



Training Report on Coral Reef Monitoring for MCA staff in Unguja and Pemba, Zanzibar

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Benthic Monitoring at Selected Coral Reef Sites in Unguja and Pemba, Zanzibar**

**For the South West Indian Ocean Fisheries
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Executive Summary

In Zanzibar, as in the rest of the region, coral reefs are under great stress, both from anthropogenic activities and from natural factors such as extreme or sudden and prolonged changes in environmental conditions, rough sea conditions, diseases, predator outbreaks and natural competition for space and food. Most of Zanzibar's coastal population is dependent on coral reef fisheries for dietary protein and for income. Management of these reefs depends on detecting changes in health status, and this is accomplished by regular monitoring, using standard protocols.

The reefs in Zanzibar have the longest monitoring history in Tanzania. However, coral reef monitoring in recent years has faltered due to a variety of reasons, including lack of funds. Fortunately the Government, through the Department of Fisheries Development and the SWIOFish Project, has revived coral reef monitoring in the country. They have also prioritized the training of marine conservation area (MCA) staff in coral reef monitoring. This report presents the results of two training workshops for MCA staff, one held in Pemba and the other in Unguja.

Coral reef monitoring training was carried out by identifying training requirements, and prepare and implementing a coral reef monitoring training programme plan. A total of 11 MCA staff attended the training course. They were field-based workshops, one in Unguja with Unguja-based MCA staff and the other in Pemba with Pemba MCA staff. Trainees were taught basic coral reef identification and monitoring methods, including the identification and monitoring of common fish species. Class methods included the use of identification manuals and field guides, background to coral reef resources, their uses and significance, threats to coral reefs and why monitoring is necessary. The field methods involved snorkelling. However, staff who already have Scuba diving certification were trained in monitoring while diving. Trainees were taught monitoring methods using standard equipment like measuring tapes, T-sticks and quadrats. The aim of this training was to equip the MCU rangers with basics of coral reef monitoring

methods. The knowledge that can be used to; i. carry out periodic rapid monitoring, report on coral bleaching and disease, fish mortalities and any drastic change in coral health. A combination of the Reef Check and GCRMN coral reef monitoring methods were taught as has been used successfully in other areas in the region e.g. Tanga Coastal Zone Programme.

1.0 Background and Objectives

The SWIOFish project contracted the Consultant for the assignment 'Undertaking Coral Reef Benthic Monitoring at Selected Coral Reef Sites in Unguja and Pemba, Zanzibar'. Besides the actual monitoring of coral reefs, under the Terms of Reference for this project the Consultant was also tasked with 'Training and skills transfer'. Specifically, this entailed training staff of the MCAs in 'field identification and monitoring techniques such that they are able to carry out periodic light monitoring including reporting on coral bleaching, fish mortalities and any drastic changes in coral reef health'.

Training requirements were identified after discussions with representatives of the Department of Fisheries Development, its Marine Conservation Unit and the SWIOFish project. A list of proposed trainees was later prepared and sent to the Consultant.

It was agreed that criteria used for selection of the trainees would be:

- Should be rangers or MCU staff actively engaged in marine conservation area activities;
- Should be physically fit.
- Should be comfortable in the field (with boating, swimming and possibly diving skills).
- Should be in a position that would entail use of the knowledge acquired in the training workshops. i.e. potential active participant in future coral reef monitoring surveys.

The Consultant further explored the training needs and capacity of the Department, with regards to coral reef monitoring. It was established that:

- The level of knowledge on coral reef monitoring methods among the trainees was low or none existent.
- Of the 11 proposed trainees, only 4 were certified divers

- Only 7 of the trainees had undergone any form of training in monitoring methods. However, it later on emerged that this knowledge was mostly absent except for the PECCA rangers, probably as a consequence of lack of practice.
- All the proposed trainees were males
- The trainees had differing levels of education, with the highest currently enrolled in a MSc programme
- All were (at the time) more-or-less field personnel, either full-time or regularly in the field.

The participants that attended the training workshops were:

1. Khamis Hamad Said from PECCA
2. Mohammed Said Suleiman from PECCA
3. Juma Haji Juma from the DFD
4. Haji Mohammed Haji from PECCA
5. Abdul-Aziz Alawy from DFD
6. Sheha Mahawi from MBCA
7. Amour Juma from MBCA
8. Nassor Rajab from MBCA
9. Pandu Khamisi from DFD
10. Yunus Abdalla from DFD
11. Mustafa Muhidini from MIMCA

The MSc student Halima Othman attended the Unguja workshop but is not included in our assessment.

2.0 Training Methods and Activities

2.1 Training Workshops

Two training workshops were conducted for this activity, one in Unguja for the Unguja-based MCA staff, and the other in Pemba for the staff based there. Seven staff from Unguja and four from Pemba participated. The training process and techniques were similar in both workshops thus these will be discussed together. Differences between the workshops lay in the location, other participants present, sites chosen for field

exercises, and number of trainees. Trainers, training material and techniques and course content were the same.

In the opening ceremonies of both workshops, the Guests of Honour expressed similar sentiments. They both expressed their appreciation for the occurrence of the training and expected their MPA rangers will soon be capable of assessing the reefs without external assistance. They urged the trainees to be attentive and actively participate in the training.

2.1.1 Training Workshop in Unguja

The training workshop in Unguja was held at the TROCEN Conference Hall, SUZA Beit el Ras campus on 22nd to 28th May 2017. The workshop was officially opened by the manager of Menai Bay Conservation Area, Mr Anas Masoud, who also officiated the closing ceremony.

The SWIOFish Coordinator was also in attendance on both occasions. For field exercises, the trainees were transported to Chapwani Island. Parts of the reefs at Chapwani are fairly shallow at low tide, and although there can be strong currents at the site, these were avoided as their timing is well known.

SWIOFish funded postgraduate students in related fields were invited to observe the training. One participated, currently enrolled in an MSc by thesis programme, with research related to coral reef fisheries.



Fig. 1. The opening ceremony of the training workshop in Unguja.

2.1.2 Training Workshop in Pemba

The training workshop in Pemba was held in Weshu, Chake Chake, on 23rd to 30th March 2017. The workshop was officially opened by the head of the Department of Fisheries Development in Pemba, Mr Sharif Mohammed Faki. He, together with the manager of the Pemba Channel Conservation Area (PECCA), officiated both the opening and closing of the training workshops. The SWIOFish Coordinator was also in attendance, as was the Monitoring, Control and Surveillance (MCS) head in Pemba. For field exercises, the trainees were transported to Misali Island. The reefs at Misali provided opportunities for both snorkeling and light diving surveys.

A local NGO, the Pemba Foundation, which is supporting the initiation of a community managed marine protected area in Gando, north west Pemba, had requested that some

members of their community participate in the training workshop, at their own cost. These additional trainees did not reduce the impact of training on the MCA staff, our target students, rather their interaction was quite fruitful. It was interesting that the PECCA staff were quick learners and helped to explain and interpret basic concepts to their compatriots from Gando. The Gando group however, being fishermen, had good indigenous knowledge of fish and invertebrate types. Lively discussions and debates frequently arose between the two groups. In the field survey practice sessions, the PECCA rangers proved much better learners and excelled in their data collection exercises.



.Fig. 2. Mr Sharif M. Faki opening the training workshop in Pemba.

2.2 Training Methodology

Lectures were given by Drs. Saleh Yahya, Mohammed Suleiman, Ali Ussi and Christopher Muhando with guest lectures by Dr Narriman Jiddawi and Mohammed Nur. The training covered the following modules:

- SWIOFish project's objectives and expected results
- Objectives and expected results of the workshop
- Management of Marine Resources, with focus on Fisheries and community participation
- General presentation of Coral Reef Monitoring, its importance and application
- Coral reef monitoring methods
- Introduction to bleaching survey methods
- Coral reef monitoring methods field exercises
- Coral reef benthic categories
- Coral reef fishes
- Field exercises, testing student's understanding, calibration
- Coral reef monitoring data collection
- Entering of data
- Presentation and discussion of the results
- General discussion about the training workshop, way forward

The languages of instruction were Kiswahili and English (for the technical terms). (Lectures were given with MS Powerpoint presentations and a number of field guides were used. In addition, each student received waterproof laminated identification guides, an underwater writing slate, pencils and erasers.

To begin with, Mr Hashim Muumin gave an introduction to the SWIOFish Project, its aims, objectives and targets. He also elaborated on the expected outcomes of the training workshop. The first day was a full lecture day and the remaining days (except for the last) were either full field days or spent half in the field and half in class. This depended on the activity, timing of tides etc.

2.2.1 Theoretical Training

Different methods for benthic measurement, macro-invertebrates counts and fish census used in coral reef monitoring were taught. The training started with theoretical part in which the following methodologies were introduced:

- Line intercept transect (LIT)
- Point transect
- Belt transect for fishes and invertebrates
- Quadrat
- Manta tow

The methods were taught and discussed on how and where to select the best method for a particular task.



Fig. 3. Discussing points raised after a presentation

2.2.3 Practical Training

2.2.3.1 On-land exercise

Having finished the theoretical part, the trainees were taken out of the class room for practical training on land before getting into the water where instruction would be difficult (Fig. 4). Since Line Intercept Transect (LIT) is the most practiced method in monitoring, the practice exercise was based on LIT. A measuring tape (20m long) was laid on the ground and all the objects intercepted by the measuring tape were identified, measured and recorded. The belt transect (one metre belt) for macroinvertebrates was also practised. The tape was then extended to 50 meters long to accommodate a theoretical fish count along the transect. Each trainee was required to practise the three activities. The practice was standardized and corrections were made for all issues that emerged.



Fig. 4. On land LIT practical training; Pemba on the left and Unguja on the right

2.2.3.2 Underwater exercise

The following day, each trainee was provided with underwater writing slate and pencil for data taking (Fig 5). For Pemba the field training was conducted in Misali reefs and for Unguja it was conducted in Chapwani Island reefs. Once the students had understood the basic concepts of coral reef monitoring using GCRMN standards, and could lay a transect and record benthic variables without the assistance of a trainer, they were allowed to survey a reef independently.

On reaching the coral reef area, a 50m long transect for fish was laid and the trainees were required to identify and count all the fishes falling within the 5m belt. After finishing the fish survey, the trainees were required to do a 20 m long LIT. Coral growth forms, macroalgae, sponges, soft corals were the major categories that were used in benthic measurements.



Fig. 5. Students carrying out underwater surveys

2.2.4 Data entry and processing

Data were then entered into MS Excel worksheets after the field trip by the students themselves and later projected onto a screen and their shortcomings (if any) discussed. For example, a common mistake was that percentage coverage of benthic categories did not add up to 100%.

2.2.4.1 Benthic cover

The participants were trained on how to process their data by calculating the distance of each object intercepted along the transect, summing up and finally how to get the percentage of each category present in the transect.

2.2.4.2 Fish and Invertebrates

The number of fish and invertebrates were also analysed by summing them up and calculating their density. The fishes were categorised according to their ecological functioning and economic/commercial importance.



Fig. 6. Data collected during the training in Pemba on the right and data processing before class room session in Unguja

Accuracy, precision and speed of data collection improved with repetition and by the last day of fieldwork comparisons of data collected by individual trainees showed some similarity. Dissimilarities within trainee-collected data occurred with respect to hard-to-identify substrate such as coralline algae and corallimorpharia. On the last field day field data surveys were carried out, by both snorkeling and diving (for those divers in the group).

The last day was spent discussing how to analyze the collected data and interpret the results. The trainees could distinguish coral morphological categories (e.g. massive, sub-massive, table, branching, encrusting) reasonably well, considering the duration of the workshop. Although trainees were taught some of the most commonly occurring coral genera, they generally could not distinguish corals to that level. Time allocated for this training would have had to be much longer to achieve this standard; however it was

a good beginning. As for fish, trainees were more familiar with fish identification since they were all connected to fishers and fisheries in one way or another. However, they sometimes lumped different species together as some different species have the same local name. Getting them to replace this indigenous knowledge with taxonomic principles was slightly challenging.

3.0 Assessment

3.1 Assessment of the training workshop

At the completion of each training workshop participants were asked to provide their assessment of the workshop. All the participants expressed significant interest in the subject matter and felt that they had gained valuable knowledge over the duration of the workshop. Almost all the participants recommended a) continued training in future, b) that they be supplied with gear/equipment to enable them to carry out coral reef monitoring surveys and practice. Likewise, the majority of trainees felt that the workshop duration was not sufficient and could have been longer.

3.2 Assessment of the trainees

The facilitators were impressed with the standard and quality of the trainees. Consistently, participants were engaged and attentive while technical materials were being presented. They would ask questions, and interact with the trainers and each other until consensus was reached. In the field the participants worked hard and did not complain. It was encouraging to see such levels of commitment in MCA staff.

Additionally to this training, the 3 PECCA rangers participated in all the Pemba coral reef monitoring surveys (the main activity under this consultancy) and the single diver in Unguja participated in the Kwale and Mnemba surveys.

A summary assessment of each participant is provided in Annex 1.

4.0 Recommendations and way forward

As we move towards the next phase of monitoring and training, a number of points need to be considered.

1. The next phase of training should preferably target the same group of individuals. The trainees were generally quite good and tried their best to work hard to understand the methods. However, usually coral reef monitoring requires a lot of practice for beginners to be able to conduct proper monitoring without close supervision. It is therefore recommended that the trainees exercise monitoring repeatedly before they can be allowed to do the actual data collection.
2. Training materials will have to be slightly more advanced, while also covering the basics of coral reef monitoring. Thus the training should cover:
 - GCRMN monitoring protocols and methods.
 - Corals to be identified to genus for the most common species. Thus identification will be a combination of genus and morphology e.g. Acropora-branching, or Porites-massive.
 - Fish to be identified to family level, and to genus level for the most common commercial species, where possible. Ecologically important categorizations of fish can be taught, depending on how recipient the trainees are. e.g. scrapers and eroders; these are herbivorous fish which are important for maintaining the resilience of coral reefs.
 - Bleaching and coral diseases will likely increase in occurrence and severity. Thus training in their detection is crucial.
 - Invertebrate survey methods should be reviewed. Identification of ecologically important invertebrates such as the Crown-of-Thorns Starfish

(COTS), and its predator, the Giant Triton. Knowledge on the respective roles of such key invertebrates in the ecosystem is also important for the students.

3. Photoquadrats and video transects are simple methods that the trainees should find easy to learn. Analyses of these is however a bit more complicated but could be taught at a simplified level, just to introduce the method and concept and its application.
4. Note that a recap of the basic knowledge about coral reef monitoring methods is necessary, as there will have been a long gap (>1 year) since the last training.
5. In the 2016/2017 training, we concentrated mostly on snorkeling surveys, as only a few of the participants were certified divers. For the next phase the Department should consider providing SCUBA diving training to the participants. This would enable serious higher level monitoring training, and possible participation (if only as assistant dive buddies) in the 2018 coral reef monitoring. Moreover, in their post workshop assessment, many participants recommended that they receive dive training.
6. There is always the potential risk of a trained monitor being promoted to a desk job, or other higher, non-field-oriented job. If this is the case with any of the present trainees, and it is decided to find a replacement, we would recommend that choice of the replacement be made with consideration to long-term plans for coral reef monitoring within the MCU or Department of Fisheries Development. Hence for example, a young graduate freshly recruited member of staff might be considered.
7. On the same note, if for instance in future the Department is considering establishing a coral reef research and monitoring team or unit then these training exercises provide an opportunity to select and mold the individuals that will form this unit.

ANNEX 1: Assessment of the trainees

Name	Age	Educational level	Position	Diver?	Ability in theory work	Ability in field work	Comments
Haji Mohammed Haji	50	High school	Ranger	Yes	Good. Needs more effort on data analysis	Excellent	
Mohammed Said Suleiman	43	High school	Ranger	Yes	Good. Needs more effort on data analysis	Excellent	
Khamis Hamad Said	46	High school	Ranger	Yes	Good. Needs more effort on data analysis	Good	
Juma Haji Juma	52	Diploma	Fisheries Officer	No	Good. Needs more effort on data analysis	Excellent	
Abdul-Aziz Alawy	33	BSc (currently enrolled in MSc)	Marine Conservation Officer	No	Good. Needs more effort on data analysis	Potentially good	Difficult to assess as was attending MSc classes at the same time. Potential leader
Mustafa Muhidini	35	High school	Ranger	Yes	Good. Needs more effort on data analysis	Excellent	

Yunus Abdalla	46	High school	Patrol officer	No	Good. Needs more effort on data analysis	Very good	
Pandu Khamisi	50	High school	Patrol officer	No	Good. Needs more effort on data analysis	Very good	
Nassor Rajab	51	High school	Patrol officer	No	Good. Needs more effort on data analysis	Very good	
Amour Juma	34	High school	Sea-going personnel	No	Good. Needs more effort on data analysis	Very good	
Sheha Mahawi	56	High school	VFC member	No	Good. Needs more effort on data analysis	Good	