

ISBN 978-967-0633-78-7  
SEAFDEC/MFRDMD/SP/52



# **DATA COLLECTION ON SHARKS AND RAYS BY SPECIES IN MALAYSIA**

**(AUGUST 2016 – JULY 2017)**



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**MARINE FISHERY RESOURCES DEVELOPMENT AND MANAGEMENT DEPARTMENT**  
**SOUTHEAST ASIAN FISHERIES DEVELOPMENT CENTER**

**2020**

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ISBN 978-967-0633-78-7

Sharks--Malaysia--Statistics.

1. Rays (Fishes)—Malaysia—Statistics.

2. Government publications—Malaysia.

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III. Lawrence Kissol Jr. IV. Rosdi Mohd. Nor.

V. Mohd Sukri Muda. VI. Title.

579.309595

Published by:

Jabatan Perikanan Malaysia

Kementerian Pertanian dan Industri Makanan

Aras 1-6, Blok Menara 4G2, Presint 4

62628 Putrajaya.

Tel: 03-8870 4000

Fax: 03-8890 3794

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<http://www.dof.gov.my>



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This publication should be cited as follows;

Abd Haris Hilmi, A.A., Hamizah, N.A., Ahmad, A., Kissol, L., Rosdi, M.N. and Sukri, M. (2020). Data Collection on Sharks and Rays by Species in Malaysia (August 2016 – July 2017). SEAFDEC/MFRDMD/SP/52.50pp.

## ACKNOWLEDGEMENT

The authors would like to thank The Honourable Dato' Haji Munir bin Haji Mohd Nawi, former Director-General of Fisheries Malaysia, for his continuous support in the implementation of this project as well as the conservation and management of sharks and rays in Malaysia.

We would particularly like to thank to Dr. Chumnarn Pongsri, former Secretary-General of SEAFDEC, Dr. Kom Silapajarn, Secretary-General of SEAFDEC for their support and to Dr. Haruko Okusu from CITES Secretariat Office in Geneva for supporting this project especially for securing funding from the European Union (EU).

We are grateful to all people for their encouragement and support in the implementation of this project especially Mr. Raja Bidin bin Raja Hassan, former Chief of SEAFDEC/MFRDMD; Dr. Masaya Katoh, Deputy Chief of SEAFDEC/MFRDMD; Dr. Osamu Abe, former Deputy Chief of SEAFDEC/MFRDMD; Dr. Ahemad bin Sade, Director of the Department of the Fisheries Sabah and Dr. Bah Piyan Tan, former Deputy Director-General of Fisheries Management.

We are highly appreciated of the effort by all former and Fisheries District Officers in Sabah and Perak especially Mr. Mohd Zamani bin Haji Nayan, Mr. Jum bin Abbas, Mr. Sallehudin bin Ismail and Mr. Rajandran S/O Ramasamy for helping and co-ordinated the project at states level.

Last but not least, we appreciated the services provided by enumerators Mr. Abdul Rahman bin Haji Ali Hasan (Larut Matang, Perak), Mr. Justin Agon and Mr. Norhairul bin Nordin (Kota Kinabalu, Sabah); supporting staff from SEAFDEC/MFRDMD Mr. Adam Luke Anak Pugas, Mr. Mohd Saki bin Noor, Mr. Nor Azman bin Zakaria, Mr. Wahab bin Daud and the late Allahyarham Mr. Ruzelan bin Jusoh, supporting staff from Department of Fisheries Sabah Ms. Angelene Lojutan, Ms. Midah Gintin, and Ms. Norsimah binti Kassim; supporting staff from FRI Kg. Aceh, Perak Mr. Hashim bin Suhaimi who are actively involve in data analysis.

## EXECUTIVE SUMMARY

This project was the outcome of ‘The Regional Technical Working Group on Data Collection for Sharks in Southeast Asia’ held in Phuket, Thailand on 22 – 24 April 2014. The European Union and The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) through the Southeast Asian Fisheries Development Center (SEAFDEC) had agreed to fund a one-year project for conducting activities in Malaysia with a grant of US\$6,000. Apart from that, the Malaysian Government allocated RM70,000 (about US\$19,000) more to ensure the smooth implementation of this project. With the funding in place, eight districts were identified with four fully sponsored by SEAFDEC and four more by the Malaysia Government.

The project aimed to enhance human resource development in elasmobranch taxonomy, to increase awareness on conservation, to improve landings data recording from generic ‘sharks’ and ‘rays’ to species level and as preparation for Malaysia to conduct Non-detriment Findings (NDFs) study for sharks and rays in the near future. During the period of 12 months from August 2016 to July 2017, recording of landings data were conducted in one district in Perak and one district in Sabah. Twelve staffs from the Department of Fisheries Malaysia and the Department of Fisheries Sabah trained in shark taxonomy were involve in the endeavor, collecting data at least 12 days per month. Larut Matang, Perak and Kota Kinabalu, Sabah were selected as the study sites under sponsorship of SEAFDEC and Malaysian Government. These districts are the main landing sites of sharks and rays in both states and the landing data were collected at seven jetties in Perak and one jetty in Sabah.

A total of 58 species of chondrichthyans belonging to nine families of sharks (26 species) and nine families of rays (32 species) were recorded during the study period. In Larut Matang, Perak a total of 16 species of rays from four families, and 10 species of sharks from four families were recorded. For Sabah, Kota Kinabalu recorded the highest number of species with 27 rays from eight families and 23 sharks from nine families. The details is as shown in **Appendix II**. In term of percentage of total marine landings, rays and sharks contributed 1.9% and 0.6% at Larut Matang and; 0.5% and 0.3% at Kota Kinabalu respectively. These figures confirmed earlier data as published in Malaysian National Statistics that rays and sharks were only by-catch and not targeted and contributed less than 2% of the total annual marine landings.

The abundance of sharks and rays species varied between the study sites. The most abundant rays species in Larut Matang were *Neotrygon orientalis*, *Maculabatis gerrardi*, *Brevitrygon heterura*, *Telatrygon biasa* and *Maculabatis pastinacoides* while for sharks were *Chiloscyllium hasseltii*, *Chiloscyllium punctatum*, *Atelomycterus marmoratus*, *Carcharhinus leucas* and *Carcharhinus sorrah*. The most abundant rays species in Kota Kinabalu were *Neotrygon orientalis* followed by *Maculabatis gerrardi*, *Telatrygon biasa* and *Rhinobatos cf jimbarensis*. For sharks, the most abundant species were *Chiloscyllium punctatum* followed by *Chiloscyllium plagiosum*, *Atelomycterus marmoratus*, *Carcharhinus sorrah* and *Sphyrna lewini*.



The top three catch per unit effort (CPUE) (kg/hauls) for rays species captured by trawl net Zone C in Larut Matang, Perak were *Maculabatis gerrardi*, *Neotrygon orientalis* and *Brevitrygon heterura* while for sharks *Chiloscyllium hasseltii*, *Chiloscyllium punctatum* and *Carcharhinus leucas*. The top three CPUE rays and sharks species captured by trawl net in Kota Kinabalu, were determined in Zone 3 and Zone 4. *Neotrygon orientalis* topped the list for both zones followed by *Maculabatis gerrardi* while *Telatrygon biasa* and *Rhinoptera jayakari* were the third in the list for Zone 3 and Zone 4 respectively. The first three sharks species were in the same order for both Zone 3 and Zone 4 where *Chiloscyllium punctatum* came first, followed by *Chiloscyllium plagiosum* and *Carcharhinus sorrah*.

Finally, based on the usage and marketing information gathered, this study confirmed that all sharks and rays were landed whole, indicated of these species full utilization with no finning activities on board of vessels.

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## **1.0 INTRODUCTION**

Malaysia is a home to a rich diversity of sharks, rays, skates and chimaeras (Class Chondrichthyes). However, shark and ray landings contribute only about 1% and 2% of total marine landings respectively. Until 2016, Malaysia recorded 162 species of Chondrichthyans comprising 70 sharks, 85 rays, six skates and one chimaera, belonging to 18 families of sharks, 12 rays, two skates and one chimaera. The high diversity of sharks was recorded from the Order Carcharhiniformes with 50 species and Orectolobiformes with 10 species. However, low diversity was recorded for the Order Hexanchiformes with three species, and Lamniformes and Squatiniformes with two species respectively. Species diversity in the Order Heterodontiformes was scanty where only one species was recorded. As for batoids, high diversity was recorded for the Order Myliobatiformes with 62 species followed by Torpediniformes with 12 species and Rhinobatiformes with eight species. Only six species were recorded from the Order Rajiformes and three species from Pristiformes. Even though the number of Chondrichthyans species recorded in Malaysia was more than 160, the actual status of its biodiversity is still unknown. With new species continuously discovered, the number is expected to increase in the future. At present, the deep water species are mostly unknown due to limited research activities. Most sharks and rays species landed especially from the families Carcharhinidae and Dasyatidae are very difficult to identify up to species level by untrained and inexperienced enumerators. Only well trained staff will be able to make the right and valid identification of species (Ahmad and Annie Lim, 2012)

### **1.1 Objective**

The objectives of this project were:

- to enhance human resource development in elasmobranch taxonomy,
- to improve landing data recording from generic ‘sharks’ and ‘rays’ to species level,
- to increase awareness on conservation, and
- to use data for Non-Detriment Findings (NDFs) study for sharks and rays

### **1.2 Data Collection at Landing Sites**

#### **1.2.1 Selection of Study Sites**

The State of Perak on the west coast of Peninsular Malaysia is a major landing state for sharks and rays. One district facing the Straits of Malacca, namely Larut Matang was selected as the study sites as it was one of the main landing sites of sharks and rays in the state. The landing data were collected at seven jetties in Larut Matang. The landing sites are private enterprises with most of the sharks and rays landing coming from trawlers. The location of the landing site is shown in **Figure 1**.

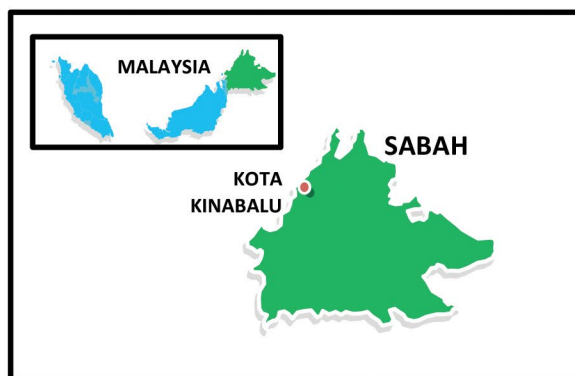




**Figure 1: Location of Study Site in the State of Perak**

Sabah, with the population of 3.544 million (2015 census) is the second largest state in Malaysia, nicknamed ‘Negeri Di Bawah Bayu’ or Land Below The Wind and occupying the northern part of Borneo. The total land area of Sabah is about 73,631 square kilometres and famed for its 4,095 meter-tall Mt. Kinabalu, the highest peak in the country, as well as for its ethnic diversity, serene beaches, virgin rainforest, coral reefs and abundant flora and fauna species. Surrounded by South China Sea in the west, Sulu Sea in the northeast and Celebes (Sulawesi) Sea in the northeast, Sabah is indeed blessed with its marine resources. In 2015, the landing marine fish in the state was 175,443 metric tonnes (mt) with the value of RM902.5 million. Sabah maintained its status as a net exporter of fisheries commodities, amounting 74,973 metric tonnes with the value of RM851.7 million in 2014.

There are 16 coastal districts in Sabah and for the purpose of this project, Kota Kinabalu in the west, was selected as the study sites, due to the fact that this district is a major fisheries landing point in Sabah (**Figure 2**).



**Figure 2: Location of Study Site in the State of Sabah**

## 1.2.2 Fisheries Structure and Background of Study Sites

### 1.2.2.1 Larut Matang

Larut Matang is one of the major landing sites for sharks and rays in Perak. All jetties belong to private enterprises. The major gears were trawl nets (545), followed by drift nets (165) and purse seine (33). All trawlers are normally operated by 4 – 5 crew members. Almost all of the sharks and rays were landed by trawlers operating beyond eight nautical miles from the coastline. Fishing operation normally between 5 – 12 days per trip. All catches were landed from 0500hr – 1000hr. The details of fishing vessels registered in this district are shown in **Table 1**.

**Table 1: Number of Licensed Fishing Vessels by Gears and Number of Fishers at Larut Matang**

<b>Gear Type</b>	<b>Fishing Zone</b>	<b>Fishing Operation (from costline)</b>	<b>No of Boat</b>	<b>No of Fishers</b>
<b>Trawlers</b>				
10 - 24.9 GRT	B	> 5 miles	302	604
25 - 39.9 GRT	B1	> 8 miles	21	52
39.9 - 69.9 GRT	C	>15 miles	214	856
> 70 GRT	C2	>15 miles	8	40
<b>Total</b>			<b>545</b>	<b>1,552</b>
<b>Purse Seiners</b>				
40 - 69.9 GRT	C			
> 70 GRT	C2	>15 miles	33	820
<b>Total</b>			<b>33</b>	<b>820</b>
<b>Drift Nets</b>	A	All areas	<b>165</b>	<b>206</b>
<b>Long Line</b>	A	All areas	<b>27</b>	<b>41</b>
<b>Others</b> (B.Ketam,Bubu,Gombang, P.Surung,Siput/kerang, Pancing)	A	All areas	<b>738</b>	<b>1,245</b>
<b>Grand Total</b>			<b>1,508</b>	<b>6,236</b>

### 1.2.2.2 Kota Kinabalu

Sabah Fisheries Marketing Authority (SAFMA) Jetty is the biggest fish landing jetty in Kota Kinabalu district. Commercial fishing vessels mainly operating trawl nets and purse seines landed their catch here on a daily basis. There are estimated around 30 fishing vessels utilizing the jetty during a particular period of landing time allowed, which is from 12 midnight until early morning in the same day.

There are 215 trawlers in Kota Kinabalu compare to purse seines which are only around 41. The operation duration per trip of trawl nets is up to a week while the purse seine's operations

only take up to three days the most. The details of commercial fishing vessels at Kota Kinabalu are shown in **Table 2**.

**Table 2: Number of Licensed Fishing Vessels by Gears and Number of Fishers at Kota Kinabalu**

<b>Gear Type</b>	<b>Fishing Zone</b>	<b>Fishing Operation (from coastline)</b>	<b>No. of Vessels</b>	<b>No. of Fishers</b>
<b>Trawlers</b>				
< 10 GRT	West Coast	> 3 nm	4	12
10 – 24.9 GRT	West Coast	> 3 nm	50	183
25 – 39.9 GRT	West Coast	> 3 nm	123	738
39.9 – 69.9 GRT	West Coast	> 3 nm	27	195
> 70 GRT	West Coast	> 30 nm	11	88
<b>Total</b>			<b>215</b>	<b>1,216</b>
<b>Purse Seiners</b>				
25 – 39.9 GRT	West Coast	> 3 nm	17	170
39.9 – 69.9 GRT	West Coast	> 3 nm	23	230
> 70 GRT	West Coast	> 3 nm	1	12
<b>Total</b>			<b>41</b>	<b>412</b>
<b>Grand Total</b>			<b>256</b>	<b>1,628</b>

### 1.3 Appointment of Enumerators and Project Coordinators

One Assistant Fisheries Officer from the State Fisheries Office of Perak and two Assistant Fisheries Officers from the Department of Fisheries Sabah were appointed as enumerators for each district or study sites. Their names and addresses are as follows:

Study site 1: Larut Matang, Perak
Mr. Abdul Rahman bin Haji Ali Hasan Pejabat Perikanan Daerah Taiping Tingkat 6, Wisma Persekutuan, Jalan Istana Larut 34000 Taiping, Perak. Tel: +6 058075311 Email: abd.rahman0865@gmail.com
Study site 2: Kota Kinabalu, Sabah
Mr. Justin Agon Senior Assistant Fisheries Officer Department of Fisheries Sabah Jalan Haji Saman 88000 Kota Kinabalu, Sabah. Tel: +6 088 262359 Email: justin.agon@sabah.gov.my



<p>Mr. Norhairul bin Nordin  Assistant Fisheries Officer  Department of Fisheries Sabah  Wisma Pertanian Sabah, Jalan Tasik Luyang (Off Jalan Maktab Gaya)  88624 Kota Kinabalu, Sabah.  Tel: +6 088 235966  Email: hairul_elut@yahoo.com</p>
<p>National Coordinator and Project Coordinator for Perak</p>
<p>Mr. Abd Haris Hilmi bin Ahmad Arshad  Senior Researcher  Fisheries Research Institute, Capture Fisheries Division  Kompleks Perikanan Kampung Acheh, Department of Fisheries Malaysia  32000 Sitiawan, Perak.  Tel: +6 056914752  Email: haris_hilmi@dof.gov.my</p>
<p>Project Coordinator for Sabah</p>
<p>Mr. Lawrence Kissol JR.  Assistant Director (Marine Resource Management)  Department of Fisheries Sabah  Wisma Pertanian Sabah, Jalan Tasik Luyang (Off Jalan Maktab Gaya)  88624 Kota Kinabalu, Sabah.  Tel: +6 088 235966  Email: Lawrence.kissol@sabah.gov.my</p>

## 1.4 Materials and Methods

### 1.4.1 Sampling Methods

The sampling activity started in August 2016 until July 2017. All enumerators were requested to record landing data and other related information in a standard form at least 12 days per month. A Standard Operating Procedure entitled ‘SOP Sharks, Rays and Skates Data Collection in the Southeast Asian Waters’ was used as a guide. The content included Standard Operation Procedure and instructions to enumerators on how to measure, weigh, record sharks and rays species at sampling sites, name of enumerator, name of landing site, date of sampling, vessel registration number, vessel GRT, fishing area, price at landing sites, name of species (common name and scientific name), total catch of sharks, rays, commercial and low-value species from each sampling vessel. The details of the standard form are shown in **Appendix I**. The completed data in excell were then submitted to the respective National Coordinator before submitted to SEAFDEC/MFRDMD before second week of the following month for verification. The data were analysed at the end of each quarter.

### 1.4.2 Selection of Fishing Vessels and Sampling Activities

Between 1 – 3 fishing vessels were selected for sampling each day for 12 days per month at each landing sites. Measurement of Total Length (TL) were taken for all skates, sharks and rays species from the families Rhynchobatidae, Rhinobatidae and Narcinidae. While Disc Length (DL) were taken for all ray species where the tail is frequently absent or damaged (mainly from the families Dasyatidae, Gymnuridae and Mobulidae). All sharks and rays specimens were measured and weighed individually if the total number was less than 50 individuals per vessel. If the total number was more than 50 individuals, only 10 – 5% were measured. The maturity stage for each individual was estimated according to Yano *et al.* (2005) and Ahmad and Annie Lim (2012). The total catch of all sharks and rays by species as well as the total catch of commercial and low-value species were also recorded for each sampling vessel. Some samples were brought back to the Fisheries Research Institute, Capture Fisheries Division, Kg. Acheh Sitiawan Perak and Fisheries Research Center, Likas, Kota Kinabalu for preservation and future references. Larger specimens were photographed and their basic taxonomic and biological characteristics noted.

### 1.4.3 Classification

The classification (scientific names) used in this report follows that of Compagno (1999), Yano *et al.* (2005), Ahmad and Annie Lim (2012), Ahmad *et al.* (2013), Ahmad *et al.* (2014), Ebert *et al.* (2013) and Last *et al.* (2016).

## 2.0 RESULTS

### 2.1 Larut Matang

#### 2.1.1 Landing Samples

A total of 279 landings were sampled during the study period. The highest landing by month was 28 in October 2016 followed by 27 in March 2017. The highest landing by gear type was using trawl net operated in Zone C with 203 landings, followed by longline with 44 and trawl net operated in Zone B with 17 landings. The details are shown in **Table 3**.

**Table 3: Number of Landings by Gear Sampled During Study at Larut Matang**

Types of Gear	Year/Month												Grand Total
	2016					2017							
	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	
Full Gear													
Drift Net	1	1	1		1			1	1	3		1	10
Longline	3	1	3	1		1	5	1	8	6	3	12	44
Trawl Net B	1		1	3	3	1	1	4	3				17
Trawl Net C	18	20	21	21	16	14	16	21	14	15	15	12	203
Trawl Net C2	1	1	2				1						5
<b>TOTAL</b>	<b>24</b>	<b>23</b>	<b>28</b>	<b>25</b>	<b>20</b>	<b>16</b>	<b>23</b>	<b>27</b>	<b>26</b>	<b>24</b>	<b>18</b>	<b>25</b>	<b>279</b>

### **2.1.2 Fishing Ground and Catch Composition by Gear Type**

The main gear with highest landing of rays as by-catch at Larut Matang was trawl net with 10,060.2 kg (45.12%) followed by longline at 6,221.1 kg (27.9%) and drift net at 594.8 kg (2.67%). Trawl nets were mostly operated beyond eight nautical miles from the coastline and longlines were operated up to 30 nm. The highest landing of rays by month was 1,569.8 kg in August 2016 from trawl net operated in Zone C followed by 1,440.6 kg in February 2017 (longline) and 1,374.7 kg in July 2017 from trawl net operated in Zone C. The main gear with highest landing of sharks was trawl net at 5,409.2 kg (24.26%) comprising Zone B with 56.7 kg, Zone C (5,229.8 kg) and Zone C2 with 122.7 kg. This followed by drift net at a very small amount (10.7 kg). The highest landing of sharks by month was 670.8 kg in July 2017 from trawl net operated in Zone C followed by November 2016 (617.1 kg) and Jun 2017 (578.9 kg) both from the same type of fishing gear. The details are shown in **Table 4**.

**Table 4: Weight of Sharks and Rays (in kg) Caught by Different Types of Gear at Larut Matang, Perak**

Types of Gear	Year/Month												Grand Total			
	2016						2017									
	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul				
<b>Ray</b>																
Drift Net	102	215	22.3		13.7			60.3	3.5	75.8					102.2	594.8
Longline	627	160.2	91.7	88.6		350	1,440.6	192	1,035.3	453.9	661.3	1,120.5				6,221.1
Trawl Net B	7.7		7.4	13.4	76.1	8.2	2.7	17.5	12.4							145.3
Trawl Net C	1,569.8	901.8	859.6	1,084.3	595.7	441.1	565.1	798.6	428.5	743	373.2	1,374.7				9,735.3
Trawl Net C2	78.5	26.8	50.7				23.6									179.6
<b>Total Ray</b>	<b>2,385.1</b>	<b>1,303.8</b>	<b>1,031.7</b>	<b>1,186.3</b>	<b>685.4</b>	<b>799.3</b>	<b>2,032.0</b>	<b>1,068.3</b>	<b>1,479.7</b>	<b>1,272.7</b>	<b>1,034.5</b>	<b>2,597.4</b>				<b>16,876.1</b>
<b>Shark</b>																
Drift Net										10.7						10.7
Trawl Net B	8.7		2.9	2.2	17.4				25.7							56.7
Trawl Net C	439.4	525.4	522.8	617.1	251.5	465.1	227.8	292.6	315.1	323.3	578.9	670.8				5,229.8
Trawl Net C2	21.8	18.5	77				5.4									122.7
<b>Total Shark</b>	<b>469.8</b>	<b>543.9</b>	<b>602.7</b>	<b>619.3</b>	<b>268.9</b>	<b>465.1</b>	<b>233.2</b>	<b>292.6</b>	<b>340.7</b>	<b>334.1</b>	<b>578.9</b>	<b>670.8</b>				<b>5,419.9</b>
<b>Grand Total</b>	<b>2,854.9</b>	<b>1,847.7</b>	<b>1,634.4</b>	<b>1,805.6</b>	<b>954.3</b>	<b>1,264.5</b>	<b>2,265.1</b>	<b>1,360.9</b>	<b>1,820.4</b>	<b>1,606.8</b>	<b>1,613.4</b>	<b>3,268.2</b>				<b>22,296.0</b>

### 2.1.3 Sharks and Rays Composition

A total of 998,901.7 kg fishes was landed from 279 landings. Rays and sharks made up 16,876.1 kg and 5,419.9 kg (1.9% and 0.6%) from the total landing respectively. Landing of bony fish was 976,605.6 kg with 97.5%. Average landing for rays and sharks were 1,406.3 kg and 451.7 kg respectively. The highest landing of rays by month was 2,597 kg in July 2017 followed by 2,385.1 kg in August 2016 and 2,032 kg in February 2017. Whereas the highest landing of sharks was 670.8 kg in July 2017 followed by 619.3 kg in November 2016 and 602.7 kg in October 2016. In term of weight percentage, the landing of rays and sharks ranged between 0.9 – 4.9% and 0.3 – 1.3% from the total landing respectively. The details are shown in **Table 5**.

**Table 5: Catch Composition of Sharks, Rays and Bony Fish by Month from 279 Landings at Larut Matang, Perak. All weight in kg**

Year	Month	Weight of Rays	% Ray	Weight of Sharks	% Sharks	Weight of Bony Fish	% Bony Fish	Total Catch
2016	Aug	2,385.1	2	469.8	0.4	118,060	97.6	120,914.9
	Sep	1,303.8	1.5	543.9	0.6	87,988.1	97.9	89,835.7
	Oct	1,031.7	0.9	602.7	0.5	113,298.6	98.6	114,933
	Nov	1,186.3	1	619.3	0.5	122,571.4	98.5	124,377
	Dec	685.4	0.9	268.9	0.4	74,653.2	98.7	75,607.4
2017	Jan	799.3	1.3	465.1	0.8	58,553.8	97.9	59,818.3
	Feb	2,032	2.8	233.2	0.3	71,175.4	96.9	73,440.5
	Mar	1,068.3	1.1	292.6	0.3	97,857.7	98.6	99,218.6
	Apr	1,479.7	3.2	340.7	0.7	44,294.7	96.1	46,115.1
	May	1,272.7	1.7	334.1	0.4	74,472.1	97.9	76,078.9
	Jun	1,034.5	1.6	578.9	0.9	63,755.5	97.5	65,368.9
	Jul	2,597.4	4.9	670.8	1.3	49,925.1	93.9	53,193.3
<b>Grand Total</b>		<b>16,876.1</b>		<b>5,419.9</b>		<b>976,605.6</b>		<b>998,901.7</b>
<b>Average</b>		<b>1,406.3</b>	<b>1.9</b>	<b>451.7</b>	<b>0.6</b>	<b>81,383.8</b>	<b>97.5</b>	<b>83,241.8</b>

### 2.1.4 Sample Size

A total of 5,655 individuals consist of 3,565 rays from 16 species and 2,090 sharks from 10 species were sampled. The most common and abundant rays species were *Neotrygon orientalis*, *Maculabatis gerrardi* and *Brevitrygon heterura*. Other common ray species were *Rhynchobatus australiae* and *Telatrygon biasa*. All these species were landed throughout the year. Other ray species such as *Himantura uarnak*, *Mobula japonica*, *Narcine maculata*, *Pateobatis fai* and *Rhina ancylostoma* were only landed one time during study period. The highest number of rays sampled by month was 380 individuals in September, followed by 375 individuals in October and 370 individuals in November 2016.

The most common and abundant species of sharks were *Chiloscyllium hasseltii*, *Chiloscyllium punctatum* and *Atelomycterus marmoratus*. Other common shark species were *Carcharhinus sorrah* and *Atelomycterus cf erdmanni*. These species were landed between 10 – 12 months. Other shark species such as *Chiloscyllium indicum*, *Carcharhinus leucas*, *Sphyrna lewini*, *Carcharhinus brevipinna* and *Galeocerdo cuvier* were only landed between 1 – 6 months. The highest number of sharks sampled by month was 272 individuals in October, followed by 223 individuals in August and 220 individuals in September 2016. The details are shown in **Table 6**.

**Table 6: Sample Size of Sharks and Rays by Species at Larut Matang, Perak**

Species	Year/Month												Total
	2016						2017						
	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	
<i>Brevitrygon heterura</i>	68	89	87	80	63	50	63	74	50	53	54	32	763
<i>Hemitrygon akajei</i>		2	2	2	3	1		9	8	11		16	54
<i>Himantura uarnak</i>										1			1
<i>Himantura undulata</i>									1	3			4
<i>Maculabatis gerrardi</i>	105	89	73	75	59	47	80	81	45	69	63	83	869
<i>Maculabatis pastinacoides</i>	13	9	12	8	3			4	29	18	3	17	116
<i>Mobula japonica</i>						1							1
<i>Narcine maculata</i>								1					1
<i>Narcine prodorsalis</i>				1									1
<i>Neotrygon orientalis</i>	99	111	120	118	79	53	79	99	70	82	51	42	1,003
<i>Pastinachus stellurostris</i>									1				1
<i>Pateobatis fai</i>			1										1
<i>Pateobatis jenkinsii</i>		1	1				1					1	4
<i>Rhina ancylostoma</i>										1			1
<i>Rhynchobatus australiae</i>	13	3	1	12	5	2	8	12	5	15	8	6	90
<i>Telatrygon biasa</i>	57	76	78	74	53	49	52	55	34	54	38	35	655
<b>Total Rays</b>	<b>355</b>	<b>380</b>	<b>375</b>	<b>370</b>	<b>265</b>	<b>203</b>	<b>283</b>	<b>335</b>	<b>243</b>	<b>307</b>	<b>217</b>	<b>232</b>	<b>3,565</b>
<i>Atelomycterus cf erdmanni</i>	13	13	7	10	8	2	4	1	2			1	61
<i>Atelomycterus marmoratus</i>	32	25	32	24	18	10	15	33	8	29	10	10	246
<i>Carcharhinus brevipinna</i>	1				2	1	2						6
<i>Carcharhinus leucas</i>	1					1				3	1	3	9
<i>Carcharhinus sorrah</i>	10	4	7	8	2		2	34	70	26	25	15	203
<i>Chiloscyllium hasseltii</i>	83	96	110	93	67	58	71	67	30	69	68	37	849
<i>Chiloscyllium indicum</i>			5	3					6	4	2	1	21
<i>Chiloscyllium punctatum</i>	81	82	111	81	55	32	36	54	33	45	46	30	686
<i>Galeocerdo cuvier</i>	2												2
<i>Sphyrna lewini</i>								1			4	2	7
<b>Total Sharks</b>	<b>223</b>	<b>220</b>	<b>272</b>	<b>219</b>	<b>152</b>	<b>104</b>	<b>130</b>	<b>190</b>	<b>149</b>	<b>176</b>	<b>156</b>	<b>99</b>	<b>2,090</b>
<b>Grand Total</b>	<b>578</b>	<b>600</b>	<b>647</b>	<b>589</b>	<b>417</b>	<b>307</b>	<b>413</b>	<b>525</b>	<b>392</b>	<b>483</b>	<b>373</b>	<b>331</b>	<b>5,655</b>

### 2.1.5 Weight of Sharks and Rays by Species

A total of 22,296 kg was landed from 279 landings comprising 16,876.1 kg of rays and 5,419.9 kg of sharks. The highest weight for rays landing was *Maculabatis gerrardi* with 8,610.6 kg followed by *Neotrygon orientalis* (3,948.5 kg) and *Maculabatis pastinacoides* with 2,073 kg. The highest landing by month for *Maculabatis gerrardi* was 1,727.2 kg in February 2017 followed by 1,687.3 kg in July 2017 and 1,297.9 kg in August 2016. The highest landing for *Neotrygon orientalis* was 558.8 kg in November 2016 followed by 512.9 kg in August 2016 and 443.1 kg in September 2016. For *Maculabatis pastinacoides*, the highest landing was 701.8 kg in April 2017 followed by 432 kg in August 2016 and 296.3 kg in July 2017. Other species with higher landings were *Brevitrygon heterura* with 724.7 kg, *Telatrygon biasa* (457.9 kg), *Hemitrygon akajei* (376.8 kg), *Rhynchobatus australiae* (242.4 kg), *Pateobatis fai* (136 kg) and *Himantura undulata* with 124.2 kg. Landing of other species were below 100 kg.

The highest landing for shark species was 2,021.2 kg for *Chiloscyllium hasseltii* followed by 1,497.7 kg for *Chiloscyllium punctatum*, 981.8 kg for *Carcharhinus leucas*, 635.4 kg for *Carcharhinus sorrah* and 186.7 kg for *Atelomyxerus marmoratus*. The highest landing by month for *Chiloscyllium hasseltii* was 253.3 kg in November 2016 followed by 351 kg in October 2016 and 285.7 kg in September 2016. For *Chiloscyllium punctatum*, the highest landing was 269.7 kg in October 2016 followed by 240 kg in September 2016 and 208 kg in November 2016. Landing of other shark species were below 100 kg. The details are shown in **Table 7**.



**Table 7: Weight of Sharks and Rays (in kg) by Species from 279 Landings at Larut Matang**

Species	Year/Month												Total
	2016						2017						
	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	
<i>Brevitrygon heterura</i>	85	91.6	67.8	73.9	57.2	51.2	41	79.6	59.3	64.2	34.3	19.6	724.7
<i>Hemitrygon akajei</i>		4.6	7.1	10.6	11.2	8.2		43.1	106.1	69.2		116.7	376.8
<i>Himantura uarnak</i>										35.5			35.5
<i>Himantura undulata</i>									43	81.2			124.2
<i>Maculabatis gerrardi</i>	1,297.9	555.6	236.9	351.6	301.8	477.1	1,727.2	543.2	273.9	396.9	761.3	1,687.3	8,610.6
<i>Maculabatis pastinacoides</i>	432	126.5	86.2	88.6	8.9			34.7	701.8	247.8	50.3	296.3	2,073
<i>Mobula japonica</i>						79							79
<i>Narcine maculata</i>								0.7					0.7
<i>Narcine prodorsalis</i>				0.2									0.2
<i>Neotrygon orientalis</i>	512.9	443.1	446	558.8	258.9	150.1	219.6	288	246.6	256.6	138.8	429.2	3,948.5
<i>Pastinachus stellurostris</i>									12.2				12.2
<i>Pateobatis fai</i>			136										136
<i>Pateobatis jenkinsii</i>		14.2	2.4				4.5					16.7	37.8
<i>Rhina ancylostoma</i>										16.7			16.7
<i>Rhynchobatus australiae</i>	20.5	13.9	0.5	42.3	11.9	3.7	10	45.1	8.3	58.2	20.9	7.3	242.4
<i>Telatrygon biasa</i>	36.8	54.3	48.9	60.3	35.5	30	29.6	34.1	28.4	46.6	29	24.4	457.9
<b>Total Weight Rays</b>	<b>2,385.1</b>	<b>1,303.8</b>	<b>1,031.7</b>	<b>1,186.3</b>	<b>685.4</b>	<b>799.3</b>	<b>2,032.0</b>	<b>1,068.3</b>	<b>1,479.7</b>	<b>1,272.7</b>	<b>1,034.5</b>	<b>2,597.4</b>	<b>16,876.1</b>
<i>Atelomycterus cf erdmanni</i>	8.2	8.7	4	5.9	3.7	1	1.7	0.4	0.9			0.6	34.9
<i>Atelomycterus marmoratus</i>	28.8	28.9	17	20.4	9.7	5.5	13.6	17.7	7.4	20.9	7.5	9.2	186.7
<i>Carcharhinus brevipinna</i>	1.9				4.5	3.2	6.3						15.9
<i>Carcharhinus leucas</i>	8.7					210				10.7	262	490.4	981.8
<i>Carcharhinus sorrah</i>	45.9	13	23.4	31.8	8.2		11.3	43.8	243.9	82.9	73.5	57.7	635.4

Species	Year/Month												Total
	2016						2017						
	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	
<i>Chiloscyllium hasseltii</i>	171.8	253.3	285.7	351	121.4	173.7	145.6	136	40.6	143.3	147.7	51.1	2,021.2
<i>Chiloscyllium indicum</i>			2.9	2.2					7.7	2	1	0.6	16.4
<i>Chiloscyllium punctatum</i>	179.1	240	269.7	208	121.4	71.7	54.7	94	40.2	74.2	84.9	59.8	1,497.7
<i>Galeocerdo cuvier</i>	25.5												25.5
<i>Sphyrna lewini</i>								0.6			2.2	1.6	4.4
<b>Total Weight Sharks</b>	<b>469.8</b>	<b>543.9</b>	<b>602.7</b>	<b>619.3</b>	<b>268.9</b>	<b>465.1</b>	<b>233.2</b>	<b>292.6</b>	<b>340.7</b>	<b>334.1</b>	<b>578.9</b>	<b>670.8</b>	<b>5,419.9</b>
<b>Grand Total</b>	<b>2,854.9</b>	<b>1,847.7</b>	<b>1,634.4</b>	<b>1,805.6</b>	<b>954.3</b>	<b>1,264.5</b>	<b>2,265.1</b>	<b>1,360.9</b>	<b>1,820.4</b>	<b>1,606.8</b>	<b>1,613.4</b>	<b>3,268.2</b>	<b>22,296</b>

### 2.1.6 Size Range of Sharks and Rays

In general, both mature and immature rays species were sampled from August 2016 to July 2017. Samples for ray species *Brevitrygon heterura*, *Telatrygon biasa* and *Pateobatis fai* landed from August 2016 to January 2017 were all matured. However, samples for ray species *Maculabatis gerrardi*, *Neotrygon orientalis*, *Rhynchobatus australiae*, *Pateobatis jenkinsii* and *Narcine prodorsalis* were all immatured. Ray species of *Maculabatis pastinacoides* and *Hemitrygon akajei* were all matured except for samples landed on September, October and December 2016. Size range of rays by species from August 2016 to January 2017 are shown in **Table 8A (i)**. Samples for ray species *Maculabatis gerrardi*, *Mobula japonica* and *Neotrygon orientalis* landed from February to July 2017 were all immature and all samples for *Rhynchobatus australiae* were juveniles. Whilst, samples other rays species were matured except for *Pateobatis jenkinsii*, samples landed on February 2017 were immatured. Size and range of rays by species from February to July 2017 are shown in **Table 8A (ii)**.

Shark species of *Atelomycterus marmoratus*, *Chiloscyllium hasseltii*, *Chiloscyllium indicum* and *Chiloscyllium punctatum* sampled from August 2016 to January 2017 were all matured. However, other shark species which were *Atelomycterus cf erdmanni*, *Carcharhinus brevipinna*, *Carcharhinus leucas*, *Carcharhinus sorrah* and *Galeocerdo cuvier* were either immatured or juveniles. Size range of sharks by species from August 2016 to January 2017 are shown in **Table 8B (i)**. All samples of shark species landed from February to July 2017 were matured except for *Atelomycterus cf erdmanni*, *Carcharhinus brevipinna*, *Carcharhinus sorrah* and *Sphyrna lewini*. Size range of sharks by species from February to July 2017 are shown in **Table 8B (ii)**.

**Table 8A (i): Size Range of Rays (Disc Length) Except for *Rhynchobatus australiae*, *Rhina ancylostoma* and *Narcine* spp. (Total Length) from August 2016 to January 2017. All measurements in cm**

Species	Year/Month																	
	2016									2017								
	Aug			Sep			Oct			Nov			Dec			Jan		
Ray	Min	Max	Av	Min	Max	Av	Min	Max	Av	Min	Max	Av	Min	Max	Av	Min	Max	Av
<i>Brevitrygon heterura</i>	16	25	20.7	16	24	20.9	14	24	19.9	16	24	20.5	15	24	21	16	24	20.9
<i>Hemitrygon akajei</i>				32	41	36.5	34	45	39.5	41	51	46	38	47	42	58	58	58
<i>Himantura uarnak</i>																		
<i>Himantura undulata</i>																		
<i>Maculabatis gerrardi</i>	16	90	48.9	18	92	38.3	18	78	34	19	86	35	17	68	36.6	18	92	37.6
<i>Maculabatis pastinacoides</i>	47	84	68.5	52	79	66.9	41	69	54.6	45	74	54.5	38	41	39.7			
<i>Mobula japanica</i>																119	119	119
<i>Narcine maculata</i>																		
<i>Narcine prodorsalis</i>										27.5	27.5	27.5						
<i>Neotrygon orientalis</i>	15	31	22.8	15	32	22.7	13.5	31	22.5	15	33	23.1	14.5	31	21.9	17	28	21.4
<i>Pastinachus stellurostris</i>																		
<i>Pateobatis fai</i>							145	145	145									
<i>Pateobatis jenkinsii</i>				66	66	66	37	37	37									
<i>Rhina ancylostoma</i>																		
<i>Rhynchobatus australiae</i>	45.5	101	62.2	54	185	97.7	47	47	47	47	117	73.1	58	96	75.6	56	84	70
<i>Telatrygon biasa</i>	15.5	31	24	18	30	23.6	18	32	24	17.5	33	24	17	30	24.7	16	31	24

**Table 8A (ii): Size Range of Rays (Disc Length) Except for *Rhynchobatus australiae*, *Rhina ancylostoma* and *Narcine* spp. (Total Length) from February to July 2017. All measurements in cm**

Species	Year/Month																	
	2017																	
	Feb			Mac			Apr			May			Jun			Jul		
Ray	Min	Max	Av	Min	Max	Av	Min	Max	Av	Min	Max	Av	Min	Max	Av	Min	Max	Av
<i>Brevitrygon heterura</i>	16	24	20.6	16	25	20.8	16	24.5	20.3	15	26.5	21	16	24	20.6	18	27	21.1
<i>Hemitrygon akajei</i>				36	51	44.7	43	62	51.4	47	58	51.4				31	62	50.8
<i>Himantura uarnak</i>										96	96	96						
<i>Himantura undulata</i>							96	96	96	62	108	87.3						
<i>Maculabatis gerrardi</i>	14	100	50.7	18	78	41.8	18.0	95	39.4	17	83	42.4	20	98	46.4	19	98	54
<i>Maculabatis pastinacoides</i>				34	77	54	56	94	67.7	44	92	63.3	63	84	73	43	89	68.8
<i>Mobula japonica</i>																		
<i>Narcine maculata</i>				39	39	39												
<i>Narcine prodorsalis</i>																		
<i>Neotrygon orientalis</i>	14.5	30	22	15	30	22	15	34	22.4	16	34	22.9	18	34	23.3	15	32	23.1
<i>Pastinachus stellurostris</i>							63	63	63									
<i>Pateobatis fai</i>																		
<i>Pateobatis jenkinsii</i>	46	46	46													71	71	71
<i>Rhina ancylostoma</i>										125	125	125						
<i>Rhynchobatus australiae</i>	45	89	58.6	51	133	80.3	49	96	66.8	49	145	84.3	49	116	74.8	45	78	61.5
<i>Telatrygon biasa</i>	17	32	23.2	15	30	23.9	17	32	24.2	19	32	25	19	37	24.7	18	32	23.4

**Table 8B (i): Size Range of Sharks (Total Length) from August 2016 to January 2017. All measurements in cm**

Species	Year/Month												
	2016						2017						
	Aug		Sep		Oct		Nov		Dec		Jan		
Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Av	
<i>Atelomycterus cf erdmanni</i>	42	53	47	53	45	56	51.1	46	55	51.3	43	53	48.9
<i>Atelomycterus marmoratus</i>	43	63	41	56	38	54	49.6	39	53	49.1	43	53	49.2
<i>Carcharhinus brevipinna</i>	74	74									75	78	76.5
<i>Carcharhinus leucas</i>	102	102											
<i>Carcharhinus sorrah</i>	62	118	83	90	81	89	86.6	81	100	91.3	78	97	87.5
<i>Chiloscyllium hasseltii</i>	43.5	83	49	85	45	87	65	51	80	64.5	35	89	63.9
<i>Chiloscyllium indicum</i>					48	53	50.2	49	55	52.7			
<i>Chiloscyllium punctatum</i>	37	95	45	91	47	94	73.5	55	91	75	48	100	71.5
<i>Galeocerdo cuvier</i>	134	139											
<i>Sphyrna lewini</i>													

**Table 8B (ii): Size Range of Sharks (Total Length) from February to July 2017. All measurements in cm**

Species	Year/Month																	
	2017																	
	Feb			Mar			Apr			May			Jun			Jul		
Shark	Min	Max	Av	Min	Max	Av	Min	Max	Av	Min	Max	Av	Min	Max	Av	Min	Max	Av
<i>Atelomycterus cf erdmanni</i>	50	53	51.3	51	51	51	49	53	53	51						55	55	55
<i>Atelomycterus marmoratus</i>	45	55	50.1	41	57	50.2	47	53	50.3	42	56	50.4	47	56	52.1	44	54	50.8
<i>Carcharhinus brevipinna</i>	80	88	84															
<i>Carcharhinus leucas</i>										75	84	78.7	302	302	302	208	275	245.7
<i>Carcharhinus sorrah</i>	51	124	87.5	49	100	57.4	48	67	58.5	48	74	62	47	109	66.6	64	135	84.7
<i>Chiloscyllium hasseltii</i>	41	82	63.7	45	79	64.5	46	83	62.8	43	81	64.4	47	84	63.6	43	76	61.5
<i>Chiloscyllium indicum</i>							49	54	51.7	39	61	48.8	55	57	56	56	56	56
<i>Chiloscyllium punctatum</i>	41	94	66.8	42	87	68	42	96	62.7	35	91	65.5	36	92	73.7	47	90	71.9
<i>Galeocerdo cuvier</i>																		
<i>Sphyrna lewini</i>				51	51	51							47.5	55	50.5	53	55	54.0



## 2.1.7 Usage and Marketing

Information on marketing at this landing site indicated that most sharks and rays meat were consumed locally except for one ray species, *Maculabatis gerrardi* was exported to Singapore. The major markets were in Perak, Johor, Penang and Kuala Lumpur. The price (RM/kg) varied according to species, size and season. The most expensive ray species was *Maculabatis gerrardi* sold at RM5 – RM20/kg followed by *Pateobatis jenkinsii* (RM6 – RM20/kg), *Neotrygon orientalis* (RM3 – RM18/kg), *Himantura uarnak* (RM10 – RM15/kg), *Himantura undulata* (RM10 – RM15/kg) and *Maculabatis pastinacoides* sold at RM12 – RM15/kg. The cheapest rays species were *Narcine maculata* and *Narcine prodorsalis* sold at RM0.6 – RM0.7/kg to fishmeal processing plant. Almost all rays were sold as a whole body. In general, bigger sized rays were more expensive than the smaller ones.

The most expensive sharks *Carcharhinus leucas* was sold at RM10 – RM35/kg followed by *Carcharhinus sorrah* sold at RM10 – RM13/kg and *Carcharhinus brevipinna* sold at RM5 – RM13/kg. Market destinations for sharks and rays were similar. Some species such as *Chiloscyllium hasseltii* and *Chiloscyllium punctatum* were marketed to Penang where they are mainly used in traditional Indian cuisine. Some sharks species were marketed to QL Industry for surimi production. During marketing process, all sharks were sold as a whole.

Normally the price at wet market was about 20 – 50% higher than at landing site. The price was almost consistent for the whole year for all species but some ray species such as *Maculabatis gerarrdi*, *Brevitrygon heterura*, *Neotrygon orientalis*, *Telatrygon biasa*, *Hemitrygon akajei* and *Rhynchobatus australiae* and shark species such as *Carcharhinus leucas* and *Carcharhinus sorrah* can fluctuate up to 50% especially when supply was limited and during festive seasons such as Chinese New Year and Hari Raya. The details are shown in **Table 9**.

**Table 9: Price of Sharks and Rays by Species and Market Destinations at Larut Matang, Perak. All Prices in RM per Kilogram**

Species	Range Price RM/kg	Part	Market Destinations
<b>Ray</b>			
<i>Brevitrygon heterura</i>	5 – 12	Whole body	Local Market, Bukit Mertajam, Pantai Remis, Seri Manjung, Butterworth, Ipoh, Sitiawan, Taiping, Kuala Lumpur, Lumut, Beruas.
<i>Hemitrygon akajei</i>	4 – 12	Whole body	Local Market, Seri Manjung, Butterworth, Sitiawan, Taiping.
<i>Himantura uarnak</i>	10 – 15	Whole body	Bukit Mertajam
<i>Himantura undulata</i>	10 – 15	Whole body	Local Market, Taiping
<i>Maculabatis gerrardi</i>	5 – 20	Whole body	Local Market, Bukit Mertajam, Pantai Remis, Seri Manjung, Butterworth, Ipoh, Sitiawan, Taiping, Kuala Lumpur, Lumut, Singapore, Johor Baharu, Sungai Siput, Cameron Hightland, Kuala kangsar, Trash.

<i>Maculabatis pastinacoides</i>	12 – 15	Whole body	Local Market, Bukit Mertajam, Seri Manjung, Ipoh, Sitiawan, Taiping, Kuala Kangsar, Cameron Hightland
<i>Mobula japanica</i>	3 – 5	Whole body	Seri Manjung
<i>Narcine maculata</i>	0.6	Whole body	Trash
<i>Narcine prodorsalis</i>	0.7	Whole body	Fish meal factory
<i>Neotrygon orientalis</i>	3 – 18	Whole body	Local Market, Bukit Mertajam, Pantai Remis, Seri Manjung, Butterworth, Ipoh, Sitiawan, Taiping, Kuala Lumpur, Johor Baharu, Sungai Siput, Pulau Pinang.
<i>Pastinachus stellurostris</i>	8 – 12	Whole body	Local Market
<i>Pateobatis fai</i>	5 – 10	Whole body	Ipoh
<i>Pateobatis jenkinsii</i>	6 – 20	Whole body	Bukit Mertajam, Seri Manjung.
<i>Rhina ancylostoma</i>	10 – 12	Whole body	Bukit Mertajam
<i>Rhynchobatus australiae</i>	10 – 15	Whole body	Local Market, Bukit Mertajam, Pantai Remis, Seri Manjung, Butterworth, Ipoh, Sitiawan, Taiping, Kuala Lumpur.
<i>Telatrygon biasa</i>	2 – 5	Whole body	Local Market, Bukit Mertajam, Pantai Remis, Seri Manjung, Butterworth, Ipoh, Sitiawan, Taiping, Kuala Lumpur, Lumut, Beruas.
<b>Shark</b>			
<i>Atelomycterus cf erdmanni</i>	5 – 11	Whole body	Local Market, Bukit Mertajam, QL Surimi Factory, Butterworth.
<i>Atelomycterus marmoratus</i>	5 – 11	Whole body	Bukit Mertajam, QL Industry, Butterworth, Taiping.
<i>Carcharhinus brevipinna</i>	5 – 13	Whole body	Bukit Mertajam, Pantai Remis, Seri Manjung, Ipoh, Taiping.
<i>Carcharhinus leucas</i>	10 – 35	Whole body	Local Market, Bukit Mertajam, Butterworth, Taiping.
<i>Carcharhinus sorrah</i>	10 – 13	Whole body	Local Market, Bukit Mertajam, Pantai Remis, Seri Manjung, Butterworth, Ipoh, Sitiawan, Taiping, Kuala Lumpur, QL Industry, Beruas.
<i>Chiloscyllium hasseltii</i>	3 – 5	Whole body	Local Market, Bukit Mertajam, Pantai Remis, Seri Manjung, Butterworth, Ipoh, Sitiawan, Taiping, Kuala Lumpur, QL Industry, Beruas, Pulau Pinang.
<i>Chiloscyllium indicum</i>	2 – 4	Whole body	Local Market, Bukit Mertajam, Butterworth, QL Industry, Sitiawan.
<i>Chiloscyllium punctatum</i>	3 – 5	Whole body	Local Market, Bukit Mertajam, Pantai Remis, Seri Manjung, Butterworth, Ipoh, Sitiawan, Taiping, Kuala Lumpur, Pulau Pinang.
<i>Galeocerdo cuvier</i>	10 – 12	Whole body	Pantai Remis, Sitiawan.
<i>Sphyrna lewini</i>	8 – 12	Whole body	Local Market

### 2.1.8 Fishing Effort and CPUE (Catch per Unit Effort)

Monthly fishing efforts (days at operation and total number of operation during the cruises) of the sampled vessels are summarized in **Table 10** and **Table 11**.

**Table 10: Days at Operation by Gears Sampled During the Study Period at Larut Matang**

Type of Gear	Year/Month												Total
	2016						2017						
	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mac	Apr	May	Jun	Jul	
Drift Net	10.5	8	2		4			12	0.5	7.5		7.5	52
Longline	13	16.5	16.5	4		3	12	4	22	32.5	11.5	32.5	167.5
Trawl Net B	40		7	6	175	0.5	18	2.5	41.5				290.5
Trawl Net C	3,036	3,355	3,315	3,361	2,208	1,821	2,070	2,988	1,871	2,594	2,100	1,566	30,285
Trawl Net C2	210	168	330				168						876

**Table 11: Total Number of Operation by Gears Sampled During the Study Period at Larut Matang**

Type of Gear	Year/Month												Total
	2016						2017						
	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mac	Apr	May	Jun	Jul	
Drift Net	10.5	8	2		4			12	0.5	7.5		7.5	52
Longline	13	16.5	16.5	4		3	12	4	22	32.5	11.5	32.5	167.5
Trawl Net B	40		7	6	175	0.5	18	2.5	41.5				290.5
Trawl Net C	3,036	3,355	3,315	3,361	2,208	1,821	2,070	2,988	1,871	2,594	2,100	1,566	30,285
Trawl Net C2	210	168	330				168						876

**Table 12** shows the top 10 catch per unit effort (CPUE) rays species captured by trawl net Zone C for Larut Matang. *Maculabatis gerrardi* topped the list with 0.14 kg/day or 0.05 kg/haul followed by *Neotrygon orientalis* with 0.13 kg/day or 0.04 kg/haul and *Brevitrygon heterura* with 0.02 kg/day or 0.01 kg/haul.

The top three CPUE for sharks were *Chiloscyllium hasseltii* with 0.06 kg/day or 0.02 kg/haul followed by *Chiloscyllium punctatum* with 0.05 kg/day or 0.02 kg/haul and *Carcharhinus leucas* with 0.03 kg/day or 0.01 kg/haul. The top 10 CPUE of rays and sharks by species captured by trawl net Zone C are shown in **Table 12** and **Table 13**.

**Table 12: Top 10 CPUE Rays Species Captured by Trawl Net C During Study Period at Larut Matang, Perak (kg/Fishing Effort)**

Number	Scientific Name	Total Weight (kg) by Species	CPUE (kg/day)	CPUE (kg/haul)
1	<i>Maculabatis gerrardi</i>	4,239.1	0.14	0.05
2	<i>Neotrygon orientalis</i>	3,818.1	0.13	0.04
3	<i>Brevitrygon heterura</i>	694.3	0.02	0.01
4	<i>Telatrygon biasa</i>	437.3	0.01	0.00
5	<i>Rhynchobatus australiae</i>	239	0.01	0.00
6	<i>Pateobatis fai</i>	136	0.004	0.001
7	<i>Mobula japanica</i>	79	0.003	0.001
8	<i>Pateobatis jenkinsii</i>	37.8	0.001	0.0004
9	<i>Himantura uarnak</i>	35.5	0.001	0.0004
10	<i>Rhina ancylostoma</i>	16.7	0.001	0.0002

**Table 13: Top 10 CPUE Sharks Species Captured by Trawl Net C During Study Period at Larut Matang, Perak (kg/Fishing Effort)**

Number	Scientific Name	Total Weight (kg) by Species	CPUE (kg/day)	CPUE (kg/haul)
1	<i>Chiloscyllium hasseltii</i>	1,931	0.06	0.02
2	<i>Chiloscyllium punctatum</i>	1,459.5	0.05	0.02
3	<i>Carcharhinus leucas</i>	962.4	0.03	0.01
4	<i>Carcharhinus sorrah</i>	606.5	0.02	0.01
5	<i>Atelomycterus marmoratus</i>	179.5	0.01	0.002
6	<i>Atelomycterus cf erdmanni</i>	33.7	0.001	0.0004
7	<i>Galeocerdo cuvier</i>	25.5	0.001	0.0003
8	<i>Carcharhinus brevipinna</i>	15.9	0.001	0.0002
9	<i>Chiloscyllium indicum</i>	11.4	0.0004	0.0001
10	<i>Sphyrna lewini</i>	4.4	0.0001	0.00005

## 2.2 Kota Kinabalu

### 2.2.1 Landing Samples

A total of 330 landings were recorded from trawl net operated in Zone 2, Zone 3 and Zone 4 during the study period. The highest landing by month was 33 in February 2017 followed by 32 in January 2017. The highest landing was from trawl net operated in Zone 3 with 171 landings followed by Zone 4 (148) and Zone 2 with 11 landings. The details are shown in **Table 14**.

**Table 14: Number of Landings by Gear Sampled During Study at Kota Kinabalu (SAFMA Jetty)**

Types of Gear	Year/Month												Grand Total
	2016					2017							
	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	
Trawl Net Zone 2	3					2	3	1		1		1	11
Trawl Net Zone 3	7	11	19	17	12	14	15	17	16	10	15	18	171
Trawl Net Zone 4	14	13	7	8	14	16	15	12	11	17	12	9	148
<b>TOTAL</b>	24	24	26	25	26	32	33	30	27	28	27	28	330

### 2.2.2 Fishing Ground and Catch Composition by Gear Type

A total weight of rays and sharks was 17,103.9 kg comprising 10,501.5 kg of rays and 6,602.5 kg of sharks. All trawlers operated beyond three nm (nautical miles) from coastline, and mainly between 12 – 30 nm from the coastline. The highest weight of rays was recorded from trawl net operated in Zone 3 with 5,159.5 kg followed by Zone 4 (4,958.5 kg) and Zone 2 at 383.5 kg. The highest weight of rays by month was in 1,029.4 kg in July 2017 from trawl net operated in Zone 4 followed by May 2017 with 714.2 kg (Zone 4) and July 2017 with 672.7 kg trawl net operated in Zone 3. As for sharks, trawl net operated in Zone 3 recorded the highest weight with 3,414.6 kg followed by Zone 4 (3,023.7 kg) and Zone 2 at 164.2 kg. The highest landing of sharks by month was 524.1 kg in May 2017 (Zone 4) followed by July 2017 with 397.1 kg (Zone 3) and April 2017 with 389.1 kg (Zone 3). The details are shown in **Table 15**.

**Table 15: Weight of Sharks and Rays (in kg) Caught by Different Types of Gear at Kota Kinabalu (SAFMA Jetty)**

Types of Gear	Year/Month												Grand Total				
	2016						2017										
	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul					
<b>Ray</b>																	
Trawl Net Zone 2	215.7						113.6	4				27.9				22.3	383.5
Trawl Net Zone 3	143.9	292.4	409.7	595.2	558.5	451.5	307.3	331.9	601.4	336.9	458.5	672.7					5,159.5
Trawl Net Zone 4	363.3	274.7	218.5	285.1	518.3	258.9	342.2	217.2	296.7	714.2	440.1	1,029.4					4,958.5
<b>Total Ray</b>	<b>722.8</b>	<b>567</b>	<b>628.2</b>	<b>880.3</b>	<b>1,076.8</b>	<b>710.3</b>	<b>763.1</b>	<b>553.1</b>	<b>898.1</b>	<b>1,079</b>	<b>898.6</b>	<b>1,724.4</b>					<b>10,501.5</b>
<b>Shark</b>																	
Trawl Net Zone 2	20.3					96	22	7.1								18.8	164.2
Trawl Net Zone 3	137.6	152.6	296.2	162.7	271	358.9	315.5	357.6	389.1	226.5	350.1	397.1					3,414.6
Trawl Net Zone 4	233.1	138.8	129.1	115.6	155.7	310.5	307.5	302.2	233.7	524.1	333.9	239.7					3,023.7
<b>Total Shark</b>	<b>391</b>	<b>291.4</b>	<b>425.2</b>	<b>278.3</b>	<b>426.6</b>	<b>765.3</b>	<b>644.9</b>	<b>666.9</b>	<b>622.8</b>	<b>750.6</b>	<b>684</b>	<b>655.6</b>					<b>6,602.5</b>
<b>Grand Total</b>	<b>1,113.8</b>	<b>858.4</b>	<b>1,053.4</b>	<b>1,158.6</b>	<b>1,503.4</b>	<b>1,475.6</b>	<b>1,408</b>	<b>1,219.9</b>	<b>1,520.9</b>	<b>1,829.6</b>	<b>1,582.6</b>	<b>2,380</b>					<b>17,103.9</b>

### 2.2.3 Sharks and Rays Composition

A total of 2,011,606.9 kg of fish was landed from 330 landings during the study period. Rays and sharks made up of 10,501.5 kg and 6,602.5 kg (0.5% and 0.3%) from the total landing respectively. Landing of bony fish was 1,994,503 kg with 99.1%. Average landing for rays and sharks were 1,615.6 kg and 1,015.8 kg respectively. The highest landing of rays by month was 1,724.4 kg in July 2017 followed by 1,079 kg in May 2017 and 1,076.8 kg in December 2016. Whilst the highest landing of sharks was 765.3 kg in January 2017 followed by 750.6 kg in May 2017 and 684 kg in Jun 2017. In general, the landing of rays and sharks ranged between 0.3 – 1.2% and 0.2 – 0.5% from the total landing respectively. The details are shown in Table 16.

**Table 16: Catch Composition of Sharks, Rays and Bony Fish by Month from 330 Landings at Kota Kinabalu (SAFMA Jetty). All weight in kg**

Year	Month	Weight of Ray	% Rays	Weight of Shark	% Shark	Weight of Bony Fish	% Bony Fish	Total Catch
2016	Aug	722.8	0.4	391	0.2	167,378	99.3	168,491.75
	Sep	567	0.4	291.4	0.2	154,902	99.4	155,760.35
	Oct	628.2	0.4	425.2	0.3	148,643	99.3	149,696.4
	Nov	880.3	0.6	278.3	0.2	151,871	99.2	153,029.55
	Dec	1,076.8	0.6	426.6	0.2	172,124	99.1	173,627.35
2017	Jan	710.3	0.3	765.3	0.4	209,712	99.3	211,187.6
	Feb	763.1	0.4	644.9	0.3	210,554	99.3	211,961.95
	Mar	553.1	0.3	666.9	0.4	157,442	99.2	158,661.9
	Apr	898.1	0.6	622.8	0.4	142,941	98.9	144,461.9
	May	1,079	0.7	750.6	0.5	157,895	98.9	159,724.55
	Jun	898.6	0.5	684	0.4	175,589	99.1	177,171.6
	Jul	1,724.4	1.2	655.6	0.4	145,452	98.4	147,832
<b>Grand Total</b>		<b>10,501.5</b>		<b>6,602.5</b>		<b>1,994,503</b>		<b>2,011,606.9</b>
<b>Average</b>		<b>1,615.6</b>	<b>0.5</b>	<b>1,015.8</b>	<b>0.3</b>	<b>306,846.6</b>	<b>99.1</b>	<b>309,478</b>

### 2.2.4 Sample Size

A total of 6,654 individuals consist of 3,688 rays and 2,955 sharks were sampled. There were 27 species of rays and 23 species of sharks recorded during the study period. The most common and abundant ray species were *Neotrygon orientalis*, *Maculabatis gerrardi*, *Telatrygon biasa* and *Pastinachus gracilicaudus*. All these species were landed throughout the year. Other common ray species were *Rhinobatos cf jimbarensis*, *Dasyatis parvonigra*, *Gymnura japonica* and *Rhynchobatus australiae*. Other ray species such as *Aetomylaeus vespertilio*, *Brevitrygon imbricata*, *Dasyatis cf thetidis*, *Bathytoshia lata*, *Pastinachus stellurostris*, *Rhinoptera jayakari* and *Urolophus expansus* were only landed one time during study period. The highest number of rays sampled by month was 423 individuals in July 2017, followed by 396 individuals in June and 388 individuals in May 2017.

The most common and abundant species of sharks were *Chiloscyllium punctatum*, *Chiloscyllium plagiosum*, *Atelomycterus marmoratus*, *Carcharhinus sorrah* and *Sphyrna lewini*. These species landed throughout the year during study period. Other common shark species were *Carcharhinus melanopterus*, *Hemigaleus microstoma*, *Hemipristis elongata* and *Loxodon macrorhinus*. These species were landed between 7 – 9 months. Other shark species



such as *Carcharhinus plumbeus*, *Chaenogaleus macrostoma*, *Mustelus mosis*, *Mustelus widodoi*, *Orectolobus leptolineatus* and *Rhizoprionodon acutus* were only landed one time during study period. The highest number of sharks sampled by month was 354 individuals in May, followed by 348 individuals in January and 334 individuals in June 2017. The details are shown in **Table 17**.

**Table 17: Sample Size of Sharks and Rays by Species at Kota Kinabalu (SAFMA Jetty)**

Species	Year/Month												Total
	2016					2017							
	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	
<i>Aetobatus ocellatus</i>	2	2			5	1	3	2		2		1	18
<i>Aetomylaeus nichofii</i>						2			1				3
<i>Aetomylaeus vespertilio</i>						1							1
<i>Brevitrygon heterura</i>	8			2	3	2	7	2	11	13	10	17	75
<i>Brevitrygon imbricata</i>						2							2
<i>Dasyatis cf thetidis</i>	1												1
<i>Dasyatis parvonigra</i>	4	8	1	3	18	9	1		2	9	10	9	74
<i>Bathytoshia lata</i>												2	2
<i>Gymnura japonica</i>	4	8		3	12	8	6	1	9	6	5	10	72
<i>Gymnura poecilura</i>	9	4	4			1	3	1		5	16	12	55
<i>Hemitrygon akajei</i>				3				1	1				5
<i>Himantura leoparda</i>	1		2	3	1	1				1	2	1	12
<i>Himantura uarnak</i>	8			1	3		2		1				15
<i>Maculabatis gerrardi</i>	63	75	57	56	38	108	99	99	88	67	88	98	936
<i>Mobula japanica</i>							1		1				2
<i>Mobula kuhlii</i>									4		2	1	7
<i>Neotrygon orientalis</i>	65	71	100	124	101	79	121	111	101	137	141	134	1,285
<i>Pastinachus gracilicaudus</i>	7	6	1	2	4	7	16	7	7	10	2	4	73
<i>Pastinachus stellurostris</i>											4		4
<i>Pateobatis fai</i>		2			1			1					4
<i>Pateobatis jenkinsii</i>			2		2	1	2	3	1	2	1	4	18
<i>Rhinobatos cf jimbarensis</i>		24	23	13	26	9	20	8	12	15	10	25	185
<i>Rhinoptera jayakari</i>												4	4
<i>Rhynchobatus australiae</i>	4	4	2		1	4	13	2	3	4	5	10	52
<i>Taeniura lymma</i>							4	4		1	3	2	14
<i>Telatrygon biasa</i>	20	21	33	22	41	58	79	75	110	116	97	89	761
<i>Urolophus expansus</i>						8							8
<b>Total Rays</b>	<b>196</b>	<b>225</b>	<b>225</b>	<b>232</b>	<b>256</b>	<b>301</b>	<b>377</b>	<b>317</b>	<b>352</b>	<b>388</b>	<b>396</b>	<b>423</b>	<b>3,688</b>
<i>Alopias pelagicus</i>							1				1		2
<i>Atelomycteris marmoratus</i>	12	15	42	7	26	70	34	20	11	35	35	14	321
<i>Carcharhinus brevipinna</i>						1		5	1	1		1	9
<i>Carcharhinus leucas</i>							2	1		1			4
<i>Carcharhinus limbatus</i>						8		7	5				20
<i>Carcharhinus melanopterus</i>	2	3		1	3				1		1	2	13
<i>Carcharhinus plumbeus</i>			2										2
<i>Carcharhinus sorrah</i>	21	12	5	8	4	3	5	7	43	71	27	43	249
<i>Chaenogaleus macrostoma</i>							2						2
<i>Chiloscyllium plagiosum</i>	37	44	69	45	83	101	52	50	45	86	81	59	752
<i>Chiloscyllium punctatum</i>	100	46	85	58	45	122	166	181	128	110	146	94	1,281
<i>Galeocerdo cuvier</i>								1		1			2
<i>Halaelurus buergeri</i>					2					3			5
<i>Hemigaleus microstoma</i>	3			1		2	1	1	1	1	2	3	15
<i>Hemipristis elongata</i>			1			10	4	4	5	7	4	3	38
<i>Loxodon macrorhinus</i>		1		3	6	4	3	3			2		22
<i>Mustelus mosis</i>						5							5
<i>Mustelus sp.</i>				2		1				2			5

<i>Mustelus widodoi</i>						5							5
<i>Orectolobus leptolineatus</i>					1								1
<i>Rhizoprionodon acutus</i>						1							1
<i>Sphyrna lewini</i>	11	7	9	8	10	9	3	6	9	36	33	44	185
<i>Squalus megalops</i>						6					2	8	16
<b>Total Sharks</b>	<b>186</b>	<b>128</b>	<b>213</b>	<b>133</b>	<b>180</b>	<b>348</b>	<b>273</b>	<b>286</b>	<b>249</b>	<b>354</b>	<b>334</b>	<b>271</b>	<b>2,955</b>
<b>Grand Total</b>	<b>382</b>	<b>353</b>	<b>438</b>	<b>365</b>	<b>436</b>	<b>649</b>	<b>650</b>	<b>603</b>	<b>601</b>	<b>742</b>	<b>730</b>	<b>694</b>	<b>6,643</b>

### 2.2.5 Weight of Sharks and Rays by Species

A total of 17,103.9 kg was landed from 330 landings comprising 10,501.5 kg of rays and 6,602.5 kg of sharks. Species of ray with the highest landing by weight was *Neotrygon orientalis* with 3,311 kg followed by *Maculabatis gerrardi* (2,370.4 kg) and *Telatrygon biasa* with 1,106.7 kg. The highest weight of landing by month for *Neotrygon orientalis* was 535.3 kg in December 2016 followed by 469.4 kg in November 2016 and 456.3 kg in Mei 2017. The highest landing for *Maculabatis gerrardi* was 339.4 kg in July 2017 followed by 285 kg in April 2017 and 213.5 kg in June 2017. For *Telatrygon biasa*, the highest landing was 221.5 kg in May 2017 followed by 150 kg in April 2017 and 140.7 kg in June 2017. Other species with higher weight of landings were *Pastinachus gracilicaudus* with 849.3 kg, *Rhinoptera jakayari* (655.5 kg), *Dasyatis parvonigra* (301.2 kg), *Himantura leoparda* (280.6 kg), *Rhinobatos cf jimbarensis* (253.6 kg) and *Aetobatus ocellatus* with 238.6 kg. Landing of other species were below 200 kg.

For shark species, the landing of *Chiloscyllium punctatum* recorded the highest weight with 3,678.2 kg followed by *Chiloscyllium plagiosum* (1,144.8 kg) and *Carcharhinus sorrah* with 685.3 kg. The highest weight of landing by month for *Chiloscyllium punctatum* was 512 kg in February followed by 504 kg in March and 439 kg in April 2017. The highest landing by month of *Chiloscyllium plagiosum* was 177 kg in June 2017 followed by 159 kg in December 2016 and 143 kg in October 2016. The highest weight of *Carcharhinus sorrah* by month was 185 kg in May 2017 followed by 137 kg in July 2017 and 66 kg in April 2017. The total landing of *Sphyrna lewini*, *Atelomycterus marmoratus* and *Carcharhinus melanopterus* during this study was 337.5 kg, 228.2 kg and 140.7 kg respectively. Whilst other species recorded weight of landing below 100 kg. The details are shown in **Table 18**.

**Table 18: Weight of Sharks and Rays (in kg) by Species from 330 Landings at Kota Kinabalu (SAFMA Jetty)**

Species	Year/Month												Total
	2016						2017						
	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	
<i>Aetobatus ocellatus</i>	12.1	35.2			81.3	16.5	37.1	2.7		37.3		16.5	238.6
<i>Aetomylaeus nicholfii</i>						6.9			8.3				15.2
<i>Aetomylaeus vesperitilo</i>						24							24
<i>Brevitrygon heterura</i>	5.8			1.7	1.2	1	2.9	0.7	4.4	9.2	3.6	6.7	37.1
<i>Brevitrygon imbricata</i>						2.6							2.6
<i>Dasyatis cf. thetidis</i>	148												148
<i>Dasyatis parvonigra</i>	27.4	31.4	5	16.3	86.2	57.2	0.5		4.3	27.7	30.9	14.4	301.2
<i>Bathytoshia lata</i>												6	6
<i>Gymnura japonica</i>	2.1	12		4	40.5	16	14.2	0.4	21.9	11.3	8.9	28.4	159.6
<i>Gymnura poecilura</i>	22.7	10	12			6.8	9.8	0.9		12.6	70.7	29.6	175.1
<i>Hemitrygon akajei</i>				22.1				7	10.3				39.4
<i>Himantura leoparda</i>	19.2		59.3	69.5	32	28.5				26.3	34.2	11.6	280.6
<i>Himantura uarnak</i>	63.1			4.5	3.1		3.8		1				75.5
<i>Maculabatis gerrardi</i>	184.7	167.1	184.9	193.5	86.6	204.6	165.4	204.5	285	141.5	213.5	339.4	2,370.4
<i>Mobula japonica</i>							13.4		11				24.4
<i>Mobula kuhlii</i>									33.3		10.7	6.4	50.4
<i>Neotrygon orientalis</i>	130.7	143.2	265.5	469.4	535.3	153.4	170.4	136.5	197.6	456.3	289.5	363.4	3,311
<i>Pastinachus gracilicaudus</i>	79.4	59.4	12.7	42	52.8	80.7	163.4	73.1	143.2	85.7	20.4	36.6	849.3
<i>Pastinachus stellurostris</i>											44.8		44.8
<i>Pateobatis fai</i>		34			23.9			4					61.9
<i>Pateobatis jenkinsii</i>			16		27.4	7.2	20.3	14.9	4.7	18.2	6	22.7	137.4
<i>Rhinobatos cf. jimbarensis</i>		36.8	26.1	18.7	53.1	7.6	18.8	15.9	15.7	19.5	12.9	28.6	253.6
<i>Rhinoptera jayakari</i>												655.5	655.5
<i>Rhynchobatus australiae</i>	6.3	6.4	3.9		0.7	10.6	33.2	3.7	7.4	10.4	9.4	20.5	112.5
<i>Taeniura lymna</i>							5.4	5.5		1.5	2.4	2.3	17.1
<i>Telatrygon biasa</i>	21.6	31.7	43	38.7	52.8	83	104.7	83.3	150	221.5	140.7	135.8	1,106.7
<i>Urolophus expansus</i>						4.1							4.1
<b>Total Weight Rays</b>	<b>722.8</b>	<b>567</b>	<b>628.2</b>	<b>880.3</b>	<b>1,076.8</b>	<b>710.3</b>	<b>763.1</b>	<b>553.1</b>	<b>898.1</b>	<b>1,079</b>	<b>898.6</b>	<b>1,724.4</b>	<b>10,501.5</b>
<i>Alopias pelagicus</i>							7.9				16		23.9
<i>Atelomycterus marmoratus</i>	10.1	11.1	37.3	5.2	19.5	51.1	19.5	11.2	6.1	21.9	25.6	9.7	228.2
<i>Carcharhinus brevipinna</i>						3.3		14	1.9	4.8		1.6	25.6

<i>Carcharhinus leucas</i>										12	3.6		29.5			45.1
<i>Carcharhinus limbatus</i>					18.1						17.4	18.1				53.6
<i>Carcharhinus melanopterus</i>	19	32.4		9.3	27.9							14		8.4	29.8	140.7
<i>Carcharhinus plumbeus</i>			9.2													9.2
<i>Carcharhinus sorrah</i>	57.9	39	28.7	38.3	17.9	33.7			21	0.9	5.6	66.3	185.2	55	136.8	685.3
<i>Chaenogaleus macrostoma</i>																0.9
<i>Chiloscyllium plagiosum</i>	42.6	49.5	142.7	56.3	159.2	141.7			54.9	46.2	47.9	177.3	142.2	177.3	84.5	1,144.8
<i>Chiloscyllium punctatum</i>	231	141.4	192.1	136.3	149.9	410.2			511.8	503.7	439.4	345.9	283.8	345.9	332.9	3,678.2
<i>Galeocerdo cuvier</i>											17.5		1.7			19.2
<i>Halaaelurus buergeri</i>					0.9								1.1			2
<i>Hemigaleus microstoma</i>	4.6			1.9		3.6			1.5	4.5	4.2	4	10.9	4	3.8	39
<i>Hemipristis elongata</i>			3.6			18.7			5.6	13.5	17.9	9.6	10.3	9.6	2.1	81.2
<i>Loxodon macrorhinus</i>		1.7		3.2	9.3	3.3			1.3	1.5		2.7				22.9
<i>Mustelus mosis</i>						10.5										10.5
<i>Mustelus sp.</i>				4.3		2.4							1			7.7
<i>Mustelus widodoi</i>						21.1										21.1
<i>Orectolobus leptolineatus</i>						5.4										5.4
<i>Rhizoprionodon acutus</i>						2.8										2.8
<i>Sphyrna lewini</i>	25.9	16.4	11.7	23.8	36.8	32.5			8.6	28.3	7	38.6	58.2	38.6	49.7	337.5
<i>Squalus megalops</i>						12.6						0.9		0.9	4.7	18.2
<b>Total Weight Sharks</b>	<b>391</b>	<b>291.4</b>	<b>425.2</b>	<b>278.3</b>	<b>426.6</b>	<b>765.3</b>			<b>644.9</b>	<b>666.9</b>	<b>622.8</b>	<b>684</b>	<b>750.6</b>	<b>684</b>	<b>655.6</b>	<b>6,602.5</b>
<b>Grand Total</b>	<b>1,113.8</b>	<b>858.4</b>	<b>1,053.4</b>	<b>1,158.6</b>	<b>1,503.4</b>	<b>1,475.6</b>			<b>1,408</b>	<b>1,219.9</b>	<b>1,520.9</b>	<b>1,582.6</b>	<b>1,829.6</b>	<b>1,582.6</b>	<b>2,380</b>	<b>17,103.9</b>

### 2.2.6 Size Range of Sharks and Rays

In general, most of rays species sampled from August 2016 to July 2017 were matured except for *Aetobatus ocellatus* and *Gymnura japonica* landed on August 2016 and March 2017. Other rays species were either immaturred or juveniles. Samples of *Pateobatis jenkinsii* landed throughout the study were immaturred except for samples landed on December 2016. Whilst, all samples of *Pastinachus gracilicaudus* were immaturred but samples landed on October and November 2016 were matured. Rays species for *Maculabatis gerrardi* and *Neotrygon orientalis* landed every month throughout the period and all samples were juveniles. Details on size range of rays by species from August 2016 to January 2017 are shown in **Table 19A (i)** and from February to July 2017 are shown in **Table 19A (ii)**.

Most of shark species sampled from August 2016 to January 2017 were matured except for *Carcharhinus brevipinna*, *Carcharhinus limbatus*, *Carcharhinus plumbeus*, *Hemipristis elongata*, *Mustelus widodoi* and *Sphyrna lewini*. Whilst, samples for *Carcharhinus sorrah* landed on October 2016 and January 2017 were matured but samples landed on August, September, November and December 2016 were juveniles. Size range of sharks by species sampled from August 2016 to January 2017 are shown in **Table 19B (i)**. However, most of shark species sampled from February to July 2017 were immaturred except for species *Atelomycterus marmoratus*, *Carcharhinus melanopterus*, *Chiloscyllium plagiosum*, *Chiloscyllium punctatum*, *Halaehurus buergeri*, *Hemigaleus microstoma* and *Squalus megalops*. Samples for *Loxodon macrorhinus* landed on Jun 2017 were matured but samples landed on February and March 2017 were juveniles. Details on size range of sharks by species sampled from February to July 2017 are shown in **Table 19B (ii)**.

**Table 19A (i): Size Range of Rays (Disc Length) Except for *Rhinobatos cf jimbarensis* and *Rhynchobatus australiae* (Total Length) from August 2016 to January 2017. All measurements in cm**

Species	Year/Month																	
	2016						2017											
	Aug		Sep		Oct		Nov		Dec		Jan							
Min	Max	Av	Min	Max	Av	Min	Max	Av	Min	Max	Av	Min	Max	Av				
<i>Aetobatus ocellatus</i>	41.3	51.3	46.3	58	69.2	63.6				57	70	63.2	67.8	67.8	67.8			
<i>Aetomylaeus nichofii</i>													30.7	45	37.9			
<i>Aetomylaeus vesperitilio</i>													74.4	74.4	74.4			
<i>Brevitrygon heterura</i>	19.5	25.5	21.9				25	27	26	20	22	21.3	21	22.5	21.8			
<i>Brevitrygon imbricata</i>													23.5	23.5	23.5			
<i>Dasyatis cf thetidis</i>	144	144	144															
<i>Dasyatis parvonigra</i>	44.2	56	49.4	30.2	52.4	42.5	45	45	45	33.5	52.3	44.6	27	56.1	21.5	57.5	38.3	
<i>Gymnura japonica</i>	18	22	20.3	21	38.2	27.8				21.2	33.2	25.6	23	44	20.8	39.6	30.9	
<i>Gymnura poecilura</i>	27.2	42.2	32.8	31	38	33.3	21.3	42.3	34						44	44	44	
<i>Hemitrygon akajei</i>										49.2	62.3	55.6						
<i>Himantura leoparda</i>	84.5	84.5	84.5				85.2	85.3	85.3	69.3	89.2	79.9	95.2	95.2	85.1	85.1	85.1	
<i>Himantura uarnak</i>	28.5	74.3	53.3							46.2	46.2	46.2	23	30.2	26.7			
<i>Maculabatis gerrardi</i>	16	80.3	30	16.2	78.3	30.7	18.2	64.2	32.8	20	69.2	37.1	18.2	58	16	71.5	30.5	
<i>Neotrygon orientalis</i>	14.4	27	20.3	14.2	32.2	20.6	13.2	31.2	20.7	14.3	30.2	22	13	26.1	14	31.1	19.3	
<i>Pastinachus gracilicaudus</i>	33.2	48.3	44.2	48.2	59.2	52.7	63.2	63.2	63.2	69.4	71.5	70.5	52.2	64.2	58	38.5	72.7	56.2
<i>Pateobatis fai</i>				66.2	72.2	69.2							69.3	69.3	69.3			
<i>Pateobatis jenkinsii</i>							53.4	61.3	57.4				64	70.2	67.1	56.9	56.9	56.9
<i>Rhinobatos cf jimbarensis</i>				50.2	96	73.6	42.3	85.2	69.5	62.3	91.2	77.9	44.2	89.2	69.8	51.3	87.7	66.2
<i>Rhynchobatus australiae</i>	54.2	78.2	66.5	56.5	78	66	69.2	77.3	73.3				53.1	53.1	53.1	56.8	97.5	78.5
<i>Telatrygon biasa</i>	18.2	31.5	25.1	19	30.3	24.1	19	32	24.7	19.4	29.2	25.1	20	31.4	23.8	19.2	33.4	25.5
<i>Urolophus expansus</i>																18.5	23.9	21.2

**Table 19A (ii): Size Range of Rays (Disc Length) Except for *Rhinobatos cf jimbarensis* and *Rhynchobatus australiae* (Total Length) from February to July 2017. All measurements in cm**

Species	Year/Month																		
	2017																		
	Feb			Mar			Apr			May			Jun			Jul			
Rays	Min	Max	Av	Min	Max	Av	Min	Max	Av	Min	Max	Av	Min	Max	Av	Min	Max	Av	
<i>Aetobatus ocellatus</i>	49	65.8	57.3	25	25.3	25.2				49	49	49	64.5	84.3	74.4			67	67
<i>Aetomylaeus nichofii</i>							49	49	49										
<i>Brevitrygon heterura</i>	19.5	24.5	22.5	22.3	22.6	22.5	21	23.7	22.9	18.8	26.1	21.9	18.2	23.3	21.6	18.5	27	22.5	22.5
<i>Dasyatis parvonigra</i>	22	22	22				28	34.5	31.3	27.2	47.1	33	21.5	52.8	36.1	25	39.8	31.9	31.9
<i>Bathytoshia lata</i>																31.3	44.4	37.9	37.9
<i>Gymnura japonica</i>	25.7	36.5	31.9	19.8	19.8	19.8	22.3	42	32.4	19.5	41.6	28.3	16.5	42.5	27.2	26.8	40.5	34.7	34.7
<i>Gymnura poecilura</i>	22.2	48.7	32.6	25.1	25.1	25.1	52.5	60.2	60.2	24.2	42.2	33.8	22.5	41.5	34.2	22.2	40.5	33.3	33.3
<i>Hemitrygon akajei</i>																			
<i>Himantura leoparda</i>										84.5	84.5	84.5	57.3	84.5	70.9	61.7	61.7	61.7	61.7
<i>Himantura uarnak</i>	29.3	37	33.2				29	29	29										
<i>Maculabatis gerrardi</i>	17.2	62.7	29.1	15.7	76	28.6	16.8	76.2	30.6	16.6	63.2	27.6	15.3	65.5	30.4	16.3	61.5	29.2	29.2
<i>Mobula japonica</i>	66.5	66.5	66.5				60.5	60.5	60.5										
<i>Mobula kuhlii</i>							39.5	85.5	54.1				38.3	54.8	46.6	52.5	52.5	52.5	52.5
<i>Neotrygon orientalis</i>	9.8	30.8	19.2	13.3	34	20.2	13.8	32	19.4	14	32	20.6	13.3	30.2	20	14.0	31.3	19.7	19.7
<i>Pastinachus gracilicaudus</i>	24.4	61.7	46	44.6	72.5	52.7	41.4	70.5	51.9	30.3	78.3	53	50.3	63.5	56.9	33.8	61.6	47.1	47.1
<i>Pastinachus stellurostris</i>													41.3	65.2	55.3				
<i>Pateobatis fai</i>				43.5	43.5	43.5													
<i>Pateobatis jenkinsii</i>	54.6	64.5	59.6	41.2	55.8	46.2	46.5	46.5	46.5	53.8	65.8	59.8	49.5	49.5	49.5	41.2	50	46.5	46.5
<i>Rhinobatos cf jimbarensis</i>	45	90.1	64.9	66.4	104.7	80.7	69.5	85.1	77	57.5	85.4	75.7	38.2	94.5	71.9	29.5	98	70	70
<i>Rhinoptera jayakari</i>																29.3	70	55.2	55.2
<i>Rhynchobatus australiae</i>	49	120.1	75	53.7	89.8	71.8	59.2	98.4	77.3	61.5	100.7	81.2	54.8	109.8	68.3	48.7	124.6	68.4	68.4
<i>Taeniura lymma</i>	24.2	35.4	30.8	23.8	33.8	30.8				31.4	31.4	31.4	18.2	32.1	25.2	24	33.7	28.9	28.9
<i>Telatrygon biasa</i>	15.3	30.8	25.1	17.7	32.2	23.9	17.8	31	24.6	18.5	33.6	24.8	14.1	30.8	23.5	16.8	31.5	24.3	24.3



**Table 19B (i): Size Range of Sharks (Total Length) from August 2016 to January 2017. All measurements in cm**

Species	Year/Month																	
	2016												2017					
	Aug			Sep			Oct			Nov			Dec			Jan		
Min	Max	Av	Min	Max	Av	Min	Max	Av	Min	Max	Av	Min	Max	Av	Min	Max	Av	
<i>Alopias pelagicus</i>																		
<i>Atelomycteris marmoratus</i>	57.2	70.3	65.1	50.2	72.3	62.1	45.1	68.2	60.1	50.1	68.2	58.7	52.2	69	60.2	33.2	77.8	57.8
<i>Carcharhinus brevipinna</i>																		
<i>Carcharhinus leucas</i>																		
<i>Carcharhinus limbatus</i>																		
<i>Carcharhinus melanopterus</i>	115.2	117	116.1	114.5	117	115.8				120.3	120.3	120.3	114.2	122.1	117.2			
<i>Carcharhinus plumbeus</i>							71.2	102.3	86.8									
<i>Carcharhinus sorrah</i>	56	108	79.8	64.2	91.2	86.6	91.3	120.3	103.8	94.2	100.2	96.1	93.2	98.2	96	122.5	127.2	124.6
<i>Chaenogaleus macrostoma</i>																		
<i>Chiloscyllium plagiosum</i>	57.2	83.1	72.1	56.3	84.2	71	48	83	71.2	55.2	84.3	71.9	49	86	69.8	39.1	89.7	68
<i>Chiloscyllium punctatum</i>	47.3	96.3	76	52.3	87	75.4	53.2	94.2	75.6	51.1	92	75.4	50.2	91.3	78	46	98.3	77.3
<i>Halaehurus buergeri</i>													39.4	45	42.2			
<i>Hemigaleus microstoma</i>	72.2	82.3	76.3															
<i>Hemipristis elongata</i>							106.3	106.3	106.3									
<i>Loxodon macrorhinus</i>				83.2	83.2	83.2				47	89.2	63.5	74	86.2	80.5	42.8	92.8	63.7
<i>Mustelus mosis</i>																		
<i>Mustelus sp.</i>												53.2	100.3	76.8				
<i>Mustelus widodoi</i>																		
<i>Orectolobus leptolineatus</i>																		
<i>Rhizoprionodon acutus</i>																		
<i>Sphyrna lewini</i>	62.3	99	78.4	55.2	93.2	77.3	51.2	93.2	62.4	53	99.2	82.5	57.2	103	89.7	49.2	158.7	79.5
<i>Squalus megalops</i>																40.2	73	54.1

**Table 19B (ii): Size Range of Sharks (Total Length) from February to July 2017. All measurements in cm**

Species	Year/Month																	
	2017																	
	Feb			Mar			Apr			May			Jun			Jul		
Min	Max	Av	Min	Max	Av	Min	Max	Av	Min	Max	Av	Min	Max	Av	Min	Max	Av	
<i>Alopias pelagicus</i>	162	162	162									205.8	205.8	205.8				
<i>Aetomysterus marmoratus</i>	42	68.2	58	38	69.8	57.9	42	66.2	57.7	41.5	69.5	59.3	44.5	69.8	50.3	74.3	61.1	
<i>Carcharhinus brevipinna</i>				61	97.5	81.6	68.6	68.6	68.6	99	99	99			70.6	70.6	70.6	
<i>Carcharhinus leucas</i>	73.4	110.4	91.9	81.6	81.6	81.6				168	168	168						
<i>Carcharhinus limbatus</i>				78.3	84.2	80.8	84	93.6	90.1									
<i>Carcharhinus melanopterus</i>				134	134	134	134	134	134				118	118	119	134	126.5	
<i>Carcharhinus sorrah</i>	64	105	93.7	56.5	62.8	58.3	55.3	67.8	60.4	53.6	120.5	63.7	50.5	117.6	62.7	146.5	82	
<i>Chaenogaleus macrostoma</i>	49	50.4	49.7															
<i>Chiloscyllium plagiosum</i>	42	83.5	69.5	49.8	83.4	67.6	54	85.5	70.4	42.5	85.5	69	39.2	96.2	52.5	85.3	71.1	
<i>Chiloscyllium punctatum</i>	45	94	76.7	43.4	99.2	76.5	40	98	75	49	103.7	75.4	48	103.3	46.6	93.5	75.3	
<i>Galeocerdo cuvier</i>				160.2	160.2	160.2				88.5	88.5	88.5						
<i>Halaehurus buergeri</i>										44.5	47.2	46.1						
<i>Hemigaleus microstoma</i>	67.3	67.3	67.3	102	102	102	96.2	96.2	96.2	120.8	120.8	120.8	54.7	89.1	42.3	85.2	59	
<i>Hemipristis elongata</i>	50	97.3	66.8	54	112.7	86.3	50	132	90.6	45.6	109	64.3	60.5	118.8	55.4	65	60	
<i>Loxodon macrorhinus</i>	54.4	59.7	56.5	53.3	66.5	57.8							69.8	86.2	78			
<i>Mustelus sp.</i>										54	55.5	54.8						
<i>Sphyrna lewini</i>	57	108	79.1	47.2	114.7	85.2	48.5	76.6	55.3	47.5	140.5	62.6	50.6	71.6	50.7	84.3	62.9	
<i>Squalus megalops</i>													45.7	46.1	36.2	70.2	49.3	

### 2.2.7 Usage and Marketing

All shark and ray species landed at this site were marketed and consumed locally. The price (RM/kg) were varied depending on species, size and season. Grilled rays are special delicacies that highly enjoyed by locals and tourists alike. All sharks and rays were sold as a whole at this landing site. The supply at SAFMA Jetty were not as limited as in Peninsular Malaysia. At SAFMA landing jetty, wholesale price of rays were in the range of RM1 – RM6/kg, quite cheaper compared to the price in Peninsular Malaysia. The price for rays species such as *Maculabatis gerrardi*, *Neotrygon orientalis*, *Rhynchobatus australiae*, *Rhinobatos cf jimbarensis* and *Dasyatis cf thetidis* can fetch up to RM6/kg while *Urolophus expansus* was only sold at RM2/kg. However, the price were possibly doubled or even more once the rays sold at the fish markets. The favourite species among consumers were *Himantura uarnak* and *Maculabatis gerrardi*. The range price for *Himantura uarnak* was RM1.3 – RM5/kg. The cheapest ray species were *Brevitrygon heterura* and *Telatrygon biasa* sold as low as RM0.8/kg.

All part of sharks were fully utilized. Shark meat were mainly sold at fish wet markets in Kota Kinabalu and some were brought to interior part of Sabah. Shark teeth and jaws were used as souvenirs and shark head's skin were considered as a new delicacy.

Whole body of shark were sold at the average price of RM2.50/kg at SAFMA landing jetty in Kota Kinabalu. The highest price for shark species of *Carcharhinus sorrah* and *Sphyrna lewini* were sold at RM6/kg. Other species were mostly sold at range price RM3 – RM5/kg. However, the prices could increase to double or even triple once it reaches the fish markets. The details of price range and market destination by species is shown in **Table 20**.

**Table 20: Price of Sharks and Rays by Species and Market Destinations at Kota Kinabalu, Sabah. All Prices in RM per Kilogram**

Species	Range Price (RM/kg)	Part	Market Destination
<b>Ray</b>			
<i>Aetobatus ocellatus</i>	1 – 5	Whole body	Local Market Kota Kinabalu
<i>Aetomylaeus nichofii</i>	2 – 5	Whole body	Local Market Kota Kinabalu
<i>Aetomylaeus vespertilio</i>	2 – 5	Whole body	Local Market Kota Kinabalu
<i>Brevitrygon heterura</i>	0.8 – 5	Whole body	Local Market Kota Kinabalu
<i>Brevitrygon imbricata</i>	1.5 – 2.5	Whole body	Local Market Kota Kinabalu
<i>Dasyatis cf thetidis</i>	2 – 6	Whole body	Local Market Kota Kinabalu
<i>Dasyatis parvonigra</i>	1.3 – 5	Whole body	Local Market Kota Kinabalu
<i>Bathytoshia lata</i>	3 – 4	Whole body	Local Market Kota Kinabalu
<i>Gymnura japonica</i>	2 – 5	Whole body	Local Market Kota Kinabalu
<i>Gymnura poecilura</i>	1.5 – 5	Whole body	Local Market Kota Kinabalu
<i>Hemitrygon akajei</i>	1.5 – 5	Whole body	Local Market Kota Kinabalu
<i>Himantura leoparda</i>	2 – 5	Whole body	Local Market Kota Kinabalu
<i>Himantura uarnak</i>	1.5 – 5	Whole body	Local Market Kota Kinabalu
<i>Maculabatis gerrardi</i>	1.3 – 6	Whole body	Local Market Kota Kinabalu
<i>Mobula japonica</i>	2 – 5	Whole body	Local Market Kota Kinabalu
<i>Mobula kuhlii</i>	4 – 5	Whole body	Local Market Kota Kinabalu

<i>Neotrygon orientalis</i>	2 – 6	Whole body	Local Market Kota Kinabalu
<i>Pastinachus gracilicaudus</i>	2 – 5	Whole body	Local Market Kota Kinabalu
<i>Pastinachus stellurostris</i>	3 – 4	Whole body	Local Market Kota Kinabalu
<i>Pateobatis fai</i>	2.5 – 5	Whole body	Local Market Kota Kinabalu
<i>Pateobatis jenkinsii</i>	2 – 5	Whole body	Local Market Kota Kinabalu
<i>Rhinobatos cf jimbarensis</i>	2 – 6	Whole body	Local Market Kota Kinabalu
<i>Rhinoptera jayakari</i>	4 – 4	Whole body	Local Market Kota Kinabalu
<i>Rhynchobatus australiae</i>	3 – 6	Whole body	Local Market Kota Kinabalu
<i>Taeniura lymma</i>	2 – 5	Whole body	Local Market Kota Kinabalu
<i>Telatrygon biasa</i>	0.8 – 5	Whole body	Local Market Kota Kinabalu
<i>Urolophus expansus</i>	2	Whole body	Local Market Kota Kinabalu
<b>Shark</b>			
<i>Alopias pelagicus</i>	3 – 4	Whole body	Local Market Kota Kinabalu
<i>Atelomycterus marmoratus</i>	2 – 3.5	Whole body	Local Market Kota Kinabalu
<i>Carcharhinus brevipinna</i>	3 – 5	Whole body	Local Market Kota Kinabalu
<i>Carcharhinus leucas</i>	3 – 5	Whole body	Local Market Kota Kinabalu
<i>Carcharhinus limbatus</i>	2.5 – 5	Whole body	Local Market Kota Kinabalu
<i>Carcharhinus melanopterus</i>	2 – 5	Whole body	Local Market Kota Kinabalu
<i>Carcharhinus plumbeus</i>	3 – 5	Whole body	Local Market Kota Kinabalu
<i>Carcharhinus sorrah</i>	2 – 6	Whole body	Local Market Kota Kinabalu
<i>Chaenogaleus macrostoma</i>	3 – 3	Whole body	Local Market Kota Kinabalu
<i>Chiloscyllium plagiosum</i>	2 – 3.5	Whole body	Local Market Kota Kinabalu
<i>Chiloscyllium punctatum</i>	2 – 3.5	Whole body	Local Market Kota Kinabalu
<i>Galeocerdo cuvier</i>	4 – 5	Whole body	Local Market Kota Kinabalu
<i>Halaaelurus buergeri</i>	2 – 3	Whole body	Local Market Kota Kinabalu
<i>Hemigaleus microstoma</i>	2 – 5	Whole body	Local Market Kota Kinabalu
<i>Hemipristis elongata</i>	2 – 5	Whole body	Local Market Kota Kinabalu
<i>Loxodon macrorhinus</i>	2 – 5	Whole body	Local Market Kota Kinabalu
<i>Mustelus mosis</i>	2 – 2.5	Whole body	Local Market Kota Kinabalu
<i>Mustelus sp.</i>	2 – 5	Whole body	Local Market Kota Kinabalu
<i>Mustelus widodoi</i>	3	Whole body	Local Market Kota Kinabalu
<i>Orectolobus leptolineatus</i>	2	Whole body	Local Market Kota Kinabalu
<i>Rhizoprionodon acutus</i>	2.5 – 2.5	Whole body	Local Market Kota Kinabalu
<i>Sphyrna lewini</i>	2 – 6	Whole body	Local Market Kota Kinabalu
<i>Squalus megalops</i>	2 – 3.5	Whole body	Local Market Kota Kinabalu

### 2.2.8 Fishing Effort and Catch Per Unit Effort (CPUE)

Monthly fishing efforts (days at operation and total number of operation during the cruise) of the sampled vessels are summarized in **Table 21** and **Table 22**.

**Table 21: Days at Operation by Gears Sampled During the Study Period at SAFMA Jetty, Sabah**

Types of Gear	Year/Month												Grand Total
	2016						2017						
	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	
Trawl Net Zone 2	224					283	390	144		120		112	1,273
Trawl Net Zone 3	843	1,300	2,214	1,737	1,309	2,256	2,421	2,923	2,731	1,896	3,146	3,265	26,041
Trawl Net Zone 4	1,827	1,308	1,016	951	2,009	2,346	2,201	1,717	2,004	3,774	2,577	2,045	23,775

**Table 22: Total Number of Operation by Gears Sampled During the Study Period at SAFMA Jetty, Sabah**

Types of Gear	Year/Month												Grand Total
	2016						2017						
	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	
Trawl Net Zone 2	672					849	1,170	432		360		336	3,819
Trawl Net Zone 3	2,529	3,900	6,642	5,211	3,927	6,768	7,263	8,769	8,193	5,688	9,438	9,795	78,123
Trawl Net Zone 4	5,481	3,924	3,048	2,853	5,961	7,038	6,603	5,151	6,012	11,322	7,731	6,135	71,259

The top 10 CPUE ray species captured by trawl net in Kota Kinabalu were different between zone. *Neotrygon orientalis* topped the list for Zone 3 and Zone 4 with 0.07 kg/day or 0.02 kg/haul and 0.06 kg/day or 0.02 kg/haul respectively. This followed by *Maculabatis gerrardi* with 0.05 kg/day or 0.02 kg/haul for Zone 3 and 0.04 kg/day or 0.01 kg/haul for Zone 4. Other species that dominated both in Zone 3 and Zone 4 are *Telatrygon biasa*, *Pastinachus gracilicaudus*, *Himantura leoparda*, *Rhinobatos cf jimbarensis*, *Aetobatus ocellatus* and *Gymnura japonica*.

The first seven species of sharks in the top 10 CPUE for both Zone 3 and Zone 4 were in the same order. *Chiloscyllium punctatum* topped the list with 0.07 kg/day followed by *Chiloscyllium plagiosum* with 0.03 kg/day, *Carcharhinus sorrah* 0.01 kg/day and *Sphyrna lewini* with 0.01 kg/day. Other three species were *Atelomycterus marmoratus*, *Carcharhinus melanopterus* and *Hemipristis elongata*. The top 10 CPUE of rays and sharks species captured by trawl net Zone 3 and Zone 4 are shown in **Table 23**, **Table 24**, **Table 25** and **Table 26**.

**Table 23: Top 10 CPUE Rays Species Captured by Trawl Net Zone 3 During Study Period at Kota Kinabalu, Sabah (kg/Fishing Effort)**

Number	Scientific Name	Total Weight (kg) by Species	CPUE (kg/day)	CPUE (kg/haul)
1	<i>Neotrygon orientalis</i>	1,812.3	0.07	0.02
2	<i>Maculabatis gerrardi</i>	1,353.9	0.05	0.02
3	<i>Telatrygon biasa</i>	480.9	0.02	0.01
4	<i>Pastinachus gracilicaudus</i>	351.3	0.01	0.004
5	<i>Dasyatis parvonigra</i>	239.7	0.01	0.003
6	<i>Himantura leoparda</i>	171.7	0.01	0.002
7	<i>Rhinobatos cf jimbarensis</i>	161.3	0.01	0.002
8	<i>Aetobatus ocellatus</i>	111.7	0.004	0.001
9	<i>Gymnura japonica</i>	93.5	0.004	0.001
10	<i>Gymnura poecilura</i>	70.8	0.003	0.001

**Table 24: Top 10 CPUE Rays Species Captured by Trawl Net Zone 4 During Study Period at Kota Kinabalu, Sabah (kg/Fishing Effort)**

Number	Scientific Name	Total Weight (kg) by Species	CPUE (kg/day)	CPUE (kg/haul)
1	<i>Neotrygon orientalis</i>	1,458	0.06	0.02
2	<i>Maculabatis gerrardi</i>	961.9	0.04	0.01
3	<i>Rhinoptera jayakari</i>	655.5	0.03	0.01
4	<i>Telatrygon biasa</i>	618.5	0.03	0.01
5	<i>Pastinachus gracilicaudus</i>	404.2	0.02	0.01
6	<i>Aetobatus ocellatus</i>	126.9	0.01	0.002
7	<i>Gymnura poecilura</i>	104.2	0.004	0.001
8	<i>Himantura leoparda</i>	97.3	0.004	0.001
9	<i>Rhinobatos cf jimbarensis</i>	92.3	0.004	0.001
10	<i>Pateobatis jenkinsii</i>	70.6	0.003	0.001

**Table 25: Top 10 CPUE Sharks Species Captured by Trawl Net Zone 3 During Study Period at Kota Kinabalu, Sabah (kg/Fishing Effort)**

Number	Scientific Name	Total Weight (kg) by Species	CPUE (kg/day)	CPUE (kg/haul)
1	<i>Chiloscyllium punctatum</i>	1,949.4	0.07	0.02
2	<i>Chiloscyllium plagiosum</i>	659.3	0.03	0.01
3	<i>Carcharhinus sorrah</i>	298.7	0.01	0.00
4	<i>Sphyrna lewini</i>	150.9	0.01	0.002
5	<i>Atelomycterus marmoratus</i>	105.8	0.004	0.001
6	<i>Carcharhinus melanopterus</i>	56.7	0.002	0.001
7	<i>Hemipristis elongata</i>	43.4	0.002	0.001
8	<i>Alopias pelagicus</i>	23.9	0.001	0.0003
9	<i>Mustelus widodoi</i>	21.0	0.001	0.0003
10	<i>Carcharhinus limbatus</i>	17.5	0.001	0.0002

**Table 26: Top 10 CPUE Sharks Species Captured by Trawl Net Zone 4 During Study Period at Kota Kinabalu, Sabah (kg/Fishing Effort)**

Number	Scientific Name	Total Weight (kg) by Species	CPUE (kg/day)	CPUE (kg/haul)
1	<i>Chiloscyllium punctatum</i>	1,630.8	0.07	0.02
2	<i>Chiloscyllium plagiosum</i>	468.5	0.02	0.01
3	<i>Carcharhinus sorrah</i>	361.6	0.02	0.01
4	<i>Sphyrna lewini</i>	184.6	0.01	0.003
5	<i>Atelomycterus marmoratus</i>	108.5	0.005	0.002
6	<i>Carcharhinus melanopterus</i>	83.9	0.004	0.001
7	<i>Hemipristis elongata</i>	37.7	0.002	0.001
8	<i>Carcharhinus limbatus</i>	36.1	0.002	0.001
9	<i>Carcharhinus leucas</i>	33.1	0.001	0.0005
10	<i>Hemigaleus microstoma</i>	21.8	0.001	0.0003

### 3.0 OUTPUT AND OUTCOME

The project outputs and outcomes are summarized in **Table 27** as shown below.

**Table 27: Output and Outcome**

No	Output	Outcome
1.	Twelve trained personnels in sharks and rays taxonomy from the Department of Fisheries Malaysia and Fisheries Department of Sabah	Trained staffs are now able to make the right and valid identification of species. Training materials stored electronically and easy to excess.
2.	A standardized format for data collection for national activity produced.	Improved technique of data collection for implementation at national level.
3.	Detailed information on the percentage of sharks and rays from the total landing	Confirmed earlier data published in Malaysian National Statistics. Sharks

	at project sites.	and rays were not targeted and contributed to less than 2% of total marine landing.
4.	Information on relative dominance of the different species of sharks and rays obtained.	Increased awareness of needs and measures of shark conservation and management on specific species.
5.	Information on the monthly fluctuation of the different species of sharks and rays obtained.	Trends of landings by species analysed for national level management.
6.	Information on usage and marketing of the landed sharks and rays were obtained from the project.	Confirmed earlier report in current NPOA-Shark that all sharks and rays are landed whole, fully utilized with no finning activities onboard vessels.
7.	A report on landing of sharks and rays up to species level from two sites in Perak and Sabah respectively.	Data recording on sharks and rays will be improved from generic terms 'sharks' and 'rays' to species level.
8.	Issues and problems arising from this activity identified and improvements made especially with the data collection format.	Development of the comprehensive national data collection system for sharks and rays as part of the National Plan of Action Shark.
9.	Specimens collected from sampling activities deposited for future reference.	A national repository for elasmobranchs has been established at the Fisheries Research Institute, Kg. Acheh, Perak and Fisheries Research Centre, Likas, Kota Kinabalu.

#### 4.0 CONCLUSION

A project on recording landing data of sharks and rays up to species level was conducted in one district in the state of Perak and Sabah respectively. During this project twelve staffs from Department of Fisheries Malaysia and Department of Fisheries Sabah trained in taxonomy and in data collection using the agreed regional format. One facing the Straits of Malacca, namely Larut Matang in Perak and Kota Kinabalu in Sabah were selected as the study sites, as they were the main landing sites of sharks and rays in the states. The landing data were collected at seven jetties in Perak and one jetty in Sabah.

A total of 16 species of rays from three Orders and four families while 10 species of sharks from two Orders and four families were recorded during the study in Larut Matang, Perak. Details are shown in **Appendix II**. In terms of percentage of total marine landings, rays and sharks contributed 1.9% and 0.6% respectively.

The most abundant rays species in Larut Matang were *Neotrygon orientalis*, *Maculabatis gerrardi*, *Brevitrygon heterura*, *Telatrygon biasa* and *Maculabatis pastinacoides* while for sharks were *Chiloscyllium hasseltii*, *Chiloscyllium punctatum*, *Atelomycterus marmoratus*, *Carcharhinus leucas* and *Carcharhinus sorrah*.

A total of 27 species of rays from two Orders and eight families while 23 species of sharks from four Orders and nine families were recorded during the study period in Kota Kinabalu,



Sabah. Details are shown in **Appendix II**. The landings of rays and sharks were also minimal, with the contribution of 0.5% and 0.3% respectively from the total marine landings. These figures confirmed earlier data as published in Malaysian National Statistics that sharks and rays were only by-catch and not targeted and contributed less than 2% of the total marine landings.

The most abundant rays species in Kota Kinabalu were *Neotrygon orientalis* followed by *Maculabatis gerrardi*, *Telatrygon biasa* and *Rhinobatos cf jimbarensis* while the most common rays species were *Brevitrygon heterura* followed by *Dasyatis parvonigra*, *Pastinachus gracilicaudus* and *Gymnura japonica*. For sharks, the most abundant species were *Chiloscyllium punctatum* followed by *Chiloscyllium plagiosum*, *Atelomycterus marmoratus*, *Carcharhinus sorrah* and *Sphyrna lewini*. The most common sharks species were *Hemipristis elongata* followed by *Loxodon macrorhinus* and *Carcharhinus limbatus*.

In Perak, sharks and rays were mainly caught by trawl nets. Other gears used were longlines and drift nets. Whilst in Sabah, trawl net is the main gear used by fishers where sharks and rays were caught together with other marine catches.

The top three CPUE (kg/haul) for rays species captured by trawl net Zone C in Perak were dominated by *Maculabatis gerrardi*, *Neotrygon orientalis* and *Brevitrygon heterura* while for sharks were dominated by *Chiloscyllium hasseltii*, *Chiloscyllium punctatum* and *Carcharhinus leucas*.

The top three CPUE for rays and sharks captured by trawl net in Kota Kinabalu were determined in Zone 3 and Zone 4 separately. *Neotrygon orientalis* topped the list for both zones followed by *Maculabatis gerrardi* while *Telatrygon biasa* and *Rhinoptera jayakari* were the third in the list for Zone 3 and Zone 4 respectively. The first three sharks species were in the same order for both Zone 3 and Zone 4 where *Chiloscyllium punctatum* came first, followed by *Chiloscyllium plagiosum* and *Carcharhinus sorrah*.

Usage and marketing information from this study confirmed that all sharks and rays were landed whole, fully utilized without finning activities on board of vessels.

## **5.0 FUTURE ACTIVITIES**

Malaysia is highly committed in managing and conserving its sharks and rays. Some future activities had been underlined, as follows;

- i. Continuing to record landing data up to species level at the existing sites.
- ii. Extending the program to other states in Malaysia.
- iii. Seeking national funding to:
  - a. Continue the sharks data collection program.
  - b. Conduct training/courses at national level.
  - c. Attend meetings and seminars at national and international level.
  - d. Conduct public awareness.
  - e. Publish materials (posters, templates, identification manuals).

- iv. Using the current program finding to:
  - a. Conduct Non-detriment Findingd (NDFs) study on sharks.
  - b. Rectify various issues concerning sharks management at national and international level.
  - c. Provide input for the next Malaysia NPOA-Shark.
- v. Conducting training for fisheries staff on sharks data collection.
- vi. Continuing public awareness campaign, such as on the current regulation on listing on endangered species, government policy on not serving shark fin soup during official events and rectifying the misconception of ‘shark finning’ and ‘shark fishing’ terms.
- vii. Enhancing enforcement capacity through relevant training, such as the identification of sharks and rays species and its parts.
- viii. Expending the ongoing study on the usage and marketing, as well as the socioeconomy related to sharks and rays in Sabah, to other states of Malaysia.

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## Sample of Standard Form

## Data Collection Project on Sharks and Rays (SEAFDEC)

<b>Country</b>		<b>State/Province</b>	
<b>Landing Site</b>		<b>Day/Month/Year</b>	
<b>Name of Enumerator</b>		<b>Record No</b>	

## Vessel Information

<b>Type of Fishing Gear</b>			
<b>Vessel Name</b>		<b>Registration No</b>	
<b>GRT</b>		<b>No of Crew</b>	

## Trip Information

<b>Days at Sea</b>		<b>Days at Operation</b>	
<b>Total Number of Operation</b>			

## Fishing Ground Information

<b>Fishing Zone</b>		<b>Depth (average)</b>	
<b>Distance from port</b>		<b>Distance from coastline</b>	
<b>Longitude</b>		<b>Latitude</b>	

## Gear Information (Select and Check One Gear below)

 Trawl Net

<b>Width of Mouth</b>		(m)	<b>Height of Mouth</b>		(m)
<b>Length of Net</b>		(m)	<b>Mesh Size (Cod End)</b>		(cm)
<b>No of Operation/day</b>		(times)	<b>Time of Operation/haul</b>		(hours)
<b>Vessel Speed</b>		(knot)	<b>Fishing Layer</b>		Mild/Bottom

 Gill Net/Drift Net

<b>Length of Net</b>		(m)	<b>Height of Net</b>		(m)
<b>Fishing Layer</b>			<b>Mesh Size</b>		(cm)
<b>No of Operation/day</b>			<b>Time of Operation/haul</b>		(hours)

 Hook and Line/Troll

<b>No of Hooks</b>		(m)	<b>Size of Hook</b>		(cm)
<b>Time of Operation/day</b>		(hours)	<b>Vessel Speed</b>		(knot)

 Longline

<b>Total No of Hooks</b>		(m)	<b>Size of Hook</b>		(cm)
<b>Length of Mainline</b>		(km)	<b>Fishing Layer</b>		Mild/Bottom
<b>No of Operation/day</b>		(times)	<b>Time of Operation/set</b>		(hours)

 Purse Seine

<b>Length of Net</b>		(m)	<b>Mesh Size (Bunt)</b>		(cm)
<b>No of Operation/day</b>		(times)	<b>Duration of Operation</b>		(hours)
<b>Fish Searching</b>	Luring / FADs / Wild / Others ( )				

Other gears:

**A. Standard Operation Procedure:**

1. This form is for a single sampling vessel.
2. Collect all fish (shark and ray) if catch is less than 50 individuals or 10 – 20% of the landed catch if more than 50 individuals. Take samples randomly.
3. Separate them by species and sex.
4. Record Total Length-Weight for all sharks, rays and skates from the Family Pristidae, Rhynchobatidae, Rhinidae, Rhinobatidae, Narcinidae and Nurkidae. Measure Disc Length-Weight for other ray species.
5. Measure Pre Caudal Length (PCL) for *Alopias* spp. or other sharks and rays (Rhynchobatidae, Rhinidae, Rhinobatidae) if tail damage or cut.
6. Record total weight of all sharks and rays by species.
7. Record total weight of commercial bony fish and trash fish.

**B. Length-weight of sharks**

No	Species	Sex	TL	Weight (kg)

**C. Actual Weight of Sharks by Species**

No	Species	Weight (kg)

**D. Length-weight of Rays**

No	Species	Sex	DL or DW	Weight (kg)

**E. Actual Weight of Rays by Species**

No	Species	Weight (kg)

**Note:**

All sharks and rays specimens should be measured and weighted if total number are less than 50 individuals/boat.

If total numbers are more than 50 individuals, only 10 – 20% (multi size and sex) should be selected for length-weight measurement.

**F. Total Catch of Sampling Vessel (kg)**

No	All Sharks	All Rays	Commercial Bony Fish	Trash Fish	TOTAL

**G. Price of Sharks and Marketing Information (Local Currency)**

Species	Price/Kg (Small size)	Price/Kg (Medium size)	Price/Kg (Big size) (Peso)	Market Destination	Utilization

**Please record:**

Small Size (TL/PCL):           cm ~ cm *ca*  
 Medium Size (TL/PCL):       cm ~ cm *ca*  
 Big Size (TL/PCL):           cm ~ cm *ca*  
 Small Size (kg):               kg ~ kg *ca*  
 Medium Size (kg):             kg ~ kg *ca*  
 Big Size (TL/PCL):           kg ~ kg *ca*

**H. Price of Rays and Marketing Information (Local Currency)**

Name of Rays	Price/Kg (Small size)	Price/Kg (Medium size)	Price/Kg (Big size)	Market Destination	Utilization

**Please record:**

Small Size (DL/TL/PCL):       cm ~ cm *ca*  
 Medium Size (DL/TL/PCL):   cm ~ cm *ca*  
 Big Size (DL/TL/PCL):       cm ~ cm *ca*  
 Small Size (kg):               kg ~ kg *ca*  
 Medium Size (kg):             kg ~ kg *ca*  
 Big Size (TL/PCL):           kg ~ kg *ca*

**Note:** \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

## Checklist of Sharks and Rays Species Recorded During the Study Period

<b>Batooids/Rays</b>			
	<b>ORDER MYLIOBATIFORMES</b>	<b>Larut Matang</b>	<b>Kota Kinabalu</b>
	<b>Family Dasyatidae</b>		
1	<i>Bathytoshia lata</i>		+
2	<i>Brevitrygon heterura</i>	+	+
3	<i>Brevitrygon imbricata</i>		+
4	<i>Dasyatis cf thetidis</i>		+
5	<i>Dasyatis parvonigra</i>		+
6	<i>Hemitrygon akajei</i>	+	+
7	<i>Himantura leoparda</i>		+
8	<i>Himantura uarnak</i>	+	+
9	<i>Himantura undulata</i>	+	
10	<i>Maculabatis gerrardi</i>	+	+
11	<i>Maculabatis pastinacoides</i>	+	
12	<i>Neotrygon orientalis</i>	+	+
13	<i>Pastinachus gracilicaudus</i>		+
14	<i>Pastinachus stellurostris</i>	+	+
15	<i>Pateobatis fai</i>	+	+
16	<i>Pateobatis jenkinsii</i>	+	+
17	<i>Taeniura lymma</i>		+
18	<i>Telatrygon biasa</i>	+	+
	<b>Family Gymnuridae</b>		
19	<i>Gymnura japonica</i>		+
20	<i>Gymnura poecilura</i>		+
	<b>Family Mobulidae</b>		
21	<i>Mobula japanica</i>	+	+
22	<i>Mobula kuhlii</i>		+
	<b>Family Myliobatidae</b>		
23	<i>Aetobatus ocellatus</i>		+
24	<i>Aetomylaeus nichofii</i>		+
25	<i>Aetomylaeus vespertilio</i>		+
	<b>Family Rhinopteridae</b>		
26	<i>Rhinoptera jayakari</i>		+
	<b>Family Urolophidae</b>		
27	<i>Urolophus expansus</i>		+
	<b>ORDER RHINOPRISTIFORMES</b>		
	<b>Family Rhinidae</b>		
28	<i>Rhina ancylostoma</i>	+	
29	<i>Rhynchobatus australiae</i>	+	+
	<b>Family Rhinobatidae</b>		
30	<i>Rhinobatos cf jimbarensis</i>		+
	<b>ORDER TORPEDINIFORMES</b>		
	<b>Family Narcinidae</b>		
31	<i>Narcine maculata</i>	+	
32	<i>Narcine prodorsalis</i>	+	
	<b>Total ray species</b>	<b>16</b>	<b>27</b>

<b>Sharks</b>			
<b>ORDER CARCHARHINIFORMES</b>			
<b>Family Carcharhinidae</b>			
1	<i>Carcharhinus brevipinna</i>	+	+
2	<i>Carcharhinus leucas</i>	+	+
3	<i>Carcharhinus limbatus</i>		+
4	<i>Carcharhinus melanopterus</i>		+
5	<i>Carcharhinus plumbeus</i>		+
6	<i>Carcharhinus sorrah</i>	+	+
7	<i>Galeocerdo cuvier</i>	+	+
8	<i>Loxodon macrorhinus</i>		+
9	<i>Rhizoprionodon acutus</i>		+
<b>Family Hemigaleidae</b>			
10	<i>Chaenogaleus macrostoma</i>		+
11	<i>Hemispristis elongata</i>		+
<b>Family Scyliorhinidae</b>			
12	<i>Atelomycterus cf erdmanni</i>	+	
13	<i>Atelomycterus marmoratus</i>	+	+
14	<i>Halaehurus buergeri</i>		+
15	<i>Hemigaleus microstoma</i>		+
<b>Family Sphyrnidae</b>			
16	<i>Sphyrna lewini</i>	+	+
<b>Family Triakidae</b>			
17	<i>Mustelus mosis</i>		+
18	<i>Mustelus sp.</i>		+
19	<i>Mustelus widodoi</i>		+
<b>ORDER LAMNIFORMES</b>			
<b>Family Alopiidae</b>			
20	<i>Alopias pelagicus</i>		+
<b>ORDER ORECTOLOBIFORMES</b>			
<b>Family Hemiscylliidae</b>			
21	<i>Chiloscyllium hasseltii</i>	+	
22	<i>Chiloscyllium indicum</i>	+	
23	<i>Chiloscyllium plagiosum</i>		+
24	<i>Chiloscyllium punctatum</i>	+	+
<b>Family Orectolobidae</b>			
25	<i>Orectolobus leptolineatus</i>		+
<b>ORDER SQUALIFORMES</b>			
<b>Family Squalidae</b>			
26	<i>Squalus megalops</i>		+
<b>Total shark species</b>		<b>10</b>	<b>23</b>



### Appendix III

#### List of Range Size of Small, Medium and Big by Species (in cm)

Disc length for all rays (except for species in family Rhinobatidae, Narcinidae and Rhinidae) and total length for all sharks species.

No.	Species	Larut Matang, Perak			Kota Kinabalu, Sabah		
		Small	Medium	Big	Small	Medium	Big
	<b>Rays</b>						
	<b>Family Dasyatidae</b>						
1	<i>Bathytoshia lata</i>				< 31.3	31.3 - 44.4	> 44.4
2	<i>Brevitrygon heterura</i>	< 14	14 - 27	> 27	< 18.2	18.2 - 27	> 27
3	<i>Brevitrygon imbricata</i>				< 23.5	23.5	> 23.5
4	<i>Dasyatis cf thetidis</i>				< 144	144	> 144
5	<i>Dasyatis parvonigra</i>				< 21.5	21.5 - 57.5	> 57.5
6	<i>Hemitrygon akajei</i>	< 31	31 - 62	> 62	< 52.5	52.5 - 62.3	> 62.3
7	<i>Himantura leoparda</i>				< 57.3	57.3 - 95.2	> 95.2
8	<i>Himantura uarnak</i>	< 96	96	> 96	< 23	23 - 74.3	> 74.3
9	<i>Himantura undulata</i>	< 62	62 - 108	> 108			
10	<i>Maculabatis gerrardi</i>	< 14	14 - 100	> 100	< 15.3	15.3 - 80.3	> 80.3
11	<i>Maculabatis pastinacoides</i>	< 34	34 - 94	> 94			
12	<i>Neotrygon orientalis</i>	< 13.5	13.5 - 34	> 34	< 9.8	9.8 - 34	> 34
13	<i>Pastinachus gracilicaudus</i>				< 24.4	24.2 - 78.3	> 78.3
14	<i>Pastinachus stellurostris</i>	< 63	63	> 63	< 41.3	41.3 - 65.2	> 65.2
15	<i>Pateobatis fai</i>	< 145	145	> 145	< 43.5	43.5 - 72.2	> 72.2
16	<i>Pateobatis jenkinsii</i>	< 37	37 - 66	> 66	< 41.2	41.2 - 70.2	> 70.2
17	<i>Taeniura lymma</i>				< 18.2	18.2 - 35.4	> 35.4
18	<i>Telatrygon biasa</i>	< 15	15 - 37	> 37	< 14.1	14.1 - 33.6	> 33.6
	<b>Family Gymnuridae</b>						
19	<i>Gymnura japonica</i>				< 16.5	16.5 - 44	> 44
20	<i>Gymnura poecilura</i>				< 21.3	21.3 - 48.7	> 48.7
	<b>Family Mobulidae</b>						
21	<i>Mobula japonica</i>	< 119	119	> 119	< 60.5	60.5 - 66.5	> 66.5
22	<i>Mobula kuhlii</i>				< 39.5	39.5 - 85.5	> 85.5
	<b>Family Myliobatidae</b>						
23	<i>Aetobatus ocellatus</i>				< 25	25 - 84.3	> 84.3
24	<i>Aetomylaeus nichofii</i>				< 30.7	30.7 - 49	> 49
25	<i>Aetomylaeus vespertilio</i>				< 74.4	74.4	> 74.4
	<b>Family Rhinopteridae</b>						
26	<i>Rhinoptera jayakari</i>				< 29.3	29.3 - 70	> 70
	<b>Family Urolophidae</b>						
27	<i>Urolophus expansus</i>				< 18.5	18.5 - 23.9	> 23.9
	<b>Family Rhinidae</b>						
28	<i>Rhina ancylostoma</i>	< 125	125	> 125			
29	<i>Rhynchobatus australiae</i>	< 45	45 - 185	> 185	< 49	49 - 124.6	> 124.6
	<b>Family Rhinobatidae</b>						
30	<i>Rhinobatos cf jimbarensis</i>				< 29.5	29.5 - 104.7	> 104.7
	<b>Family Narcinidae</b>						
31	<i>Narcine maculata</i>	< 39	39	> 39			
32	<i>Narcine prodorsalis</i>	< 27.5	27.5	> 27.5			

	<b>Sharks</b>						
	<i>Carcharhinus brevipinna</i>	< 74	74 - 88	> 88	< 61	61 - 99	> 99
	<i>Carcharhinus leucas</i>	< 75	75 - 302	> 302	< 73.4	73.4 - 168	> 168
	<i>Carcharhinus limbatus</i>				< 54.6	54.6 - 93.6	> 93.6
	<i>Carcharhinus melanopterus</i>				< 114.2	114.2 - 134	> 134
	<i>Carcharhinus plumbeus</i>				< 71.2	71.2 - 102.3	> 102.3
	<i>Carcharhinus sorrah</i>	< 47	47 - 135	> 135	< 50.2	50.2 - 146.5	> 146.5
	<i>Galeocerdo cuvier</i>	< 134	134 - 139	> 139	< 88.5	88.5 - 160.2	> 160.2
	<i>Loxodon macrorhinus</i>				< 42.8	42.8 - 92.8	> 92.8
	<i>Rhizoprionodon acutus</i>				< 91.6	91.6	> 91.6
	<b>Family Hemigaleidae</b>						
	<i>Chaenogaleus macrostoma</i>				< 49	49 - 50.4	> 50.4
	<i>Hemispristis elongata</i>				< 45.6	45.6 - 118.8	> 118.8
	<b>Family Scyliorhinidae</b>						
	<i>Atelomycterus cf erdmanni</i>	< 42	42 - 56	> 56			
	<i>Atelomycterus marmoratus</i>	< 38	38 - 57	> 57	< 33.2	33.2 - 778	> 77.8
	<i>Halaelurus buergeri</i>				< 39.4	39.4 - 47.2	> 47.2
	<i>Hemigaleus microstoma</i>				< 42.3	42.3 - 120.8	> 120.8
	<b>Family Sphyrnidae</b>						
	<i>Sphyrna lewini</i>	< 47.5	47.5 - 55	> 55	< 47.2	47.2 - 158.7	> 158.7
	<b>Family Triakidae</b>						
	<i>Mustelus mosis</i>				< 70.3	70.3 - 98	> 98
	<i>Mustelus sp.</i>				< 53.2	53.2 - 100.3	> 100.3
	<i>Mustelus widodoi</i>				< 90	90 - 112	> 112
	<b>Family Alopidae</b>						
	<i>Alopias pelagicus</i>				< 162	162 - 205.8	> 205.8
	<b>Family Hemiscylliidae</b>						
	<i>Chiloscyllium hasseltii</i>	< 35	35 - 89	> 89			
	<i>Chiloscyllium indicum</i>	< 39	39 - 61	> 61			
	<i>Chiloscyllium plagiosum</i>				< 39.1	39.1 - 89.7	> 89.7
	<i>Chiloscyllium punctatum</i>	< 35	35 - 100	> 100	< 40	40 - 103.7	> 103.7
	<b>Family Orectolobidae</b>						
	<i>Orectolobus leptolineatus</i>				< 91.2	91.2	> 91.2
	<b>Family Squalidae</b>						
	<i>Squalus megalops</i>				< 36.2	36.2 - 73	> 73





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ISBN 978-967-0633-78-7



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