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**GLOBAL CORAL REEF MONITORING NETWORK
"POLYNESIA MANA" NODE**

**ESTABLISHMENT OF A CORAL REEF MONITORING PROGRAM IN
KURIA, ABEMAMA AND TARAWA, GILBERT GROUP, REPUBLIC
OF KIRIBATI, MAY 7TH- 23RD 2004.**

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I. Context of the mission

The mission in Kiribati was carried out thanks to the invitation of the SPC Procfish program which provided technical support and organization. GCRMN coordinator took part of the mission and followed the PROCFISH team in the sites pre-selected, islands of Kuria and Abemama of the Gilbert group. In order to make the mission as relevant as possible for the future monitoring, it was decided to stay in Tarawa at the end of the PROCFISH fieldtrip in order to survey sites in this key island.

SPC PROCFISH organized the mission and SPREP covered the costs for the Polynesia Mana coordinator, airfares and local expenses. Unfortunately, funds did not allow the coordinator to cover expenses for field assistance but the Fisheries department decided to send their coral specialist to assist and be trained during this mission. Taratau Kirata split his time to assist PROCFISH and GCRMN. Sites surveyed under GCRMN were much less numerous, one or two sites per island depending on island profiles.

II. Sites surveyed

Kuria – Gilbert Group – 2 sites

Abemama – Gilbert Group – 1 site

Tarawa – Gilbert Group – 3 sites

SITE	DATE	LONGITUDE	LATITUDE
Kuria West	May 12, 2004	E 173° 24' 42.66"	N 00° 11' 43.26"
Kuria South Corner	May 13, 2004	E 173° 25' 38.1"	N 00° 11' 31.44"
Abemama	May 17, 2004	E 173° 45' 41.88"	N 00° 22' 44.58"
Tarawa Hospital	May 25, 2004	E 173° 08' 44.7"	N 01° 21' 28.5"
Tarawa Teoraereke	May 25, 2004	E 173° 01' 10.32"	N 01° 20' 4.44"
North Tarawa	May 26, 2004	E 172° 57' 40.32"	N 01° 38' 23.76"

Table 1: site GPS position

III. Field Method

The method was chosen according to financial means at disposal for the mission. It was decided not to use scuba gear to carry out the survey. A digital camera, Sony Cybershot 5 mega pixels was used along with a 75 squaremeter quadrat. Sites were selected on the outer slope, at 6 meters in order to allow safe free diving. Slopes had to be relatively flat and homogeneous to allow a good positioning of the quadrat. The quadrat was sent randomly, head outside the water. When the quadrat did not fall flat enough to make a good picture, it was brought up to the surface and dropped again.



Picture 1 : quadrat sent randomly in North Tarawa

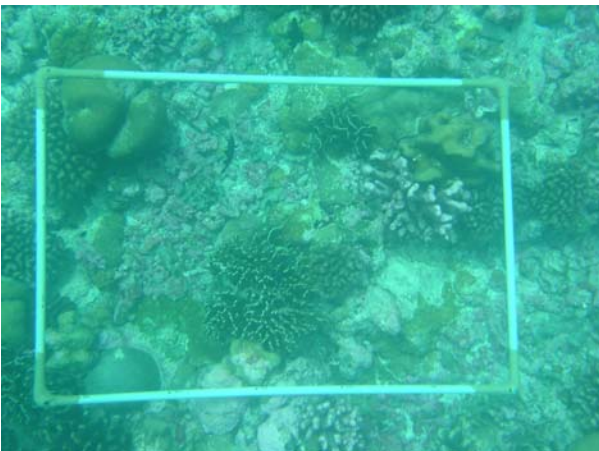


Picture 2: picture of the quadrat taken at 6 meters

IV. Analyse Method : CPCe – Coral Point Count with Excel Extension

A. Pictures processed with photoshop

All the picture appeared blue due to the quick absorption of red underwater. Photoshop allows to apply a red filter to get the original color, to reframe the picture to keep just the quadrat and to adjust the contrast to make the analyse easier.



Picture 3 : original digital picture



Picture 4 : picture after photoshop processing

B. Analyse of the live coral cover with CPCe software

The CPCe (Coral Point Count with Excel extensions) program is a Windows-based program that provides a tool for the determination of coral cover using transect photographs. A specified number of random points are distributed on a quadrat image, and coral species/substrate lying under these points are identified. Microsoft Excel spreadsheets can be created to further analyze the data.

This program has been written by Kevin Kohler from the National Coral Reef Institute of the Nova Southeastern University Oceanographic Center in Florida. CPCe has been downloaded for free following Kevin's instructions (kevin@nova.edu). A user manual is included in the program and requires very little time to be able to analyse the data.

1. Selection of benthic categories

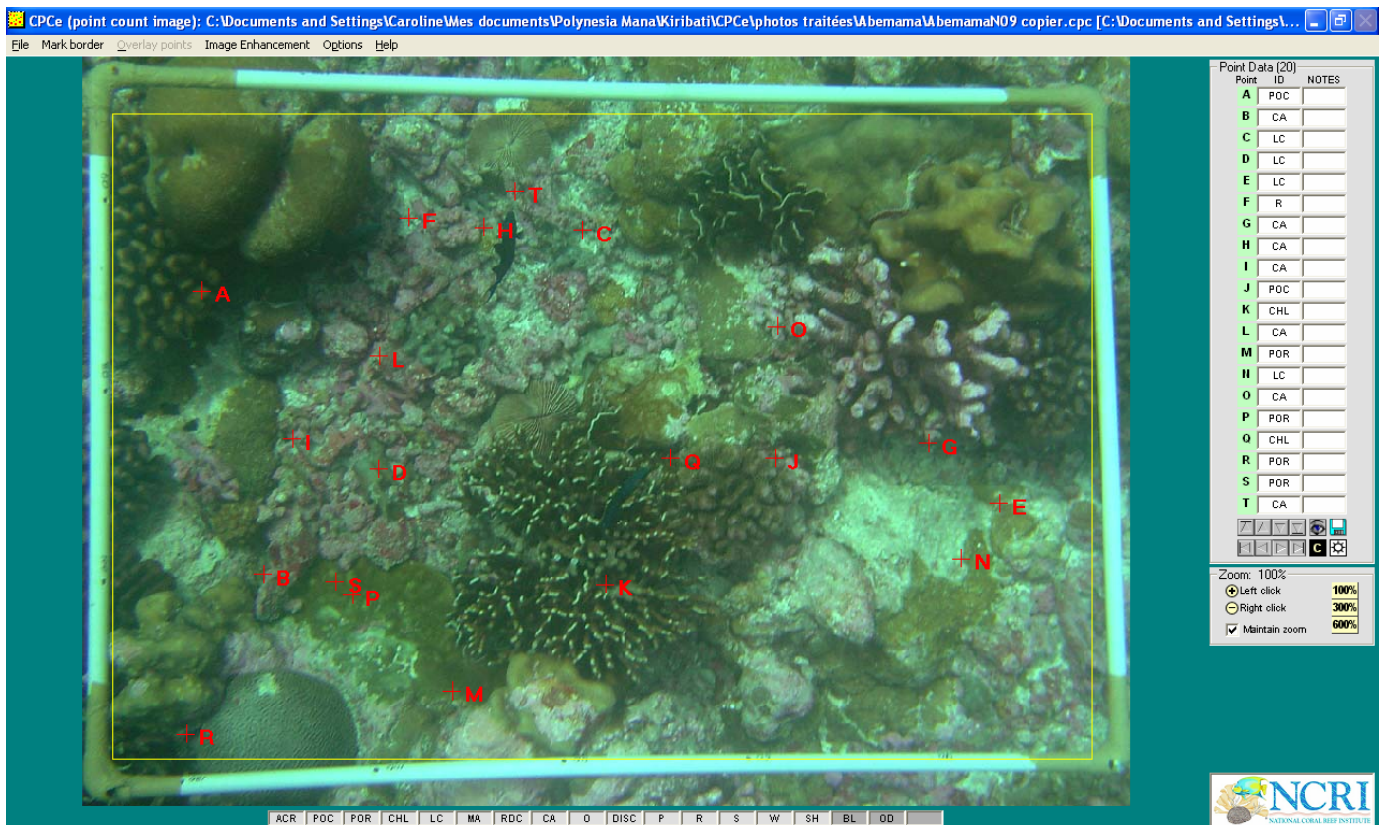
The following categories and codes have been selected

MAIN BENTHIC CATEGORIES	CODES	BENTHIC SUB-CATEGORIES	CODES
CORAL	C	ACROPORA	ACR
	C	POCILLOPORA	POC
	C	PORITES	POR
	C	HELIOPORA	CHL
	C	OTHER LIVE CORAL	LC
ALGAE	A	MACROALGAE	MA
	A	CORALLINE ALGAE	CA
OTHER LIVE	OL		
DEAD CORAL	DC	RECENTLY DEAD CORAL	RDC
	DC	PAVEMENT	P
DISEASED CORAL	DIS	BLEACHED	BL
		OTHER DISEASE	OD
SAND, RUBBLE	SR	SAND	S
	SR	RUBBLE	R
UNKNOWN	U		
TAPE, WAND, SHADOW	TWS	WAND	W
		SHADOW	S

Table 2 : benthic categories, subcategories and codes used for the analysis

2. Image analysis

An area is selected and delimited by a yellow frame. Inside this area, 20 points are projected randomly. We could have projected more or less points, it is up to the user. We chose this amount according to previous photo analysis carried out at the Moorea Research Center. We also decided to analyse 15 pictures per site after a statistical study.



Picture 5: picture analysis screen displayed by the CPCe program.

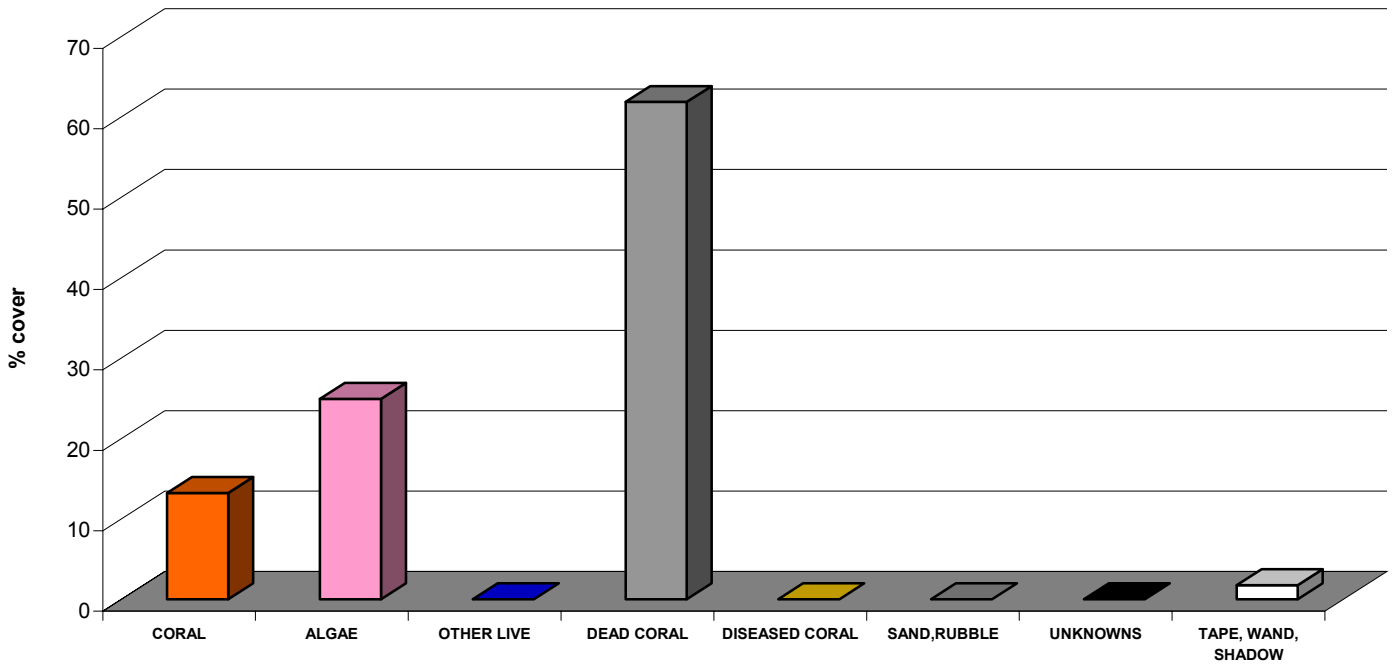
When the points are projected, the benthic subcategories selected appeared below the picture and for each point, the user just has to click on the categories and it is recorded in the table on the right side of the screen. Each picture analysed is saved both on a CPCe format, to be able to re-analyse the picture, and to an excel file to present the results. Two types of graphs were produced, one showing the main benthic categories recorded and the second ones give a more detailed composition of the benthos.

V. Results

A. Main benthic categories

1. Kuria Island

a) Kuria West Site



Graph 1 : Kuria main benthic categories

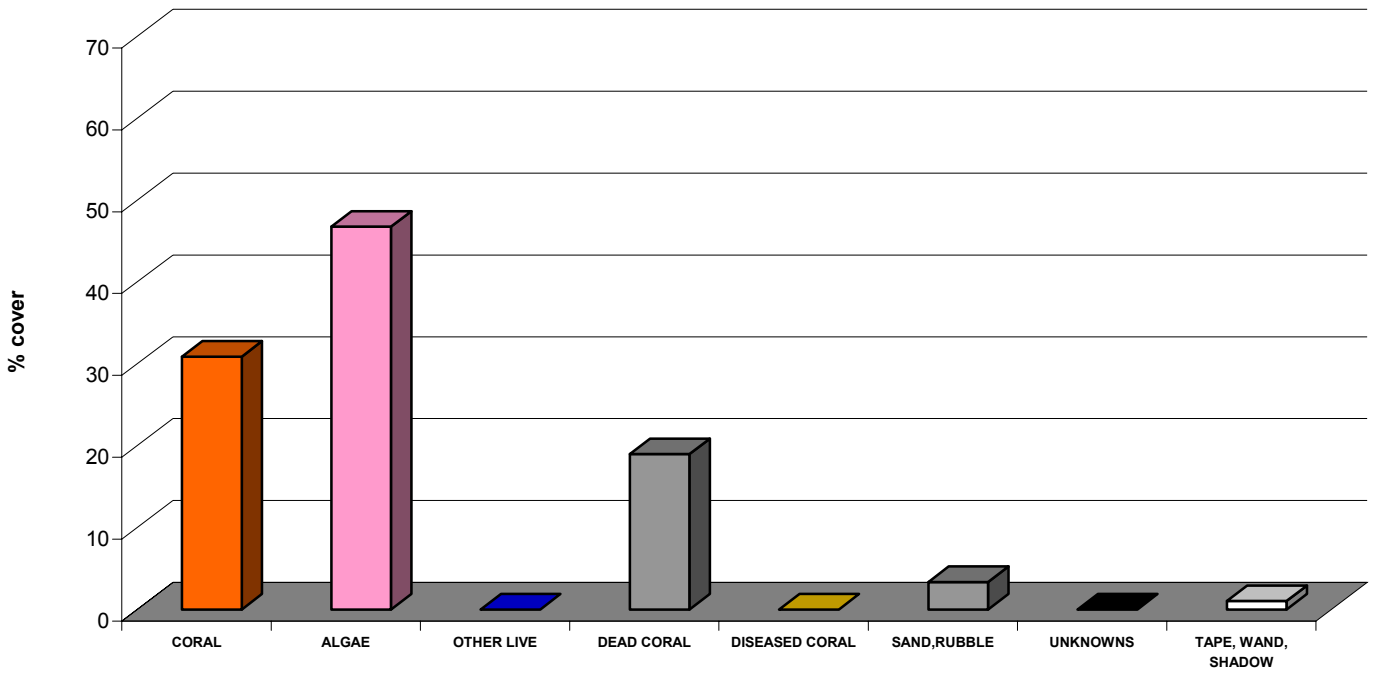
The Kuria West Site is located on the same side as the Fish market and the blasted channel. According to manta towing done along the coast, the profile presented in this graph seems representative of the benthos in this area.

Dead coral is dominant in this area (62%) with only 13% of live coral cover.



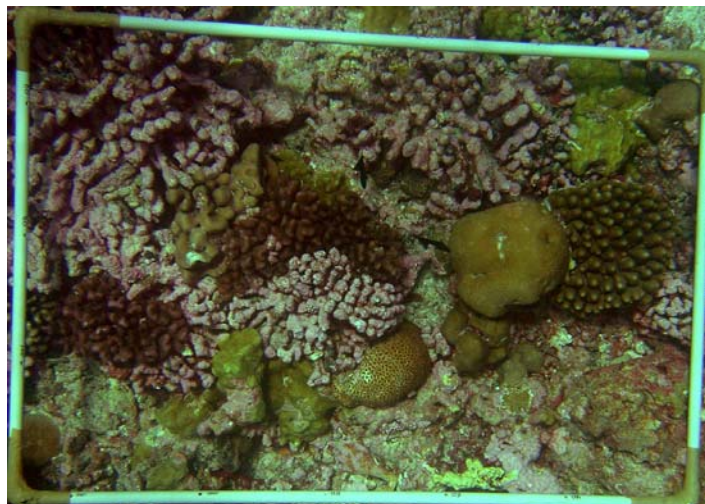
Picture 6: Kuria West site at 6 metres

b) Kuria South Corner Site



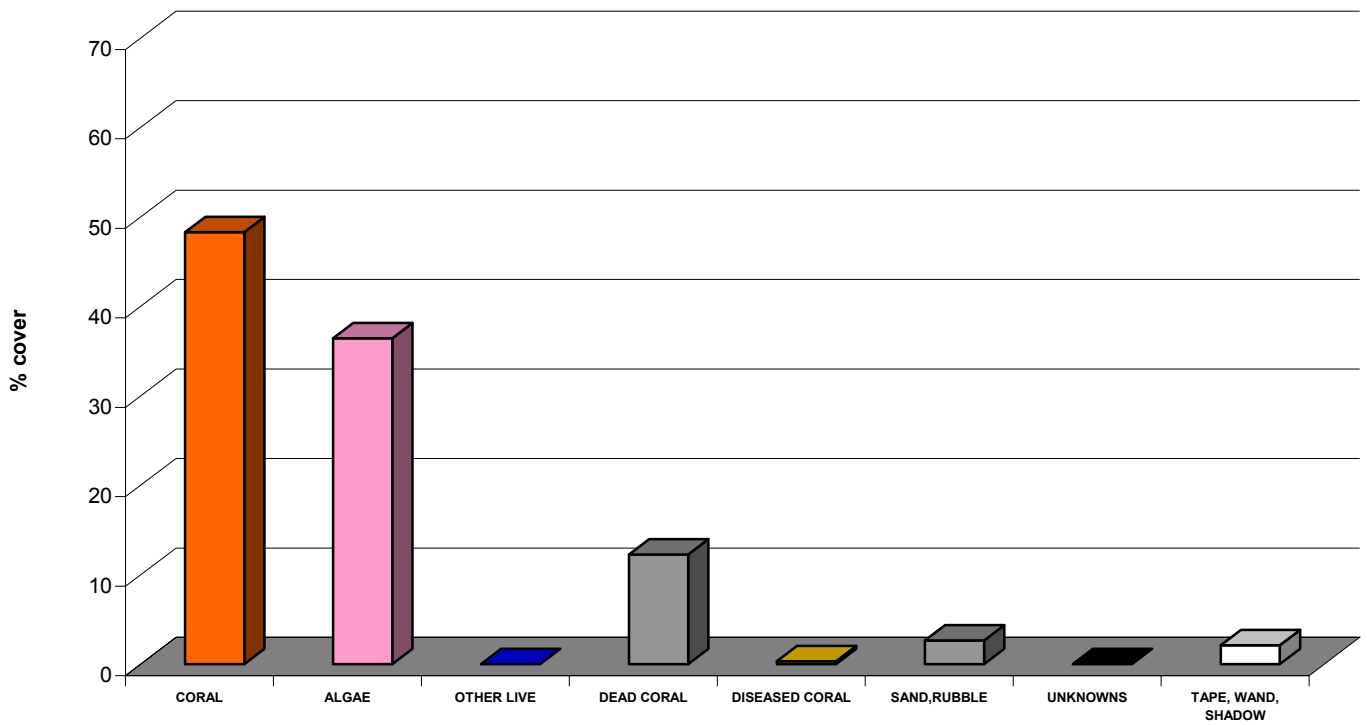
Graph 2 : Kuria South Corner main benthic categories

The South Corner Site in Kuria is much different from the West site with a benthos dominated by algae (47%), a higher live coral cover (31%) and only 19% dead coral cover.



Picture 7 : Kuria South Corner site at 6 meters

2. *Abemama atoll*



Graph 3 : Abemama benthic main categories

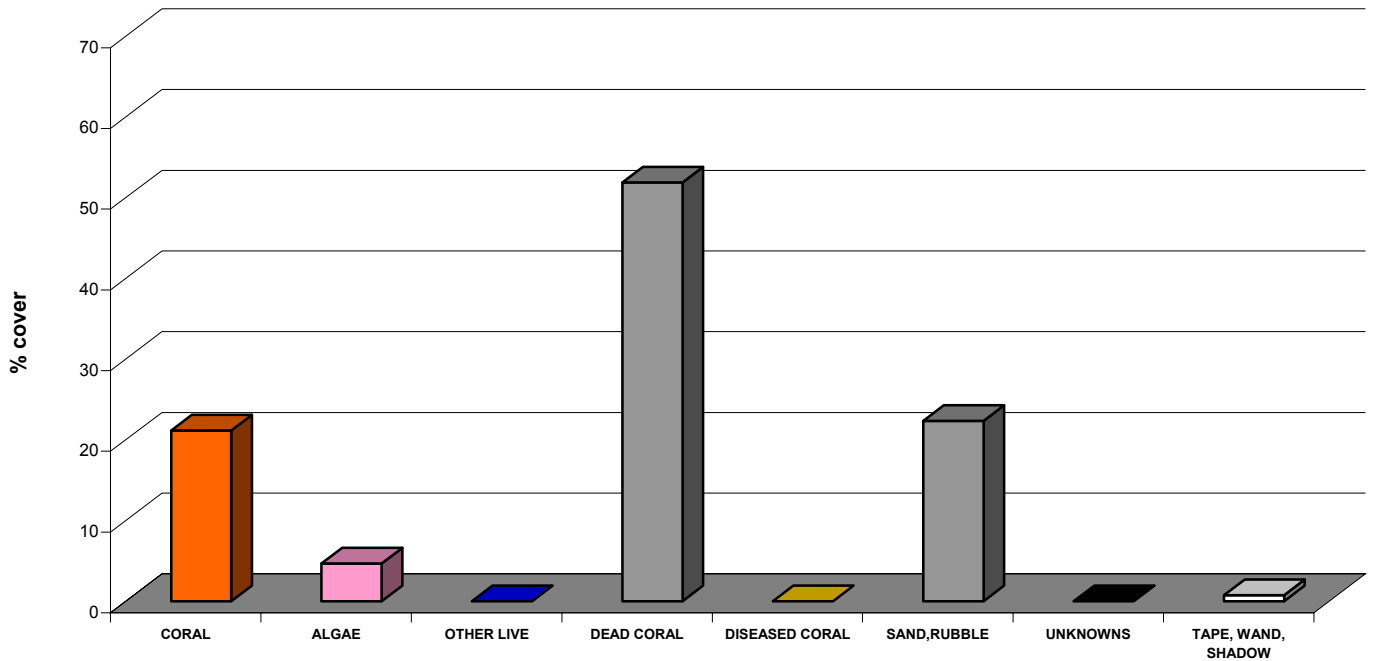
Abemama site is characterized by a high live coral cover compared to Kuria (48%) and a low dead coral cover (12%) and a 36% algae cover.



Picture 8: Abemama site at 6 meters

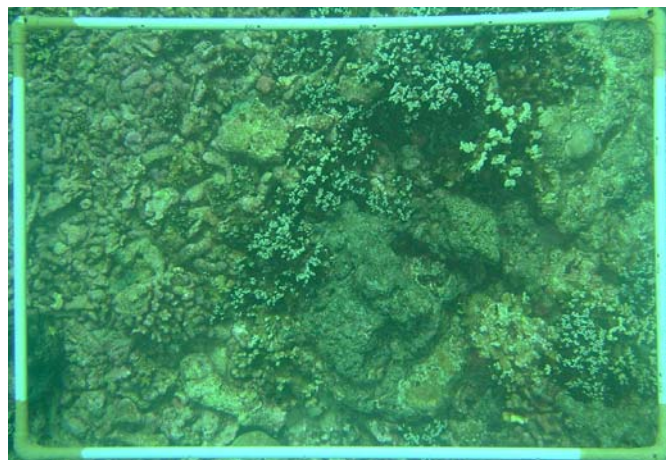
3. Tarawa atoll

a) South Tarawa Hospital Site



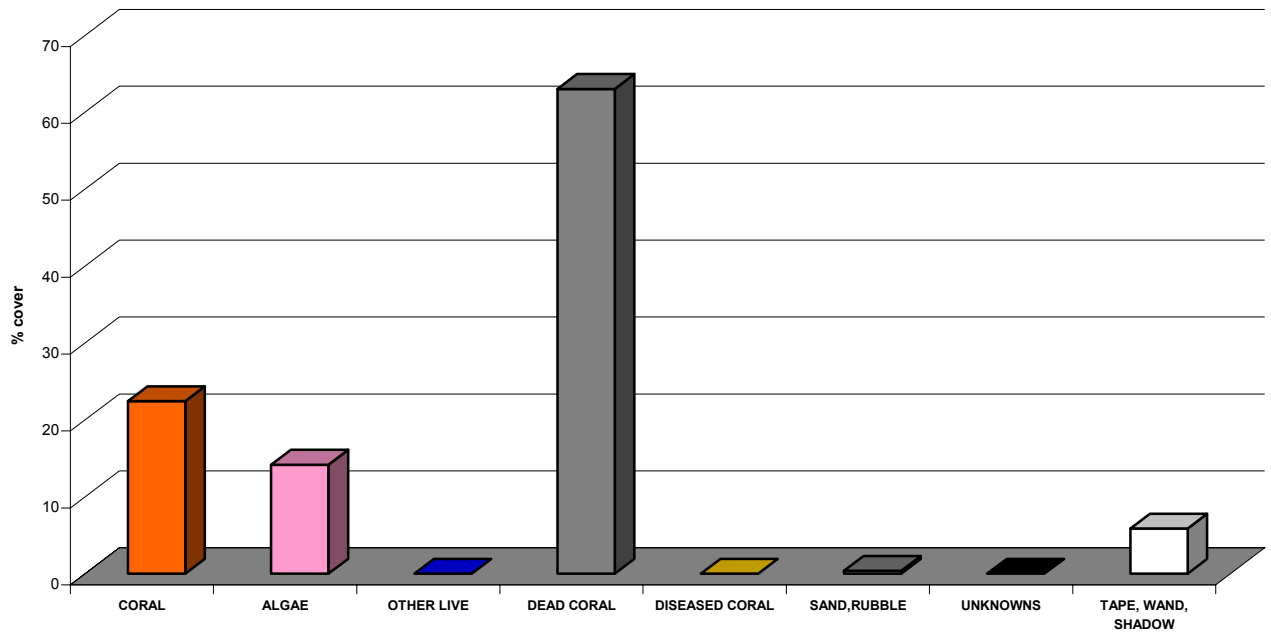
Graph 4 : South Tarawa Hospital main benthic categories

South Tarawa Hospital site shows a 52% dead coral cover as well as 22% of sand and rubble. Live coral represents 21% of the benthos and algae are rare with 5% cover.



Picture 9 : South Tarawa – Hospital site at 6 meters

b) South Tarawa – Teoraereke Site



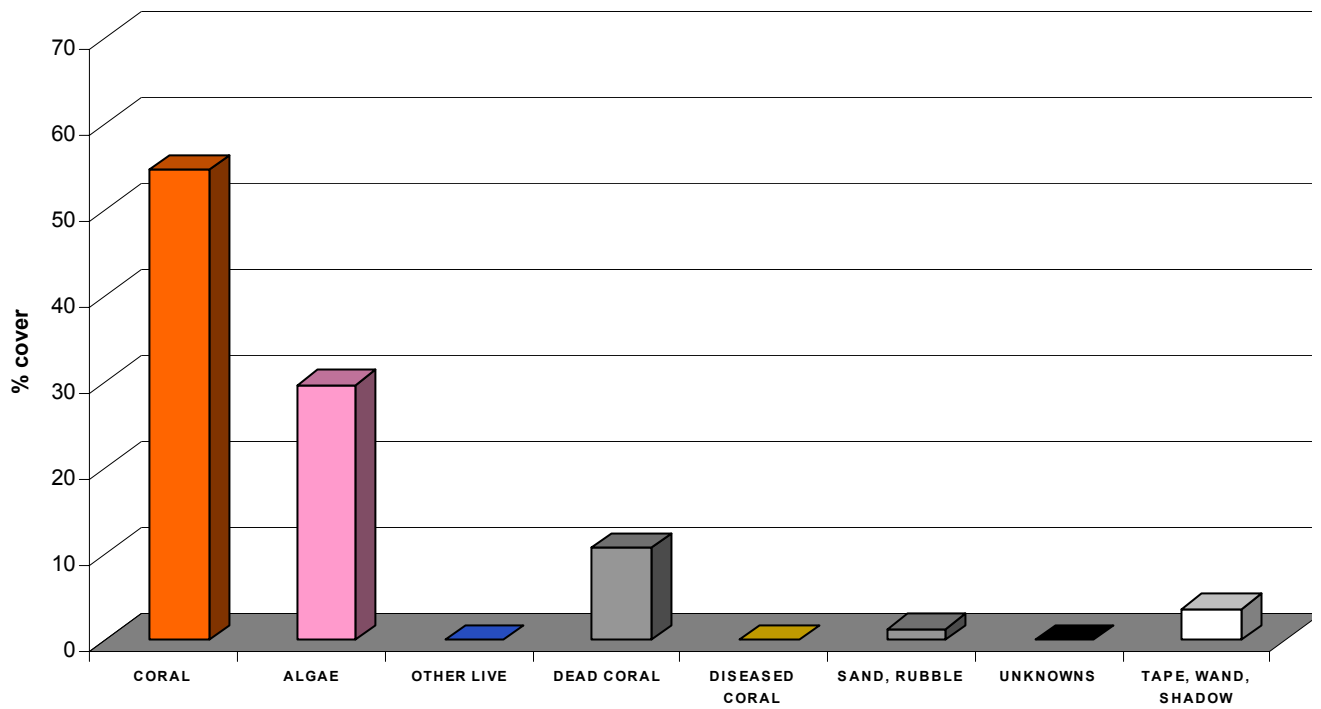
Graph 5 : South Tarawa Teoraereke main benthic categories

South Tarawa – Teoraereke site is very similar to the hospital site with a domination of dead coral in the benthic composition (63%) and just 22% live coral cover and 14% algae cover.



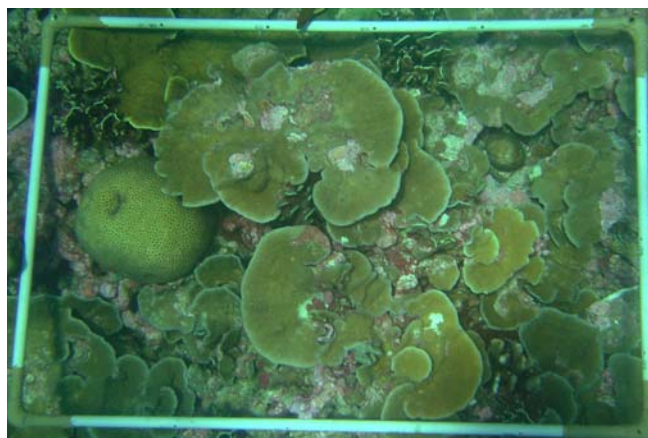
Picture 10 : South Tarawa – Teoraereke site at 6 meters

c) North Tarawa



Graph 6 : North Tarawa main benthic categories

North Tarawa site shows 55% live coral cover, the highest in Tarawa and in all the sites surveyed. Dead coral represents 11% of the benthic composition and algae cover is around 30%. This main composition is very similar to Abemama's (NT: 53/A:48), Algae (NT:28/A: 36), Dead Coral (NT: 9/A:12).



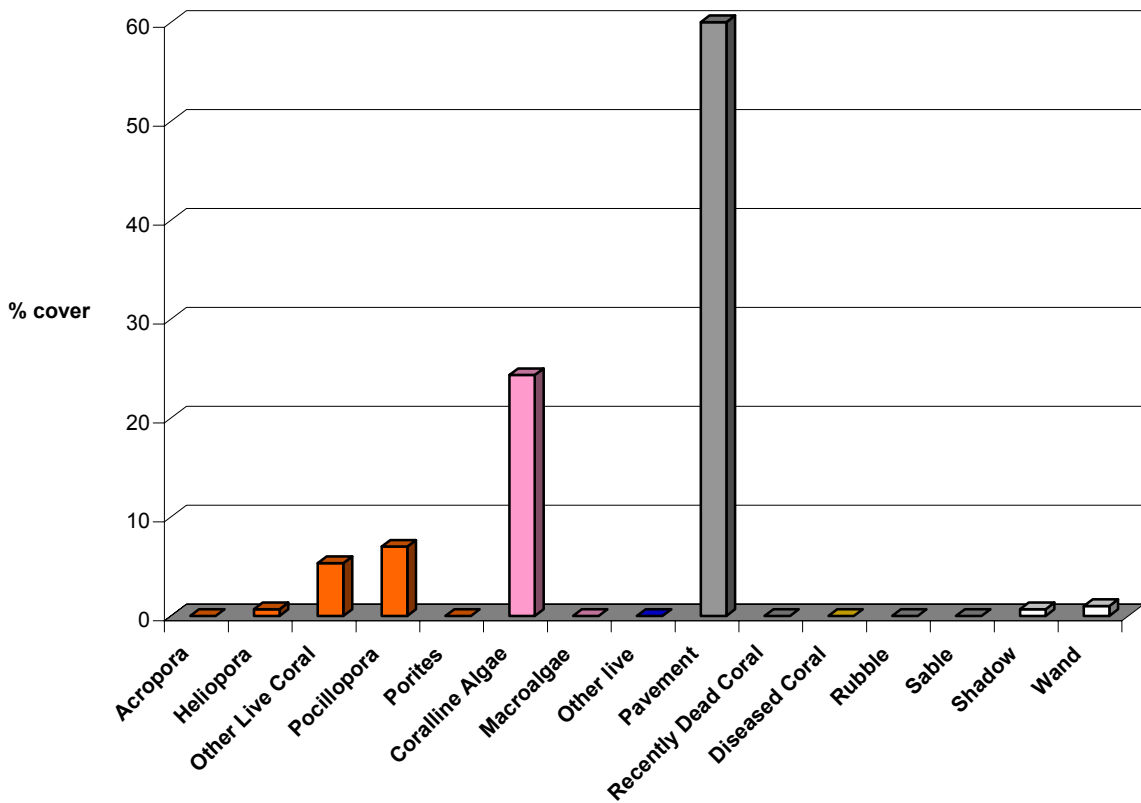
Picture 11 : North Tarawa site at 6 meters

The following results will give more details about the benthic composition.

B. Benthic composition

1. Kuria

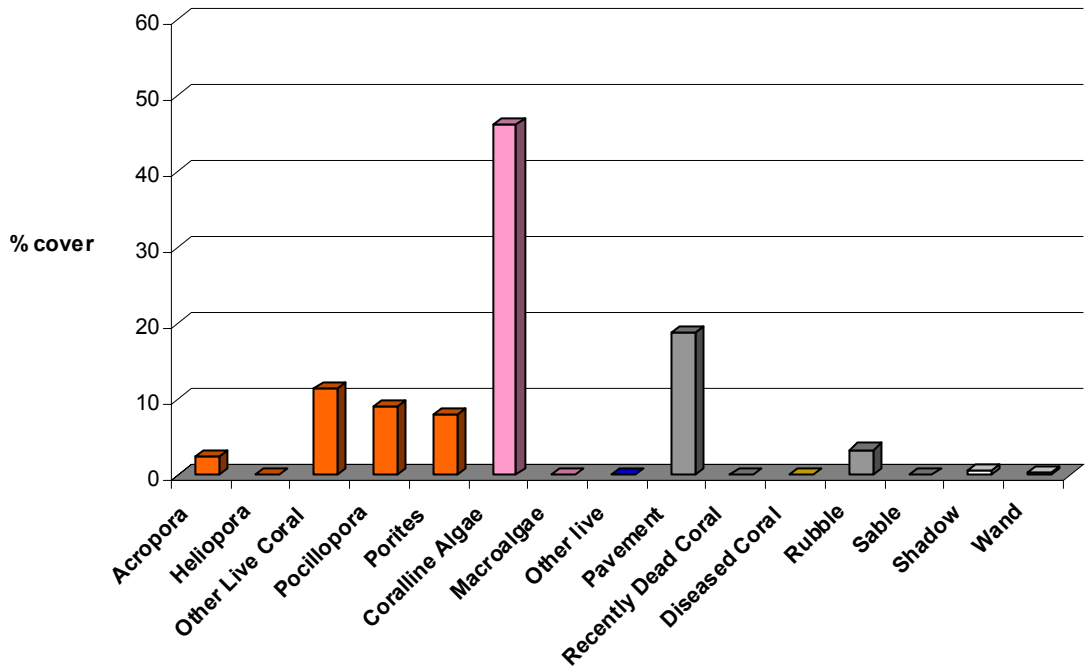
a) Kuria West



Graph 7 : Kuria benthic composition

In Kuria, live coral population is dominated by Pocillopora representing 7 of the 13 % total live coral cover, the other 5% are represented by various genus of corals. Algae is exclusively coralline type and dead coral, only pavement. No recently dead coral was observed.

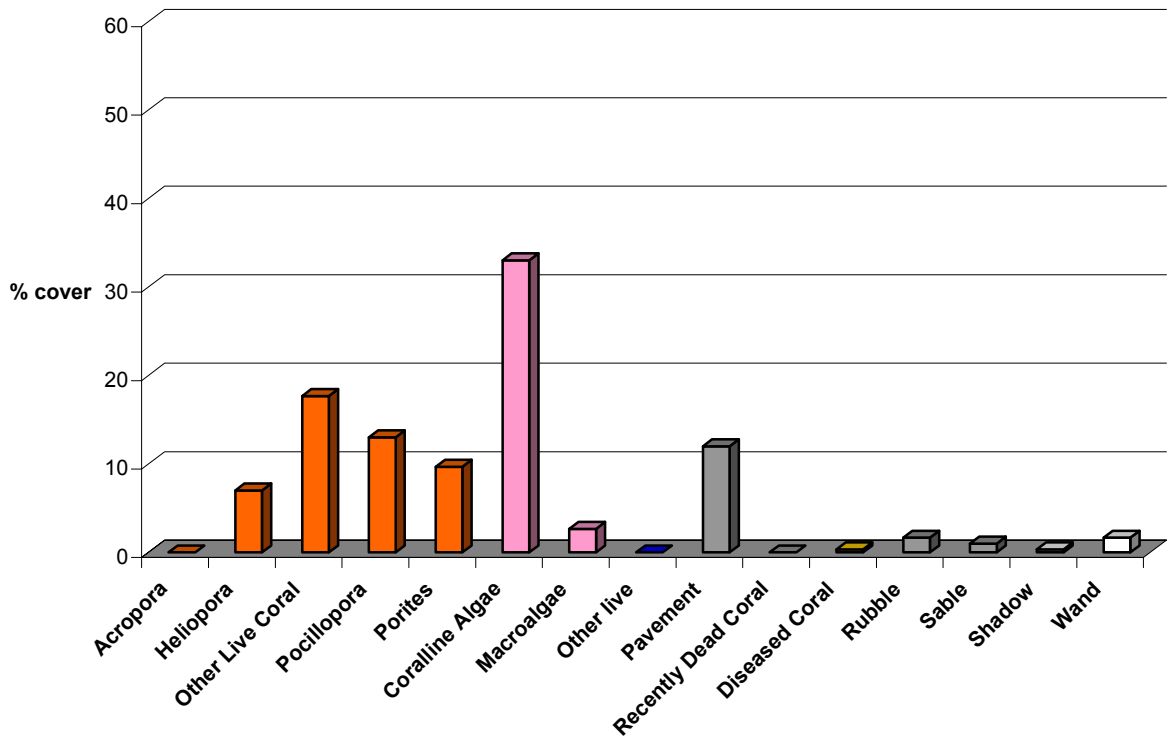
b) Kuria South Corner



Graph 8 : Kuria South Corner benthic composition

In Kuria South Corner, live coral cover (31%) is dominated by Pocillopora (9%) Porites (8%) and various genus of corals (11%) but very few Acropora (2%). Algae recorded (46%) is only coralline and dead coral (19%) only pavement. No recently dead coral or diseased was observed.

2. Abemama

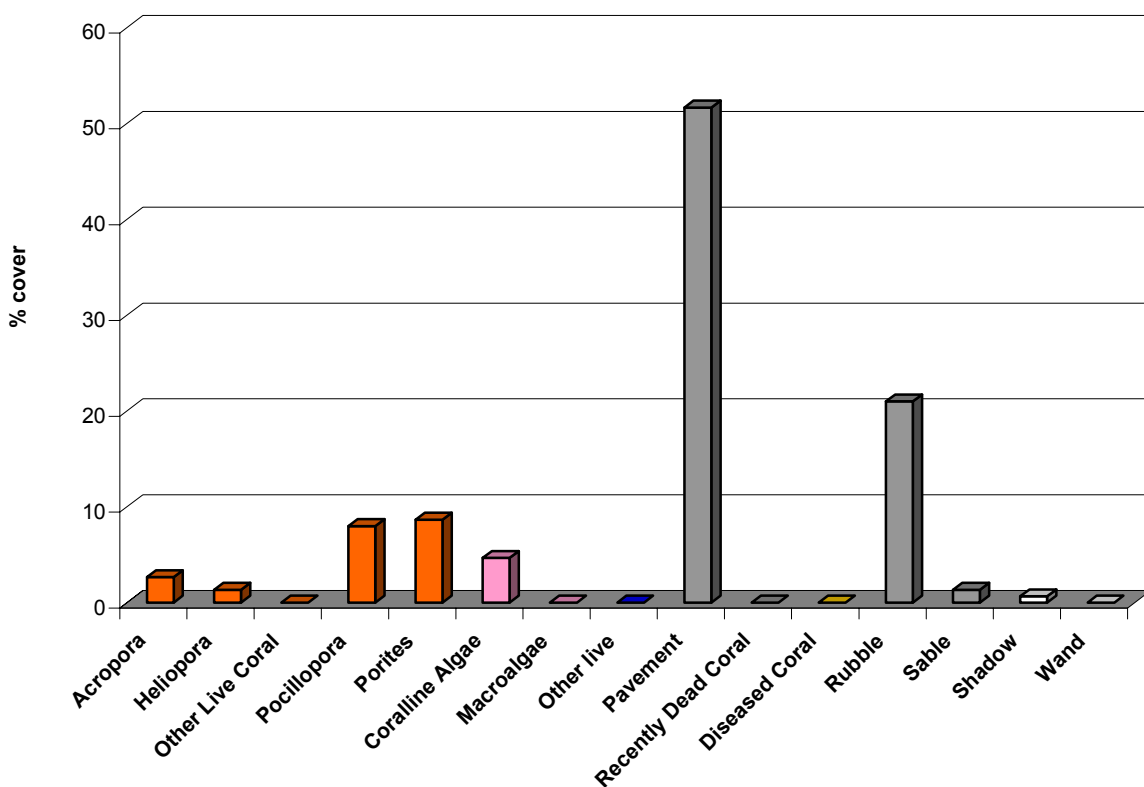


Graph 9 : Abemama benthic composition

Pocillopora, Porites and Heliopora represents the main genres recorded in Abemama with respectively 13, 10 and 7% of the 48% total live coral cover. The remaining part gathers other genus but Acropora was not found. Algae recorded (36%) are mainly coralline (33%) but there is a few macroalgae as well (3%). Dead coral is only pavement, not dead recently or diseased was observed..

3. Tarawa

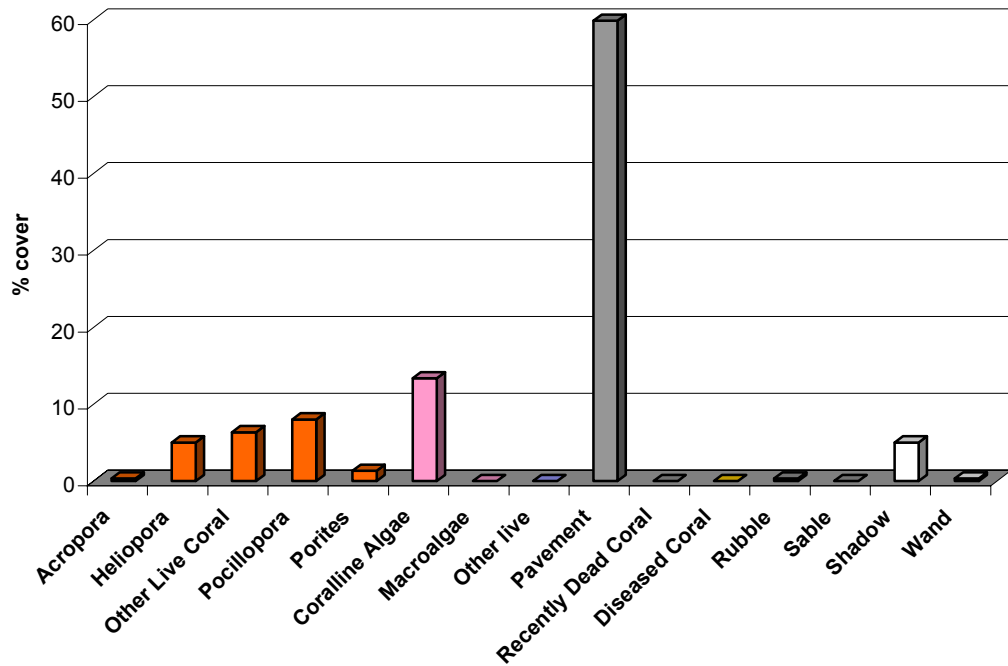
a) South Tarawa – Hospital



Graph 10 : South Tarawa Hospital benthic composition

In South Tarawa Hospital, coral population (21 % cover) is dominated by Porites (9%) and Pocillopora (8%) with few Acropora (3%) and very few Heliopora (1%). It is worth noting that no other coral genus was found. The very few algae recorded (5%) were only coralline type. Dead coral is only pavement and rubble represents 20% of the benthic composition. No recently dead or diseased corals were found.

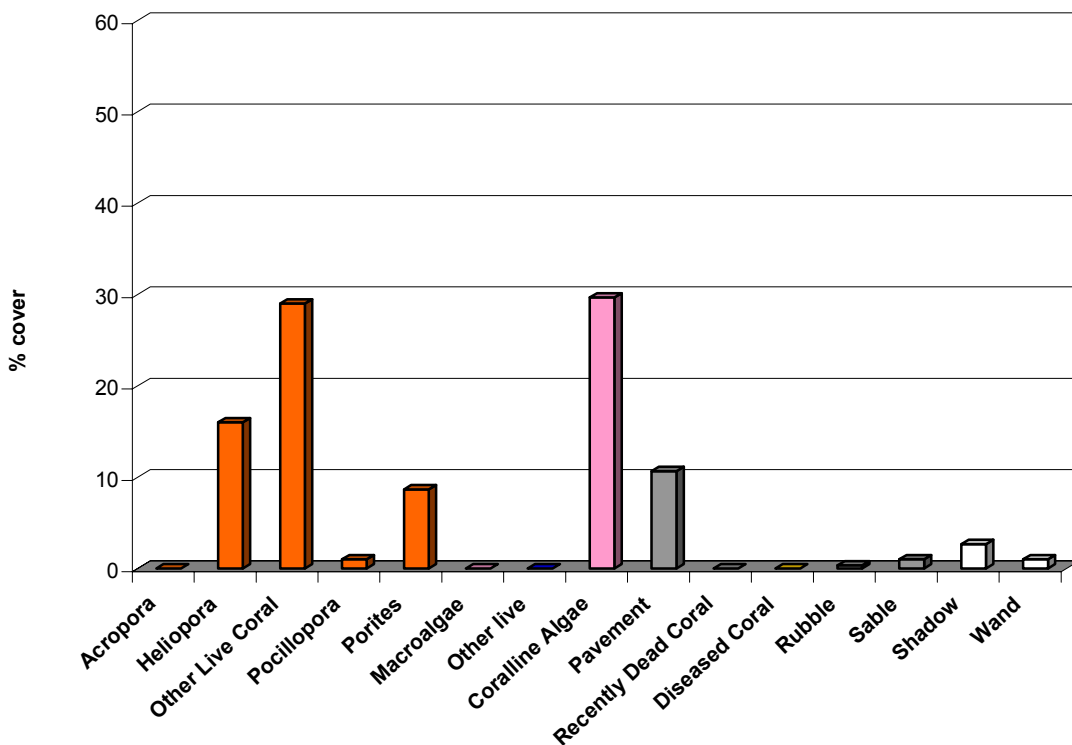
b) South Tarawa – Teoraereke



Graph 11 : South Tarawa Teoraereke benthic composition

In Teoraereke, coral population (22%) is mainly composed of Pocillopora (8%) , other genres (6%) and Heliopora (5%) with very few Porites (1%) and no Acropora. Algae is dominated by coralline and dead coral by pavement. No recently or diseased coral was observed.

c) North Tarawa



Graph 12: North Tarawa benthic composition

A characteristic of North tarawa is the dominance of other coral genuses than Pocillopora and Porites with 29% of the 55% total coral cover. Another point is the 16% Heliopora cover. If 9% Porites were recorded, only 1% Pocillopora was found and no Acropora. This site shows very few branching type corals.

It is also worth noting that one giant clam, *Tridacna gigas*, was found at this site.

Algae is represented exclusively by coralline (30%) and dead coral by pavement (11%).

C. Comments

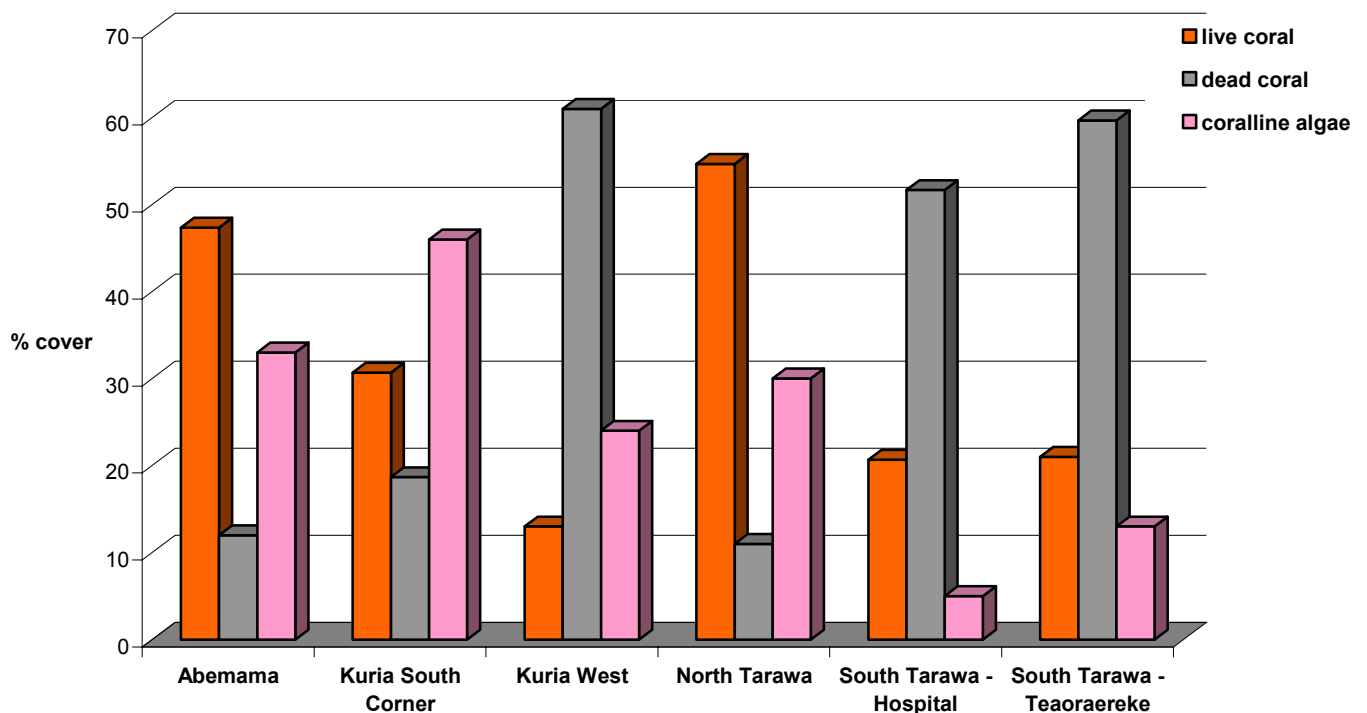
As a global comment, these results show common points between all the sites surveyed, first is the very low abundance of Acropora genus as it is absent in 4 of the 6 sites surveyed and in the two sites where it was recorded, the cover is around 2%.

Almost no or very few macroalgae were observed in all the sites surveyed.

Heliopora genus was recorded in every site except in Kuria South Corner and the highest abundance were found in North Tarawa with 16% of the benthos composed of Heliopora.

In all sites, there was no record of recent bleaching event, all dead coral recorded has not died recently, no disease was observed as well.

D. Comparison between sites



Graph 13 : dead coral, live coral and coralline cover comparison between the sites surveyed

From this graph, sites can be divided in two groups. The first one gets together sites with a dead coral cover over 50% and a live coral cover below 20%. These sites are South Tarawa-Teaoaraereke, South Tarawa-Hospital and Kuria West.

The second group gets together sites where the live coral cover is around 50% and the dead coral cover below or around 10%. These sites are North Tarawa and Abemama.

As an intermediate state is the site of Kuria South Corner where the live coral cover is lower than 50% but where the dead coral is also much lower than 50%. In this site, dominant benthos is coralline algae.

Sites with the highest dead coral cover are the ones impacted by human activity, massive urbanization in the two sites of South Tarawa and the near blasted channel in Kuria West where ciguatera is also a major issue.

The abundance of coralline algae may be linked with the exposure of sites. Coralline may be more abundant on swell exposed sites and less in sheltered sites like South Tarawa Hospital and Teoraereke. Influence of human pressure on coralline is not well known.

VI. Conclusion

This is a first set of data for Kiribati and it is hoped that the sites will be surveyed each year and that additional sites in other islands and other groups will be surveyed in the next years.

The method used does not allow to work deeper than 6 meters without scuba gear but on the other hand, the very light equipment required with this method make the fieldwork much easier and cheaper which make the monitoring more sustainable on a longer term. We can imagine that additional funds can be found when a disturbance will be observed with this method in order to make more detailed studies when needed.

Regarding the analysis, the CPCe program is a free software developed especially for this kind of study and allow to work at any levels of details in the analysis. With very basic training, local environment and fishery departments can be self sufficient both in data collection and analysis. Records of digital pictures can be stored.

This monitoring lacks the fish component but the fisheries department has been trained by the Procfish team and is planning to make regular surveys and we can think of a surveying some simliar sites in order to have reef and fish data for these sites.