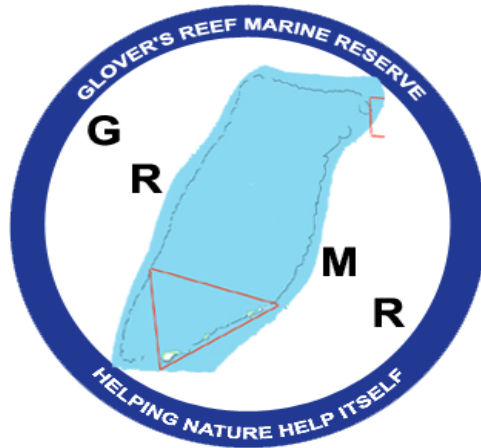


Glover's Reef Marine Reserve



P.O. Box 148, Belize City, Belize, C.A.
Tel: 603-0277 - Fax: 223-2983 – E-mail: gloversreef@yahoo.com

YEARLY REPORT 2007

1.0 Introduction

1.1 Glover's Reef

Glover's Reef is uniquely positioned deep within Belize's territorial waters, and it is recognized by many to be a spectacle of the Caribbean. In fact, Glover's as it is frequently referred to, according to Dahl et al. (1974), is said to be, "the prototypic atoll of the Caribbean, which is not only the best developed biologically, but also possess the greatest diversity of reef types."

Formed almost seven million years ago by faulting offshore resulting in submarine escarpments, Glover's Reef is Belize's best formed coral atoll structure, with an approximate area of 260 km² and dimensions of 32 km long and 12 km wide. In addition, it is the southernmost of Belize's three offshore atolls and is about 75 km southeast of Belize City, and 45 km east, from the mainland.

Historically, because of its geographical location, Glover's Reef was once an important trading post for the indigenous Mayas of Meso-America, more than 900 years ago. However, in more recent times, the atoll once served as a refuge for British buccaneers. As a matter of fact, the name Glover's is derived from the famous British pirate, John Grovers. Nowadays, Glover's Reef is renowned, and acclaims international recognition, for its majestic cays, vibrant marine flora & fauna, and of course, its unique reef structure, which is rugged, and resembles a mountain like precipice, of "spectacular walls and coral canyons." But above all else, the area is treasured for its geological & scientific attributes.

It was a result of the latter, that in 1993, Glover's Reef was officially designated as a marine reserve. According to (Munnings et al. 2002), the reserve was established by the government to maintain the ecological process, to preserve the genetic diversity, to maintain natural areas for educational and research, to provide social and economic benefits through ecologically sensitive recreation and tourism, and to achieve sustainable use of its resources through wise management of the species and their habitats. To date, Glover's Reef is the third largest marine protected area in Belize and is managed by the Belize Fisheries Department.

1.2 Reserve boundaries and zones.

The atoll is divided into four zones.

1. The General Use Zone is approximately 261 km², and allows for extractive activities. These include commercial fishing within the context of Belize Fisheries Regulations, however, no traps, long line, or nets are permitted.
2. The Conservation Zone is about 70 km², encompassing all cays of the atoll. This area is designated as a non extractive activity zone, with the intention to protect a representative sample of the atoll's habitats. To provide an area for

recreational activities, and provide a relatively undisturbed area for research purposes.

3. The Wilderness Zone is located at the southern tip of Middle Caye and only scientific activity is permitted.
4. The Special Protected Zone is a bank located at the northern point of the atoll where the spawning aggregation of Nassau grouper is monitored. The bank is closed all year to fishing.

Visitors can differentiate the different zones by large cylindrical buoys deployed around the Conservation Zone.

1.3 Rules & regulations

The reserve staff has a mandate to enforce all fisheries regulations including those of all marine reserve.

The Fisheries regulations states that all persons engaged in commercial fishing [must be in possession of a valid fisher folk license, and all fishing vessel must also be licensed.](#)

Reserve officers also checked for the possession of marine products in closed season and compliance with size limits.

In addition, reserve staff [has the power to arrest anyone found in violation of these regulations, and such persons shall be charged and prosecuted in a court of law.](#)

The rules of the reserve are as follows:

1. All visitors must check in with the reserve staff upon entering the reserve.
2. There is a park fee set in place for foreign visitors. The fee is \$10.00 per person/day, and \$30.00 per person/week.
3. The sport fishing fee is \$25.00 per person/week and only catch and release sport fishing is allowed.
4. Boat should avoid anchoring by using mooring buoys where they are available.
5. All boat operators must display the “diver’s down” flag when diving.

2.0 Enforcement

2.1 Patrol

Enforcement plays a very vital role in the survival of the species and proper management of the marine reserve. For that reason enforcement remains as one of the most important aspects of marine conservation within a marine reserve. Regular patrols and checks of fishermen catch helps reduce illegal fishing and preserve the livelihood of our marine resources at Glovers. Without enforcement fishers would have no fear to take marine creatures illegally.

At Glovers there is a no take zone which serves to protect marine species in order for them to reach maturity and reproduce thus maintaining the area with a relevant number of individuals. Glovers as we know is a relatively large reserve and with the given tools it is impossible to patrol the entire area on a daily basis. Thus more effort is placed on the conservation zone. Daily patrols are done in this area and boats within the immediate surroundings are checked.

Most of the fishermen that fish within Glovers are sailboat fishermen who are engaged in spare fishing and diving for conch and lobsters, a good number of these guys come all the way from Sarteneja, Belize City, Cayo and Orange Walk. We also get fishermen from Dangriga and Hopkins these guys don't use sailboat they use skiff and most of them are engaged in hand line fishing for fish. The fishermen from the sailboats usually stay out at sea for 7 days before they go back into the mainland to deliver their products and those from Hopkins and Dangriga usually spend 4 days.

Enforcement activities led to the discovery of several boats that use the marine reserve, below is a list of the boats that visited the area in 2007.

Table 1. Fishing Vessels found within GRMR in 2007

Boat Name	Captain's Name	# of Crew
Seagul	Rodney Castillo	2
Ben	Ben Castillo	2
Vivian	Denmar Ventura	4
Twins	Anthony Nunez	3
Lenox	Lenox Maximo	4
Shayanne	Arthur Miller	5
Nadia	Lucas Olivas	3
Timeless	Anthony Vernon	3
Lady	Francis Ramirez	4
Fulanito	Mark Card	3
Los Bublo	Cesar Munoz	5
Luke	Robert Casimero	4
2000	Wilfred Coleman	2
Dolphin	Alex Usher	2
Crystal	Indolesio Ortega	3
Darling	Nelson Ortega	3
Lanchce	Taulfo Rivero Jr.	6
Yeseri	Grasiliano Rivero	4
Edmar	Jose Tut	3
Daira	Anastasio Castillo	6
Marce	Pablo Castillo	2
Bella	Elmer Cruz	10
Nixa	Mario Cordoba	8
Princess	Leobihildo Tamai	8
Julia	Mr. Palmero	7
Ginie	Oscar Mena	9
UbaFu	Eddie Tamai	9
Sandinoe	Alberto Palmero	7
La Bonita	Taulfo Rivero	7
Tormento	Francisco Lopez	9
Adinely	Fidel Viamill	10
Mariana	Nelson Garcia	6
Miss Southwest	George Dawson	5
Nikeman	Cilfford Doran	3
Chico	Luke Nunez	3
Ibzan	Pancho	3
Teo	Gilbert Quilin	3
Maggie	Nick Casimero	3
Sandinoe 1	Julious Forman	4
Nena	Oscar Mena	9

The list below shows that forty one fishing vessels visited Glovers Atoll in 2007. Nevertheless from these forty one vessels that visited the area two vessels were changed by two different captains. These vessels are Nena and Ginie which are used by the same captain and crew, also Sin Frontera and Timeless which is used by the same captain.

2.2 Warnings

Warnings are given to persons who are found committing minor offenses. The main reason the reserve staff gives warnings is due to the fact that we are on a quest to educate and make them realize that it is important that they harvest the fisheries resources in a sustainable manner.

In January several verbal warnings were given to fishers found with Nassau Grouper and also a verbal warning was given to Leobihildo Tamai who was found fishing for lobster and conch in the reserve up at the lighthouse. A list of some of the warnings given is listed below:



Figure 1. Sailboat Ufafu showing a crew of twelve.

- 1) Juan Munoz for abetting of a fisherman without a valid fisher folk's license and carrying of more passengers than allowed by law.
- 2) Cesar Munoz for fishing without a valid fisher folk's license and harvesting of Nassau Grouper out of season.
- 3) Lorenzo Garbut for harvesting of Nassau Grouper out of season.
- 4) Lito Cortes for fishing without a valid fisher folk's license.

- 5) Robert Garbut for fishing without a valid fisher folk's license.

In February seven written warnings were given and it was observed that a very common offense committed by fishermen is not having a valid fisher folk's license. The warnings given are listed below:

- 1) Alberto Palmero of Sandinoe for carrying fishermen without a valid fisher folk's license and for transportation of more passengers than required by law.
- 2) Orlando Perez for not having a valid fisher folk's license.
- 3) Glen for not having a valid fisher folk's license.
- 4) Hernando Rivero for abetting of a fisherman without a valid fisher folk's license.
- 5) Meridaldo Allen for not having a valid fisher folk's license.
- 6) Alfonso Nunez for not having a valid fisher folk's and vessel license.
- 7) Taulfo Rivero for abetting of a fisherman (cook) without a valid fisher folk's license.

Several minor warnings were given for the month of July. Warnings given are for possession of undersized lobsters and failure to produce a fishing license. It is understood that at times we make mistakes in that several fishermen are seen harvesting one or two small lobsters depending on the total number of lobsters caught.

In August two illegal activities were noticed in which warnings were given on both occasions. The first occasion involved a total of five individuals all supposedly from Hopkins village. Two adults and three minors were found fishing within the conservation zone during the night. The captain of the vessel was Darrell Castillo and the reason for no arrest was due to their aggressive behavior. The other incident involved a fisherman from Ubafu sailboat. This individual was seen fishing within the conservation zone, however when approached nothing was found in his possession. His dory and fisher folk's license was taken away for the day and returned to him the other day. This action was taken in order to let him really think over his actions.

In October patrols led to the issuing of two warnings for the harvesting of undersized conch. The two individuals are Orlando Perez and Romaldo Catsim. Also several fishermen were met with undersized conch that were still in the shell and these conchs were taken away and released in the conservation zone next to Middle Caye.

Table 2. The warnings given in November were

28/10/07	Nicholas Poot	In possession of undersized conch	29 live conch	Princess (usually onboard Bonita) La	Warning issued by Luis Novelo
29/10/07	Alberto Palmero	Harvesting of undersized conch	3 dead conch	Sandynoe	Warning issued by Luis Novelo
29/10/07	Eddie P. Garcia	Harvesting of undersized conch	2 dead conch	Sandynoe	Warning issued by Luis Novelo
28/10/07	Ranhel F. Caballeros	In possession of undersized conch	3 live conch	Princess (usually onboard Bonita) La	Warning issued by Luis Novelo
15/11/07	Taulfo Rivero	Harvesting of undersized conch	8 dead conch	La Bonita	Warning given by Elias Cantun

In December warnings were given to Fidel Viamil captain of Adinely was given a warning for abetting of fishermen without a valid fisher folk license. Also Melvan Murio, Jose Victor Naji, Fredy Cortez and Carlos Gonzales were warned for not being able to provided a valid fisher folk license. Also Crispino Verde was warned for the harvesting of three undersized conch.

2.3 Arrests



Figure 2. Nassau Groupers caught out of season.



Figure 3. Fisherman who caught the Groupers

In February several persons were met engage in the harvesting of Nassau Grouper and as a result were all arrested. The arrests are listed below:

- 1) Taulfo Rivero for harvesting of Nassau Grouper during the close season.
- 2) Oved Rivero for harvesting of Nassau Grouper during the close season.
- 3) Nicolas Rivero for harvesting of Nassau Grouper during the close season.

One individual was arrested for the harvesting of undersized conch for the month of March. This was Yorjelino Palmero who was found with 26 undersized conchs.

Two arrests were made for the month of June. Kenroy Meighan was arrested for the possession of one undersized lobster, spent a night in prison, taken to court and charged one hundred eighty dollars. The other person arrested was Ardulfo Rivero who also spent a night in prison and was charged two hundred ten dollars for the possession of three undersized lobsters.

Three persons were arrested for the month of July. All were occupants of a sailboat by the name of Sandinoe 1. The persons are as follows:

- 1) Randy A. Payy for fishing without a valid fisher folk license.
- 2) Julious Forman for abetting of fisherman without a fisher folk license.
- 3) Juan Baki for fishing within the conservation zone and harvesting of conch out of season.



Figure 4. Staff on Patrol



Figure 5. Reserve staff taking away live small conch

In November a total of five warnings were given for harvesting of undersized conch and four arrests were made for harvesting of undersized conch. The table below shows the arrests and warnings given.

Table 3. Arrests

Date	Person Name	Offense	Quantity of Product	Onboard vessel	Result
28/10/07	Rigoberto Garcia	Harvesting and possession of undersized conch	10 dead conch and 31 live conch	Princess	Arrested for dead conch and warning given for live conch by Luis Novelo.
29/10/07	Moises E. Jimenez	Harvesting of undersized conch	35 dead conch	Sandynoe	Arrested by Luis Novelo
29/10/07	Daniel J. Flores	Harvesting of undersized conch	86 dead conch	Sandynoe	Arrested by Luis Novelo
31/10/07	Francisco J. Garcia	Harvesting of undersized conch	25 dead conch	Sandynoe	Arrested by Luis Novelo

3.0 Monitoring

3.1 Marker buoys

In an effort to resolve the problems of missing marker buoys in the conservation zone, the same GPS coordinates received was used. The only thing is that at the end of the day the pins were difficult to be found, however the only choice was to make anchors out of tires filled with concrete and place at each site were the pins should have been. Beside this, a new GPS points was taken were the tire anchor were placed so we could keep an account as to where they were placed. The ones that were there before was given a thorough maintenance and the ones that needed to be changed as well. As to complete the whole conservation zone with proper marker buoys for the reserve boundary only four more will be place for this coming month and it will be ready for the coming season when all fishing vessel will be out to harvest products.

In September fishermen have been using the excuse of the conservation not being properly deployed in their correct delineation for sometime now. But this month with the assistance of two fishermen who fish these waters of Glover's reef atoll for many years and knows where the pins of the missing marker buoys are, assisted in finding the pins and four marker buoys were delineated at there respected places. Mr. Leobihldo Tamai and one of his crew from the fishing vessel Princess and two fisheries staff Mr. Martinez and Mr. Cantun all took quality time to make a great effort in properly fixing this problem, and have these demarcation buoys properly align. All of this activity took place at the northern area of the conservation zone of the marine reserve.



Figure 6. Reserve Staff making anchors for Marker Buoys



Figure 7. Reserve Staff making anchors for Marker Buoys

3.2 Nassau Grouper Aggregation

Spawning aggregation monitoring for the month of January was commenced on the 8th to 11th with WCS scientist, Fisheries staff, Enric Sala and Rick Star. The area that the monitoring took place was at the north point of the atoll also called the Grouper Bank.

Table 4. Nassau Groupers seen at the Northern Lighthouse Spawn Site within Glovers Atoll for the month of January.

Date	Dive	Number of Nassau Groupers Seen	Number of Tiger Groupers Seen
January 8 th	1 st (morning)	500	-
January 8 th	2 nd (afternoon)	250	-
January 8 th	3 rd (evening)	500	-
January 9 th	1 st (evening)	520	5
January 10 th	1 st (morning)	570	-
January 10 th	2 nd (evening)	570	-
January 11 th	1 st (evening)	300	1

On the 8th at the north point an estimated total of five hundred Nassau Grouper (*Epinephelus striatus*) was observed. On the 9th almost the same amount, along with five Tiger Grouper (*Mysterroperca Tigris*) were seen displaying color changes and spawning activities. On the 10th an estimated amount of five hundred and seventy nassua groupers was seen, a little more than previous days and five tiger grouper was observed, still having color changes but no spawning activities. Then on the last day another dive was done and a small amount of three hundred nassua was observed along with one Tiger grouper, this time we noticed that the majority had already began to leave the area and only a couple who we suspect could be the ones late for the aggregation. For All dives that were taking place most of it was done between 9am to 5:45pm before sunsets which is the best time when the groupers spawn. All of these activities usually take place five days after the full moon, during a period of ten days between the hours of sunrise to just before sunset.

Table 5. Nassau Groupers seen at the Northern Lighthouse Spawn Site within Glovers Atoll for the month of February.

Date	Dive	Number of Nassau Groupers seen	Number of Tiger Groupers seen	Number of Black Grouper seen
February 3 rd	1 st (evening)	500	8	2
February 5 th	1 st (evening)	800		
February 6 th	1 st (evening)	800		
February 8 th	1 st (evening)	180		

Another spawning aggregation was conducted for the month of February this time it was WCS staff and Fisheries staff who took part in this monitoring. It lasted from the 3rd to

the 8th, which on this first dive five hundred Nassua Groupers (*Epinephelus Striatus*) were observed together with eight Tiger Grouper (*Mysterroperca tigris*) and two Black Grouper. No dives were done on the 4th until the 5th where a bigger amount of eight hundred Nassua Groupers was observed displaying color changes and spawning activities. This dive was conducted around 5:30pm before sunsets which is the peak time for spawning. On the 6th a same amount of eight hundred Nassua Groupers was estimated at the site and they were still displaying color changes and spawning activities, this dive was conducted late evening again before the sunsets. The 7th no spag was done until the 8th the last day when at 5:45pm the best time before sunsets only a small amount of about one hundred and eighty was observed this means that most of them have already left the site.

For these two months of observing the Nassua Groupers (*Epinephelus striatus*) it has been seen that the population is decreasing at a very rapid rate, due to the fact that in previous years far more Nassua Groupers were seen at this same Grouper Bank site. One of the reasons why this is happening is because of the lack of respect towards the closure of the fishing of Nassau Groupers by our local fishermen. Three major issues are occurring with our local fishermen. First is that of those in near by communities visiting the spawning bank and fishing it during the close season. Next is that of fishermen especially sailboat fishermen sparing Nassau Groupers during the close season. Finally is one of the worst situation of fishermen catching and sparing very small juvenile Nassau Groupers (also many other species of fishes such as Hog Snapper and Mutton Snapper).

3.3 Mutton Snapper Aggregation

Spawning Aggregation Monitoring for the Mutton snappers at north east Caye channel took place from the 2nd to the 5th of July, with a team of five people. The team consists of two fisheries staff Mr. Martinez and reserve biologist Mr. Cantun, Mrs. Mary from MBRS and two WCS staff Mr. Hoare and Mr. Buck. For the first day an evening dive was conducted for the purpose of locating the actual spot the activities should be taking place but unfortunately no activity was observed.

For the other days which were the 3rd and the 4th due to rough seas it was difficult to reach its location so the dive was postponed. In the evening on the 3rd only one mutton snapper was observed and on the 4th morning roughly two hundred Margate was observed in the area of the spawning site of the mutton snapper. On the 5th the same type of observation was conducted only this day no mutton snappers was seen only the Margate fish again.

During this survey its shows that a dramatic loss of these fish species at this spawning aggregation site, that has been monitored for a couple of years back has either departed to some other spawning location or have either been active earlier than the usual time which is after the full moon. It has come to my opinion that to prove this, spawning aggregation survey should need to take place before and after the full moon just to have a clearer idea that they either been coming sooner of aren't coming to the site anymore.

3.4 Lobster Survey

The Lobster Survey for this year after closed season was carried out from the 23rd to the 25th of February 2007, by Mr.Cantun, Mr.Carballo, Mr. Martinez and Luis Novelo. In the survey a total of 14 patches were surveyed following the Field Protocol for Monitoring Coral Reef Fisheries Resources in Belize 2003 edition. Seven of the sites surveyed were in the conservation zone while the other seven was in the general use zone.

At each site an average time of one hour was spent to have enough time to search the crevices for lobsters well hidden. The total amount of lobsters found was eighty five. Sixty five was in the conservation zone of the marine reserve and twenty was found in the general use zone of the atoll.

Method

The survey was done following the Field Protocol for Monitoring Coral Reef Fisheries Resources in Belize 2003 edition. While carrying out this survey different parameters were collected. The average temperature at each site was about 26.5⁰ C. The average conductivity was around 54ms, the average salinity at the different sites was around 35ppt, the average visibility at the different sites was 26 meters (m), and the depths at the different sites varied but most were shallow patch reefs some of which were deeper on the edges. The time that the survey was carried out was around 9:30 am in the morning and around 5:30pm in the evening.

At the different patch reefs, the survey was carried out by swimming crossing patterns across the whole reef structure (2003 edition), All the rock crevices were searched to find the lobsters an a average of an hour was spent at each sites. This depended on the amount of lobsters founded at the particular sites. When the Lobsters were found they were measured for size, sexed, and checked for egg masses, without capturing the animal (2003 edition). The carapace length was measured by placing a marked tickle stick over the dorsal surface of the carapace and it was estimated to the nearest cm. The way the sex was determine on the lobsters was that the adult male have a third walking leg that is much longer than all other legs and no frilly tip swimmerets, while the adult females have swimmerets with frilly tips under the abdomen and all pair of legs are of approximately the same size. It is always possible to try and look under the ventral side of the abdomen of the female lobsters because they sometimes have egg mass on them and is visible. (2003

Results

A total of eighty five lobsters were found within the fourteen patches, seven of which was in the conservation zone and seven of which was in the general use zone. In the conservation zone 65 was found and in the general use zone 20 was seen.

In the conservation zone a total of 43 female lobsters were found ranging from 3cm to 25 cm of which 37 was of legal size. Only one of these females was found with eggs. A total of 22 male lobsters were sampled ranging from 3cm to 20cm, of which 20 was of legal size.

On the other hand within the general use zone a total of 13 female lobsters were sampled one of which one had eggs and only five where of legal size. These females ranged from 3cm to 20cm. 7 male lobsters were observed and 3 of these were of legal size. These lobster ranges from 2cm to 20cm.

Conclusion

The survey show that of the 85 lobsters samples 20 were of illegal size and 65 of legal size. In addition most of the illegal size lobsters occurred in the general use zone. Hence there is more mature, reproductive lobster protected in the conservation zone that could add to the population. The survey shows 76% of the lobsters occurring in conservation zone and 24% of the lobsters occurring in the general use zone. Therefore the conservation zone is contributing in a big way to the livelihood of the lobster population out at Glover's Reef.

Another lobster survey was conducted before the opening of the lobster season which is June 15th by Mr. Elias Cantun, Mr. Carballo, Mr. Martinez and Mr. Luis the new ranger. In the survey a total of 14 patches were surveys following the Field Protocol for Monitoring Coral Reef Fisheries Resources in Belize 2003 edition. Seven of these sites where in the conservation zone and seven where in the general use zone.

An average of one hour was spent at each patch. A total of 65 lobsters were sample in which 45 where from the conservation zone and 20 where from the general use zone.

Method

The survey was done following the Field Protocol for Monitoring Coral Reef Fisheries Resources in Belize 2003 edition. While carrying out this survey different parameters where collected. The average temperature at each site was about 26.5⁰ C. The average conductivity was around 53ms, the average salinity at the different sites was around 35ppt, the average visibility at the different sites was 75m, and the depth at the different sites where about 5m. The time that the survey was carried out was around 9:30 am in the morning and around 4:00 pm in the afternoon. At the different patch reef the survey was carried out by swimming crossing patterns across the whole reef structure (2003 edition), All the rock crevices were searched to find the lobsters an a average of an hour was spent at each sites. This was depended on the amount of lobsters founded at the particular sites. When the Lobsters were found they were measured for size, sexed, and checked for egg masses, without capturing the animal if possible (2003 edition). The size length was measured by placing a marked stick over the dorsal surface of the carapace and it was estimated to the nearest cm. The sex was determine by, the adult male have a third walking leg that is much longer than all other legs, the adult female have swimmerets with frilly tips under the abdomen, under the ventral side of the abdomen of the female sometimes an egg mass is visible.

3.5 Biological Lobster Data Collection

This monitoring is conducted on a monthly basis, where a total of two hundred lobsters are all measured for their carapace lengths, their status if male or female and also their internal pleopods were observed to see the development of the different stages of their setae. The lobsters were also observed for tar spots, molting and also for eggs. To do this a two day period is required to go onboard different fishing vessels and conduct surveys on their catch of the day and collect each lobster samples before they are been beheaded.



Figure 8. Collecting Samples for Lobster Biological Data



Figure 9. Collecting Biological Lobster Samples.

Table 6. Female Lobsters

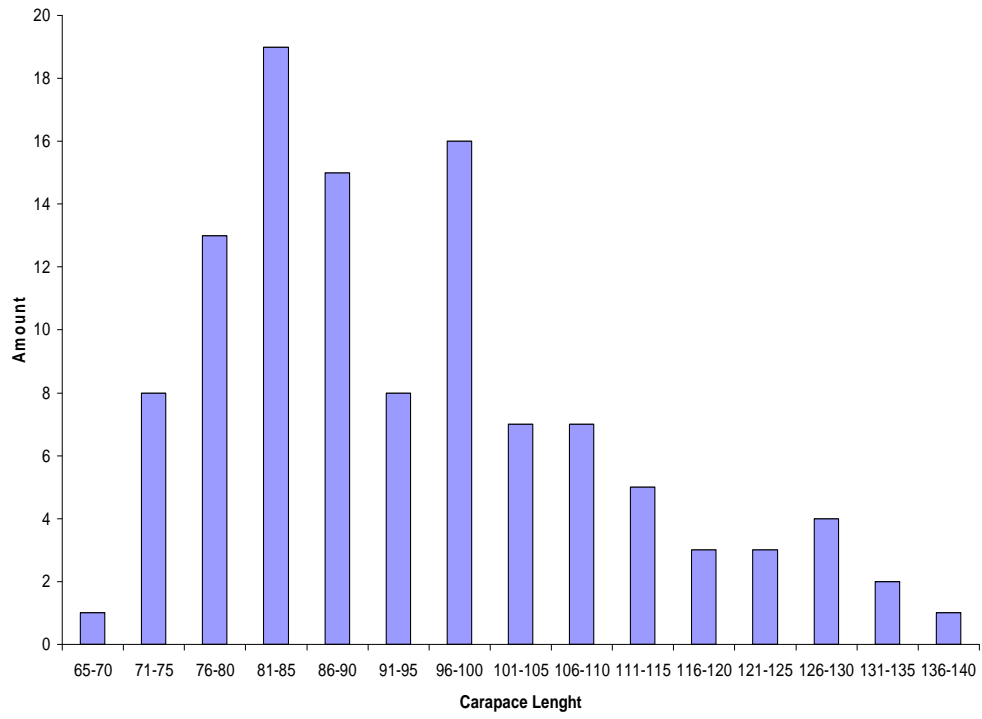
Molting	Eggs	Tar Spot
1	1	7

This is a table to show that for all the female lobsters during this period only one was in the stage of molting. Another data was collected from a lobster that had eggs, while seven had tar spot.

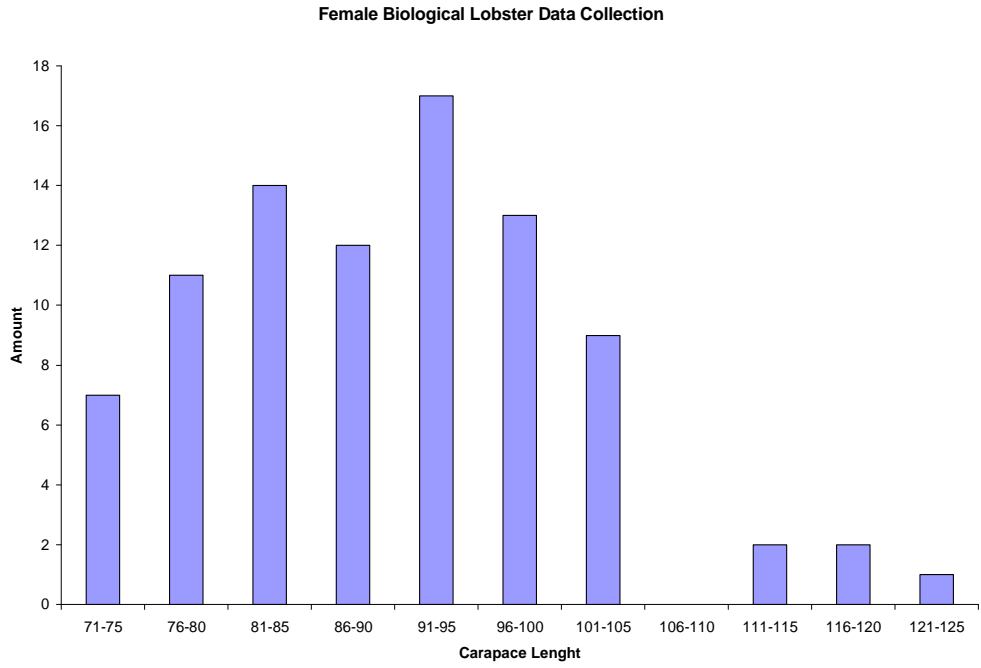
The Graph below shows the amount of lobster sample collected from local fishing vessel who fishes the Glover's reef atoll. For male carapace length an observation was noticed that the majority of lobsters collected were between the ranges of 65 mm to 140 mm.

Graph 1. Male Lobster found.

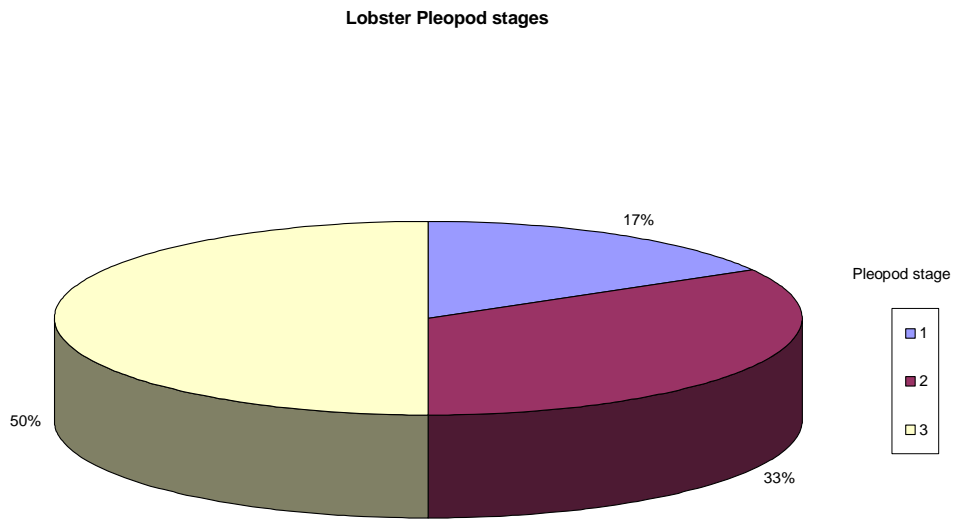
Male Biological Lobster Data Collection



Graph 2. Female lobsters found.



Graph 3. Female lobsters pleopod stages.



3.6 (Lamp Survey) Lobster, Conch and Finfish Survey

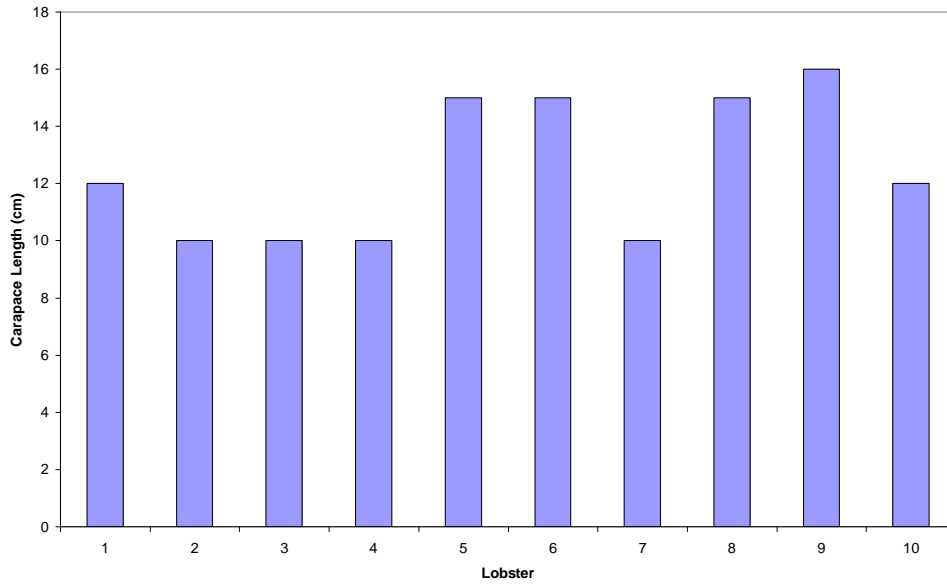
For this period the Lamp survey was headed by the Wildlife Conservation Society (WCS) Mr. Sergio Hoare from the organization was in charge of this survey. The reserve biologist Mr. Elias Cantun and Robin from WCS also took part in the survey.

The survey includes collecting data at thirty three different sites. Three dive sites and thirty snorkeling sites. Two different habitats are also surveyed for the presence of marine species. The habitats are sand flats where fifty meter transects are set and patch reefs which are surveyed by swimming around the patches and documenting the species. While carrying out this survey different parameters were collected. The average temperature at each site was about 26.5⁰ C. The average conductivity was around 54ms, the average salinity at the different sites was around 35ppt, the average visibility at the different sites was 78m, and the depth at the different sites were about 5m. The time that the survey was carried out was around 9:30 am in the morning and around 2:00pm in the afternoon. In addition the species that are searched for include; Lobster, Queen Conch, Milk Conch, Hawking Conch, Mutton Snapper, Hog fish, Queen Trigger fish, Black Grouper, and Nassau Grouper.

From what have been observed in this survey is that a more active marine life was seen in the conservation zone than in the surveys conducted in the General use Zone, where some of the thirty three sites is been located. It also shows that these areas in the General use Zone is not doing much improvement in the abundance of the different species. Nevertheless a greater number of species were observed in the conservation zone. There seems to be some factor that is contributing to the decrease in the abundance of these species especially within the general use zone. Several factors that may contribute to this is the over harvesting of these species by local fishermen and also weather conditions that may cause the species to either hide or travel to other place.

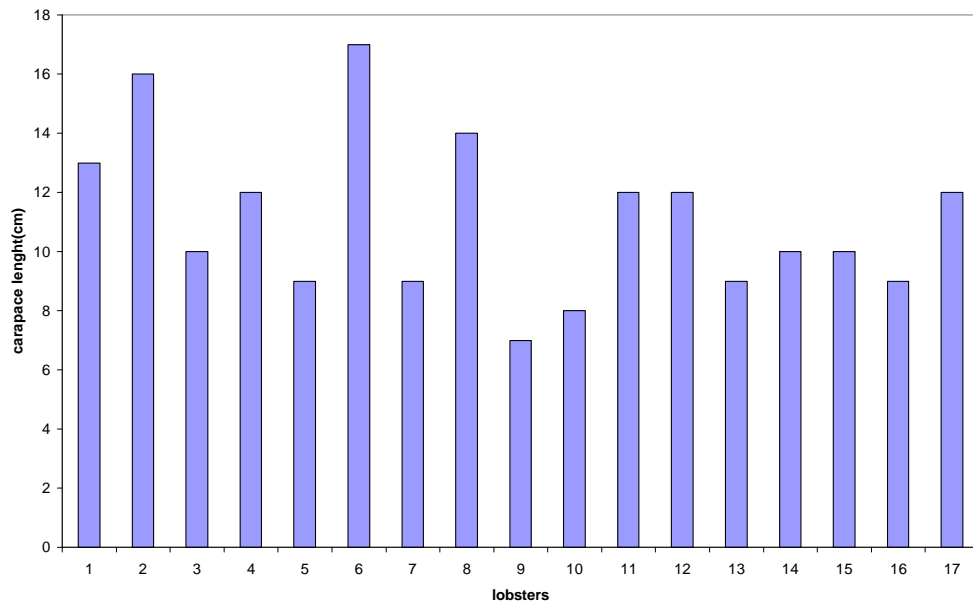
Graph 4. Female lobsters found.

Female lobsters found

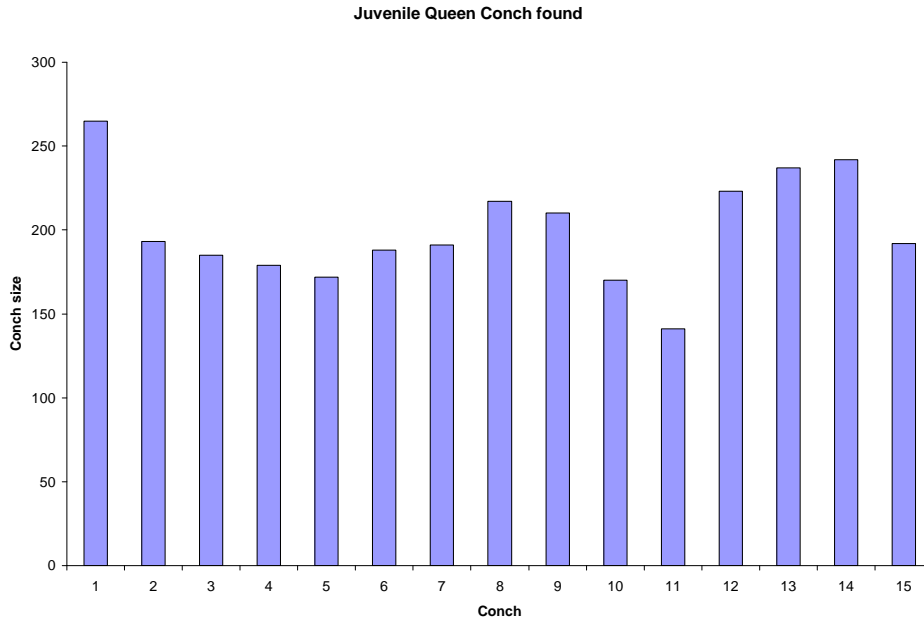


Graph 5. Male lobsters found

Male Lobsters found



Graph 6. Juvenile conch found.



On August 13th and 14th Luis Novelo and Roberto Carballo assisted WCS with their LAMP survey. The survey includes collecting data at thirty three different sites. Three dive sites and thirty snorkeling sites. Two different habitats are also surveyed for the presence of marine species. The habitats are sand flats where fifty meter transects are set and patch reefs which are surveyed by swimming around the patches and documenting the species.

Another LAMP survey was conducted from the 13th to the 16th November. Mr. Sergio Hoare from WCS was in charge of the survey as well as Ms Robin Coleman. Some of the others included in this team were Mr. Elias Cantun, Mr. Gilford Martinez from reserve staff and also Randolph Nunez assisted in taking part in the survey.

The survey includes taking data at thirty three different sites. Eleven dive sites and twenty two snorkeling sites; however three sites were dived and thirty were snorkeled. Two different habitats are also surveyed for the presence of marine species. The habitats are sand flats where fifty meter transects are set and patch reefs which are surveys by swimming around the patches and documenting the species seen. In addition the species that are searched for in this survey includes: lobsters, queen conch, milk conch, hawking conch, mutton snappers, hog fish, queen trigger fish, black grouper, Nassau grouper and all parrot fishes.

It was observed on this survey by the team that not much improvement is occurring in the marine reserve. The number of species inside both conservation and general use zone has seemed to remain almost the same in the patch reef sites, however in the sand flat sites the population has decline somewhat. This is for all the marine species studied, except that of the Nassau Grouper which has been increasing slowly in its juvenile population. In the sand flat areas mostly juvenile conchs were observed while within the patch reefs

adult conchs make up the larger portion of the population. Nevertheless a greater number of marine species remains to exist within the conservation zone than the general use zone.

One must also take in mind that the survey was conducted approximately six weeks after the opening of the conch season and that this year there was a dramatic increase in the number of fishermen fishing in the area; more than double the normal fisherman's population that fish the waters of Glover's Reef. Hence this has contributed largely to the data collected.

For this survey conducted all the Data collected will be analyzed by the WCS head of the team and will be handed over to the fisheries department.

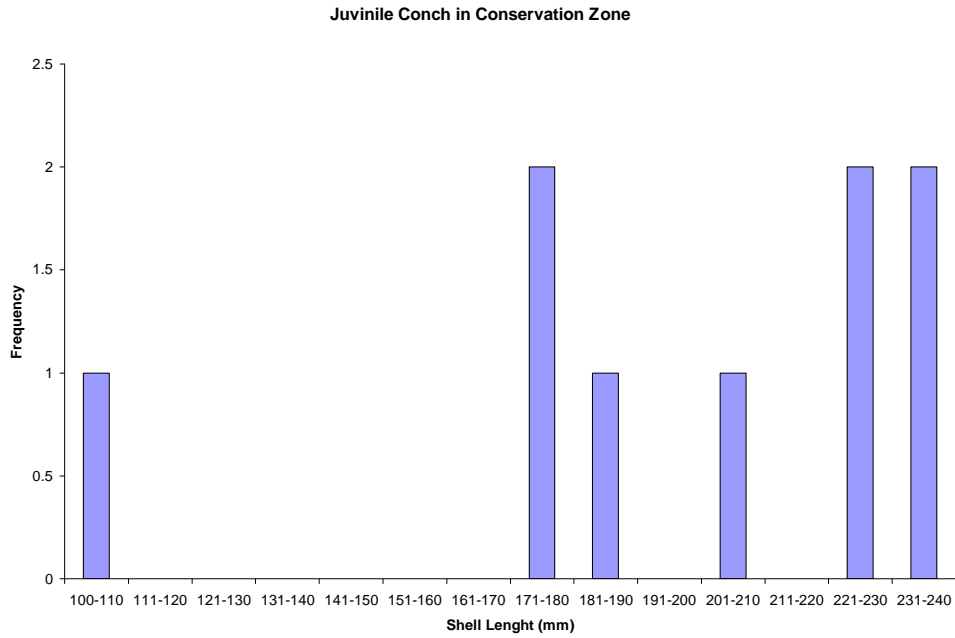
3.7 Conch Survey

The Conch (*Strombus gigas*) survey was conducted from the 29th September to the 30th it was done this time of the month due to the opening of the season on the 1st of October. The survey team consisted of two individuals Mr. Cantun and Mr. Martinez. For this survey six specific sites was designated for this purpose and three was in the Conservation Zone while the other three was in the General Use Zone.

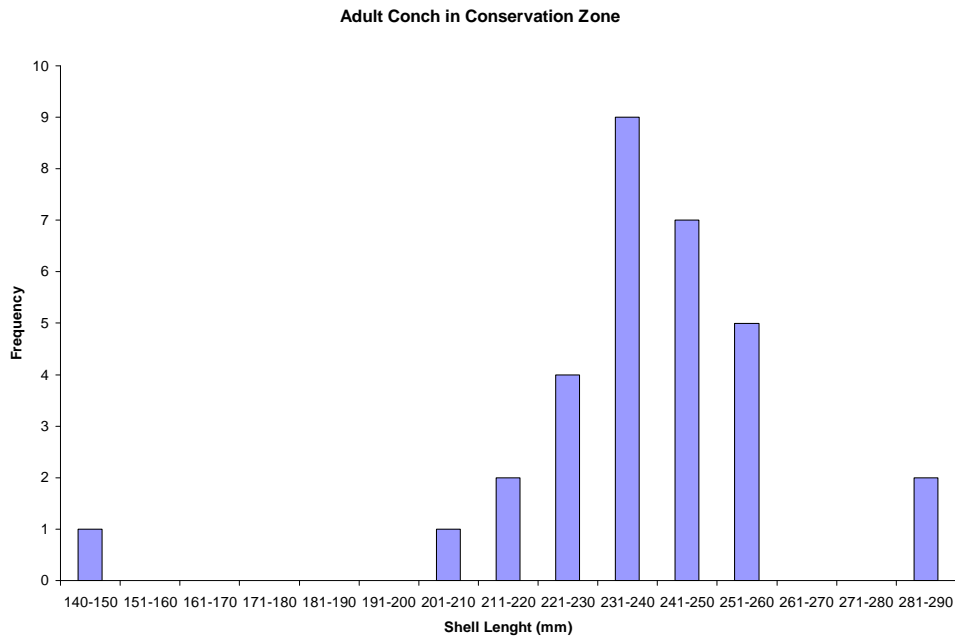
For each of the Conch found they were briefly observed for any signs of eggs before any collection of data. The data collected consist of the quantity of conch observed during the transect swims, with the exception of copulating and spawning adults. The shell length which is from the tip of the spire to the siphonal canal is measured to the nearest millimeter (mm), the lip thickness and the width is also measured in millimeters all using a sliding caliper.

Upon completion of all the measurements all animals were returned to the sea in most cases the area they are captured.

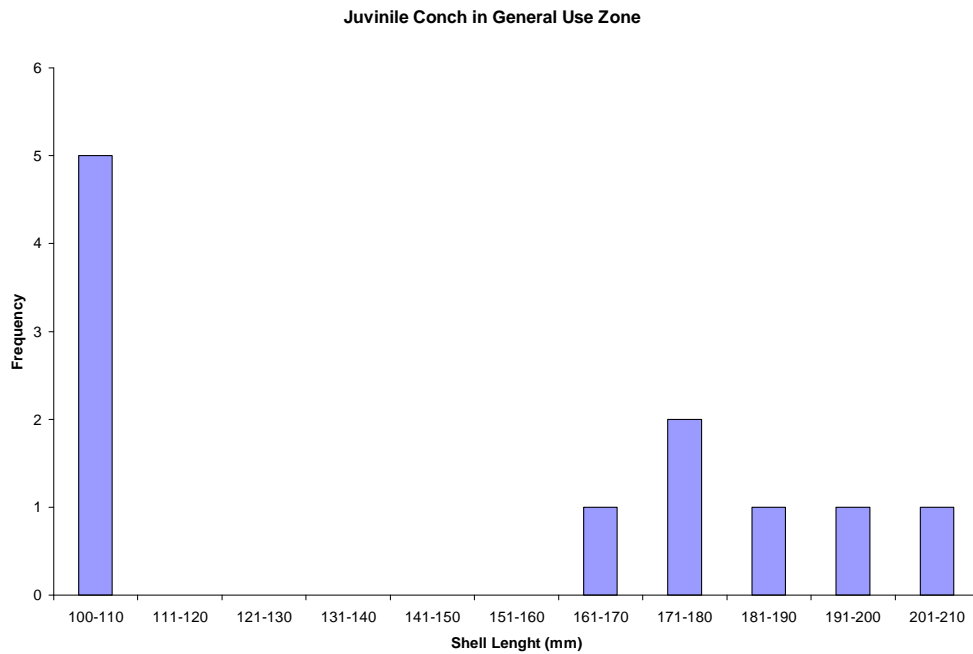
Graph 7. Juvenile Conch in Conservation Zone



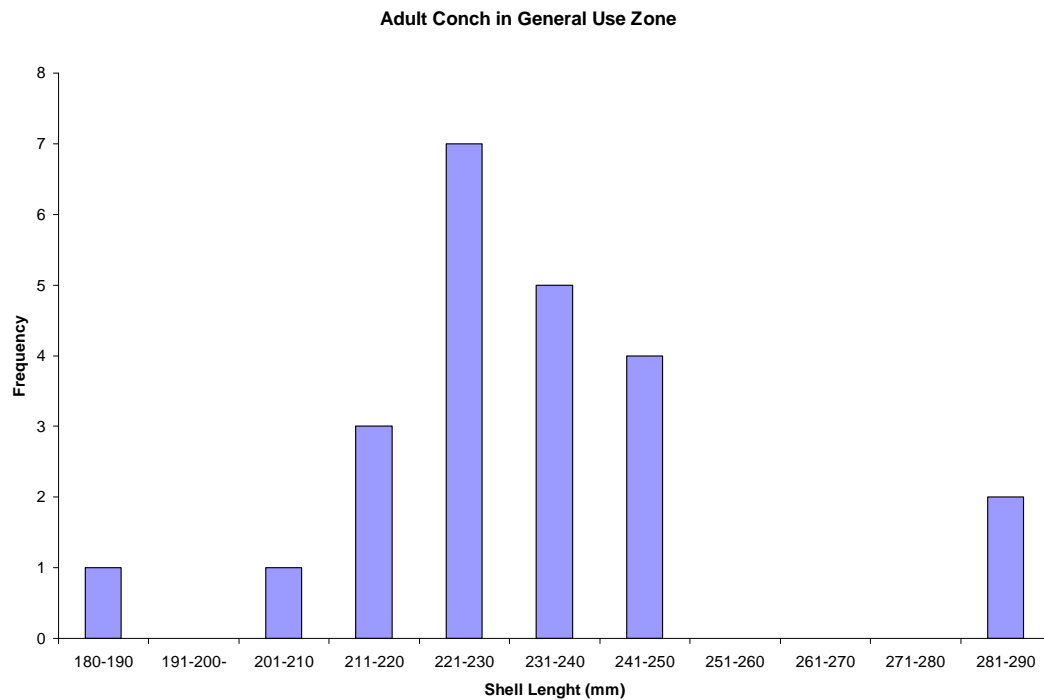
Graph 8. Adult Conch in Conservation Zone



Graph 9. Juvenile Conch in General Use Zone



Graph 10. Adult Conch in General Use Zone



A total of eighty two conchs were found during the survey of which forty eight occur in the Conservation zone and thirty four within the General use zone. Of the forty eight conchs found in the Conservation zone nine were juveniles and thirty nine were adults.

Of the thirty four found in the General use zone eleven were juveniles and twenty three were adults. The juvenile conch population of the General use zone was higher than in the Conservation zone. However majority of the juvenile conchs found in the Conservation zone were larger in shell length. Fisheries Laws permits the harvesting of conch at a shell length of one hundred seventy five millimeters (mm). Eight of the juvenile conch that occur in the Conservation zone had a shell length of one hundred and seventy five millimeter or more while five was in the General use zone .

During this survey a couple of conch was also found copulating so their measurements were not entered in the survey. The conch survey was also conducted at strategic points of interest. To do this, under water visual survey methods were perform using line transects of 50 meters long by 4 meters wide and 30 meters apart. Then one swimmer will swim at each side of the transect taking down all measurements of any conch in a 4 meter range. At each site five transect were conducted at a 30 meter range apart.

3.8 Synoptic Monitoring Program

Another Synoptic Monitoring Program was conducted with the assistance of two reserve staff from Glover's reef and the manager of South Water Caye Reserve. This monitoring program involves the studying of four different sites at Glover's reef, where two of the sites is located at the fore reef and is done by scuba diving while the back reef is done by snorkeling. This monitoring is completed on a twice a year basis which involves the study of fish and corals. For fish the methods used are by placing eight transect lines of thirty meters and collect information's on some certain fish species within a two meter range. For corals a different method is used which is by placing five transects of thirty meters and at every twenty five centimeter a study on the different types of corals was conducted.

On the first back reef site which is outside the reserve by South West Caye we noticed that more dead corals is observed than at the other back reef site that is in the reserve by Long Caye. The reason for this, we suspected could be from too many fishing activities in that area by local fishermen. The other back reef site that is located by Long Caye, contains more healthy corals than the other back reef site because of it's location in the marine reserve. The sites where the fore reef is located, one is in front of Middle Caye and the other in front of Long Caye, there we observed a more diverse and healthy array of corals which is similar and could easily compare each one with all the fishes and corals around. This is because of the amount of protection enforced in these areas which are the most used areas for diving activities done mostly by neighboring resorts.

For the fish survey the same methods was used. At the two fore reef sites more fish species and quantity was observed in that area this is due to the fact that it is also in the marine reserve and no fishing activities take place there, which also is frequently used as dive sites for tourism. At the back reef sites, the one by Long Caye we noticed an average amount of fish which is both adults and juvenile. At the site outside the reserve by South West Caye a smaller quantity of adult fish species was observed and more juvenile fish species seen. This was suspected due to too many fishing activities in that particular area.

For these monitoring conducted all data was submitted to MBRS through their computer system.

3.9 Turtle Monitoring

For the study of sea turtles three main species were observed while conducting the monitoring and the tagging. The species that was most abundant during the survey was the Hawksbill turtle then the loggerhead and lastly the Green turtle. To conduct these monitoring on these sea reptiles some studies and some field work were needed to be done. First you had to know the different types of turtles by identifying them, their tracks and reproduction status as well as their nesting behavior.

To identify these creatures their shell or carapace will all have a different look from each other and their head looks different as well. On sea turtles researcher are still studying their sexual maturity. Estimates of sexual maturity in sea turtles vary not only among species, but also among different populations of the same species. Maturity may range from as early as three years in Hawksbill; 12 to 30 years in Loggerheads; and 20 to 50 years in green sea turtles.

For most species, courtship activities usually occur several weeks before the nesting season. For this sometimes two or more male may do the courting. Males tend to have enlarged claws on their front flippers. These aid males in grasping the shells of the females during mating. Like other turtles, sea turtles lay eggs. They must come ashore to do so. Depending on the species, sea turtle nesting follow a set pattern. Females usually nest during the warmest months of the year and they return to the same nesting beach each year. Female of most species usually comes ashore at night, alone, most often during high tides. A female sea turtle crawls above the high tide line and, using her front flippers digs out a "body pit." Then using her hind flippers, she digs an egg cavity. The depth of the cavity is determined by the length of the stretched hind flippers. Depending on the species, the females deposits 50 to 200 eggs into the cavity. The female then covers the cavity with her hind flippers and leave. They may spend two or more hours out of the water during the entire nesting process.

To monitor the exact time these sea creatures nest and lay, a daily beach combing on the different nesting beaches of the cayes is conducted. For this nesting period this year three have been identify and noticed if laid. The loggerhead has been the most active nesting sea turtles identified up to now, and has been seen at a period of 14 days apart from each time, so it's a possibility that it could be the same Turtle that comes ashore to nest the three different times. There have also been studies that these sea reptiles can nest more than ones for the year a timely basis of up to 14 days from the first date nested. This year the first nest was observed at Long Caye beach and was identify and monitored if laying activities were performed. The reserve biologist was notified and the month and date was logged so as to keep a track on the day they hatch. On these same nesting beaches monitored, a number of 4 unsuccessful nests were also discovered. Below is a table

confirming the actual time they were seen nesting and the species as well as the time period that the hatchlings should start hatching.

Table 7. Turtle nests found at Glover's Atoll

<i>Turtle Species</i>	<i>Nesting Dates</i>	<i>Time Period for hatching to occur</i>	<i>Location of Nest</i>
Loggerhead turtle	May 22 nd ,2007	July 9 th to 30 th	Long Caye
Loggerhead turtle	June 4 th ,2007	July 22 nd to August 12 th	Long Caye
Loggerhead turtle	June 15 th ,2007	August 1 st to 15 th	Long Caye

This monitoring takes place at a daily routine from the month of May this year up to date for the observation of nesting sites and hatchings of these species. Up to this dated not much of these species has nested only for a Logger head at Long Caye that nested three times. The other beach at South West Caye have been getting nest other years but until know no nest, but observation is still in effect. The hatching period of the nest at Long Caye beach has come, and a survey was conducted by the reserve biologist. This survey shows and proved that hatchings did occur on the 15th July, it was also noted that one of the nest had hatching activities around midnight. This site was not watched that night because of the time, but according to observations conducted by a watch guard, some night birds were seen very active in that particular area. The other day the site was surveyed and a deep hole was observed in the nest that was due to hatch the same period of time which the date given was from the 9th to the 30th of July. The nest was then dogged up to have an idea of how many of these species did nest and how many didn't. The remaining unhatched eggs and the eggs that hatched were found and a count was conducted. Nineteen eggs hatched from the hundred forty four eggs that was laid. In addition out of the nineteen hatchling one had receive some type of injury and was place by the beach for protection but unfortunately died later.

The first observations that were monitored for this first nesting site was the incubations period of these eggs that took fifty five days before they are ready to hatch. The other observation are that why so little hatchings, and that was because of the location of the site. The location of this site was not in a properly situated place which should be at a high sandy area, while this nest was in a low sandy area beside the beach. This proved after all that the eggs which were extracted from nest for count was mostly moist due to high tides and the ones that manage to hatch were the ones on the top which had the correct temperature for proper incubation.

After all eggs were monitored and count, they were replaced in the nest and buried once again. For the other two nests that are more closer to the beach should be having the same types of problems which might lead poor hatchlings as well. A quick meeting with the land owner was done and they came up with suggestions for future nests, close to beaches like this one. A great idea that was suggested, to have successful eggs hatching was to build artificial nest in the middle of the Caye and have eggs relocate to the nest very quietly and slowly without moving the eggs around and placing them the same way they

were set in the real nest. This actually has to be accomplished within a twelve hour period right after hatchings occur.

The other survey was conducted on the 26th of August at the second turtle nest on Long Caye. The nest was also dug up and it was discovered that a total of one hundred forty eight eggs were laid. Thirty two of these eggs hatched successfully, one turtle hatchling was found in the nest, and one hundred fifteen eggs did not hatch. The nest was dug up by Luis Novelo. The eggs from the nest that did not hatch were also buried back in the same spot.

One final nest is left and is suspected to hatch anytime soon. It has been noticed that the reason for such low percentage of successful hatchlings is still due to the fact that the nests are very close to the water. On both occasions some of the eggs are actually touching the water. Plans are still in place to relocate the nests for next year.

Table 8. Logger Head Turtle Nestlings

Date Nested	Hatchling Periods
1. May 22 nd ,2007	July 9 th to July 30 th
2. June 4 th ,2007	July 17 th to August 6 th
3. June 15 th ,2007	August 1 st to August 15 th

Figure 10. Staff counting turtle eggs.



Eggs from the first nesting site.

4.0 Staff

4.1 GRMR Staff

In February of 2007 a new ranger, Mr. Luis Novelo, was hired to assist the reserve staff with their daily operations at Glovers Reef Marine Reserve. The ranger was paid a salary of One Thousand Dollars a month through funds collected from stakeholders of the atoll. His salary was paid by these funds from February to July. Furthermore Mr. Majil provided the ranger with his salary for August and September at which point he was then officially hired by the Belize Fisheries Department.

The marine reserve is equipped with a staff of four members: a manager, Mr. Roberto Carballo, a marine biologist; Mr. Elias Cantun, and two rangers, Mr. Gilford Martinez and Mr. Luis Novelo. The reserve staff is responsible for the enforcement of the Belize Fisheries regulations and some monitoring activities within the atoll. Also they log all visitations and collect park fees within the marine reserve. The staff works on a two weeks on, one week off rotational schedule which allows for two reserve staff to be present at all times on the atoll.

5.0 Trainings/Meetings

5.1 Staff Meeting

The reserve staff holds meetings once every month to discuss staff schedule and other matters that refer to the marine reserve. These meetings are usually held at the ending of each month in order to update the staff on the upcoming month's work plan and staff schedule.

Tentative Work Schedule for 2008

December 28, 2007 – January 3, 2008 > Elias and Gilford
January 4, 2008 – January 11, 2008 > Elias, Gilford, Luis and Roberto
January 12, 2008 – January 17, 2008 > Luis and Roberto
January 18, 2008 – January 24, 2008 > Elias and Gilford
January 25 – January 31 > Elias, Gilford, Luis and Roberto
February 1 – February 7 > Luis and Roberto
February 8 – February 14 > Elias and Gilford
February 15 – February 21 > Elias, Gilford, Luis and Roberto
February 22 – February 28 > Luis and Roberto
February 29 – March 6 > Elias and Gilford
March 7 – March 13 > Elias, Gilford, Luis and Roberto
March 14 – March 20 > Luis and Roberto
March 21 – March 27 > Elias and Gilford
March 28 – April 3 > Elias, Gilford, Luis and Roberto
April 4 – April 10 > Luis and Roberto
April 11 – April 17 > Elias and Gilford
April 18 – April 24 > Elias, Gilford, Luis and Roberto

April 25 – May 1 > Luis and Roberto
May 2 – May 8 > Elias and Gilford
May 9 – May 15 > Elias, Gilford, Luis and Roberto
May 16 – May 22 > Luis and Roberto
May 23 – May 29 > Elias and Gilford
May 30 – June 5 > Elias, Gilford, Luis and Roberto
June 6 – June 12 > Luis and Roberto
June 13 – June 19 > Elias and Gilford
June 20 – June 26 > Elias, Gilford, Luis and Roberto
June 27 – July 3 > Luis and Roberto
July 4 – July 10 > Elias and Gilford
July 11 – July 17 > Elias, Gilford, Luis and Roberto
July 18 – July 24 > Luis and Roberto
July 25 – July 31 > Elias and Gilford
August 1 – August 7 > Elias, Gilford, Luis and Roberto
August 8 – August 14 > Luis and Roberto
August 15 – August 21 > Elias and Gilford
August 22 - August 28 > Elias, Gilford, Luis and Roberto
August 29 – September 4 > Luis and Roberto
September 5 – September 11 > Elias and Gilford
September 12 – September 18 > Elias, Gilford, Luis and Roberto
September 19 – September 25 > Luis and Roberto
September 26 – October 2 > Elias and Gilford
October 3 – October 9 > Elias, Gilford, Luis and Roberto
October 10 – October 16 > Luis and Roberto
October 17 – October 23 > Elias and Gilford
October 24 – October 30 > Elias, Gilford, Luis and Roberto
October 31 – November 6 > Luis and Roberto
November 7 – November 13 > Elias and Gilford
November 14 – November 20 > Elias, Gilford, Luis and Roberto
November 21 – November 27 > Luis and Roberto
November 28 – December 4 > Elias and Gilford
December 5 – December 11 > Elias, Gilford, Luis and Roberto
December 12 – December 18 > Luis and Roberto
December 19 – December 25 > Elias and Gilford
December 26 – January 1 , 2009 > Elias, Gilford, Luis and Roberto

5.2 Advisory Committee Meetings

On January 24 an advisory committee meeting was held at the Belize Fisheries Department. In this meeting several matters were discussed. The most important of these were that the reserve has now received their new vessel and the only thing left is for the changing over of the engines to the new vessel. This is to occur in the following week. Also the reserve has received a small twenty three fiberglass vessel for use within the atoll however an engine is needed for this vessel. In addition it was made mention

that the stakeholders should contribute something in order to acquire a part time ranger to help in enforcement activities within the atoll since this is seen to be a very big problem.

On the 19th of April an advisory committee meeting was held in Dangriga. At the meeting several topics were discussed. Mr. Majil mentioned that the fisheries laws are currently being revised. Also it was said that Mr. Leobihildo Tamai will assist the reserve staff with placing the marker buoys in their correct positions. A presentation by Ms. Zoey Walker on the new management plan was made and another presentation by two individuals was made concerning the development guidelines for Glover's Atoll.

Another advisory committee meeting was held in June and this was one of the most interesting meetings. Several issues were discussed from new enforcement measures to the opening of a channel for fishermen to fish lobsters and fish only. It was agreed that starting sometime either this year or next year a special license will be issued to fishermen to fish within the waters of Glovers Reef Marine Reserve. Any persons wanting to fish the waters of Glover's Atoll must possess this special license. In addition fishermen will be asked to stop fishing Nassau Grouper on a whole; there will not be any charge for persons who break this agreement. A meeting will be held with the fishermen who fish the waters of Glover's in order to discuss the matter and also another meeting will be held with the captains of the boat. The captain's meeting will be to discuss many issues but especially to inform them of the fact that we will start holding them responsible for any offenses made on board.

In October several members of the committee meet in Dangriga and had there quarterly GRAC meeting. Several little issues were discussed but the most interesting issue was that of the introduction of a special license to fish within the waters of Glover's Reef Marine Reserve. The issuing of the special license will commence on 1st January, 2008, for the first year it will be free and for the second year and additional twenty five dollars will be charged per individual fisherman.

5.3 Managers Meetings

On the 15th February a meeting was held in Belize City to discuss the issue of appraisals and let the reserve staff more aware of where they are given the fact that they are now hired as open vote. In addition on that same day two other meetings were held. One with the fisheries inspector to discuss the whole issue of the closing of the lobster season and the other meeting was with all managers to discuss issues at the different reserve.

On the 3rd of April a managers meeting was held at the fisheries department where the necessary arrangements for the agricultural show were made. It was agreed that the same posters from last year were going to be used and also one person from each reserve will attend the show to offer assistance. In addition it was also made mention that in May training on enforcement is going to be held with the involvement of the manager and a ranger from each reserve. Finally was that of mooring buoys which are to be deployed in May also.

5.4 Turtle training

On April 20th to the 27th sea turtle training was conducted at Glover's Reef Marine Reserve where a six staffs from three marine reserves together with three staff from Wildlife Conservation Society (WCS) joined together in this training and gain new ideas on how to keep on protecting sea turtles. The training was given by Ms. Cathie a researcher from WCS.

On the first day we all acquired more knowledge about sea turtles behaviors and the different ways of identifying them. A lot of useful questions were asked and they were clearly answered. The first lesson was on how to identify turtle tracks and their nest. We learned that the tracks of the different species can be difficult to tell apart, especially those of *Caretta lepidochelys* and the *eretmochelys*. It was also made clear that for us to conduct accurate turtle monitoring or gather data, we need to conduct sufficient field work, spend quantity and quality time watching nesting turtles and document their characteristics that distinguish the tracks made by each species. We also learned the descriptions of nest, their track width, the type of tracks, their preferred beach type, eggs sizes and numbers of geographic location of nesting beaches.

We then came up with the idea to go to the different cayes where nesting turtles used to occur and find solution especially on how we can improve vegetation on turtle nesting beaches. Most of the training was done in the field and for this we had to go out for most of the day and see if we could spot turtles either by boat or by snorkeling along the wall and continental shelf of different parts of the atoll.

At the end of the training it was confirmed that a total amount of thirty eight sea turtle was spotted, of that ten were capture. One loggerhead, one green turtle and eight hawksbills were captured. The procedures we used to capture these turtles so we can have some idea of how to gather data on the turtle itself. The turtle was captured by diving them up or waiting for them to come up for air at which point a person would then capture the turtle. Once a turtle was captured he was placed in the boat and the survey team would continue until they finished the survey. When the survey was completed we then measured the captured turtles using a tape to do over the curve measurements and a caliper to do straight measurements. On each sea turtle captured a minimum straight notch to notch carapace length, straight notch to tip carapace length and straight carapace width was taken using the caliper. In addition an over the curve notch to notch carapace length, over the curve notch to tip carapace length and over the curve carapace width was also taken. A straight notch to notch plastrum length including the scale length and straight plastrum width were taken. A measurement from the tip of the scale to the vent and from the tip of the scale to the end of the tail was also taken.

Afterwards we continued with the measurements of the body depth using the caliper and a measurement of the head width. After measuring the turtles they were weighed then tagged with some metal tags on both front flippers and they were carefully observed to see if they had any markings, scars or any bump. Next a tissue sample was taken from one of the back flippers then stored in some vials that were later label. The turtles were then taken at the same location they where first seen and released.

The second face of the turtle monitoring program was done from 24th to 27th September. This time it involved just a quick review of the methodology and purpose of the project. Then we headed directly to the water to start spotting, capturing and tagging turtles. So far up to September 25 we have successfully captured and tagged four turtles; two hawksbills and two green turtles.



Figure 11. Turtles that were caught.



Figure 12. Instructor showing how to collect measurements from turtle.

5.5 Enforcement Trainings

On the 10th to the 11th the manager and the biologist attended an enforcement workshop in Belize City. The workshop offer individuals extra knowledge on procedures of arrest, report writing, handling of evidence and also the opportunity to ask question about points that were not clear to anyone. The training was given by both a police inspector and the fisheries inspector who gave us all the necessary information the reserve staff needed in order to effectively carry out arrest. In addition Mr. Coleman told the group how to approach a boat and also how to search the boat. Three needed books were issued at this training and these are The Belize Fisheries Regulations, Special Constable's Training Manual and Belize Fisheries Act Chapter 210.

Also since members from all the different reserves were together an opportunity to discuss and come up with some basic rules that should apply to all reserves was taken. Also a list of items that are necessary for the proper functioning of the reserve was written down.

6.0 Education / Public Awareness

The staff made an extra effort this quarter to educate and inform both fishermen and other users of the atoll about the rules and regulations that govern the atoll of Glovers Reef. We also gave them T-shirts, pamphlets with the fisheries regulations and brochures. We had several discussions with the people and especially fishermen on the importance of sustainability. Explaining to them the need for them to take it upon themselves and use the waters in a sustainable manner making sure they are not exploiting the marine resources and damaging corals.



Figure 13. Reserve staff distributing booklets and T-shirts to fisherman.



Figure 14. Reserve staff discussing with fisherman.

In April the reserve staff along with other individuals from other reserve and WCS went to the different island to give information on turtle nesting, and allow stakeholders to know what kind of practices should be taken when turtles are nesting.

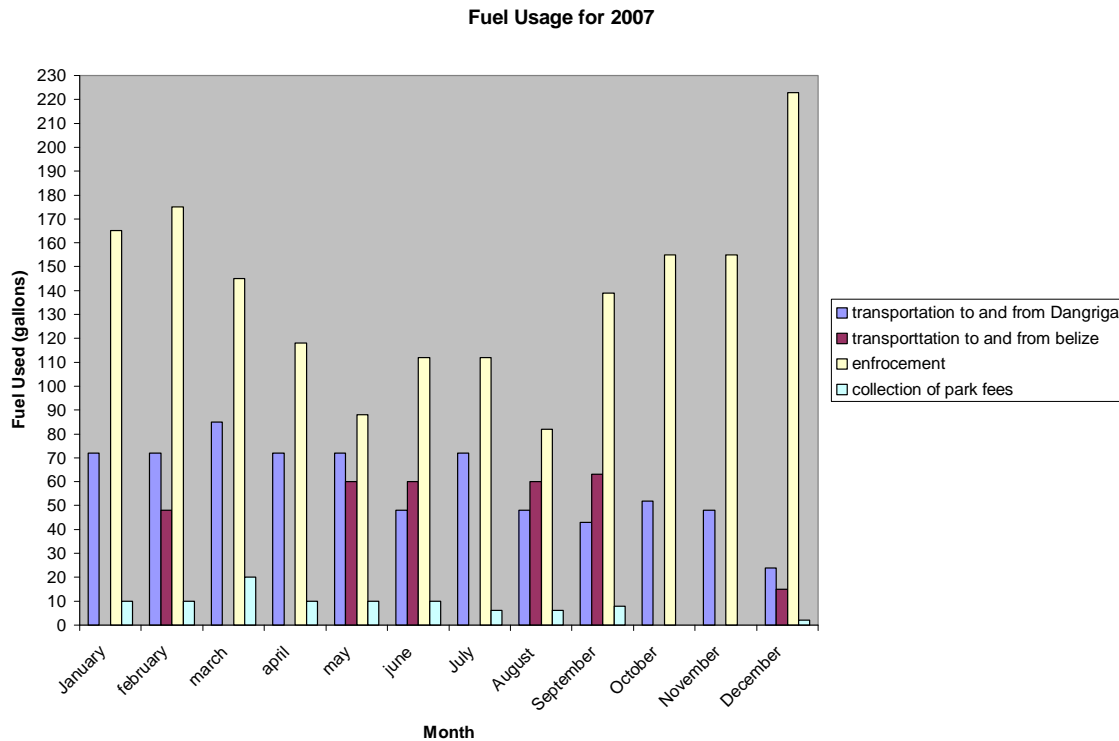
The reserve staff also maintains the responsibility of informing visitors of the basic information and laws that govern the atoll. Information is given out in the form of brochures and also by speaking to the individuals. This specific task is done on a day to day basis as new visitors come to the atoll.

This quarter involve the constant reminder to both fishermen and stakeholders that the conch season is closed and no one should be seen harvesting conch. In addition they were told to not even take one or two for fishing purposes. Nevertheless some fresh conchs were observed to have been harvested in the western reef area.

The reserve staff also maintains the responsibility of informing visitors of the basic information and laws that govern the atoll. Information is given out in the form of brochures and also by speaking to the individuals. This specific task is done on a day to day basis as new visitors come to the atoll.

7.0 Fuel Usage

Graph 11. Fuel Usage for 2007



Each reserve is allotted two hundred gallons of fuel each month to carry out their work. This fuel is not enough however the department has been working hard to try and fix this problem. In special times of the year like for the opening of seasons the department has extended their help by offering a little more fuel to carry out effective enforcement and monitoring of these marine resources. Also the department has started to equipped each reserve with a small boat (apart from the bigger vessel they now have) and a small engine in order to lower the daily use of fuel and allow for more to be done with the same amount of fuel.

8.0 Revenue

Month	Fees collected by GRMR staff
Jan-07	5,880.00
Feb-07	7,580.00
Mar-07	7,730.00
Apr-07	4,670.00
May-07	_____
Jun-07	4590.00
Jul-07	_____
Aug-07	_____
Sep-07	930.00
Oct-07	1,100.00
Nov-07	940.00
Dec-07	6830.00
Total	~ \$ 40,250.00

9.0 Infrastructure

The reserve station is a two store wooden building. The upper flat is divided into rooms for the reserve staff. The lower flat has a kitchen, and two other rooms that are used for storage of materials. There are other infrastructures on the island but these are the property of WCS.

The reserve station is in need of some repairs. Some rooms do not have a door, a window is missing from one of the staff room, the kitchen need to be sealed up and secure. These minor problems will be dealt with this coming month.

The four control cables for the reserve vessel GRMR1 have been purchased at Marelco and replaced on both 40hp engines and working in good conditions.



Figure 15. Ranger repairing boat engine



Figure 16. Staff changing control cables on boat engine

