



# CORAL TRIANGLE INITIATIVE

ON CORAL REEFS, FISHERIES AND FOOD SECURITY



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

NOVEMBER 2010



*Survey Report from the Iabam-Pahilele Coral Reef Monitoring Team*

**June 2013**

This publication was prepared for Papua New Guinea's National Coordinating Committee and the Iabam/Pahilele Community Manage Marine Area with funding from the United States Agency for International Development's Coral Triangle Support Partnership (CTSP).



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

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**USAID PROJECT NUMBER:** GCP LWA Award # LAG-A-00-99-00048-00

**CITATION:** Solipo, J., W. Wamula, and N. Wangunu. *Nuakata, Iabam & Pahilele Community Coral Reef Monitoring Survey Report: November, 2010: Survey Report from the Iabam-Pahilele Coral Reef Monitoring Team*. Honolulu, HI: The USAID Coral Triangle Support Partnership, 2011. Print.

**PRINTED IN:** Honolulu, Hawaii, USA, June 2013

This is a publication of the Coral Triangle Initiative on Corals, Fisheries and Food Security (CTI-CFF). Funding for the preparation of this document was provided by the USAID-funded Coral Triangle Support Partnership (CTSP). CTSP is a consortium led by the World Wildlife Fund, The Nature Conservancy, and Conservation International with funding support from the United States Agency for International Development's Regional Asia Program.

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

Survey Report from the Iabam-Pahilele Coral Reef Monitoring Team



Typical coral garden with multi coral species outside Pahilele Island (Monitoring Site OT. 3)

Survey Report Compiled by Jameson Solipo & Wellington Wamula  
February 2011

## 1. INTRODUCTION

The sea area surrounding the Islands of Iabam and Pahilele are now managed as Iabam-Pahilele community managed marine area (CMMA) and is also part of the general Nuakata, Iabam and Pahilele CMMA. The joint management of this reef area with Nuakata Island together forms the Nuakata, Iabam-Pahilele Community Managed Marine Areas (NIPCMMA). Reefs that are within traditional and customary custody of the people of Iabam and Pahilele islands fall under management jurisdiction of the Iabam-Pahilele management committee. This committee also conducts biological monitoring and surveillance of the entire reef boundary within their management responsibilities.

A first biological assessment including setting up of permanent monitoring stations for long term monitoring has been undertaken by the management committee and this report summarizes basic findings from reefs located inside demarcated no-take or (Conservation Areas) and from reefs which are inside traditional fishing areas. Locations of reefs both inside and outside conservation area is further shown in map 1. Areas marked as monitoring areas have been placed with permanent monitoring transects, marked with rear bars or star pickets. These reefs will be monitored 4 times annually and results generated from each monitoring will be used to provide the management committees to make relevant decisions on the daily management of their CMMA.

Findings from this survey are preliminary as data collectors during 2010 assessment were first timers that were recently trained by CI to conduct annual assessment and are inexperienced. Moreover, analysis of raw field data was also analyzed as part of a training process for local data officers who are also part of the locally trained reef monitors. It should be noted that much of the results presented in this report seeks to give an overview and difference in the status of reefs found inside no-take zones and those outside.

## 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 transect 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. Community selected reef fishes

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 Iabam and Pahilele Islands. The main groups they represent include herbivorous fishes, reef carnivores' fishes and species that are of IUCN concern as well as their aesthetic values they provide to dive tourism.

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.

**Map 1.** Monitoring sites inside no-take (yellow font) and outside no-take (white font) which monitoring was conducted last November, and will further be monitored following every 3 months in a year.



As illustrated in Map 1, the number of monitoring transects inside no-take was 6 and those outside was 6. Areas with bright yellow circles are conservation areas (no-takes) that are managed by the Iabam/Pahilele management committees while those that are managed by the Nuakata management committee is not shown. Coupling 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.

<b>Reef Code</b>	<b>Reefs inside Conservation Area (No-Take Zone)</b>	<b>Reef Code</b>	<b>Reefs outside conservation (no-take areas)</b>
NT.01	Tawali Namonamo	OT.01	Iabam (NW)
NT.02	Luluwalagena	OT.02	Iabam (SE)
NT.03.	Dana Gedu	OT.03	Pahilele (SE)
NT.04	Siasialina	OT.04	Tawali Balabala
NT.05	Hanakubakuba Island	OT.05	Manikutu
NT.06	Banibani Siga	OT.06	Kiwakiwalina

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

Belt transect 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 meter transect with width of 5m meters was used to identify and document presence of key reef fish indicators. The same transect 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 transect was then used to determine the presence of marine invertebrates. With a 100m length and 5 meter wide.

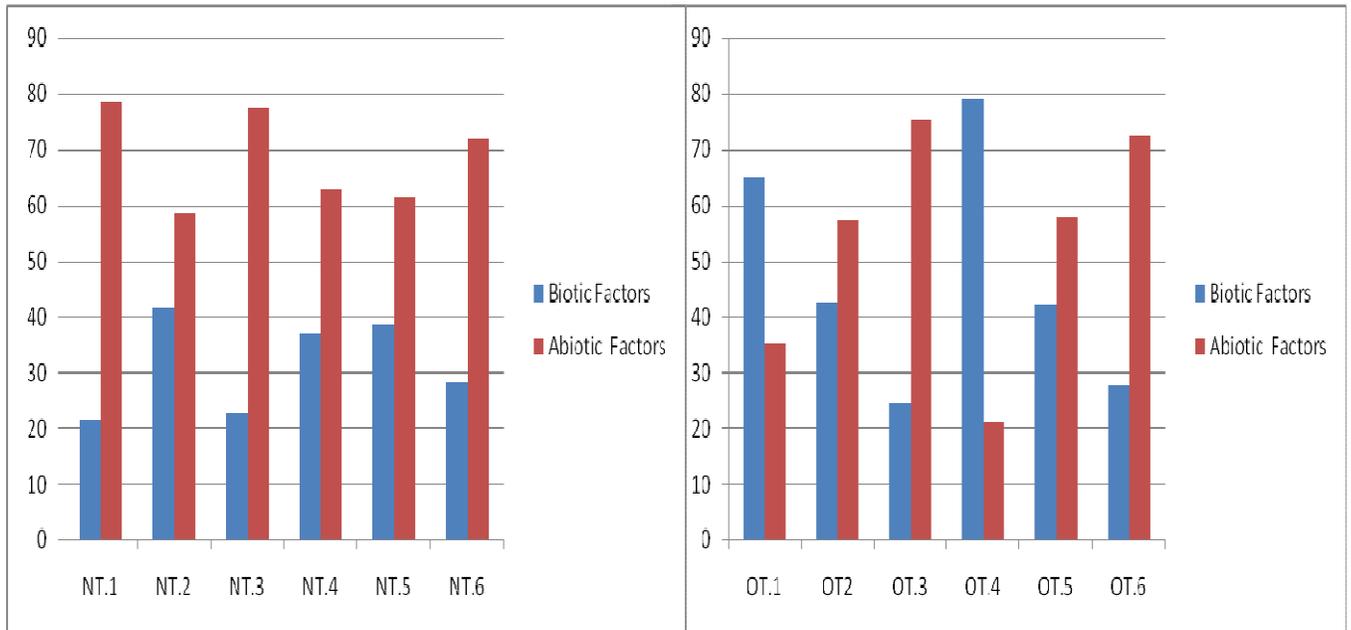
## **2.2. Data analysis**

All raw data collected during the assessment were entered into a created Microsoft Excel database which was kept by the monitoring team data officers. Simple analysis such as calculating totals for fish groups, benthic substrate and invertebrates were done immediately after each survey, and the data were then entered into a prepared hardcopy database which is kept at the community by the data specialists. A copy of the data is also stored electronically at CI office.

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



Analysis of benthic substrate categorized as biotic (live coral cover) and abiotic (dead materials such as coral rubble, hard bedrock and sand) for areas inside and outside no-take zones illustrates that.

From given result it is evident that Luluwalagena (NT.2) had more coral cover compared to other monitoring stations inside Iabam-Pahilele CMMA. Thus, Tawali Namonamo recorded the least cover percentage for all no-take monitoring areas.

Reefs outside no-take/conservation zones had similar pattern where Tawali Balabala (OT.4) had 28% live coral cover and Siasialina and Hanakubakuba each comprised 20% live coral and a biotic factors respectively.

##### Sites inside no-take

1. Live coral cover in side no-take was lower than abiotic factors for all monitoring sites inside all no-take monitoring areas.

2. The reefs of Luluwalagena (NT.2), Siasialina (NT.4) and reefs outside Hanakubakuba Island (NT.5) all had average live coral cover ranging between (37-41.5%). Other areas had reduced coral cover percent where Tawali Namonamo (NT.3) showed a very low percentage of (21.5%).

3. Abiotic substrate for most reef areas inside areas was dominated by dead coral rubble and hard bedrock substratum.

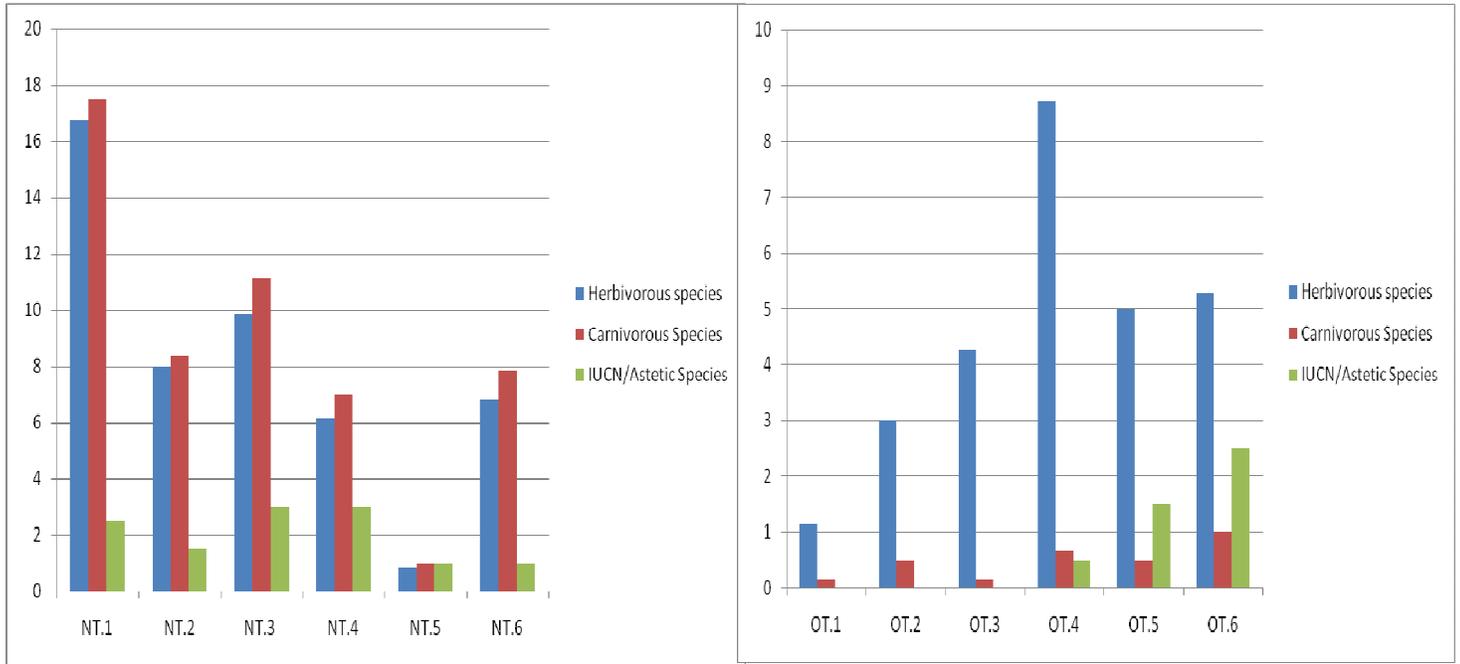
##### Sites outside no-take

1. The areas marked outside conservation zones generally contained a lot more live coral cover than abiotic substrate. Thus, live coral cover for Tawali Balabala was the highest with 79% live coral cover along the transect, while Tawali Namonamo (OT.1) had the second

highest live coral cover of 65%. From this two areas OT.4 was dominated by branching coral while OT.1 was dominated by soft corals of *Sinularia* species. The only reef area that show very low coral cover was Pahilele SE (OT.3) which had individual patches of branched and table corals sparsely recorded along the monitored transect.

### 3.2. Population of target reef fishes inside and outside of no-take areas.

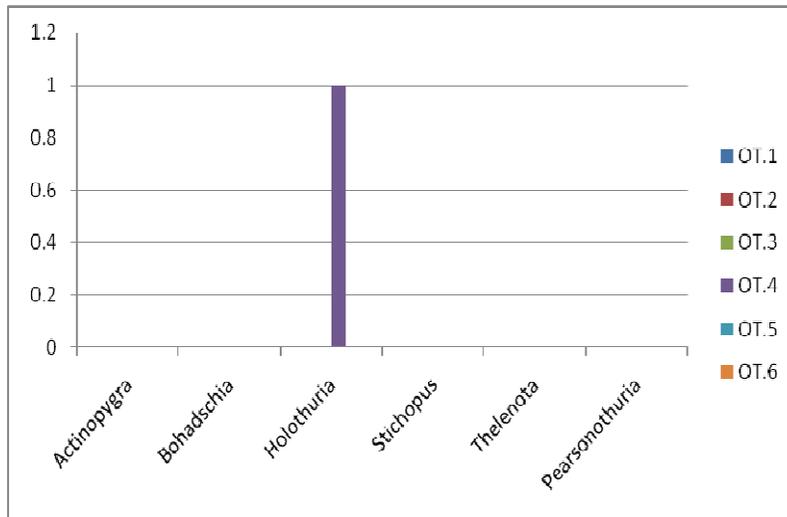
#### Sites inside no-take & sites outside no-take



Firstly, the sites inside no-take have an average of 9 -16 reef herbivorous fishes per site; carnivorous fishes of average 8-17 fishes per site and IUCN/aesthetic species 2 individual fishes per site. Tawali Namonamo recorded the highest number of herbivorous and carnivorous reef fishes (i.e. 16 and 17 fishes respectively) while Dana Gedu recorded the second highest with herbivorous fishes with 9 and 11 fishes respectively). The fringing reefs on the northern end of Hanakubakuba recorded the least number of all target fishes.

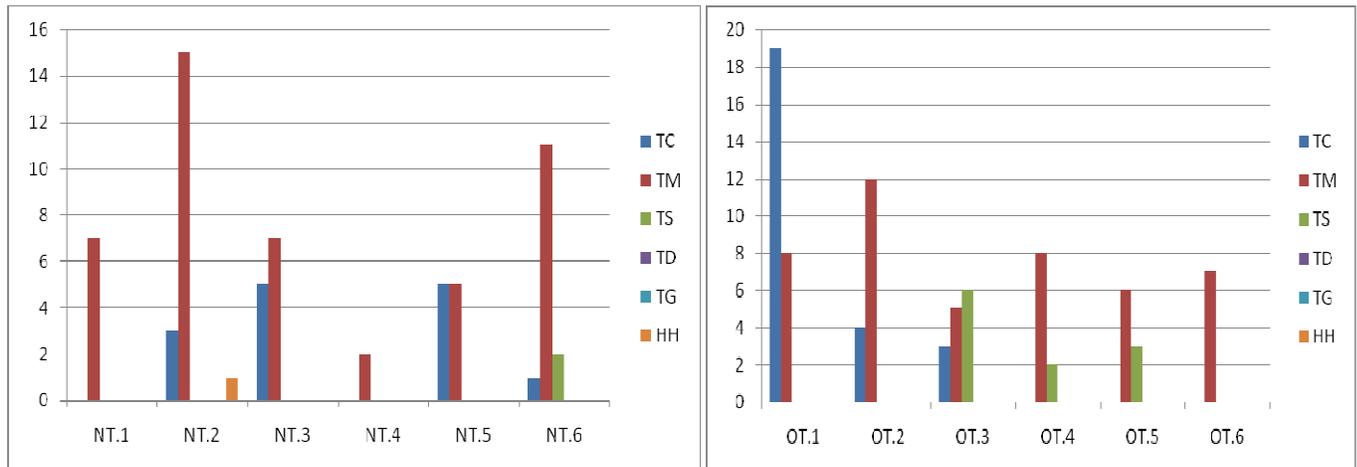
Secondly, the population of herbivorous fishes for sites outside no-take zones showed that Tawali Balabala has a lot of herbivorous fishes with a total record of 8 fishes per 500m<sup>2</sup> transects followed by Manikutu (OT.5) and Kiwakiwalina (OT.6), each having 5 representatives per 500m<sup>2</sup> respectively. Presence of carnivorous fish group was very low for all sites located outside of no-take where Pahilele SE transects only recorded 1 fish per 500m<sup>2</sup>. Kiwakiwalina (OT.6) was the only reef to have up 2 representative of IUCN/aesthetic species per surveyed transect area.

### 3.3. Sea cucumber



Data from sea cucumber clearly showed that sea cucumber in the genera *Holothuria* occurred the most inside reefs that are out of the no-take zones. Other species had one of two individuals in recorded however, was not statistically large enough to provide any statistical values. There was no record for any sea cucumber genera inside all sampled transects.

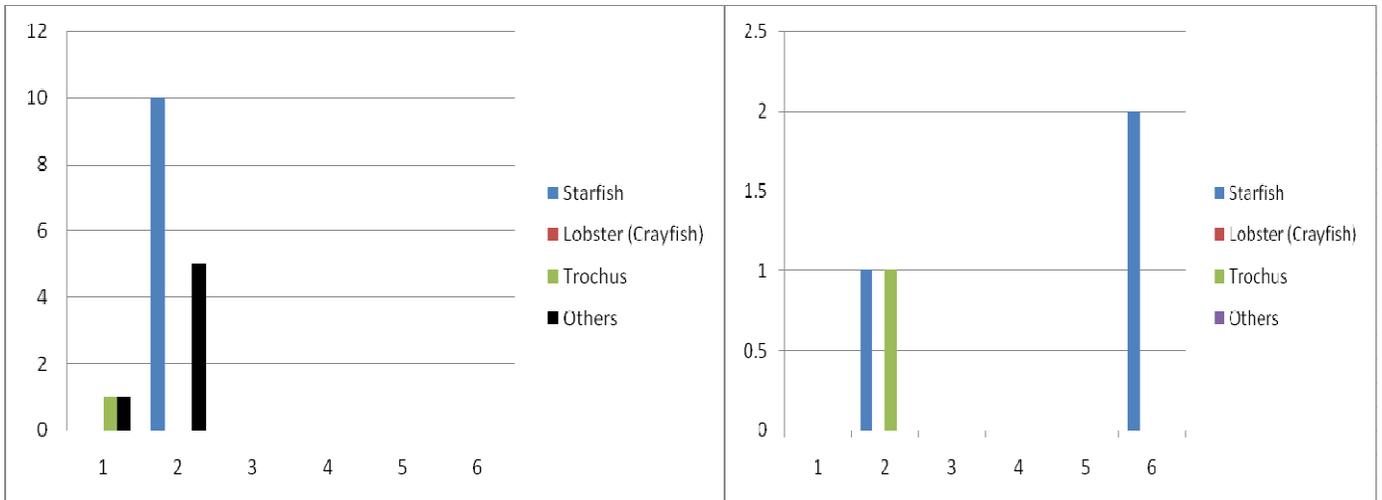
### 3.4. Clam



Data for clam in the protected zone and in areas outside were almost the same. There was no major difference in the occurrence. Inside no-take areas TM (*Tridacna maxima*) showed high distribution in most of the surveyed transects. Luluwalgena (NT.2) recorded the highest counts of TM with 15 individuals followed by Banibani Siga (NT.6) following with 11 records. TC (*Tridacna crocea*) or Crocus clam had second highest distribution inside Dana Gedu (NT. 3) and Hanakubakuba Island (NT.5).

Data for reefs outside no-take showed that TG (*Tridacna gigas*) showed high average abundance inside Iabam (NW) or OT.1. TM (*T. maxima*) also had equal distribution and similar abundance in all reefs. Iabam (SE) or OT.2 showed high abundance of TM in comparison to other reef areas surveyed.

### 3.5. Other marine invertebrates



Presences of other marine invertebrates illustrate that sea starfish (*Linckia lavigata*) was more common than other invertebrates and were recorded at Tawali Namonamo (NT.1), Iabam SE (OT.2) and Kiwakwalina (OT.6). Inside no-take there were presence of crown of thorn starfish recorded inside Tawali Namonamo (NT.1) and Luluwalagena (NT.2) Iabam SE (NT.2). Presence of trochus shells was recorded at Iabam SE (OT.2).

## 4. DISCUSSION

### 4.1. Benthic substrate

Results from benthic substrate showed that abiotic factors were more dominant throughout all sampling stations inside no-take (conservation areas). Tawali Namonamo (NT.01), Dana Gedu (NT.03) and Banibani Siga (NT.06) were the three reefs which had very low live coral cover in comparison to other sites inside no-take areas. The reef structure of Tawali Namonamo composed largely hard rocky bedrock (40%) and dead coral rubble (36%) while the most dominant live coral cover was only 11.5% which comprised of isolated patches of *Acropora* sp. distributed along the 100m transect. At Dana Gedu (NT.04), the dominant benthic substrate was hard calcareous bedrock which forms the western barrier reef shelving off the mainland from Iabam and Pahilele Islands. This bedrock constitute 58.5% of the entire 100m transect. More coral cover were found on the reef centre where the monitoring transect was laid. This reef center contained 8.5% of live branching corals. Moreover, being a barrier reef, it was exposed strong currents and wave forces which as a result, there were a lot of dead coral algae particularly from broken branched corals. Other reef areas such as Luluwalagena (NT.02), Siasialina (NT.04) and Hanakubakuba (NT.05) contained average live coral cover.

Sites outside no-take were a lot different from no-take. The site NW of Iabam Island (OT.01) was part of the sheltered fringing reef located on the leeward side of the Island where wave action was very low. As such, this area had the highest distribution of soft corals of *Sinularia* sp., making up 44% of the entire 100m sampling area. Tawali Balabala was the only reef that recorded large numbers of sclerectinian corals whereby branching corals constitute the largest percentage of (66%) of the sampling area.

## 4.2. Reef fishes

Survey results indicate that reef carnivorous fishes were more abundant on reefs located inside no-take zones compared to those that were outside. This high numbers is could be attributed to the reefs location and biophysical conditions. As most of the no-take reefs are located outside of the island fringing reefs, they provided suitable conditions for these fish groups to survive. Reefs outside of no-take zones also had some distribution of this species however, were seen as solitary and in very low numbers. The opposite was witnessed for reef herbivorous species. The mainland fringing reefs surrounding Nuakata had a lot more herbivore fish than those located on patch and barrier reefs (especially those in the no-take zones).

Of all areas surveyed, Iabam (NW) recorded the highest average of 17 carnivores and 16 herbivorous fishes respectively. The long Barrier Reef at Dana Gedu recorded the second highest number of carnivore and herbivore fishes. In general, the abundance of fishes recorded in the 500m<sup>2</sup> illustrates a healthy distribution of fish population. Fish size was also indicating that fishing pressure inside NIPCMMMA was low.

## 4.3. Sea cucumber

Records from sea cucumber found inside and outside no-take areas for Iabam and Pahilele were very low. These low numbers are attributes of heavy commercial fishing activities by local communities over the last 2 decades. Many species that were expected to be found on reefs with necessary habitat qualities were not seen. Although the survey only accounted for a small space of 500m<sup>2</sup>, the entire reef flat and drop-offs that were also surveyed showed very low numbers in terms of species and general sea cucumber quantity. From all surveyed reefs inside and outside no-take areas, the genera *holothuria* was the only type that recorded sparse distribution of species *Holothuria atra* (Lollyfish). All other species were significantly low in numbers and dispersion. This result now calls for desperate action to provide sound management stock replenishment inside Iabam-Pahilele territorial waters. Thus, the management of the islands resource today as part of NIPCMMMA could provide the remedy should strict management regulations are effected now than later.

## 4.4. Clam shells

There was good population distribution and abundance of TM (Maxima clam) and TC (Crococ clam) in all sites assessed. The only concern at this moment where Iabam-Pahilele should consider is low population of TS (Fluted giant clam), TD (Smooth giant clam), TG (giant clam) and HH (Bear paw clams). There has been numerous evidences of local harvest around Hanakubakuba Islands were discards of both long lived dead shells and fresh dead shells were recorded during baseline surveys. It is apparent that management rules and penalties put in place for no-take zones be strictly adhered enforced by Iabam-Pahilele management in order for these declining species to rejuvenate.

## 4.5. Other invertebrates

Presence of other marine invertebrates was highly displayed by blue starfish and others (which was crown of thorn star fish). Other invertebrates like painted lobster (*Panilurus versicolor*) were also common at Siasialina despite not being recorded inside monitoring transect. Their abundance is a good indicator of excellent habitat provided by reef crevices on reef wall as well as on reef flats protected by coral ledges. With the protection granted by no-take, we anticipate to record more rock lobsters and abundant blue starfishes on many of the no-take reefs in the coming monitoring programs. Abundance of trochus shells inside monitoring areas further shows deteriorating state. This result can be summoned to local overharvesting over many years inside the Iabam-Pahilele waters. Although there were some records of many undersized individuals in areas outside monitoring transects, a lot

more effort need to be put in to ensure high productivity and return of this species in the coming years. Lastly, the most distressing sign illustrated by many studied areas were scars from crown of thorn starfish. There were evidence of many live crown of thorns recorded inside the transact as well as areas surveyed outside of the transact. Despite having very poor conditions that were not conducive for any crown of thorn outbreak, their presence on many reefs could be a natural and/or biological occurrence however, with the removal of their top predators (Triton shell) and low population of triggerfishes could have being the cause to their high counts. A mitigative solution toward eradicating this organism is impossible at this stage however; the local community at Iabam and Pahilele need to be aware of the main population regulators of crown of thorn and do something to improve population numbers of their natural predators or population controllers.



**Figure 1.** Scar left behind from a crown of thorn feeding

Results from areas inside and outside no-take indicate that generally the whole reef system inside NIPCMMA is still in a good condition. The reefs still have a high potential for recovery if protection and management is instilled at this time. The transact 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 transacts are important tools that will provide us with information on the condition of our resources. Over a long time of monitoring we can be able to detect trends indicating if our resources are recovering or further declining.

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