CORAL TRIANGLE INITIATIVE
ON CORAL REEFS, FISHERIES AND FOOD SECURITY

PAPUA NEW GUINEA

NUAKATA COMMUNITY BASED RESOURCE MONITORING PROGRAM SURVEY REPORT #: 9

MONITORING PERIOD: DECEMBER 2012

June 2013

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Nuakata Community Based Resource Monitoring Program Survey Report #: 9 Monitoring Period: December 2012

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9

NUAKATA COMMUNITY BASED RESOURCE MONITORING PROGRAM

SURVEY REPORT #: 9
MONITORING PERIOD: December 2012

MONITORING REPORT WRITTEN BY
JOEL ARAEA
(Nuakata CMMA Data Specialist)

PREFACE

Mr. Joel Araea (on behalf of the chairman)

Chairman
Nuakata CMMA

On behalf of the chairman and the committee for Nuakata CMMA, I welcome you all to this 9th monitoring report for Nuakata Island community Marine Managed Area (NCMMA). Firstly I would like to thank the Nuakata monitoring team for a wonderful effort displayed in this monitoring. This monitoring was a lot tougher than the previous monitoring programs. The weather was just unpredictable, tougher conditions induced by strong south east winds and west east winds driven by rough seas, swells and strong surface, and under water currents which you all felt during your assessment. I am very pleased to say that despite all this obstacles, with the perseverance and determination shown by each member of the monitoring team, I congratulate you all for your time and effort in this important community activity. (YAUWEDO) thanks a lot.

ABOUT THIS REPORT

This December Monitoring Report has been written in two parts. Part 1 of the report presents the results for data gathered during the December 2012 monitoring period while Part 2 of the report shows the population trend for all data from December 2010 to December 2012. Population trend for the 2 years shows provides us some indication of our resources since we adopted the concept of resource management.

1. INTRODUCTION

The successful completion of this 9th monitoring is another milestone for the local monitors for Nuakata Community Marine Managed Areas (NCMMA). Faced with great challenges and task, the monitoring teams have done it again through sheer determination and enthusiasm.

Monitoring results for this period have indicated some slight changes in numbers of monitoring species however; there not so different to those done in October and July 2012. Some results have shown some changes, while some showed no change at all. Of all this results from permanent monitoring stations, other general observation for many reefs showed significant coral recruitment with a lot of new settlements on areas with bare bedrock. This has been one positive result for many reefs. A major setback for the last two monitoring periods was high density records for (crown- of- thorns) CoT starfish which continue to show increase abundance in some monitoring transact. In fact the average recorded for No-Take was 2.25 CoT per 500m2 per surveyed transact. Many interesting findings in the area include increase population of reef herbivore fishes which signifies a very healthy and pristine condition in many of the reefs; increase records for carnivore fishes inside many no-take sampling stations which are good indication of what CMMAs can provide as good seeding or supplier for many open fishing areas for the people of Nuakata Island. There are many interesting findings summarized in the report which we would like you to read and know about what is happening in Nuakata Island (NCMMA). Should there be any questions or queries you face as you read through this report, please do not hesitate to contact me (Joel Araea) or my supervising Marine Biologist (Mr. Noel Wangunu), CI office in Alotau on Phone# 6410349

2. METHODS

2.1. Field Data Collection

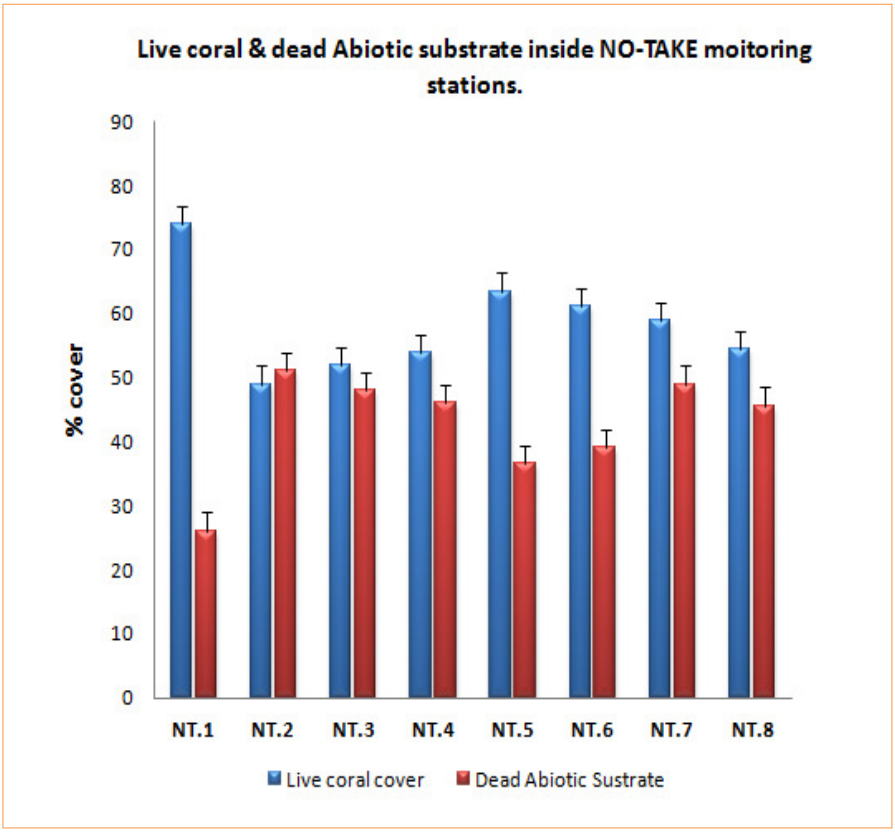
The community based monitoring program was done in the same way using all survey methods described in most of the monitoring reports. There was no introduction of new survey techniques nor was there any changes or alteration to the way we collect our data or to the monitoring stations.

2.2. Data analysis

All data have been prearranged after each day's monitoring and have been filled into a mock database as that kept and used by Conservation International. These "paper" database or raw data is then being entered into the electronic database on a Microsoft Excel spreadsheet where relevant analysis was then conducted to produce the results shown in Section 3 (Results) of this report.

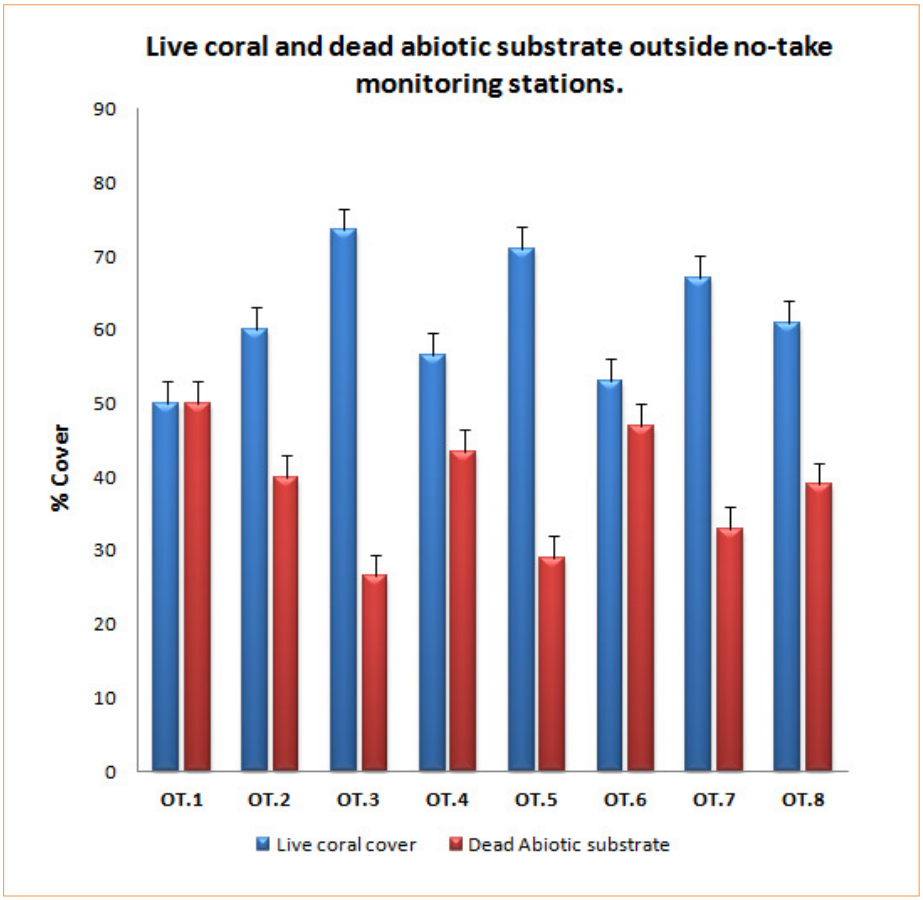
3. RESULTS

3.1.1 Benthic substrate for reefs inside No-Take



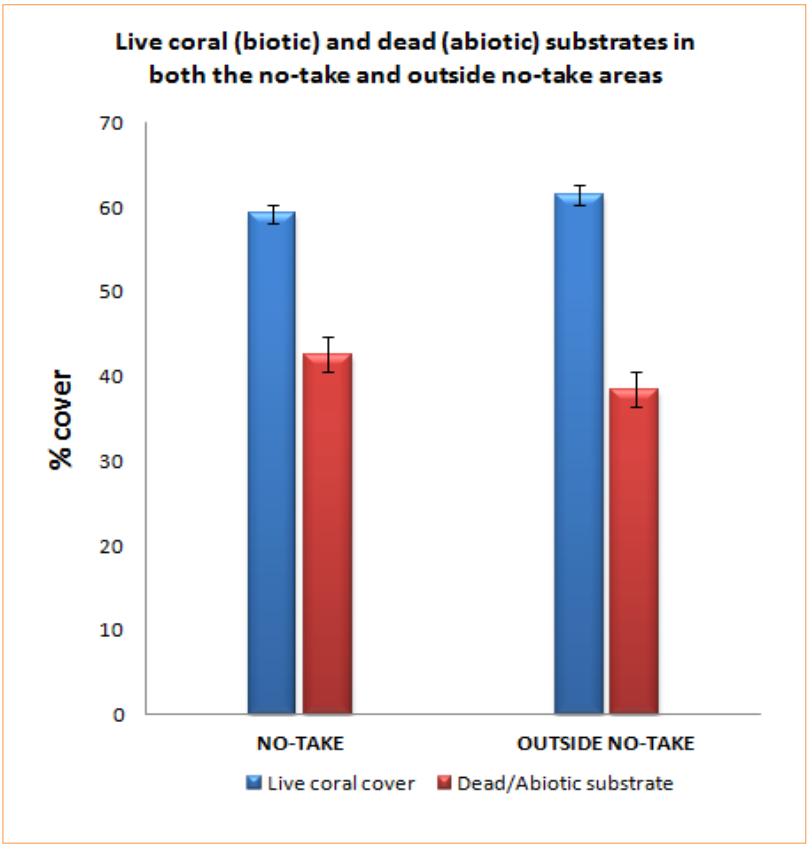
Hibwa (NT.1) recorded the highest coral cover with 74% of which 17.5% comprised branching corals (BC). The monitoring station at Gallows northeast (NT.5) recorded second high coral cover with 63.5% where the majority of the corals within the survey area were 21.5% table corals (TC) while Gallows SE (NT.6) had 61% which 21.5% also comprised table corals (TC). The monitoring station outside Grace Island (NT.7) had a high dominance of SMC (26.5%) and the monitoring station on the SE end (NT.8) has high dominance of SMC (13.5%), BC (10%). Thus, in this monitoring period our data clearly show that 87.5% of all monitoring stations has high coral cover that dead and abiotic substrates.

3.1.2. Benthic substrates for reefs outside No-Take areas



Results from this stations outside no-take has a similar coral cover distribution as those inside no-take. All monitoring stations recorded higher coral cover than dead, abiotic substrates where Gaima Niugini (OT.3) showed an individual high percentage of 73.5% which 17.5 comprised table coral (TC) and 14.5% was soft coral (SC).Tawali Gadohoa (OT.5) was the next site with the second highest live coral cover percent (71%) which 14.5% was branched corals (BC) and 12% submassive corals (SMC). Tupahilihili (OT.6) recorded 61% coral cover where 10.5% was soft corals (SC) while branched corals (BC) and table corals (TC) recorded 7.5% in the sampling area. All other monitoring stations had live coral cover percentage ranging 50-60%. All dead and abiotic substrates were lower than live coral percentage for this monitoring period.

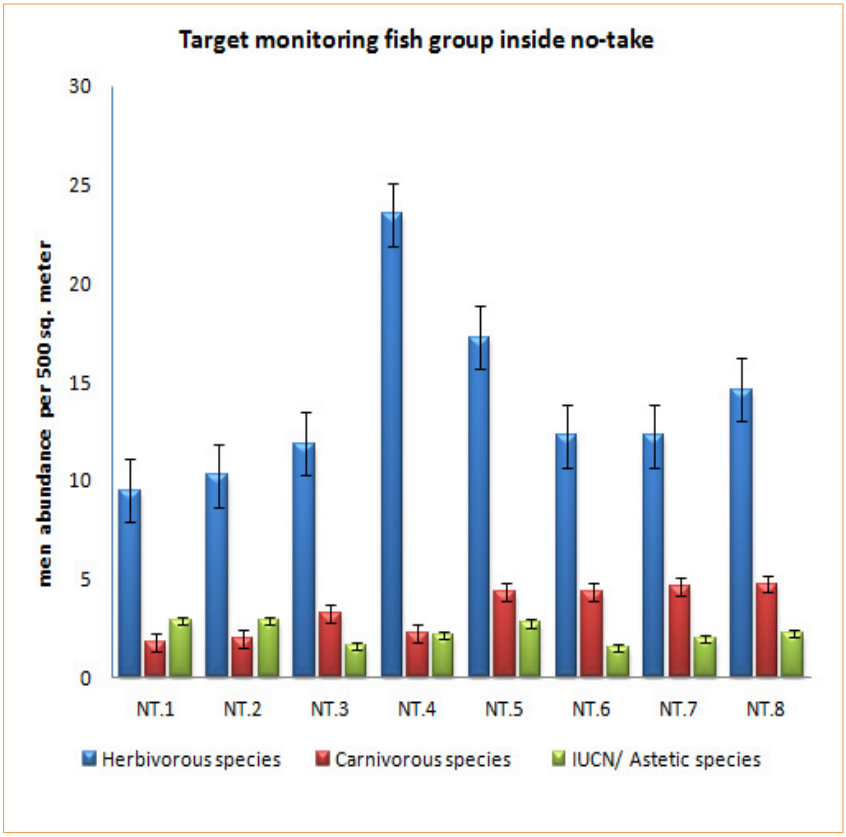
3.1.3. Benthic substrates for monitoring stations inside and outside No-Take combined



As shown in the graph for sites inside no-take and sites outside no-take there were more coral cover inside no-take and outside no-take. Thus, live coral cover for no-take areas amount to 59.3% and stations outside no-take recorded 61.5%. Distribution of coral substrates like table corals (TC), branching corals (BC), soft corals (SC) and submassive corals (SMC) had a wide distribution in many of the monitoring stations. Monitoring stations outside no-take also show a similar distribution pattern as those for the no-take paper.

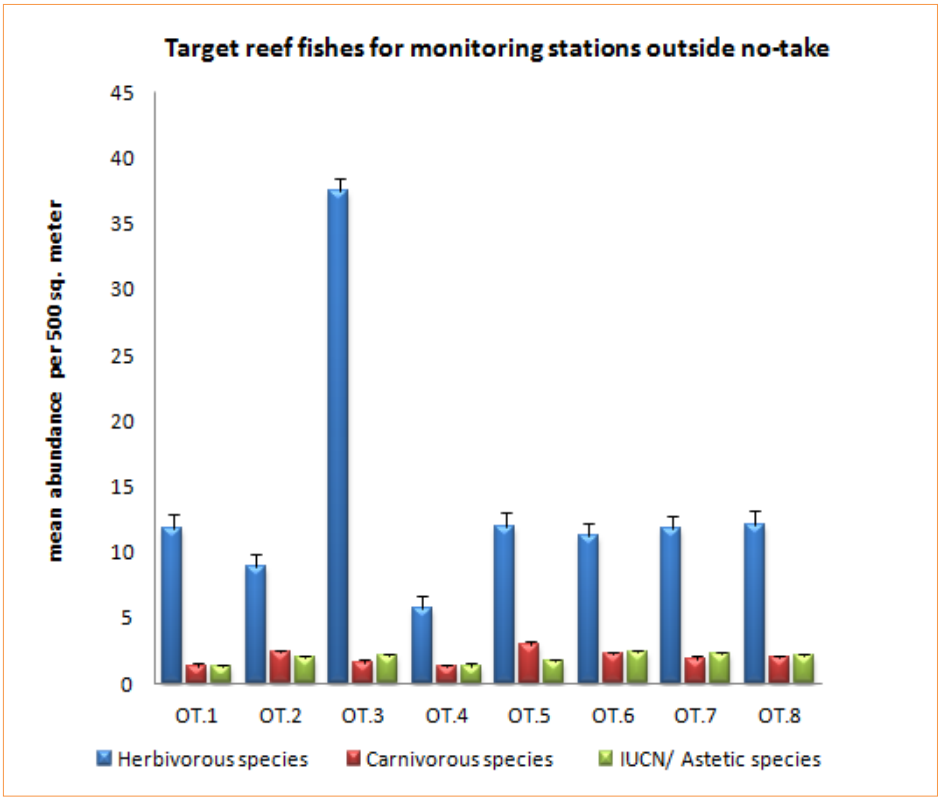
3.2 REEF FISH INDICATORS INSIDE & OUTSIDE NO-TAKE AREAS

3.2.1. Target Reef Fish indicators inside No-Take



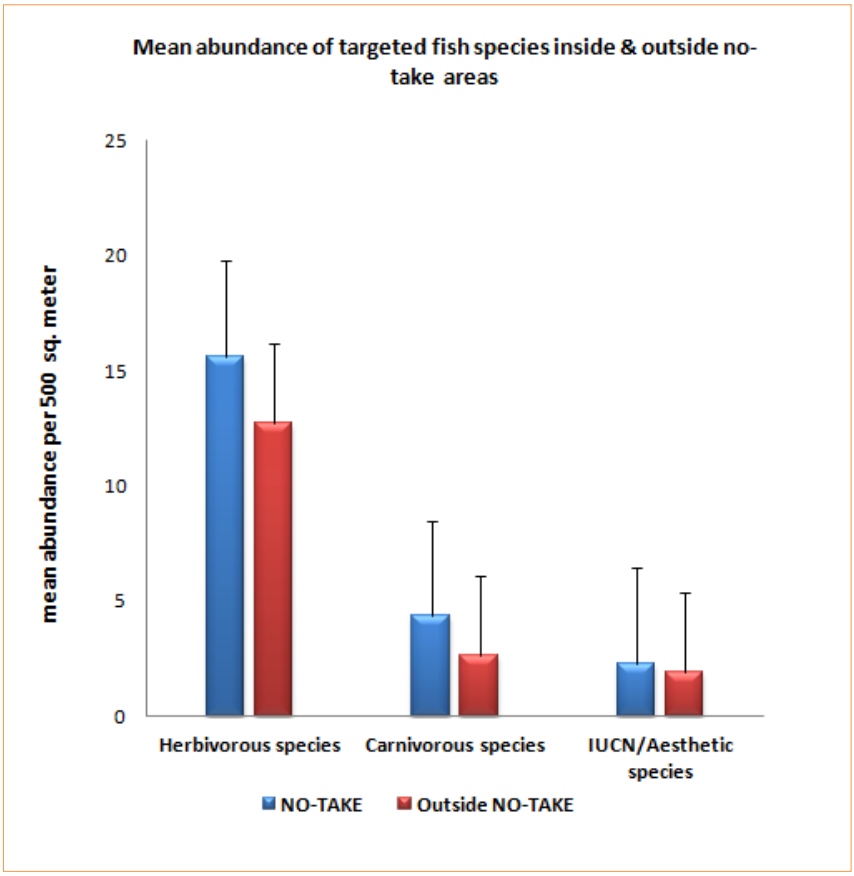
The results from this monitoring continue to show high distribution and abundance of herbivore fishes. Badila Dabobona shows a very high abundance with mean distribution with 23.0 herbivore/500m^2. This distribution is seconded by Gallows NE with mean abundance of 17.3 herbivore/500m^2. The reefs southeast of Grace Island records the third highest distribution with mean value of 14.6 herbivore/500m^2. In this averages our data also shows that striated surgeonfish *(Ctenochaetus striatus)* and bullethead parrotfish *(Chlorurus sordidus)* were the two species with high abundance at Badila Dabobona (NT.3) while at Galows, the Striated surgeonfish also has the high distribution followed by Debi Silverspine foot *(Siganus argenteus)* and at Grace Island, Striated surgeonfish and bullethead parrotfish were also common. Population for carnivore fishes continue to be low with the high average being 4.8 carnivore/500m^2 and was around the southeastern part of Grace Island (NT.8). All other monitoring stations recorded low distributions for carnivore fishes. Population counts for the endangered Humphead Maori Wrasse and moray eel continue to be very low in this monitoring period when compared to the previous two monitoring programs.

3.2.2 Target reef fish monitoring indicators outside No-Take



The distribution and abundance of indicator fish species for outside no-take areas showed that Gaima Nuigini (OT.3) had the highest average abundance of Herbivore species, 37 fishes per 500m^2 of the surveyed transact. Tuphahilihili (OT.8) had second highest average abundance for herbivore species with 12 herbivore/500m^2. All other monitoring stations recorded between 12.1 and 11.3 herbivore fishes. The lowest record for herbivore fishes was at Illabo (OT.4) with a low mean average of 5.8 herbivore/500m^2. Population numbers for carnivore fishes was significantly low for all monitoring stations in this assessment period. The highest mean value for the carnivore fishes was 3.0 carnivore/500m^2 and was from Tawali Gadohoa (OT.5) and the lowest average was 1.2 carnivore/500m^2 and was at Illabo (OT.4). This low abundance counts was also the same for the endangered Humphead Maori wrasse and moray eel. Sobasoba (OT.2) was the only side to record an average of 2.0 species/500m^2 while all other sites had much lower averages.

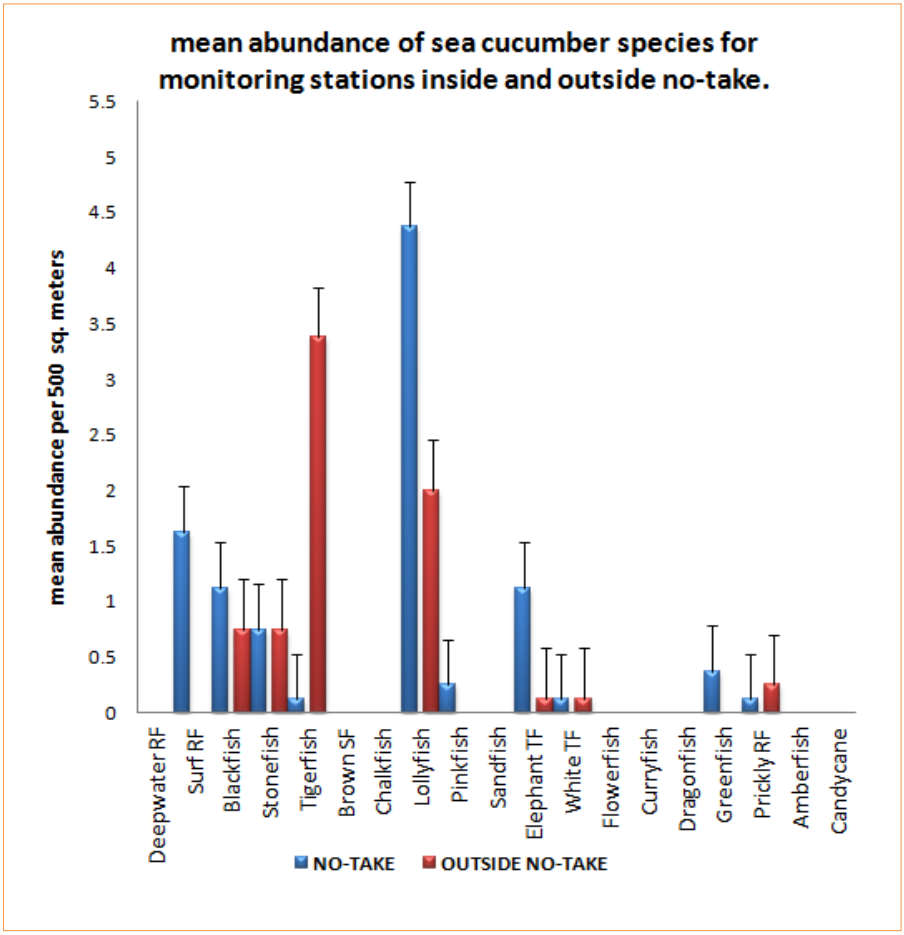
3.2.3. Mean abundances for target monitoring fishes inside & outside No-Take areas combined



This graph clearly shows high averages for herbivore fishes inside no-take with an average of 15.6 herbivore/500m^2 and 12.7 herbivore for the stations outside no-take. Mean values for carnivore fishes inside no-take was 4.3 carnivore/500m^2 while those outside no-take was 2.6 carnivore/500m^2. Abundance and distribution for the endangered Humphead Maori Wrasse and moray eel inside no-take was 2.3 species/500m^2 and 1.9 species/500m^2 for the stations outside no-take.

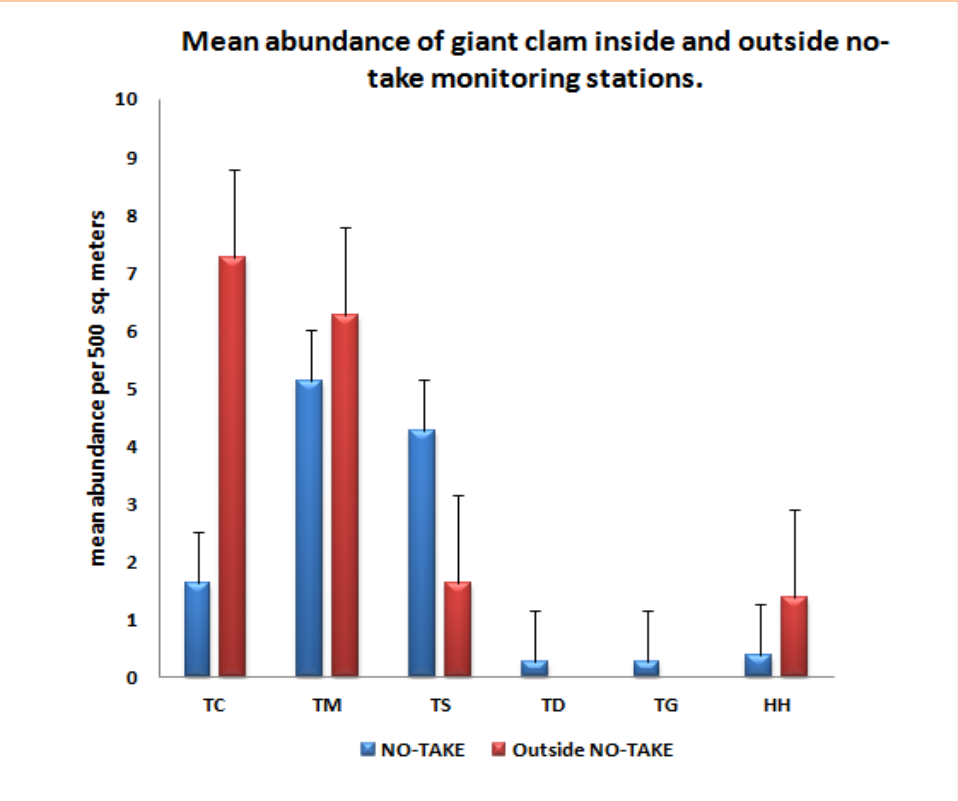
3.3 MARINE INVERTEBRATE

3.3.1. Sea cucumber



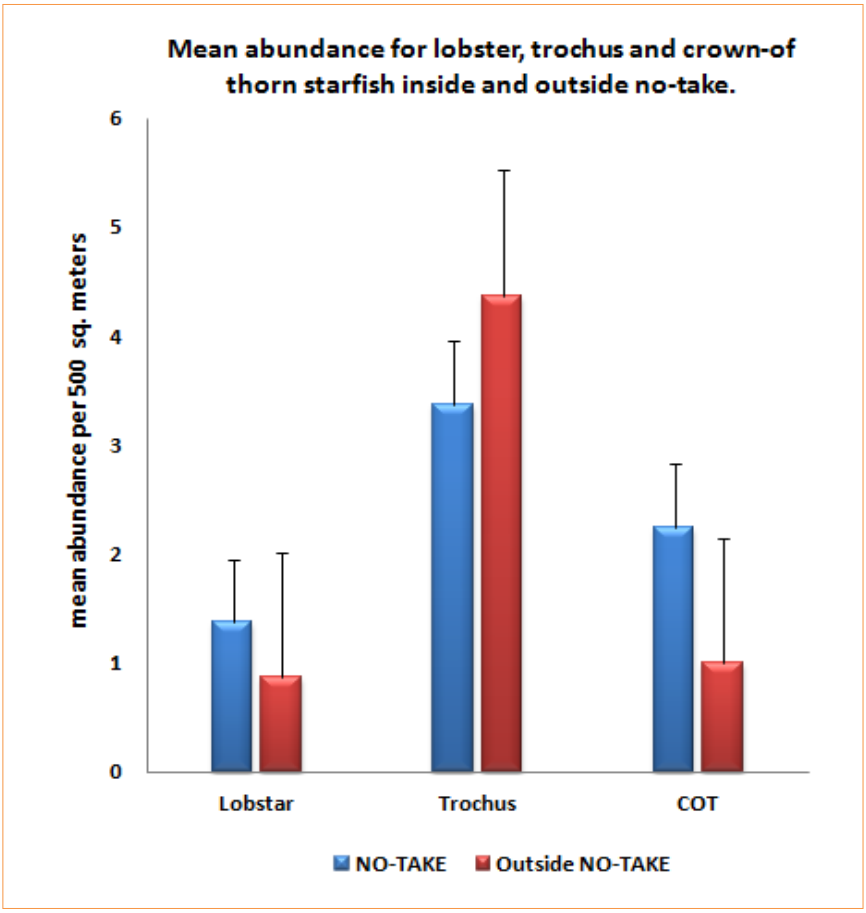
The graph above shows a presence of 9 species inside the no-take monitoring areas. Species recorded include; Blackfish, Stonefish, Tigerfish, Lollyfish, Pinkfish, Elephant Trunkfish, White Teatfish, Greenfish and Prickly redfish) From the given 9 species, Lollyfish had the highest average of 4.4 species/500m^2 for the 8 no-take monitoring stations. Other sea cucumber species and their averages include; Surf redfish with mean abundance of 1.7 species/500m^2; Elephant Trunkfish and Blackfish with averages of 1.1 species/500m^2. for the monitoring stations outside of the no-take, Tigerfish had the widest distribution and abundance with an average value of 3.4 species/500m^2 followed by Lollyfish with an average of 2.0 species/500m^2.

3.3.2. Giant Clam



In all monitoring stations inside no-take, the Maxima clam (TM) recorded high average of 5.1 species/500m^2 followed by Scaly Clam (TS) recorded 4.25 species/500m^2 in followed by Boring Clam (TC) recorded 1.6 species/500m^2, Bear Paw Clam (HH) with average of 0.38 species/500m^2 while TG and TD recorded the lowest averages of 0.3 species/500m2 respectively. The monitoring stations outside no-take shows high presence for TC, TM and HH. On average TC recorded 7.3 individuals/500m^2 followed by TM with an average of 6.3 individuals/500m^2 and HH recording an average of 1.4 individuals/500m^2.

3.3.3. Other Marine sedentary resources (Lobster, trochus crown-of-thorn starfish)



This graph clearly shows that the average record for lobsters per 500m^2 for sites inside no-take was 1.4 individuals/500m^2 while those outside no-take was 0.9 individuals/500m^2. Distribution and abundance of trochus shells inside no-take zones were lower than those recorded for the monitoring stations no-take. Thus, the no-take areas had an average abundance of 3.4 individuals/500m^2 and sites inside no-take was 4.4 individuals/500m^2. There were presence of crown-of-torn starfishes in both the no-take areas and outside no-take. The average gathered for no-take was 2.3 CoT/500m^2 for the 8 monitoring stations while sites outside no-take recorded an average of 1.0 CoT/500m^2.

4. DISCUSSION

4.1. Benthic substrate

The December 2013 monitoring program records the highest coral cover for the 2012 monitoring period with averages of 59.3% live corals and biotic substrates inside the no-take areas. Previous monitoring like that in March recorded 38.4% cover while July recorded 33.1% and in October, the no-take recorded 54.5%. Having this increased coral cover percentage does not mean that a lot of coral grew between March and December because corals do not grow fast in a short space of time. There are many reasons that could have lead to this high percentage. Factors such as bad weather conditions could be a reason affecting effective data collection in March and July. It was obvious that sea temperature was cooler than usual and was captured in those respective monitoring reports. Inconsistency in the ability to accurately record substrate data by newly trained monitors could have been another factor as in every monitoring program there is a wave of new monitors being trained and used in data collection.

These fluctuations shows us that although the no-takes are located on the far most exposed reefs where coral growth is limited as a result of harsh environment conditions like waves and strong currents, these barrier reefs also house high coral diversity as well as high percentage cover. Thus, most of the healthy coral reefs in those areas are often located on the back reef of the larger barrier reef or on the shallow inner part of the barrier reefs which are often sheltered from harsh sea conditions. Having said that, we can speculate on the outcome for the coming April 2013 monitoring to see if there will be any difference in coral cover.

Results from the monitoring of permanent transacts inside no-take shows that the following corals types or morphologies were dominant in each of those monitoring stations.

No-Take Codes	Name of No-take	Order of Dominance
NT.1	Hibwa	BC/SMC
NT.2	Batututi (Bagshaw)	BC/DC
NT.3	Tawali Iks	BC/MA
NT.4	Badila Dabobona	BC/TC/MA
NT.5	Gallows (NE)	BC/TC
NT.6	Gallows (SE)	TC/DC/MA
NT.7	Grace Island (SE)	SMC/MC/MA
NT.8	Grace island (NE)	SMC/BC/DC

In many monitoring transacts it appeared that Branching corals shows high dominance and is always results in high percentage. The monitoring station at Gallows (NT.6) shows high dominance of table corals (TC) which was totally different from the many other monitoring stations inside the no-take. The high distribution this coral morphology also resulted in a large fish abundance due to the high level of complexity the habitats provide.

4.2. Reef Fish

4.2.1. Distributions herbivore, carnivore and Humphead Maori Wrasse.

Population for reef fishes continued to show good numbers for herbivore fishes both inside and outside of no-take. With a high average of 17.5 herbivore/500m^2 recorded as the average for the target herbivore fishes, individual site record for sites like Badila Dabobona (NT.4) recording 72 counts of Diyadiyayana (Striated Surgeonfish) and 45 counts of Osaos (Bullethead Parrotfish) per 500m^2 sampling area while the northwestern transact outside Grace Island recording 38 Ovili (Blueline surgeonfish) and 34 Osaos (bullethead parrotfish) per 500m^2 of its sampling area signifies a healthy reef system due to the fact that the more herbivore fishes a reef possess, those reefs have good regulators for macroalgae which keep their growth under control. The same results displayed in the no-take stations was also shown in the sites outside no-take or in your open fishing access areas. Despite these good records it is still a concern for the local subsistence fishery as the sizes for many of the monitoring species and other herbivore species are quiet low. Many of the fishes are not in their full adult sizes and this could be explained by the intensity of fishing on this fish group as well as the kind of gear the community of Nuakata have been using over the last 20 years. Recovery for this fish groups in terms of their sizes is imminent should the local subsistence fishing practices be regulated and done in a manner which allows a balance for different size classes.

It is uncommon to have a high number of the carnivore fish inside a 500m^2 monitoring transact as carnivore fishes have large territories and often move between and within a reefs. For this reason, their presence inside a monitoring transact area will always be spatial and temporal. Their abundance is always low however, there may be times where there are recorded in numbers which this could be attributed to feeding aggregations and/or local spawning activities. Observations made on areas outside monitoring transacts but within the same reefs shows presence of other carnivore fishes. Other carnivore fishes like Red Bass *(Lutjanus bohr)*, Tomato Rock Cod *(Cephalopholis sonnerati)*, Painted sweetlips (*Plectorhinchus chaetodontiodes*), Slender grouper (*Anyperedon leucogrammicus*) and reef emperor *(Lethrinus xanthochilus, L. erythracanthus, L. harak)* have been commonly observed on deeper areas, outside any monitoring stations and this data is captured in the deepwater monitoring program that is conducted by Conservation International.

Local population for Humphead Maori wrasse monitoring as IUCN or endangered species are quite low in sampling 500m^2 area however; they are abundant on many reef areas. Their sizes class indicate a healthy population distribution for NIPCMMA. This monitoring species has a healthy and viable population which will increase significantly in the coming years given that their habitats are maintained and not destroyed.

4.3. Sea Cucumber

The representation of the population for different species of sea cucumber within the 500m^2 monitoring transact indicate that they are present in many reefs. The closure of the sea cucumber fishery for three years and the second year of extension to the moratorium has contributed significantly to their quick recovery. Although not all species are present, our study area is limited in terms of size therefore we can only assume that there is evidence of fast recovery and growth in reefs inside and outside no-take zones. Our monitoring program is specific to daylight hours therefore we cannot capture any data for those species that feed and become active at night. Sea cucumber population distribution on the deeper parts of the

reefs cannot be provided in this report but will be provided by specific deepwater surveys that will be conducted by Conservation International.

4.4. Clam Shell

The population for clams inside has been fluctuating over the last monitoring period. In theory, the abundance of each clam should be in the following order (1). Crocus clam (TC), (2). Maxima clam (TM), Bear paw clam (HH), Scaly clam (TS), southern giant clam (TD) and the giant clam (TG). In many cases you would expect to find these clams in the following habitats (1). TC - mostly burrowers and are found on mainland fringing reefs in either silty or clear water environment. They are the smallest of all clam species. (2). TM - They are also burrowers but a little bigger than TC and tend to be distributed on shallow fringing reefs with turbid or clear water. They are also found in the shallow patch and barrier reefs. TS - This is a bigger clam species with asymmetrical shell meaning one side of the shell is exactly the same as the other and the under hinge is located directly under and in the centre of the shell. In our monitoring program we have observed that there is still a lot of confusion between TM and TS. This problem will again be addressed with the local monitors so that correct species is recorded during each monitoring program.

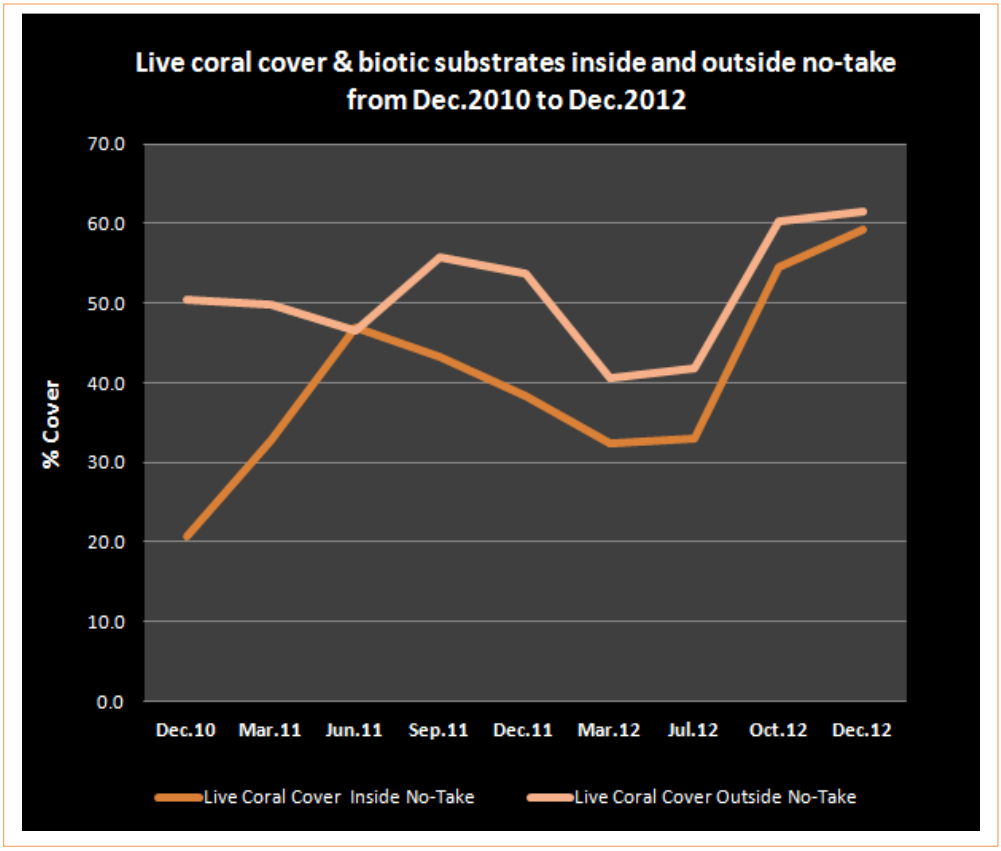
4.5. Other invertebrates (Lobster, trochus, crown-of-thorn starfish)

There is an upward increase in the averages for lobster, trochus and crown-of-thorn starfish since the last two monitoring periods conducted in July and October 2013. Mean values for lobster in July was 0.8 lobster/500m^2 followed by 1.4 lobster/500m^2 in October and an average of 1.4 lobster/500m^2 in this December 2012 for monitoring stations inside no-take. Population numbers for trochus also showed a similar trend where 1.4 trochus/500m^2 was recorded in July. Then in October the average record for trochus increased to 1.9 trochus/500m^2 and a high average of 3.4 trochus/500m^2 in this December 2012. The population of crown-of-thorn starfish varied in the 3 monitoring periods. In July there was no record in any sites inside no-take but then an average of 4.5 CoT/500m^2 was recorded and in October and than an average of 2.1 CoT/500m2 recorded in this December 2012 monitoring period. The averages recorded for each no-take for lobster and trochus gives us a good indication of stock abundance in many no-take reefs that we do not sample.

PART B. POPULATION TREND FOR TARGET MONITORING PARAMETERS OVER 1 YEAR (December 2010 – December 2012)

Population trend shown in the relevant sections of this report has been calculated for all data collected in the monitoring period December 2010, March 2011, July 2011, September 2011, December 2011, March 2012, July 2012, October 2012 and December 2012. A total of 2 years worth of data collection done every quarter of a year has been put together to show what the status of resources are over the 2 year period. Population trend has been only calculated for live coral cover and for reef fishes. Population trend in the abundance of herbivore, carnivore and IUCN, endangered or aesthetic species for all monitoring stations inside No-Take zones and outside No-Take zones. We will begin with live coral cover than reef fishes.

1. Live Coral Cover for Monitoring Stations Inside and Outside No-Take between December 2010 and December 2012



Distribution of live coral cover between December 2010 and December 2012 was not consistent. There appeared to be periods of increase coral cover, periods of slight decrease, and period of abrupt increase in coral cover percentage for monitoring reefs found inside the 8 no-take zones. The first every monitoring program conducted in December 2010 revealed the lowest coral cover for monitoring stations inside no-take. The percentage cover recorded at that time was 20.8%. In the second monitoring period (March 2011) this percentage rose to 32.9 then faced slight decline to 32.4% in March of 2012. In the July 2012 the percentage of coral cover remained the same at 33.1%. The monitoring periods between October and December 2012 shows us that the percentage of live coral cover was 54.5% then increased to 59.3% in December 2012. Looking at the data presented for the two year monitoring program we can say that there are a number of factors which could have lead to the inconsistency in our data between December 2010 and March 2012. During this period our monitoring teams were conducting training while doing their monitoring and there was a high probability of making mistakes in our data collection. Thus, the substrate codes were new to us and the fact that doing monitoring with minimum supervision from CI could have contributed to a lot of miss identification of many coral substrates. Having said that, we can dwell on the positives of such trainings and minimum supervision from CI that it has enabled us to be eager to learn and get to know what we are doing as CI and its personnel will not always be around to make sure we do the monitoring correctly. As a result of this, our level of understanding and level of accuracy has increased over the last 24 months. Thus, the last two monitoring (October and December) has been a stepping stone for us to collect data accurately. Results from the coming monitoring for 2013 will again show us the level of confidence we now have at Nuakata Island.

The second line on the graph illustrates coral cover for the monitoring stations located outside of the no-take zones. This graph also shows that there has not been any consistency in the recording of data. In December 2010 the monitoring team recorded a high percentage cover of 50.4%. The data fluctuated by first declining in June 2011 then reduced further and later rose to 55.8% cover in September. The lowest coral cover experienced was in March 2012 where live coral cover declined to as low as 40.6% then finally increased to 60.2% cover in October and 61.5% in December 2012. A thorough analysis and comparison made for dominant coral morphologies for live coral cover for no-take stations indicate that Branching corals (BC) is the most dominant species comprising 46% of all biotic substrates followed by submassive corals (SMC) making up 31.4% then macroalgae (16.7%) and table corals making up the other 7%. The graph of coral trend also showed that sites outside the no-take recorded high percentage of live corals in each, individual sites.

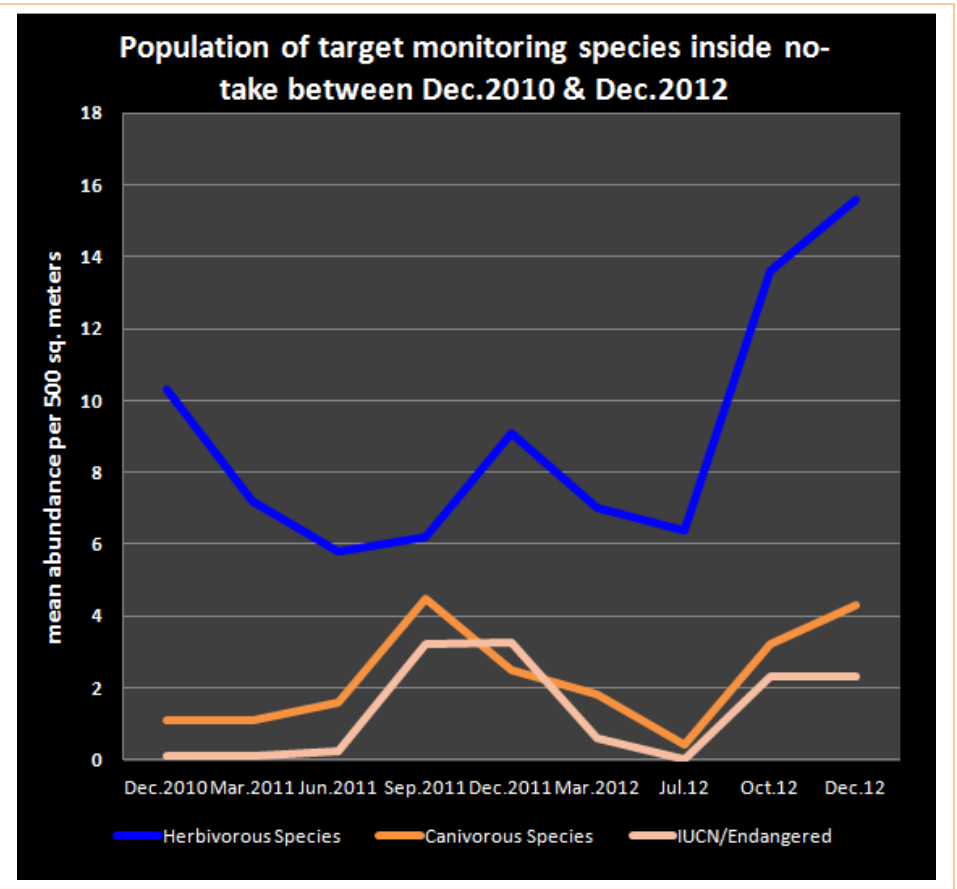
Having mentioned all the positive attributes and the trend by which coral cover around Nuakata Island is at, I would like to bring to light some of the major constraints which I believe could have also contributed to low coral cover percentage and the fluctuations we can see on the graph.

- Strong SE Trade winds & cold water temperatures affecting the performance of local monitors
- Continuous training program for many local youths during monitoring could have resulted in those inexperienced youths misidentifying substrates and marine resources incorrectly.

Despite these obstacles, the monitoring team pursued their tasks and completed all 4 monitoring programs that was scheduled to be done for 2012 and their results presented has been of high value and standard.

2. Population of Target Monitoring Reef Fishes in the No-Take Zones and outside of the No-Take for December 2010-December 2012.

A. Population Trend for Monitoring Stations Inside No-Take

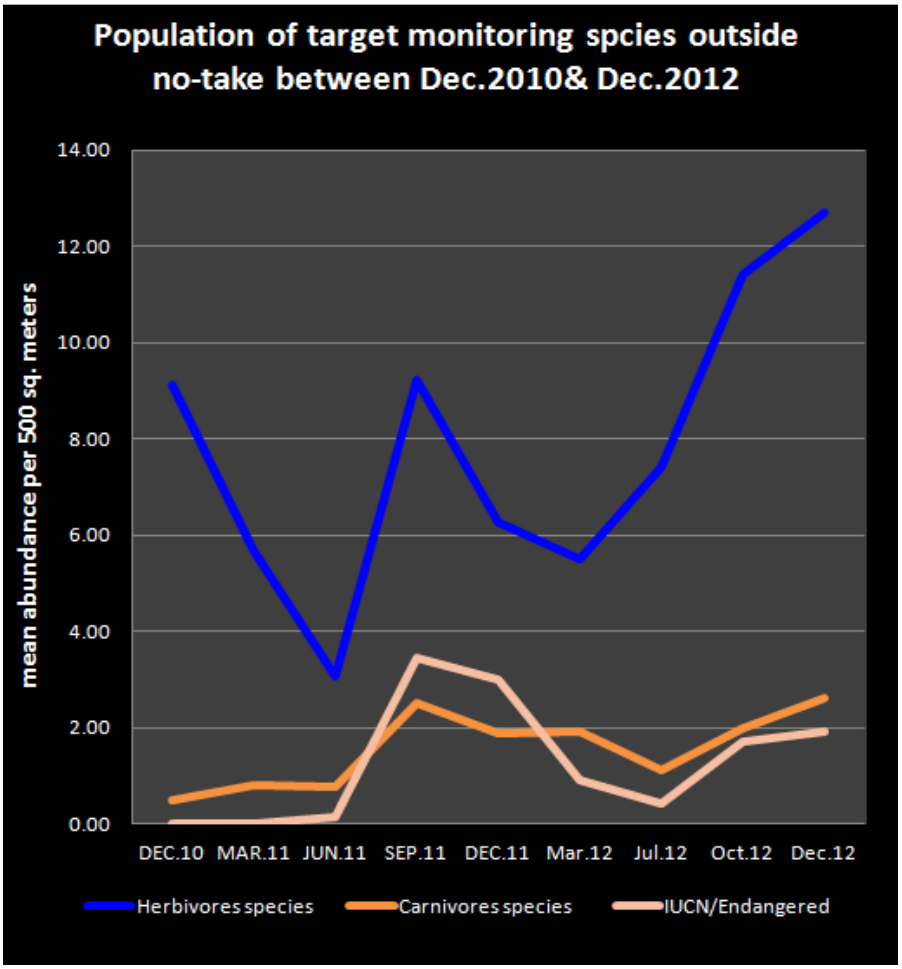


Population trend for the 3 monitoring fish groups shows that herbivore fishes continue to have high averages than the carnivore and the endangered Maori Wrasse and moray eel. The trend showed by herbivore indicate a high to low and some fluctuations in between. Between December 2010 and July 2012 the mean averages for this fish group was relatively low. The average was high in December 2010 with a mean value of 10.3 herbivore/500m^2 then declined to a low value of 5.8 herbivore/500m^2 in June 2011.The average then rose to 9.1 herbivore/500m^2 in December 2011. Monitoring period in July 2012 showed a very low average for no-take areas with 6.4 herbivore/500m^2 followed by a sharp increase between July and October giving an average count of 13.6m2/500m^2 and the highest record in December with an average value of 15.6 herbivore/500m^2.

Distribution and abundance of carnivore fishes in the last 24 month showed a low average and abundance for this fish group. The highest only high average for the monitoring period was 4.5 carnivore/500m^2 and was in September 2011 while the lowest average was 0.4 carnivore/500m^2 and recorded in July 2012. There fluctuations we see in the data may be attributed to the fish presence and absence in the monitoring area as a result of their feeding movements within the reef area. A simple breakup of the months into seasons (i.e. October - March) which experiences the north-west monsoon winds and the months between April and September which is the southeast trade winds show no effect on the abundance of fish

species. Thus, the average abundance calculated for the NW monsoon season was 2.4 carnivore/500m^2 while the SE trade winds recorded an average of 2.2 carnivore/500m^2 for all 8 monitoring stations inside and outside no-take.

B. Population Trend for Monitoring Stations Outside No-Take



Monitoring data for reef fishes outside no-take is very similar to that shown for sites inside no-take. The population of herbivore fishes appeared to be highly distributed in comparison to carnivore and IUCN/endangered species. The population of carnivore fishes appeared to be of low abundance at the start of the program then steadily increase between June 2011 and September 2011 with an average of 2.5 carnivore/500m^2. This value started declining to a low mean value of 1.1 carnivore/500m^2 and then slightly increased between July and December 2012. The averages for IUCN/endangered species was the lowest during the first 3 monitoring program then increased from 0.13 species/500m^2 to 3.4 species/500m^2 in September 2011. The population of this group continue to fluctuate between December 2011 and December 2012. It will be interesting to see look at the trend again after the third year of monitoring in 2013.

5. CONCLUSION

In the two years of community based monitoring program there has been good results as well as results that we did not expect. It was good to observed changes in live coral cover in many reefs inside and outside no-take. Many of the changes have been reflected in the population trend which has been described in this monitoring report. The analysis of population trend for coral cover and community monitoring fish groups provided us with some information about their abundance over the last two years. It will take some more years before we can see a clear population trend for the reef fishes if all conditions continue to remain as they area in the coming years.

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