CORAL TRIANGLE INITIATIVE
ON CORAL REEFS, FISHERIES AND FOOD SECURITY

# NUAKATA COMMUNITY BASED RESOURCE MONITORING PROGRAM SURVEY REPORT #: 2

MONITORING PERIOD: MARCH 2011

**June 2013**

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# Nuakata Community Based Resource Monitoring Program
# Survey Report #: 2
# Monitoring Period: March 2011

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# NUAKATA COMMUNITY BASED RESOURCE MONITORING PROGRAM

## SURVEY REPORT #: 2
## MONITORING PERIOD: MARCH 2011

*Large sized carnivorous fishes inside a conservation area (no-take) at Nuakata Island, Milne Bay Province*

**MONITORING REPORT WRITTEN BY**
**SIMEON ISAAC (*Nuakata CMMA Data Specialist*) and Edited by NOEL WANGUNU (*Conservation International*)**

## 1. INTRODUCTION

The Nuakata and Iabam-Pahilele Community Management Marine Area (NIPCMMA) have completed its first monitoring program for March 2011. The monitoring program has been scheduled by the management committee to take place every 3 months, and will be carried out in the months of March, June, September and December.

This report presents the findings from the March 2011 monitoring where assessments were done in the areas that have been planted with permanent monitoring stations. In this monitoring period, the local monitors was supervised by CI officers and Village Engagement Team played a major supervisory role during this survey as locally trained monitors did their assessments in areas marked no-take and in areas outside of no-take.

This March monitoring program also included installments of deepwater permanent transacts in adjacent shallow monitoring areas for assessment of fish and marine invertebrates. Having deepwater transacts shall provide further information on species diversity on the deeper waters of each sites and, information provided will further complement results from shallow monitoring stations. A vertical movement targeting mobile fish and invertebrate species as representatives for each area inside and outside no-take zones. Most of the deepwater transacts have been placed with the use of SCUBA and was undertaken by qualified SCUBA divers. The deepwater monitoring stations will at present be monitored by CI while the shallow monitoring stations be monitored by local communities. In the long run, it is anticipated that some of the local monitoring will be trained to also do monitoring for the deepwater transacts.

Shallow water monitoring station for Nuakata CMMA community

Deepwater fish and invertebrate transacts undertaken by using SCUBA

## 2. METHODS

### 2.1. Field Data Collection

Survey methods used during this March 2011 monitoring program is the same as that methods used during the 1st monitoring program in December, 2010. (Refer to December 2010 Report). List of indicators used and the survey team was the same. All surveys were done at the sites that have been planted with permanent monitoring transacts. Sites that monitoring was undertaken in this period are provided in the table below.

Table 1. Monitoring stations inside and outside no-take for Nuakata CMMA

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

Equipments and logistics used by the Nuakata Monitoring Team Include;

1. 1 x dinghy (40hsp)
2. 8 x set of snorkeling gears (kept by CI-Alotau Office)
3. 1 x GPS (recording coordinates for transacts)
4. 1 x 100 meter fiber glass tape measure
5. 2 x Underwater Digital Camera (kept by CI-Alotau Office)

### 2.2. Data analysis

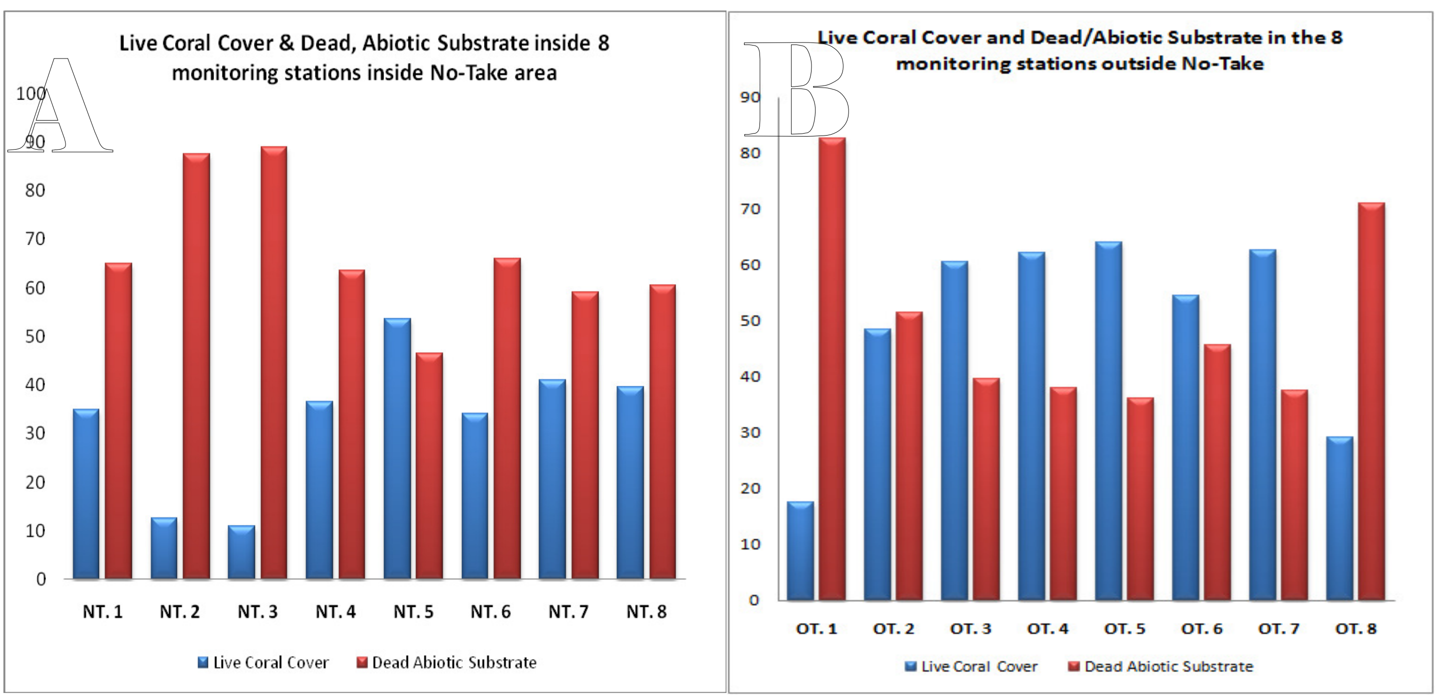
All raw field data collected in March were pre-analyzed and organized into the CMMA's hard copy datasheets before being transferred into a kept electronic spreadsheet database kept by Conservation International in Alotau.

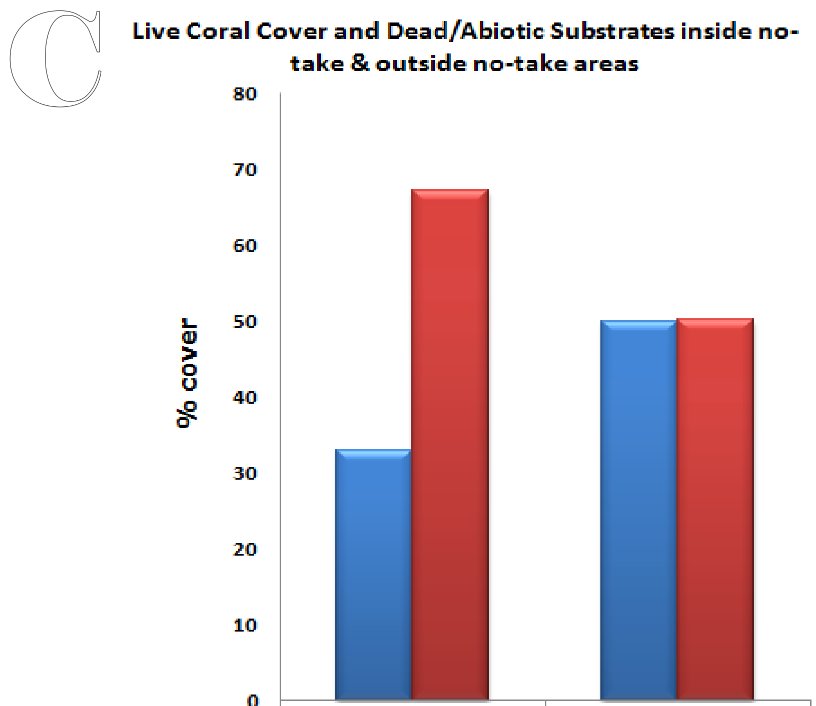
Data were analyzed following a data analysis protocol drafted by Mr. Wangunu (CI-Marine Biologist). This protocol sets the benchmark for any later data analysis and data interpretation which will be used during data analysis and monitoring report writing.

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 for reefs inside no-take and reefs outside no-take areas.





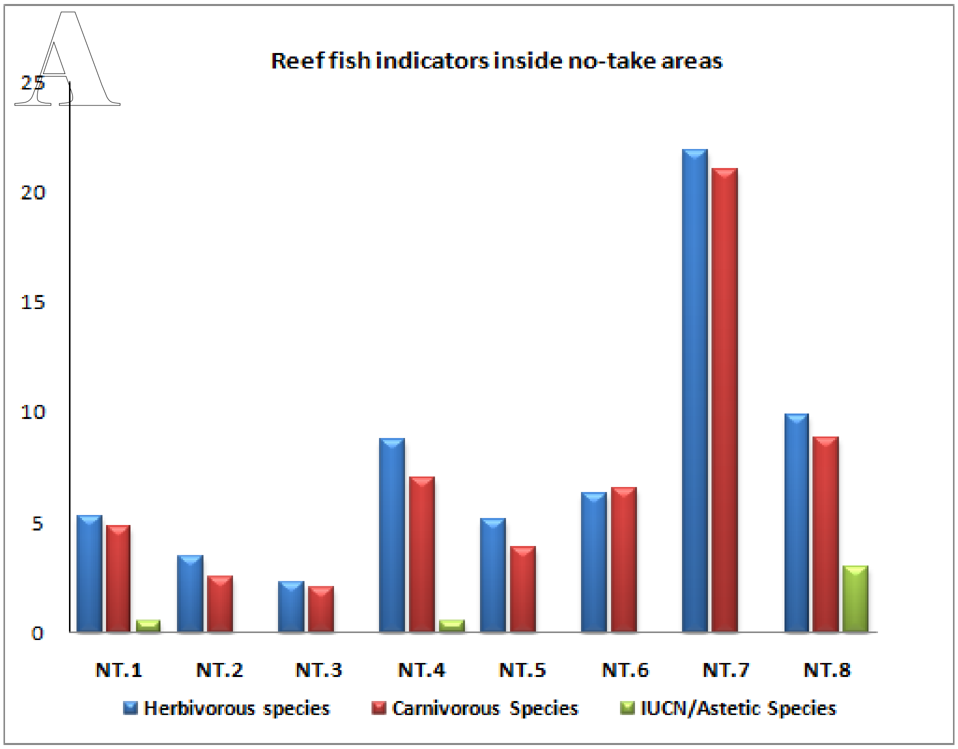

| | No-Take | Outside No-Take |
|---|---|---|
| Live Coral Cover | 32.875 | 49.8125 |
| Dead, abiotic substrate | 67.125 | 50.1875 |

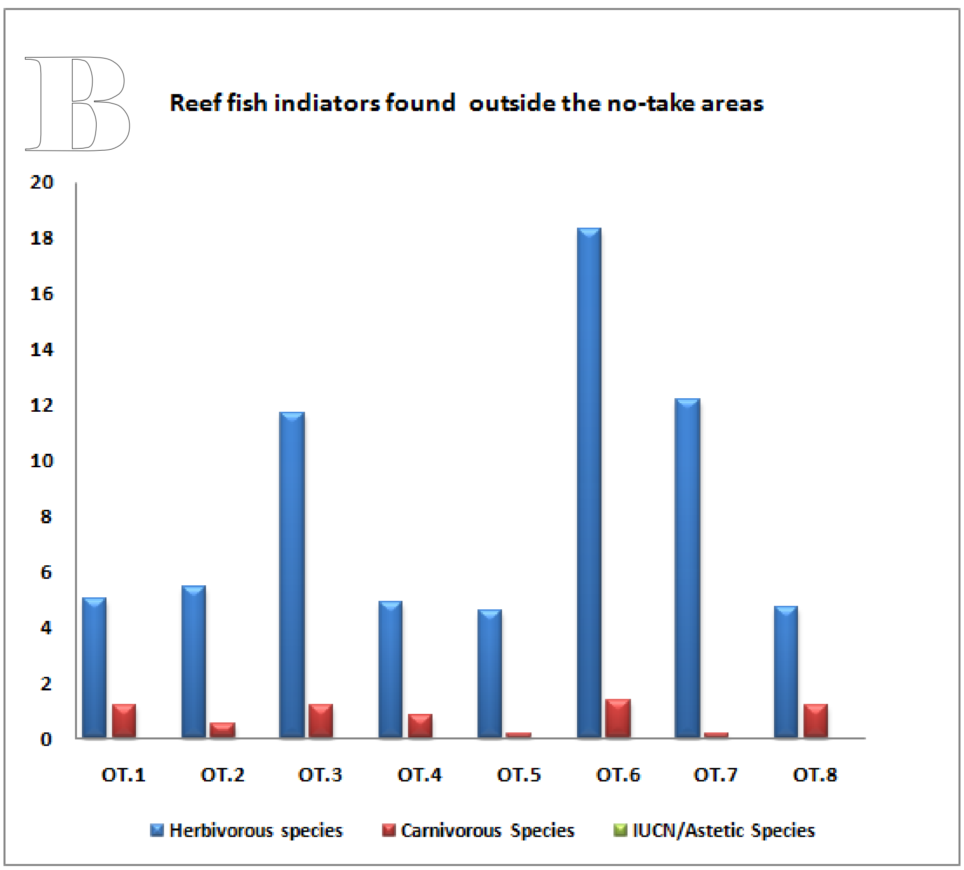
***Graph A:*** *This graph describes benthic composition for individual monitoring stations located inside Nuakata's conservation areas (no-take). Results presented in this graph illustrate high dead and abiotic substrate as dominant substrate for all monitoring stations. Live coral cover (biotic factors) was less however; some monitoring sites illustrate fair coral cover. The monitoring site located NE of Gallows Reef was the only site to have over 50% live coral cover. Other sites such like Panamoimoi SE and Panamoimoi NW each had coral cover of (41%) and (39.5%) each indicating an average presence of live corals. All other sites did have live corals present however; their percentages were all below 30%. Two reefs with very low coral cover and high dead coral/abiotic substrate were at Batutuli (NT.2) and Tawali Iks (NT.3) respectively. Live coral cover in these two sites comprised 12.5% and 11% respectively)*

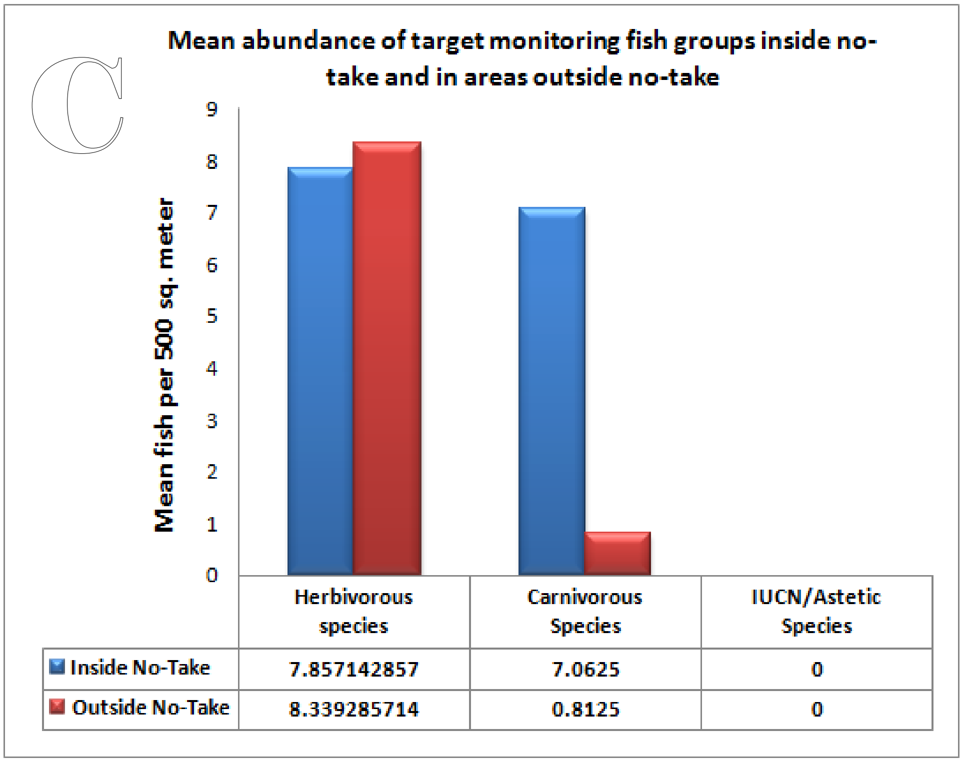
***GRAPH B:*** *Our study sites outside of the conservation areas (no-take) showed major differences to the no-take areas. Live coral cover was equally represented in many sites. 63% of all surveyed areas had coral cover dominant over dead coral and abiotic substrates. Reefs such as Gaima Niugini (OT.3) with 60.5%, Illabou (OT.4) having 62%, Tawali Gadohoa (OT.5) with 64%, Boirama (OT.6) with 54.5% and Daiwari (OT.7) having 62.5% live coral cover within the samples 500 square meters transacts. The only two sites that had high dead coral and abiotic substrates were Sioyaoaoya (OT.1) having 82.5% and Tupahilihili (OT.8) with 71% dead coral substrates and abiotic factors.*

***GRAPH C:*** *Calculating average for all monitoring stations inside and outside no-take provides an over view on how much value there is between no-take and open access areas. In general it can be noted that average live coral cover inside no-take is less than substrates dominated by dead coral and abiotic factors. No-take areas comprised 33% live coral cover while live coral cover for all sites outside the conservation area was at 50%, matching the amount of abiotic substrate.*

## 3.2. REEF FISH INDICATORS INSIDE & OUTSIDE NO-TAKE AREAS





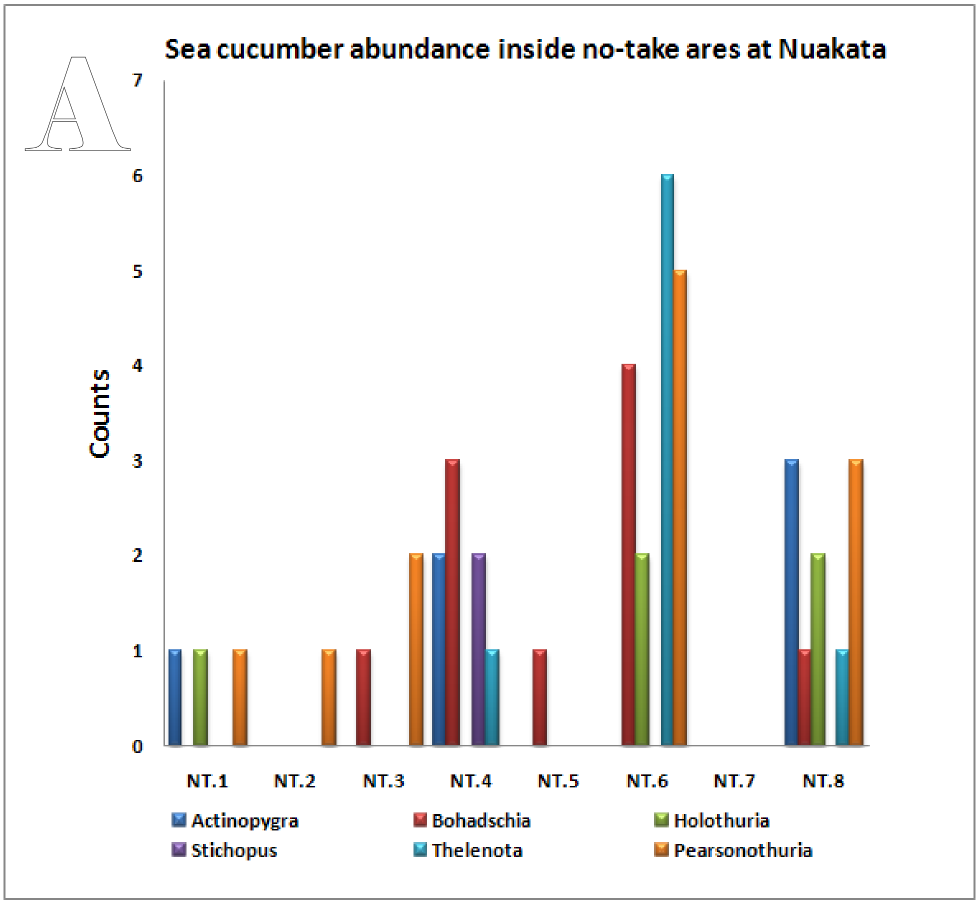

***GRAPH A:*** *Distribution and abundance of the key monitoring indicator fish species for no-take areas showed that the Southeast reefs off Panamoimoi (Grace Island) had the highest average abundance of both herbivorous fishes (22 fishes per 500 square meter of the surveyed transact) while records for carnivorous fishes had an average abundance of 21 fishes per 500 square meter of the sampling transact). Distribution of both herbivore and carnivore fishes were nearly the same however, abundance in each sites fluctuated meaning some sites have more fish per 500 square meters while others have low abundance while others had less in the sampling and/or monitoring area (500m*$^2$*)*

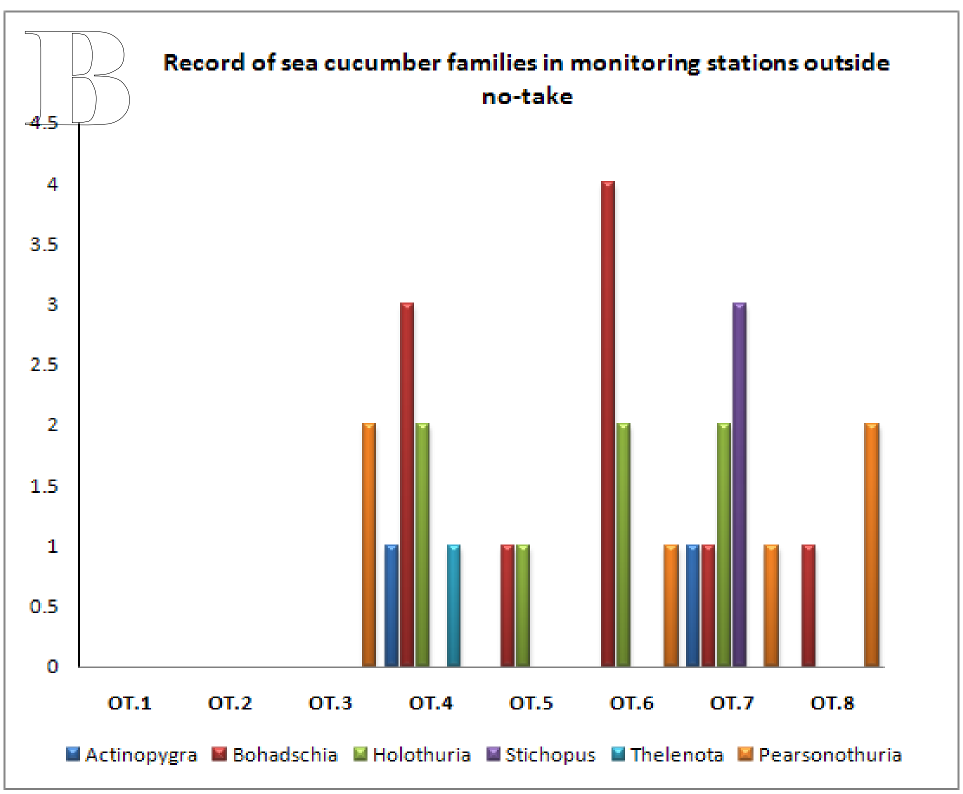
***GRAPH B:*** *on the contrary, population of herbivorous fishes was much higher than population of carnivorous fishes in the each of the 8 monitoring stations outside of no-take areas. Thus, Boirama (OT.6) had the highest average of reef herbivores with 18 fish per 500 square meters of its permanent monitoring station. Fringing reefs off Gaima Niugini (OT.3) and Daiwari (OT.7) have similar mean population of 12 fishes per 500 square meters. Average populations for carnivorous fish were very low in all 8 monitoring stations outside of no-take.*

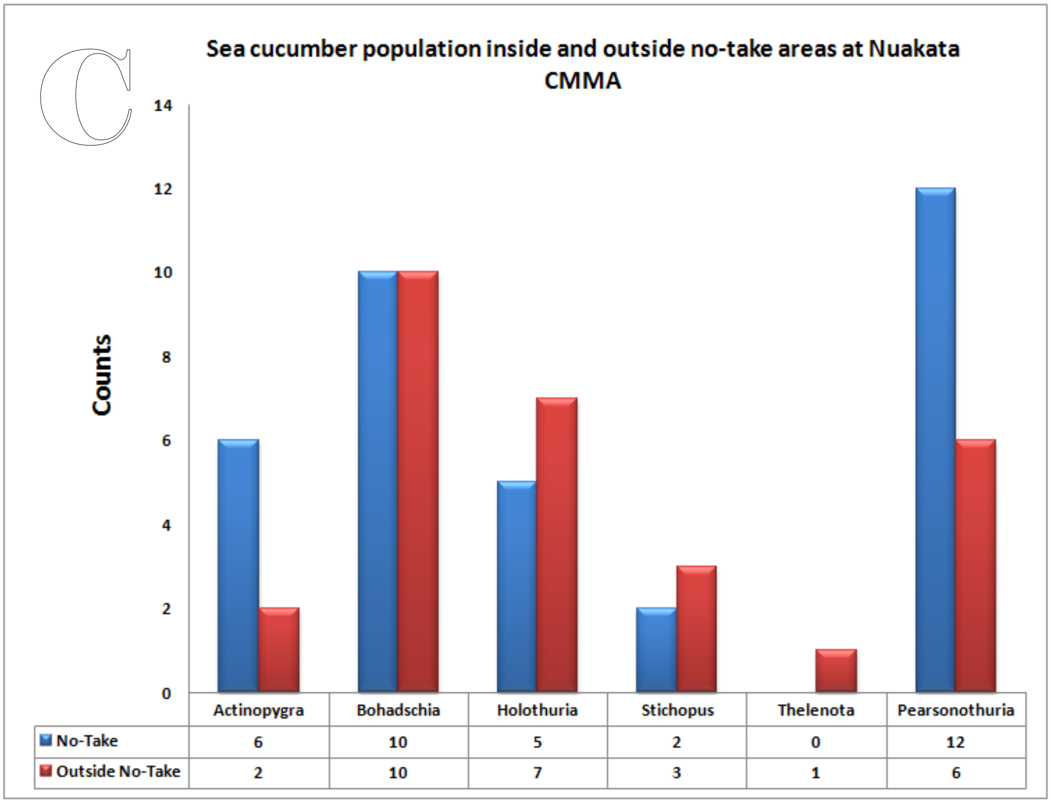
***GRAPH C:*** *Combining data on average fishes for monitoring stations inside and outside no-take clearly illustrate that there were high counts of herbivorous fishes inside individual no-take sites as well as outside the no-take areas. Carnivorous fish species showed high abundance in sites inside no-take than areas outside. There were no records for any Humphead Maori Wrasse (IUCN Redlisted Species).*

### 3.3. MARINE INVERTEBRATES

#### 3.3.1. Sea cucumber population in no-take sites and in sites outside no-take





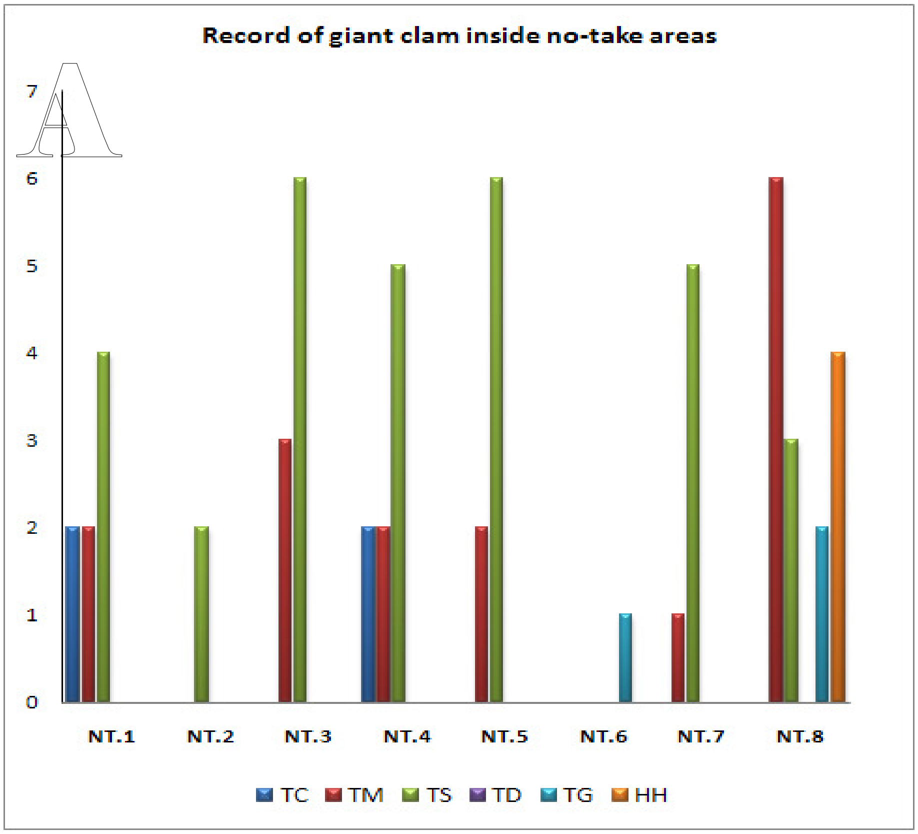

***Summary of the graphs***

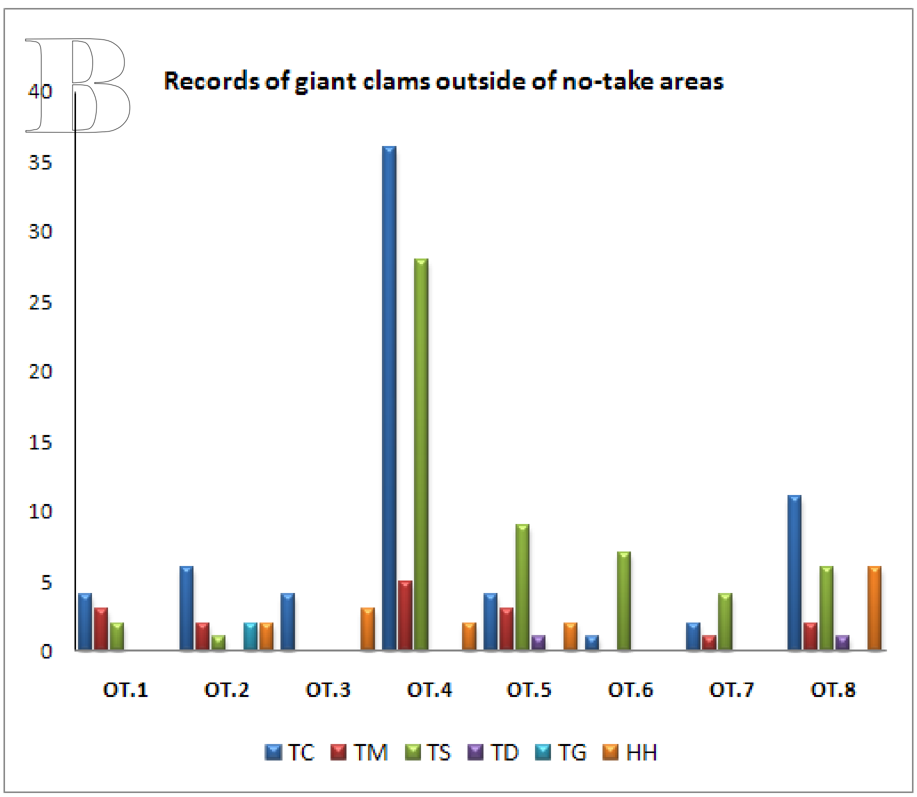
***GRAPH A: the*** *reef at southern most reef at Gallows (NT.6) recorded very high distribution and abundance of sea cucumber, having 6 counts of Thelenota, 5 Pearsonothuria, 4 Bohadschia and 2 Holothuria species. Badila Dabobona (NT.4) and Panamoimoi (NT.8) were two other sites with good record of sea cucumber. Thus, NT.4 recorded 3 Bohadschia, 2 Actinopygra and 2 Stichopus each. NT. 8 recorded 3 Actinopygra and Pearsonothuria and 2 Holothuria species. Monitoring site in Panamoimoi (SE) did not have any record of sea cucumber.*

***GRAPH B:*** *Sites outside no-take had Bohadschia dominant inside Boirama (OT.6) with 4 individuals inside its 500 meter square transact area. All other sea cucumber families had low population for the 5 major sea cucumber families. Thus, Stichopus showed an abundance of 3 individual species inside Daiwari (OT.7).*

***GRAPH C:*** *In general, no-take areas had high distribution of sea cucumber which was contributed by Pearsonothuria (35%) followed by Bohadschia (28%) and Actinopygra (17%). All other species had less than 20%. Sites outside of no-take revealed that Bohadschia contained 34% of Bohadschia, 24% (Holothuria) and 20% (Pearsonothuria) while all other species had less than 10% each.*

### 3.3.2. Distribution of giant clam inside no-take and in areas outside no-take

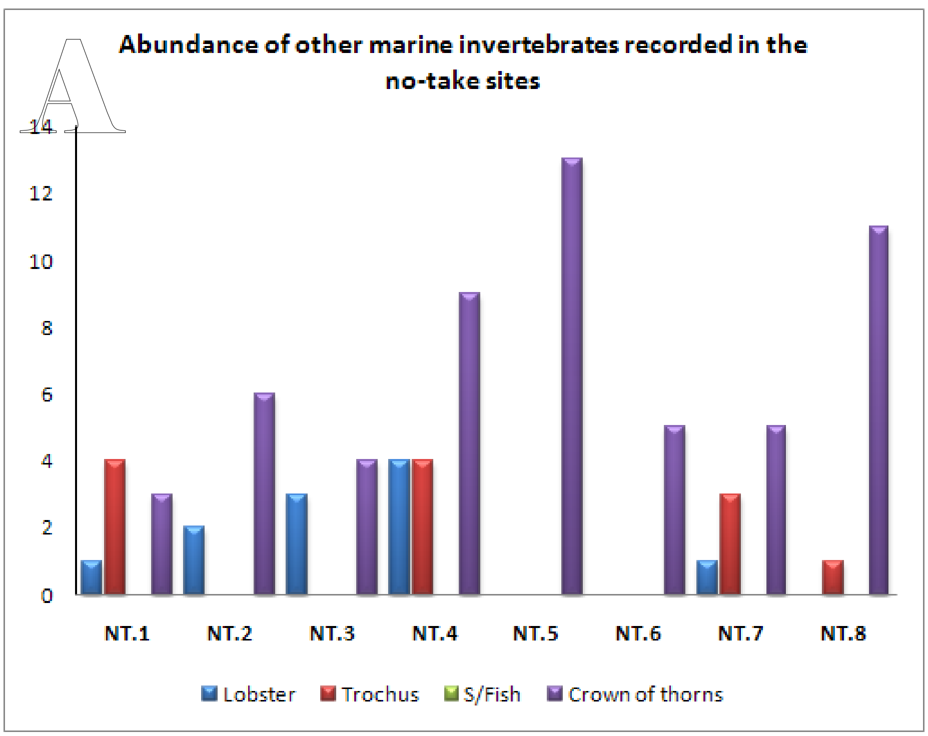


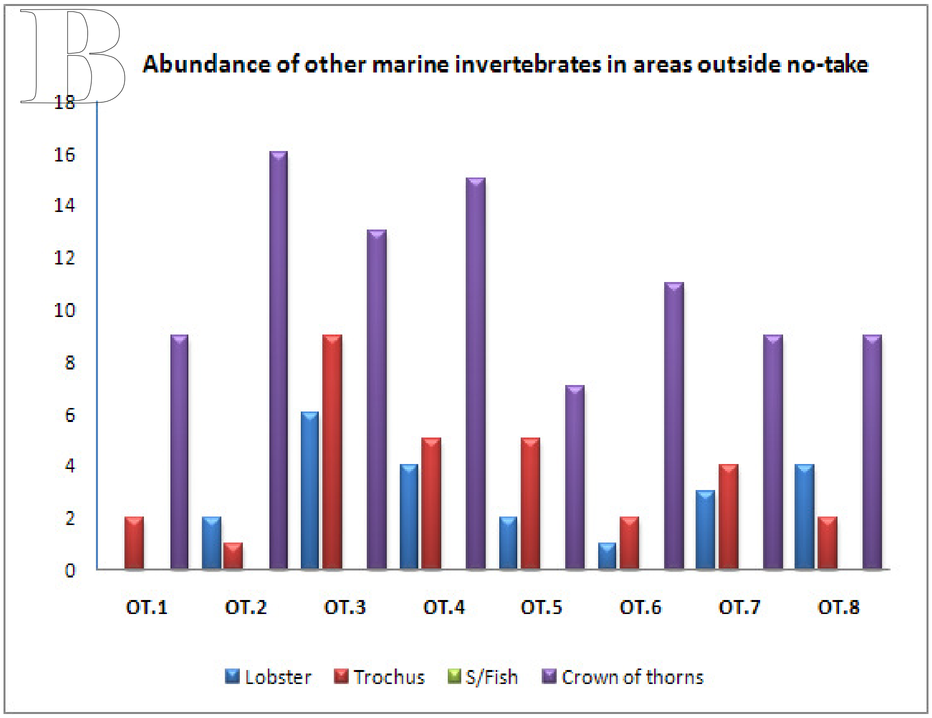



*GRAPH A: Data from this monitoring period indicate that Tridacna squamosa (TS) had high distribution and abundance inside all no-take areas. Tawali Iks (NT.3) and Tawali Gadohoa (NT.5) were two areas that showed high abundance of 6 records each. Badila Dabobona (NT.4) and Panamoimoi southeast (OT.7) were both in rank with 5 individuals each recorded inside the 500 square meter transact. All other areas had distributions of less than 4 individuals. Tridacna maxima (TM) recorded its highest abundance at the southern reef monitoring station at Gallows (NT.6). This site had a record of 6 individual. All other sites had some record of T. maxima (TM) except the monitoring stations at Batutuli (NT.2) and Gallows southern reef (NT.6) which did not have any record. Other clam species like T. crocea (TC), T. derasa (TD) and T. gigas (TG) were also present but in very low numbers. Giant clam Hippopus hippopus (HH) was only recorded in Panamoimoi northwest (OT.8)*

*GRAPH B: Distribution of giant clam shells outside of conservation areas (outside no-take) clearly show that Tridacna croacea (TC) is still the most dominant clam species found in all monitoring sites. The site outside Asailo Bay, called Illabou (OT.4) recorded the highest number of clams with a total of 36 clams within the 500 square meter area. The other site that also had high counts for this species was Tupahilihili (OT.8) recording a total of 8 clam shells. T. squamosa (TS) was recorded as the second highest distributed species having 28 counts inside Illabou (OT.4). Other clam species had low numbers scattered through the sampling transacts. Hippopus hippopus (HH) was only recorded inside Tupahilihili (OT.8) and was not recorded in the other transects.*

### 3.3.3. Other marine invertebrates (lobster, sea starfish, trochus, crown-of-thorns)






***GRAPH A:*** *Data for other marine invertebrates such as lobster, trochus shell, starfish and crown of thorn star fish (COT) in the each sites in the no-take areas showed that there were high numbers of crown of thorn starfish in the northwest reef of Gallows (NT.5) with 13 counts per 500 square meter of the transect. The northwest end of Panamoimoi also had a significant record with 11 individuals per 500 square meter area; Badila Dabobona (NT.4) with 9 COT per 500 square meter. All other transacts and/or monitoring stations inside the no-take zone all had crown of thorn starfish (i.e. 3-5 individuals per site). There were some records of lobster in some of the sites inside no-take. Badila Dabobona (NT.4) recorded 4 lobsters (Palinurus versicolor) while Tawali Iks (NT.3) had 3 and Batutuli had 2 records. All these lobsters were located inside the 500 square meters transact. Hibwa (NT.1) and Badila Dabobona (NT.4) further recorded 4 trochus shells and Panamoimoi SE also recorded 3 individuals of the same species (Trochus niloticus). There was no record of sea star fish in any of the 8 monitoring stations in this particular survey.*

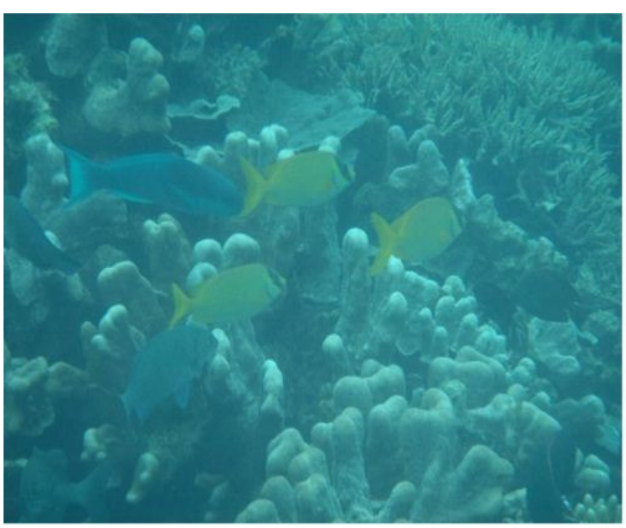
***GRAPH B:*** *Data for these invertebrates in the areas outside of no-take also showed high distribution and abundance in many of the reefs outside of the no-take. In particular, Soba Soba (OT.2) recorded the highest number of crown of thorns per 500 square meters with an abundance of 16 individuals. Illabou (OT.4) had the second highest record with 14 individuals inside the 500 square meter area; Gaima Niugini (OT.3) and Boirama (OT. 6) each recorded 13 and 11 individuals respectively; Sioyoayoa (OT.1), Daiwari (OT.7) and Tupahilihili (OT.8) each had 9 each. Tawali Gadohoa (OT.5) had the least number with 5 crown of thorn starfish recorded inside its 500 square meter transact. Records for other invertebrates like lobster showed dominance inside Gaima Niugini (OT.3) with 6 individual records. Following closely is Illabou (OT.4) and Tupahilihili (OT.8) with 4 records each. All other sites had sightings of less than 3 individuals. Trochus shell was recorded highest inside Gaima Niugini (OT.3) with 9 sightings followed by Illabou (OT.4) and Tawali Gadohoa (OT.5) with records of 5 individuals. All other sites had 3 or less records.*

## 4. DISCUSSION

### 4.1. Benthic substrate

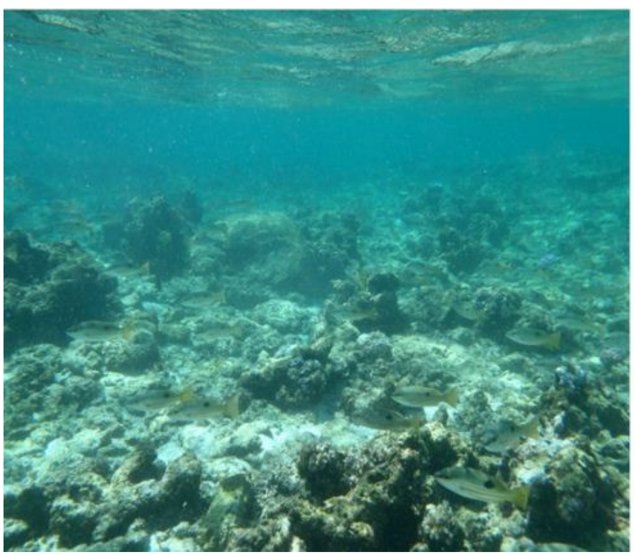
No take areas have been described to having low live coral cover when compared to dead coral/abiotic substrates (Section 3.1. Graph A) on the basis that many of these reefs are located on the peripheral areas of the main continental shelf that forms the Island of Nuakata as such, are always subjected to high prevalent conditions (or high seas/swells/drastic conditions) that is often driven by strong southeast trade winds. Some of the monitoring sites are also located on isolated patch reefs (example. Hibwa, Tawali Iks, and Batutuli) which, less strength coral types like Acropora corals that often bear branches and table morphological features often thrive in these conditions making them prone to the described conditions. Despite facing these conditions, their location away from anthropogenic impacts enables their natural ability to recover or regenerate much higher (i.e. high resilience) that they regenerate quick even after short period of natural disaster. Furthermore, less number of live coral cover does not necessarily mean that all areas have dead coral rubble. Results from Hibwa (NT.1), Badila Dabobona (NT.4), Panamoimoi Island (NT.7) and southern reef of Gallow (NT.6) showed that these areas were dominated by hard rocky bedrock substratum which coral recruitment into these areas showed signs of new recruitment. The high contribution of this bedrock did highly influence the data which showed high dead corals and abiotic substrate over live coral cover. Thus the main composition of the abiotic substrates in each of the areas with high abiotic materials is summarized as NT.1 = Rock, NT. 4 = Rock, NT. = 6 and NT. 7 = Rock. The only areas having high dead coral rubble were Batutuli (NT. 2) and Tawali Iks (NT.3). These areas of hard bedrock and also provided good substrate for coral settlement and in some areas showed large coral recruitment.

All monitoring stations for sites outside of no-take are located on the mainland fringing reef. These fringing reefs are exposed to both oceanic conditions as well as terrigenous conditions that discharge during periods of heavy rain. The general condition in these reefs cannot be described 100% oceanic. Amount of coral cover on fringing reefs equal the amount of dead coral and abiotic substrates. On average, coral morphologies forming live coral cover in the area comprised 50% of staghorn corals (particularly branch corals) while 25% were corals with submassive structures (SMC) and the remaining were soft corals and individuals of massive coral bounders. It is particularly noted that in areas where sediments accumulated corals with submassive and massive structures tend to seen more while in areas of sheltered bays like Illabou (OT. 4) and Tawali Gadohoa (OT.5) seagrass was more dominant. Areas with constant water circulation and current flow showed high preference to branching corals; Gaima Niugini (OT.3), Daiwari (OT.7) and Tupahilihili (OT.8) are examples of these areas with constant current circulation and healthy branching corals.




## 4.2. Reef Fish

The high abundance of carnivorous fishes inside Nuakata's CMMA has direct relationship with local community fishing patterns. From previous household studies by Conservation International it was apparent that may fishing activities for daily livelihood often take place inside the islands fringing reefs on a daily basis (Christensen et al. 2002). Fishing on the patch reefs often take place on weekly basis and the furthest barrier and outermost reefs such as Badila Dabobona (NT.4) and Gallows (NT.5 and NT.6) usually take place during the northwest Monsoon season when the seas are calm. Thus, usually motorized boats are used by the islanders in those locations. Frequency of visit there is very minimal. Base on these and island food security issues, many sites designated as no-take and/or conservation areas were located in these outskirt reefs. Results generated from the current and the previous study done in December 2010 indicated that number of carnivorous fishes were on average higher in the conservation areas than in the open fishing area (outside no-take) fish indicators like Bailawa (*Sabre squerellfish*), Auauli (*Bluespotted hind*) and Gilita'ata'ai ( *Foursaddle grouper*) all proved these. There were more abundant per 500 square meter transact in no-take than in sampling stations outside no-take. Results for herbivorous fishes were different to this. Abundance of herbivores inside no-take was the same as those outside the no-take (Section 3.2, Graph B). Fishes such as Ovili (*Blueline surgeonfish*), Osaalaalawa (*Dark capped parrotfish),* Wulioalaoalu (*Orangespine unicornfish*) and Debi (*Fork tail rabbitfish*) used as indicators all showed high abundances in each representative monitoring sites indicating that each reefs studied contained high abundance of this reef health keepers. The high population of herbivores could be attributed to the communities reef management practices exercised over the last decade whereby bad fishing practices such as use of gillnets, derris vines and blast fishing using dynamites have been abandoned.



## 4.3. Sea Cucumber

Data generated from Nuakata's second monitoring program clearly indicates two things. (a). Numbers and aggregation of large brook stock (breeding adult) sea cucumber in all sampling stations indicate that sea cucumber populations have been severely depleted by the sea cucumber trade. There has been a massive reduction that even though there were many suitable environments relevant for different species, there was no record of any aggregation of >4 sea cucumber 100 square meters. Relevant environments that you would expect to find different species of sea cucumber did not show any sea cucumber. Or if there were, then it is individuals of different species and not an aggregation of different species. (b). There were a lot of new juvenile sea cucumber in many areas both inside and outside of the no-take; indicating positive signs of local recruitment. Furthermore, the current moratorium (or ban) that has been imposed by the PNG National Fisheries Authority on sea cucumber exports in Milne Bay has helped populations in some areas recovered however; many shallow habitats for species of high commercial values still require a lot more time for recovery. As indicated by graph

C in section 3.3.1, the common occurring families at this present time include Bohadschia, Pearsonothuria and Holothuiria, and with common species like *Bohadschia argus* (Tigerfish), *Pearonothuria graffei* (Flowerfish) and *Holothuria atra* (Lollyfish). Observations from outside 500 square areas further showed good population of *Actinopygra leuconara* (Stonefish) Hence, our general impression on sea cucumber population (i.e. regardless of whether they are high or low value species) does indicate that the effort on closing off sea cucumber fishery in the province over the last 2 years has allowed new recruitment in many areas. Thus, it would only be better if this closure is further extended to another 3 years. Furthermore, results from other complementary study like the deepwater transacts study clearly showed that there are large sea cucumbers in deeper waters however; more time is required for an active supply of brood stock to repopulate areas that have been overfished.

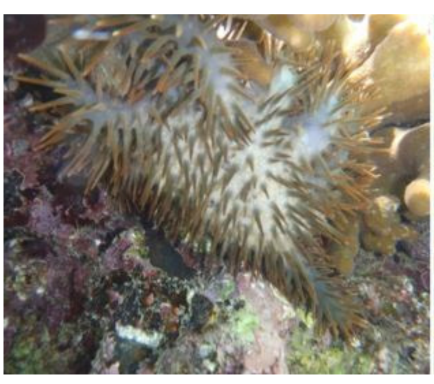


### 4.4. Clam Shell

Monitoring results presented in section 3.3.2; Graphs A, showing *Tridacna squamosa* (TS) having high abundance in all no-take areas is not accurate as a result of incompetence's in distinguishing differences and correctly identifying *T. squamosa* (TS) from *T. maxima* (TM) by local monitoring. TM should have been more abundant than (TS). *T. crocea* (TC) continue to dominate the shallow fringing reefs areas that have hard coral and reef bedrock were they easily barrow into. Water conditions associated with sediment and nutrient provided important habitat for these species thereby enhancing their population on shallow fringing reefs.

### 4.5. Other invertebrates *(Lobster, trochus, crown of thorn starfish & starfish)*

Results generated from inside and outside no-take shows that population of rock lobster, trochus and starfish were very low in many reefs that had suitable environments for these organisms. Although there were presences of the described invertebrates, their density per 500 square meter of study implies that that general population is extremely low in both areas. Crown of thorn population found during this period is a worry as the density was extremely high. Data from NT.8. Panamoimoi (NW) showed an abundance of 11 individuals per 500 square meters while the reefs outside of no-take (OT.2) Soba Soba showed the highest record of having 16 crown of thorn (COT) starfish inside 500 square meters. The high number of crown of thorn records during this monitoring may be a result of some imbalances in ecosystem process which we do not know at this stage. It is important that the coming monitoring period in June will investigate potential causes of the high numbers recorded.



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