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Assessment of the 2012 Catch and Effort Data for the Pedro Bank Queen Conch Fishery

Prepared by:

Anginette Murray, Stephen Smikle, Ricardo Morris, Kimberlee Cooke-Panton, Junior Squire, Farrah Hansel

Fisheries Division,
Ministry of Agriculture & Fisheries

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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 (TAC's) are established based on scientific assessments of the status of the conch population on the Pedro Bank.

Jamaica has conducted five (5) such conch abundance surveys, the most recent of which was conducted during the period of November to December 2011. Appropriate sampling methods allowing for the guidance in determining appropriate management decisions were used. The analyses conducted took into consideration earlier estimates of population densities (conch/ha) and abundance (population size); a description of population structure (size/age) and the maximum sustainable yield (MSY).

In the absence of abundance surveys (for example since 2007 until 2011), a series of reviews of the catch and effort data were used to help determine TAC's. This study looks at CPUE trends of the 2012 conch fishing season giving special considerations of the findings of the most recent results of the abundance survey.

Overall, the assessment showed the following:

- Data quality presented represents a reliable interpretation of the data.
- Fishing pressure was generally spread across the Bank as well as within the shallower areas. With the results showing relatively stable catch rates being attained; high estimates of population densities of the fishable stocks across the Bank (ranging from 452 - 582 percent over the recommended 70 individuals/hectare) as shown from the 2011 abundance survey; as well as the expected high levels of anticipated recruits over the next 2 years are indicative of a healthy stock. In this regards, the possibility of localized stock collapse did not occur.
- **Setting a TAC of approximately 550 MT as in the 2012 fishing season would be non-detrimental to the sustainability of the queen conch population on the Pedro 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).

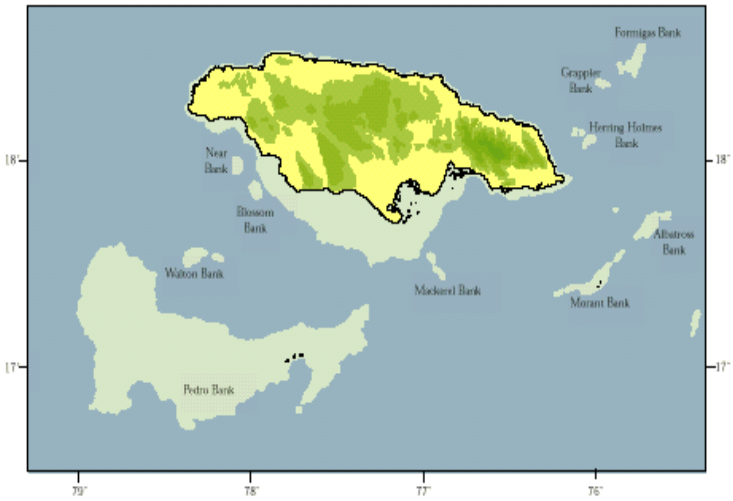

Figure 1. Mainland Jamaica and the offshore fishing grounds. The Pedro Bank to the south of the Island is the largest, and is the area where commercial fishing for conch takes place.

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). Jamaica has conducted five (5) such conch abundance surveys, the most recent of which was conducted during the period of November to December 2011. Appropriate sampling methods allowing for the guidance in determining appropriate management decisions were used. The analyses conducted took into consideration earlier estimates of population densities (conch/ha) and abundance (population size); a description of population structure (size/age) and the maximum sustainable yield (MSY).

In the absence of abundance surveys, a series of reviews of the catch and effort data were used to help determine TAC's. This study looks at CPUE trends of the 2012 conch fishing season giving special considerations of the most recent results of the abundance survey. The assessment herein will advise management on the next steps for the upcoming fishing season.

3 OBJECTIVES

To determine an appropriate level of total allowable catch for the 2013 fishing season 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.
3. Comparison of the results of the findings of CPUE trends with that of the findings of the 2011 abundance surveys

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 (and dory) 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. As in previous years 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 the lowest average CPUE (Table 1) was attained by Lady Kim while Rajmilour continues to attain the highest level of catch rates. All remaining vessels maintained similar catch rates ranging from 31.83 to 38.33 kgs/diver*hour during the season. The overall CPUE for all vessels was 37.03 kg/Diver*Hour.

Table 1. Catch per Unit of Effort (CPUE) and Total Catch for all Conch Fishing, Vessels 2012 Fishing season

	Average CPUE (Catch/Diver*Hour**)**			**Total Catch**	
Conch Fishing Vessels	**lbs/hr**	**kgs/hr**	**conch/hr †**	**lbs**	**MT**
ANDRE	70.18	31.83	193.7	51,346	23.29
CAPTAIN SEAN	77.77	35.28	214.64	178,294	80.87
LADY KIM	52.49	23.81	144.87	123,459	56.00
MV BRYCE	84.51	38.33	233.24	172,466	78.21
NATOYA	71.29	32.34	196.77	50,527	22.92
RAJMILOUR	144.38	65.49	398.49	66,817	30.31
WINDJAMMER	70.80	32.11	195.41	191,682	86.95
Grand Average	**81.63**	**37.03**	**225.30**		
Total Reported Catch				834,591	378.56
(† Using conversion factor of 2.76 conch/lb of unprocessed conch meat)					

Figures 2a and 2b are the graphical outputs of average 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 each graph. 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.

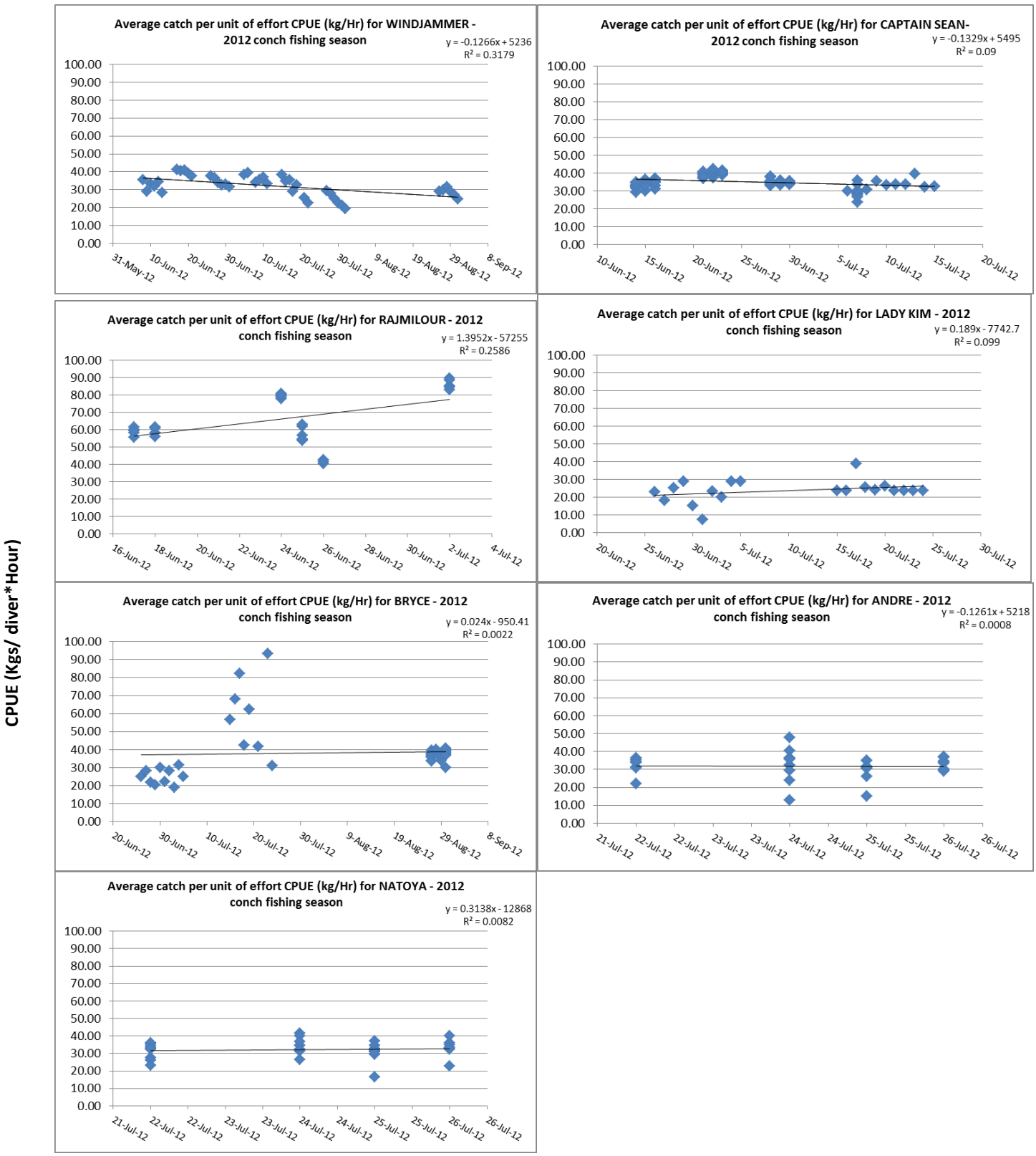

Figure 2. Trend in CPUE for each conch fishing vessel for the 2012 fishing season, Pedro Bank Jamaica.

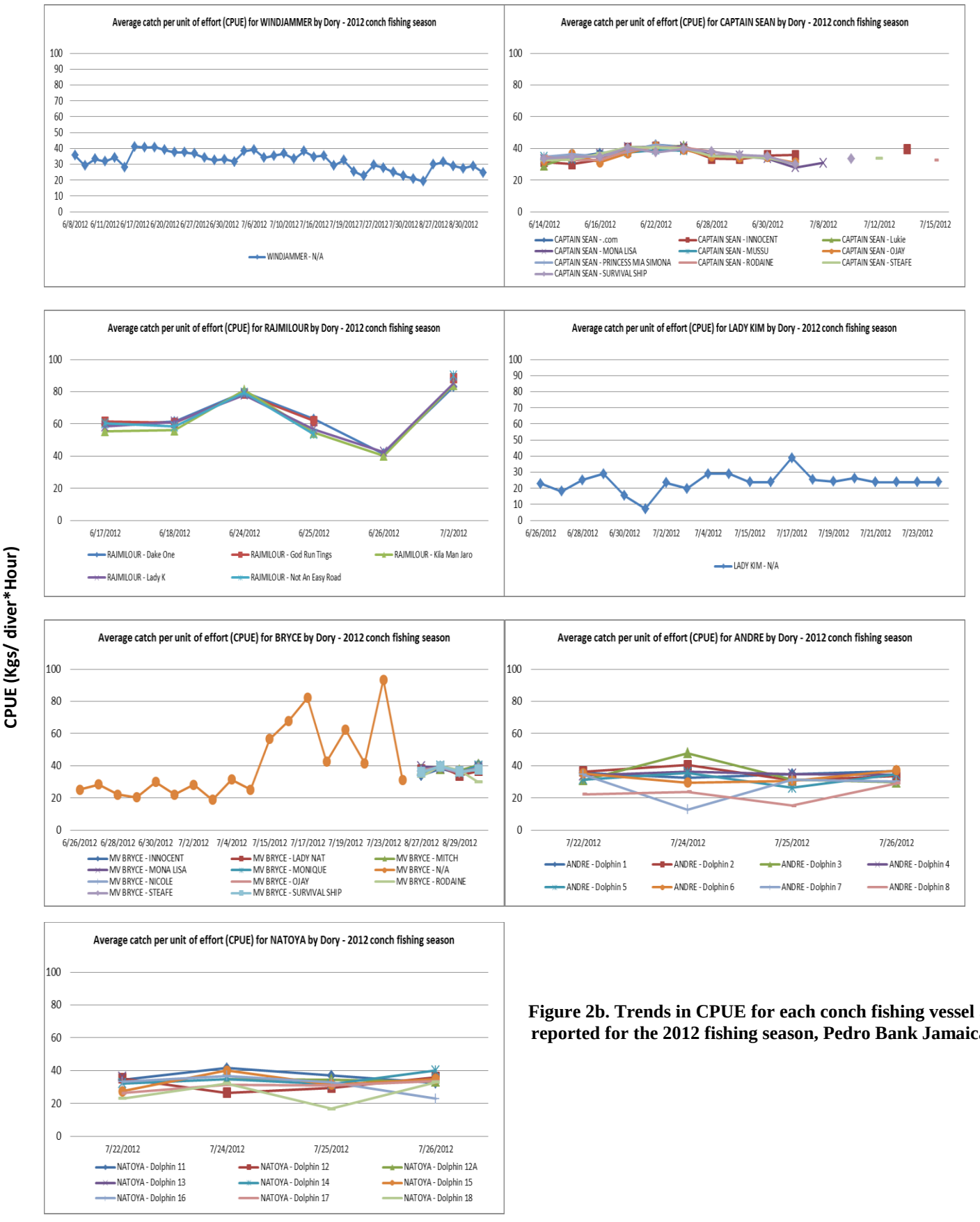

Figure 2b. Trends in CPUE for each conch fishing vessel as reported for the 2012 fishing season, Pedro Bank Jamaica.

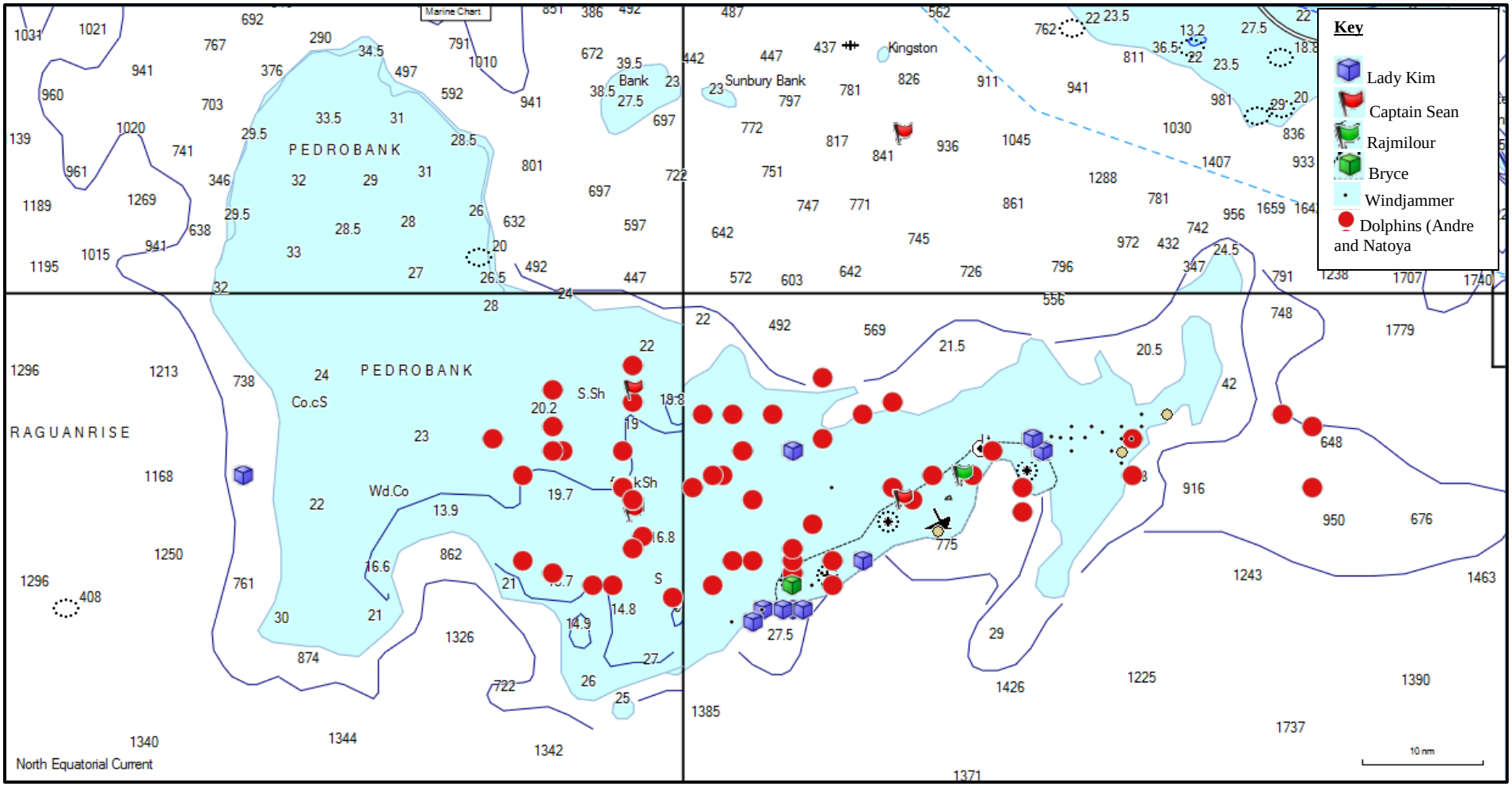

Figure 3. The distribution of fishing effort for queen conch across the Pedro Bank. Each marker represents the average location of fishing vessel or canoe on a reported fishing day.

Figure 3 illustrates that fishing was carried out extensively across the bank and mainly by the Dolphins which fished for the carrier vessels Andre and Natoya. Other vessels conducted their activities from the central and shallower areas closer to the cays.

6 DISCUSSION

For the 2012 conch fishing season it should be noted that the quality of data submitted has maintained a relatively high standard as in recent years. This may be as a result of the fact that all exportation of the queen conch must be accompanied by a Catch Certificate issued by the Fisheries Division. The submission of log sheets of fishing trip is therefore mandatory. There were a few instances where log sheets were incompletely filled out but nevertheless, the results of the catch and effort data assessment are deemed reliable.

Based on previous assessment of catch and effort reports (Murray, 2011 and Smikle, 2010), 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 was not the case for the 2012 fishing season. The data indicated that fishing was carried out extensively across the bank and mainly by the Dolphins which fished for the Andre MRV and Natoya. Other vessels conducted their activities from the central and shallower areas closer to the cays. The latter is seemingly a common practice of the operators over the years which may have been alluded to their attempt to keep capital costs down. Concerns about localized stock depletion were previously raised in this regards and recommendations were then made to ensure that operators spread-out their activities across the bank until the status of the stock could be accurately ascertained. The uncertainty of the stock status was primarily due to a long overdue abundance survey that should have been conducted from as early as 2010.

In summary, the results of the 2011 (Morris et al., in prep.) survey the results showed that for estimates of mean densities across strata (A, B and C) for each size class were 407.71, 316.54 and 385.71 conch/ha respectively having a combined average of 369.89 conch/ha. This represents a percentage range of 452 – 582 over the minimum required density of 70 individuals/hectare established for the Jamaica fishery. The mean densities for the exploitable biomass (inclusive of size classes greater than 200 mm in shell length) across strata were 243.31, 144.81 and 165.44 conch/ha respectively with a combined average of 184.52 conch/ha. Due to the extensive coverage of the survey the biomass estimate is believed to be more accurate and is indeed closer to 1994 densities – the start of the close monitoring of industrial fishing effort. This would imply that harvest localized depletion never occurred.

Table 2 summarizes the estimated values of average CPUE and Biomass for the queen conch fishery on the Pedro Bank 1994 – 2012. Table 1 indicated that the lowest average CPUE was attained by Lady Kim, Rajmilour the highest level while the remaining vessels maintained similar catch rates

ranging from 31.83 to 38.33 kgs/diver*hour during the season. The overall CPUE for all vessels was 37.03 kg/Diver*Hour.

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	
2011		12,213.98
2012	37.03	

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

It is crucial to note that the Dolphins having fished extensively across the bank attained an average CPUE of 32.09 kg/ diver*hour similar to individual CPUE for the majority of vessels that fished central and shallower areas closer to the cays. With CPUE being commonly used as an index of abundance this result confirms the findings of the 2011 abundance surveys. It should also be noted that during the warmer months conch is easily detected due to the high-density spawning aggregations that are formed. It is possible then that the similarities in catch rates are directly related to this as the fishing period spanned the period from early June towards the end of August. As such, fishers being mindful of this and also fully aware of fishing grounds (habitat and spawning aggregations) would target their efforts in areas of high densities. Hence, as it has been noted over the years that fishers tend to fish nearer to mainland, the behavior of the conch during this time reduces the time fishers would spend in searching for conch.

Anecdotal information suggests that fishers may have been conducting corralling prior to the start of the conch fishing season. There have been concerns raised as to whether this will affect the true picture of the catch rates. It is highly unlikely that this is the practice mainly because it has been proven that the densities are great across strata hence there is no need for this to occur.

7 RECOMMENDATIONS

The Fisheries Division should collect information from knowledgeable fishers that have past experiences on the distribution of the commercial concentrations of conch. Attempt should be made to conduct surveys within these areas to confirm the specific aggregating sites especially during the inter-survey period.

Quota allocations should be issued so as to allow for fishers to fish prior to spawning periods.

8 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.

Many factors indicate that the queen conch on the Pedro Banks are in a very healthy condition including high estimates of population densities of the fishable stocks across the Bank and the relatively stable catch rates across fishing vessels. The findings of this study then confirm that the queen conch population was not adversely affected by not only the 2012 fishing pressure but also that of previous years. It can therefore be concluded that the management regime in place for Jamaica is highly effective. The full cooperation in the management of the industry by its members is strongly encouraged.

Given the results of the findings, the determination of the annual catch quota for 2013 should be in keeping with the management objective of optimizing harvests for long term sustainable yields and so setting a TAC of 550 MT should prove to be sustainable.

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