CORAL TRIANGLE INITIATIVE
ON CORAL REEFS, FISHERIES AND FOOD SECURITY

PAPUA NEW GUINEA

# NUAKATA, IABAM & PAHILELE COMMUNITY CORAL REEF MONITORING SURVEY REPORT

NOVEMBER 2010

*Survey Report from the Nuakata Coral Reef Monitoring Team*

**June 2013**

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# Nuakata, Iabam & Pahilele Community Coral Reef Monitoring Survey Report: November, 2010: Survey Report from the Nuakata Coral Reef Monitoring Team


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# Nuakata, Iabam & Pahilele Community Coral Reef Monitoring Survey Report November, 2010

Survey Report from the Nuakata Coral Reef Monitoring Team

**Multispecies fish feeding aggregation at Badila Dabobona, a site inside No-take (NT.04)**

**Survey Report Compiled by Joel Araea, Simeon Isaac and Levis Sakiusa**
**February 2011**

## INTRODUCTION

The sea area surrounding Nuakata Island can now be considered a management area. Management areas simply mean there is control over the use of the area because some areas are now managed as conservation areas or community managed marine area (CMMA). Thus, the sea area of Nuakata Islands is managed as part of the Nuakata Iabam and Pahilele Community managed marine area (CMMA). This includes reefs that are under Iabam and Pahilele custody, is now all managed as a CMMA.

These initiatives to manage these areas as CMMA are driven by rapid decline in marine resource specifically those that provided local communities with cash income. Population of sea cucumber, trochus, clam shells and other important marine animals that play vital ecosystem functions have been affected as a result of poor resource use and lack of resource management over years. It is therefore based on this reasons that these communities have opted for a better management system to manage what resources is now available to enable stock recovery through the functions of marine protected area or CMMA.

This conservation and natural resource management effort is a pilot project which lessons learnt from success and failures derived therein can be used to improve the approach when embarking on other areas which communities have also express high interest.

## 2. METHOD

### 2.1. Field Data Collection

Biological monitoring methods used during this survey can be found in English et al. (1997). Underwater visual census (UVC) technique was used by the monitoring team to record target marine organisms seen underwater. Important data were collected for coral cover morphologies (Table 1), important reef fish indicators (Table 2), and marine invertebrates including sea cucumber, trochus, clam and other invertebrate species.

**Table 1.** Substrate morphology

| | | | | | |
|---|---|---|---|---|---|
| **BC** | **Branching Coral** | **SMC** | **Submassive Coral** | **RK** | **Rock substratum** |
| **TC** | Table Coral | **DC** | Digitate Coral | **DCR** | Dead Coral Rubble |
| **MC** | Massive Coral | **SC** | Soft Coral | **SG** | Seagrass |
| **FC** | Foliose Coral | **SP** | Sponge | **S** | Sand |
| **EC** | Encrusting coral | **MA** | Macroalgae | **OT** | Other |
| **DDT** | Dead Corals | | | | |

Coral substrate was recorded along the 100 meter transact at 0.5m interval. Thus, any substrate of both biotic and abiotic value in the ecosystem was considered important and was accounted for by the survey team.

**Table 2.** List of target monitoring fishes selected by NIPCMMA community members.

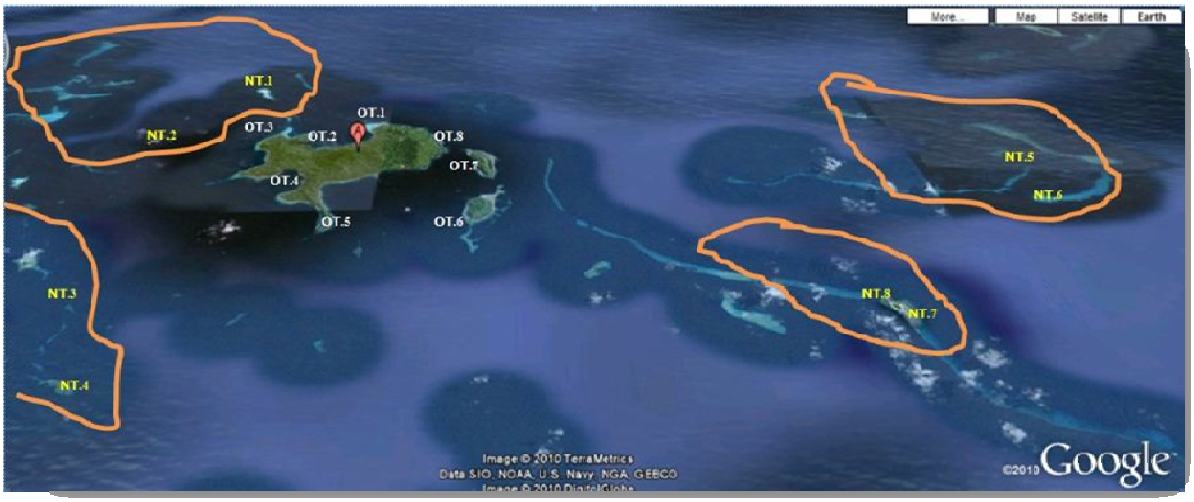
| Code | Nuakata vernacular | Iabam/Pahilele Vernacular | Common English Name |
|---|---|---|---|
| 1 | Ovili | Wekaha | Blueline surgeonfish |
| 2 | Diyadiyayana | Tuhilili | Striated surgeonfish |
| 3 | Wulioalaoalauto | Kwalukwaluto | Orangespine unicornfish |
| 4 | Osaosa | Igomida | Bullethead parrotfish |
| 5 | Osaalaalawa | Wauwalumo | Yellowbarred parrotfish |
| 6 | Hinegayuyu | Hinaya | Barred rabbitfish |
| 7 | Debi | Debi | Silver spinefoot (rabbitfish) |
| 8 | Mami | Mamli | Humphead Maori wrasse |
| 9 | Lauhapelo | Towotowolo | Coral trout |
| 10 | Eoala Gabugabubu | Potumani | Blackspot snapper |
| 11 | Gilita'ata'ai | Lusaido | Bluespotted hind |
| 12 | Auauli | Kaukauli | Black tipped grouper |
| 13 | Ulutapotapoi | Malamohali | Big-eye bream |
| 14 | Bailawa | Bilawa | Sabre squirrelfish |
| 15 | Luwayai | Luwayai | Any moray eel |

These species list presented above represents three important functional groups of reef fishes seen inside Nuakata, Iabam and Pahilele Islands. The main groups represented are reef herbivorous fishes, reef carnivores' fishes and species that are of IUCN concern as well as their aesthetic value in the natural environment.

List of marine invertebrates further include sea cucumber species classed into major genera (i.e. Actinopygra, Bohadchia, Holothuria, Stichopus, Thelenota and Pearsonothuria); 6 types of clam shells, trochus shells, crown of thorn starfish, and other marine invertebrates.

Areas by which NIPCMMA resource monitoring was conducted is further illustrated in Map1

**Map 1.** Sites inside and outside no-take that now bear permanent monitoring stations for Nuakata CMMA.



As illustrated in Map 1, the number of monitoring transacts inside no-take was 8 and those outside was 8. Areas with bright yellow circles are conservation areas (no-takes) that are managed by the Nuakata management committees while those that are managed by the Iabam-Pahilele management community is not shown. Combining these two management committees and their management areas forms NIPCMMA committee and NIPCMMA, MPA. Moreover, the name of the reefs that now has permanent monitoring stations is shown the Table 3.

**Table 3.** List of reefs locations around Nuakata that has permanent monitoring sites inside and outside conservation areas.

| Reef Code | Reefs inside Conservation Area (No-Take Zone) | Reef Code | Reefs outside conservation (no-take areas) |
|---|---|---|---|
| NT.01 | Hibwa | OT.01 | Sioayoaoyoa |
| NT.02 | Batutuli (Bagshaw) | OT.02 | Soba soba |
| NT.03. | Iks Dabobona | OT.03 | Gaima Niugini |
| NT.04 | Badila Dabobona | OT.04 | Illabo (Asailo Bay) |
| NT.05 | Gallows (NE) | OT.05 | Tawali Gadohoa |
| NT.06 | Gallows (S) | OT.06 | Bwelama (Boirama) |
| NT.07 | Panamoimoi (Grace Island) SE | OT.07 | Daiwari |
| NT.08 | Panamoimoi (Grace Island) NE | OT.08 | Tuphahilihili |

The survey methods which this monitoring team used are described as follows;

Belt transact which data were collected for target reef fish species, marine invertebrates including sea cucumber, clam, trochus and other key species and benthic substrate which was used to determine percentage of live coral cover, growth of macroalgae and other abiotic substrate that formed the reef substratum.

A 100 transact with width of 5m meters was used to identify and document presence of key reef fish indicators (See figure 1). The same transact was also used for substrate and invertebrate assessment. During substrate assessment, data was recorded every 0.5 of a meters. Live corals, soft coral, sponge, rock, dead coral rubble that lies under the 0.5 meters mark was recorded on an underwater paper. The same transact was then used to determine the presence of marine invertebrates. With a 100m length and 5 meter wide transact.

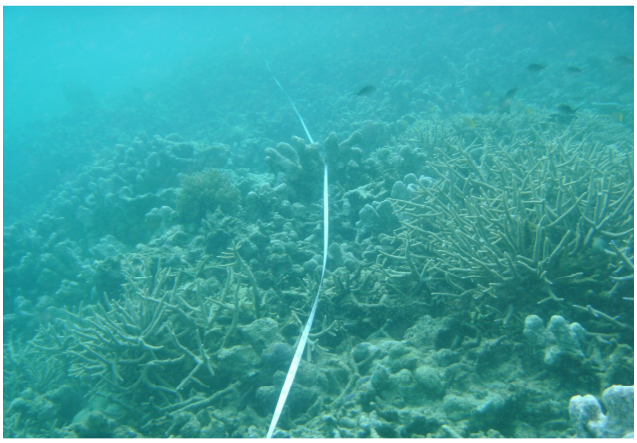


**Figure 1.** Parts of the 100m transact line which was used to assess benthic substrate conditions, reef fishes and marine invertebrates.

**Figure 2.** Levi and Noel of Nuakata CMMA sorting and transferring raw data into a created database.

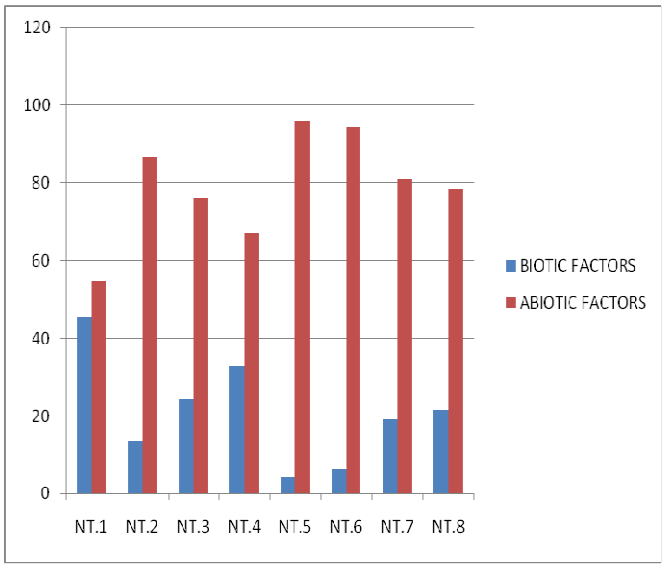
**2.2. Data analysis**

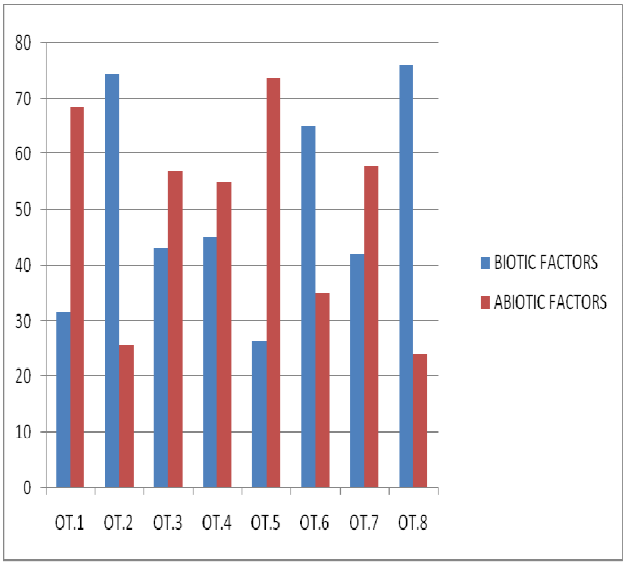
All raw data collected during the assessment were entered into developed database which was kept by the monitoring team data officers. Simple analysis such as calculating totals of each fish species, benthic substrate and invertebrates were done by Nuakata CMMA data management officers. These raw data were later transferred to a computer at CI office Alotau, which contained developed monitoring database.

Results presented in this report were analyzed using MS. Excel spreadsheet where graphs and charts were constructed to provide simple and easy to-understand representation of what is found inside each studied areas.

**3. RESULTS**

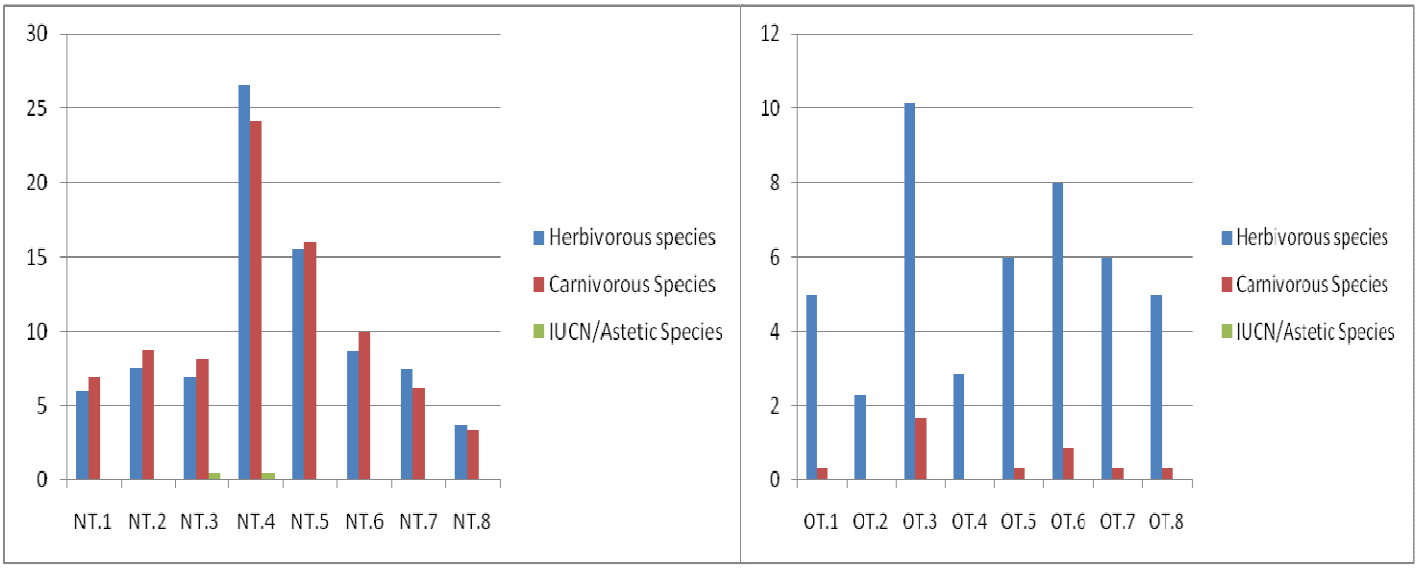
3.1. Benthic substrate of reefs inside no-take and those outside no-take



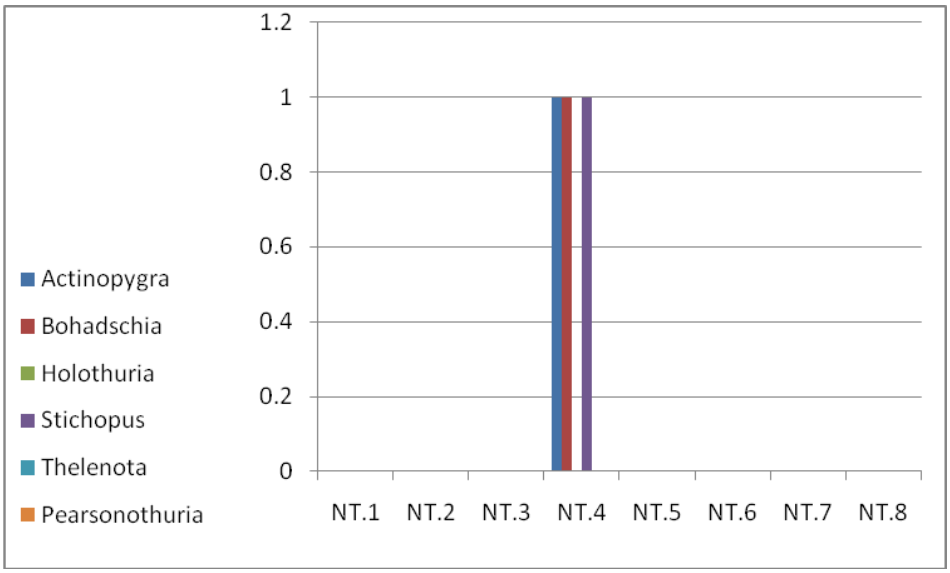

Results for benthic coral substrate inside no-take areas clearly show that biotic factors in all reefs were lower than abiotic factors. Hibwa (NT.1), Iks Dabobona (NT.4) and Badila Dabobona had over 20% live biotic factors.

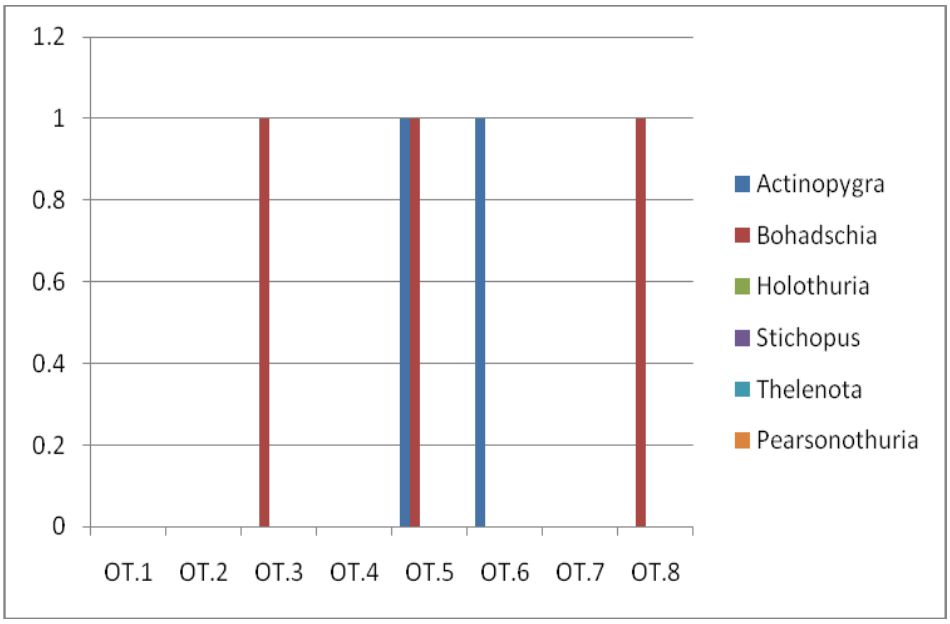
### 3.2. Reef fishes




Analysis for target indicator fishes inside no-take and outside no-take for Nuakata CMMA clearly shows that on average there was good presence of reef herbivorous fishes. The average high record for no-take was 26 individuals while outside conservation areas showed 10 different fishes from the monitoring group. Badila Dabobona (NT.4) had the highest average fish counts for herbivorous and carnivorous fishes trailed by Gallows NE (NT.5) while the NE end of Panamoimoi had the lowest population of both representative species. In the areas outside no-take, all sites showed significant population counts over reef carnivorous species. IUCN species, the Maoiri Wrasse was least seen inside any transacts are however was sighted in areas outside the transact on numerous occasions.

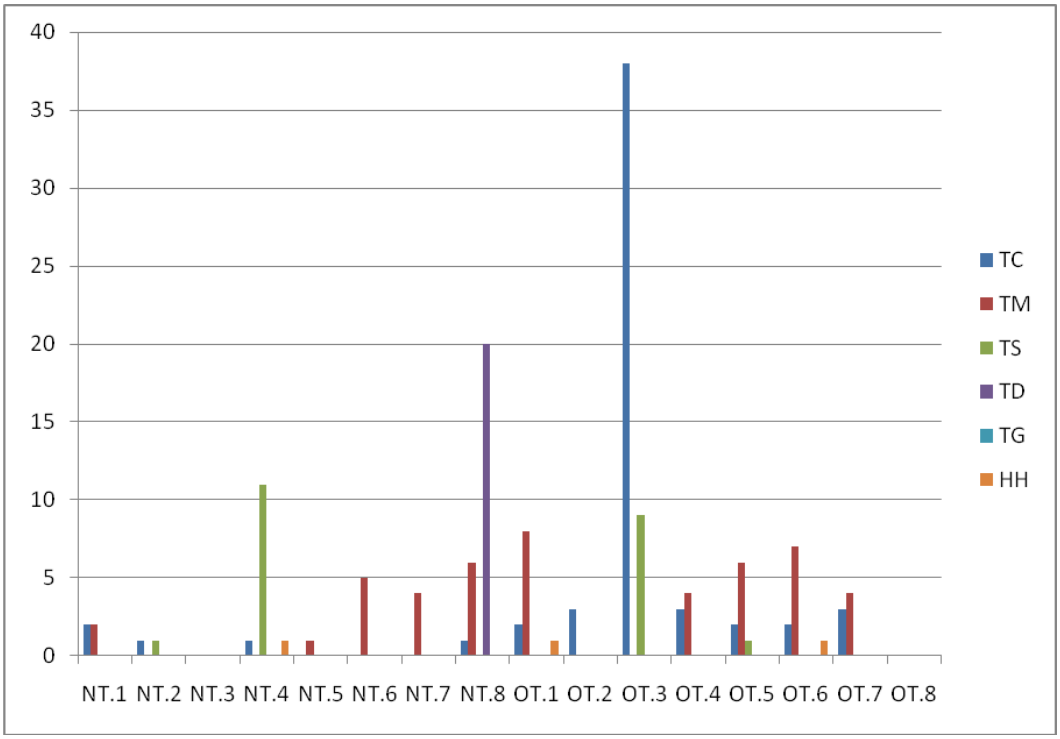
### 3.3. Sea cucumber





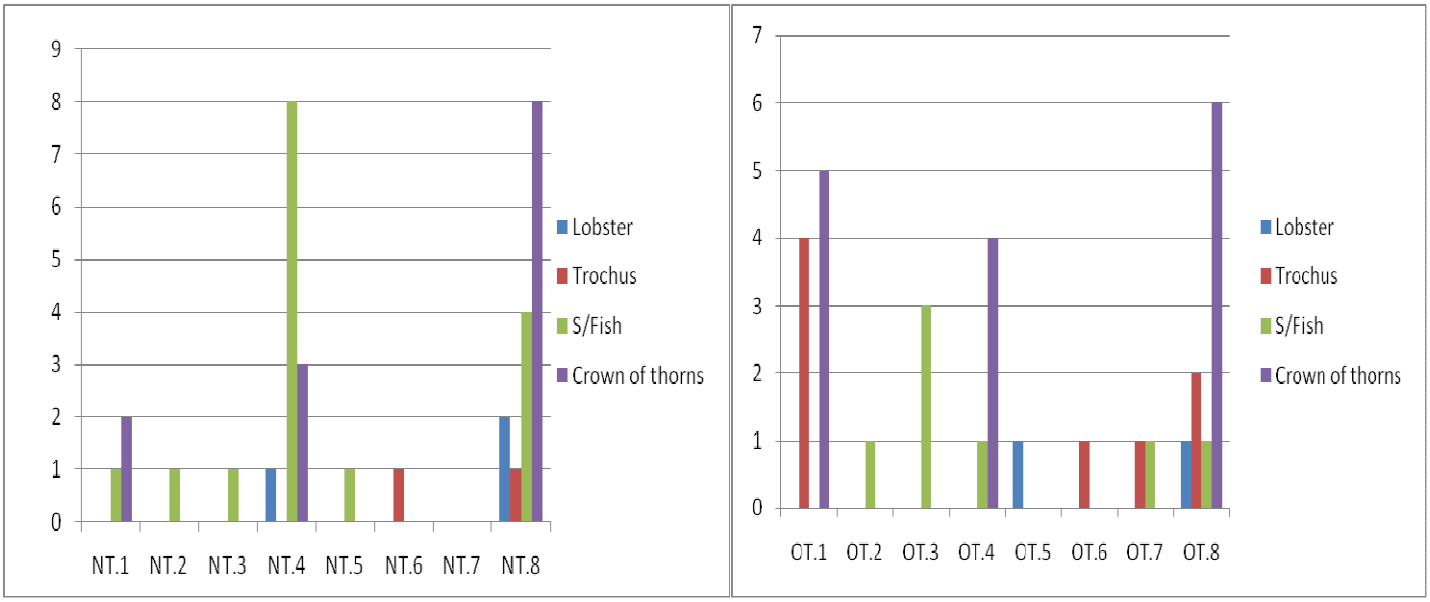

Data for sea cucumber in both no-take and outside no-take clearly illustrates low abundance in all assessed sea cucumber genera. The only record inside the 500m$^2$ area for Badila Dabobona was single individuals from genus Actinopygra, Bohadschia and Stichopus. All other sea cucumber genera were not recorded in any transacts inside the no-take areas. Results from areas outside no-take were slightly different. Sea cucumber was present in 4 different reef areas and the common occurring species in those areas were Actinopygra, Bohadschia and Stichopus.

**3.4. Clam shells**



The above graph presents combined information on the clam shells inside and outside no-take areas. The no-take areas clearly illustrate a higher presence of TC at Panamoimoi (NE) and abundance of hippopus hippopus (HH) at Badila Dabobona (NT.4). Other species also recorded in goods abundance was TM, where many were recorded at Gallows (S), Panamoimoi (SE) and Panamoimoi (NW). Reef areas outside no-take also showed significant results where Gaima Niugini had the highest distribution and abundance of Maxima clam (TM). Following that was Hippopus hippopus (HH). Other reef areas recorded very low number of each species while Maxima clam (TM) was a little higher than the others.

### 3.5. Other invertebrates




The two graphs provided above shows that Star fish (*Linckia latvigata*) was most common in all reefs surveyed. Their high presence inside the sampling area of 500m$^2$ clearly illustrates their abundance in many parts of the reef. The was also very high records of crown of thorn starfish which Panamoimoi NE or NT.8 recorded the highest count of 8 individuals inside the 500m$^2$ sampled area. Areas outside no-take further showed the same result. There were 3 records of lobster, all found inside the area of study at Badila Dabobona.

## 4. DISCUSSION

### 4.1. Benthic substrate

The general impression showed by data analyzed for all reefs inside and outside no-take illustrates high abiotic factors recorded as dominant benthic substrate in the no-take reefs. The high abiotic factors are attributed to bare rock substratum and areas with high dominance of dead coral rubble. Live coral cover was present in most transact however; were not the dominant substrate in all surveyed transacts. Findings for reefs located outside no take were different. There were reefs that had a lot more live coral cover and other biotic materials than abiotic. Transacts at Soba soba (OT.2) showed high coral dominance over abiotic substrate and was made up of dense aggregation of two sea grass and branching corals. At Bwelama (OT.6) corals with submassive (SMC) structure were

more dominant through the transact than any other live corals. Findings for Tupahilihili (OT.8) showed high dominance of branching staghorn corals and soft corals, particularly *Sinularia sp.*

It is noted that most of the reefs in the no-take areas are exposed to open sea conditions as most of these corals have been located on barrier and raised patch and ribbon reefs which is often exposed to high wave conditions that is driven by SE Trade winds that often occurs between May and October each year. These seasons has had catastrophic impact on some of the reef systems by uprooting and slashing large coral colonies from strong wave breaks. (Figure 3)

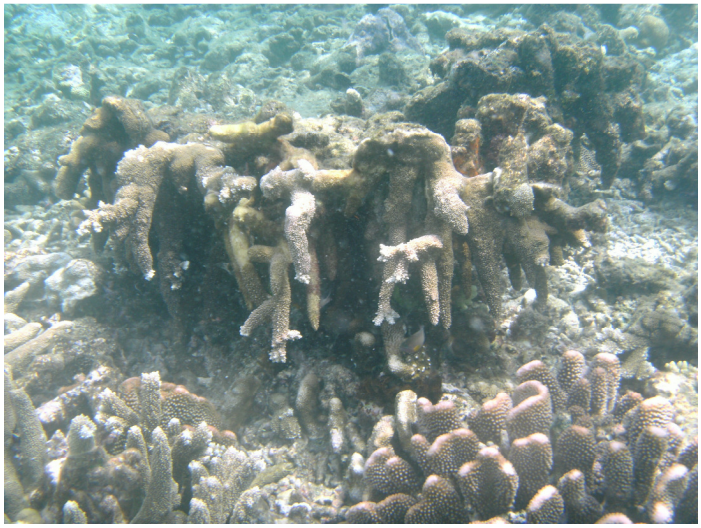


**Figure 3**. Large uprooting and overturning of *Acropora palifera* coral

**4.2. Reef fishes**

Analysis of reef fish data clearly shows that target reef carnivorous fishes were more abundant in most of the reefs inside the no-take area. Badila Dabobona (NT.4), Gallows NE (NT.5) and Gallows S (NT.6) had the highest average abundance of reef carnivores. Badila Dabobona recorded the highest average with 25 fishes and Gallows NE with 16 species recorded inside the transact. This average abundance illustrate that there is good population of reef carnivorous in other parts of the reef sampled. Furthermore, Badila Dabobona (NT.4) also recorded the highest abundance of reef herbivorous fishes with the average of 26 fishes inside sampled transact. Gallows NW or NT.5 also has the same distribution trailing very closely with average of 15 species recorded in the area of $500m^2$.

Most of the reefs inside no-take showed healthy populations and large size individuals indicating that fishing pressure on these reefs were low. It is important to understand that these large size individuals seen in each reefs will provide a successful return in terms of larval productivity to maintain a healthy population of fish stocks both inside and outside the no-take areas. Presence in high numbers of reef herbivorous fishes is an essential part of a healthy coral reef ecosystem. Their presences in high numbers could have been a possible explanation of low algae growth in n some areas that could have large algae.

Reefs outside no-take areas also had very good numbers of all target monitoring species. Hence, there were also many other species of the same functional groups observed inside and outside the sampling areas and have not been recorded.

### 4.3. Sea cucumber

Population of sea cucumber both inside and outside of no-take areas for Nuakata region is a worry. In all transacts sampled, Badila Dabobona was the only reef that recorded presence of the following sea cucumber groups, Actinopygra, Bohadschia and Sticophus. Thus, Stonefish (*Actinopygra lecanora*, Tigerfish (*Bohadschia argus*) and Greenfish (*Sticophus chloronotus*) were the only sea cucumber recorded inside the transact. Moreover, there were also presence of Stonefish, surf redfish, lollyfish, prickly redfish and amberfish seen outside of the 500m$^2$ monitoring areas.

From the estimations of sea cucumber species recorded inside the transact it is evident that population of sea cucumbers hence species abundance has dropped significantly when compared to an initial baseline data of marine stocks conducted by Conservation International in 2005. This is an indication of heavy exploitation over the last 6 years. An example of this was that during the 2005 there were a lot of *Pearsonothuria graeffei* (Kundu) recorded in side all reefs survey however; this survey did not record any of this sea cucumber inside the 500m2 nor was there any record anywhere outside in areas outside the transact.

### 4.4. Clam shells

Data for giant clam on reefs inside and outside no-take illustrates that *Tridacna crocea* (TC) or Crocus clam is the more abundant species than any other clam species. The second most abundant species was *T. maxima* (TM) or Maxima clam. Population of *T. squamosa* (TS) was only abundant at Badila Dabobona (NT.4) than anywhere else.

These results further indicate that local harvests of giant clams by local communities have also been very high. There were evidences of dead shells also noted on some of the reefs and many piles of dead shells have also been recorded at Hanakubakuba Island, Iabam, Pahilele and Grace Island (Panamoimoi Island).

### 4.5. Other invertebrates

Other marine invertebrates were highly represented by sea starfish (*Linckia lavigata*). This star fish plays a vital role in ensuring reef health is maintained by feeding on filamentous and microalgae which keeps the benthic substrate free for any settlement of coral larvae. There were some presence of lobster particularly *Panilirus versicolor* (Painted spiny lobster) in small reef crevices both inside 500m$^2$ sampling area and outside sampling areas. Presences of other target indicator species were generally low. There were numerous records of crown of thorn starfish (*Acanthester planci*) both inside transacts in no-take, outside no-take and in many areas outside 500m2 transact. A direct result of this has been dead, bleached scars imprinted on corals where predation has occurred (Figure 4 & 5). There were a total of 4 Trochus shells (*Trochus niloticus*) recorded inside Sioayoaoyoa (OT.1). Other reefs assessed also had sparse abundance of trochus however, were not recorded as they were found outside of the 500m$^2$ transact area.

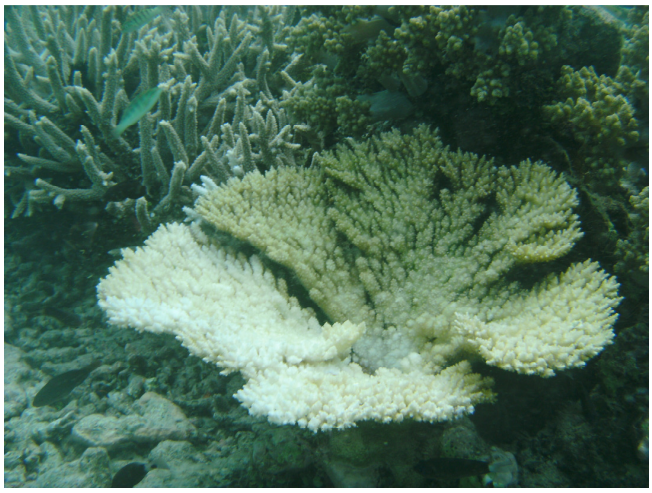


**Figure 4.** Scar left behind from a crown of thorn feeding

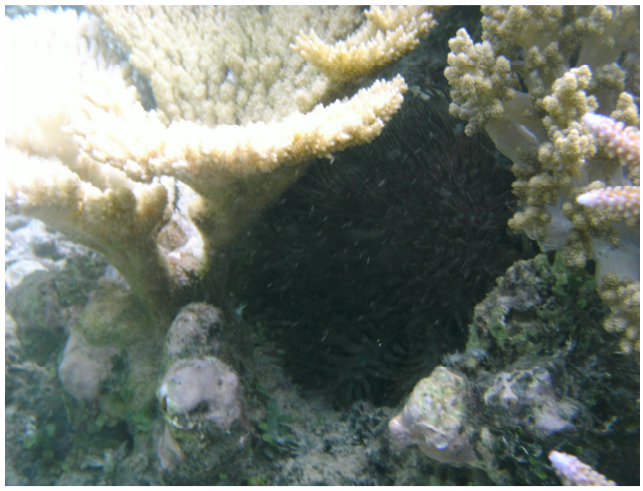


**Figure 5.** A crown of thorn starfish seeking refuge under an Infested Table coral (TC)

Results from areas inside and outside no-take generally indicate that the whole reef system inside NIPCMMA is still in a good condition. These reefs have further potentials for recovery if protection and management is adapted and used at this time. The installed monitoring transacts surveys only provide a snapshot of the conditions of reefs and also provides us with the information we need to know about the conditions of our reef.

Establishment of permanent transacts inside and outside conservation areas are important tools that will provide information on the condition of our resources over a long time of monitoring. Trend in resource decline or recovery can only be determined through long term monitoring and data collection.

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