2ND MEETING OF THE CFMC/WECAFC/CITES/OSPESCA/CRFM WORKING GROUP ON QUEEN CONCH

PROPOSAL

CONVERSION FACTORS FOR PROCESSED QUEEN CONCH TO LIVE WEIGHT

CFMC/WECAFC/OSPESCA/CRFM Working Group on Queen Conch

Panama City, Panama

November 2014

Table of Contents

INTRODUCTION

The first meeting of the CFMC/OSPESCA/WECAFC/CRFM working group on queen conch (Panama City, Panama, October 2012), the 16th meeting of the CITES Conference of the Parties (Bangkok, Thailand, March 2013), and the 15th session of the WECAFC Commission (Port of Spain, Trinidad and Tobago, March 2014) highlighted the need of having regionally harmonized terminology and conversion factors for queen conch (*Strombus gigas*). Specifically, the WECAFC session adopted a recommendation stating that: "*Members Countries of WECAFC to work towards determining and adopting national conversion factors based on regionally agreed processing grades and terminologies before the end of 2015 and communicate the adoption formally to the FAO and CITES Secretariats*".

Establishment of regional conversion factors was then included as one of the major activities in the recently approved project "*CITES-FAO joint capacity building for implementation of the Decisions on "Regional cooperation on the management of and trade in queen conch (*Strombus gigas*)" adopted at the 16th meeting of the Conference of Parties to CITES (CoP16)*" providing an opportunity to fund activities on conversion factors.

Following an FAO FishCode-STF/OSPESCA workshop (Panama, Panama City, February 2007) on queen conch, three countries (Dominican Republic, Honduras and Nicaragua) had volunteered to participate in field surveys to establish conversion factors for different processing grades. Results and the methodology adopted were published in the FAO Fisheries and Aquaculture Circular No. 1042 (Aspra et al., 2009). However, processing grades and conversion factors vary significantly throughout the region and additional *ad hoc* surveys in other countries were needed in order to obtain a wider coverage of the region.

This document summarizes the results of the field surveys reported in the FAO Fisheries Circular No. 1042, the new field surveys carried out in 2014, and data already available from other countries which had been published in peer-reviewed journals. Regional conversion factors of different processing grades for the whole Western Central Atlantic (FAO Fishing Area 31) are proposed on the basis of this information gathered.

JUSTIFICATION AND OBJECTIVE

In order to be comparable among countries and allow consistent studies on regional trends, all queen conch catch data should be in live weight (animal with shell). Catch statistics reported by countries to FAO are often not referring to the whole animal with the shell, but to various levels of processing and most countries do not specify in their reports which processing grade their data refer to. The level of processing of the queen conch meat varies and depends on the marketing system and the final destination (export versus national market) or cultural preferences.

Establishment of valid conversion factors for the different levels of queen conch meat processing grades is necessary to raise the weight of processed queen conch meat to the live weight. So far, FAO has applied the standard conversion factor '7.5' to data from all countries and territories (i.e. Anguilla, Antigua, Bahamas, Barbados, Belize, Colombia, Costa Rica, Guadeloupe, Honduras, Jamaica, Martinique, Puerto Rico, St. Kitts Nev, St. Lucia, St. Vincent, Turks & Caicos, and US Virgin Islands) which reported data in meat weight, regardless the processing grade.

Each country has its own standardized processing grades, varying from different grades such as "dirty meat" (meat without shell) up to 100 percent cleaned. However, the terminology used is not yet standardized throughout the region and within the seafood industry. In general, the different grades refer to the level of tissue loss that occurs with processing.

The final objective of this study was to propose regional conversion factors for three standard and most commonly used processing grades (dirty, 50% clean and 100% clean) to back calculate the live weight of the animals caught and obtain harmonized and comparable statistics between countries.

METHODOLOGY

The original plan was to carry out field samplings in at least four countries of the Caribbean before the second working group workshop in Panama but, unfortunately, in several countries a queen conch closed season was being implemented and field collection of specimens was not possible. Therefore, efforts were made to get weight data from processing grades also from countries which had already collected data from similar samplings and from the literature.

Eventually, weight data for the three standard processing grades were obtained for the following nine countries and territories: Antigua and

Barbuda, Bahamas, Barbados, Belize, Dominican Republic, Honduras, Martinique, Mexico and Nicaragua. All sub-regions of the Western Central Atlantic were represented, with two countries from the northern Caribbean, three from the eastern Caribbean, and four countries from the continental America.

With the support of the CITES-FAO project and IFREMER, Belize and Martinique carried out in October 2014 sampling of weight data from specimens in accordance with the agreed guidelines. Barbados, The Bahamas and Mexico provided data already collected for their own national purposes, respectively from October 2008 to August 2014, February to June 2014 and from May 2008 to April 2009. Data from Honduras, Nicaragua, and the Dominican Republic were those obtained from the field surveys carried out in 2007 with the support of FAO and OSPESCA (Aspra et al, 2009). Data from Antigua y Barbuda were obtained from the study of Horsford et al. (2011). Table 1 shows the number of individuals sampled by each country.

Table 1. Dates and sample size of queen conch used for conversion factor analyses

	Antigua & Barbuda	Bahamas	Barbados	Belize	Dominican Rep.	Honduras	Martinique	Mexico	Nicaragua
Date	2011	Feb - Jun 14	Oct 08 - Aug 14	Oct-14	May-Jun 07	May - Jun 07	Oct-14	May 08 - Apr 09	May- Jun 07
Sample size (# IND)	1231	258	231	400	475	405	210	372	711

In order to obtain standard and simplified regional conversion factors, the data were collected on the three most common processing grades (Table 2). To fit in with the standard processing grades and make data comparable, the grade classified as "tissue weight" by Antigua & Barbuda was considered as "dirty weight".

Table 2. Description of the three standard processing grades

Processing grade	Description
Live weight	Complete animal, including the shell
Without processing (dirty)	Complete animal extracted from the shell, meat with skin, viscera, penis, organs and nail
50 percent clean	Operculum (claw) and the visceral bag are removed
100 percent clean (fillet)	Fillet of white meat only. The skin, viscera, nail, penis and organs are removed

With the exception of Antigua & Barbuda and the Dominican Republic because the required data was not available; in the other countries regression analyses, calculation of conversion factors and statistical analyses (t student and analyses of variance) were carried out.

In addition to natural variation, differences in the estimation of conversion factors could be attributed to several different factors such as the fishing grounds/sampling sites the queen conch was harvested, different stocks with different growth parameters, local customs and classification in processing: the sampling was carried out on board or in a processing plant or the processing was carried out by a biologist or a fisher. Other factors include whether the sampling was carried out on fresh or frozen and thawed animals (Castelo et al., 2011 reported a conversion factor which considers the animal kept on ice and transported for 48 hours) and the method of extraction of the meat from the shell. If a new regional study would be envisaged in the future, it is suggested to consider the differences in sampling fresh or thawed animals in order to take into account weight variations and correct the data accordingly. It should also be necessary to standardize sampling procedures as much as possible.

RESULTS

The relation between live weight and 100 percent clean weight was tested using a simple regression model. Per country linear regressions were estimated, and the significance of each regression parameter was tested through a t-test. Outliers were consequently discarded. All regression parameters were significantly different from 0 and the R values were significant, although low R^2 must be noted (Figure 1).

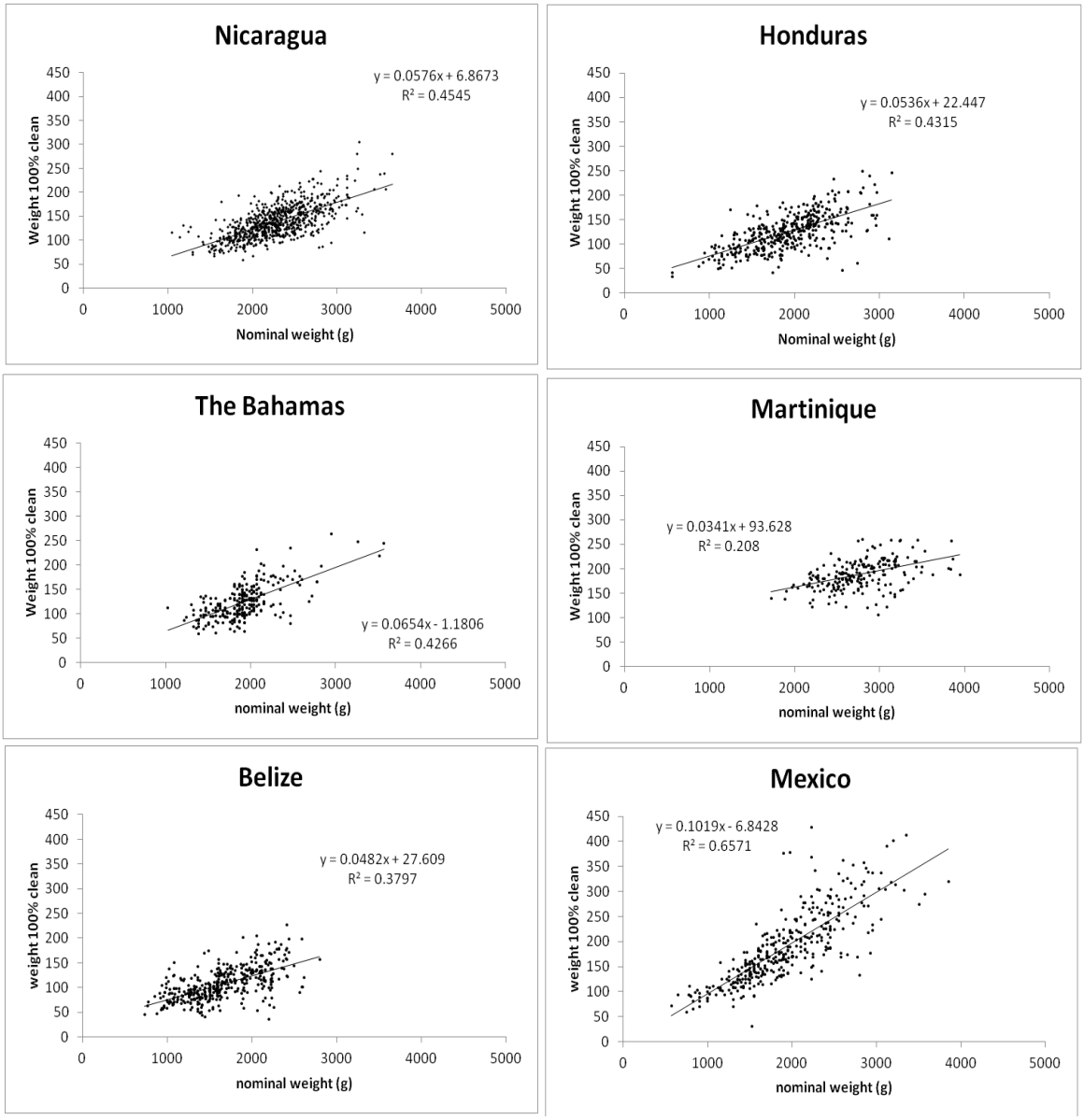

Figure 1. Linear regression between 100 percent clean meat and live weight

Table 3 shows the conversion factors estimated for each country and the weighted mean (dirty to live weight, 50% clean meat to live weight and 100% clean meat to live weight). Weighted mean was applied to give more importance to the results from countries that collected more specimens. The weighted mean for dirty meat was 5.3, 7.9 for 50% clean meat and 13.2 for 100% clean meat to live weight.

Table 3. Conversion factors to live weight
(ANT= Antigua & Barbuda, BAH= The Bahamas, BAR= Barbados, BLZ= Belize, DRM= Dominican Republic, HND= Honduras, MTQ= Martinique, MEX= Mexico, NIC= Nicaragua)

DIRTY TO LIVE WEIGHT

	ANT	BAH	BAR	BLZ	DRM	HND	MTQ	MEX	NIC	Weighted mean
Mean	5.5	5.8	4.8	3.5	6.1	5.8	5.6	4.4	5.5	**5.3**
St. deviation	1.02	1.23	1.27	1.09	1.30	1.57	0.97	1.84	0.84	
Variance	1.04	1.50	1.61	1.19	1.69	2.46	0.94	3.38	0.71	
N (sample size)	1231	258	231	400	475	405	210	372	711	
Confidence limits (95%)	0.06	0.15	0.16	0.11	0.12	0.15	0.13	0.19	0.06	

50% CLEAN TO LIVE WEIGHT

	ANT	BAH	BAR	BLZ	DRM	HND	MTQ	MEX	NIC	Weighted mean
Mean	6.8	11.8		5.8	8.4		8.6	6.1	10.2	**7.9**
St. Deviation	1.40	2.76		1.80	1.74		1.47	3.03	1.63	
Variance	1.96	7.61		3.24	3.03		2.15	9.20	2.65	
N (sample size)	1231	258		400	475		210	372	711	
Confidence limits (95%)	0.08	0.34		0.18	0.16		0.20	0.31	0.12	

100% CLEAN TO LIVE WEIGHT

	ANT	BAH	BAR	BLZ	DRM	HND	MTQ	MEX	NIC	Weighted mean
Mean	10.0	16.2		10.1	15.9	16.1	15.0	9.9	17.0	**13.2**
St. Deviation	2.19	3.70		3.42	4.14	4.62	2.67	4.37	3.24	
Variance	4.80	13.66		11.68	17.14	21.35	7.14	19.14	10.51	
N (sample size)	1231	259		397	475	402	210	372	711	
Confidence limits (95%)	0.12	0.45		0.34	0.37	0.45	0.36	0.45	0.24	

Various authors reported (Aspra et al., 2009; Horsford et al., 2011, Castelo et al., 2011) that there are differences between conversion factors, either by country, by fishing ground or by maturity stage, although in some cases in this study the difference between some countries was not significant.

Figure 2 shows the conversion factors for dirty to live weight. With the exception of Belize, Mexico and Barbados, in the other countries conversion factors were more or less similar in the order of magnitude.

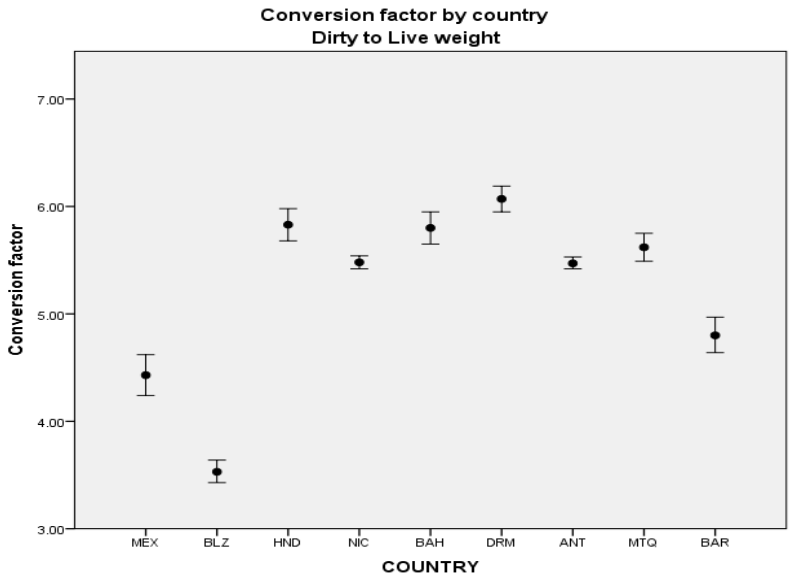

Figure 2. Conversion factors and confidence limits (95%) by country for dirty meat weight to live weight. Position of the countries in the x axis according to the geographical position. (ANT= Antigua & Barbuda, BAH= The Bahamas, BAR= Barbados, BLZ= Belize, DRM= Dominican Republic, HND= Honduras, MTQ= Martinique, MEX= Mexico, NIC= Nicaragua,)

Figure 3 shows the conversion factors estimated for 50% clean meat weight to live weight. In this case there is no clear trend and the differences are more clear, although Belize and Mexico, and Martinique and the Dominican Republic showed no significant difference.

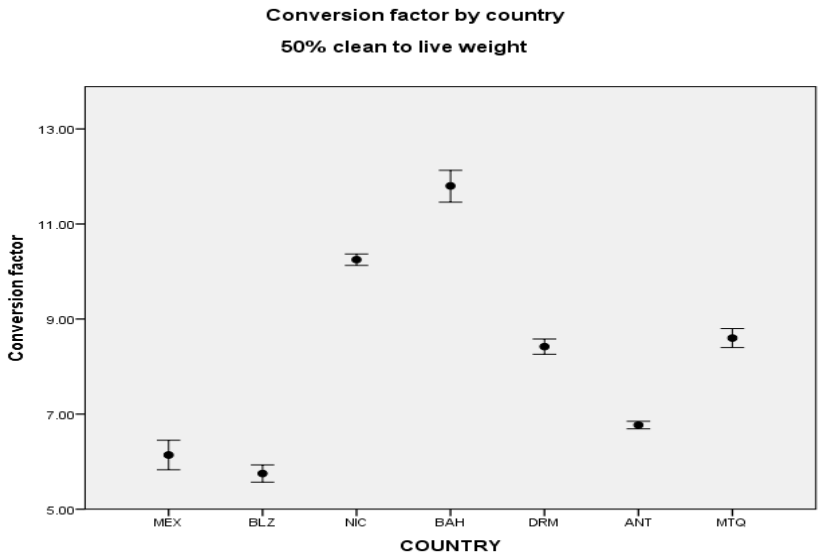

Figure 3. Conversion factors and confidence limits (95%) by country for 50% clean meat weight to live weight. Position of the countries in the x axis according to the geographical position. (ANT= Antigua & Barbuda, BAH= The Bahamas, BLZ= Belize, DRM= Dominican Republic, HND= Honduras, MTQ= Martinique, MEX= Mexico, NIC= Nicaragua,)

Figure 4 shows the conversion factors estimated for 100% clean meat weight to live weight. Again, there are groups of countries with close values, e.g. one group consists of Antigua & Barbuda, Belize and Mexico, which is different from the group comprising The Bahamas, Dominican Republic, Honduras and Nicaragua. Martinique is closer to the latter group.

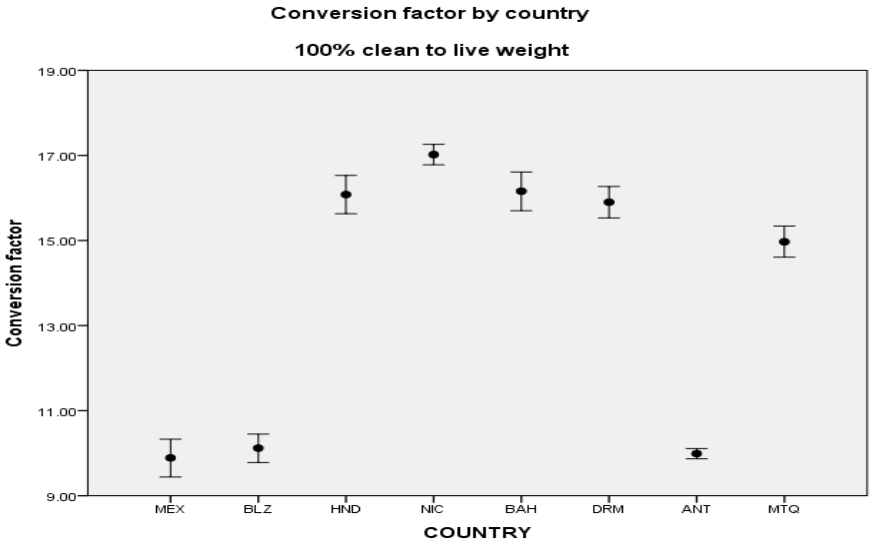

Figure 4. Conversion factors and confidence limits (95%) by country for 100% clean meat weight to live weight. Position of the countries in the x axis according to the geographical position. (ANT= Antigua & Barbuda, BAH= The Bahamas, BLZ= Belize, DRM= Dominican Republic, HND= Honduras, MTQ= Martinique, MEX= Mexico, NIC= Nicaragua,)

DISCUSSION AND RECOMMENDATIONS

Despite the short time available before the regional workshop and limited updated data available, this study made possible to have a regional approach on conversion factors with data from nine countries. Although some significant statistical differences were noted in some of the cases presented, there is the need to agree on common regional conversion factors to finally obtain a clear picture of historical and current harvest of queen conch in the region. The proposed conversion factors could be improved in the future if countries will make available new information collected according to the same criteria that have been adopted for the field surveys campaigns that have been carried out in 2007 and 2014.

The main recommendations are then:

- Proposed common regional conversion factors:

Processing grade	Conversion factor
Dirty meat	**5.3**
50% clean	**7.9**
100% clean	**13.2**

- If the above conversion factors will be endorsed by the 2nd Working Group meeting on queen conch, all countries and territories are requested to report to FAO in which processing grade their original had been submitted or provide the whole historical data series on queen conch harvest in live weight according to the newly agreed conversion factors;
- Countries should continue to collect weight data by processing grades to update and improve the proposed conversion factors

REFERENCES

Appeldoorn, R.S. 1988. Age determination, growth, mortality, and age of first reproduction in adult queen conch, *Strombus gigas* L., off Puerto Rico. *Fisheries Research* 6:363-378.

Aspra, B., R. Barnutti, J. Mateo, F. Marttin, and M. Scalisi, 2009. Conversion factors for processed queen conch to nominal weight. *FAO Fisheries and Aquaculture Circular*. No. 1042. Food and Agriculture Organization of the United Nations, Rome, Italy. 97 pp.

Castelo, R; A. García, J. Montes de Oca, and M. Formoso, 2011.Factores de conversión del caracol reina Strombus gigas en Cuba. Revista Cubana de Investigaciones Pesqueras.Julio-diciembre, 2011, vol. 28, NO. 2, ISSN 0138-8452, pp. 45-51

Horsford, I., M. Ishida, G. Looby, M. Archibald, H. Simon, T. Edwards, T. Lovell, P. James, J. Webber and Ch. Appleton. 2011. The morphology of the queen conch (*Strombus gigas*) from the Antigua and Barbuda shelf – implications for fisheries management. Proceedings of the 64 Gulf and Caribbean Fisheries Institute, October 31 - November 5, 2011, Puerto Morelos, Mexico

Acknowledgments

Thanks are due to Mr. Ian Horsford (Antigua & Barbuda), Mr. Lester Gittens (The Bahamas), Ms. Hazel Oxenford (Barbados), Mr. Mauro Gongora (Belize), Ms. Gabriela Pineda (Honduras), Ms. Myryam Bouaziz (Martinique), Ms. Dalila Aldana (Mexico) and Mr. Renaldi Barnutti (Nicaragua) for their contributions in order to make this study possible.

To Luca Garibaldi (FAO, Rome) for his comments and suggestions and Miguel Rolon (CFMC) and Raymon VanAnrooy (FAO, Barbados) for their support to carry out the study.

ANNEX 1 TERMINOLOGY

- Lip thickness: thickness of the shell lip measured in the mid-lateral region, roughly 40mm inward from the edge of the lip.
- Live weight: nominal weight
- Knocking/breaking: standard method used by divers in harvesting queen conch meat. The conch meat is extracted by cutting a small hole in the fourth whirl of the spire and subsequently severing the columnar muscle attached to the central axis.
- Nominal weight: Complete animal, including the shell
- Shell length: length of the shell from the apex of the spire to the end of the siphonal canal
- Without processing meat (dirty): Animal without the shell
- 50 percent clean meat: Removal of the operculum (claw) and the visceral bag.
- 65 percent clean meat: All of the above, plus the "head" (eyes, stem and proboscis) and part of the mantle
- 85 percent clean meat: All of the above, plus the edge, the mantle and remaining parts of the skin
- 100 percent clean meat (fillet): Only the white meat remains