MALAYSIA
NATIONAL PLAN OF ACTION
FOR THE CONSERVATION AND
MANAGEMENT OF SHARK
(MALAYSIA NPOA - SHARK)

DEPARTMENT OF FISHERIES
MINISTRY OF AGRICULTURE AND AGRO-BASED INDUSTRY
MALAYSIA

2006
Malaysia national plan of action for the conservation and management of shark (Malaysia NPOA-shark).
1. Sharks--Conservation--Malaysia. 2. Fishery management--Malaysia. 597.309595

Department of Fisheries Malaysia
Ministry of Agriculture and Agro-based Industry Malaysia,
Level 1-7, Wisma Tani,
Lot 4G2, Presint 4,
61628 Putrajaya.

Tel: 603 88704000
Fax: 603 88891233
E-mail: hqhelp@dof.moa.my
http://agrolink.moa.my/dof/

Copyright©2006 Department of Fisheries Malaysia

All Rights Reserved: No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical photocopying, recording or otherwise, without prior permission of the copyright owner.

This publication should be cited as follows:

Department of Fisheries Malaysia, 2006. Malaysia National Plan of Action for the Conservation and Management of Shark, Ministry of Agriculture and Agro-based Industry Malaysia, Putrajaya. 66 pp
SUMMARY

Malaysia NPOA-Shark was developed according to the guidelines as set out in the FAO International Plan of Action for the Conservation and Management of Sharks (IPOA-Sharks). The main objective of Malaysia NPOA-Shark is to ensure the conservation and management of shark and their long-term sustainable use. For the purpose of this document, the term ‘shark’ refers to all chondrichthyan or cartilaginous fishes, comprising sharks, skates, rays and chimaeras.

This management plan will provide a national guideline for managers and interested stakeholders on how to incorporate the conservation and management issues of sharks and rays into the overall management of fisheries resources.

The Malaysia NPOA-Shark is divided into four parts:

CHAPTER I: INTRODUCTION
• Provides a description of why the NPOA-Shark has been developed and how it will be implemented.
• Lists the conservation and management issues the NPOA-Shark strives to address.
• Provides a discussion of issues relating to its implementation and review.

CHAPTER II: SYNOPSIS OF MALAYSIAN FISHERIES
• Provides a general overview of Malaysian Fisheries.
• Presents status of sharks and rays resources in Malaysia.
• Discusses issues related to trade and products of sharks species.
• Discusses issues related to the economics of sharks in Malaysian fishery.

CHAPTER III: MANAGEMENT PLAN AND IMPLEMENTATION FRAMEWORK
• Provides descriptions of each of conservation and management measures as addressed by the NPOA-Shark.
• Discusses matters related to the management of action plan.
• Provides mechanism to evaluate management process.
• Discusses issues related to management.
• Provides the action plans and implementation schedule from 2006 to 2010.

CHAPTER IV: CONCLUSION
• Provides list of activities need to be undertake by the Government of Malaysia in the conservation, enhancement and management of shark resources.
The chondrichthyan biodiversity in Malaysia is among the richest in the Southeast Asia region with 134 species have been recorded comprising 63 species of sharks, 68 species of rays and 3 species of chimaeras. For centuries, coastal fishers have conducted fishing for this resource sustainably in coastal waters, and some still do. However, during recent decades, modern technology in combination with access to distant markets have caused an increase in effort and yield of catches, as well as an expansion of the fishing areas.

Sharks and rays are not targeted by fishers in Malaysia, but they are caught together with other commercially important species. The landings contributed only a minor portion of less than 2.2% of the total marine landings. However, the landing of sharks and rays shows the increasing trend. Thus there is a need to address more specific and strategic conservation and management measures of sharks and their relatives which have been characterised by “K-selected life history traits” including slow growth, late sex maturity, low fecundity and long live. Their life histories of low rates of population increase make these species highly vulnerable to overexploitation and slow to recover once their populations have been depleted.

Even though the Malaysian fishers do not purposely targeting for shark, but as a member of the UN FAO, Malaysia is committed to producing its own National Plan of Action for the Conservation and Management of Shark. However, since Malaysia has tropical-multispecies fisheries, it would be impossible to focus on individual resource, or specific mono-species stock of fish. Management is best achieved for fish population as a whole.

The Malaysia NPOA-Shark highlights the background of Malaysian fisheries, which focuses on the status of shark and ray resources, capture methods, trade and utilisation, their economics, as well as technical measures and strategies to overcome problems in conservation and management. This management plan is very informative, useful and meaningful to the country as a national guideline for the conservation and management activities for long-term sustainable use of elasmobranch resources.

I would like to take this opportunity to thank Mr. Raja Mohammad Noordin bin Raja Omar for his initiative to establish the Malaysia NPOA-Shark Working Group which comprised of officers from various disciplines in the DoFM. With the dedication, ideas and effort of the Group, this document could be published as scheduled.

I also would like to thank all staff of the DoFM and other government agencies, NGOs, private sectors and personal who were actively participated during the stakeholder meetings which were held in Putrajaya and Bintulu.

DATO’ JUNAI DI BIN CHE AYUB
Wisma Tani, Putrajaya
2006
FOREWORD

Much of the original content of this document was written and compiled by Mr. Ahmad bin Ali, Ms. Mahyam binti Mohd. Isa and Mr. Abdul Haris Hilmi bin Ahmad Arshad in 2004 with substantial assistance from members of Malaysia NPOA-Shark Working Group. Three meetings were organised in 2004 to discuss various issues of elasmobranch including their taxonomy, biology, habitat, trend of landings, fishing gears, management issues as well as conservation and management strategies.

The final draft was completed in February 2005 and can be accessed by public and stakeholders through internet at www.mfrdmd.org.my. It was presented to the Departmental Planning Committee of the Department of Fisheries Malaysia chaired by the Director-General of Fisheries Malaysia in Mac 2005 for comments and approval. Additional inputs were gathered through two series of discussion with stakeholders which were held in Putrajaya in August 2005 and in Bintulu, Sarawak in November 2005.

I hope this guideline will be used as a reference for managers and administrators of the DoFM in their planning and action taken in order to achieve the sustainable utilisation of shark resources in the future.

I would like to take this opportunity to thank the Honourable Dato’ Junaidi bin Che Ayub, the Director-General of Fisheries Malaysia for his encouragement and guidance throughout the group’s work. I would like also to express my sincerest gratitude to all the members of Group from many disciplines in the DoFM, other governmental organisation, NGOs as well as individuals for their ideas, time, information and tireless efforts in realizing this guideline.

Thank you.

RAJA MOHAMMAD NOORDIN BIN RAJA OMAR
Chairman,
Malaysia NPOA-Shark Working Group
DPPSPM
Kuala Terengganu
2006
1. Mr. Raja Mohammad Noordin bin Raja Omar, Director, Marine Fishery Resources Development and Management Department, Kuala Terengganu, Terengganu.


3. Mr. Ahmad bin Ali, Head, Resource Exploration and Conservation Unit, Marine Fishery Resources Development and Management Department, Kuala Terengganu, Terengganu.

4. Mr. Ku Kassim bin Ku Yaacob, Head, Remote Sensing and Fish Forecasting Unit, Marine Fishery Resources Development and Management Department, Kuala Terengganu, Terengganu.

5. Mr. Abu Talib bin Ahmad, Head, Resource Section, Fisheries Research Institute, Batu Maung, Penang.

6. Mr. Abdul Haris Hilmi bin Ahmad Arshad, Research Officer, Fisheries Research Institute, Batu Maung, Penang.

7. Mr. Albert Chuan Gambang, Head, Fisheries Research Institute, Sarawak Branch, Bintawa, Sarawak.

8. Dr. Ahemad bin Sade, Head, Fisheries Research Center, Likas, Sabah.

9. Mr. Abdul Jamal bin Mydin, Former Director of Resource Conservation Division, Department of Fisheries Malaysia, Putrajaya.

10. Mr. Ahmad Saktian bin Langgang, Head, Coastal Resources Section, Department of Fisheries Malaysia, Putrajaya.

11. Mr. Ismaili bin Hj. Bujang Pit Head, Marine Fish Technology and Post-harvest Section, Department of Fisheries Malaysia, Putrajaya.

12. Ms. Arfah Faris Mohd. Amin Fisheries Officer, Department of Fisheries Malaysia, Putrajaya.
Back row from left: Mr. Raja Mohammad Noordin bin Raja Omar, Mr. Abdul Jamal bin Mydin, Mr. Albert Chuan Gambang, Mr. Ahmad Saktian bin Langgang, Mr. Abu Talib bin Ahmad and Mr. Ahmad bin Ali.

Front row from left: Mr. Abdul Haris Hilmi bin Ahmad Arshad, Mr. Ku Kassim bin Ku Yaacob, Ms. Mahyam binti Mohd Isa and Ms. Arfah Faris binti Mohd Amin.

Not in the picture: Dr. Ahemad bin Sade, Mr. Ismaili bin Hj. Bujang Pit.
We would like to thank the Honourable Dato’ Junaidi bin Che Ayub, Director-General of Fisheries Malaysia for his support in the preparation of this document.

We are grateful to all people in the DoFM, particularly Mr. Mohd. Shaupi bin Derahman, Director of Planning and International Division; Mr. Hj. Mhd. Shah bin Abdul Hamid, Director of Human and Resource Development Division; Mr. Abdul Hamid bin Abdul Shukor, Director of Extension and Fish Quality Division; Mr. Haji Abdul Rahman bin Muhammad, Director of Licensing and Resource Management Division; Mr. Leong Phin Feng, Director of Engineering Division; Mr. Ismail bin Abu Hassan, Director of Aquaculture Division; Mr. Hj. Suhaili bin Lee, Director of Department of Marine Fisheries Sarawak; Mr. Azlisha bin Ab. Aziz, Director of Management Fisheries Information; Mr. Abdul Khalil bin Abdul Karim, Director of Resource Protection; Mr. Zainol bin Mohd Top, Head of Fisheries Training Institute; Mr. Hj. Ahmad Azahari bin Ahmad, Head of Planning Section; Dr. Sukarno bin Wagiman, Head of Conservation Section; Mr. Daim bin Hj. Basrun, Department of Fisheries Sabah and Mr. Abdullah bin Jaafar, Legal Section of DoFM for their contribution during the presentation of the Malaysia NPOA-shark document in the Departmental Planning Committee Meeting on 28 March 2005.

We are also grateful to Prof. Dato’ Dr. Mohamed Shariff bin Mohamed Din (Malaysia Fisheries Association); Mr. Ahamad Sabki bin Mahmood, Deputy Director-General of Fisheries (Operation); Mr. Mohamad bin Mat Saman, Director Department of Fisheries Pahang; Ms. Fauzidah binti Othman, Head of Aquaculture Marine Section; Mr. Awangku Isa bin Pengiran Hj. Amjah, Department of Marine Fisheries Sarawak; Mr. Hj. Pathi bin Hj. Kerni (Sarawak Chief Minister Office); Mr. Rooney Biusing, Department of Fisheries Sabah; Mr. Hj. Raihan bin Hj. Sheikh Ahmad, Director Department of Fisheries Negeri Sembilan; Mr. Hj. Mohd Sufian bin Sulaiman, Director Department of Fisheries Malacca; Ms. Azwa binti Abdul Hamid, Department of Fisheries Perak; Ms. Zahaitun Mahani binti Zakariah (MIMA); Ms. Noraini binti Awang Anak (Traffic Southeast Asia); Mr. Johari bin Mohd Noor (PENENTU, Terengganu); Mr. Hj. Arshat bin Kasa (PEN MUTIARA) and many other individuals from the states and federal governments as well as non-governmental organization who are directly or indirectly contribute their ideas and suggestions during the discussion with respectively stakeholders held in Putrajaya and Bintulu on 16 August 2005 and 24 November 2005.

Many other individuals also involved in collecting of scientific information especially during the “Data Collection and Biological Study of Sharks for Fisheries Management in Malaysia” which was conducted from July 2003-August 2004. They were Ms. Maimunah binti Sulong (DoF Pahang); Mr. Mohd. Ali bin Hashim (DoF Perak); Mr. Binjamin Martin and Mr. Irman Isnain (FRC, Likas); Mr. Guraim Gueh, Mr. Chin En Kiong and Mr. Mazlee Duguh (DoF Sabah); Mr. Hamzah Yusop and Mr. Lim Hong Peng (DoF Sarawak); Ms. Annie Lim Pheik Khio (FRI, Bintawa) and Mr. Abdul Rahman Majid (FRI, Penang). The trade data were collected by Ms. Lim Chai Fong and Ms. Yeo Moi Eim from Department of Fisheries Malaysia (Putrajaya).

Last but not least we also wish to thank Ms. Haryati Abd. Wahab, Ms. Faizah binti Ismail, Mr. Chong Yew Lim, Ms. Azimah binti Jumaiti, Mr. Solahuddin A. Razak and Mr. Nor Azman Zakaria for helping us in many ways in the preparation of this guideline.
<table>
<thead>
<tr>
<th>Table</th>
<th>Descriptions</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.</td>
<td>Average catch rates (kg hr⁻¹) of sharks by depth strata on the east and west coasts of Peninsular Malaysia from trawl resource surveys (1970 - 2001). (Depths are in metres)</td>
<td>16</td>
</tr>
<tr>
<td>4.</td>
<td>Average catch rates (kg hr⁻¹) of rays by depth strata on the east and west coasts of Peninsular Malaysia from trawl resource surveys (1970 - 2001). (Depths are in metres)</td>
<td>17</td>
</tr>
<tr>
<td>5.</td>
<td>Percentage (%) of catch by weight of sharks by depth strata from trawl surveys on west coast and east coast of Peninsular Malaysia (1970 - 2001). (Depths are in metres)</td>
<td>21</td>
</tr>
<tr>
<td>6.</td>
<td>Percentage (%) of catch by weight of rays by depth strata from trawls surveys on west coast and east coast of Peninsular Malaysia (1970 - 2001). (Depths are in metres)</td>
<td>21</td>
</tr>
<tr>
<td>7.</td>
<td>Catch rate (kg hr⁻¹) and the percentage (%) of catch by weight of sharks and rays by depth strata from trawl surveys of the coasts of Sarawak and Sabah in 1998. (Depths are in metres)</td>
<td>22</td>
</tr>
<tr>
<td>8.</td>
<td>Fishing grounds of sharks and rays in Malaysian waters.</td>
<td>23</td>
</tr>
<tr>
<td>9.</td>
<td>Species compositions of the ten most dominant species by landing site (percentage by numbers).</td>
<td>25</td>
</tr>
<tr>
<td>10.</td>
<td>Size distribution of sharks by species and area.</td>
<td>26</td>
</tr>
<tr>
<td>11.</td>
<td>Percentage of maturity for five most dominant species of sharks by area and sex.</td>
<td>27</td>
</tr>
<tr>
<td>12.</td>
<td>Changes in the catch composition of sharks percentage for Peninsular Malaysia by different gears from 1965 – 2001.</td>
<td>28</td>
</tr>
<tr>
<td>13.</td>
<td>Price, local usage and marketing destination of shark at six landing sites based on study conducted from July 2003 to August 2004.</td>
<td>30</td>
</tr>
<tr>
<td>Table</td>
<td>Descriptions</td>
<td>Page</td>
</tr>
<tr>
<td>---------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>15.</td>
<td>The landing and market prices of sharks and rays in Malaysia. (Source: Ahmad et al., 2004).</td>
<td>35</td>
</tr>
<tr>
<td>16.</td>
<td>The landing and market prices of fins and other products of sharks and rays in Malaysia (Source: Ahmad et al., 2004).</td>
<td>35</td>
</tr>
</tbody>
</table>
# List of Figures

<table>
<thead>
<tr>
<th>Figure</th>
<th>Descriptions</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.</td>
<td>Map showing location of landing centres for sharks.</td>
<td>14</td>
</tr>
</tbody>
</table>

# List of Appendix

<table>
<thead>
<tr>
<th>Appendix</th>
<th>Descriptions</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Checklist of Elasmobranchs recorded from Malaysia.</td>
<td>58</td>
</tr>
</tbody>
</table>
### List of Acronyms

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Full Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASEAN</td>
<td>Association of Southeast Asian Nation</td>
</tr>
<tr>
<td>DoFM</td>
<td>Department of Fisheries Malaysia</td>
</tr>
<tr>
<td>DPPSPM</td>
<td>Departmen Penyelidikan dan Pengurusan Sumber Perikanan Marin</td>
</tr>
<tr>
<td>EEZ</td>
<td>Economic Exclusive Zone</td>
</tr>
<tr>
<td>FAO</td>
<td>Food and Agriculture Organisation</td>
</tr>
<tr>
<td>FRC</td>
<td>Fisheries Research Centre</td>
</tr>
<tr>
<td>FDAM</td>
<td>Fisheries Development Authority of Malaysia</td>
</tr>
<tr>
<td>FMID</td>
<td>Fisheries Management and Information Division</td>
</tr>
<tr>
<td>IPOA</td>
<td>International Plan of Action</td>
</tr>
<tr>
<td>MARDI</td>
<td>Malaysian Agriculture and Research Development Institute</td>
</tr>
<tr>
<td>MoAAI</td>
<td>Ministry of Agriculture and Agro-Based Industry</td>
</tr>
<tr>
<td>MITI</td>
<td>Ministry of International Trade and Industry</td>
</tr>
<tr>
<td>MIMA</td>
<td>Maritime Institute of Malaysia</td>
</tr>
<tr>
<td>MNRE</td>
<td>Ministry of National Resources</td>
</tr>
<tr>
<td>MEY</td>
<td>Maximum Economic Yield</td>
</tr>
<tr>
<td>MSY</td>
<td>Maximum Sustainable Yield</td>
</tr>
<tr>
<td>NEKMAT</td>
<td>National Fishermen Association</td>
</tr>
<tr>
<td>NPOA</td>
<td>National Plan of Action</td>
</tr>
<tr>
<td>RD</td>
<td>Research Division</td>
</tr>
<tr>
<td>SEAFDEC</td>
<td>Southeast Asian Fisheries Development Center</td>
</tr>
<tr>
<td>UN FAO</td>
<td>United Nation of Food and Agriculture Organisation</td>
</tr>
<tr>
<td>USA</td>
<td>United State of America</td>
</tr>
<tr>
<td>WWF</td>
<td>World Wildlife Fund</td>
</tr>
</tbody>
</table>
# CONTENTS

<table>
<thead>
<tr>
<th>Summary</th>
<th>iii</th>
</tr>
</thead>
<tbody>
<tr>
<td>Massage by the Director-General of Fisheries Malaysia</td>
<td>iv</td>
</tr>
<tr>
<td>Foreword</td>
<td>v</td>
</tr>
<tr>
<td>Members of Malaysia NPOA-Shark Working Group</td>
<td>vi</td>
</tr>
<tr>
<td>Acknowledgements</td>
<td>viii</td>
</tr>
<tr>
<td>List of Tables</td>
<td>ix</td>
</tr>
<tr>
<td>List of Figures</td>
<td>xi</td>
</tr>
<tr>
<td>List of Appendix</td>
<td>xi</td>
</tr>
<tr>
<td>List of Acronyms</td>
<td>xii</td>
</tr>
</tbody>
</table>

## CHAPTER 1

### INTRODUCTION

- Purpose and Need: 1
- Overall Objective of NPOA-Shark: 2
- Issues in the Conservation and Management of Sharks and Rays Resources: 2
- Monitoring and Evaluation: 3

## CHAPTER II

### SYNOPSIS OF MALAYSIAN FISHERIES

- General Overview of Malaysian Fisheries: 7
ACTION PLAN

Strengthening of Data Collection on Biology and Related Habitats

Strengthening of Data Collection on Socio-economic of Fishers and Traders

Strengthening of Data Collection on Trades and Encouraging the Utilisation of Elasmobranch Catches

Capacity Building and Coordinated Research

Effective Conservation and Management

IMPLEMENTATION SCHEDULE

CHAPTER IV

CONCLUSION

References

Appendix I
INTRODUCTION

Purpose and Need

In recognition of the expanding global catch of shark and the potential negative impact on shark population both directly and indirectly by a wide array of human activities, the International Plan of Action for the Conservation and Management of Sharks (IPOA-Sharks) was adopted by the 23rd Session of the United Nations of Food and Agriculture Organizations (UN FAO) Committee on Fisheries in 1999. The IPOA-Sharks is a voluntary international instrument developed so that nations can take positive action to ensure the conservation and management of shark and their long-term sustainable use. It is widely known that sharks generally have low reproduction rate, late maturity and small population size. As a result, sharks are susceptible to overfishing and slow to recover if overfished. Even though Malaysia is not a major shark fishing nation but as a member of the UN FAO, Malaysia is committed to produce its own National Plan of Action for Shark. This is also agreed during the second ASEAN-SEAFDEC Regional Technical Consultation on Sharks Fisheries, held in Phuket, Thailand from 13 to 15 July 2004.

The NPOA-Shark has been developed based on information collected by Department of Fisheries Malaysia (DoFM) through several series of demersal trawl surveys conducted in the Malaysian Exclusive Economic Zone (EEZ) from 1971 to 2001. Information was also gathered from the Annual Fisheries Statistics obtained from DoFM and the Southeast Asian Fisheries Development Center (SEAFDEC). A study to collect information on elasmobranch biodiversity in Sabah was conducted by Sharks Specialist Group's Darwin Project from January 1996 to June 1997. From 1999 to 2004, a project, entitled, “Biology and Fishery of Sharks in SEAFDEC Member Countries” was conducted in collaboration with Seikai Laboratory National Fishery Research Institute, Ishigaki Tropical Station, Okinawa, Japan. The project provides information on taxonomy, biology and distribution of shark species. In addition, more comprehensive data on sharks landings, biology, trade and utilization were collected through a cost-sharing project between SEAFDEC and DoFM. The project was conducted from July 2003 to August 2004.

Information collected on shark was assessed and a committee comprising fisheries resource managers and researchers prepared this NPOA-Shark. The outcomes of the discussion were then presented to stakeholders comprising of government agencies, universities, fishers associations, recreational fishing associations, non-governmental organisations and fishers representatives to obtain feedbacks and general acceptance of the NPOA-Shark.

The plan addresses the importance of shark resources in the conservation of marine biodiversity and sustainable use of the resources for future generation. The success of the plan depends on the close cooperation between the implementing agencies and stakeholders.
Overall Objective of NPOA-Shark

The overall objective of the NPOA-Shark is to ensure the conservation and management of sharks and rays and their long-term sustainable use, as mentioned in the FAO IPOA-Sharks.

The plan aims to:

• Ensure that sharks and rays catches are sustainable;

• Assess threats to sharks and rays population, determine and protect critical habitats, and implement harvesting strategies consistent with the principal of biological sustainability and rational long-term economic use;

• Identify and provide special attention in particular to vulnerable or threatened sharks and rays stocks;

• Improve and develop framework for establishing and coordinating effective consultation involving stakeholders in research, management and educational initiatives within and between States;

• Minimise unutilised incidental catches of sharks and rays;

• Contribute to the protection of biodiversity and ecosystem structure and functions;

• Minimise waste and discards from sharks and rays catches in accordance with article 7.2.2 (g) of the Code of Conduct for Responsible Fisheries (for example, requiring the retention of sharks from which fins are removed);

• Encourage full use of dead sharks;

• Facilitate improved species-specific catch and landings data and monitoring of sharks and rays catches; and

• Facilitate the identification and reporting of species-specific biological and trade data.

Issues in the Conservation and Management of Sharks and Rays Resources

1. Investment in research and management of sharks and rays has historically been a low priority due to its low level of production (an average of 1.8% from 1982-2003) relative to those bony (teleost) fishes. In terms of export value of fish, the sharks and rays products fetch an average of only 1.2% of total earnings from 1977 to 1996.

2. Due to low and seasonal landings, information on both volume and species composition of catches and landings of sharks and rays is still scanty, fragmented and poorly reported and recorded. The lack of information on stock structure, abundance, life history or reproductive rate of most species of sharks and rays further limits the quality of information available for stock assessment and effective management.
3. There is no proper coordination on sharks and rays research among research institutions, universities and non-governmental organisations.

4. The sharks and rays landings are regarded as associated catches in most tropical fisheries. There are no targeted fisheries for sharks and rays in Malaysia.

5. All parts of sharks and rays are fully utilised, both for human consumption as well as animal’s feeds.

6. Information on socio-economic of fishers and traders involved in sharks and rays fisheries are still inadequate.

7. The present statistical data collection does not record landings by species. This does not indicate the status of the resources either by abundance, vulnerable or endangered.

8. Information regarding freshwater sharks and rays is still scanty for the purpose of conservation and management. Most of these freshwater species are endemic in nature. Therefore, more efforts are needed to protect them from being extinct in the near future.

**Monitoring and Evaluation**

The lead agency in the development and review of the Malaysia NPOA-Shark is the DoFM. The committee, which includes other agencies and stakeholders who have an interest on the matter was initiated. This committee consists of representatives from Department of Fisheries Malaysia (DoFM), Ministry of Agriculture and Agro-based Industry (MoAAI), Fisheries Development Authority of Malaysia (FDAM), Ministry of Natural Resources and Environment (MNRE), Malaysian Agriculture Research and Development Institute (MARDI), Ministry of International Trade and Industry (MITI), National Fisheries Association (NEKMAT), Universities, Non-governmental Organisations (Anglers Association of Malaysia, WWF Malaysia) and Maritime Institute of Malaysia (MIMA).
General Overview of Malaysian Fisheries

The fisheries sector in Malaysia plays a significant role in supporting the country’s economic growth through provision of employment and providing source of much needed protein to the population. Over recent years, the per capita fish consumption has risen from 39.1 kg in 1995 to 49.0 kg in 2000 (Annual Fisheries Statistic, 2001). In 2003, the total fish production amounts to 1,483,958 tonnes valued at RM5.22 billion (US$ 1.36 billion). This contributed to about 1.37% of Gross Domestic Product (GDP) and provided direct employment to 89,433 fishers and 21,114 fish aquaculturists (Annual Fisheries Statistic, 2003).

The Malaysian fisheries sector is divided into capture fisheries (marine and inland) and aquaculture. The marine capture fisheries cover a total area of 547,200 km$^2$ and categorized into coastal fisheries and deep-sea fisheries. In 2003, the coastal fisheries and deep-sea fisheries contributed about 1,084,802 tonnes (73.1%) and 198,453 tonnes (13.4%) respectively, to the total marine landings. There are still potential for further development in the deep-sea fisheries that is projected to contribute 430,000 tonnes in 2010.

The sharks and rays landings that constitute a part of the demersal fishery occur throughout the Malaysian fisheries waters, from the coasts to the edges of its EEZ. The landings contribute only a minor portion of less than 2.2% of total marine landings.

Sharks are not targeted by fishers but are caught together with other commercially important species. They are brought back as a whole to the port and sold at a reasonable price with the fins fetching a better price. Similarly rays are caught and sold at a reasonable price.
Few studies and publications dealing with identification of shark are available in Malaysia. Cantor (1849) published a catalogue of Malaysian fishes, comprising 292 fishes and only 28 species of sharks and rays. Scott (1959) described 294 marine fishes of Malaysia, of which, only 25 species are sharks and rays. Mohammed Shaari (1971) identified 6 species of sharks and rays in the trawl catches of Penang waters. Mohsin and Ambak (1996) provided taxonomic keys to 40 species of sharks and rays from 19 families found in Malaysian waters. In an 18-month shark biodiversity study, Manjaji (2002) has managed to record 32 species of sharks and 41 species of rays in both inland and marine waters of Sabah. Mansor et al. (1998) produced a field guide on commercial marine fishes of the South China Sea area describing 8 species of sharks and 8 species of rays.

Ahmad et al. (1999) reported 48 species of sharks and 41 species of rays inhabiting the Malaysian fisheries waters from a study conducted within a year. In the other study and compilation by Ahmad et al. (2004), a total of 63 species of sharks, 68 species of rays and 3 species of chimaeras were recorded. Recent study conducted by Yano et al. (2005), a total of 56 species of sharks, 52 species of rays and 2 species of chimaeras were confirmed to inhabit in Malaysian waters. The study also indicates that only 7 species of sharks and 5 species of batoids are common and widely distributed in Malaysia. Out of this, almost all the sharks and rays species are food fish (with exception of batoids from family Narcinidae).

The widely distributed sharks and batoids species include Spot-tail shark; *Carcharhinus sorrah*, Blackspot shark; *Carcharhinus sealei*, Milk shark; *Rhizoprionodon acutus*, Scalloped hammerhead shark; *Sphyrna lewini*, Sicklefin weasel shark; *Hemigaleus microstoma*, Brown-banded bamboo shark; *Chiloscyllium punctatum*, Grey bamboo shark; *Chiloscyllium griseum*, Blue-spotted maskray; *Dasyatis kuhlii*, Whitespotted whipray; *Himantura gerrardi*, Scaly whipray *Himantura imbricata*, Pale-edged stingray; *Dasyatis zugei*, and Dwarf whipray; *Himantura walga*. The latest information on elasmobranch species recorded in Malaysia is shown in Appendix I.

Based on landing data collected from 2003 to 2004, the most dominant species of sharks found in Malaysia are from the family Hemiscyllidae (longtailed carpet sharks) and Carcharhinidae (requiem sharks). As for rays, the most common family is from Dasyatidae (whiptail stingrays). The elasmobranch species such as the Borneo river shark (*Glyphis* sp.), giant freshwater stingray (*Himantura chaophraya*), white-edge freshwater whipray (*Himantura signifer*), knifetooth sawfish (*Anoxypristis cuspidata*), greattooth or freshwater sawfish (*Pristis microdon*), green sawfish (*Pristis zijsron*) and smalltooth wide sawfish (*Pristis pectinata*) are rarely found (Ahmad and Mahyam 2004).
Commercial Landing of Sharks and Rays in Malaysia

The landings of sharks and rays have increased considerably from 10,792 tonnes in 1982 to 27,948 tonnes in 2003, with significant growth since the late 1980s (Figure 1). The rays have contributed to the significant increase in landings from 5,540 tonnes in 1985 to 10,550 tonnes in 1987. Malaysia reports its catches by groups of sharks and rays but not by species. In 2003, the catches of sharks and rays were 8,695 tonnes and 19,253 tonnes respectively (Table 1).

Landing Trends of Sharks

The trend of sharks’ landings has increased from 4,140 tonnes in 1990 and reached its peak at 8,695 tonnes in 2003. It is observed that the trend stabilised at around 5,000 tonnes from 1982 to 1990 but increased gradually to 8,695 tonnes in 2003 (Figure 1). This is mainly due to the contribution of the deep-sea trawlers since 1987.

In 2003, total landings of sharks in Peninsular Malaysia, Sarawak, Sabah and the Federal Territory of Labuan were 3,195 tonnes, 3,499 tonnes, 1,878 tonnes and 124 tonnes, respectively. The catches from Sarawak, Sabah and the Federal Territory of Labuan contribute 60% of the total catch. Since 1989, a continual increase in sharks’ landings has been observed for Sarawak and Federal Territory of Labuan (Figure 2). This increase in Sarawak is attributed to the deep-sea catch from chartered vessels introduced in 1999. In Sabah, a significant increase in landings has been observed since 1991 and the landings peaked at 3,176 tonnes in 1995. It then declined gradually to 1,577 tonnes in 2001 and this could be due to the overfishing in limited trawlable areas. As for the west coast and east coast of Peninsular Malaysia, the landings of sharks stabilised at around 1,000 tonnes and 1,500 tonnes, respectively.

Figure 1: Trends of landings of sharks and rays (in tonnes) in Malaysia
Landing Trends of Rays

The overall landing of rays in Malaysia stabilised from 1982 to 1985 at around 6,000 tonnes with a prominent upward trend from 7,029 tonnes in 1986 to 19,253 tonnes in 2003. The landings sustained above 14,000 tonnes since 1993 (Table 1 and Figure 1).

The total landing of rays in 2003 is 19,253 tonnes of which 56% is landed in Peninsular Malaysia (Table 1 and Table 2). In the west coast of Peninsular Malaysia, the landing fluctuated between 4,000 and 6,000 tonnes. For the east coast of Peninsular Malaysia, the landing increased from 1,968 tonnes in 1989 to 6,386 tonnes in 1999 after which it declined sharply to 4,725 tonnes in 2003. The landings of rays in Sarawak stabilised at around 2,000 tonnes and increased sharply to 6,658 tonnes in 2003. In Sabah, the catch stabilised at around 700 tonnes from 1982 to 1990 after which it increased gradually to stabilise at around 3,000 tonnes from 1995 until 1999 but it declined gradually thereafter. Since 1991, a continual increase in the landing trends of rays has been observed in Sarawak (see Figure 4 for details).

Table 1: Landings of sharks and rays in Malaysia from 1982 to 2003.

<table>
<thead>
<tr>
<th>Year</th>
<th>Sharks (Tonnes)</th>
<th>Sharks (%)</th>
<th>Rays (Tonnes)</th>
<th>Rays (%)</th>
<th>Elasmobranch (Tonnes)</th>
<th>Elasmobranch (%)</th>
<th>Total (Tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1982</td>
<td>4,444</td>
<td>0.6</td>
<td>6,348</td>
<td>0.9</td>
<td>10,792</td>
<td>1.5</td>
<td>694,274</td>
</tr>
<tr>
<td>1983</td>
<td>5,016</td>
<td>0.7</td>
<td>6,044</td>
<td>0.8</td>
<td>11,060</td>
<td>1.5</td>
<td>741,205</td>
</tr>
<tr>
<td>1984</td>
<td>5,281</td>
<td>0.8</td>
<td>5,795</td>
<td>0.8</td>
<td>11,076</td>
<td>1.6</td>
<td>671,816</td>
</tr>
<tr>
<td>1985</td>
<td>4,745</td>
<td>0.7</td>
<td>5,440</td>
<td>0.9</td>
<td>10,185</td>
<td>1.6</td>
<td>630,022</td>
</tr>
<tr>
<td>1986</td>
<td>4,820</td>
<td>0.8</td>
<td>7,029</td>
<td>1.1</td>
<td>11,849</td>
<td>1.9</td>
<td>619,247</td>
</tr>
<tr>
<td>1987</td>
<td>4,699</td>
<td>0.5</td>
<td>10,550</td>
<td>1.2</td>
<td>15,249</td>
<td>1.7</td>
<td>908,939</td>
</tr>
<tr>
<td>1988</td>
<td>4,677</td>
<td>0.6</td>
<td>11,517</td>
<td>1.3</td>
<td>16,194</td>
<td>1.9</td>
<td>869,447</td>
</tr>
<tr>
<td>1989</td>
<td>4,264</td>
<td>0.5</td>
<td>9,414</td>
<td>1.0</td>
<td>13,678</td>
<td>1.5</td>
<td>934,582</td>
</tr>
<tr>
<td>1990</td>
<td>4,140</td>
<td>0.4</td>
<td>13,220</td>
<td>1.3</td>
<td>17,360</td>
<td>1.7</td>
<td>1,002,576</td>
</tr>
<tr>
<td>1991</td>
<td>5,677</td>
<td>0.6</td>
<td>11,485</td>
<td>1.2</td>
<td>17,162</td>
<td>1.2</td>
<td>969,793</td>
</tr>
<tr>
<td>1992</td>
<td>7,240</td>
<td>0.6</td>
<td>13,531</td>
<td>1.2</td>
<td>20,771</td>
<td>1.8</td>
<td>1,104,988</td>
</tr>
<tr>
<td>1993</td>
<td>6,294</td>
<td>0.5</td>
<td>14,604</td>
<td>1.3</td>
<td>20,898</td>
<td>1.8</td>
<td>1,154,557</td>
</tr>
<tr>
<td>1994</td>
<td>6,889</td>
<td>0.6</td>
<td>14,000</td>
<td>1.2</td>
<td>20,889</td>
<td>1.8</td>
<td>1,181,763</td>
</tr>
<tr>
<td>1995</td>
<td>8,437</td>
<td>0.7</td>
<td>15,707</td>
<td>1.3</td>
<td>24,144</td>
<td>1.9</td>
<td>1,245,117</td>
</tr>
<tr>
<td>1996</td>
<td>8,080</td>
<td>0.7</td>
<td>15,928</td>
<td>1.4</td>
<td>24,008</td>
<td>2.1</td>
<td>1,126,689</td>
</tr>
<tr>
<td>1997</td>
<td>7,483</td>
<td>0.6</td>
<td>17,282</td>
<td>1.5</td>
<td>24,765</td>
<td>2.1</td>
<td>1,168,973</td>
</tr>
<tr>
<td>1998</td>
<td>7,839</td>
<td>0.6</td>
<td>16,104</td>
<td>1.3</td>
<td>23,943</td>
<td>1.9</td>
<td>1,215,206</td>
</tr>
<tr>
<td>1999</td>
<td>8,092</td>
<td>0.6</td>
<td>17,033</td>
<td>1.4</td>
<td>25,125</td>
<td>2.0</td>
<td>1,248,402</td>
</tr>
<tr>
<td>2000</td>
<td>7,948</td>
<td>0.6</td>
<td>16,573</td>
<td>1.3</td>
<td>24,521</td>
<td>1.9</td>
<td>1,285,696</td>
</tr>
<tr>
<td>2001</td>
<td>8,663</td>
<td>0.7</td>
<td>16,532</td>
<td>1.4</td>
<td>25,195</td>
<td>2.1</td>
<td>1,231,289</td>
</tr>
<tr>
<td>2002</td>
<td>8,226</td>
<td>0.6</td>
<td>15,941</td>
<td>1.3</td>
<td>24,167</td>
<td>1.9</td>
<td>1,272,078</td>
</tr>
<tr>
<td>2003</td>
<td>8,695</td>
<td>0.7</td>
<td>19,253</td>
<td>1.5</td>
<td>27,948</td>
<td>2.2</td>
<td>1,283,256</td>
</tr>
</tbody>
</table>
Landing Trends of Sharks and Rays by Geographical Areas in Malaysia

About 78% of the total landings of sharks and rays from the west coast of Peninsular Malaysia in 2003 are derived from Perak and Selangor (Table 2). As for the east coast of Peninsular Malaysia, the major landing states are Pahang, Terengganu and Johore (east).

The landings of sharks and rays in Sarawak, Sabah and the Federal Territory of Labuan in 2003 were recorded at 10,157 tonnes, 3,697 tonnes and 231 tonnes respectively. Sarawak recorded the highest total catch for sharks and rays in 20 years from 1982 to 2003 (99,900 tonnes) followed by Sabah (70,905 tonnes), Perak (59,014 tonnes) and Johore (48,287 tonnes). In 2003, the catch of sharks and rays for Sarawak was 36.3% of the national landing. In the same year, Sarawak also recorded the highest catch of both sharks and rays at 3,499 tonnes (40.2%) and 6,658 tonnes (34.6%) of the total national landings respectively (Table 2).

In Sabah, the catch of sharks and rays amounting to 3,697 tonnes in the year 2003 is the third highest after Sarawak (10,157 tonnes) and Perak (3,995 tonnes). The catch for sharks increased sharply from 716 tonnes in 1982 to 1,878 tonnes in 2003 (Figure 2). The catch for rays also increased from 685 tonnes in 1982 to 1,819 tonnes in 2003 (Figure 4).
Table 2: Landings of sharks and rays by states in Malaysia (1982-2003).

<table>
<thead>
<tr>
<th>Year</th>
<th>Elasmob.</th>
<th>PER</th>
<th>KED</th>
<th>PEN</th>
<th>PRK</th>
<th>S'GOR</th>
<th>N9</th>
<th>MLCA</th>
<th>W.JHR</th>
<th>KLN</th>
<th>TRG</th>
<th>PHG</th>
<th>E.JHR</th>
<th>S'WAK</th>
<th>S'BAH</th>
<th>LAB</th>
</tr>
</thead>
<tbody>
<tr>
<td>1982</td>
<td>Sharks</td>
<td>61</td>
<td>296</td>
<td>12</td>
<td>287</td>
<td>338</td>
<td>16</td>
<td>46</td>
<td>92</td>
<td>14</td>
<td>48</td>
<td>103</td>
<td>673</td>
<td>53</td>
<td>850</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>Rays</td>
<td>103</td>
<td>673</td>
<td>53</td>
<td>850</td>
<td>22</td>
<td>14</td>
<td>46</td>
<td>92</td>
<td>14</td>
<td>48</td>
<td>103</td>
<td>673</td>
<td>53</td>
<td>850</td>
<td>22</td>
</tr>
<tr>
<td>1983</td>
<td>Sharks</td>
<td>48</td>
<td>233</td>
<td>15</td>
<td>228</td>
<td>338</td>
<td>16</td>
<td>46</td>
<td>92</td>
<td>14</td>
<td>48</td>
<td>103</td>
<td>673</td>
<td>53</td>
<td>850</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>Rays</td>
<td>103</td>
<td>673</td>
<td>53</td>
<td>850</td>
<td>22</td>
<td>14</td>
<td>46</td>
<td>92</td>
<td>14</td>
<td>48</td>
<td>103</td>
<td>673</td>
<td>53</td>
<td>850</td>
<td>22</td>
</tr>
<tr>
<td>1984</td>
<td>Sharks</td>
<td>17</td>
<td>545</td>
<td>12</td>
<td>287</td>
<td>338</td>
<td>16</td>
<td>46</td>
<td>92</td>
<td>14</td>
<td>48</td>
<td>103</td>
<td>673</td>
<td>53</td>
<td>850</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>Rays</td>
<td>103</td>
<td>673</td>
<td>53</td>
<td>850</td>
<td>22</td>
<td>14</td>
<td>46</td>
<td>92</td>
<td>14</td>
<td>48</td>
<td>103</td>
<td>673</td>
<td>53</td>
<td>850</td>
<td>22</td>
</tr>
<tr>
<td>1985</td>
<td>Sharks</td>
<td>48</td>
<td>233</td>
<td>15</td>
<td>228</td>
<td>338</td>
<td>16</td>
<td>46</td>
<td>92</td>
<td>14</td>
<td>48</td>
<td>103</td>
<td>673</td>
<td>53</td>
<td>850</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>Rays</td>
<td>103</td>
<td>673</td>
<td>53</td>
<td>850</td>
<td>22</td>
<td>14</td>
<td>46</td>
<td>92</td>
<td>14</td>
<td>48</td>
<td>103</td>
<td>673</td>
<td>53</td>
<td>850</td>
<td>22</td>
</tr>
<tr>
<td>1986</td>
<td>Sharks</td>
<td>17</td>
<td>545</td>
<td>12</td>
<td>287</td>
<td>338</td>
<td>16</td>
<td>46</td>
<td>92</td>
<td>14</td>
<td>48</td>
<td>103</td>
<td>673</td>
<td>53</td>
<td>850</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>Rays</td>
<td>103</td>
<td>673</td>
<td>53</td>
<td>850</td>
<td>22</td>
<td>14</td>
<td>46</td>
<td>92</td>
<td>14</td>
<td>48</td>
<td>103</td>
<td>673</td>
<td>53</td>
<td>850</td>
<td>22</td>
</tr>
<tr>
<td>1987</td>
<td>Sharks</td>
<td>48</td>
<td>233</td>
<td>15</td>
<td>228</td>
<td>338</td>
<td>16</td>
<td>46</td>
<td>92</td>
<td>14</td>
<td>48</td>
<td>103</td>
<td>673</td>
<td>53</td>
<td>850</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>Rays</td>
<td>103</td>
<td>673</td>
<td>53</td>
<td>850</td>
<td>22</td>
<td>14</td>
<td>46</td>
<td>92</td>
<td>14</td>
<td>48</td>
<td>103</td>
<td>673</td>
<td>53</td>
<td>850</td>
<td>22</td>
</tr>
<tr>
<td>1988</td>
<td>Sharks</td>
<td>17</td>
<td>545</td>
<td>12</td>
<td>287</td>
<td>338</td>
<td>16</td>
<td>46</td>
<td>92</td>
<td>14</td>
<td>48</td>
<td>103</td>
<td>673</td>
<td>53</td>
<td>850</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>Rays</td>
<td>103</td>
<td>673</td>
<td>53</td>
<td>850</td>
<td>22</td>
<td>14</td>
<td>46</td>
<td>92</td>
<td>14</td>
<td>48</td>
<td>103</td>
<td>673</td>
<td>53</td>
<td>850</td>
<td>22</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Elasmob.</th>
<th>PER</th>
<th>KED</th>
<th>PEN</th>
<th>PRK</th>
<th>S'GOR</th>
<th>N9</th>
<th>MLCA</th>
<th>W.JHR</th>
<th>KLN</th>
<th>TRG</th>
<th>PHG</th>
<th>E.JHR</th>
<th>S'WAK</th>
<th>S'BAH</th>
<th>LAB</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td>Sharks</td>
<td>46</td>
<td>77</td>
<td>64</td>
<td>357</td>
<td>280</td>
<td>3</td>
<td>93</td>
<td>42</td>
<td>148</td>
<td>229</td>
<td>560</td>
<td>448</td>
<td>2,736</td>
<td>3,176</td>
<td>178</td>
<td>8,437</td>
</tr>
<tr>
<td></td>
<td>Rays</td>
<td>199</td>
<td>528</td>
<td>367</td>
<td>1,977</td>
<td>1,140</td>
<td>33</td>
<td>79</td>
<td>347</td>
<td>1,137</td>
<td>1,003</td>
<td>1,876</td>
<td>1,418</td>
<td>2,440</td>
<td>2,993</td>
<td>170</td>
<td>15,707</td>
</tr>
<tr>
<td>1996</td>
<td>Sharks</td>
<td>23</td>
<td>76</td>
<td>54</td>
<td>382</td>
<td>275</td>
<td>1</td>
<td>111</td>
<td>48</td>
<td>61</td>
<td>288</td>
<td>509</td>
<td>551</td>
<td>2,484</td>
<td>2,846</td>
<td>371</td>
<td>8,080</td>
</tr>
<tr>
<td></td>
<td>Rays</td>
<td>156</td>
<td>409</td>
<td>437</td>
<td>2,207</td>
<td>1,332</td>
<td>33</td>
<td>97</td>
<td>340</td>
<td>575</td>
<td>1,902</td>
<td>1,574</td>
<td>1,505</td>
<td>2,392</td>
<td>2,765</td>
<td>204</td>
<td>15,928</td>
</tr>
<tr>
<td>1997</td>
<td>Sharks</td>
<td>17</td>
<td>134</td>
<td>45</td>
<td>35</td>
<td>215</td>
<td>2</td>
<td>99</td>
<td>44</td>
<td>44</td>
<td>571</td>
<td>443</td>
<td>560</td>
<td>1,651</td>
<td>3,073</td>
<td>234</td>
<td>7,483</td>
</tr>
<tr>
<td></td>
<td>Rays</td>
<td>127</td>
<td>559</td>
<td>3551</td>
<td>2,960</td>
<td>1,765</td>
<td>29</td>
<td>91</td>
<td>273</td>
<td>494</td>
<td>1,944</td>
<td>1,509</td>
<td>1,886</td>
<td>1,951</td>
<td>3,179</td>
<td>160</td>
<td>17,282</td>
</tr>
<tr>
<td>1998</td>
<td>Sharks</td>
<td>15</td>
<td>93</td>
<td>29</td>
<td>373</td>
<td>454</td>
<td>3</td>
<td>79</td>
<td>47</td>
<td>25</td>
<td>741</td>
<td>521</td>
<td>486</td>
<td>1,771</td>
<td>3,111</td>
<td>91</td>
<td>7,839</td>
</tr>
<tr>
<td></td>
<td>Rays</td>
<td>69</td>
<td>521</td>
<td>168</td>
<td>2,048</td>
<td>1,109</td>
<td>31</td>
<td>130</td>
<td>239</td>
<td>237</td>
<td>2,756</td>
<td>1,716</td>
<td>1,638</td>
<td>2,378</td>
<td>2,934</td>
<td>130</td>
<td>16,104</td>
</tr>
<tr>
<td>1999</td>
<td>Sharks</td>
<td>13</td>
<td>91</td>
<td>24</td>
<td>272</td>
<td>282</td>
<td>3</td>
<td>72</td>
<td>24</td>
<td>17</td>
<td>782</td>
<td>660</td>
<td>583</td>
<td>2,214</td>
<td>2,935</td>
<td>120</td>
<td>8,092</td>
</tr>
<tr>
<td></td>
<td>Rays</td>
<td>76</td>
<td>651</td>
<td>191</td>
<td>2,771</td>
<td>1,131</td>
<td>13</td>
<td>141</td>
<td>205</td>
<td>140</td>
<td>2,126</td>
<td>1,248</td>
<td>1,972</td>
<td>2,496</td>
<td>2,864</td>
<td>108</td>
<td>17,033</td>
</tr>
<tr>
<td>2000</td>
<td>Sharks</td>
<td>7</td>
<td>100</td>
<td>13</td>
<td>705</td>
<td>443</td>
<td>3</td>
<td>66</td>
<td>94</td>
<td>43</td>
<td>355</td>
<td>984</td>
<td>648</td>
<td>2,603</td>
<td>1,797</td>
<td>87</td>
<td>7,948</td>
</tr>
<tr>
<td></td>
<td>Rays</td>
<td>166</td>
<td>586</td>
<td>314</td>
<td>3,129</td>
<td>1,180</td>
<td>14</td>
<td>134</td>
<td>228</td>
<td>309</td>
<td>961</td>
<td>2,117</td>
<td>2,212</td>
<td>2,840</td>
<td>2,301</td>
<td>82</td>
<td>16,573</td>
</tr>
<tr>
<td>2001</td>
<td>Sharks</td>
<td>4</td>
<td>155</td>
<td>18</td>
<td>693</td>
<td>232</td>
<td>3</td>
<td>60</td>
<td>88</td>
<td>40</td>
<td>541</td>
<td>938</td>
<td>620</td>
<td>3,579</td>
<td>1,577</td>
<td>115</td>
<td>8,663</td>
</tr>
<tr>
<td></td>
<td>Rays</td>
<td>129</td>
<td>306</td>
<td>327</td>
<td>2,896</td>
<td>1,504</td>
<td>14</td>
<td>139</td>
<td>200</td>
<td>140</td>
<td>982</td>
<td>1,692</td>
<td>1,915</td>
<td>4,169</td>
<td>2,020</td>
<td>99</td>
<td>16,532</td>
</tr>
<tr>
<td>2002</td>
<td>Sharks</td>
<td>7</td>
<td>140</td>
<td>20</td>
<td>700</td>
<td>348</td>
<td>1</td>
<td>68</td>
<td>89</td>
<td>61</td>
<td>532</td>
<td>675</td>
<td>694</td>
<td>2,710</td>
<td>2,052</td>
<td>119</td>
<td>8,226</td>
</tr>
<tr>
<td></td>
<td>Rays</td>
<td>129</td>
<td>375</td>
<td>540</td>
<td>2,814</td>
<td>1,181</td>
<td>19</td>
<td>141</td>
<td>284</td>
<td>128</td>
<td>863</td>
<td>1,410</td>
<td>1,778</td>
<td>4,190</td>
<td>1,987</td>
<td>102</td>
<td>15,941</td>
</tr>
<tr>
<td>2003</td>
<td>Sharks</td>
<td>7</td>
<td>126</td>
<td>12</td>
<td>559</td>
<td>290</td>
<td>1</td>
<td>57</td>
<td>36</td>
<td>69</td>
<td>553</td>
<td>678</td>
<td>807</td>
<td>3,499</td>
<td>1,878</td>
<td>124</td>
<td>8,695</td>
</tr>
<tr>
<td></td>
<td>Rays</td>
<td>104</td>
<td>212</td>
<td>562</td>
<td>3,436</td>
<td>1,192</td>
<td>23</td>
<td>147</td>
<td>267</td>
<td>178</td>
<td>781</td>
<td>1,754</td>
<td>2,012</td>
<td>6,658</td>
<td>1,819</td>
<td>107</td>
<td>19,253</td>
</tr>
</tbody>
</table>

Note: * Included in the landing of Sabah

PER = Perlis; KED = Kedah; PRK = Perak; PEN = Penang; S’GOR = Selangor; N9 = Negeri Sembilan; MLCA = Malacca; W. JHR = West Johore; KLN = Kelantan; TRG = Terengganu; PHG = Pahang; EJHR = East Johore; S’WAK = Sarawak; S’BAH = Sabah; LAB = Labuan
Figure 3: Map showing location of landing centres for sharks.

Figure 4: Trends of landings of rays (in tonnes) by geographical areas in Malaysia. Source: Annual Fisheries Statistics, Department of Fisheries Malaysia (1982-2003).
Trawl resource surveys in the coastal waters of Malaysia have been carried out periodically to monitor the status of fishery resources. The first survey was conducted in 1969 and the most recent one was in 2001. The average catch rates for sharks and rays by depth strata during the resource surveys are shown in Table 3 and Table 4, respectively.

**Sharks**

Table 3 shows the average catch rates of sharks by depth strata on the east and west coasts of Peninsular Malaysia from trawl resource surveys conducted from 1970 to 2001. In 1969, sharks were normally caught at a rate of less than 10 kg hr\(^{-1}\) at all depth strata in the east coast of Peninsular Malaysia. Occasionally higher landings were also observed but this is due to the landing of large sized single specimens at certain depth strata. Based on the data from twenty surveys conducted from 1970 to 2001 in Peninsular Malaysia, higher catch rates were recorded in the area deeper than 30 m.

The highest catch rate in the west coast of Peninsular Malaysia was recorded in 1971 at 7.64 kg hr\(^{-1}\) in the depth stratum of 50 - 59 m. On the east coast of Peninsular Malaysia, the highest catch rate of 11.92 kg hr\(^{-1}\) was obtained in 1970 at depths from 40 to 49 m. Pathansali et al. (1974) reported that the most common species caught was milk shark (*Rhizoprionodon acutus*), a small-sized species belonging to the family Carcharhinidae. In 2001, the coastal resource survey conducted on the east coast of Peninsular Malaysia showed the average catch rates for sharks in the depth strata of 10 - 19 m and 20 - 29 m were 1.12 and 1.13 kg hr\(^{-1}\) respectively (Sharum, 2002).

Sharks were caught in very few hauls in deeper waters (stratum 56 - 91 m), during the survey in the west coast of Peninsular Malaysia. The catch rate of the individual haul off Penang and north Perak ranged from 0.1 to 5.0 kg hr\(^{-1}\). The highest catch rate from an individual haul was attained at 14.0 kg hr\(^{-1}\) in waters off Selangor. In the east coast, sharks were rarely caught in the northern part of Kelantan. The highest catch rate from an individual haul was attained at 14.0 kg hr\(^{-1}\) in waters off Terengganu. In the other areas of the east coast, the catch rates ranged from less than 0.1 to 15.0 kg hr\(^{-1}\) with the highest mean catch rate per stratum recorded at 7.0 kg hr\(^{-1}\) in Pahang waters (Abu Talib, 2002).

**Rays**

Table 4 shows the average catch rates of rays from 1970 to 2001. The dominant species of rays caught during the surveys of 1970s in Peninsular Malaysia were *Dasyatis zugei*, *Himantura walga*, *Gymnura poecilura*, *Aetobatus nichofii* and *Rhynchobatus djiddensis* (Pathansali et al., 1974; Mohammed Shaari et al., 1974; and Jothy et al., 1975). The species were caught in the waters between 10-20 m stratum and to a smaller extent in deeper waters. The honeycomb whipray (*Himantura uarnak*), a large species that weighs over 50 kg, was occasionally caught in waters of 40 - 60 m depth stratum.
Table 3: Average catch rates (kg hr\(^{-1}\)) of sharks by depth strata on the east and west coasts of Peninsular Malaysia from trawl resource surveys (1970 - 2001). (Depths are in metres).

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>5.68</td>
<td>7.38</td>
<td>2.02</td>
<td>11.92</td>
<td>3.18</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1971</td>
<td>0.05</td>
<td>0.09</td>
<td>0.67</td>
<td>0.69</td>
<td>7.64</td>
<td></td>
<td>1.88</td>
<td>3.89</td>
<td>4.49</td>
<td>2.89</td>
<td>2.61</td>
<td></td>
</tr>
<tr>
<td>1972</td>
<td>0.47</td>
<td>1.75</td>
<td>0.33</td>
<td>0.47</td>
<td>0.73</td>
<td></td>
<td>2.40</td>
<td>3.80</td>
<td>2.09</td>
<td>3.64</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1974</td>
<td>0.29</td>
<td>0.78</td>
<td>3.34</td>
<td>0.33</td>
<td></td>
<td>5.15</td>
<td>2.28</td>
<td>1.38</td>
<td>7.67</td>
<td>0.74</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1978</td>
<td>0.07</td>
<td>0.84</td>
<td>1.00</td>
<td>0.34</td>
<td>0.11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1980</td>
<td>0.22</td>
<td>0.52</td>
<td>2.94</td>
<td>0.05</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1981</td>
<td>0.04</td>
<td>0.13</td>
<td>1.47</td>
<td></td>
<td></td>
<td>1.39</td>
<td>0.39</td>
<td>0.59</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1983</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.41</td>
<td>0.68</td>
<td>8.8</td>
<td>1.24</td>
<td>0.12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1984</td>
<td>0.06</td>
<td>0.22</td>
<td>0.5</td>
<td></td>
<td></td>
<td>0.50</td>
<td>1.94</td>
<td>2.02</td>
<td>0.9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1986</td>
<td>0.08</td>
<td>0.19</td>
<td>0.15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1988</td>
<td>4.51</td>
<td>1.10</td>
<td>0.29</td>
<td></td>
<td></td>
<td>0.16</td>
<td>0.50</td>
<td>0.33</td>
<td>1.31</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1990</td>
<td></td>
<td></td>
<td></td>
<td>8.04</td>
<td>0.74</td>
<td>1.14</td>
<td>4.38</td>
<td>6.32</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1990/91</td>
<td>0.01</td>
<td>1.25</td>
<td>0.02</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1991/92</td>
<td>0.38</td>
<td></td>
<td></td>
<td></td>
<td>1.8</td>
<td>0.81</td>
<td>0.32</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1992/93</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.07</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1995</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.15</td>
<td>0.28</td>
<td>0.15</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1997</td>
<td>0.31</td>
<td>0.13</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1998</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.12</td>
<td>0.46</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1999</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.83</td>
<td>1.04</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2001</td>
<td>1.12</td>
<td>1.13</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 4: Average catch rates (kg hr\(^{-1}\)) of rays by depth strata on the east and west coasts of Peninsular Malaysia from trawl resource surveys (1970 - 2001). ( Depths are in metres).

<table>
<thead>
<tr>
<th>Year</th>
<th>West Coast of Peninsular Malaysia</th>
<th>East Coast of Peninsular Malaysia</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>17.21 1.85 4.87 12.35 5.01</td>
<td></td>
</tr>
<tr>
<td>1971</td>
<td>1.90 4.53 15.32 6.03 0.09</td>
<td>5.86 8.46 17.12 6.23 0.74</td>
</tr>
<tr>
<td>1972</td>
<td>1.11 0.91 0.3</td>
<td>2.76 8.65 10.33 6.64 7.59</td>
</tr>
<tr>
<td>1974</td>
<td>6.08 0.57 0.57 4.03 4.93</td>
<td>31.00 4.50 8.55 0.64 1.30</td>
</tr>
<tr>
<td>1978</td>
<td>0.19 0.38 0.97 1.96 4.3</td>
<td></td>
</tr>
<tr>
<td>1980</td>
<td>0.56 1.22 1.58 1.36 2.39</td>
<td></td>
</tr>
<tr>
<td>1981</td>
<td>0.57 0.31 0.66 1.06 2.37</td>
<td>7.22 18.09 0.87 1.20 2.83</td>
</tr>
<tr>
<td>1983</td>
<td>22.76 5.92 21.19 1.49 0.05</td>
<td></td>
</tr>
<tr>
<td>1984</td>
<td>0.36 1.77 0.93 2.09</td>
<td>9.89 14.09 1.85 10.37 1.02</td>
</tr>
<tr>
<td>1986</td>
<td>4.20 10.31 0.84 1.82 5.82</td>
<td></td>
</tr>
<tr>
<td>1988</td>
<td>0.29 0.75 3.57 21.03 0.84</td>
<td>36.2 6.42</td>
</tr>
<tr>
<td>1990</td>
<td>2.01 7.49 22.66 16.74 0.84</td>
<td></td>
</tr>
<tr>
<td>1990/91</td>
<td>1.98 1.07 0.46 3.29 1.07</td>
<td></td>
</tr>
<tr>
<td>1991/92</td>
<td>0.98 2.86 3.48 4.37 1.53</td>
<td></td>
</tr>
<tr>
<td>1992/93</td>
<td>1.19 0.24 0.72</td>
<td></td>
</tr>
<tr>
<td>1995</td>
<td>1.80 2.20 0.30 0.20 0.60</td>
<td></td>
</tr>
<tr>
<td>1997</td>
<td>5.28 1.54</td>
<td></td>
</tr>
<tr>
<td>1998</td>
<td></td>
<td>0.07 0.48</td>
</tr>
<tr>
<td>1999</td>
<td></td>
<td>0.23 0.79</td>
</tr>
<tr>
<td>2000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2001</td>
<td></td>
<td>17.10 5.30</td>
</tr>
</tbody>
</table>
In the west coast of Peninsular Malaysia, the average catch rates for all depth strata in all the surveys conducted in the northern region were much lower than the southern. This shows that the southern part of the Straits of Malacca is richer in ray resources.

Rays were found to be more abundant in the depth stratum below 40 m in the east coast. However the overall catch rate for the whole surveyed area showed a declining trend from 9.19 kg hr⁻¹ in 1971 to 6.49 kg hr⁻¹ in 1981 and 0.88 kg hr⁻¹ in 1985. Results from the coastal resource survey in 2001 in the same area showed that the average catch rate for rays in depth stratum less than 18 m (17.1 kg hr⁻¹) was higher than those in deeper areas (5.3 kg hr⁻¹), with an average of 7.53 kg hr⁻¹ (Sharum, 2002).
PERCENTAGE COMPOSITION FROM TRAWL SURVEYS IN PENINSULAR MALAYSIA

The percentages of sharks and rays in the total fish caught off both coasts of Peninsular Malaysia were compared in all the trawl surveys conducted by the Fisheries Research Institute of the DoFM. They are shown in Table 5 and Table 6.

**Sharks**

In the west coast, the percentage of sharks in the catch varied throughout the surveys. The percentages were higher in depth strata exceeding 30 m (Table 5).

In the east coast, sharks appeared uniformly in all depth strata. In 1990 the percentage composition of sharks was high in all depth strata. The overall percentage of shark in 2001 coastal resource survey in the east coast of Peninsular Malaysia was about 1.6% of the total catch (Sharum, 2002).

**Rays**

In the west coast, the depth stratum of 30 - 49 m had the most consistent catches of rays, reaching 43.3% in 1988 (Table 6).

In the east coast, rays appear predominantly in the shallower strata up to 50 m depth. The percentage for the 10 - 29 m depth stratum increased from 1.1% in 1974 to 17.4% in 1988. In subsequent surveys in 1990, 1991 and 1995, their contributions dropped to between 3.8% and 5.3%. The waters of the 30 - 49 m depth stratum appeared to be the next most important stratum for rays with a contribution of 18.4% to the total catch in 1990. The result of a 2001 survey showed that the percentage of rays for depth stratum 10 - 29 m was higher than that of depth stratum exceeding 30 m, i.e., 19.2% and 8.2% respectively with an average of 10.8% of the total catch (Sharum, 2002).
Surveys conducted in 1998 showed that sharks were mostly distributed in the deeper waters of Sarawak. This was shown by the results of demersal trawl surveys, where the catch rate in deeper waters of 92 -185 m depth stratum was 1.81 kg hr⁻¹ compared to 0.23 - 0.64 kg hr⁻¹ in the shallow waters of 18 - 91 m depth stratum. In the overall catch composition of demersal fish, sharks constituted 0.97 % of the catch.

Rays were mostly distributed in the shallow waters, where the catch rate was 7.25 kg hr⁻¹ in the 18 - 55 m depth stratum. In the deeper waters, the catch rates were 5.86 kg hr⁻¹ in the 56 - 91 m depth stratum and 1.14 kg hr⁻¹ at depth stratum of 92 - 185m. Rays constitute 2.7% of the total demersal fish catch composition (Table 7).

The sharks in Sabah were mostly distributed in the deeper waters. The catch rate from trawl surveys was 6.07 kg hr⁻¹ in deeper waters (92 - 185 m). In shallow waters, the catch rate ranged from 0.74 kg hr⁻¹ (18 - 55m) to 1.98 kg hr⁻¹ (56 - 91m). The rays were mostly distributed in the shallow waters where the catch rate ranged from 3.69 kg hr⁻¹ (18 - 55m) to 9.79 kg hr⁻¹ (56 - 91m). In deeper waters at depth stratum 92 - 185 m, the catch rate was 0.83 kg/hr. In the overall demersal catch composition, sharks and rays occupied 1.9% and 4.1% respectively (Table 7).
Table 5: Percentage (%) of catch by weight of sharks by depth strata from trawl surveys on west coast and east coast of Peninsular Malaysia (1970 - 2001)

<table>
<thead>
<tr>
<th>Year</th>
<th>West Coast of Peninsular Malaysia</th>
<th>East Coast of Peninsular Malaysia</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10 - 29</td>
<td>30 - 49</td>
</tr>
<tr>
<td>1970</td>
<td>0.9</td>
<td>1.6</td>
</tr>
<tr>
<td>1971</td>
<td>0.1</td>
<td>1.4</td>
</tr>
<tr>
<td>1972</td>
<td>1.6</td>
<td>0.5</td>
</tr>
<tr>
<td>1974</td>
<td>0.3</td>
<td>4.1</td>
</tr>
<tr>
<td>1978</td>
<td>0.2</td>
<td>1.8</td>
</tr>
<tr>
<td>1980</td>
<td>0.4</td>
<td>5.2</td>
</tr>
<tr>
<td>1981</td>
<td>0.4</td>
<td>0.8</td>
</tr>
<tr>
<td>1983</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1984</td>
<td>0.2</td>
<td>1.4</td>
</tr>
<tr>
<td>1986</td>
<td>0.2</td>
<td>0.5</td>
</tr>
<tr>
<td>1988</td>
<td>9.0</td>
<td>1.2</td>
</tr>
<tr>
<td>1990</td>
<td>0.1</td>
<td>3.6</td>
</tr>
<tr>
<td>1990/91</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1991/92</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1992/93</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1995</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1997</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1998</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1999</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2001</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 6: Percentage (%) of catch by weight of rays by depth strata from trawls surveys on west coast and east coast of Peninsular Malaysia (1970 - 2001).

<table>
<thead>
<tr>
<th>Year</th>
<th>West Coast of Peninsular Malaysia</th>
<th>East Coast of Peninsular Malaysia</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10 - 29</td>
<td>30 - 49</td>
</tr>
<tr>
<td>1970</td>
<td>1.2</td>
<td>2.1</td>
</tr>
<tr>
<td>1971</td>
<td>6.4</td>
<td>21.4</td>
</tr>
<tr>
<td>1972</td>
<td>1.3</td>
<td>0.4</td>
</tr>
<tr>
<td>1974</td>
<td>6.7</td>
<td>4.7</td>
</tr>
<tr>
<td>1978</td>
<td>0.8</td>
<td>3.8</td>
</tr>
<tr>
<td>1980</td>
<td>2.9</td>
<td>4.4</td>
</tr>
<tr>
<td>1981</td>
<td>2.2</td>
<td>3.7</td>
</tr>
<tr>
<td>1983</td>
<td>8.6</td>
<td>5.8</td>
</tr>
<tr>
<td>1984</td>
<td>20.1</td>
<td>4.1</td>
</tr>
<tr>
<td>1986</td>
<td>3.1</td>
<td>43.3</td>
</tr>
<tr>
<td>1988</td>
<td>10.2</td>
<td>11.1</td>
</tr>
<tr>
<td>1990</td>
<td>5.4</td>
<td>2.8</td>
</tr>
<tr>
<td>1990/91</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1991/92</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1992/93</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1995</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1997</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1998</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1999</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2001</td>
<td>19.2</td>
<td>8.2</td>
</tr>
</tbody>
</table>
Table 7  Catch rate (kg hr⁻¹) and the percentage (%) of catch by weight of sharks and rays by depth strata from trawl surveys of the coasts of Sarawak and Sabah in 1998. ( Depths are in metres).

<table>
<thead>
<tr>
<th>Species</th>
<th>18 – 55 Kg hr⁻¹</th>
<th>%</th>
<th>56 – 91 Kg hr⁻¹</th>
<th>%</th>
<th>92 – 185 Kg hr⁻¹</th>
<th>%</th>
<th>All depth strata Kg hr⁻¹</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sharks</td>
<td>0.64</td>
<td>0.4</td>
<td>0.23</td>
<td>0.1</td>
<td>1.81</td>
<td>0.4</td>
<td>0.92</td>
<td>1.0</td>
</tr>
<tr>
<td>Rays</td>
<td>7.25</td>
<td>4.9</td>
<td>5.86</td>
<td>3.2</td>
<td>1.14</td>
<td>0.3</td>
<td>3.67</td>
<td>2.7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Species</th>
<th>18 – 55 Kg hr⁻¹</th>
<th>%</th>
<th>56 – 91 Kg hr⁻¹</th>
<th>%</th>
<th>92 – 185 Kg hr⁻¹</th>
<th>%</th>
<th>All depth strata Kg hr⁻¹</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sharks</td>
<td>0.74</td>
<td>1.0</td>
<td>1.98</td>
<td>1.0</td>
<td>6.07</td>
<td>7.0</td>
<td>2.40</td>
<td>1.9</td>
</tr>
<tr>
<td>Rays</td>
<td>3.69</td>
<td>4.0</td>
<td>9.79</td>
<td>5.0</td>
<td>0.83</td>
<td>1.0</td>
<td>5.10</td>
<td>4.1</td>
</tr>
</tbody>
</table>
RECENT DATA COLLECTION ON SHARKS

Recent data on landings, biology, taxonomy and trade were collected from July 2003 to August 2004 at six landing ports namely Kuantan (Pahang), Hutan Melintang (Perak), Mukah and Bintulu (Sarawak), and Sandakan and Kota Kinabalu (Sabah). This project was jointly funded by DoFM and the Southeast Asian Fisheries Development Center (SEAFDEC).

Data collected in the months of October and December in 2003, and March and June in 2004 at those six landing sites have shown that trawl net is the main gear that caught sharks at the range between 0.2 - 2.0% of the total catch except for Mukah. The main gear that caught sharks in Mukah is gill net, which contributed about 77.8 to 100.0% of the total catch landed.

Fishing Grounds

The fishing grounds in west coast of Peninsular Malaysia is rather limited, mostly confined within areas of Pulau Perak, Pulau Pangkor and Southern Part of Perak (Table 8). However, in the east coast of Peninsular Malaysia, fishing grounds for shark is rather wide, mostly beyond Zone B and C areas (more than 12 nm). As for Sarawak, sharks landed from Mukah are mostly caught by gillnets which operate in coastal areas. For Bintulu, the sharks are mostly caught by trawl nets and gillnets in areas beyond 12 nm.

<table>
<thead>
<tr>
<th>Fishing Grounds</th>
<th>Depths (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>West Coast of Peninsular Malaysia</td>
<td>Confined within areas of Pulau Perak, Pulau Pangkor and Southern Part of Perak</td>
</tr>
<tr>
<td>East Coast of Peninsular Malaysia</td>
<td>Scattered in areas of more than 12 nm from shoreline</td>
</tr>
<tr>
<td>Sarawak: Mukah</td>
<td>Coastal areas</td>
</tr>
<tr>
<td>Bintulu</td>
<td>More than 12 nm from shoreline</td>
</tr>
<tr>
<td>Sarawak: Kota Kinabalu</td>
<td>Coastal areas</td>
</tr>
<tr>
<td>Sabah: Sandakan</td>
<td>Confined within Malaysian waters around Sandakan</td>
</tr>
</tbody>
</table>
Species Distribution by Areas

As shown in Table 9, *Chiloscyllium punctatum* is the most dominant species in Hutan Melintang and Kuantan in terms of number. The next two dominant species in Hutan Melintang are *Chiloscyllium hasselti* and *Scoliodon laticaudus*, whereas in Kuantan are *Chiloscyllium griseum* and *Carcharhinus sealei*.

The most dominant shark species in Mukah and Bintulu is *Scoliodon laticaudus*, whereas in Kota Kinabalu and Sandakan are *Hemigaleus microstoma* and *Carcharhinus sorrah* respectively. Species of *Sphyrna lewini*, *Carcharhinus sorrah* and *Carcharhinus dussumieri* are among the next most dominant species in Bintulu, Kota Kinabalu and Sandakan.

Size Distribution of Shark by Species and Areas

The size of shark species by areas is shown in Table 10. In general, most of the size of sharks species on the west coast of Peninsular Malaysia (Area 1) is smaller (except for *Carcharhinus leucas*) as compared to the size of sharks species on the east coast of Peninsular Malaysia (Area 2), Sarawak (Area 3) and Sabah (Area 4).

Reproductive Biology

The percentage maturity of five most dominant sharks species by area and sex is shown in Table 11. Most of the species in Area 1 are mature (>51.1%) except for *C. sorrah* where only 2.0% are matured. In Area 2, the percentage of mature *C. sealei* and *C. sorrah* are between 20.0% and 53.3% whereas the remaining three species are matured at more than 78.9%.

In Area 3, four species are immature at more than 72.5%. However, more than 81.2% of *S. laticaudus* is mature. Three of the shark species in Area 4 are mostly immature. As for *C. dussumieri*, the percentage of mature species is more than 55.6%. About 67% of female *C. sorrah* is mature and only 27.3% in males.

Catching Methods

Prior to the introduction of trawls in 1960s, sharks were caught by gill nets and hooks and lines. In 1965, when the use of trawls was still in its infancy stage, sharks caught by this gear constituted 4.0% of the total shark landings. In 1970, the relative amount of sharks caught by trawlers increased to 35.0%. By 1975, trawls became the main fishing gear catching sharks in the country. Sharks caught by trawls in the year 2001 contributed 60.0% of the total sharks landings followed by drift nets (26.0%) and hooks and lines (13.0%). Other fishing gears include portable traps, stationary gears, barrier nets, purse seines and other seines (Table 12).
Table 9: Species compositions of the ten most dominant species by landing site (percentage by numbers).

<table>
<thead>
<tr>
<th>Species</th>
<th>H. M</th>
<th>KTN</th>
<th>MKH</th>
<th>BTLU</th>
<th>K.K</th>
<th>SDN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alopias sp.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.4(9)</td>
</tr>
<tr>
<td>Atelomycterus marmoratus</td>
<td>2.3(5)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carcharhinus amblyrhynchoides</td>
<td>4.8(5)</td>
<td>10.8(6)</td>
<td>1.4(10)</td>
<td>6.7(7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carcharhinus borneensis</td>
<td></td>
<td></td>
<td>9.1(3)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carcharhinus brevipinna</td>
<td></td>
<td></td>
<td>2.6(8)</td>
<td>5.8(5)</td>
<td>11.7(2)</td>
<td></td>
</tr>
<tr>
<td>Carcharhinus dussumieri</td>
<td>0.2(7)</td>
<td>2.6(10)</td>
<td>1.5(9)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carcharhinus leucas</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>7.5(5)</td>
</tr>
<tr>
<td>Carcharhinus melanopterus</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carcharhinus sealei</td>
<td>11.0(3)</td>
<td>13.1(2)</td>
<td>12.6(5)</td>
<td></td>
<td>5.8(9)</td>
<td></td>
</tr>
<tr>
<td>Carcharhinus sorrah</td>
<td>7.5(4)</td>
<td>9.8(4)</td>
<td>8.2(4)</td>
<td>16.0(2)</td>
<td>11.6(3)</td>
<td>16.7(1)</td>
</tr>
<tr>
<td>Carcharhinus limbatus</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2.9(8)</td>
<td></td>
</tr>
<tr>
<td>Chiloscyllium griseum</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>11.0(2)</td>
<td></td>
</tr>
<tr>
<td>Chiloscyllium hasselti</td>
<td>23.7(2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chiloscyllium indicum</td>
<td></td>
<td>4.1(9)</td>
<td>2.7(6)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chiloscyllium punctatum</td>
<td>47.7(1)</td>
<td>28.9(1)</td>
<td>7.4(7)</td>
<td>10.1(4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hemigaleus microstoma</td>
<td>6.4(7)</td>
<td></td>
<td></td>
<td>36.2(1)</td>
<td>8.3(4)</td>
<td></td>
</tr>
<tr>
<td>Lamiopsis temmincki</td>
<td></td>
<td></td>
<td></td>
<td>0.2(10)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loxodon macrorhinus</td>
<td>7.7(5)</td>
<td>4.3(6)</td>
<td>5.8(10)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rhizoprionodon acutus</td>
<td>0.4(8)</td>
<td>6.7(6)</td>
<td>1.5(7)</td>
<td>13.0(4)</td>
<td>7.5(6)</td>
<td></td>
</tr>
<tr>
<td>Rhizoprionodon oligolinx</td>
<td>0.4(9)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scoliodon laticaudus</td>
<td>16.6(3)</td>
<td>58.9(1)</td>
<td>19.3(1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sphyrna lewini</td>
<td>1.1(6)</td>
<td>6.2(8)</td>
<td>0.4(8)</td>
<td>15.2(3)</td>
<td>17.4(2)</td>
<td>10.8(3)</td>
</tr>
<tr>
<td>Sphyrna mokarran</td>
<td>0.1(9)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stegostoma fasciatum</td>
<td>0.1(10)</td>
<td>0.7(10)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Numbers in bracket indicate rank of dominance
H.M = Hutan Melintang; KTN = Kuantan; MKH = Mukah; BTLU = Bintulu; K.K = Kota Kinabalu; SDN = Sandakan
Table 10: Size distribution of sharks by species and area.

<table>
<thead>
<tr>
<th>Species</th>
<th>Area 1 Total Length (cm)</th>
<th>Area 2 Total Length (cm)</th>
<th>Area 3 Total Length (cm)</th>
<th>Area 4 Total Length (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. A. marmoratus</td>
<td>31.7</td>
<td>55.5</td>
<td>49.5</td>
<td></td>
</tr>
<tr>
<td>2. C. amblyrhynchoides</td>
<td></td>
<td></td>
<td></td>
<td>53.0</td>
</tr>
<tr>
<td>3. C. brevipinna</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. C. borneensis</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. C. dussumieri</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. C. leucas</td>
<td>178.0</td>
<td>390.0</td>
<td>267.7</td>
<td>42.0</td>
</tr>
<tr>
<td>7. C. limbatus</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. C. melanopterus</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. C. sealei</td>
<td>31.5</td>
<td>93.0</td>
<td>70.0</td>
<td>36.0</td>
</tr>
<tr>
<td>10. C. sorrah</td>
<td>43.8</td>
<td>146.0</td>
<td>71.1</td>
<td>37.8</td>
</tr>
<tr>
<td>11. C. griseum</td>
<td>38.5</td>
<td>83.0</td>
<td>63.6</td>
<td></td>
</tr>
<tr>
<td>12. C. hasselti</td>
<td>38.8</td>
<td>82.6</td>
<td>59.3</td>
<td></td>
</tr>
<tr>
<td>13. C. indicum</td>
<td>39.3</td>
<td>65.0</td>
<td>54.2</td>
<td></td>
</tr>
<tr>
<td>14. C. punctatum</td>
<td>32.3</td>
<td>94.1</td>
<td>66.4</td>
<td>38.3</td>
</tr>
<tr>
<td>15. H. microstoma</td>
<td>38.8</td>
<td>102.0</td>
<td>78.6</td>
<td>44.5</td>
</tr>
<tr>
<td>16. L. macrorhinus</td>
<td>57.7</td>
<td>84.0</td>
<td>74.7</td>
<td></td>
</tr>
<tr>
<td>17. R. acutus</td>
<td>47.9</td>
<td>77.4</td>
<td>70.4</td>
<td>36.0</td>
</tr>
<tr>
<td>18. S. laticaudus</td>
<td>26.6</td>
<td>60.5</td>
<td>41.1</td>
<td></td>
</tr>
<tr>
<td>19. S. lewini</td>
<td>48.3</td>
<td>77.5</td>
<td>55.8</td>
<td>47.3</td>
</tr>
<tr>
<td>20. S. mokarran</td>
<td>68.0</td>
<td>71.3</td>
<td>69.7</td>
<td></td>
</tr>
</tbody>
</table>
Table 11: Percentage of maturity for five most dominant species of sharks by area and sex.

<table>
<thead>
<tr>
<th>Species</th>
<th>C. punctatum</th>
<th>C. hasselti</th>
<th>S. laticaudus</th>
<th>C. sorrah</th>
<th>A. marmoratus</th>
</tr>
</thead>
<tbody>
<tr>
<td>MALE</td>
<td>N = 357</td>
<td>N = 139</td>
<td>N = 48</td>
<td>N = 50</td>
<td>N = 13</td>
</tr>
<tr>
<td>Immature</td>
<td>45.4</td>
<td>48.9</td>
<td>14.6</td>
<td>98.0</td>
<td>15.4</td>
</tr>
<tr>
<td>Mature</td>
<td>54.6</td>
<td>51.1</td>
<td>85.4</td>
<td>2.0</td>
<td>84.6</td>
</tr>
<tr>
<td>FEMALE</td>
<td>N = 182</td>
<td>N = 63</td>
<td>N = 44</td>
<td>N = 14</td>
<td>N = 8</td>
</tr>
<tr>
<td>Immature</td>
<td>45.6</td>
<td>34.9</td>
<td>13.6</td>
<td>100.0</td>
<td>84.6</td>
</tr>
<tr>
<td>Mature</td>
<td>54.4</td>
<td>65.1</td>
<td>86.4</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Species</th>
<th>C. punctatum</th>
<th>C. griseum</th>
<th>C. sealei</th>
<th>C. sorrah</th>
<th>L. macrorhinus</th>
</tr>
</thead>
<tbody>
<tr>
<td>MALE</td>
<td>N = 52</td>
<td>N = 19</td>
<td>N = 31</td>
<td>N = 26</td>
<td>N = 20</td>
</tr>
<tr>
<td>Immature</td>
<td>13.4</td>
<td>21.1</td>
<td>54.8</td>
<td>53.8</td>
<td>20.0</td>
</tr>
<tr>
<td>Mature</td>
<td>86.6</td>
<td>78.9</td>
<td>45.2</td>
<td>46.2</td>
<td>80.0</td>
</tr>
<tr>
<td>FEMALE</td>
<td>N = 69</td>
<td>N = 27</td>
<td>N = 15</td>
<td>N = 15</td>
<td>N = 12</td>
</tr>
<tr>
<td>Immature</td>
<td>5.8</td>
<td>14.8</td>
<td>46.7</td>
<td>80.0</td>
<td>8.4</td>
</tr>
<tr>
<td>Mature</td>
<td>94.2</td>
<td>85.2</td>
<td>53.3</td>
<td>20.0</td>
<td>91.6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Species</th>
<th>S. laticaudus</th>
<th>C. sealei</th>
<th>C. sorrah</th>
<th>S. lewini</th>
<th>C. amblyrhynchoides</th>
</tr>
</thead>
<tbody>
<tr>
<td>MALE</td>
<td>N = 329</td>
<td>N = 65</td>
<td>N = 65</td>
<td>N = 51</td>
<td>N = 40</td>
</tr>
<tr>
<td>Immature</td>
<td>18.8</td>
<td>89.2</td>
<td>100.0</td>
<td>98.0</td>
<td>72.5</td>
</tr>
<tr>
<td>Mature</td>
<td>81.2</td>
<td>10.8</td>
<td>2.0</td>
<td>27.5</td>
<td>27.5</td>
</tr>
<tr>
<td>FEMALE</td>
<td>N = 314</td>
<td>N = 76</td>
<td>N = 36</td>
<td>N = 44</td>
<td>N = 21</td>
</tr>
<tr>
<td>Immature</td>
<td>12.7</td>
<td>96.1</td>
<td>100.0</td>
<td>97.7</td>
<td>100.0</td>
</tr>
<tr>
<td>Mature</td>
<td>87.3</td>
<td>3.9</td>
<td>2.3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Species</th>
<th>C. sorrah</th>
<th>C. dussumieri</th>
<th>S. lewini</th>
<th>H. microstoma</th>
<th>C. melanopterus</th>
</tr>
</thead>
<tbody>
<tr>
<td>MALE</td>
<td>N = 11</td>
<td>N = 9</td>
<td>N = 9</td>
<td>N = 6</td>
<td>N = 5</td>
</tr>
<tr>
<td>Immature</td>
<td>72.7</td>
<td>44.4</td>
<td>88.9</td>
<td>100.0</td>
<td>60.0</td>
</tr>
<tr>
<td>Mature</td>
<td>27.3</td>
<td>55.6</td>
<td>11.1</td>
<td>40.0</td>
<td></td>
</tr>
<tr>
<td>FEMALE</td>
<td>N = 9</td>
<td>N = 5</td>
<td>N = 4</td>
<td>N = 4</td>
<td>N = 4</td>
</tr>
<tr>
<td>Immature</td>
<td>33.3</td>
<td>40.0</td>
<td>100.0</td>
<td>75.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Mature</td>
<td>66.7</td>
<td>60.0</td>
<td>25.0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Gambang (1994) reported on the composition of sharks, caught using lines (hooks and lines, and longlines), within the untrawlable areas of Sarawak. In these areas, sharks constituted 13.0% of the catch. High catches were recorded off Tanjung Datu close to the Natuna Islands.

In 2001, rays caught by trawls constituted about 74.0% of the total landing of rays followed by hooks and lines (14.0%) and drift nets (10.0%). Other gears include stationary gears, portable traps, seines and bag nets.

### Status of Exploitation

Alias (pers. comm.) applied Fox’s Surplus Production Model to the annual statistics of the west coast of Peninsular Malaysia from 1969 to 1991 and provided yield-effort curves for every species including sharks and rays. The Maximum Sustainable Yield (MSY) estimated for sharks on the west coast was 1,274 tonnes at total effort of 538,753 trawler horse power (hp). The MSY and fMSY values for rays were estimated at 4,240 tonnes and 1,325,310 hp respectively. From these MSY values, the present landings of sharks and rays on the west coast have exceeded since 1985 and 1986 respectively. The status of these resources on the east coast has not been assessed so far.

<table>
<thead>
<tr>
<th>Year</th>
<th>Trawls (%)</th>
<th>Hook and lines (%)</th>
<th>Drift/gillnets (%)</th>
<th>Others (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1965</td>
<td>4</td>
<td>31</td>
<td>62</td>
<td>3</td>
</tr>
<tr>
<td>1970</td>
<td>35</td>
<td>27</td>
<td>37</td>
<td>1</td>
</tr>
<tr>
<td>1975</td>
<td>64</td>
<td>16</td>
<td>19</td>
<td>1</td>
</tr>
<tr>
<td>1980</td>
<td>58</td>
<td>24</td>
<td>14</td>
<td>4</td>
</tr>
<tr>
<td>1985</td>
<td>37</td>
<td>22</td>
<td>40</td>
<td>1</td>
</tr>
<tr>
<td>1990</td>
<td>79</td>
<td>8</td>
<td>13</td>
<td>0</td>
</tr>
<tr>
<td>1995</td>
<td>72</td>
<td>10</td>
<td>17</td>
<td>1</td>
</tr>
<tr>
<td>2001</td>
<td>60</td>
<td>13</td>
<td>26</td>
<td>1</td>
</tr>
</tbody>
</table>
**TRADE OF SHARKS AND RAYS AND THEIR PRODUCTS**

**Utilisation of Sharks and Rays**

There are only a few small-scale sharks processing plants in the form of cottage industry operated mostly by fisher folks. This is due to the irregular supply of raw materials for continuous operation of these plants.

Sharks are mostly utilised as fresh meat, although some are processed as salted fish (Table 13). In Mukah Division in Sarawak, where sharks are caught mainly by gill nets, shark meat is mainly eaten raw—a local delicacy called “umai”. “Umai” is a mixture of raw fish meat with local ingredients and the product is now commercially produced in Mukah and Bintulu. A small number of shark’s jaws, and even teeth, are sold as rare souvenir items to enthusiasts. Cartilage and some other discarded parts of the fish are used as bait for fish and crab traps. Small sharks, as well as those that are non-edible or unsuitable for bait are sold to fish mill factories for fertilizers. Rays are mostly consumed fresh (cooked or smoked) and salted.

Mohsin and Ambak (1996) reported that only five shark species are locally accepted as table food. Both meat and fins from species such as silky shark (*Carcharhinus falciformis*), blacktip shark (*C. limbatus*), hardnose shark (*C. macloti*), spottail shark (*C. sorrah*), and spadenose shark (*Scoliodon laticaudus*) are in great demand and the prices of these species are increasing. Other species are also popular locally amongst Malaysian Chinese for their fins and meat, especially blacktip reef shark (*Carcharhinus melanopterus*), blackspot shark (*C. sealei*), scallop hammerhead (*Sphyrna lewini*), great hammerhead (*S. mokarran*) and smooth hammerhead (*S. zygaena*). Currently almost all shark species are accepted as table food.

**Marketing of Sharks and Rays**

Local usage and marketing study conducted in 2003 at six landing sites showed that most sharks are consumed locally. Shark fins are mostly exported to Hong Kong and Singapore. The prices of fresh whole shark range between US$ 0.2 - 1.6 kg⁻¹ depending on the species. Sharks species from the family Carcharhinidae (requiem sharks) are sold at higher price of US$ 0.6 - 1.6 kg⁻¹ compared to species from family Hemiscyllidae (longtail carpetsharks) which fetched a price of US$ 0.2 - 0.5 kg⁻¹. The detail information at six landing sites on sharks prices, local usage and marketing destinations is shown in Table 13.

Table 14 gives the import and export volumes of shark products (fresh, dried, salted or smoked) in terms of weight and value. The volume of imported shark products fluctuated from a peak of 642 tonnes in 1983 to its lowest of 69 tonnes in 1987. The value of imports did not exceed US$2.0 million during this period. The volume of export did not exceed 50 tonnes, except in 1982 when it was about 103 tonnes. In terms of value, the export of shark’s products from Malaysia has always been less than US$250,000 except in 1993 when it is about US$1.413 million. However, the import of shark’s products was always higher than export in terms of volume and value.

The Malaysian trade in shark’s fin is on a small scale and only about 2.0% of that of Singapore. Malaysia imports shark’s fin from more than 25 countries and exports it to about 15 countries.

On exports of shark’s meat have been reported since 1991 when they stood at 34 tonnes and worth US$ 42,000. Export has not been very regular and in 1997 they amounted to only 35 tonnes, worth US$15,000.
Table 13: Price, local usage and marketing destination of shark at six landing sites based on study conducted from July 2003 to August 2004.

<table>
<thead>
<tr>
<th>Landing Site</th>
<th>Family</th>
<th>Usage</th>
<th>Local Price (US$ kg⁻¹)</th>
<th>Marketing Destination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hutan Melintang</td>
<td>Carcharhinidae</td>
<td>Whole body</td>
<td>0.60-1.60*</td>
<td>Domestic markets in Perak, Selangor and Kuala Lumpur</td>
</tr>
<tr>
<td></td>
<td>Hemiscyllidae</td>
<td>Shark fin</td>
<td>0.20-0.40*</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fish ball</td>
<td>0.70*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sphyrnidae</td>
<td>Whole body</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Shark fin</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fish ball</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kuantan</td>
<td>Carcharhinidae</td>
<td>Whole body</td>
<td>0.90*</td>
<td>Wholesale markets in Malaysia (K. Lumpur, Muar, Batu Pahat) and shark’s fin export to Singapore and Hong Kong</td>
</tr>
<tr>
<td></td>
<td>Hemiscyllidae</td>
<td>Shark fin</td>
<td>0.50*</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fish ball</td>
<td>0.90*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sphyrnidae</td>
<td>Whole body</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Shark fin</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fish ball</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bintulu</td>
<td>Carcharhinidae</td>
<td>Whole body</td>
<td>0.4-0.6*</td>
<td>Local markets in Bintulu and Sibu</td>
</tr>
<tr>
<td></td>
<td>Hemiscyllidae</td>
<td>Shark fin</td>
<td>0.2-0.4*</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fish ball</td>
<td>0.4-0.6*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sphyrnidae</td>
<td>Whole body</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Shark fin</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fish ball</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mukah</td>
<td>Carcharhinidae</td>
<td>Whole body</td>
<td>0.4-1.0*</td>
<td>Local markets in Mukah, Sibu and Kuching</td>
</tr>
<tr>
<td></td>
<td>Hemiscyllidae</td>
<td>Shark fin</td>
<td>0.4-0.6*</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Salted meat</td>
<td>0.4-1.0*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sphyrnidae</td>
<td>Whole body</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Shark fin</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fish ball</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sandakan</td>
<td>Carcharhinidae</td>
<td>Whole body</td>
<td>0.4-0.5*</td>
<td>Local markets in Sandakan and Peninsular Malaysia</td>
</tr>
<tr>
<td></td>
<td>Hemiscyllidae</td>
<td>Shark fin</td>
<td>0.2-0.4*</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Salted meat</td>
<td>0.4-0.5*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sphyrnidae</td>
<td>Whole body</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Shark fin</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Frozen meat</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fish ball</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kota Kinabalu</td>
<td>Carcharhinidae</td>
<td>Whole body</td>
<td>0.6-0.7*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hemiscyllidae</td>
<td>Whole body</td>
<td>0.2-0.4*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sphyrnidae</td>
<td>Whole body</td>
<td>0.6-0.7*</td>
<td></td>
</tr>
</tbody>
</table>

* The price only refers to whole sharks
The Annual Fisheries Statistics does not differentiate the different species of sharks that are caught and processed. Data concerning these products are only available under the general headings of:

- Dogfish and other sharks (exclude livers and roes, frozen)
- Shark’s fin salted but not dried or smoked and in brine
- Shark’s fin dried weather or not salted but not smoked
- Shark’s fin

Under category of dogfish and other shark, Malaysia export 24.51 tonnes to China and 0.05 tonnes to Brunei Darussalam in 2002. Malaysia imports the same product from New Zealand (10.57 tonnes), Indonesia (1.0 tonnes) and Sri Lanka (0.04 tonnes) respectively.

The main markets for sharks’s fin (salted but not dried or smoked and in brine) in 2002 was Hong Kong at about 8.81 tonnes. Malaysia imports similar products from Spain (25.22 tonnes), Philippines (8.72 tonnes) and Singapore (1.35 tonnes).

The main market for shark’s fins, dried, weather or not salted but not smoked in 2002 were Thailand (2.91 tonnes) followed by China (1.8 tonnes), and Hong Kong (0.73 tonnes). Malaysia also exports a small amount of this product to Singapore, United Kingdom and Australia. However Malaysia import 15.92 tonnes from Indonesia, 4 tonnes from Sri Lanka, 2.73 tonnes from USA, 2.33 tonnes from Singapore and 2.14 tonnes from China. A small amount of these products also imported from Australia and Myanmar.

In the same year, Singapore, USA and Philippines have been the major countries that export shark’s fins to Malaysia, at 1.31 tonnes, 0.47 tonnes and 0.36 tonnes, respectively. Malaysia in turn has provided export of the same products to Singapore at 4.46 tonnes.

Fins are normally extracted from very small sharks from families Carcharhinidae, Hemiscyllidae and Hemigalidae of less than 1 m in size. Fresh fins and their processed items may be easily found at several wet markets especially in Kuantan, Kota Kinabalu and Sandakan (Abdul-Haris et al., 2004)

A trade study made by TRAFFIC (Chen, 1996) showed that most of the shark’s fin processors in Malaysia do not want their activities to be known by the public. Most traders do not advertise their activities in trade directories, chambers of commerce or the dried seafood associations. Except for the sale of popular products such as sashimi and sushi in local supermarkets, shark’s fin processors in Malaysia have not ventured into processing of ready-to-eat products. However, attempts to produce local canned shark’s fin soup were made. One established Malaysian company distributes pouched shark fin soups and dishes under its own label, but the product was processed and packed in Thailand.

Some medicine shops also stock processed shark’s fin and a variety of differently labelled imported shark products that include shark’s cartilage and squalene. The shark’s cartilage has been claimed by producers to have some anti-vascularization or anti-angiogenesis properties, and has the potential to provide some cure for the following pathological conditions: cancer (prostate, breast, colon and central nervous system cancers), arthritis (rheumatoid disease, progressive systemic sclerosis, osteoarthritis and mixed connective tissue diseases), skin conditions (burns, wound healing, psoriasis, eczema, hemangiomas, angiofibroma, kaposi’s sarcoma), eye diseases (diabetic retinopathy, retrolental fibroplasia, macular degeneration, corneal vascularization, neovascular glaucoma) and inflammatory (bowel diseases).
Table 14: The import and export of shark's products in Malaysia in terms of volume (tonnes) and value (US$) during the period 1977 - 1996. Source: SEAFDEC Fishery Statistical Bulletin for the South China Sea Area (1977 - 1996)

| Year | Import | | Export | | |
|------|--------|--------|--------|--------|
|      | Volume (tonnes) | Value (US$) | Volume (tonnes) | Value (US$) |
| 1977 | 209 | 838,000 | 13 | 20,000 |
| 1978 | 422 | 863,000 | 25 | 64,000 |
| 1979 | 272 | 1,150,000 | 16 | 117,000 |
| 1980 | 446 | 1,169,000 | 41 | 161,000 |
| 1981 | 606 | 1,818,000 | 12 | 194,000 |
| 1982 | 456 | 1,887,000 | 103 | 204,000 |
| 1983 | 642 | 1,862,000 | 41 | 148,000 |
| 1984 | 285 | 1,409,000 | 9 | 63,000 |
| 1985 | 172 | 944,000 | 7 | 49,000 |
| 1986 | 78 | 367,000 | 8 | 25,000 |
| 1987 | 69 | 347,000 | 18 | 101,000 |
| 1988 | 128 | 414,000 | 9 | 161,000 |
| 1989 | 96 | 582,000 | 7 | 173,000 |
| 1990 | 102 | 568,000 | 8 | 133,000 |
| 1991 | 112 | 517,000 | 5 | 22,000 |
| 1992 | 209 | 736,000 | 2 | 28,000 |
| 1993 | 165 | 944,000 | 30 | 1,413,000 |
| 1994 | 238 | 774,000 | 19 | 126,000 |
| 1995 | 123 | 749,000 | 22 | 169,000 |
| 1996 | 187 | 768,000 | 4 | 62,000 |
Prices of Sharks and Rays

Table 15 and Table 16 shows the ex-vessel and market prices of sharks and rays and their products, respectively, based on information collected at several fish markets and landing sites in 2003. The prices vary according to species and locations. The average price for small size shark (less than 0.5 kg per fish) is about U$ 0.20-1.80 kg⁻¹. The price of sharks without fins (all sizes) in Sabah and Sarawak is about U$ 0.20 - 0.70 kg⁻¹. The prices of all species of elasmobranch in Peninsular Malaysia are found to be always higher than that of the Federal Territory of Labuan, Sabah and Sarawak. The most expensive sharks fins are from white-spotted wedgefish or giant guitarfish (Rhynchobatus djiddensis) and white-spotted shovelnose rays (Rhynchobatus australiae) that can fetch up to US$ 500 kg⁻¹. Other species of big shark fins only fetch between US$ 50.00 - 65.00.

Revenue from the Fishery

In terms of percentage, the value of elasmobranch is not more than 1.0% of the value of the total marine fish landed as shown in Table 17. The current low economic value of sharks is probably due to their occurrence as a fishery associated catch. This is not reflective of its true economic potential in other areas such as recreational fishing and ecotourism. However, from data compiled by SEAFDEC during 1977 to 1996, the value of the elasmobranch fishery is on the increase from US$ 5.84 million in 1977 to US$ 24.93 million in 1996 in Southeast Asian region.

Revenue from Recreational Fishing

Recreational fishing is becoming more important in Malaysia, and a million anglers are estimated to be involved in this activity. The relatively few occurrences of big game fish like marlins in Malaysian waters, has driven sport fishers to look for a new game fish, and sharks could well fit in, probably due to their spirited struggles against capture when hooked by anglers. To catch marlins, anglers need to go far out to the open water, but this is not the case with some sharks and rays, which are found in considerable numbers in inshore areas.

Under eco-tourism activities, snorkelling and diving among the corals and fish, including sharks, is a big attraction and could provide a huge economic return. These activities are fast gaining in popularity, and are rapidly expanding following the proclamation of island resorts as marine park areas. The presence of sharks at established diving sites is a strong lure for most divers, and it can be promoted to support other economic and tourism related activities such as rental of boats and diving equipment, creation of jobs like tourist guides, etc. Feeding young black tip reef sharks (Carcharhinus melanopterus) found in the shallow waters, such as at the Pulau Payar Marine Park, has now become a unique source of delight for tourists.
Table 15: The landing and market prices of sharks and rays in Malaysia. (Source: Ahmad et al., 2004).

<table>
<thead>
<tr>
<th>Locations</th>
<th>Prices kg⁻¹ US$</th>
<th>Prices kg⁻¹ US$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Landing Prices</td>
<td>Landing Prices</td>
</tr>
<tr>
<td>Sharks (Whole body with fins</td>
<td>0.30 - 1.10</td>
<td>0.70 - 1.00</td>
</tr>
<tr>
<td>attached for small size)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rays (Whole body for small size)</td>
<td>0.30 - 1.00</td>
<td>0.60 - 1.00</td>
</tr>
<tr>
<td></td>
<td>0.20 - 0.80</td>
<td>0.20 - 0.70</td>
</tr>
</tbody>
</table>

|                                   | Market prices  | Market prices  |
|                                   | (Whole body with fins attached for small size) | (Whole body for small size) |
| West coast of Peninsular Malaysia | 0.60 - 1.80    | 1.00 - 1.30    |
| East coast of Peninsular Malaysia | 0.50 - 1.40    | 1.00 - 1.20    |
| FT Labuan, Sabah and Sarawak      | 0.50 - 1.20    | 0.40 - 1.00    |

Table 16: The landing and market prices of fins and other products of sharks and rays in Malaysia (Source: Ahmad et al., 2004).

<table>
<thead>
<tr>
<th>Products</th>
<th>Landing Prices/kg US$</th>
<th>Landing Prices/kg US$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(Sharks)</td>
<td>(Rays)</td>
</tr>
<tr>
<td></td>
<td>Wet Fins only</td>
<td>Wet Fins only</td>
</tr>
<tr>
<td>Rhynchobatus spp. (Fin height &gt; 35 cm)</td>
<td>80.00 - 90.00</td>
<td></td>
</tr>
<tr>
<td>Rhynchobatus spp. (Fin height &lt; 35 cm)</td>
<td>&lt; 80.00</td>
<td></td>
</tr>
<tr>
<td>Other species mostly from family Carcharhinidae (Fin height &gt; 20 cm)</td>
<td>50.00 - 65.00</td>
<td></td>
</tr>
<tr>
<td>Other species mostly from family Carcharhinidae (Fin height &lt; 20 cm)</td>
<td>13.00 - 20.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Market prices</td>
<td>Market prices</td>
</tr>
<tr>
<td></td>
<td>(Dry fins)</td>
<td>(Dry fins)</td>
</tr>
<tr>
<td>Rhynchobatus spp. (Fin height &gt; 35 cm)</td>
<td>&gt; 500.00</td>
<td></td>
</tr>
<tr>
<td>Rhynchobatus spp. (Fin height &lt; 35 cm)</td>
<td>200.00 - 350.00</td>
<td></td>
</tr>
<tr>
<td>Other species mostly from family Carcharhinidae (Fin height &gt; 20 cm)</td>
<td>&gt; 400.00</td>
<td></td>
</tr>
<tr>
<td>Other species mostly from family Carcharhinidae (Fin height &lt; 20 cm)</td>
<td>50.00 - 150.00</td>
<td></td>
</tr>
<tr>
<td>Other species (very small fins) &lt; 10 cm</td>
<td>Various prices</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other products</td>
<td></td>
</tr>
<tr>
<td>Salted shark meat</td>
<td>1.70 - 2.50</td>
<td></td>
</tr>
<tr>
<td>Shark’s skin</td>
<td>0.90</td>
<td></td>
</tr>
<tr>
<td>Shark’s jaw</td>
<td>10.00 - 17.00/set</td>
<td></td>
</tr>
<tr>
<td>Meat only</td>
<td>2.00 - 2.20</td>
<td>1.50 - 1.70</td>
</tr>
</tbody>
</table>
Table 17: The value of elasmobranch fishery in Malaysia in terms of percentage during 1977 - 1996. 

<table>
<thead>
<tr>
<th>Year</th>
<th>Value (US$1,000)</th>
<th>Value (US$1,000)</th>
<th>% Value (Elasmobranch)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sharks</td>
<td>Rays</td>
<td>Elasmobranch</td>
</tr>
<tr>
<td>1977</td>
<td>2,458</td>
<td>3,386</td>
<td>5,844</td>
</tr>
<tr>
<td>1978</td>
<td>5,208</td>
<td>5,720</td>
<td>10,928</td>
</tr>
<tr>
<td>1979</td>
<td>2,750</td>
<td>3,236</td>
<td>5,986</td>
</tr>
<tr>
<td>1980</td>
<td>2,931</td>
<td>4,462</td>
<td>7,393</td>
</tr>
<tr>
<td>1981</td>
<td>2,951</td>
<td>3,374</td>
<td>6,325</td>
</tr>
<tr>
<td>1982</td>
<td>2,762</td>
<td>3,793</td>
<td>6,555</td>
</tr>
<tr>
<td>1983</td>
<td>1,954</td>
<td>2,999</td>
<td>4,953</td>
</tr>
<tr>
<td>1984</td>
<td>2,151</td>
<td>2,872</td>
<td>5,023</td>
</tr>
<tr>
<td>1985</td>
<td>1,773</td>
<td>2,705</td>
<td>4,478</td>
</tr>
<tr>
<td>1986</td>
<td>1,916</td>
<td>3,654</td>
<td>5,570</td>
</tr>
<tr>
<td>1987</td>
<td>1,343</td>
<td>4,481</td>
<td>5,824</td>
</tr>
<tr>
<td>1988</td>
<td>1,555</td>
<td>4,278</td>
<td>5,833</td>
</tr>
<tr>
<td>1989</td>
<td>1,555</td>
<td>4,495</td>
<td>6,050</td>
</tr>
<tr>
<td>1990</td>
<td>1,940</td>
<td>4,814</td>
<td>6,754</td>
</tr>
<tr>
<td>1991</td>
<td>2,255</td>
<td>7,569</td>
<td>9,824</td>
</tr>
<tr>
<td>1992</td>
<td>3,837</td>
<td>9,066</td>
<td>12,903</td>
</tr>
<tr>
<td>1993</td>
<td>3,184</td>
<td>12,217</td>
<td>15,401</td>
</tr>
<tr>
<td>1994</td>
<td>5,511</td>
<td>14,560</td>
<td>20,071</td>
</tr>
<tr>
<td>1995</td>
<td>6,831</td>
<td>15,768</td>
<td>22,599</td>
</tr>
<tr>
<td>1996</td>
<td>6,976</td>
<td>17,954</td>
<td>24,930</td>
</tr>
</tbody>
</table>
Responsible Government Agencies

The Ministry of Agriculture and Agro-based Industry is responsible for setting up management policies relating to agriculture and fishery. Policies adopted for implementation are the end results of efforts by various agencies under the Ministry, whose task is that of policy formulation. These policies are then reviewed at intervals to ensure and monitor their effectiveness and suitability and they may undergo modifications to meet extent needs.

Although other agencies also exist under the Ministry in relation to fishery matters, the two most important ones that provide the lead are the Department of Fisheries Malaysia (DoFM) and the Fisheries Development Authority of Malaysia (FDAM). The DoFM has the responsibility in almost all important aspects of fisheries, from resource management enforcement, research and development extension works, corporate planning to legislation. The FDAM undertakes the task of improving the socio-economic aspects of the fishers and shareholders, fish marketing, and the general management of the fishers associations.

The most important objective under consideration by the DoFM at present relates to the developing and managing the marine fishery resources to increase production through the rational exploitation of the natural resources, and also by various forms of aquaculture. The fisheries policy currently adopted is targeted towards the exploration and exploitation of resources in new areas in the offshore waters and expansion of aquaculture on a large-scale commercial basis. At the same time, Malaysia will continue to give great importance to the maintenance of the existing coastal fisheries. These are expected to contribute the bulk of marine fish landings and provide employment to a major proportion of the fishing labour force.

Conservation and Management Strategies

The development of the fishing industry in Malaysia closely followed the guidelines of the Third National Agriculture Policy. The policy intends to bring about changes in the industry so that it will evolve into a commercial, modern and progressive sector. It is also sensitive to the environment, socio-economy and sustainability of resources.

In order to achieve the balance between fishing effort, sustainability of resources, and environmental conservation, various conservation and management strategies were implemented, *inter alia*, as follows:

- Limit fishing effort through the issuance of fishing gear and fishing vessel licenses
- Restructuring of ownership patterns of fishing licenses
- Registration of fishers
- Management of a zoning system based on the tonnage of fishing vessels, type of fishing gears used and ownership patterns
• Relocation of fishers to other economic activities such as aquaculture, ecotourism or other related activities

• Conservation and rehabilitation of the marine ecosystems through the establishment of marine parks and construction of artificial reefs

• Continuous research and development, particularly in the monitoring of resource potential, and development of eco-friendly fishing technology
There is nothing in the policy statements, or in the management strategy of the DoFM, that explicitly expresses the need for management of sharks and rays resources. This is understandable given the nature of tropical multi-species fisheries, as in Malaysia, where management is best achieved for fish populations as a whole. It would be impossible to focus on individual resources, or specific mono-species stocks of fish. Furthermore, sharks and rays have never been featured conspicuously in the landings of marine capture fisheries, either in terms of volume or value. Their contributions have been 2% of the overall fish landings.

There is still a need for a comprehensive understanding of the biology and ecology of sharks and rays especially in the areas pertaining to their population dynamics, critical habitat requirements during their life cycles and conservation needs. These are crucial factors for the successful management of sharks and rays resources. The absence of such comprehensive studies hinders the formulation of management plan.

**Fisheries Act 1985**

Under the Fisheries Act 1985, the Minister of Agriculture is empowered to make regulations for the proper management of specific marine fisheries resources. However, there is no specific regulation pertaining to the management of sharks and rays except for whale shark (*Rhincodon typus*), which is listed under the Fisheries (Control of Endangered Species of Fish) Regulations 1999. There is no regulation pertaining to the management of freshwater sharks and rays, which is under the jurisdiction of the states. However, the current list of regulations enacted under the Fisheries Act 1985 has in one way or another, provides some protection for the sharks and rays resources. More regulations need to be formulated to protect rare species such as pale whipray (*Himantura signifer*) found in Pahang, and Kinabatangan river shark (*Glyphis* sp.) and giant stingray (*Himantura chaophraya*) in Sabah.

**Fisheries (Control of Endangered Species of Fish) Regulations 1999**

Under this regulation there are 30 species listed as endangered marine animals in Malaysia, and one of them is the whale shark (*Rhincodon typus*). The regulation stipulates that no person shall fish or, disturb, harass, catch, kill, take, posses, sell, buy, export or transport any endangered species except with the written permission from Director-General of Fisheries Malaysia. Any person who contravenes the regulations is committing an offence under Section 25(b) Fisheries Act 1985 and can be fined not exceeding RM 20,000 (US$ 5,229) or a term of imprisonment not exceeding two years or both.

**Resource Access**

The exploitation of fishery resources in the Malaysian fisheries waters is controlled through general licensing provisions of the Fisheries Act 1985. Only those licensed are allowed to fish where strict rules and procedures applied. The terms and conditions printed on the license, *inter alia*, are the tonnage and horsepower of the fishing vessel,
types of fishing appliance, area of fishing, fishing time and the number of crew allowed. An annual license fee is charged on the fishing gear and fishing vessel.

**Restrictions of Fishing Gears and Methods**

In order to ensure sustainable exploitation of resources, several gear restrictions are imposed as specified in the Fisheries (Regulation of Method of Fishing) Regulation 1980 - Amendment 1990. Fishing methods that are known to be destructive to the fish resources and their environment are totally banned. These include dynamite and cyanide fishing, fishing using electric shock, pair trawling, and push nets. The locally known *pukat pari*, a drift net with a mesh size of more than 25.4 cm (10 inches), which was once used to catch large sized sharks and rays has been banned since 1990. The banning of these gears nationwide helped to reduce the excessive exploitation of the adult sharks and rays and provided some conservation of the breeding stocks.

**Zoning of Fishing Areas**

The fishing areas are categorised generally into four zones, i.e., Zone A, Zone B, Zone C and Zone C2. The areas are defined as follows:

- Zone A area (less than 5 nm from shore) are reserved for the traditional fishing gears such as portable and non-portable fishing traps, hook and line, handline, gillnet, and the drift net, operated on vessels of less than 40 GRT. Commercial gears (i.e. trawlers, purse seiners) are not allowed to operate within this zone.

- Zone B area (5-12 nm from shore) are reserved for commercial trawlers and purse seiners of less than 40 GRT and are owner-operated. Vessels greater than this size are not allowed to fish in this zone, but the areas are accessible to traditional gear operators using vessels of less than 40 GRT.

- Zone C area (12-30 nm from shore) are reserved for commercial trawlers and purse seiners of less than 70 GRT. The vessels of Zone A and Zone B are also allowed to fish in this zone.

- Zone C2 area (over 30 nm from shore) are open to all vessels of 70 GRT and above regardless of fishing methods. The vessels of Zone A, Zone B and Zone C are also allowed to fish in this zone.

Note:
Anchovy purse seiners can fish in all zones.

Zone A has been identified as breeding and nursery ground of most sharks and rays. The banning of trawlers in this area has indirectly protected the juveniles of sharks, rays and other fish (Abdul Haris Hilmi *et al.*, 2004).
Sabah Aquaculture and Inland Fisheries Enactment 2003

This enactment was gazetted in year 2003 and fully implemented in year 2005. The freshwater sharks and rays that can be found in Sabah waters and listed under IUCN Red List and or CITES shall be managed in sustainable manner. Results of the studies conducted in Sabah rivers have shown that there are two sharks species found in these rivers: Borneo river shark (*Glyphis* sp.) and Bullsharks (*Carcharhinus leucas*); three batoids: giant freshwater stingray (*Himantura chaophraya*) and two sawfishes (*Pristis microdon* and *P. zijsron*). Rules and regulations imposed under the specified section of this enactment eventually will conserve any threatened, protected, control and endangered freshwater sharks and rays. The related Section applied notably stipulated under Section (V): Fisheries and River Fishing (e.g. Prohibition of destructive/illegal fishing methods, selling and or keeping of its catches by using explosive, poisonous chemical, and electrical shock; Section (VI): Control of Fish (e.g. any species listed under controlled species are not allowed to catch which include freshwater sharks and rays); Section (VIII): Protection of Fish Habitat (e.g. Prohibition of destructive activities that threatening, disturbing or destroying fish habitat); and Section (IX): Fish Sanctuary (e.g. the establishment of Fish Sanctuary mainly for conservation of flora and fauna and its habitat).

Proposed Marine Recreational Fishing Regulation

The importance in the conservation and management of sharks has been realised because of its biological characteristics, which limits its capacity to recover from overfishing. Efforts are now underway to manage these resources through recreational fishing regulations. Besides the issue of recreational fishing, management steps are also taken in recognition that sharks have significant ecotourism value, particularly for the ardent divers, and recreational anglers. After a period of protracted discussions with the relevant interest groups, which include the various anglers associations, tourism operators, non-governmental organisations, traders etc., the Department of Fisheries is now ready to implement this regulation. The Marine Recreational Fishing Regulations, promulgated under the Fisheries Act 1985, have already been approved by the Minister of Agriculture and Agro-based Industry and will be implemented after they have been gazetted.

Under this regulation, recreational fishing shall only be allowed after the Director General of Fisheries has issued a license. For the purpose of resource conservation, fish species incidentally caught by anglers and listed under the First Schedule are prohibited from being landed. Only catch-and-release fishing is allowed for these species. There are 2 species of sharks and 5 species of rays in the Schedule as listed below:

- *Atelomycterus marmoratus* (Bennett, 1830); Coral catshark
- *Rhincodon typus* (Smith, 1828); Whale shark
- *Anoxypristis cuspidata* (Lathan,1974); Narrow sawfish
- *Pristis microdon* Lathan 1974; Largetooth sawfish
• *Pristis zijsron* Bleeker, 1851; Longcomb sawfish
• *Pristis pectinata* Lathan, 1974; Smalltooth sawfish
• *Himantura chaophraya* Monkolprasit and Robert, 1970; Freshwater whipray

Sharks species such as *Atelomycterus marmoratus* is common and relatively abundant in inshore waters compared to those further offshore. This species is not caught for consumption by recreational anglers but are immediately released and conserved to maintain the recreational fishery.

The whale shark (*Rhincodon typus*) being an endangered species must not be caught. If caught incidentally it must also be released immediately. The whale shark, which is entirely a filter feeder, feeds on plankton and small fish. Anglers who are fortunate enough to come across this fish may harm it because of its harmless in nature. It may be found in Malaysian coastal waters during the peak season of sargastid shrimps (*Acetes* sp.), which occur from November to April. The whale shark is a great attraction to divers, and is regarded as a flagship species. It is also listed under the IUCN Red List of Threatened Animals 1996.

A few rays species were very rarely found and restricted only in certain areas and most probably are endangered and threatened and require serious protective measures to prevent them from becoming severely threatened or extinct. These species are *Pristis microdon*, *Anoxypristis cuspidata*, *Pristis zijsron*, *Pristis pectinata* and *Himantura chaophraya*. 
EVALUATION ON STATUS OF RESOURCES

The fisheries management has always taken into account the relevant biological, technological, economical, social, environmental and commercial aspects, towards ensuring the effective conservation, management and development of all living aquatic resources. The achievement of the resources, socio-economy and ecology parameters to be evaluated and assessed using sustainable indicators. Determining the current stock biomass or resource potential in the form of Maximum Sustainable Yield has always been an important tool for fisheries managers in Malaysia. Sustainable indicators such as fisheries performance indicators (catch rate and exploitation rate), reference points (MSY, MEY and optimum effort) and trigger points (the catch above MSY) have always been used to monitor the status of the stocks. Up-to-date information on the indicators is vital for the management to formulate policies for the conservation and sustainable exploitation of sharks and rays resources in the area.

The management in the DoFM normally seeks scientific advice on resource status from its Research Division, particularly on fish stock assessment. The latest information regarding the status of the fishery and its resources is provided to management, normally with supporting data. The management will make changes accordingly on policies in conformance to the advice given.

Important issues that may create a serious impact on the Malaysian fisheries are discussed at length within the DoFM and also with other relevant parties such as, *inter alia*, fishers' associations, universities, non-governmental organisations and related government agencies. The views, suggestions, and criticisms are taken into consideration in the decision making of the DoFM. This consultative approach is necessary not only to ensure that the best advice is obtained but also to create a better compliance and closer working relationship between the DoFM and stakeholders.

The results obtained from resource surveys and other research activities are presented to the top management of the DoFM and other scientific seminars.
MANAGEMENT COSTS

The costs of managing the Malaysian fisheries are entirely borne by the Government which the smooth running of these fisheries as being part of its responsibility to the people and for good of the country. The various government agencies and departments that have been established, such as the DoFM and FDAM, have personnel whose salaries are entirely paid for by the Government. These personnel do not have any invested interests in the fisheries other than the responsibility and duty that have been entrusted to them to ensure the smooth running and prosperity of the fisheries. In 1998, the Government allocated around US$ 12.1 million to the DoFM to achieve the Department's objectively cost recovery models in the management process of the entire Malaysian fisheries have up to now been considered.

The DoFM has come up with comprehensive management schemes to manage fisheries resources in Malaysia. Laws and regulations are promulgated for this purpose. However, these are meaningless without proper enforcement. Enforcement is deemed necessary in an effective management, and the DoFM has the capacity and capability to deliver it.

Few regulations now exist which are known to explicitly benefit the shark resources; the most recent is that related to recreational fishing. This expresses explicitly the need for conservation of a few species of sharks such that only catch and release fishing is allowed. Although other existing management measures are not directly aimed towards the conservation and management of the shark fisheries, their implementation, nevertheless, does provide some benefits for these resources.

Control in the allocation of fishery licenses helps to regulate fishing effort, thus reducing the incidence of shark capture. The establishment of Marine Parks and other protected areas helps to protect the marine ecosystem, nursery areas of a number of fish and the shark species found within them. The zoning system helps prevent fishers conflicts between different sized vessels, particularly the trawlers and reduces excessive fishing activities in the inshore waters by the different types of gear. The banning of certain gears, such as the large mesh gillnets, helps to conserve breeding stocks by allowing the escape of the larger, more fecund, females.

Eventhough most of the existing management measures are directed towards the management of the fisheries as a whole, Malaysia has the legal framework to formulate specific measures aimed towards the conservation of sharks, if the need arises, and the capacity and capability to implement, and enforce, such measures.

There is a clear set of objectives for the management of the fishing industry in Malaysia, as mentioned above. Strategies that have been devised, and are currently being implemented by the Department of Fisheries, are deliberate steps to achieve management objectives. Support from all quarters is greatly needed and in this respect the expertise, skill and competence from the various stakeholder groups need to be harnessed and maintained.
The department staff frequently undertakes educational initiatives, directed at raising the public awareness in matters relating to the prosperous fishing industry. In most of these activities, response from the target groups, which include the fishers and stakeholders, is good, and poses few problems.

Up-to-date information on the status of the fishery, usually in the form of biological resource advice from relevant researchers and advisors, is vital to enable a correct balance be reached between the needs of the fishing community and availability of the fish resources, which should not be exploited at the maximum sustainable level. Incorrect management decisions would adversely affect the resources and may cause economic disaster for the communities dependent on them. However, the fisheries managers should also strive for a prosperous fishing industry which would have the capability to produce enough fish for the needs of the county, reduce imported fish products and improve the cash flow of the country. The industry should also develop profitable careers, create opportunities for higher living standards for fishers, if not more at least on par with these in other industries, and make a greater contribution to the National Gross Domestic Product.

Fishers are generally happy with the current situation of fishery resources in Malaysia, although at times criticisms and suggestions are also given that are considered at formal meetings held between researchers and advisors. Fisher and stakeholders generally try to obtain as many benefits as possible from the fishery. Although few are willing to consider the negative aspects of resource overexploitation and habitat degradation, they nevertheless generally comply with any legislative procedures and regulations set by the Department.
ISSUES AND CHALLENGES

Biological Information of Sharks and Related Habitats

- Lack of information on stock structure, abundance, life history or reproductive rate of most species of sharks and rays
- Lack of quality information available for stock assessment and effective management
- Present statistical data collection does not record landings by species. This does not indicate the status of the resources either by abundance, vulnerable or endangered
- Investment in research and management of sharks and rays are still lacking
- Information regarding freshwater sharks and rays is still scanty for the purpose of conservation and management. Most of these freshwater species are endemic in nature. Therefore, more efforts are needed to protect them from being extinct in the near future.

Socio-economic Information of Fishers and Traders

- Information on socio-economic of fishers and traders involved in sharks and rays fisheries are still inadequate.

Utilisation, Marketing and Trade Information

- All parts of sharks and rays are fully utilised, both for human consumption as well as animal’s feeds. However, detailed and compiled information on these products are still inadequate without any proper data collection mechanism.
- Information on marketing and trade is still lacking.

Coordinated Research and Expertise on Shark

- No proper coordination on sharks and rays research among research institutions universities and non-governmental organisations.
- Research on shark is conducted mainly on individual interest.
- No networking among experts and researchers is yet available.

Conservation and Management

- Lack of enforcement to conserve vulnerable or threatened sharks and rays stocks.
- No identification and use of indicators for sustainable exploitation.
- Lack of effective protection to possible critical habitats in some coastal areas.
- No proper areas for sustainable eco-tourism activities.
- Catch-and-release activities of elasmobranchs are not widely practised among recreational anglers.
Strengthening of Data Collection on Biology and Related Habitats

The following programmes are to be implemented in order to ensure sustainable exploitation of elasmobranch resources:

• Improvement of data collection on landings by major species. Action to be taken by Fisheries Management and Information Division (FMID) in collaboration with Research Division (RD).

• Identification of natural habitats for breeding and nursery grounds of elasmobranchs for conservation and protection. Action to be taken by RD.

• Study on biology and taxonomy of elasmobranchs to determine status of stock. Action to be taken by RD.

• Improvement of data acquisition on elasmobranch products and trade. Action to be taken by FMID.

• Collection and compilation of information on stock structure, abundance, life history and reproduction rates. Action to be taken by RD.

• Facilitate the identification and reporting of species-specific biological and trade data. Action to be taken by FMID and RD.

Strengthening of Data Collection on Socio-economic of Fishers and Traders

The following programmes are to be implemented to ensure the social well being of fishers and traders:

• Study on socio-economy importance of elasmobranch resources.

• Study on demographic profile, fisheries profile, fishing operation practices, problems, and fishery systems.

• Study on traditional communities structure and institutional management.

• Study the possibility of elasmobranch aquaculture. Action to be taken by Aquaculture Division.

Strengthening of Data Collection on Trades and Encouraging the Utilisation of Elasmobranch Catches

The following programmes are to be implemented in order to sustain the industry:

• Study on marketing mechanism and trade flows including credit facilities and post-harvest processing.
• Implement harvesting strategies consistent with the principal of biological sustainability and rational long-term economic use.

• Minimise waste and discards from elasmobranch catches.

• Development of value-added elasmobranch products (meat, skin, cartilage etc.) by RD and Extension Division in collaboration with MARDI.

• Develop DNA fingerprint study to identify shark species listed by CITES

**Capacity Building and Coordinated Research**

The following programmes are to be implemented in order to coordinate research on sharks and to enhance knowledge of the species:

• Improve and develop knowledge on biology, taxonomy and ecology of elasmobranch resources.

• Improve public awareness on the importance of elasmobranch resources and their species in the ecosystems.

• Conduct national training on taxonomy and biology to build capable research and extension personnel within the country.

• Participate in seminars and meetings related to elasmobranchs at national, regional and international levels.

• Attend national, regional and international training courses on elasmobranchs to build highly capable researchers.

• Strengthening of public awareness among fishers and other stakeholders on the importance of conservation of elasmobranch resources by Extension Division.

• Enforcement on the implementation of Fisheries (Control of Endangered Species of Fish) Regulations 1999. Action to be taken by enforcement agencies and to be coordinated by DoFM.

• Improve and develop framework for establishing and coordinating effective consultation involving stakeholders in research, management and educational initiatives within and between States.

• Encourage multinational surveys targeted on deep-water and oceanic elasmobranchs.
Effective Conservation and Management

- Identify and provide special attention in particular to vulnerable or threatened sharks and rays stocks. Action to be taken by RD.

- Identify indicators for sustainable exploitation.

- Establish baseline data on population and taxonomy.

- Conserve and rehabilitate critical habitats.

- Develop sustainable eco-tourism activities in areas where there are seasonal aggregation of elasmobranchs.

- Encourage catch-and-release elasmobranchs among recreational anglers.

- Provide elasmobranch identification sheet to anglers.
1. Strengthening data collection on biology and related habitats

2. Strengthening data collection on socio-economy of fishers and traders

3. Strengthening data collection on trade and encourage utilisation of resources

4. Capacity building and coordinate research

5. Implement effective conservation and management strategies

<table>
<thead>
<tr>
<th>No.</th>
<th>Actions</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Strengthening data collection on biology and related habitats</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Strengthening data collection on socio-economy of fishers and traders</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Strengthening data collection on trade and encourage utilisation of resources</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Capacity building and coordinate research</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Implement effective conservation and management strategies</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
CONCLUSION

Sharks are not targeted by fishers but are caught together with other commercially important species. They are brought back as a whole to the port and sold at a reasonable price with the fins fetching a better price. Similarly rays are caught and sold at a reasonable price.

Management of fisheries resources in Malaysia is solely under the control of the Federal Government through the licensing system and entries into the fisheries are restricted. For this reason, it is unlikely that pressures on shark catches by Malaysian fishing vessels will increase in the future. However, a well plan management measures can ensure that the resources will be exploited in a sustainable manner and this will eventually benefit us all in the future.

In order to achieve the above vision, the Government of Malaysia needs to undertake the following activities in the conservation, enhancement and management of Shark resources:

- Strengthen data collection on biology and related habitats.
- Collect and compile list of dominant, vulnerable and endangered shark species found in Malaysia
- Monitor landings so that it stabilized at sustainable manner
- Identify habitats for reproduction and nursery ground and these need to be protected from destruction and fishing activities.
- Strengthen data collection on socio-economic of fishers and traders
- Strengthen data collection on trade
- Encourage full utilisation of elasmobranch catches by improving value-added of shark’s product especially meat, skin and cartilage.
- Improve and develop framework for establishing and coordinating effective consultation involving stakeholders in research, management and educational initiatives within and between States.
- Strengthen education and public awareness among fishers and people on importance of conservation of shark resources.
- Implement effective conservation and management strategies on shark resources.
REFERENCES


Sharum 2002, Demersal Fish Stock Assessment in the Inshore Area of the East Coast of Peninsular Malaysia. In Demersal Fish Resources in Malaysian Waters. Thirteenth Trawl Survey of the Coastal Waters off the East Coast of Peninsular Malaysia (April June 2001), Department of Fisheries Malaysia. (15 - 37).

## Appendix I

### Checklist of Elasmobranchs Recorded from Malaysia

1. 🦈 Recorded elsewhere in Malaysia
2. 🦈 Record during 1999-2004 studies
3. 🦈 First record from Malaysia

The system of classification for sharks and rays follows that of Compagno (1999). New records from Malaysia was ascertained by comparison with several publications as listed below: Cantor (1849), Maxwell (1921), Herre (1940), Scott (1959), Ommanney (1961), Monkolprasit (1984), Mohsin et al., (1993), Khan et al., (1996), Mohsin and Ambak (1996), Mansor et al., (1998), and Manjaji (2002).

<table>
<thead>
<tr>
<th>No.</th>
<th>Order/Family/Scientific name/Common name</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>SHARKS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>ORDER HEXANCHIFORMES</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>COW AND FRILLED SHARKS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Family: HEXANCHIDAE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sixgill and sevengill sharks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>ORDER: SQUALIFORMES</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>DOGFISH SHARKS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Family: SQUALIDAE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Family: CENTROPHORIDAE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gulper sharks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>ORDER: SQUATINIFORMES</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>ANGEL SHARKS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Family: SQUATINIDAE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Angel sharks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>ORDER: HETERODONTIFORMES</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>BULLHEAD SHARKS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Family: HETERONTIDAE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bullhead sharks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Order/Family/Scientific name/Common name</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>-----</td>
<td>----------------------------------------</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>

**ORDER: ORECTOLOBIFORMES**

**CARPET SHARKS**

Family: *ORECTOLOBIDAE*

*Webbegongs*

| 7.  | *Orectolobus maculatus* (Bonnaterre, 1788). Spotted wobbegong. | ![Image] |
| 8.  | *Orectolobus* sp. | | |

Family: *HEMISCYLLIDAE*

*Longtailed carpet sharks*

| 10. | *Chiloscyllium hasselti* Bleeker, 1852. Indonesian bambooshark. | ![Image] |
| 11. | *Chiloscyllium indicum* (Gmelin, 1789). Slender bambooshark. | ![Image] |
| 12. | *Chiloscyllium plagiosum* (Bennett, 1830). White-spotted bambooshark. | ![Image] |

Family: *GINGLYMOSTOMATIDAE*

*Nurse sharks*

| 14. | *Nebrius ferrugineus* (Lesson, 1830). Tawny nurse shark. | ![Image] |

Family: *STEGOSTOMATIDAE*

*Zebra sharks*

| 15. | *Stegostoma fasciatum* (Hermann, 1783). Zebra shark. | ![Image] |

Family: *RHINCODONTIDAE*

*Whale sharks*

| 16. | *Rhincodon typus* (Smith, 1828). Whale shark. | ![Image] |

**ORDER: LAMNIFORMES**

**MACKEREL SHARKS**

Family: *ALOPIDAE*

*Thresher sharks*
<table>
<thead>
<tr>
<th>No.</th>
<th>Order/Family/Scientific name/Common name</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Family: LAMNIDAE</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Mackerel sharks</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>ORDER: CARCHARHINIFORMES</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>GROUND SHARKS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Family: SCYLIORHINIDAE</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Cat sharks</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Family: TRIAKIDAE</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Hound sharks</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27.</td>
<td><em>Mustelus</em> sp. 1</td>
<td>![Image]</td>
<td>![Image]</td>
<td>![Image]</td>
</tr>
<tr>
<td>28.</td>
<td><em>Mustelus</em> sp. 2</td>
<td>![Image]</td>
<td>![Image]</td>
<td>![Image]</td>
</tr>
<tr>
<td></td>
<td><strong>Family: HAMIGALEIDAE</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Weasel sharks</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Order/Family/Scientific name/Common name</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----</td>
<td>----------------------------------------------------------------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>38.</td>
<td><em>Carcharhinus melanopterus</em> (Quoy &amp; Gaimard, 1824). Blacktip reef shark.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>44.</td>
<td><em>Carcharhinus borneensis</em> (Bleeker, 1859). Borneo shark.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>48.</td>
<td><em>Carcharhinus</em> sp. [Yano et al., 2005]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50.</td>
<td><em>Glyphis</em> sp. B (Borneo river shark)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>55.</td>
<td><em>Rhizoprionodon acutus</em> (Rüppell, 1837). Milk shark.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Order/Family/Scientific name/Common name</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>-----</td>
<td>--------------------------------------------------------------------------------------------------------</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>

**Family: SPHYRNIDAE**

**Hammerhead sharks**

<table>
<thead>
<tr>
<th>No.</th>
<th>Order/Family/Scientific name/Common name</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>63.</td>
<td><em>Eusphyra blochii</em> (Cuvier, 1817). Winghead shark.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**BATOIDS**

**ORDER: PRISTIFORMES**

**SAWFISHES**

**Family: PRISTIDAE**

**Modern sawfishes**

<table>
<thead>
<tr>
<th>No.</th>
<th>Order/Family/Scientific name/Common name</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
</table>

**ORDER: RHINIFORMES**

**WEDGEFISHES**

**Family: RHINIDAE**

**Sharkrays**

<table>
<thead>
<tr>
<th>No.</th>
<th>Order/Family/Scientific name/Common name</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>No.</td>
<td>Order/Family/Scientific name/Common name</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>-----</td>
<td>----------------------------------------</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>7.</td>
<td><em>Rhinobatus laevis</em> (Bloch &amp; Schneider, 1801). Smooth nose wedgefish.</td>
<td><img src="image1.png" alt="Image" /></td>
<td><img src="image2.png" alt="Image" /></td>
<td><img src="image3.png" alt="Image" /></td>
</tr>
<tr>
<td>8.</td>
<td><em>Rhynchobatus djiddensis</em> (Forsskael, 1775). White-spotted wedgefish or giant guitarfish</td>
<td><img src="image4.png" alt="Image" /></td>
<td><img src="image5.png" alt="Image" /></td>
<td><img src="image6.png" alt="Image" /></td>
</tr>
<tr>
<td><strong>ORDER: RHINOBATIFORMES</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>GUITARFISHES</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Family: RHINOBATIDAE</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td><em>Rhinobatos formosensis</em> (Norman, 1926). Taiwan guitarfish.</td>
<td><img src="image7.png" alt="Image" /></td>
<td><img src="image8.png" alt="Image" /></td>
<td><img src="image9.png" alt="Image" /></td>
</tr>
<tr>
<td>10.</td>
<td><em>Rhinobatos typus</em> (Bennett, 1830). Giant shovelnose ray.</td>
<td><img src="image10.png" alt="Image" /></td>
<td><img src="image11.png" alt="Image" /></td>
<td><img src="image12.png" alt="Image" /></td>
</tr>
<tr>
<td>11.</td>
<td><em>Rhinobatos thouin</em> (Anonymous, 1798). Clubnose guitarfish.</td>
<td><img src="image13.png" alt="Image" /></td>
<td><img src="image14.png" alt="Image" /></td>
<td><img src="image15.png" alt="Image" /></td>
</tr>
<tr>
<td>12.</td>
<td><em>Rhinobatos halavi</em> (Forsskael, 1775). Halavi guitarfish.</td>
<td><img src="image16.png" alt="Image" /></td>
<td><img src="image17.png" alt="Image" /></td>
<td><img src="image18.png" alt="Image" /></td>
</tr>
<tr>
<td>13.</td>
<td><em>Rhinobatos obtusus</em> (Müller and Henle, 1841). Widenose guitarfish.</td>
<td><img src="image19.png" alt="Image" /></td>
<td><img src="image20.png" alt="Image" /></td>
<td><img src="image21.png" alt="Image" /></td>
</tr>
<tr>
<td><strong>ORDER: TORPEDINIFORMES</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ELECTRIC RAYS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Family: NARCINIDAE</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td><em>Narcine brunnea</em> (Annandale, 1909). Brown electric ray.</td>
<td><img src="image22.png" alt="Image" /></td>
<td><img src="image23.png" alt="Image" /></td>
<td><img src="image24.png" alt="Image" /></td>
</tr>
<tr>
<td>15.</td>
<td><em>Narcine indica</em> (Henle, 1834). Indian electric ray.</td>
<td><img src="image25.png" alt="Image" /></td>
<td><img src="image26.png" alt="Image" /></td>
<td><img src="image27.png" alt="Image" /></td>
</tr>
<tr>
<td>16.</td>
<td><em>Narcine maculata</em> (Shaw, 1804). Dark-spotted electric ray.</td>
<td><img src="image28.png" alt="Image" /></td>
<td><img src="image29.png" alt="Image" /></td>
<td><img src="image30.png" alt="Image" /></td>
</tr>
<tr>
<td>17.</td>
<td><em>Narcine timlei</em> (Bloch &amp; Schneider, 1801). Black-spotted electric ray.</td>
<td><img src="image31.png" alt="Image" /></td>
<td><img src="image32.png" alt="Image" /></td>
<td><img src="image33.png" alt="Image" /></td>
</tr>
<tr>
<td>18.</td>
<td><em>Narcine prodorsalis</em> (Bessednow, 1966). Tonkin electric ray.</td>
<td><img src="image34.png" alt="Image" /></td>
<td><img src="image35.png" alt="Image" /></td>
<td><img src="image36.png" alt="Image" /></td>
</tr>
<tr>
<td><strong>Family: NARKIDAE</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19.</td>
<td><em>Temera hardwickii</em> (Gray, 1831). Finless sleeper ray.</td>
<td><img src="image37.png" alt="Image" /></td>
<td><img src="image38.png" alt="Image" /></td>
<td><img src="image39.png" alt="Image" /></td>
</tr>
<tr>
<td>No.</td>
<td>Order/Family/Scientific name/Common name</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>-----</td>
<td>--------------------------------------</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td><strong>ORDER: RAJIFORMES</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>SKATES</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Family: RAJIDAE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Skates</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>ORDER: MYLIOBATIFORMES</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>STINGRAYS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Family: PLESIOBATIDAE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Giant stingarees</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Family: DASYATIDAE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Whiptail stingrays</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27.</td>
<td>Dasyatis kuhlii (Müller and Henle, 1841). Blue-spotted stingray.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30.</td>
<td>Dasyatis thetidis Ogilby, 1899. Thorn stingray</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>34.</td>
<td>Himantura gerrardi (Gray, 1851). Sharpnose stingray.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35.</td>
<td>Himantura granulata (Macleay, 1883). Mangrove whipray.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>36.</td>
<td>Himantura imbricata (Bloch &amp; Schneider, 1801). Scaly stingray.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Order/Family/Scientific name/Common name</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>-----</td>
<td>--------------------------------------------------------------------------------------------------------</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>39.</td>
<td>Himantura pastinacoides (Bleeker, 1852). Round whip ray.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>41.</td>
<td>Himantura sp A. [Yano et al., 2005]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>42.</td>
<td>Himantura sp B. [Yano et al., 2005]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>44.</td>
<td>Himantura umnacoides (Bleeker, 1852). Whitenose whip ray.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45.</td>
<td>Himantura uarnak (Forsskål, 1775). Honeycomb whipray.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>46.</td>
<td>Himantura undulata (Bleeker, 1852). Leopard whip ray.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>47.</td>
<td>Himantura walga (Müller and Henle, 1841). Dwarf whip ray.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>48.</td>
<td>Pastinachus sephen (Forsskål, 1775). Feathertail stingray.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>49.</td>
<td>Pastinachus solasirostris Last, Manjaji and Yearsley 2005</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50.</td>
<td>Taeniura lymma (Forsskål, 1775). Ribbon-tailed stingray.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>51.</td>
<td>Taeniura mayeni Müller and Henle, 1841. Fantail stingray.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>52.</td>
<td>Urogenymus asperrimus (Bloch &amp; Schneider, 1801). Porcupine ray.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Family: GYMNUMURIDAE**

*Butterfly rays*

<table>
<thead>
<tr>
<th>No.</th>
<th>Scientific name/Common name</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>54.</td>
<td>Gymnura poecilura (Shaw, 1804). Longtail butterfly ray.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>56.</td>
<td>Gymnura micrura (Bloch &amp; Schneider, 1801). Smooth butterfly ray.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>57.</td>
<td>Gymnura sp.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Family: MYLIOBATIDAE**

*Eagle rays*

<table>
<thead>
<tr>
<th>No.</th>
<th>Scientific name/Common name</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>58.</td>
<td>Aetobatus guttatus (Shaw, 1804) Indian eagle ray.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60.</td>
<td>Aetomyleus maculatus (Gray, 1832). Mottled eagle ray.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>61.</td>
<td>Aetomyælus milvus (Valenciennes, in Müller and Henle, 1841) Ocellate eagle ray.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Order/Family/Scientific name/Common name</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>-----</td>
<td>----------------------------------------</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>63.</td>
<td><em>Aetomyleus vespertilio</em> (Bleeker, 1852). Ornate eagle ray.</td>
<td>![Image]</td>
<td>![Image]</td>
<td>![Image]</td>
</tr>
</tbody>
</table>

**Family: RHINOPTERIDAE**  
**Cow-nose rays**

<table>
<thead>
<tr>
<th>No.</th>
<th>Scientific name (Author and Year)</th>
<th>Common name</th>
</tr>
</thead>
<tbody>
<tr>
<td>64.</td>
<td><em>Rhinoptera adspersa</em> (Valenciennes, <em>in</em> Müller and Henle, 1841)</td>
<td>Rough cow-nose ray</td>
</tr>
</tbody>
</table>

**Family: MOBULIDAE**  
**Devil rays**

<table>
<thead>
<tr>
<th>No.</th>
<th>Scientific name (Author and Year)</th>
<th>Common name</th>
</tr>
</thead>
<tbody>
<tr>
<td>66.</td>
<td><em>Manta birostris</em> (Donndorff, 1758).</td>
<td>Manta</td>
</tr>
<tr>
<td>67.</td>
<td><em>Mobula eregoodooetenkee</em> Garman, 1913.</td>
<td>Logfin devil ray</td>
</tr>
<tr>
<td>68.</td>
<td><em>Mobula japonica</em> (Müller and Henle, 1841).</td>
<td>Spinetail devil ray</td>
</tr>
<tr>
<td>70.</td>
<td><em>Mobula thurstoni</em> (Lloyd, 1908).</td>
<td>Benfin or smooth tail devil ray</td>
</tr>
</tbody>
</table>

**CHIMAERAS**

**ORDER: CHIMAERIFORMES**  
**RATFISHES**

**Family: CHIMAERIDAE**  
**Ratfishes**

<table>
<thead>
<tr>
<th>No.</th>
<th>Scientific name (Author and Year)</th>
<th>Common name</th>
</tr>
</thead>
<tbody>
<tr>
<td>71.</td>
<td><em>Chimaera phantasma</em> (Jordan and Snyder, 1900).</td>
<td>Silver chimarea</td>
</tr>
<tr>
<td>72.</td>
<td><em>Hidrolagus</em> sp. [Yano <em>et al.</em>, 2005]</td>
<td></td>
</tr>
<tr>
<td>73.</td>
<td><em>Chimaera</em> sp. [Yano <em>et al.</em>, 2005]</td>
<td></td>
</tr>
</tbody>
</table>
Errata

Page 43
The last and second lines from bottom:
Anoxypristis cuspidata (Lathan, 1974) should be read as
Anoxypristis cuspidata (Lathan, 1794)

Pristis microdon Lathan 1974 should be read as
Pristis microdon Lathan 1794

Page 44
Second line from top:
Pristis pectinata Lathan 1974, should be read as
Pristis pectinata Lathan 1794

Page 60
Item 19. Last column (column no 3) should be empty
Item 20, Last column ( column 3) should have label