



SUPPLY CHAIN ANALYSIS OF RED SPANNER CRAB (*RANINA RANINALINNAEUS*, 1758) IN ZAMBOANGA CITY

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ABSTRACT

The Red frog crab or Spanner crab (*Ranina ranina* Linnaeus, 1758), locally known as “Curacha”, is an important edible crab abundant in the coastal waters of Southwestern Mindanao, Philippines. The increased demands of this species for domestic and foreign consumption had greatly increased its retail in the local market. This study aimed to determine the supply chain analysis of Red Spanner crab (*Ranina ranina*, Linnaeus) in Zamboanga City. Specifically, it sought to determine the supply chain of Red Spanner crab (*Ranina ranina*, Linnaeus) from the fisherman to the wholesaler and to the retailer. To determine its morphometric characteristics, total length, width, circular diameter and its total mass were measured. The abundance of red Spanner crabs was measured in terms of kilograms per week. The study was conducted in Zamboanga City Public Market, and Aderes Flea Market Guiwan, Zamboanga City. This study is a descriptive-qualitative and quantitative analysis using survey method. This study was conducted within the month of April and May, 2018. The respondents were personally interviewed. Based on the study conducted, many of the respondents' age ranges from 31-40 and the least ranges from 20-30 years' old. Mostly were males and mostly were of Visayan tribe/ethnicity. Mostly were of Islam religion and all were living in District 2. Based on the results, Red spanner crabs are commonly caught in Basilan, Dumalitap, Manalipa, Pangant (66.67%) and Jolo (33.33%). Caught crabs were transported to the wholesaler which were located in Zamboanga City public market. Many of the wholesalers (66.67%) were the ones who funded the fishermen to catch the said species while the rest (33.33%) purchased it from the fisherman and other wholesaler. Some of the crabs were sold to retailers especially in Guiwan market vendors, some were sold to Alavar seafood restaurant which also serve Curacha or red Spanner delicacies in their restaurant in Zamboanga City as well as in Manila and to the rest of their branches and some were sold to consumers directly. Retailers sold their products to consumers. The mass of the S. crab determines its size. Small-sized weighs 0.250 kg but less than 0.5 kg, large sized weighs 0.5 kg but less than 1 kg, and jumbo sized or extra-large sized weighs 1 kg or more. The bigger the size of red spanner crab, the greater is its length, width and circular diameter. Medium-sized crabs were considered as good size. Accordingly, costumers prefer to buy female ones due to its nutritional value as well the presence of its eggs. Prices vary greatly on the seasons of the products which is every two months. The respondents had a very high sales of Red Spanner crab during its seasons but prices are low. On the contrary, the number of the products decreases when not in season or during breeding season however, prices are very high due to high demands from the consumers. Based on the results, concerned institutions should monitor the number of catch of Red Spanner crab and limits the size to be caught to a minimum of 8.6 cm carapace length or the dorsal part of the crab.

KEYWORDS: *Ranina ranina*, abundance, Supply chain, Red Spanner crab, Fisherman, wholesaler, retailer.

INTRODUCTION

The Red frog crab or Spanner crab (*Ranina ranina* Linnaeus, 1758), locally known as “curacha”, is an important edible crab abundant in the coastal waters of Southwestern Mindanao, Philippines. These crabs are also found in the eastern coast of Africa, across the Indian Ocean to Indonesia, in Australia, Japan and Hawaii (Brown 1986). They are fished commercially to a limited extent in Japan and the Philippines. The largest commercial fishery of this crab is found off the eastern

coast of Australia where the annual commercial catch is estimated at 3,592 metric tons (Queensland Fisheries 2010).

In Mindanao, Philippines, they are available year round and in 2011, their price ranged from P300 to 350 per kg depending on size and abundance. As a highly priced food commodity, *R. ranina* is a potential species for domestication, aquaculture and stock enhancement.

According to Tito O. and Alanana J., the increased demands of this species for domestic and foreign consumption had greatly increased its retail in the local market.

A supply chain is a system of organizations, people, technology, activities, information and resources involved in moving a product or service from supplier to customer. Supply chain activities transform natural resources, raw materials and components into finished product that is delivered to the end customers. Thus supply chain also refers to the sequence of stages involved in transferring product from the farm to the consumer. Supply chains underlie value chains because, without them no producer has the ability to give customers what they want, when and where they want it and what is the price they want to pay (Nick W, 2014).

For fishery resource management and conservation biodiversity purposes, some aspect of red spanner crab has to be investigated specifically its abundance from the landing area for sustainable utilization of the said species and its supply chain from the fisherman to the wholesaler and to the retailer, thus, were the main aims of this study. Notwithstanding, it will serve as a basis for regulating the number of catch of Red spanner crab in the area where it thrives.

MATERIALS AND METHODS

Description of the study sites. The Red Spanner crabs were collected in Zamboanga City Public Market, Aderes Flea Market Guiwan and Baliwasan seaside Zamboanga City. Zamboanga City Public Market is located downtown Zone I, Zamboanga City. It is 0.55 km away from City Hall. Baliwasan is an Urban barangay and is a seaside barangay on the west coast. It's about 3.5 kilometers from City Hall. It borders Campo Islam to the south/west and San Jose Gusu to the North/West. The Zamboanga Int'l Airport borders it to the North and the barangay of Canelar to the North/west.

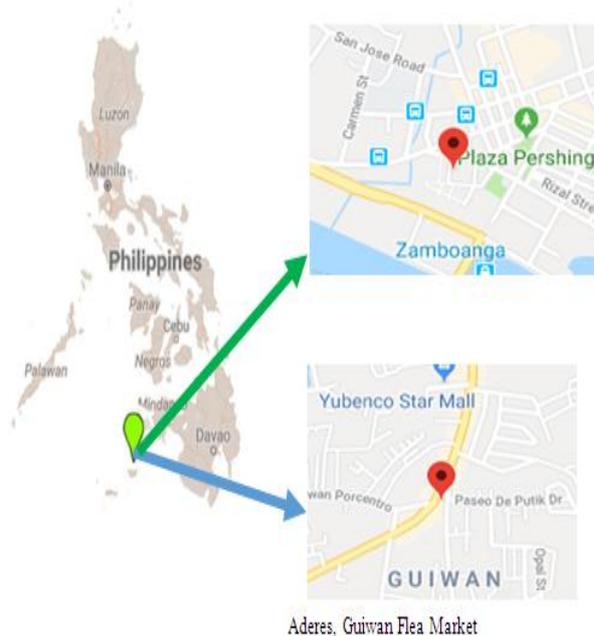


Figure 1.0: Map of the Philippines showing the two (2) sites.

Collection of samples: This study is a descriptive-qualitative and quantitative analysis using survey method. This study was conducted within the month of April and May, 2018. An informed consent was given to the respondents informing them of what the study is all about and the risks and benefits they would get out from the study conducted. A total of 22 respondents composed of fisherman, wholesaler and retailer were interviewed. The researcher personally interviewed the respondents using survey questionnaire made by the researcher. During the interview, the researcher took a photo documentation as well as video and voice recording using a SONY camera and a cellphone. Then data were recorded.

Results and Discussions: The Red spanner crab belongs to Kingdom Animalia, Phylum Arthropoda, Subphylum Crustacea, Class Malacostraca, Subclass Eumalacostraca, Superorder Eucarida, Order Decapoda, Suborder Pleocyemata, Infraorder Brachyura, Superfamily Raninoidea, Family Raninidae, Genus Ranina, Species *Ranina ranina* (Linnaeus, 1758). Table 1 showed that most of the respondents' age were 31-40 years old (40.91%) and the least were 20-30 years' old (18.18%). There were 86.36% males and 13.64% females. Mostly were of Visayan tribe/ethnicity (36.36%). Mostly were of Islam in religion and all were living in District 2.

Table 1: The Demographic profile of the Fisherman, Wholesaler, and Retailer.

Demographic Profile of the Respondents	Fisherman (%count) N=22	Wholesaler (% count) N=22	Retailer (% count) N=22
1. Age			
a. 20-30 yrs. old	33.33 (1)	16.67 (1)	15.38 (2)
b. 31-40 yrs. old	66.67 (2)	50.00 (3)	30.77 (4)

c. 41-50 yrs. old			15.38 (2)
d. 51-60 yrs. old		33.33 (2)	15.38 (2)
e. 61-70 yrs. old			23.08 (3)
2. Gender			
a. Male	100 (3)	100 (3)	76.92 (10)
b. Female			23.08 (3)
3. Ethnicity			
a. Badjao		16.67 (1)	7.62 (1)
b. Bisaya	66.67 (2)	33.33 (2)	30.774
c. Chavacano			7.69 (1)
d. Ilonggo			23.08 (3)
e. Samal		16.67 (1)	7.69 (1)
f. Tausug		16.67 (1)	15.38 (2)
g. Yakan	33.33 (1)	16.67 (1)	7.69 (1)
4. Religion			
a. Islam	33.33 (1)	66.67 (4)	38.46 (5)
b. Roman Catholic	66.67 (2)	33.33 (2)	61.54 (8)
5. District			
a. 1			
b. 2	100 (3)	100 (6)	100 (13)

Table 2 showed the second part of the survey questionnaire of the fisherman. All of the respondents were engaged in catching Red Spanner crab for about 20 years. All of them catch 1000-1,500 kilograms of Red Spanner crab during its season. However, if the crabs are not in season, the respondents usually catch 500 kg or less. Its price depends greatly on its size. Small sized is worth ₱200-₱250, medium-sized is worth ₱251-₱300, large sized is ₱301-₱350, and extra-large sized or the so called jumbo is ₱351-₱400 during its season. On the contrary, its price becomes high especially if it's not in season. Small sized is worth ₱300-₱350, medium-sized is worth ₱351-₱400, large sized is ₱401-₱450, and extra-large sized or the so called jumbo is ₱451-₱500. One kilogram of small sized S. crab ranges from 5-8 pieces, medium-sized 3-4 pieces, large 2-3 pieces and jumbo 1 piece. Accordingly, all the Red spanner crab caught were

sold directly to the wholesaler/retailer. Prices were not fixed since wholesaler/retailer would always ask for a discount. The S. crab were transported using trucks directly to the landing areas. Usually they use ice box and sea plast as a container. Small container can hold at most 50 kg, medium-sized container can hold up to 100 kg and the large container can hold up to 150 kg of S. crab. They did not wash the crabs before transportation since the latter were not that dirty and were actually live as it were directly brought to the buyers. Notwithstanding, they did not use any chemicals in preserving the freshness of Red Spanner crab. Red spanner crabs are in season during the months of March-April, July-August, and November-December or every two months. They are not in season during the months of January-February, May-June and September-October.

Table 2: Survey Questionnaire (Fisherman).

PART 2. Interview	Frequency count	% count
Q1		
0-10		
11-20	3	100
21-30		
Q2		
Season (weekly)		
0-500	3	100
501-1000	3	100
1001-1500	3	100
Not season		
0-500	3	100
501-1000		
1001-1500		
Q3		
Season		
Small size 200-250	3	100
Good Size 251-300	3	100

Large 301-350	3	100
Jumbo351-400	3	100
Not season		
Small size 300-350	3	100
Good Size 351-400	3	100
Large 401-450	3	100
Jumbo 451-500	3	100
Q4		
Small size 5-8	3	100
Good Size 3-4	3	100
Large 1-2	3	100
Jumbo 1	3	100
Q5		
Weekly (Season)		
1-500		
501-1000	3	100
1001-1500		
Not season		
1-500	3	100
501-1000		
1001-1500		
Q6		
Wholesaler	3	100
retailer	3	100
Consumer		
Q7		
Yes		
No	3	100
Q8		
Ice box	3	100
Sea Plast	3	100
Q9		
small ice box/sea plast 0-50	3	100
medium ice box/sea plast 51-100	3	100
Large ice box/sea plast 101-150	3	100
Q10		
Truck/Van	3	100
Boat		
Q11		
Yes		
No	3	100
Q12		
Ice	3	100
fresh water	3	100
Q13		
Yes		
No	3	100
Q14		
January-February		
March-April	3	100
May-June		
July-August	3	100
September-October		
November-December	3	100
Q15		
January-February	3	100
March-April		
May-June	3	100

July-August		
September-October	3	100
November-December		

Table 3 showed the second part of the survey questionnaire of the wholesalers. All of the respondents were engaged in wholesaling Red Spanner crab for about 20 years. The S. crab came from Basilan, Dumalitap, Manalipa, Panganat, and Jolo, Sulu. Its price depends greatly on its size. Small sized is worth ₱250-₱300, medium-sized is worth ₱300-₱350, large sized is ₱351-₱400, and extra-large sized or the so called jumbo is ₱401-₱450 during its season. On the contrary, its price becomes high especially if it's not in season. Small sized is worth ₱300-₱350, medium-sized is worth ₱351-₱400, large sized is ₱401-₱450, and extra-large sized or the so called jumbo is ₱451-₱500. One kilogram of small sized S. crab ranges from 5-8 pieces, medium-sized 3-4 pieces, large 2-3 pieces and jumbo 1 piece. All of them purchased 1000-1,500 kilograms of Red Spanner crab during its season. However, if the crabs are not in season, the respondents usually purchase 500 kg or less. Accordingly, all the Red spanner crab caught were sold

directly to the wholesaler/retailer. Prices were not fixed since retailers and consumers would always ask for a discount. The respondents have not loaned yet since they used their own money to finance their business. They used ice box and sea plast as a container. Small container can hold at most 50 kg, medium-sized container can hold up to 100 kg and the large container can hold up to 150 kg of S. crab. They were not washed and iced during purchased since the latter were not that dirty and were actually live as they were directly brought to the buyers and they do not have any washing facility. Notwithstanding, they did not use any chemicals in preserving the freshness of Red Spanner crab but they only placed freshwater and iced to preserve its freshness. Red spanner crabs are in season during the months of March- April, July-August, and November-December or every two months. They are not in season during the months of January-February, May-June and September-October.

Table 3.0: Survey Questionnaire (Wholesaler).

PART 2. Interview	Frequency	% count
Q1		
0-10	2	0.33
Nov-20	4	0.67
21-30		
Q2		
Basilan	4	0.67
Dumalitap	4	0.67
Jolo, Sulu	2	0.33
Manalipa	4	0.67
Panganat	4	0.67
Q3		
Season		
Small size 250-300	6	100.00
Good Size 301-350	6	100.00
Large 351-400	6	100.00
Jumbo 401-450	6	100.00
Not season		
Small size 300-350	6	100.00
Good Size 351-400	6	100.00
Large 401-450	6	100.00
Jumbo 451-500	6	100.00
Q4		
Season		
Small size 300-350	6	100.00
Good Size 351-400	6	100.00
Large 401-450	6	100.00
Jumbo 451-500	6	100.00
Not season		
Small size 350-400	6	100.00
Good Size 401-450	6	100.00
Large 451-500	6	100.00
Jumbo 501-550	6	100.00

Q5		
Small size 5-8	6	100.00
Good Size 3-4	6	100.00
Large 1-2	6	100.00
Jumbo 1	6	100.00
Q6		
Weekly (Season)		
1-500	2	0.33
501-1000		
1001-1500	4	0.67
Not season		
1-500	6	100.00
501-1000		
1001-1500		
Q7		
Weekly (Season)		
1-500	2	0.33
501-1000		
1001-1500	4	0.67
Not season		
1-500	6	100.00
501-1000		
Q8		
Wholesaler	6	100.00
retailer	6	100.00
Consumer	6	100.00
Q9		
Yes		
No	6	100.00
Q10		
Yes		
No	6	100.00
Q11		
Ice box	6	100.00
Sea Plast	6	100.00
Q12		
small ice box/sea plast 0-50	3	100.00
medium ice box/sea plast 51-100	6	100.00
Large ice box/sea plast 101-150	4	0.67
Q13		
Yes		
No	6	100.00
Q14		
Yes		
No	6	100.00
Q15		
Yes		
No	6	100.00
Q16		
Yes		
No	6	100.00
Q17		
Ice	6	100.00
fresh water	6	100.00
Q18		
Yes		
No	6	100.00
Q19		

January-February		
March-April	6	100.00
May-June		
July-August	6	100.00
September-October		
November-December	6	100.00
Q20		
January-February	6	100.00
March-April		
May-June	6	100.00
July-August		
September-October	6	100.00
November-December		

Table 4 showed that many of the respondents were engaged in retailing Red Spanner crab for about 21-30 years. Mostly of the S. crab came from Basilan, Dumalitag, Manalipa, Panganat (66.67%), and Jolo, Sulu (33.33%). Its price depends greatly on its size. Small sized is worth ₱300-₱350, medium-sized is worth ₱400-₱450, large sized is ₱451-₱500, and extra-large sized or the so called jumbo is ₱501-₱550 during its season. On the contrary, its price becomes high especially if it's not in season. Small sized is worth ₱350-₱400, medium-sized is worth ₱401-₱450, large sized is ₱451-₱500, and extra-large sized or the so called jumbo is ₱551-₱600 and sometimes it's price becomes ₱700. One kilogram of small sized S. crab ranges from 5-8 pieces, medium-sized 3-4 pieces, large 2-3 pieces and jumbo 1 piece. All of them purchased 1000-1,500 kilograms of Red Spanner crab during its season. However, if the crabs are not in season, the respondents usually purchase 500 kg or less. Accordingly, all the Red spanner crab caught were sold directly to the retailer and consumers. Prices were not

fixed since retailers and consumers would always ask for a discount. Many of the respondents have not loaned yet since they used their own money to finance their business while others do lend money from lending agency. They used ice box and sea plast as a container. Small container can hold at most 50 kg, medium-sized container can hold up to 100 kg and the large container can hold up to 150 kg of S. crab. They were not washed and iced during purchased since the latter were not that dirty and were actually live as they were directly brought to the buyers and they do not have any washing facility. Notwithstanding, they did not use any chemicals in preserving the freshness of Red Spanner crab but they only placed freshwater and iced to preserve its freshness. Red spanner crabs are in season during the months of March- April, July-August, and November-December or every two months. They are not in season during the months of January-February, May-June and September-October.

Table 4: Part 2 Survey Questionnaire (Retailer).

PART 2. Interview	Frequency	% Count
Q1		
0-10	4	0.31
Nov-20	4	0.31
21-30	5	0.38
Q2		
Arena Blanco	1	0.08
Baliwasn seaside	1	0.08
Basilan	2	0.15
Jolo	4	0.31
Manalipa	2	0.15
Zamboanga City public Market	3	0.23
Q3		
Season		
Small size 300-350	13	100.00
Good Size 351-400	13	100.00
Large 401-450	13	100.00
Jumbo 451-500	13	100.00
Not season		
Small size 350-400	13	100.00
Good Size 401-450	13	100.00
Large 451-500	13	100.00

Jumbo 501-550	13	100.00
Q4		
Season		
Small size 350-400	13	100.00
Good Size 401-450	13	100.00
Large 451-500	13	100.00
Jumbo 550-600	13	100.00
Not season		
Small size 400-450	13	100.00
Good Size 451-500	13	100.00
Large 501-550	13	100.00
Jumbo 551-600 up	13	100.00
Q5		
Small size 5-8	13	100.00
Good Size 3-4	13	100.00
Large 1-2	13	100.00
Jumbo 1	13	100.00
Q6		
Weekly (Season)		
1-500	4	0.31
501-1000		
1001-1500	9	0.69
Not season		
1-500	13	100.00
501-1000		
1001-1500		
Q7		
Weekly (Season)		
1-500	4	0.31
501-1000		
1001-1500	9	0.69
Not season		
1-500	13	100
501-1000		
1001-1500		
Q8		
Wholesaler		
retailer	13	100
Consumer	13	100
Q9		
Yes		
No	13	100
Q10		
Yes		
No	13	100
Q11		
Ice box	13	100
Sea Plast	4	0.31
Q12		
small ice box/sea plast 0-50	13	100
medium ice box/sea plast 51-100	12	0.92
Large ice box/sea plast 101-150	9	0.69
Q13		
Yes	2	0.15
No	11	0.84
Q14		
Yes	4	0.31
No	9	0.69

Q15		
Yes	5	0.38
No	8	0.62
Q16		
Yes	13	100
No		
Q17		
Ice	13	100
fresh water	13	100
Q18		
Yes		
No	13	100
Q19		
January-February		
March-April	13	100
May-June		
July-August	13	100
September-October		
November-December	13	100
Q20		
January-February	13	100
March-April		
May-June	13	100
July-August		
September-October	13	100
November-December		

Table 4 shows the measurements of Red Spanner crab in terms of mass, length, width and circular diameter. Based on the data presented, the mass of the *S.* crab determines its size. Small-sized weighs less than 0.250 kg, medium-sized weighs 0.250 kg but less than 0.5 kg, large sized weighs 0.5 kg but less than 1 kg, and jumbo sized or

extra-large sized weighs 1 kg or more. The bigger the size of red spanner crab, the greater is its length, width and circular diameter. Medium-sized crabs were considered as good size. Accordingly, costumers prefer to buy female ones due to its nutritional value as well the presence of its eggs.

Table 4: Mean measurements of Red Spanner crabs (Male/Female).

Sample	Mean mass (kg)	Mean length (cm)	Mean width (cm)	Mean circular diameter (cm)
Male	0.58	17.27	11.7	24.57
Female	0.53	17.18	11.42	22.69



Figure 2: Measuring the length of Red Spanner crab.



Figure 3: Measuring the width of Red spanner crab.



Figure 4: Measuring the circular diameter of Red Spanner crab.

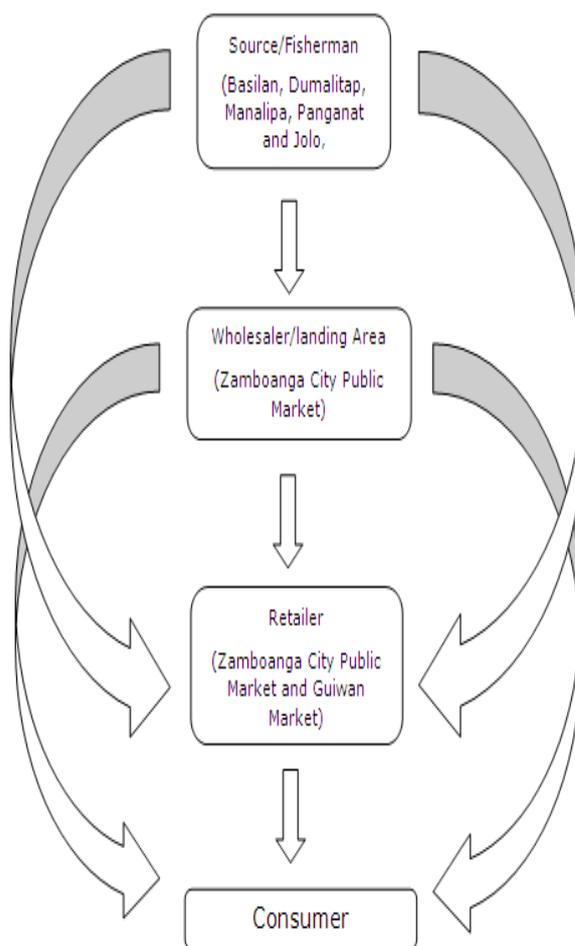


Figure 5: Measuring the ventral length of Red Spanner crab.



Figure 6: Measuring the mass of the Red Spanner crab

Supply chain of Red Spanner crab



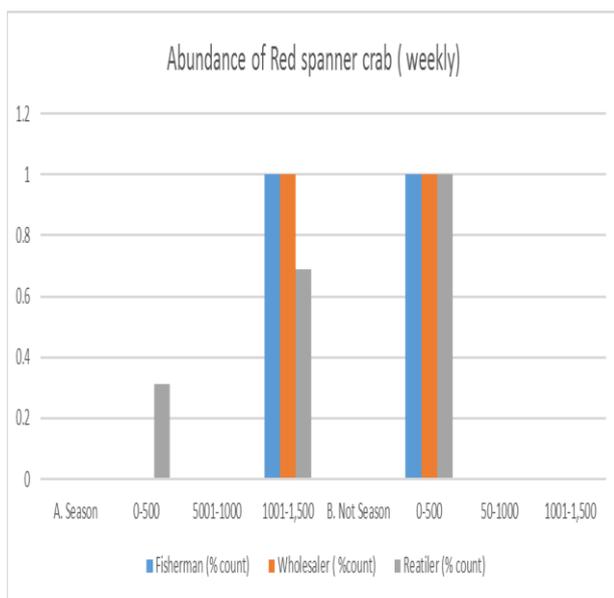
Based on the diagram above, Red spanner crabs are commonly caught in Basilan, Dumalitag, Manalipa, Panganat (66.67%) and Jolo (33.33%). Caught crabs were transported to the wholesaler which was located in Zamboanga City public market. Many of the wholesalers (66.67%) were the ones who funded the fishermen to catch the said species and the rest (33.33%) just purchased it from the fisherman. Some of the crabs were sold to retailers especially in Guiwan market vendors, some were sold to Alavar seafood restaurant which serve Curacha or red Spanner delicacies in their restaurant in Zamboanga City as well as in Manila and to the rest of their branches and some were sold to consumers directly. Retailers sold their products to consumers.

Table 6 presented the prices of the Red spanner crab from the fisherman to the wholesaler and to the retailer. Prices of the said crabs vary for a range of ₱50-₱100 difference as it goes to the retailer from the source.

Table 6.0: Prices of Red Spanner crabs per kilogram.

Size	Source/Fisherman	Wholesaler	Retailer
Season			
Small size	₱200-₱250	₱250-₱300	₱300-₱350
Medium size	₱251-₱300	₱301-₱350	₱351-₱400
Large size	₱301-₱350	₱351-₱400	₱451-₱500
Jumbo	₱351-₱400	₱401-₱450	₱501-₱550
Not season			
Small size	₱250-₱300	₱300-₱350	₱350-₱400
Medium size	₱301-₱350	₱351-₱400	₱401-₱450
Large size	₱351-₱400	₱401-₱450	₱451-₱500
Jumbo	₱401-₱450	₱451-₱500	₱501-₱550
			₱551-₱600
			₱601-₱700

Figure 7. showed the abundance of red spanner crabs in terms of kilograms weekly. During its season, the Red spanner crabs are very abundant in which it reached up to 1, 500 kg weekly (56.33%). However, if it was not in its season, the number of Red spanner crabs greatly decreases to a range of 0-500 kg weekly.

**Figure 7: Abundance of red Spanner crabs by week (kg).**

CONCLUSIONS

Based on the results of the study, Red spanner crabs are commonly caught in Basilan, Dumalitag, Manalipa, Jolo and Panganat. Caught crabs were transported to the wholesaler which were located in Zamboanga City public market. Many of the wholesalers were the ones who funded the fishermen to catch the said species. Some of the crabs were sold to retailers especially in Guiwan market vendors, some were sold to Alavar seafood restaurant which also serve Curacha or red Spanner delicacies in their restaurant in Zamboanga City as well as in Manila and to the rest of their branches and some were sold to consumers directly. Retailers sold their products to consumers. Prices vary greatly on the

seasons of the products which is every two months (refer to the data presented in a table form). The respondents had a very high sales of Red Spanner crab during its seasons but prices are low. On the contrary, the number of the products decreases when not in season or during breeding season however, prices are very high due to high demands from the consumers. Therefore, according to the respondents, their net profits were balanced by the demand and supply of the products. The higher the supply of the products, the lower is its demands, thus, prices are low. On the other hand, the lower the supply of the products, the higher is the demand thus, prices are very high (supply-demand law). Based on the results, concerned institutions should monitor the number of catch of Red Spanner crab and limits the size to be caught to a minimum of 8.6 cm carapace length or the dorsal part of the crab.

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