – *Cawaki* |
| Kanace | 4 | 5 | *2- Lase* |
| Dogo | 4 | 4 | *3. Kawakawa* |
| Kaikoso | 3 | 6 | *4. Dogo* |
| Vasua | 2 | 8 | *5. Kanace* |
| Sici | 0 | 9 | *6. Kaikoso* |
| Lase | 7 | 2 | *7. Qari* |
| Kawakawa | 6 | 3 | *8. Vasua* |
| Cawakii | 8 | 1 | *9. Sici* |

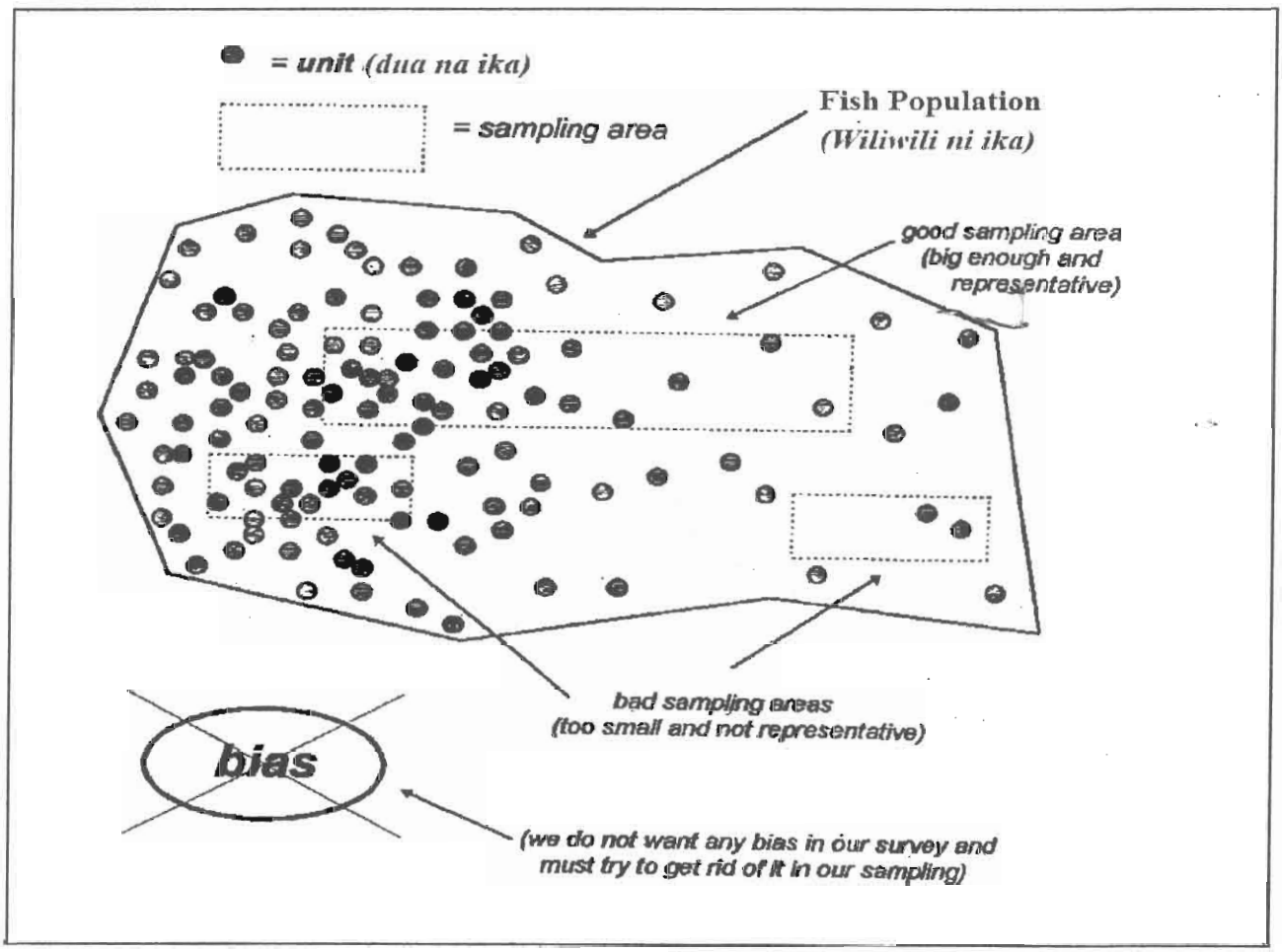
- Share and discuss briefly the biology, life cycle, reproduction and important information about these identified species.

## SESSION 4A: SAMPLING DESIGN CONCEPTS

**OBJECTIVES**

- To illustrate good and bad sampling examples
- To demonstrate the concept of REPRESENTATIVENESS in monitoring

### "Sampling: choosing a *turaga ni koro* (speaks for the whole)"




(Source: Panlks, 1997)

**INSTRUCTIONS/METHODS:**

- Explain why sampling needs to be done rather than counting the entire area.
- Explain the characteristics of a good sampling design (*see illustrated example above)*
- Do practical exercise.

**Exercise**

Define an area in village green and spread out randomly about 200 fish cut out of heavy paper. Trial variously possible sampling methods (e.g. count ¼ of one end, place tape and use 1 $m^2$ quadrat every ___X___ meters and compare results with the "right" answer based on the total area and number of fish.

For example if 10 $m^2$ of a 100$m^2$ was sampled and 5 fish found, there would be 50 fish in the total area.

$$\frac{\text{Number of fish counted}}{\text{Sample area}} = \frac{\text{Total fish expected}}{\text{Total area}}$$

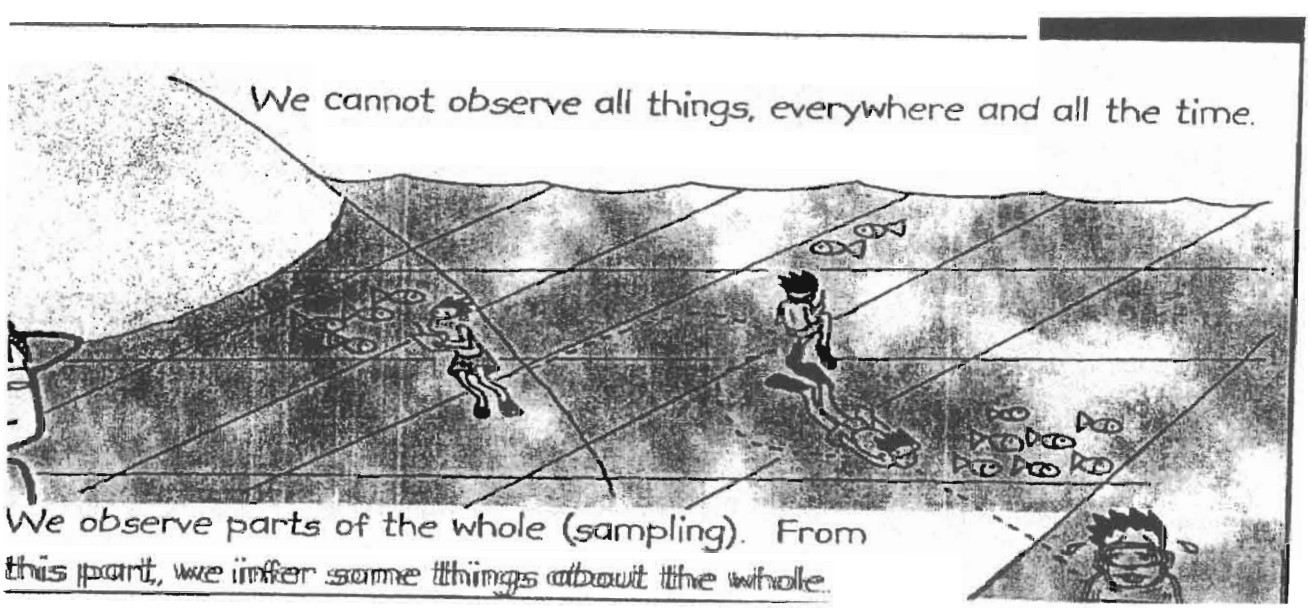
- ***Discuss Common Problems Encountered in Monitoring Surveys***

1) The whole "***i qoliqoli***" or fishing ground cannot be surveyed because:
   - it will take a lot of time
   - it will need a lot of people to do the monitoring
   - it will be expensive

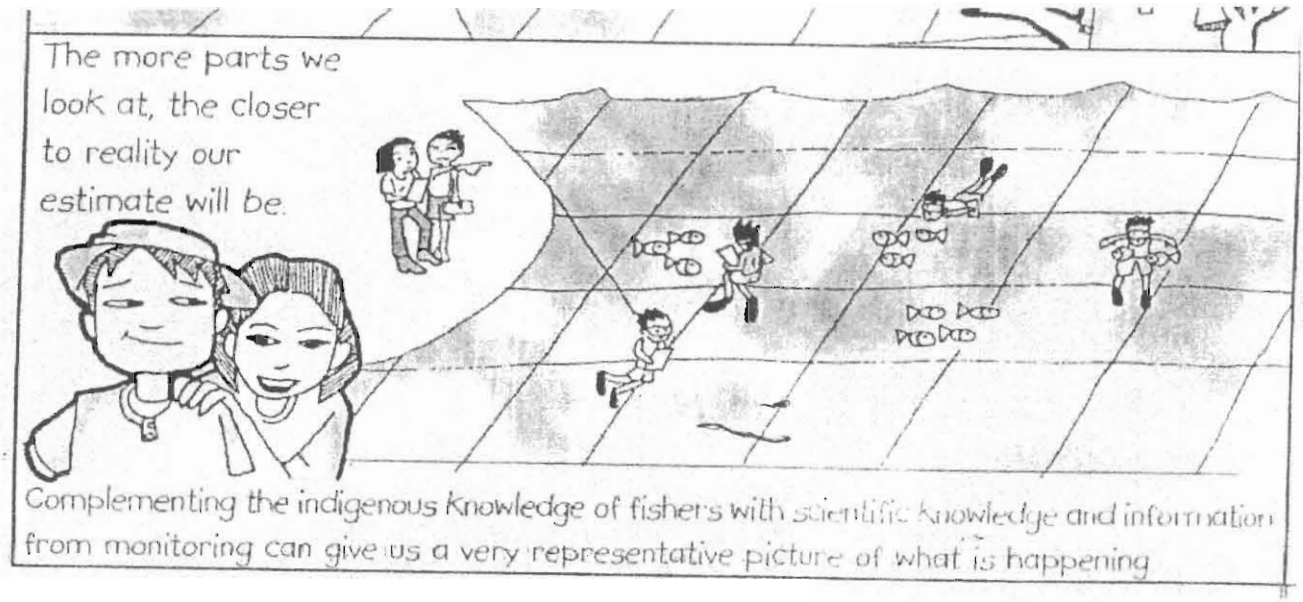
2) Surveyed population and size of samples may not be representative.

***Solution***

- Select only portions of the *i qoliqolis* to survey, do representative sampling. Surveyed samples should be easy and quick.



- Monitor several areas and not only concentrating on the healthy marine areas but with the not so healthy marine areas and as much as possible try to randomly choose your sampling areas. In other words it is important **not to be biased.**




## SESSION 4B: PAIRED SAMPLING AND DATA QUALITY CONTROL (*TABU* VS CONTROL)

The aim of this session is to see why sampling a control site is important and to discuss sampling issues that will help improve the quality of the information.

***INSTRUCTION***

- **Discuss benefits of *tabu* areas.**

The main assumption is that when marine resource population within the *tabu* area has recovered it will ***"spillover"***, ***"reseed"*** and ***replenish*** adjacent harvest areas.

- **Discuss need for sampling inside and outside impacted area to determine change (Use of control site).**

*To judge the effectiveness of the 'tabu' area, we sample from two "paired" sites:*

This way, we can compare the harvested population with the control population to see if there is any change, and if so, how much of one.

Sampling a control site can also indicate to us whether the decline in fish numbers is caused by overfishing or other problems such as pollution and coral harvesting; for example if the *tabu* area does not increase in fish population faster than the control site, overfishing is probably not the only/main problem.

- **Discuss some questions to address when deciding on a suitable sample:**

1) Sampling **sites:** How many places do we sample?
   ⇒ Should have at least 2 sampling sites (e.g. tabu and control)
2) Sampling **size:** How large of an area/how many units do we want to sample?
   ⇒ Can do at least 5 replicate samples within a site (e.g. 5 x 100m transects within a site)
3) Sampling **frequency**: How often do we sample?
   ⇒ E.g. for fish and benthos survey, it should be done at least once a year but encourage to do survey several times a year (can be every six months) in the first two years to be able to determine initial expected changes.

- **Discuss some issues related to monitoring that will affect the result and quality of the survey result.**
  (Time, Tide, Weather, Method, Sampling plan.)
  ⇒ Timing of the monitoring not right
    - bad weather
    - low tide
    - identified species are in hiding
  ⇒ Inappropriate monitoring methods

The **golden rule** is when doing replicate surveys is to try and be **consistent as possible** with the method used, sampling site and stations (use permanent transects) and sampling time (tide, weather and time) employed during the baseline survey. This way, it will increase the quality of the survey results.

## Session 5: MONITORING METHODS TRAINING

*QUESTIONS IN DESIGNING METHODS*

1. What is to be monitored?
2. Which method of monitoring is appropriate?
3. When is the best monitoring time?

**OBJECTIVE**

- To present the theory of the main survey methods below
    a) belt transect
    b) line transect
    c) time count
- To design result sheets for collecting information
- To practice methods with some dry practice on methods and equipment

**INSTRUCTIONS**

1. Set up 3 stations for the 3 methods commonly used
2. Divide into 3 groups and go through stages of method including design of result/data sheets thoroughly with participants
3. Demonstrate how to use equipment and allow them to practice how to use them e.g. Compass
4. When everyone has a fair idea of how survey is done, ask your group members move to the next station.
5. Rotate until the group has gone through all the methods.

| Stations | 1 | 2 | 3 |
|---|---|---|---|
| LINE Transect | Cuvu and Wai District | Navukavu | Korolevu-i-Wai |
| BELT Transect | Korolevu-i-Wai | Cuvu and Wai Districts | Navukavu |
| TIME Count | Navukavu | Korolevu-i-Wai | Cuvu and Wai Districts |

# BIOLOGICAL SURVEYS METHODOLOGY

## A) BELT TRANSECT METHOD

### *OBJECTIVES*

1. To determine density (number) of fish and other marine resources that move around slowly on the reef and invertebrates that can easily be seen while snorkeling.

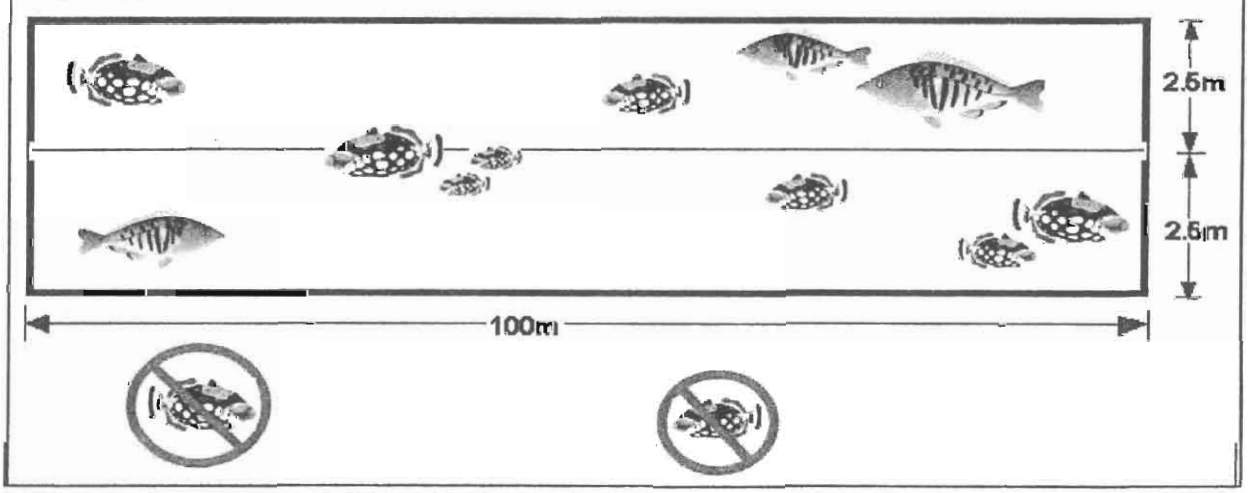
### *Material Preparation*

- Measuring tape, Paper, Pencil
- Bulldog clip and rubber band, Snorkeling gear

### *Monitoring method*

1. Laying out of 100m measuring tape on desired area making sure it is done properly
2. After a lapse of 15 minutes (when divers no longer disturb the area) start counting the fish. After every five meter stops (5, 10, 15, 20m....) count the fish for 3 minutes within the 5m corridor (2.5m on either side of the meter tape) before moving to the next stop. Do not count fish outside the 2.5m sampling area. Can use full arms length (slightly shorter than 2.5m) as a guide to check on sampling boundary. Fish sizes can also be estimated.
3. One diver records fish on one side of the line followed by another on the other side. Alternatively, Diver 1 can record the first 20m segment while Diver 2 can do the second 20 m segment and so on. Care is needed to properly label slates and to avoid double counting.
4. At least two samples or indicator species can be observed and recorded:
   - two in the reserve area and same two in the non-reserve area

Fig 2.0(a): Belt transect method



## SAMPLE RESULT SHEET
## FISH/INVERTEBRATE BELT TRANSECTS:

Date: _____ Time: _____ Tide(H-high, L-low): _____

Indicator species: *Ulavi, Kawakawa*

Monitoring Team: _____

Recorder: *Jim Batireregа*

Compass Bearing: _____ Landmark: _____

**TRANSECT 1**

| **Stations (S)** | ***Number of parrotfish (Ulavi)*** | **Total** | ***Number of Grouper (Kawakawa)*** | **Total** |
|---|---|---|---|---|
| S1 (0m) | | | | |
| S2 (5m) | | | | |
| S3 (10m) | | | | |
| S4 (15m) | | | | |
| S5(20m) | | | | |
| S6 (25m) | | | | |
| S7 (30m) | | | | |
| S8 (35m) | | | | |
| S9 (40m) | | | | |
| S10 (45m)..... | | | | |
| .....S20 (95m) | | | | |
| Total | | | | |

## B) LINE TRANSECT & QUADRAT

### OBJECTIVE

- Used to determine substrate types and cover including the population of sessile marine species.

### Possible Indicator Species

- Shellfish, Trochus, Sea Cucumber, Coral health, Sand substrate

### Material Preparation

- Measuring tape, Data sheet on recording slate.
- Snorkeling gear, Quadrat, Pencil

### *Monitoring method*

1. Lay tape for a 100 metres on reef edge
2. Lay your transect with reference to a compass reading and record reading
3. Lay the quadrat (one square metal meter) every 10m starting from 0 m
4. For marine resource monitoring
   a) Count target species being monitored within the quadrat. Do not count outside the quadrat
   b) Use meter tape or ruler for measuring invertebrate sizes

5. For Reef Ecosystem monitoring
   a) Estimate percentage of live coral, dead coral and sand/rubble coverage
   b) Estimate percentage points that make up live coral and sand within quadrat. (One meter quadrat divided by string into 100 equal squares- in each square determines which cover is dominant.

**E.g. Estimating substrate cover within one quadrat**

| Live Coral – 32 points | Dead coral-30 points | Sand/rubble – 38 points |
|---|---|---|
| 32/100 x 100 = 32% | 30/100 x 100 = 30% | 38/100 x 100 = 38% |

## SAMPLE RESULT SHEET

Date: High/Low Tide:

Indicator species: Monitoring Team:

Recorder:

| **Stations/Quadrat numbers** | **TRANSECT 1** | **TRANSECT 2** | **TRANSECT 3** | **TRANSECT 4** |
|---|---|---|---|---|
| Comp. Bearing/<br>Landmark:<br>Time: | _____<br>_____<br>_____ | _____<br>_____<br>_____ | _____<br>_____<br>_____ | _____<br>_____<br>_____ |
| Q1 (0m) | | | | |
| Q2 (10m) | | | | |
| Q3 (20m) | | | | |
| Q4 (30m) | | | | |
| Q5(40m) | | | | |
| Q6 (50m) | | | | |
| Q7 (60m) | | | | |
| Q8 (70m) | | | | |
| Q9 (80m) | | | | |
| Q10 (90m) | | | | |

## C) TIME COUNT METHOD

**BACKGROUND**

⇒ This rapid assessment survey method is particularly useful in determining catch per unit effort (CPUE) of invertebrates such as crabs and other mangroves species, particularly in protected areas where it almost impossible to establish permanent plots or transects.

⇒ The main limitation to this survey method is that indicator species density (numbers per sampling area), which is a more accurate measure of change, will not be **precise.**

**OBJECTIVE**

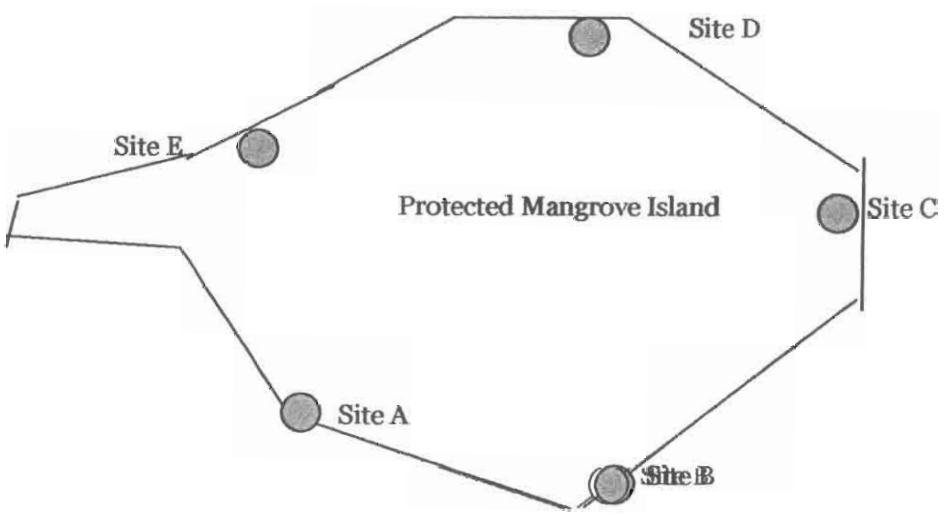
- To evaluate marine resources one can harvest in one pre-determined time period (Catch per unit effort (CPUE))

**Material Preparation**

- Map of fishing ground
- Clock
- Whistle
- Paper and pen

**Monitoring Exercise**

- Divide surveyed area to be monitored equally on the map and mark segmented sampling sites on the map: A, B, C.....
- Each of the monitoring team to be allocated a sampling area to be monitored as per A, B, C.....
- Elaborate with an example:




- It is important to maintain consistency in the number per team and gender balance and they need to be moving in a specified direction (E.g. For crab

monitoring in a very dense mangrove areas, observers can just walk, search, count and record crabs found as they move from the shoreward end to the seaward end of the surveyed mangrove area).

- Try to ensure that the team do not double count the indicator species (for crabs, possible categories are mating crabs (male and female) found together, single crabs found either on top of crab holes/under mangrove roots and fresh crab holes where crabs are confirmed to be inside the hole).
- One of the team members to take note of the time of monitoring.
- Start the survey by blowing the whistle and stop the survey when the whistle is blown again at the end of the allocated time.

**SAMPLE RESULT SHEET**

Surveyed Area: Protected Mangrove Island

Sampling Area: Site A Monitoring Team: Viti and Meli

Recorder: Viti Date: 14-02-2002

Time: 2:30pm - 3:30pm Allocated time: 1 hour

| Sampling Area | # of observers | Frequency of | | | Total |
|---|---|---|---|---|---|
| | | *- Male and female crabs seen together (Drua) (x2)* | *Single Crabs visible (raica)* | *Fresh crab holes (Qara)* | |
| A | 2 | - | II | II | 4 |
| B | 2 | II | I | III | 8 |
| C | 2 | - | I | III | 4 |
| D | 2 | II | IIII | IIII | 16 |
| E | 2 | I | II | ~~IIII~~ II | 11 |
| **Total** | **10** | **10** | **10** | **19** | **39** |

**ANALYSIS**

Step 1: Total the number of crabs observed from each sampling area and calculate the total number of crabs observed in the surveyed area. (Note: multiply the mating crabs (Drua) observed by 2)

Step 2: Total the number of observers.

Step 3: Calculate CPUE: $\frac{\text{Total number of Crabs observed}}{\text{Total number of observers}} = \frac{39}{10}$

**= 3.9 ~ 4 Crabs/Fisher/hr**

- The replicate survey should be carried out in the same sampling sites surveyed earlier and ideally by the same observers.

## *(Day 3 Thursday, 5th March)*

The third day allows participants to role play and practice survey methods step by step, sampling designs and to acquaint themselves to the different tasks each team member needs to undertake first on dry land before going to the water or to the area to be surveyed. At the end of this session, participants should be able to determine which survey method is suitable for the indicator species that they have chosen. Participants are encouraged to try out all the survey methods.

During the field practice session, participants are able to collect baseline data for the host site. It also gives them opportunity to realistically assess the different tasks involved, time involved and how best to work as a team.

## SESSION 6 BRIEF ON FIELD PRACTICE PLANS

**OBJECTIVE**

- To be able to plan out the field practice exercise, design a data sheet, and work in teams.

**Method**

- Divide all participants into 2 big teams (groups chose names as Lami and Nauluvatu)
- Sit together and discuss the plan for the field trip
- The training will be done for snorkel and check if all are competent swimmers.
- Make sure to assign individuals to responsibilities in a team of at least 5 per team such as laying transect tapes (2 persons), recorder and buddy (2 persons), fish count (1) and rotate or change the teams according to the group total until everyone has had a chance to practice all roles.
- Make sure to also brief participants again on what to do first on the boat on dry land before getting into the water.

The Lami Team chose *cawaki* (*Tripneustes gratilla*) as their indicator while the Nauluvatu Team chose *ulavi* (parrotfish), *kawakawa* (grouper) and substrate cover (live coral cover).

**Lami Team**

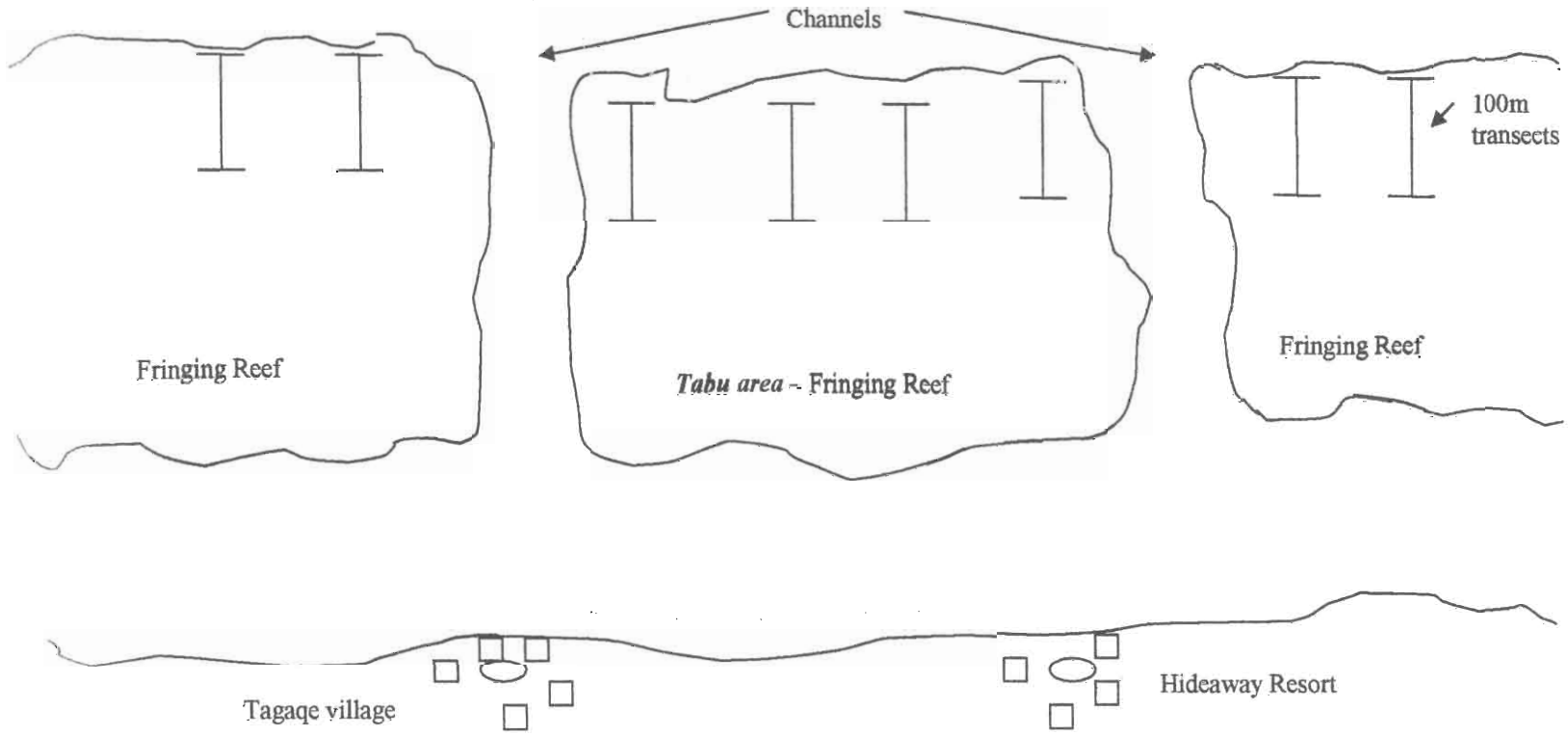
Belt transect was chosen to survey *cawaki* (sea urchins)

**Nauluvatu Team**

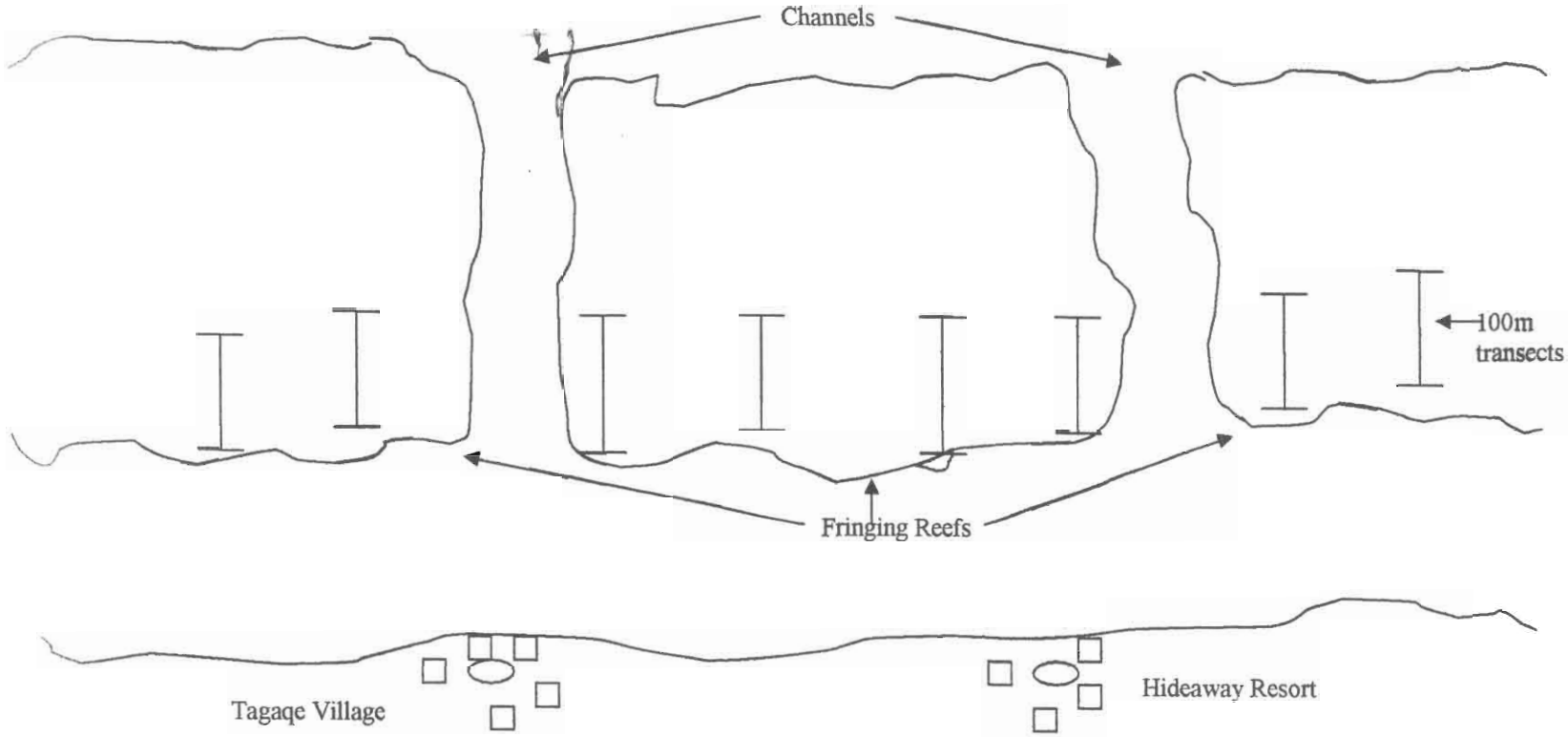
- Quadrat on Line Transect was chosen for coral cover estimation.
- Belt Transect was also chosen for fish (*ulavi* (parrotfish), *kawakawa* (grouper)) counts.
- For this team the same transect was used for fish survey first before coral cover was surveyed.

## MONITORING TRAINING PLANNING EXERCISE AT TAGAQE

*Plan for Team Nauluvatu*



*Plan for Team Lami*



# SESSION 7: FIELD PRACTICE

## Objective

- To gain field experience in conducting biological survey
- To conduct the baseline data survey for the Tagaqe fishing ground

## Method

- Each team to organize data collection using agreed sampling design from both the tabu and the adjacent harvest areas using the respective methods they selected
- Go out and do the survey
- Allow some time after the field practice for participants to regroup and review how the survey method used, teamwork, monitoring equipment needed, survey logistics and time of survey can be improved.

## REVIEW OF THE FIELD PRACTICE

1. **TEAMWORK**
   - Line quadrat – need maximum of 4 monitors
   - Belt transect – need a maximum of 5 monitors

2. **TIME OF MONITORING**
   - For all surveys, it is best if done in fine weather
   - Number of monitoring team to be limited to only five or less
   - Belt transect for fish and sea urchin survey to be done at high tide (due to shallow fringing reef that is nearly dry at low tide)

3. **MONITORING GEAR**

   Need:
   - Diving shoes
   - Marked rope with lead to replace the tape
   - Compass, diving outfit
   - To be together as a team (buddy) and to encourage gender balance
   - Boat
   - First aid kit

*(Day 4 Friday, 7th March)*

## SESSION 8: THINKING ABOUT THE DATA

**Objective**

- To train participants on how to keep data/information safe (data management).
- To introduce the different ways of presenting data, that is in the form of tables and histograms.
- To develop skills on how to analyze and interpret data.

**Method:**

- Group discussion on data management. After the survey, what do we do with the result sheet so that the information is safe and can be used again when needed at a later date? **ANS: DATA MANAGEMENT**

***Steps:***

⇒ Copy the raw data from your wet result sheet/slate onto a dry FIELD RECORD BOOK -Database.

⇒ Keep your field record book in a safe dry place. It is always advisable to have several copies of the same data with members of monitoring team.

⇒ Send a copy of the data to your partner organization (E.g. Korolevu-i-wai to send to USP) to be coded and entered onto an electronic database.

- Introduce and define **analysis.**

  ⇒ You will be wasting your valuable time if you just collect the data or be involved in the data collection only without knowing what the data means to you and your community members.

- Complete **check list** before analyzing results
  - Do we know why we do monitoring and how it relates to the project?
  - Do we know what threats we are addressing and what indicators to monitor that determine whether or not project objectives are being met or not?
  - Do we know our objectives (SMARTI) and our expected outcomes?
  - Are we clear on the survey method(s) that we will be using to monitor our indicator species in the future?
  - Are our surveys completed?
  - Have we placed this information/data in a safe place so that we can find and use it in the future?
  - Do we want to present our survey results to the rest of our community members?
  - Are we going to discuss the results in our next village meeting with our management plan?
- If all the boxes are checked off then we can go ahead with the analysis.

## ANALYSIS OF MONITORING RESULTS

- Discuss using an example, ways of presenting the data so that community members can easily follow and understand. Note that majority of the members of the community were not part of the survey and objective setting.

**Veratavou project example:**

***SMARTI Objective:*** In addressing overfishing, Ucunivaua villagers agreed to impose *tabu* in Lomo for five years. They were expecting at least a three-fold increase in marine resources after five years and an increase in abundances of harvestable sizes of clams.

**Indicator species:** *Anadara* Clam

The individual data for each of the 9 size classes measured from the 50 quadrat stations are tallied and added together, for example in Lomo in 1997 the raw data sheet is shown below:

**Site:** *Lomo- Tabu area, Ucunivanua village.* **Date/ time:** *23 April, 1997: 1pm*

**Recorder:** *Pio Radikedike* **Monitoring Team:** *Te Nawadra, Inoke, Maleya, Paula, Venina*

**Starting point:** *"Binibini vasua",* ***5 x 100m Transects***

| Quadrat number (Q) | Total | Frequency for each size class: 1= <2.5cm, 2=2.5-3.0 cm, 3=3.1-3.5cm, 4=3.6-4.0cm, 5= 4.1-4.5cm, 6= 4.6-5.0cm, 7=5.1-5.5cm, 8=5.6-6.0cm, 9=>6.1cm | | | | | | | | Forward Bearing (FB),Transect number (T) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 8 | 9 | |
| Q1 | 1 | | | | 1 | | | | | T1 -FB: 270' |
| Q2 | 0 | | | | | | | | | |
| Q3 | 1 | | | 1 | | | | | | |
| Q4 | 0 | | | | | | | | | |
| Q5 | 1 | | | 1 | | | | | | |
| Q6 | 0 | | | | | | | | | |
| Q7 | 0 | | | | | | | | | |
| Q8 | 1 | | 1 | | | | | | | |
| Q9 | 0 | | | | | | | | | |
| Q10 | 0 | | | | | | | | | T2- FB: 270' |
| Q11 | 0 | | | | | | | | | |
| Q12 | 0 | | | | | | 1 | | | |
| Q13 | 1 | | | | | | | | | |
| Q14 | 0 | | | | | | | | | |
| Q15 | 1 | | 1 | | | | | | | |
| Q16 | 2 | | | 1 | | | 1 | | | |
| Q17 | 0 | | | | | | | | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Q18 | 0 | | | | | | | | | |
| Q19 | 0 | | | | | | | | | |
| Q20 | 1 | | 1 | | | | | | | T3- FB: 90' |
| Q21 | 0 | | | | | | | | | |
| Q22 | 0 | | | | | | | | | |
| Q23 | 0 | | | | | | | | | |
| Q24 | 2 | | 1 | 1 | | | | | | |
| Q25 | 0 | | | | | | | | | |
| Q26 | 0 | | | | | | | | | |
| Q27 | 1 | | | 1 | | | | | | |
| Q28 | 0 | | | | | | | | | |
| Q29 | 1 | | | | | 1 | | | | |
| Q30 | 0 | | | | | | | | | T4- FB:180' |
| Q31 | 1 | | | | | | 1 | | | |
| Q32 | 0 | | | | | | | | | |
| Q33 | 1 | | | | 1 | | | | | |
| Q34 | 1 | | | | | | | 1 | | |
| Q35 | 0 | | | | | | | | | |
| Q36 | 0 | | | | | | | | | |
| Q37 | 1 | | | | 1 | | | | | |
| Q38 | 1 | | | | 1 | | | | | |
| Q39 | 0 | | | | | | | | | |
| Q40 | 1 | | | | | 1 | | | | T5- FB: 90' |
| Q41 | 0 | | | | | | | | | |
| Q42 | 1 | | | | | 1 | | | | |
| Q43 | 0 | | | | | | | | | |
| Q44 | 2 | | | | 1 | 1 | | | | |
| Q45 | 0 | | | | | | | | | |
| Q46 | 1 | | | | | | 1 | | | |
| Q47 | 1 | | | | | 1 | | | | |
| Q48 | 0 | | | | | | | | | |
| Q49 | 1 | | | | 1 | | | | | |
| Q50 | 0 | | | | | | | | | |
| **Total** | **25** | | **4** | **5** | **6** | **5** | **4** | **1** | | |

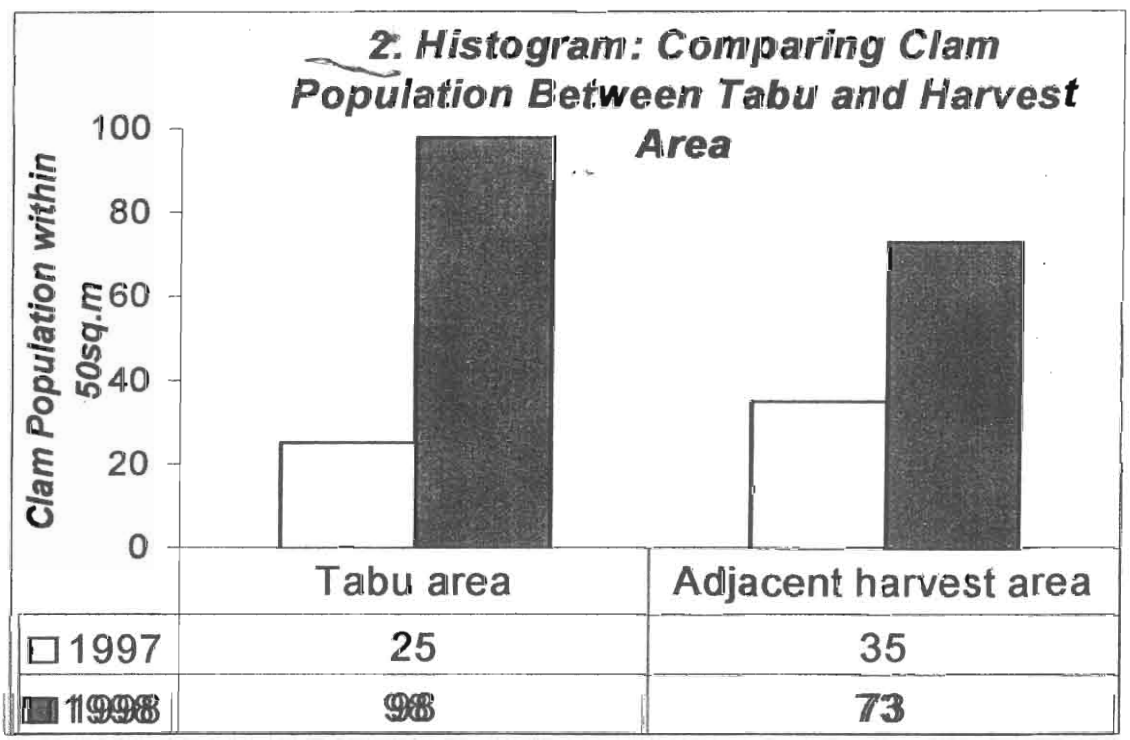
These numbers are added to get the total number counted. In 1997, the only data available (baseline in addition to the size classes' frequency) was 25 clams in 50 quadrats in Lomo and 35 in Matanaiverata. After 1998, a useful comparison can be made, particularly the total clams found in the 50 quadrats. One way of presenting the results is by using summary table such as the one shown below.

**1. Tabulated results**

| Verata sites | 1997 | 1998 |
|---|---|---|
| *Tabu* area (500m)(Lomo) | 25 | 98 |
| Adjacent harvest area (500m) (Matanaiverata) | 35 | 73 |

Another way to make a greater impact on community members is to elaborate these data visually called a histogram. This uses the box to represent the number of *kaikoso*; the taller the box the more the *kaikoso*. To do this:

- Make lines on the y-axis of equal distance to represent a certain number of clam or fish.
- Make sure the largest number you have can fit on the paper.
- From the vertical y-axis make a line parallel to x-axis to show how many clams (fish) were counted.
- Draw lines down to x-axis and make a rectangular box.
- More than one result can be placed on a graph. The thing counted or surveyed is given below the x-axis.
- Different color pens or shading can be used to show different years or *tabu* (reserve) vs. open (non-reserve) areas.




Since one of their goals was increase in clams, for quantitative purposes (besides this visual ones) % change can be calculated.

**% change in a given area** = $\frac{\text{1998 result}}{\text{1997 result}} \times 100\% = \frac{98}{25} \times 100\% = 392$ % for Lomo

For Matanaiverata the change is 209%. Thus for Lomo the five year goal was met in one year. People were very happy about this.

**Result Presentation:**

- A meeting was convened for the seven villages of the Tikina (district) of Verata at which the above results were presented and discussed. Other villages were keen to also set up *tabu* areas within their fishing ground.

- It was emphasized at this meeting that the data is their property and their permission should be sought from any individual or organization wanting access to this information.

- Divide into small groups and using the collected data, collate, analyze, discuss and prepare the results both as frequency tables and histograms. Appoint someone from the group to present back in the plenary.

- Discuss with the participants what the results mean or how best to interpret results as they are presented.

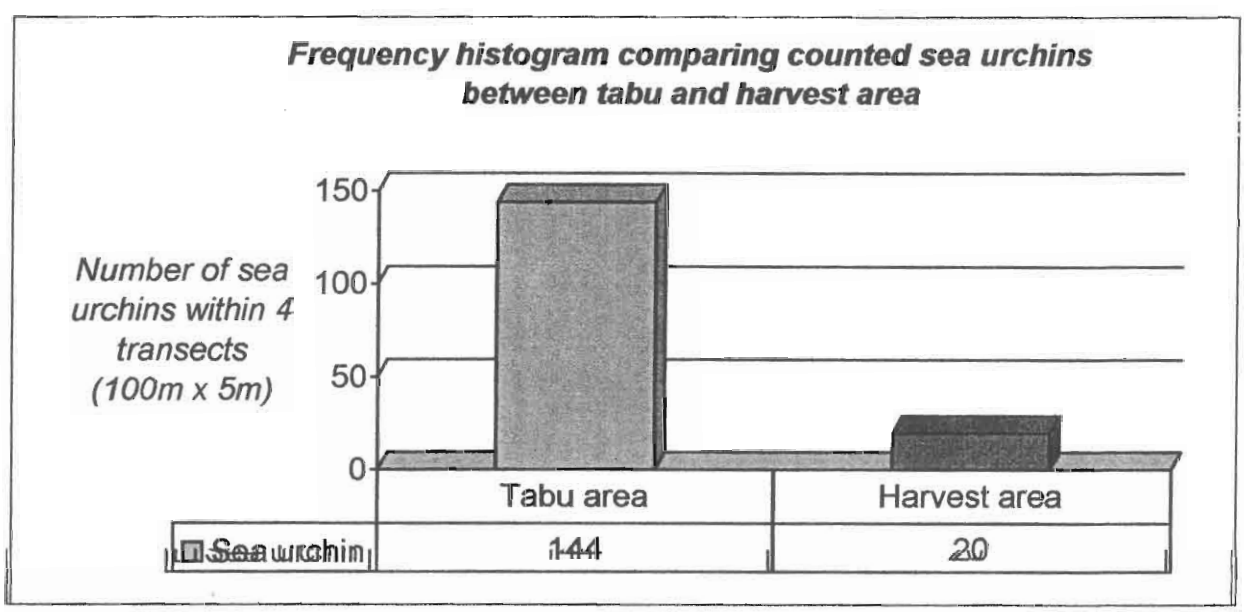
**KOROLEVU-I-WAI MONITORING RESULTS.**

**LAMI TEAM:**

**1. Summary Table**

| Area | Transect 1 | Transect 2 | Transect 3 | Transect 4 | Total |
|---|---|---|---|---|---|
| *Harvest* | 8 | 2 | 6 | 4 | 20 |
| *Tabu* | 3 | 5 | 4 | 132 | 144 |

**2. Histogram**



There were more (7 times the difference) sea urchins within the recently imposed (6 months) *tabu* area compared to the harvest area. Sea urchins may not be good indicators of resource health and resource recovery as they thrive wherever nutrient levels are high and where sea grass and filamentous algae are dominant. The *tabu* area is immediately in front of the village and the hotel is believed to supply additional nutrients from sewerage outlets.

## NAULUVATU TEAM

### 1. Raw data

**Step 1:** For each transect, calculate the average % cover for the 10 stations to give you the % live coral cover per $m^2$ per transect

Site: *Harvest area* Date: *6th March 2003* Tide: *Low*

Indicator species: *Live coral cover* Monitoring Team: *Nauluvatu Team*

Recorder: *Tevita*

| Stations/Quadrat numbers | TRANSECT 1 % | TRANSECT 2 % | TRANSECT 3 % | TRANSECT 4 % |
|---|---|---|---|---|
| Q1 (0m) | 13 | 2 | 5 | 1 |
| Q2 (10m) | 3 | 5 | 3 | 1 |
| Q3 (20m) | 8 | 5 | 8 | 5 |
| Q4 (30m) | 8 | 6 | 8 | 4 |
| Q5(40m) | 10 | 4 | 8 | 2 |
| Q6 (50m) | 5 | 0 | 5 | 0 |
| Q7 (60m) | 1 | 0 | 1 | 3 |
| Q8 (70m) | 0 | 0 | 0 | 2 |
| Q9 (80m) | 0 | 0 | 2 | 4 |
| Q10 (90m) | 2 | 1 | 0 | 1 |
| % cover per $m^2$ | **5.4** | **2.3** | **4** | **2.3** |

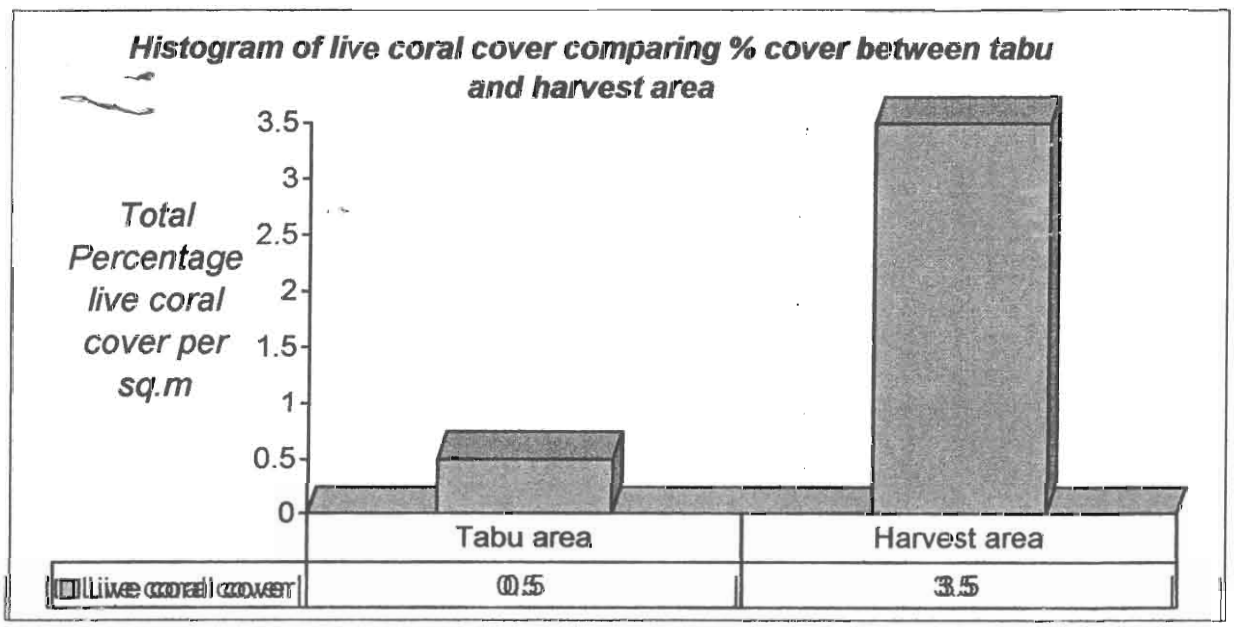
## 2. Summary Table

**Step 2:** Average the % cover per $m^2$ for each transect to give you the total % cover per $m^2$ for the harvest area.

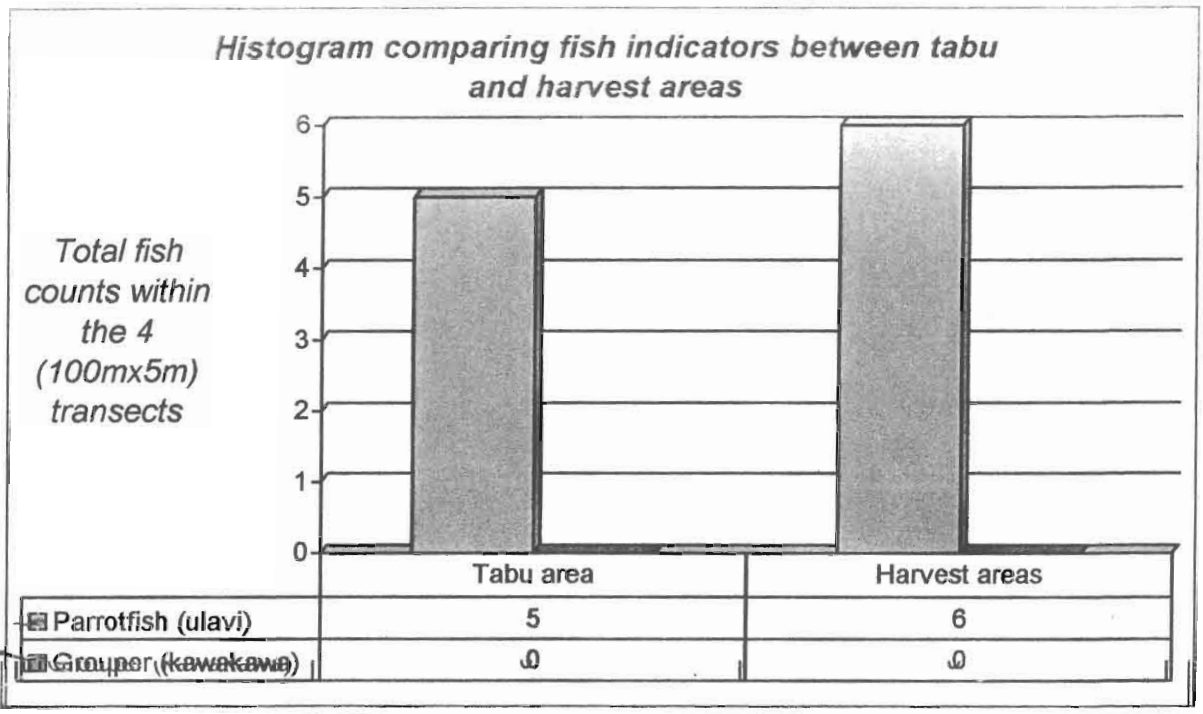
| Area | Transect 1 | Transect 2 | Transect 3 | Transect 4 | Total % cover per $m^2$ |
|---|---|---|---|---|---|
| *Harvest* | 5.4 | 2.3 | 4 | 2.3 | 3.5 |
| *Tabu* | 0.6 | 0.3 | 0.5 | 0.6 | 0.5 |

## 3. Histogram

**Step 3:** Demonstrate the summary result visually using a histogram.




Percentage live coral cover in the two areas (*tabu* and harvest) was very low. Monitors also noticed that algae dominated both these areas.




There was no difference in the numbers of fish indicators counted. Participants agreed that tide is an important consideration when surveying fish indicators. High tide was confirmed to be the most appropriate time to monitor fish.

## SESSION 9 FINALIZE MONITORING WORK PLAN

### Objective

- To develop monitoring plan for each project

### Method

- Divide into groups by Project sites
- Develop your monitoring plan and present/share it with the rest of the project site representatives
  - tasks to be accomplished
  - objectives
  - Identify best indicators
- Monitoring methods to be used
  - How many transects?
  - Determine monitoring times?
  - Who will carry out the monitoring? Names?
  - Where the monitoring will take place?
  - When to inform community members of monitoring results

Monitoring Plan (an example from Verata)

| Best Indicator Identified | Monitoring Method & Communicating Analyzed Results | When to carry out monitoring | Who implements monitoring tasks | Area to be surveyed |
|---|---|---|---|---|
| Population and sizes of "*kaikoso*" | - Line Transect Quadrat<br>1.Count and measure "*kaikoso*" population and sizes within the quadrat (1x1m) at the end of ten meters within a 100m reserve-5 transect (500m)<br>non-reserve -5 transect (500m)<br>2. Communicate results at village and Tikina Council meetings after the monitoring | 1. Low tide<br><br>2. Every 6 months | Identify monitoring team | Ucunivanua<br><br>Tabu area - Lomo<br>Non-Harvest area- Matanaiverata |

## BIOLOGICAL MONITORING PLAN FOR KOROLEVU-I-WAI QOLIQOLI

| **Best Indicators** | **Monitoring Method/ Information Gathering** | **When and how often this should be carried out.** | **Who should be responsible?** | **Where should this be carried out.** |
|---|---|---|---|---|
| *Votua*:<br>1. Coral cover<br>2. Parrot fish | Line Transect/ Quadrat<br>1. Percentage of coral in every 10 meters in a 100m x 5 transects.<br>2. Number of parrot fish in every 100m x 5 (Belt Transect) | High Tide<br>1. Every 4 months<br>2. Every 4 months | Biological Monitoring team.<br>1st - IAS<br>2nd – *Tikina*<br>3rd - Village | Korolevu<br><br>Namo Vunavao |
| Vatu-o-lalai<br>1. Coral cover<br>2. Parrot fish | 1. Line Transect/ Quadrat: Percentage of coral in every 10 meters in a 100m x 5 transects.<br>2. Number of parrot fish in every 100m x 5 transect (Belt Transect) | High Tide<br>1. Every 4 months<br>2. Every 4 months | Biological Monitoring team.<br>1st - IAS<br>2nd – *Tikina*<br>3rd - Village | Muahara/ Wailevu |
| *Tagaqe*:<br>1. Coral cover<br>2. Parrot fish/grouper | 1. Line/ quadrat transect.<br>2. Belt transect | High tide<br>1. Every 4 months<br>2. Every 4 months | Tikina Biological Monitoring team | Vatjuniga/ ono Vadrakatakata |
| *Namada*:<br>1. Coral cover<br>2. Parrot fish | 3. Line/ quadrat transect.<br>4. Belt transect | High tide<br>3. Every 4 months<br>4. Every 4 months | Tikina Biological Monitoring team | Nadriuce/ Naduwe |
| Biological monitoring team **MUST** convey results of monitoring to the community after every survey. | | | | |

## BIOLOGICAL MONITORING PLAN FOR CUVU & MALOLO QOLIQOLI

| Indicator | Method of Monitoring | How often do you conduct monitoring | Who should take part | Area of survey | To whom should we share the information? |
|---|---|---|---|---|---|
| **CUVU:**<br>• *Cawaki* | • Line transect<br>4 Transect-*Tabu*<br>4 Transect-*Tara*<br>100m/transect | • Six month at high tide. | • Fish wardens and the *Cuvu* Environment Committee. | • The *Tabu* and the Fishing areas. | • Village meeting<br>• Environment Committee meeting. |
| **MALOLO:**<br>• *Kaikoso* | • Line Quadrat transect.<br>4 Transects - *Tabu*<br>4 Transects - *Tara*<br>100m/ transect | • Six month at low tide. | • Survey team | • **Reserve**<br>*-Vimolimoli*<br>*-Cubi*<br>• ***Non-Reserve***<br>*-Solevu I ra.* | • Village meeting<br>• District Council Meeting |

## CUVU & MALOLO MONITORING WORKPLAN

| Problem to be solved | Problem Solution Activities to be done in 2003 | The purpose of doing it. | Indicator |
|---|---|---|---|
| Littering of the *qoliqoli* | • Reforestation of mangroves<br>• Planting young hybrid coconuts.<br>• Setting *tabu* site in one part of the *qoliqolis*.<br>• Creating an Artificial Wetland | • Prevent soil erosion in to the reef<br>• Absorbs polluted water and prevent it in flowing in the sea.<br>• Nursery for marine resources juveniles.<br>• Filtered polluted water from resorts. | • Sea Urchins (*Cawaki*)<br>• *Sargarssum* |

## BIOLOGICAL MONITORING TRAINING EVALUATION

1. Review expectations and objectives of the training with participants to see if they have been met and identify expectation not met before they fill out the 3 question evaluation.
2. Pass out simple three-part questionnaire.

Below are the summary of the participants' responses.

### 1. What do you like about this training?

- Widen my knowledge and thinking of marine resources and ecosystems.
- The training was done in Fijian language with methodology suited to community level.
- Hands on training.
- Enhances my knowledge of fishing grounds and resources.
- Enhances my knowledge of the natural resources and the abundance and depletion of marine resources.
- Liked the different organizations involved in the training.
- Conservation of our marine resources.
- The monitoring process and collection of data in the reserve area.
- Training with emphasis on monitoring methods most appropriate to be applied in our situation and villages.
- The support by community members at large as they were eager to learn more about their marine resources.
- Liked relationships developed as a result of the training.
- Liked the facilitators with their smiling and radiant faces which accelerated our getting to know each other sooner rather than later.
- My awareness of the different marine resources in the parts of Fiji.
- Community participants having most input into the development of a monitoring plan.
- To actually know and not "only perceive or assume" the changes.
- The way the training was organized.

### 2 Suggestions for Improvement

- Ground rules must be followed and the one in charge to enforce these rules accordingly.
- We should all be at the "*tanoa*" chat in the evening as good and new information are presented and discussed in detail.
- Facilitators should make more visits to communities so that you would have more in-depth knowledge of village members and our fishing grounds.
- Monitoring gear should be adequate.
- Explanation on paper on English words and technical names used.
- One time keeper to watch time of individual sessions.
- More women should participate in workshops like this.

- Check to see that communities properly acquire monitoring skills before doing monitoring.
- All resource owners should be present at workshop venue.
- A bigger house/venue for workshop.
- More training workshops of this kind.
- Schedule smaller sessions so that we will gain more understanding
- Encourage more participation by all participants

**3. Other Comments**

- Training of this kind to be carried out more frequently.
- Grateful to all facilitators and all those supporting the training.
- Provide time for energizers in the afternoon.
- The training to be one full week from Monday to Friday.
- Carry out training of this kind in other parts of Fiji.
- Monitoring to be done in other fishing grounds.
- Monitoring gear to be given out from those in charge.
- Time to be used wisely and proper adherence to our management plan.

## REFERENCES


Parks, John. 1997. Summary Report on the 1997 Verata tikina Marine Resource Monitoring Workshop. Institute of Applied Science, USP, Suva.

Uychiaoco, A.J., Green, S.J., Dela Cruz, M.T., Gaite, P.A., Arceo, H.o., Alino, P.M. and White A.T. 2000. A guide to Simple Reef Monitoring for Management. U.P. Marine Science Institute, Quezon City, Philippines.

English, S., Wilkinson,C. and Baker, V. 1997. Survey Manual for tropical Marine Resources. Australian Institute of Marine Science (AIMS). Townsville, Australia.

**APPENDIX 1.0**

**TIKINA O KOROLEVU-I-WAI MANAGEMENT PLAN**

| PROBLEM | MANAGEMENT PLAN | WHAT HAS BEEN DONE TO DATE | PROPOSED SOLUTIONS TO FURTHER RESOLVE THE PROBLEM |
|---|---|---|---|
| Not too much respect paid on conserving natural resources | "coast care" initiative<br>- better rubbish disposal outlets<br>- establish marine reserve | Completed | - on going care on rubbish disposal<br>- more firm measures to ensure marine reserve is respected |
| Sewage | - research and monitoring of effects of sewage | On going | Assessing and trialing of different toilet outlets to stop spill of sewage into the ocean. SPC Specialist.<br>Women's organization will plan out and arrange for building suitable toilets |
| Duva | Discussed in village meeting | Decided ban on "Duva" | - enforcement on ban of 'duva'<br>- To take pictures of those involved in destructive fishing method and forward it to the Fisheries Department as soon as possible. |

## ADDITIONAL TASKS TO MANAGEMENT PLAN (KOROLEVU-I-WAI)

| OTHER TASKS FOR 2003 | VISION |
|---|---|
| Reinforce marine reserve watch<br>- Tagaqe<br>- Votua<br>- Namada<br>- Vatu-o-lalai | Conserve Today Richly Rewarded Tomorrow<br>- Rehabilitate degraded habitats and important species<br>- Increase in tourism activities<br>- Restocking of depleted species |
| DUVA – Enforce its ban – government to assist | Proper enforcement of rules will result in the abundance of marine resource |
| Attention to sewage disposal and investigate proper toilet types that minimizes nutrient discharge to the sea. | Protection of marine resources and reef ecosystem will ensure success of project. |

**APPENDIX 2.0**

**Workshop Program: Sessions, Objectives/ Outputs, Methods / Tasks**

| Time | Content/ Session | Objectives and Outputs | Methods/ Task | Person Coordinating |
|---|---|---|---|---|
| **Day 1 (Tuesday, 4th March).**<br><br>10.30 am–12 noon | Arrival and sevusevu. | | | Pio Radikedike |
| | • Opening<br>• Introduction of workshop objectives, resource people and participants.<br>• Training overview | • To introduce participants to the purpose of the training workshop.<br>• To identify participants expectations and correlate with workshop objectives | 1. Participants to self – introduce after the sevusevu.<br>- Name, village, good news you want to share<br>- Expectations for the workshop (Nanamaki)<br>-Collate expectations and list them on a flip chart<br>-Check with workshop objectives | S Meo |
| ***12.00-2 pm*** | ***Lunch*** | | | |

| | | | | |
|---|---|---|---|---|
| 2.00-5.00 pm | **Review each Marine Resource Management Plans** | • Evaluate Initial Management Actions: what is being implemented to address threats and the decisions for further actions.<br>• Identify 3 priority actions for 2003 | ***Each project sites to bring their management plans***<br>• ***Group work (based on sites) and share with each other***<br>• ***Group presentation*** | ***Alifereti and Etika*** |
| | **Identify Key Resource Management Outcomes**<br><br>**General Discussion** | • For each of the 3 priority actions identify the expected benefits to community | • ***Group work (based on sites) and share with each other***<br>• ***Group presentation*** | |
| 6.30 pm | **Dinner** | | | |
| 7.00-9pm | **Video** | **Show educational video to the village if possible (Mangroves, Coral reefs, etc)** | | |
| **Day 2 Wed 5th** 8.30 – 9.00am | Devotion and introduction | • Recap Day 1 and introduce Day 2 objectives | | **Pio** |

| | | | | |
|---|---|---|---|---|
| 9-11 am | **Why Monitoring is important?**<br>**Belief Vs Fact (Nanuma kei na Kila)**<br><br>**Develop Draft Monitoring plan** | • Develop monitoring plan to help answer specific community needs and outcomes (resource change and expected benefits to community)<br>• Time defined objectives/targets | 1. Each group determine possible indicators for each of the 3 priority actions (from Day 1)<br>2. Group work to determine 1 indicator to start with for each site.<br>3. Group presentation | Alifereti |
| | **Develop SMARTI objectives/indicators and Monitoring or Survey Team** | • | Plenary discussion | |
| 11-12.30 pm | **Sampling Design Concepts**<br>- Representative<br>- Good and bad sampling examples (bias)<br><br>- Paired sampling, (*Tabu* vs Control) | 1. Identify common management actions eg *Tabu* area<br>2. Steps : -<br>• *Show prepared example*<br>• *Take them outside for sampling exercise (count)*<br>• *Evaluate what is the best sampling size, no BIAS*<br><br>3. Why sampling a control site is important. | | Ron |
| ***12.00-2 pm*** | ***Lunch- Facilitators meeting to decide method for each group after lunch*** | | | |
| 2.00- 5.00pm | **Biological Survey Methods –Theory & Concepts** | **Present Theory for the 4 main survey methods likely to be used in a plenary. At the most 10 minutes presentation** | | Etika (session facilitator)<br><br>Group |

| | | | | |
|---|---|---|---|---|
| | **- Best methods for chosen indicators**<br>**1) Line transects (Ron)**<br>**○ Point Sampling**<br>**○ Quadrat method**<br>**2) Belt transect (Akuila)**<br>**3) Time counts (Meo)**<br>**4) Catch Surveys (CPUE) – (Alifereti/ Batiri)** | • **Divide into 3-4 groups (depending on what indicator have been chosen and the best method to monitor) and discuss in detail the STEPS in the methods**<br>• **Result sheet Design to include as part of the STEPS** to determine what information (abundance, sizes, catch, etc) to be collected from the survey.<br>• **Dry Practice on Methods and equipments to be used**<br>Transects, quadrats etc. compass, permanent makers, metal stakes, | | Facilitator- |
| 6.30 pm | **Dinner** | | | |
| 7.00-9pm | **Video** | **Show educational video to the village if possible (Mangroves, Coral reefs, etc)** | | |
| **Day 3 Thurs 6 th** 8.30 – 9.00am | Devotion and introduction | • Recap Day 1 and introduce Day 2 objectives<br>• **BRIEF ON FIELD PRACTICE PLANS** | | **Meo/Ron (Overall)**<br>**Group Leaders - TBD** |
| 9.00- 2.00pm | **Field Practice – Baseline data collection** | **4 main working groups**<br>-Depends on the methods applicable to Tagaqe/chosen MPA | 1. | |
| ***2.00- 4.00pm*** | ***Lunch*** | | | |
| 4.00 – 5.00pm | **Field Practice – Baseline data collection** | Complete survey and look at data | 1. | |

| | | | | |
|---|---|---|---|---|
| *6.30 – 7pm* | ***Dinner*** | | | |
| 7.00-9pm | **Continue Looking at Data** | | | |
| **Day 4 (Fri. ,7th ) 8.30-9.00am** | Devotion and introduction | • Recap Day 3 and introduce Day 4 objectives | | Pio |
| 9.00-1pm | **Thinking about the data**<br>• Data management- keeping the data/information safe<br>• Ways to present data/results- Tables, Histograms etc<br>• Results preparation/ presentation<br>• Results interpretations<br>**Finalize Monitoring Work plan**<br>**Next Steps** | | **Presentations in plenary on data analysis and communicating results**<br><br>**Group work to practice aspects of analysis, etc.** | **Alifereti** |
| ***1.00pm-2pm*** | ***Lunch*** | | | |
| 2-4 pm | • **Evaluation and closing**<br>• **Present I tatau** | • | | Pio |
| 4.00 | • **Depart for Suva** | | | |

**Participants: (30)**

- Korolevu iwai- 14
- Yavusa Navukavu, Muaivuso- 8
- Cuvu tikina & Tikina Wai 6
- Hideaway and Mikes Divers (Votua) 2

***Participants***

***A) Yavusa Navukavu***

1. Samuela Mataka (Muaivusu)
2. Josaia Tamanikaibau
3. Tevita Nasorowale
4. Marika Tubuna (Nabaka)
5. Isireli Caginivalu
6. Aisake Biu (Waiqanake)
7. Jolame Sikolia
8. Joave Naimila (Namakala)

***B) Tikina Cuvu and Malolo***

9) Tevita Tunitoto (malolo)
10) Nepote Senikau (Cuvu)
11) Napolioni (Cuvu)

***C) Tikina Wai***

12) Manoa Nariri (Lomawai)
13) Jerry Vuniwai (Korokula)
14) Ilaitia V (Tau)