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# Assessment of the 2010 Catch and Effort Data for the Pedro Bank Queen Conch Fishery

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# 1 EXECUTIVE SUMMARY

Jamaica has been recognised as a major producer of the queen conch (*Strombus gigas*) regionally. The commercial fishery for queen conch is based on the Pedro Bank and is managed utilizing annual total allowable catch limits and individual non-transferable quota systems. Total allowable catches are established based on scientific assessments of the status of the conch population on the Pedro Bank. In the absence of a conch abundance survey at the end of the 2010 fishing season, an assessment of the 2010 catch and effort data was conducted to ascertain if the data from catch effort was indeed a reliable measure of the status of the conch population on the bank.

Overall, the assessment showed the following:

- Data quality has improved when compared to previous years hence more reliable interpretation of the data.
- The overall CPUE trends indicated that there was a slight increase in catch rates over time. However, there was a decline in catch rates by the majority of vessels along and fishing activities were concentrated to one area of the Bank. The possibility of localized stock collapse may occur. The Fisheries Division should examine in its upcoming stock abundance survey the status of conch in this area to ascertain whether this is the case or not.
- Considerations should also be given in reducing fishing pressure for the area of the Bank that was heavily fished during 2010 to allow for stock recovery until the true status of the stock can be validated.
- **Setting a TAC of approximately 400 MT should not have a negative impact on the Pedro Bank queen conch population once fishing is spread across the Bank**.

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## 2 INTRODUCTION

The queen conch (*Strombus gigas*) is a large edible marine gastropod of the family *Strombidae*, and is found throughout the Caribbean but with greatest populations reported for the west, central and northern Caribbean (Ehrhardt and Valle-Esquivel 2008). The fishery for queen conch has a long tradition in the Caribbean region, with the species being valued, especially for its meat, for several centuries dating back to pre-Columbian times (Brownell and Stevely 1981). By the end of the mid-nineties, harvest levels have been estimated to be around 6,000t of conch meat per year, not accounting for the conch meat that is harvested for local subsistence consumption and the unknown amount of conch that is taken by illegal fishing (Chakallal and Cochrane 1996). The wholesale value of these landings is estimated to be around 60 million USD per year, but may be multiplied several fold taking into account jobs created in the processing and marketing of *Strombus gigas* products, particularly in the ornamental, tourist and restaurant industry (Chakalall and Cochrane, 1996; Appeldoorn 1995).

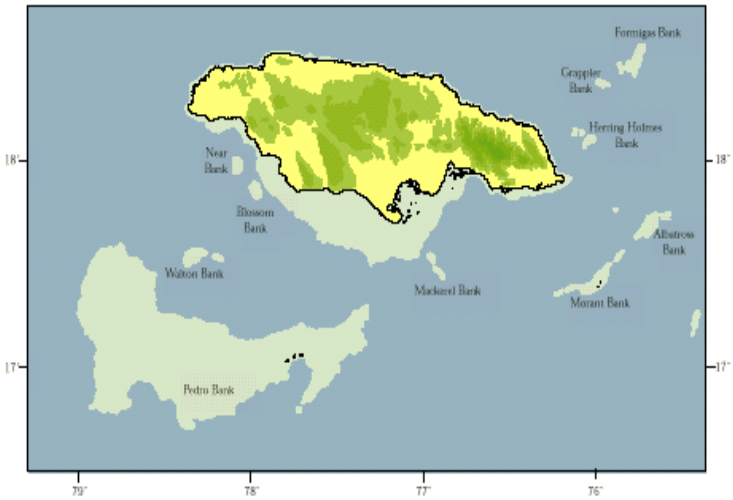


**Figure 1. Mainland Jamaica and the offshore fishing grounds. The Pedro Bank to the south of the Island is the largest, and is the area where commercial fishing for conch takes place.**

Jamaica has been recognised as a major conch producer regionally (Chakallal and Cochrane 1996) and continues to do so with exports averaging 500MT since 2005 (NEPA CITES export data, 2005 - 2007). The commercial fishery for queen conch is based on the Pedro Bank (Figure 1) and has been reported on by several authors (Aiken et al. 1999; Smikle 1997). The fishery is managed utilizing annual total allowable catch limits and individual non-transferable quota systems (Aiken et al. 2006; Kong 1997). Total allowable catches are established based on scientific assessments of the status of the conch population on the Pedro Bank.

Since 1994, when the first quota system was introduced, all conch assessments have been based on biomass (stock abundance) surveys of the conch population on the Pedro Bank (Appeldoorn 1995; Tewfik and Appeldoorn 1998; Smikle and Appeldoorn 2002). In the absence of a stock abundance survey this assessment looks at available catch and effort data for the 2010 conch fishing season so as to assist the Scientific Authority in making the required non detriment finding for establishing the National Export Quota (NEQ).

# 3 OBJECTIVES

To determine an appropriate level of total allowable catch for the 2011 fishing season in the absence of a conch population survey, through:

1. Examination of the catch and effort data to determine if CPUE was adversely affected by the level of fishing (or any adverse changes in CPUE).
2. Examination of the spatial distribution of fishing effort so as to ascertain if there were any risks of localized depletions from overfishing a small range of the conch stock.

# 4 METHODS

- Data from conch vessel log sheets were compiled into a spreadsheet (MS Excel) and made available by the Fisheries Division. The vessel log data included: Trip Date; Number of Divers; Dive time; latitude and longitude of vessel during fishing; total catch per trip
- Computation of CPUE was done for each reported fishing trip for each vessel where possible. Total catch and average CPUE were reported for each vessel over the fishing season where possible.
- Available GPS location data were plotted for the fishing trips using electronic charting software (Garmin Mapsource, version 9.5).

# 5 RESULTS

Table 1 summarizes the CPUE and total catches for all the conch vessels based on reported landings. CPUE was calculated at the level of catch of conch per diver hour (i.e. diver hour is the unit representing the number of divers times the average dive time for each dive). The CPUE is shown in the table as catch in pounds, kilograms and corresponding numbers of whole live conch. The conversion factor used from meat weight to numbers of conch is 2.76 conchs per pound of unprocessed (no tissue loss, animal simply removed from shell) or 'dirty' conch.

In general, it was observed that lower average CPUE (Table 1) were attained by Andre, Natoya and Windjammer the latter experiencing the lowest; while Rajmilour attained the highest catch rates. Specifically, catch rates declined over time for Andre, Bryce and Natoya; relatively constant for Rajmilour but increased for Windjammer. The average CPUE for all vessels was 41.08 kg/Diver*Hour.

**Table 1. Catch per Unit of Effort (CPUE) and Total Catch for all Conch Fishing, Vessels2010 Fishing season**

| | **Average CPUE** (Catch/Diver*Hour) | | | **Total Catch** | |
|---|---|---|---|---|---|
| **Conch Fishing Vessels** | **lbs/hr** | **kgs/hr** | **conch/hr †** | **lbs** | **MT** |
| Andre | 73.35 | 33.27 | 202 | 160,021.00 | 72.5843 |
| Bryce | 108.34 | 49.14 | 299 | 156,952.00 | 71.1922 |
| Lady Kim | | 0.00 | 0 | 44,872.00 | 20.3536 |
| Natoya | 61.00 | 27.67 | 168 | 183,772.00 | 83.3576 |
| Rajmilour | 154.43 | 70.05 | 426 | 217,126.00 | 98.4867 |
| Wind Jammer | 55.67 | 25.25 | 154 | 87,314.00 | 39.6050 |
| Grand Average | **90.56** | **41.08** | **249.95** | 141,676.17 | 64.2632 |
| Total Catch | | | | **850,057.00** | **385.5794** |
| († Using conversion factor of 2.76 conch/lb of unprocessed conch meat) | | | | | |

Figure 2 are the graphical outputs of average catch per unit of effort (CPUE) across the fishing season (time) for those conch fishing vessels where both catch and effort data were available. For each graph the points represent the average CPUE according to each industrial fishing vessel or canoe. The trend line included is based on simple regression analysis, with the corresponding equations and $R^2$ values shown on the graphs.

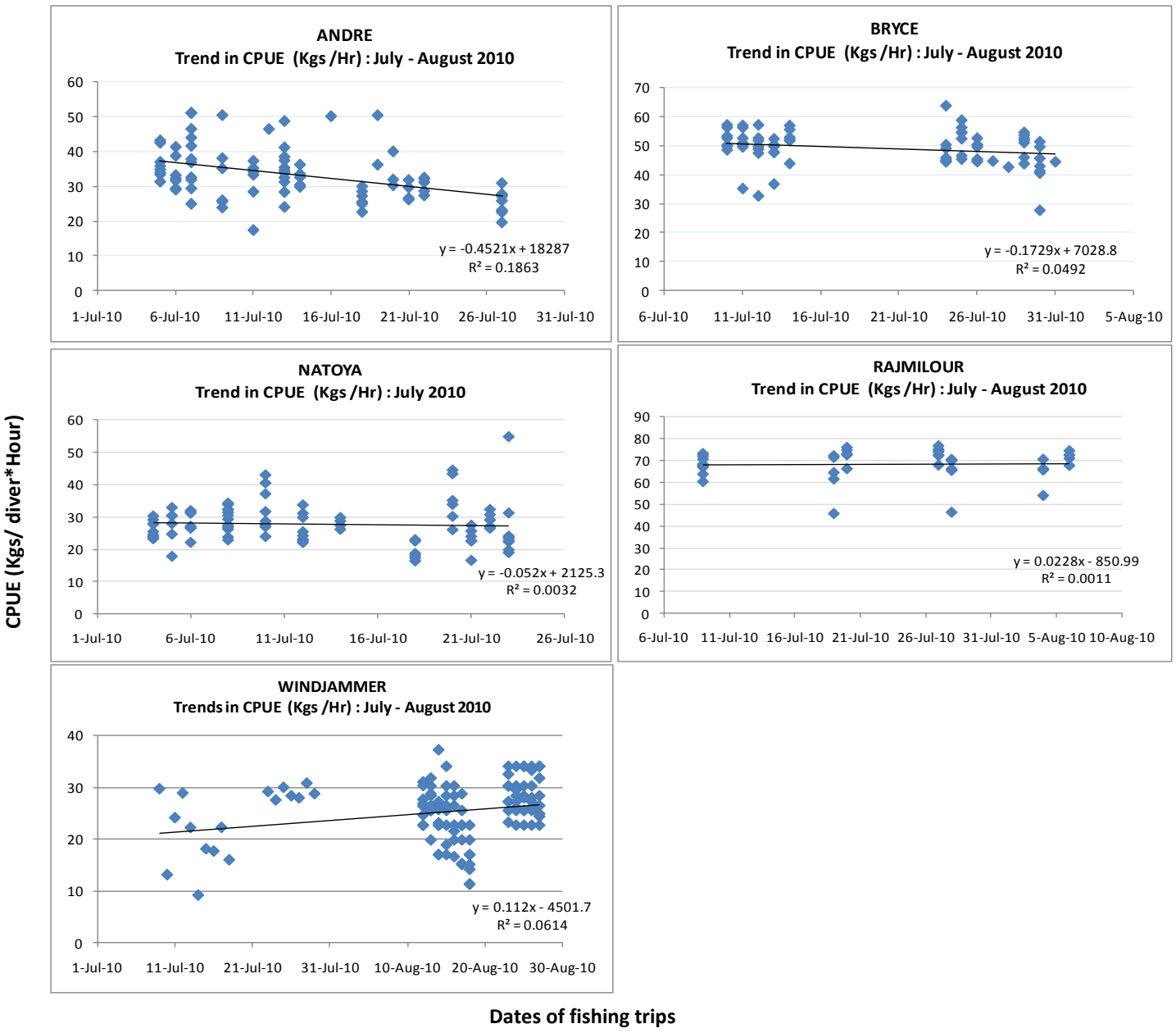


**Figure 2. Trend in CPUE for each conch fishing vessel for the 2010 fishing season, Pedro Bank Jamaica.**

Figure 3 shows a map of the geo-referenced (via Global Positioning Satellite system) location for each conch fishing vessel on a recorded fishing day. All the positions represent the average positions of both the industrial vessels (larger Mother Fishing Boat) as well as dories/canoes associated with these vessels on a recorded fishing day. For the purposes of this assessment the name of the mother vessel was used to represent the positions of the associated dories/canoes.

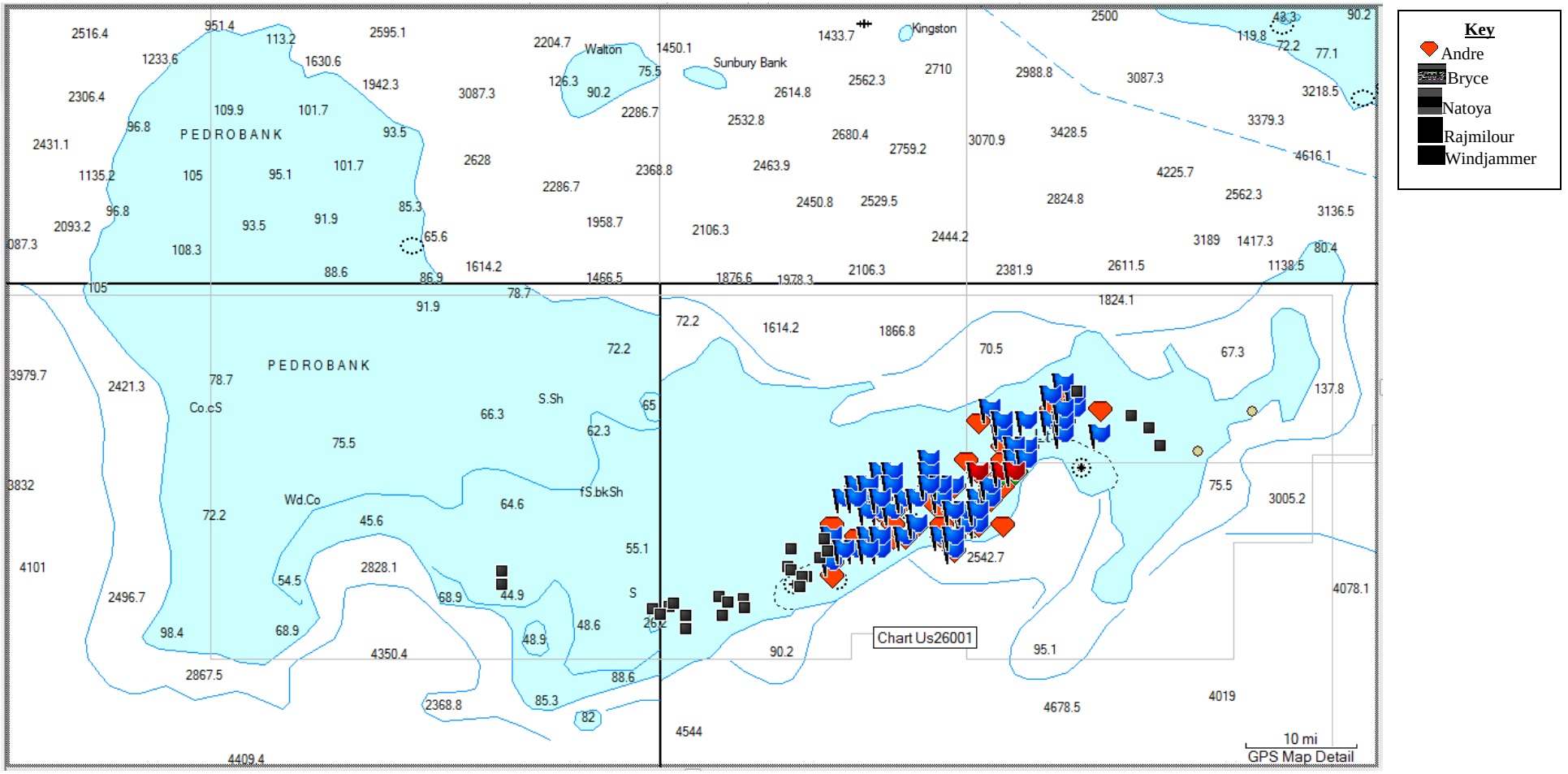


**Figure 3. The distribution of fishing effort for queen conch across the Pedro Bank. Each marker represents the average location of fishing vessel or canoe on a reported fishing day.**

# 6 DISCUSSION

For the 2010 conch fishing season it should be noted that the quality of data submitted has improved significantly in comparison to previous years' data. Consequently, the results of the catch and effort data assessment are more reliable than that of previous years. It was observed that only one vessel still had not submitted data in the recommended format and was therefore excluded from the assessment. It is believed that their fishing activity would not significantly affect the interpretation of the data as the catch was relatively small (5 percent of the total) in comparison to the combined catch of all vessels.

The distribution of fishing effort shown in Figure 3 illustrates that fishing activity was basically confined to the area of the Bank around the south-east Shoals with the exception of Windjammer, that for most of its fishing days fished a greater area (east to west). This is not new to Windjammer as the previous year's assessment indicated that this was the general area in which fishing efforts were concentrated. While the data for 2009 showed that Windjammer had the highest catch rates on average (from three to five times more than the other vessels), the data for 2010 showed that average catch rates were the least of all fishing vessels. In the previous year the distribution of fishing effort for all other vessels were widespread and included fishing grounds predominantly fished by Windjammer.

Based on two years of available GPS data, Smikle (2010) noted that no fishing took place in a part of the 20 – 30 m depth zone on the western end of the bank which corresponds to parts of zones 4 and 5 of the Veterinary Services Division's classified conch production zones. This remains to be the case for the 2010 fishing season. It was suggested that the required harvest rates were being met from the central and shallower areas of the bank closer to the cays, thereby helping operators to keep capital costs down. Nevertheless, as it relates to this assessment, it should be noted that the majority of the catch was taken from a concentrated area on the Bank and that the average catch rates declined over time. The regression statistics for all vessels are unexplained by the regression line but with a negative slope for three vessels (Andre, Bryce and Natoya), having a combined catch of more than 60 % of the total weight, indicates a negative trend in CPUE over the fishing period. This is cause for concern as if this should continue in subsequent fishing periods there may be a stock collapse in the targeted area. Caution should therefore be applied as already there is evidence of stock reduction as implied by the decline in CPUE trends.

It should however be noted that the assessment of Smikle (2010) which examined catch and effort data of the 2009 conch fishing season, showed that the overall catch rates was 38.45 kg/ diver*hour. This figure was based on a more reliable dataset submitted by one set of vessel operators as their existed uncertainty in how the catch and effort were distributed across the Pedro Bank as well as how the data were reported for several of the larger vessels. Consequently, the estimates of the 2010 catch

and effort showed a slight increase of 6.8 percent to 41.08 kg/ diver*hour (Table 2) over that of the previous year.

**Table 2. Estimated values for Average CPUE and Biomass for the queen conch fishery on the Pedro Bank 1994 - 2010**

| Year | Average CPUE | Biomass MT |
|---|---|---|
| 1994 | 40 | 13,325.48 |
| 1995 | 32 | |
| 1996 | 22 | |
| 1997 | 16 | 12,203.27 |
| 1998 | 18 | |
| 2002 | 26 | 15,305.85 |
| 2007 | — | 7,421.78 |
| 2008 | 35 | |
| 2009 | 52 (38 ⌖) | |
| 2010 | 44.4 | |

⌖ Average CPUE for SF&T Dolphins which was believed to have the more reliable data.

In this regard, it would imply that catch rates increased by a mere 6 percent. While the assumption remains to be that the queen stock on the Pedro Bank was not adversely affected by the fishing pressure one should bear in mind that the results did show a decrease in catch rates over time.

# 7 CONCLUSION

It is clear that the data quality has improved over the past year. Consequently the analysis and interpretation of the data has become more meaningful to advise policy makers and fisheries managers on the impact of fishing pressure on the stock of the queen conch on the Pedro Bank.

The overall CPUE trends indicate that there was a slight increase in catch rates over time. It is therefore reasonable to assume that since there was a slight increase in the overall catch rates from that of the previous year then it is possible that the queen conch stock on the Pedro Bank was not adversely affected by the fishing pressure. In this regard, the determination of the annual catch quota for 2011 should be in keeping with the management objective of optimizing harvests for long term sustainable yields and so setting a TAC of approximately 400 MT should not have a negative impact on the stock population once fishing is spread across the Bank. This will ensure the protection of the stock from collapsing that may result from natural fluctuations in recruitment or environmental impacts.

Finally, it is strongly recommended that the Fisheries Division conduct a biomass survey at the end of the 2011 fishing season to assess the conch population on the Pedro Bank and to verify current CPUE trends especially in light of the fact that the last survey was conducted in 2007.

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