Glover's Reef Marine Reserve

Fisheries Catch Data Collection Program

Report for the period
January 2005 to June 2012

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Cover Photos: Top to Bottom: Sarteneja Village fisher in dory removing conch from shell at Glover's Reef Marine Reserve (R. Coleman); Data Collector measuring lobster (S. Hoare); and sailboat from Sarteneja Village fishing on the Glover's Reef Atoll (R. Coleman)

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EXECUTIVE SUMMARY

Fishing is one of the most important economic activities in Belize, and the Marine Protected Area (MPA) system is expected to contribute to sustainable fisheries by providing refuge areas that allow for species reproduction and ultimately, the replenishment of adjacent fished areas. In 2005, the Glover's Reef Atoll Fisheries Catch Data Collection Program, a fishery-dependent long term monitoring program, was introduced at the Glover's Reef Marine Reserve, the third largest marine protected area in Belize with an area of 35,876 hectares. This monitoring program involves sampling the catch from fishers: the species composition, the amount and size of fish products harvested from the Atoll's General Use Zone. The data are used to provide Catch per Unit Effort (CPUE) information which can be used to determine trends in landings and fishing pressure at the Atoll and gauge the effectiveness (e.g. spill over effects) of the marine reserve's 'no take' zones on fisheries production. Since the inception of the program, a total of 375 fishers have participated in the surveys. This report presents data collected for the conch, lobster and finfish fishery for the period January 2005 to June 2012.

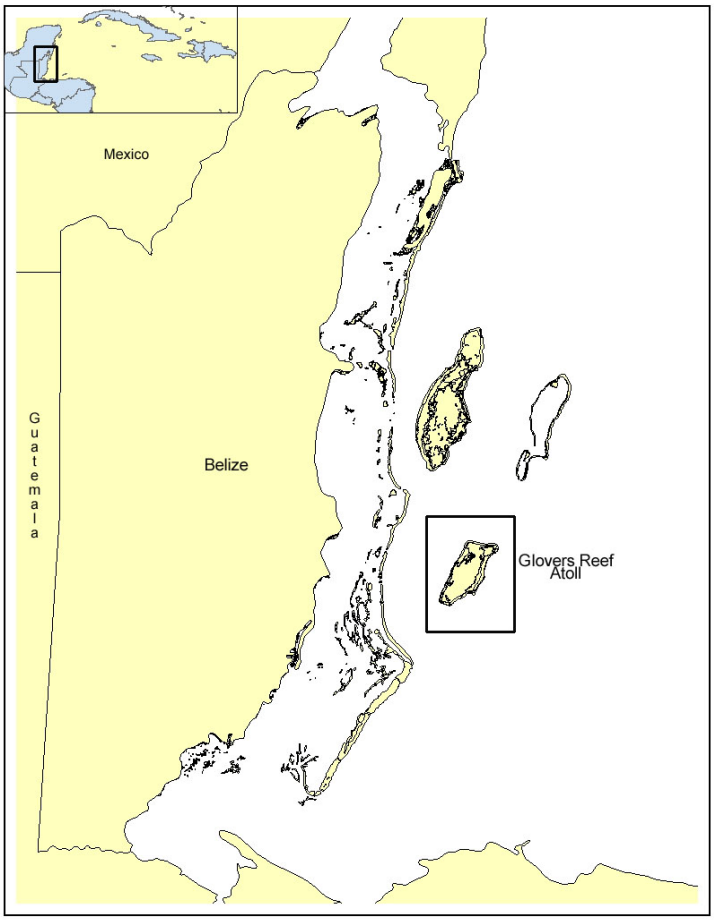
The highest average CPUE of 10.4 conch/hour/fisher was recorded at Glover's Reef during the 2011 conch open season. This also coincided with the early closure of the 2011 conch season in April 2012, and not end of June 2012, due to the National Conch Quota being met; an indication that it was a productive season for the conch fishery. The average CPUE for lobster remains stable but low with the latest 2011 open season results showing an average CPUE of 1.2 lobsters/hour/fisher. A total of 18 species types representing 60 identified species have been recorded during the period January 2005 to December 2011. Snappers accounted for the majority of the catch sampled (69.6%) in the handline fishery. Five species types, Hogfish, Snapper, Parrotfish, Grouper and Angelfish accounted for 89.4% of the spear gun fishery. The results showed that the fishers are in compliance with the ban on the harvesting of parrotfish since no parrotfish have been recorded since the ban was implemented in 2009. The average CPUE for the three most sampled species in the spear gun fishery showed a low but stable trend for the Hogfish, Snapper and Grouper each showing an average CPUE of less than 1.0 fish per hour per fisher. Similarly, the average weight (g) CPUE for these three species showed that a stable trend.

INTRODUCTION

Glover's Reef Atoll

The Glover's Reef Atoll (16º44'N, 87º48'W) is about 32 km long and 12 km wide with an area of 35,876 ha. The atoll lies approximately 45 km east of the Belizean mainland and 25 km to the east of the Belize Barrier Reef (Figure 1). The entire Glover's Reef Atoll was established as a Marine Protected Area in 1993 (Statutory Instrument 38 of 1993 under the Fisheries Act Chapter 210) and is managed by the Belize Fisheries Department. The Glover's Reef Marine Reserve (GRMR) includes five management zones: General Use Zone, Conservation Zone, Wilderness Zone, Seasonal Closure Zone and Spawning Aggregation Site (Figure 2).

Figure 1: Location of Glover's Reef Atoll



The shallow protected waters of the Atoll's lagoon provide nursery and feeding habitats for at least three species of sea turtles, eight species of sharks and rays, more than twenty species of aggregating reef fish, and numerous species of coral (Wildtracks/WCS, 2007). The depth ranges from 300 m to 400 m to the north and west of the atoll, while the east side drops to over 1000 m. Water depth in the inner lagoon averages 6 m to 8 m deep with depths up to 18 m (Figure 3). There are three main channels that connect the ocean reef and lagoon habitats, with the latter containing approximately 850 patch reefs.

Portion of Glover's Reef Atoll showing backreef and forereef areas (Photo: Sergio Hoare/WCS)

Figure 2: Glover's Reef Marine Reserve: Management Zones

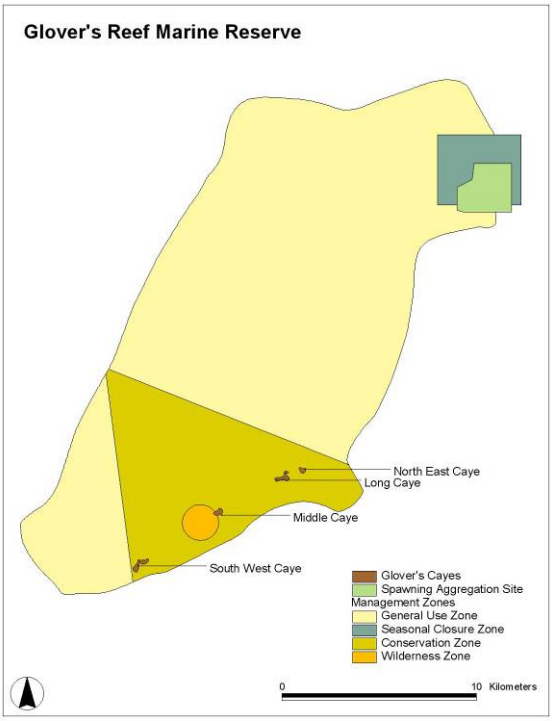
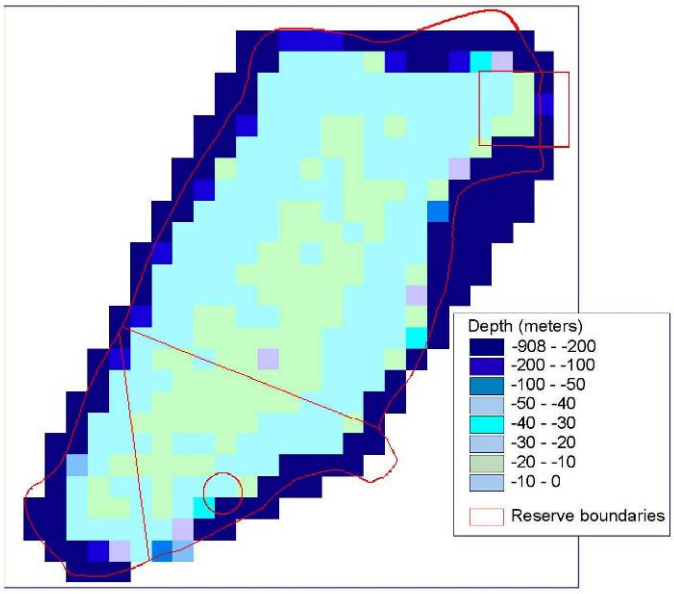


Figure 3: Bathymetry of Glover's Reef Atoll



Glover's Reef Atoll Fisheries Data Collection Program

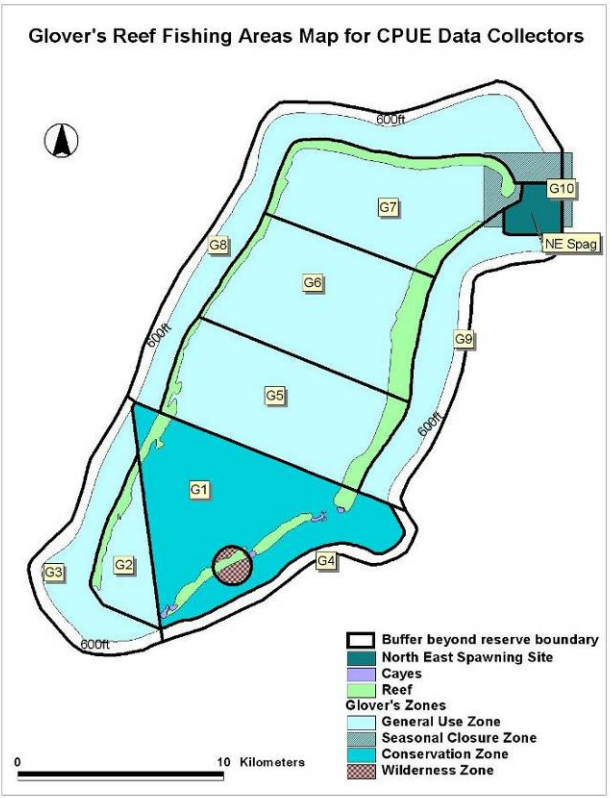
The Glover's Reef Atoll fisheries data collection program was developed by Sandra Grant, a consultant, hired by the Wildlife Conservation Society (WCS) and the Caribbean Regional Fisheries Mechanism (CRFM) Secretariat. The data collection program was developed based on information gathered from a Glover's Reef Marine Reserve (GRMR) boat census in 2004 which looked at fishing patterns, gear use, landing patterns, number of boats and fishers utilizing the GRMR. The census showed that the majority of fishers originated from Sarteneja Village, Dangriga Town and Hopkins Village with a small number of fishers from Belize City.

The sampling program was divided into two sections to reflect the distinct fishing patterns and gear use of the fishers: (1) Skiffs operated by fishers from Hopkins Village and Dangriga Town and (2) Sailboats operated mainly by fishers from Sarteneja Village. Data collection from the skiffs is based on landings data gathered in Hopkins Village and Dangriga Town while data are collected at sea from the Sarteneja Village fishers. A pilot study was conducted in August 2004 and the program commenced in January 2005.

METHODOLOGY

The catch from fishers is sampled for the species composition, the amount and size of the product harvested, gear type used and fishing effort. Starting in March 2006, the location of where the catch was harvested was also recorded according to zones G1, G2 etc. (Figure 4). Catch data are recorded for lobster, conch and finfish. For each fisher's catch, the name of the fisher, species caught, fishing gear and total fishing effort (hours fished) are recorded. The following were also recorded: for lobster - weight (g) and carapace length (mm); for conch - shell length (mm), shell width (mm), lip thickness (mm) and weight (g) at various stages of processing; and for finfish - fork or tail length size (cm) and weight (g).

Figure 4: Glovers Reef Fishing Areas Map



DATA COLLECTION FROM FISHERS ON SITE AT GLOVER'S REEF ATOLL

Sarteneja fishers use sailboats and spend approximately eight days per fishing trip at the Atoll. The sailboat "houses" approximately 5 to 8 fishers who use individual 'dories' to fish. Fishing intensity is seasonal ranging from eight sailboats that normally fish the Atoll to significantly more sailboats at the lobster and conch open seasons. Each month, the fisheries data collector samples approximately three sailboats which includes five or more fishers per sailboat. The sampling is done on three consecutive days per month and data may be collected from one to three days depending on the presence of Sarteneja sailboats. Sarteneja fishers tend to use a systematic route when fishing at the Atoll and they are sampled at these locations along this route. A fishing day lasts approximately six to eight hours, commencing at approximately 8:00 a.m. The fishers return to the sailboat at midday to put the catch on ice and to have lunch after which they continue to fish until about 4:00 p.m. Catch data are collected normally starting at midday when the fishers return to the sailboat.

DATA COLLECTION FROM FISHERS ON THE MAINLAND (DANGRIGA AND HOPKINS)

Hopkins and Dangriga fishers use skiffs and spend approximately two to three days per fishing trip at the Atoll. Each skiff carries about 4 fishers who primarily harvest conch and pelagic fish species. The data collector would sample opportunistically from the skiffs once they return to the mainland on a monthly basis. Data collection has proven to be challenging using this approach, so starting 2010 data from the Hopkins/Dangriga fishers are being collected on site at Glover's Reef Atoll.

RESULTS

CONCH

Since 2005, data have been collected for seven consecutive conch open seasons which last from 1 October to 30 June of the following year. Data were collected each season for at least 8 of the 9 months during the open season, however for the 2011 conch open season (1 October 2011 – 30 June 2012) there was an early closure of the harvesting season (Table 1). This closure took effect countrywide on 23 April, 2012 since the National Conch Quota had been met. As a result, only 5 months were sampled during the 2011 season. This also resulted in the fewest number of days, fishers and boats sampled during the 2011 open season compared to the other open seasons (Table 1).

Table 1: Fisheries Catch Data Sampling Effort at Glover's Reef Marine Reserve for the 2005 to 2011 Conch Open Seasons

Conch Open Season (1 October - 30 June)	No. of Months Sampled	No. of Days Sampled	No. of Fishers Sampled	No. of Boats Sampled
2005 Season Oct 2005 to June 2006	**9**	**94**	**72**	**16**
2006	**9**	**52**	**110**	**18**
2007	**9**	**42**	**95**	**14**
2008	**8**	**16**	**54**	**7**
2009	**8**	**21**	**71**	**9**
2010	**9**	**24**	**79**	**10**
2011	**5**	**12**	**47**	**5**

The CPUE results for conch showed that since 2009, the average CPUE for conch has been increasing with the highest average CPUE of 10.4 conch/hour/fisher recorded during the 2011 conch open season (1 October 2011 to 23 April 2012) (Figure 5).

An analysis of the average CPUE for conch per month during the 2011 season showed that the highest recorded CPUE occurred during December 2011 (14.0 conch/hour/fisher) and the lowest in February 2012 (5.6 conch/hour/fisher) (Table 2). The highest average CPUE for conch recorded was 15.7 conch/hour/fisher in March 2006 (2005 season) and the lowest was 1.1 conch/hour/fisher in January 2005 (2004 season).

Figure 5: Average number of conch caught per hour per fisher at Glover's Reef Marine Reserve for the 2004 to 2011 Conch Open Seasons
(Conch Open Season – 1 October to 30 June)

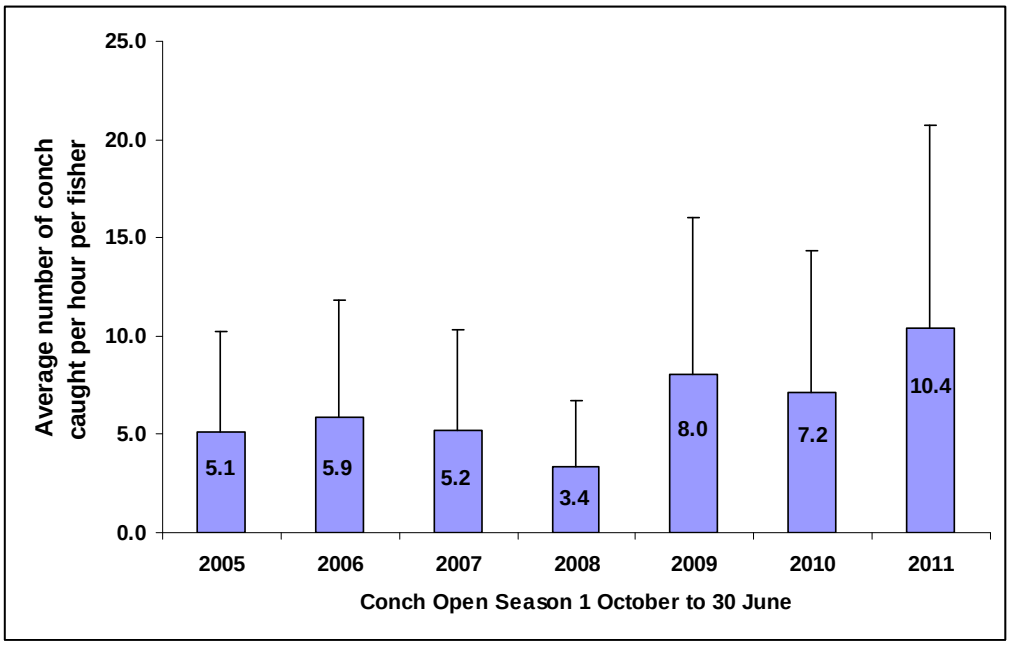


Table 2: Average number of conch per hour per fisher caught at Glover's Reef Marine Reserve for the months sampled during the 2011 Conch Open Season.

Month Sampled	Average no. of conch/hour/fisher
November 2011	7.3
December 2011	14.0
January 2012	12.1
February 2012	5.6
March 2012	12.1

LOBSTER

The lobster open season is from 15 June to 14 February of the following year. Lobster catches were sampled for 6 to 8 months of the 9 month open season with a maximum of 79 fishers sampled during the 2005 to 2011 lobster open seasons (Table 3).

Table 3: Fisheries Catch Data Sampling Effort at Glover's Reef Marine Reserve for the 2005 to 2011 Lobster Open Fishing Seasons
(Lobster Open Season - 15 June to 14 February)

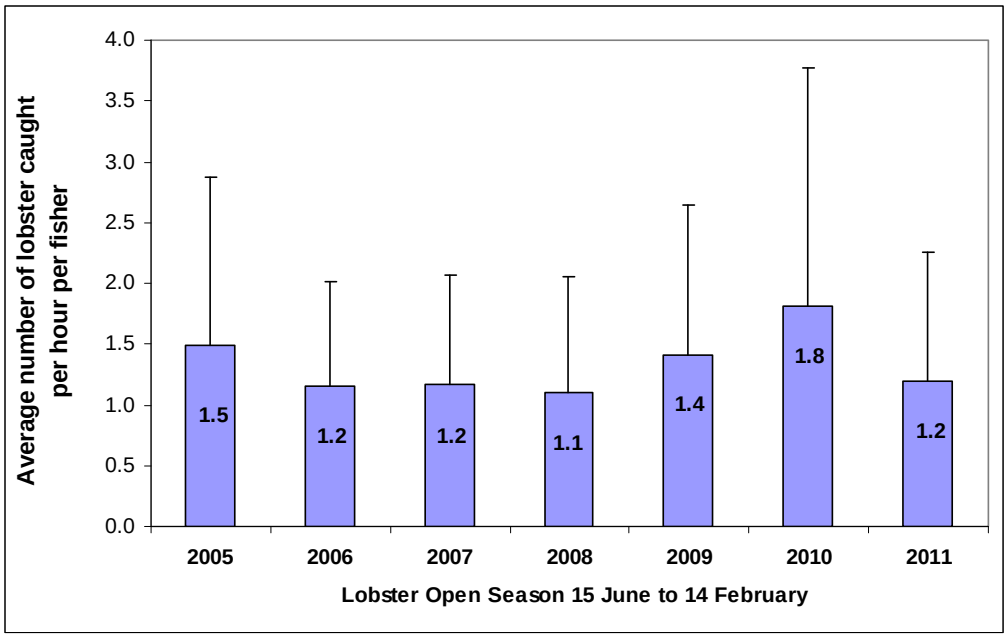
Lobster Open Season (15 June – 14 February)	No. of Months Sampled	No. of Days Sampled	No. of Fishers Sampled	No. of Boats Sampled
2005 Season June 2005 to Feb 2006	6	16	53	8
2006	6	13	46	7
2007	8	23	74	9
2008	7	20	62	7
2009	8	20	79	10
2010	7	20	57	9
2011	6	14	34	5

Measuring lobster tails (Photo: R. Coleman)

Determining sex of lobster (Photo: R. Coleman)

Although there was a small increase in the average CPUE (average number of lobsters/hour/fisher) during the 2010 season (1.8 lobster/hour/fisher), the 2011 season saw a decrease to 1.2 lobsters/hour/fisher (Figure 6).

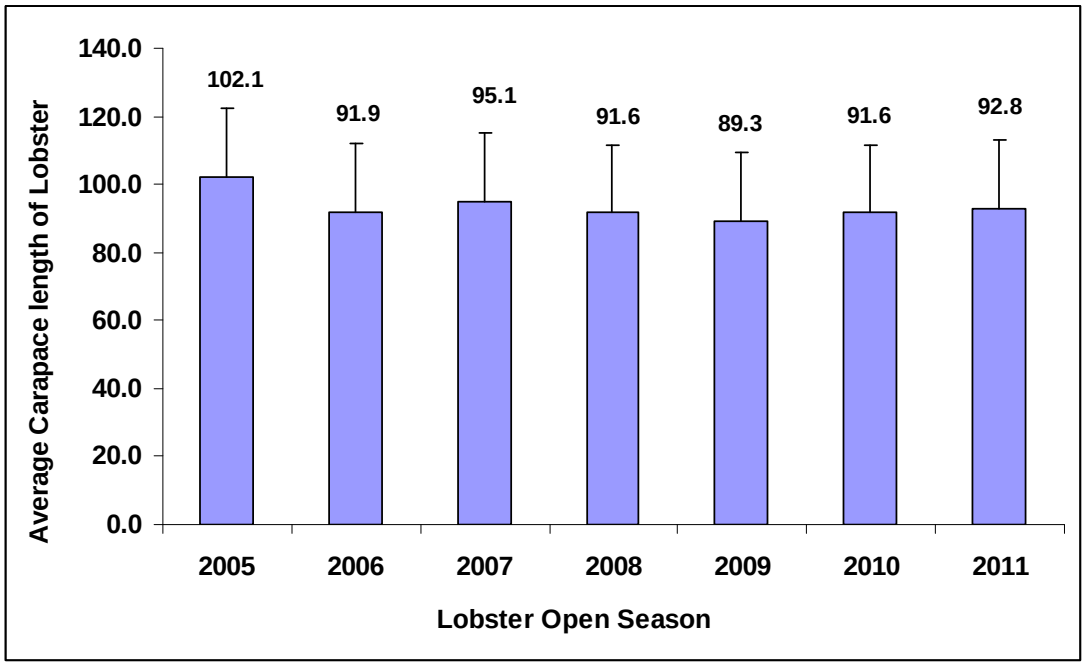
Figure 6: Average number of lobster per hour per fisher caught at Glover's Reef Marine Reserve for the 2005 to 2011 Lobster Open Fishing Seasons



For the 2011 open season, 9.5% of the spiny lobsters (*Panulirus argus*) sampled were below the minimum harvestable size limit of 76.0 mm Cl (carapace length). Compliance was best in 2007 with 8.8% of the lobsters sampled below the minimum harvestable size limit and the worst in 2009 when 20.6% of the lobsters were below the minimum size.

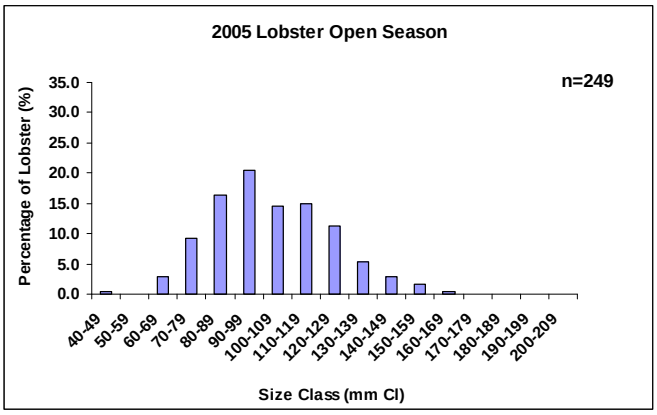
The highest average Cl of spiny lobsters recorded was in 2005 with 102.1 mm (standard deviation (s.d.) = 20.8). Since 2005, the average Cl each season has decreased but remained stable with a range between 89.3 mm Cl (s.d. = 16.3) and 95.1 mm Cl (s.d. = 16.0) (Figure 7).

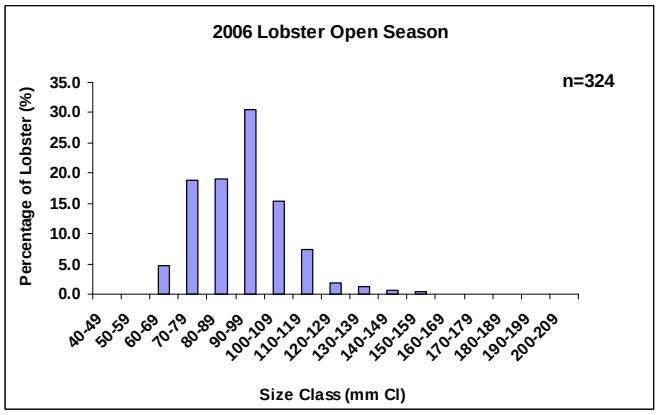
Figure 7: Average Carapace Length of Spiny lobster (*Panulirus argus*) recorded during the 2005 – 2011 Lobster Open Seasons

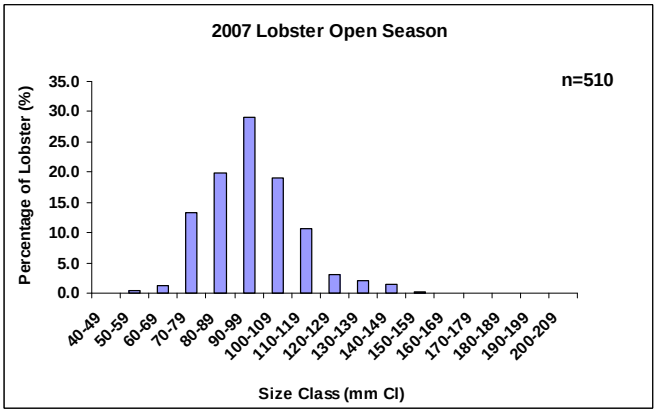


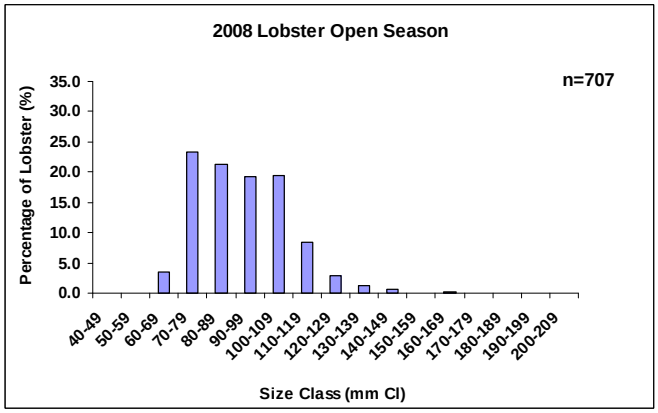
The population size class structure of spiny lobster showed that except for 2005, the majority of the lobsters were from the 70 – 119 mm range (Figure 8). During the 2005 season, 21.3% of the lobsters sampled were greater than 120 mm Cl. Since the 2005 season, the largest percentage of lobsters sampled greater than 120 mm Cl were 6.7% in 2007 and 6.3% in 2011.

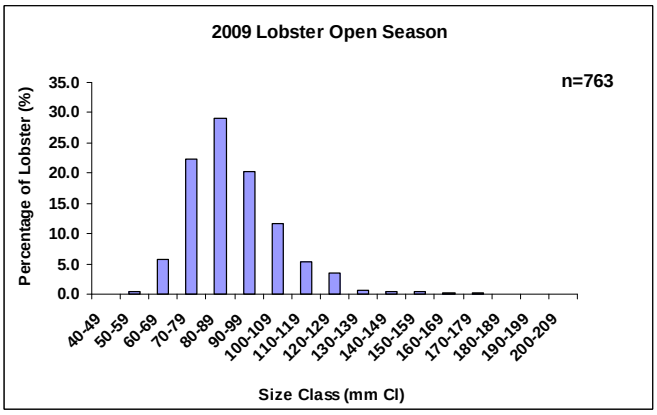
Figure 8: Population Size Class Structure of Spiny lobster (*Panulirus argus*) for the 2005 – 2011 Lobster Open Seasons

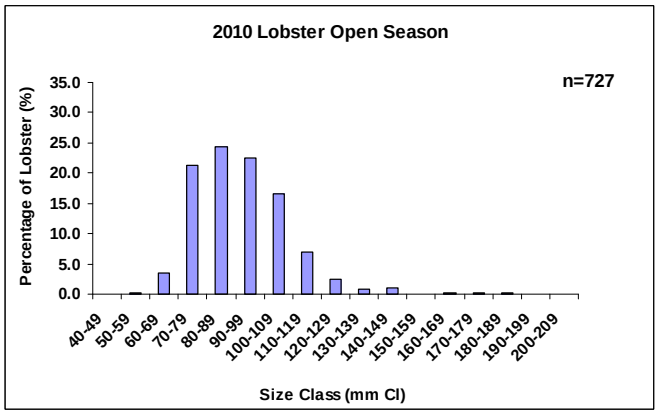


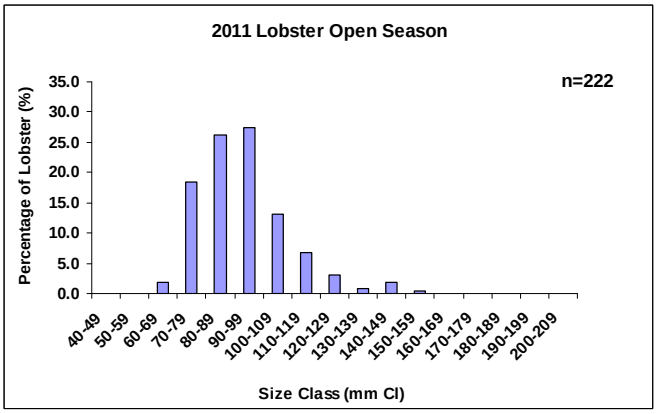












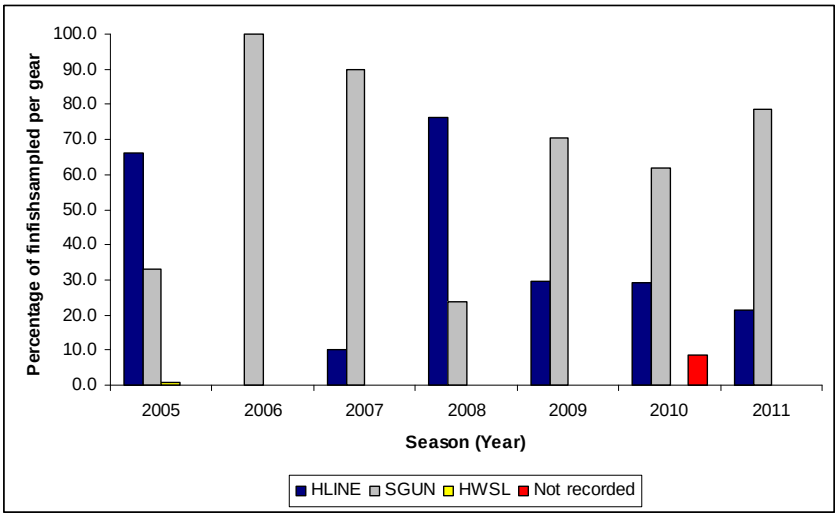
FINFISH

A total of 175 fishers were sampled for the period January 2005 to December 2011 ranging from 25 fishers in 2011 to 61 fishers in 2008 (Table 4). The handline fishery made up 50.2% of the catch and the spear gun fishery 49.6%. The Hawaiian sling was recorded in 2005 only and accounted for 0.2% of the catch (Figure 9). A total of 18 species types representing 60 identified species were recorded during the period January 2005 to December 2011 (Appendix 1).

Table 4: Fisheries Catch Data Sampling Effort at Glover's Reef Marine Reserve for the 2005 to 2011 Finfish Seasons (Finfish Season – January - December)

Season (January-December)	No. of Months Sampled	No. of Days Sampled	No. of Fishers Sampled	No. of Boats Sampled
2005	10	65	35	14
2006	9	21	30	8
2007	10	16	29	10
2008	10	39	61	14
2009	10	19	54	12
2010	11	22	50	13
2011	5	9	25	9

Figure 9: Percentage of gear type being used by fishers sampled at Glover's Reef Atoll for the period January 2005 to December 2011



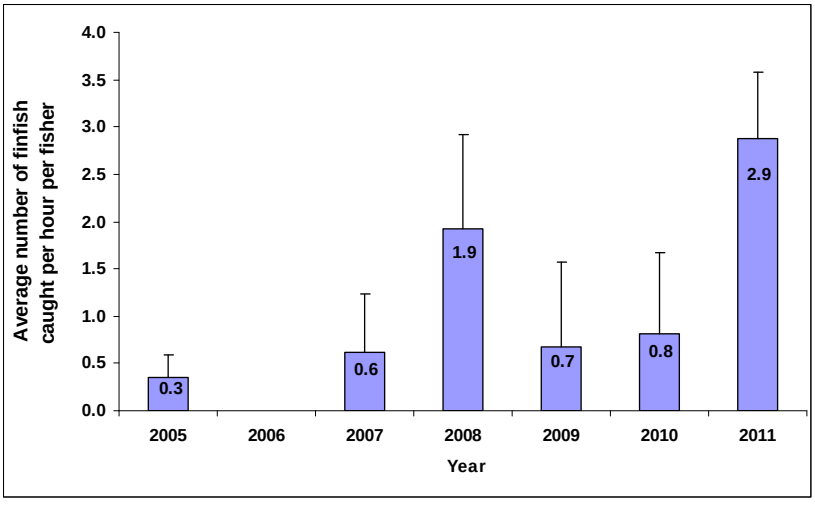
Handline Fishery

For the handline fishery, Snappers accounted for 69.6% of the sample recorded, Barracuda 17.3%, Mackerel 4.7% and Grouper 3.6% (Table 5). The other 8 species types accounted for 4.7%. These included Triggerfish, Jack, Grunt, Porgy, Angelfish, Hogfish, Parrotfish and Tuna. No data were collected from handline fishers in 2006. The average CPUE for snappers caught in the handline fishery showed an increase to 2.9 finfish/hour/fisher in 2011 (Figure 10).

Table 5: Species Type recorded by the handline fishery at Glover's Reef Marine Reserve for the 2005 to 2011 Fishing Season (2005 Season – January to December 2005)

	Year							
Species Type	**2005**	**2007**	**2008**	**2009**	**2010**	**2011**	**Total no. of Individuals**	**Percentage of Sample**
SNAPPER	352	11	873	154	75	46	**1511**	**69.6**
BARRACUDA	273		89	3	11		**376**	**17.3**
MACKEREL	59		37	4	1		**101**	**4.7**
GROUPER	36	2	18	12	10	1	**79**	**3.6**
TRIGGERFISH	21		2	9	3		**35**	**1.6**
JACK			20	5	7	1	**33**	**1.5**
GRUNT	5	7		6			**18**	**0.8**
PORGY	4	1		4			**9**	**0.4**
ANGELFISH				2	1		**3**	**0.1**
HOGFISH		1		2			**3**	**0.1**
PARROTFISH			1				**1**	**0.0**
TUNA				1			**1**	**0.0**
Total no. of individuals	**750**	**22**	**1040**	**202**	**108**	**48**	**2170**	**100.0**

Figure 10: Average number of snappers per hour per fisher caught in the handline fishery at Glover's Reef Marine Reserve for the period 2005 to 2011



Spear Gun Fishery

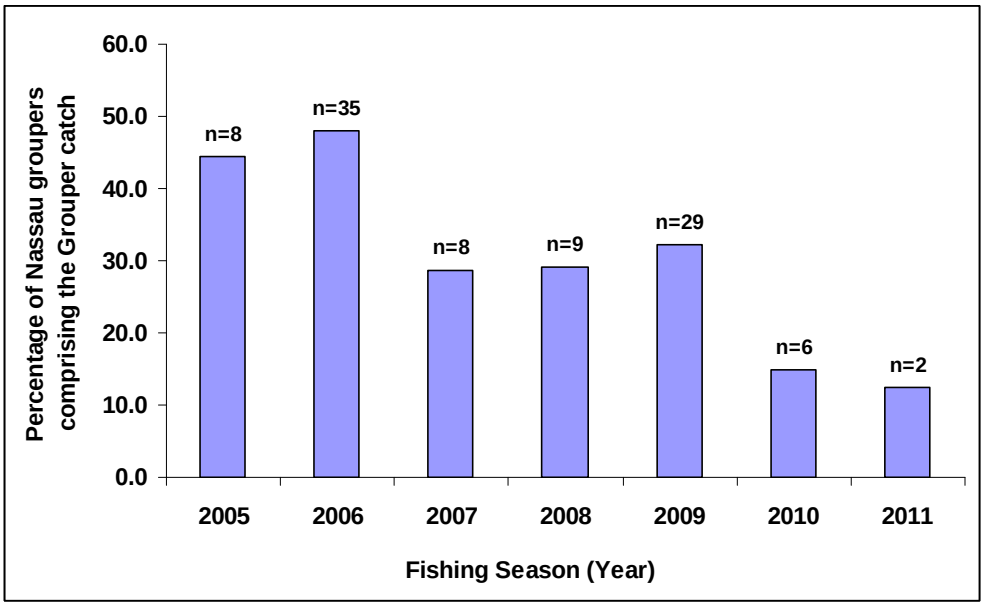
For the spear gun fishery, of the 18 species types recorded, Hogfish, Snapper, Parrotfish, Grouper and Angelfish accounted for 89.4% of the sample (Table 6). No Parrotfish have been recorded since the ban was placed in 2009, however, the number of Angelfish sampled increased significantly in 2009.

Table 6: Species Type recorded by the spear gun fishery at Glover's Reef Marine Reserve for the 2005 to 2011 Fishing Season (2005 Season – January to December 2005)

	Year								
Species Type	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**Total no. of Individuals**	**Percentage of Sample**
HOGFISH	63	59	72	76	145	123	54	**592**	**27.6**
SNAPPER	41	111	43	91	60	32	69	**447**	**20.9**
PARROTFISH	198	63	25	68	0	0	0	**354**	**16.5**
GROUPER	18	73	28	31	90	40	16	**296**	**13.8**
ANGELFISH	28	22	5	4	142	9	17	**227**	**10.6**
TRIGGERFISH	18	8	7	9	4	3	3	**52**	**2.4**
PORGY	2	6	4	17	13	1	6	**49**	**2.3**
JACK	2	8	3	2	4	9	7	**35**	**1.6**
BARRACUDA	4	4	1	16	2	5	2	**34**	**1.6**
GRUNT	2	3	1	5	17	2	3	**33**	**1.5**
MOJARRA	0	4	1	1	0	0	0	**6**	**0.3**
FILE FISH	0	1		2	1	0	0	**4**	**0.2**
MACKEREL	0	1	1	0	0	2	0	**4**	**0.2**
SURGEONFISH	0	0	0	0	3	0	0	**3**	**0.1**
SHARK	0	0	2	0	0	0	0	**2**	**0.1**
SNAPPER	0	0	0	0	0	2	0	**2**	**0.1**
BOXFISH	0	0	0	1	0	0	0	**1**	**0.0**
GOATFISH	0	1	0	0	0	0	0	**1**	**0.0**
Total no. of Individuals	**376**	**364**	**193**	**323**	**481**	**228**	**177**	**2142**	

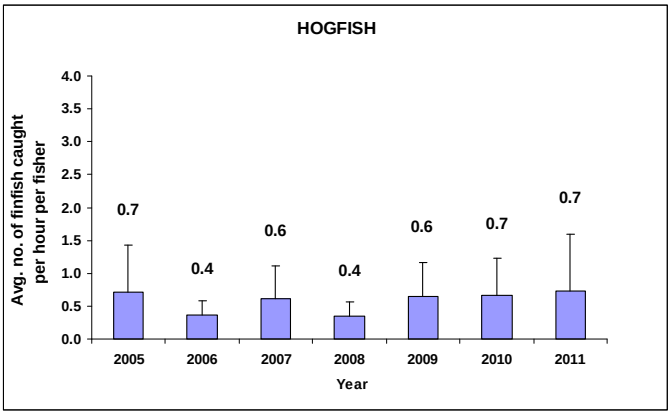
Of the groupers, Nassau grouper comprised 32.8% of the catch between 2005 and 2011; however, the number of individuals sampled ranged from 2 individuals in 2011 to 35 individuals in 2006 (Figure 11).

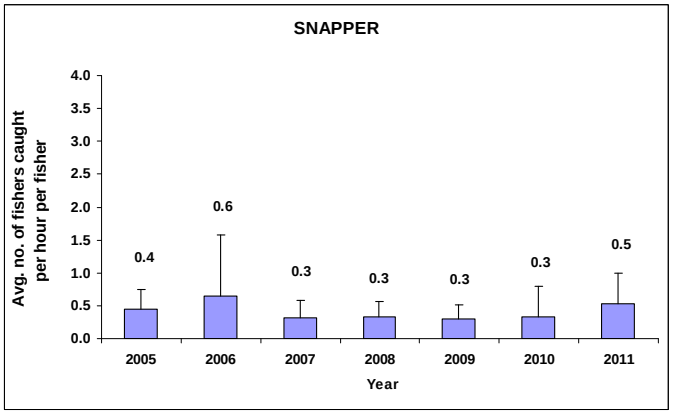
Figure 11: Nassau groupers as a percentage of all types of Groupers sampled at Glover's Reef Marine Reserve for the period 2005 to 2011

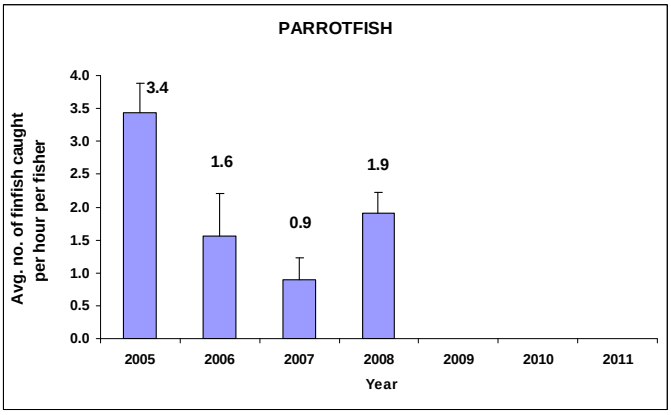


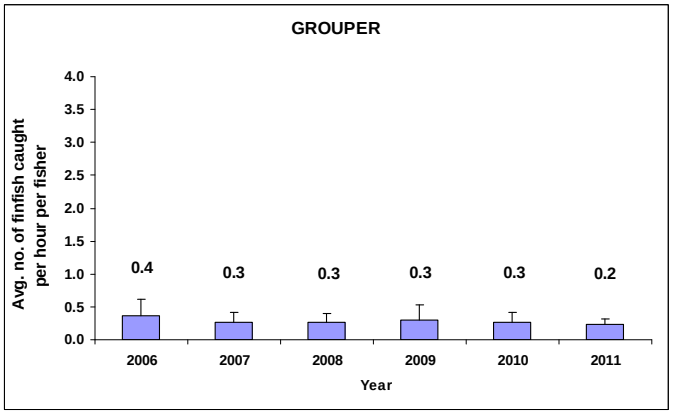
The average CPUE, in the spear gun fishery, showed a low but stable trend for the Hogfish, Snapper and Grouper (Figure 12) each with an average CPUE of less than 1.0 fish per hour per fisher. The Parrotfish had started to show a decrease in average CPUE in 2008 just prior to the ban in 2009; while the Angelfish showed an increase in average CPUE in 2009. Similarly, the average weight (g) CPUE showed a stable trend for the Hogfish, Snapper and Grouper. The Parrotfish showed a decrease in average weight (g) CPUE by 2008 while the Angelfish showed an increase in 2009 (Figure 13).

Figure 12: Average number of finfish per hour per fisher caught in the spear gun fishery for the five most sampled species type at Glover's Reef Marine Reserve for the period 2005 to 2011.









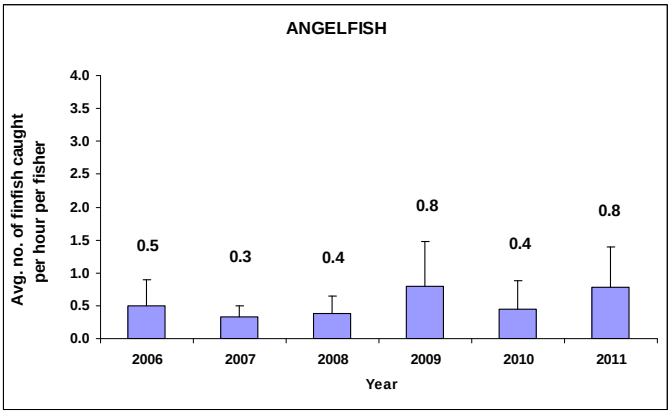
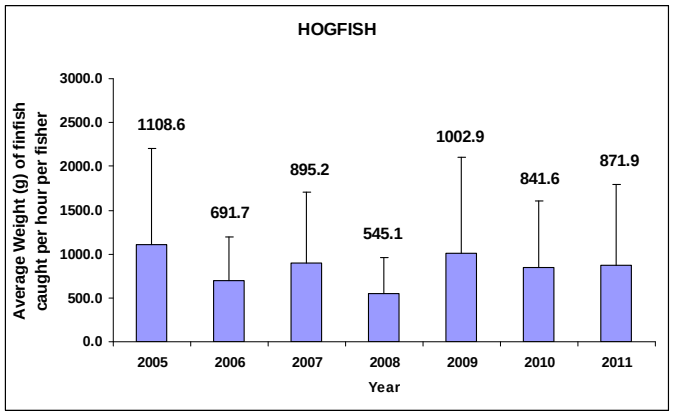
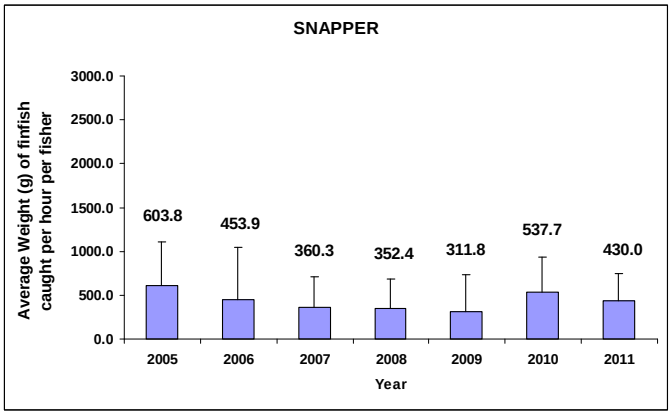
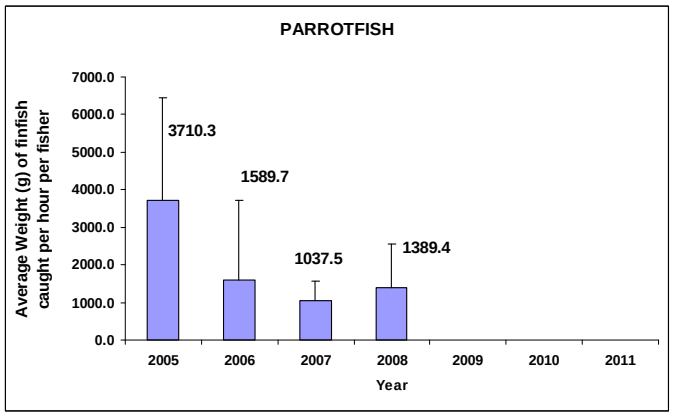
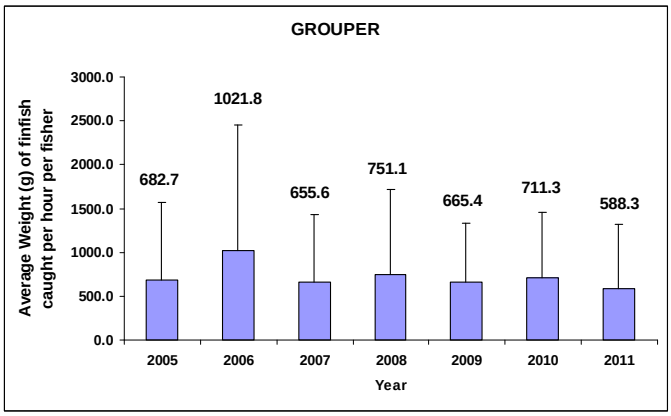


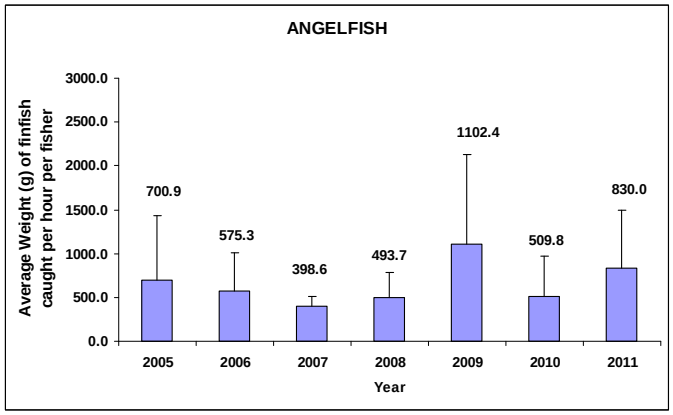
Figure 13: Average weight (g) of finfish per hour per fisher caught in the spear gun fishery for the five most sampled species type at Glover's Reef Marine Reserve for the period 2005 to 2011.











SUMMARY AND CONCLUSIONS

There was an early closure on 23 April, 2012 of the 2011 conch harvesting season due to the National Conch quota being met prior to the scheduled closure date of 30 June, 2012. It was during this harvesting period from October 2011 to April 2012 that the highest average CPUE of 10.4 conch/hour/fisher was recorded at Glover's Reef indicating that the 2011 season was very productive for the conch fishery. The second highest average CPUE was recorded during the 2009 season with 8.0 conch/hour/fisher.

The average CPUE for spiny lobster (*Panulirus argus*) remains stable but low and the last sampling period, the 2011 season, showed a small decrease of 1.2 lobsters/hour/fisher compared to the 2010 season of 1.8 lobster/hour/fisher. The population size class structure of spiny lobster showed that except for 2005, the majority of the lobsters were from the 70 – 119 mm Cl (carapace length) range. Since the 2005 season, when 21.3% of the lobsters sampled were greater than 120 mm Cl, the largest percentage of lobsters sampled greater than 120 mm Cl were 6.7% in 2007 and 6.3% in 2011. This suggests that there are fewer larger sized lobsters in fished areas, however, since 2005, the average Cl has remained stable ranging between 89.3 mm Cl (s.d. = 16.3) and 95.1 mm Cl (s.d. = 16.0). In 2011, 9.5% of the lobsters sampled were below the minimum harvestable size limit of 76.0 mm Cl, indicating that fishers are still not in full compliance with the fisheries regulations.

A total of 18 species types representing 60 identified species were recorded during the period January 2005 to December 2011. Snappers accounted for the majority of the catch sampled (69.6%) in the handline fishery. Five species types, Hogfish, Snapper, Parrotfish, Grouper and Angelfish accounted for 89.4% in the spear gun fishery. The percentage of fishers using a particular type of fishing gear changed from year to year, however, this may be a reflection of the type of boat being sampled since sailboat fishers tend to use spear guns while fishers on skiffs use handline. The results showed that the fishers are acting in compliance with the ban on the harvesting of Parrotfish since no Parrotfish have been recorded since the ban was implemented in 2009. Following the ban on Parrotfish, the

Angelfish became the targeted species, but the percentage of catch recorded decreased significantly in 2010 and 2011. Hogfish, Snapper and Grouper remain three of the most caught species types. The Nassau grouper represented a very low percentage of the catch sampled in the spear gun fishery and during the last two sampling periods in 2010 and 2011, only 6 and 2 individuals were recorded, respectively. This implies that the fishers have shifted their attention to other species or there may be low densities of Nassau grouper in the areas being fished.

The average CPUE for the most sampled species in the spear gun fishery showed a stable trend for the Hogfish, Snapper and Grouper each showing an average CPUE of less than 1.0 fish per hour per fisher. Similarly, the average weight (g) CPUE for these species showed a stable trend. The Parrotfish showed a decrease in average weight (g) CPUE by 2008 while the Angelfish showed an increase in 2009.

LITERATURE CITED

Wildtracks, Wildlife Conservation Society (2007). Management Plan – Glover's Reef Marine Reserve – World Heritage Site 2008 -2013. 167 pp.

APPENDIX A List of finfish species recorded during the Glover's Reef Atoll Fisheries Catch data Collection Program during the period January 2005 to December 2011

Species Type	Common Name	Family	Species
ANGELFISH	ANGELFISH FRENCH ANGEL GRAY ANGEL QUEEN ANGEL	Pomacanthidae	 *Pomacanthus paru* *Pomacanthus arcuatus* *Holacanthus ciliaris*
BARRACUDA	BARRACUDA	Sphyraenidae	*Sphyraena barracuda*
BOXFISH	TRUNKFISH	Ostraciidae	*Lactophrys trigonus*
FILE FISH	SCRAWLED FILEFISH	Monacanthidae	*Aluterus scriptus*
GOATFISH	SPOTTED GOAT	Mullidae	*Pseudupeneus maculatus*
GROUPER	BLACK GROUPER CONEY GOLIATH GROUPER NASSAU GROUPER PYGMY GROUPER RED GROUPER RED HIND ROCK HIND TIGER GROUPER YELLOW WING JULL YELLOWFIN GROUPER	Serranidae	*Mycteroperca bonaci* *Cephalopholis fulva* *Epinephelus itajara* *Epinephelus striatus* *Epinephelus morio* *Epinephelus guttatus* *Epinephelus adscensionis* *Mycteroperca tigris* *Mycteroperca venenosa*
GRUNT	GRUNT BLACK GRUNT FRENCH GRUNT MARGATE - WHITE WHITE GRUNT	Haemulidae	 *Haemulon bonariense* *Haemulon flavolineatum* *Haemulon album* *Haemulon plumieri*
HOGFISH	HOGFISH	Labridae	*Lachnolaimus maximus*
JACK	AFRICAN POMPANO AMBERJACK BAR JACK BLACK JACK BLUE RUNNER CREVALLE JACK DEEPWATER CREVALLE HORSE-EYE JACK OCEAN JACK	Carangidae	*Alectis ciliaris* *Seriola dumerili* *Caranx ruber* *Caranx lugubris* *Caranx crysos* *Caranx hippos* *Caranx latus*

	APPENDIX A Contd.		
Species Type	**Common Name**	**Family**	**Species**
MACKEREL	MACKEREL KING MACKEREL SPANISH MACKEREL	Scombridae	 *Scomberomorus cavalla* *Scomberomorus maculatus*
TUNA	YELLOWFIN TUNA	Scombridae	*Thunnus albacares*
MOJARRA	YELLOWFIN MOJARRA	Gerreidae	*Gerres cinereus*
PARROTFISH	PARROTFISH STOPLIGHT PARROTFISH	Scaridae	 *Sparisoma viride*
PORGY	JOLT HEAD PORGY PLUMA PORGY SILVER PORGY	Sparidae	*Calamus bajonado* *Calamus pennatula* *Diplodus argenteus*
SHARK	REEF SHARK	Carcharhinidae	*Carcharhinus perezi*
SNAPPER	SNAPPER BLACKFIN SNAPPER DEEP WATER BLACK SNAPPER DOG SNAPPER GRAY SNAPPER LANE SNAPPER MAHOGANY SNAPPER MUTTON SNAPPER QUEEN SILK RED BAND SNAPPER RED SNAPPER SCHOOLMASTER SILK SNAPPER YELLOW TAIL	Lutjanidae	 *Lutjanus buccanella* *Apsilus dentatus* *Lutjanus jocu* *Lutjanus griseus* *Lutjanus synagris* *Lutjanus mahogoni* *Lutjanus analis* *Etelis oculatus* *Lutjanus campechanus* *Lutjanus apodus* *Lutjanus vivanus* *Ocyurus chrysurus*
SURGEONFISH	DOCTORFISH	Acanthuridae	*Acanthurus chirurgus*
TRIGGERFISH	TRIGGERFISH BLACK DURGON OCEAN TRIGGERFISH QUEEN TRIGGERFISH	Balistidae	 *Melichthys niger* *Canthidermis sufflamen* *Balistes vetula*