CHAPTER 2 – REGIONAL SYNTHESIS ON THE 1-YEAR STUDY ON SHARK CATCH, LOCAL USE AND TRADE

2.1   Methodology

With the support of SEAFDEC, eight ASEAN member countries agreed to collect baseline information in their selected landing sites. Lao PDR, a landlocked country, and Singapore, without any significant fishery, did not participate to the baseline study. All shark species (some information was also collected on rays but will not be presented in this regional synthesis) commonly caught and landed by fishers in each ASEAN member country was covered by the project. As the taxonomy and identification of sharks can be an important constraint to the collection of accurate data, SEAFDEC and the member countries developed national identification sheets and posters to support data collection on selected species.

2.1.1 Timeframe

The study was planned to start in August 2003, carried-out on a quarterly basis. However, only three countries were able to do so and the five other were delayed to next quarter, as shown in Table 1.

Table 1. The timeframe of shark 1-year data collection by country

Country	1st August 2003 to 31st October 2003	1st November 2003 to 31st January 2004	1st February 2004 to 30th April 2004	1st May 2004 to 31st July 2004	1st August 2004 to 31st October 2004
Brunei	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	
Cambodia		1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Indonesia		1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Malaysia	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	
Myanmar		1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
The Philippines	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	
Thailand		1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Vietnam		1st Quarter	2nd Quarter	3rd Quarter	4th Quarter

2.1.2 Landing Sites

In order to keep the study within a practical scope, only a few landing sites were selected in each country. Each country selected a number of landing sites, according the project funding, using several criteria for their identification, as shown in Table 2.

The site selection concerned a fishing port, a small locality but not a wide geographic area such a district or province (e.g. Phuket port not Phuket Island).

Twenty-eight landing sites were selected in the region, as shown in Figure 1 and enumerated and named in Table 2.

Table 2. Selected landing sites

Criteria for the selection of landing sites
1. It regularly shows the occurrence of shark capture with considerable volumes
2. It is representative of a main type of fishing boats/gears present in the country (coastal/commercial fisheries)
3. It is representative of a main coastal ecosystems (coastal, offshore, etc.) in the country
4. It is easily accessible through convenient ways of communication
5. It should be of manageable size, where the information collected would only concern local capacity.
6. It should have a functional public market or similar facilities for local fisheries catches

Number and name of landing sites selected with project funding	
Brunei Darussalam	2 (Muara and Jerudong)
Cambodia	3 (Koh Sdach, Tomnop Rolok and Kampong Bay)
Indonesia	5 (Muara Baru, Palabuhan Ratu, Cilacap, Benoa Denpassar and Bitung)
Malaysia	6 (Hutan Melingtan, Kuantan, Mukah, Kota Kinabalu, Bintulu and Sandakan Baru)
Myanmar	3 (Sittwe, Myeik and Hine-Gyi)
Philippines	4 (San Jose, Coron, Appari and Mabua)
Thailand	3 (Songkhla, Phuket and Samut Prakarn)
Vietnam	2 (Vung Tu and Phan Thiet)

Figure 1. Selected landing sites for the 1-year data collection

2.1.3 Reporting mechanisms

While SEAFDEC Secretariat ensured the overall coordination of the project with the assistance of the members of the Working Group on the Regional Fisheries Policy (WGRFP), a National Project Coordinator (NPC) was designed for each country (Table 3). The NPC supervised and managed all required national activities and ensured regular communication with SEAFDEC. As the core for the research activity, a group of researchers was selected nationally. Directly based at the landing site level were the enumerators, qualified technical staff, working in collaboration with the researchers.

Table 3. Study's national coordinators

Country	Name (position)
Brunei Darussalam	Mr. Idris bin Haji Abdul Hamid (Head of Management and Conservation Section, Department of Fisheries) E-mail: idris_hamid@fisheries.gov.bn
Cambodia	Mr. Ing Try (Deputy Director, Department of Fisheries) E-mail: tmmp.cam@online.com.kh
Indonesia	Mr. Parlin Tambunan (Director for Fishery Resource Management) E-mail: dfrmdgf@indosat.net.id
Malaysia	Mr. Adbul Haris Helmi bin Ahmad Arshad (Research Officer, Fisheries Research Institute, Department of Fisheries) E-mail: haris_arshad@yahoo.com
Myanmar	Mr. Myint Pe (Assistant Director, Department of Fisheries) E-mail: myintpe@myanmar.com.mm
The Philippines	Mr. Noel C. Barut (Chief, Marine Research Division, National Fisheries Research and Development Institute, Bureau of Fisheries and Aquatic Resources) E-mail: noel_barut@hotmail.com
Thailand	Ms. Ratanawalee Phoonsawat (Fisheries Biologist, Department of Fisheries) E-mail: ratvaree@yahoo.com
Vietnam	Dr. Nguyen Long (Deputy Director, Research Institute for Marine Fisheries Ministry of Fisheries) E-mail: nlong@hn.vnn.vn

Shortly after data collection was completed for each quarter, the national coordinator was to gather and consolidate the results from the researchers/enumerators and prepare a progress report using a frame developed by SEAFDEC. After completion of the fourth quarter, they were to use these progress reports to develop and submit a final report (these are included in Appendix I). This mechanism is presented in Figure 2.
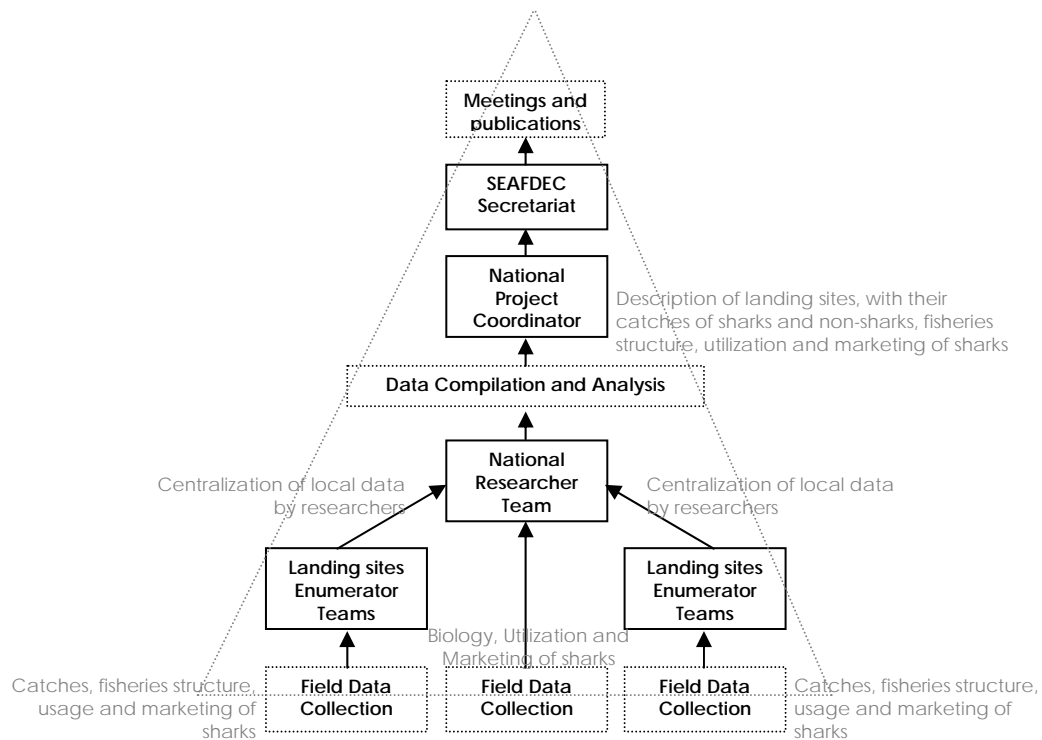
Figure 2. Reporting mechanism

2.1.4 Range of data collected

The data collected by each ASEAN Country on shark catch and on fisheries catching sharks at each selected landing site included:

1. General description of the fisheries (local socio-economic importance)
2. Landing data, mostly total catch of shark
3. Research on shark biology

The study relied on local enumerators, based at each landing sites for most (Table 4) who collected regular basic data and information in a time period for each quarter, complemented and supported by national researchers who visited the site a week per quarter (Table 5). The latter were strongly recommended to consult and cross-check information through discussion with the enumerators. An important part of the duty of the researchers was collecting specimens of sharks for biological studies. The most dominant species of sharks that are captured in national waters were selected first-hand for these studies (between 4 and 10 species according to the country) on length-frequency, sex ratio, and maturity stage.

Table 4. Data collection by enumerators

Timeframe	Daily basis, for 30 days per quarter.
Location	Each landing site individually.
Tasks	1. To collect the *total volume of shark and non-shark catches*. Shark catches should be very preferably collected by type of fishing gear while no distinction is necessary in term of species.
	2. To collect *descriptive information on the fisheries structure, and on the local usage and marketing of sharks.*

Table 5. Data collection by researchers

Timeframe	Daily basis, for 7 days per quarter (possibly shortly after completion of quarterly data collection by enumerators).
Location	Each landing site individually
Tasks	1. To provide a *general description of the landing site*, including description of the fishing boats, with their size, crews and gears, the fishing grounds, with their location and area, and the socio-economic characteristics of the shark fisheries.
	2. To collect data on the *shark biology*. This includes species composition, length frequency and sex and maturity
	3. To describe the *utilization and marketing of sharks*, how sharks are used, into which kind of product, from which fishing source and for which type of market destination. Some assessment of local prices of shark parts and products should also be carried-out.
	4. To *collect existing secondary information on shark utilization and trade* available in the government (e.g. Central Bureau of Statistics, Ministry of Trades, or others). Available data of at least the last 5-10 years should be collected.

2.1.5 Limitations

It is important to note at this stage that some of the submitted quarterly reports were sometime incomplete or containing inaccuracies which negatively affected their use and the making of this regional synthesis. The different starting time for the study, it was not planned to be so, as mentioned above further hindered the development of a regional picture of the shark fisheries and could have lead to inaccuracy and bias. It is therefore suggested to take the results presented in this Chapter with caution and to refer when needed to the national reports (Appendix I). The purpose of this Chapter is to compile both quantitative and qualitative data collected in the region in a simple manner in order to draw a gross yet simple picture of the situation in Southeast Asia.

Data was only available for 25 landing sites of the 28 selected one, distributed amongst 7 countries, since Brunei did not provide complete results for any of his 2 landing sites and Indonesia did not continue her data collection in Bintung (not accessible enough).

2.2   Results

2.2.1 Quantity of shark catch and its proportion to total fish catch

Total catch data recorded at the landing sites in each country is shown on Table 6, was measured in terms of body weight. Since most of shark catches can be landed in pieces rather than the whole body, the data can possibly be biased. In general, shark catch as relative to total catch in all eight countries is fairly low and this reflects the general by-catch nature of shark catch in Southeast Asia. Higher percentages, as reported in Brunei Darussalam, the Philippines and Indonesia, are mostly certainly to be related with very low sampling sizes and the fact the enumerators might have targeted fishing boat with lots of shark in the catch thus biasing the proportion. The percentages in these 3 cases are likely to be widely overestimated.

It is however quite clear that long lines are frequently associated with the by-catch of sharks, and that in these two countries, there exist some limited fisheries using long lines that target sharks. Indonesia and the Philippines are archipelagic in nature and have different target species than other more "continental" countries, as they are likely to catch more migratory species. They therefore use different fishing gear, which are more adapted for pelagic species, while not

having many trawlers. It might be worthwhile to explore the ecological difference of coastal and migratory species of shark, to see if this influence a higher rate of by-catch.

Countries with a bigger sampling size show more coherent results with typically less than 1% of catch of shark (in terms of bodyweight) when compared to total fish catch. In Malaysia and Thailand, trawlers were the main culprit in the by-catch of sharks but the proportion the shark catches as relative to total catches remained low.

Table 6. Total catch of shark and its proportion to total fish catch during the study

Country	Total sampling size of fish (in kg)	Total sampling size of shark (in kg)	Shark catch as relative to total catch (%)
Brunei Darussalam	**33,885**	4,309	**12.72***
Cambodia	25,481,010	149,803	0.59
Indonesia	**739,442**	101,471	**13.72***
Malaysia	19,214,035	131,819	0.69
Myanmar	25,978,057	51,792	0.20
Philippines	**113,696**	11,090	**9.75***
Thailand	15,596,568	38,097	0.24
Vietnam	30,056,961	119,098	0.40

Likely to be insignificant due low sampling size and enumerators investigating fishing boat with lot of shark catches.

2.2.2 Total weight composition of fishing gear catching shark

Total weight composition of fishing gear catching shark in each country, excluding Myanmar, is shown on the Figure 3 for the 1-year data collection.

Most of the shark catches in Brunei Darussalam were landed by gill-netters, while half of the sharks in Cambodia were also caught with the same gear. In Indonesia, the Philippines, and Vietnam, gill-netters also contributed significantly to shark catch, with namely 39.19%, 27.64%, and 28.42% respectively. Long-liners have contributed to the largest proportion of shark landings in Indonesia, the Philippines, and Vietnam, namely with 60.74%, 63.87%, and 65.57% respectively. Meanwhile, in Malaysia and Thailand, trawlers were found to be a fishing gear that significantly catch sharks, namely at 87.97% and 96.57% respectively. The significant shark catch landed by trawlers was also recorded in Cambodia, at 39.41% of the total shark catch by weight. A few sharks were reported to be caught by purse seiners in Myanmar and Thailand but other fishing gears were found to have no significant by-catch of shark in the Southeast Asian region.
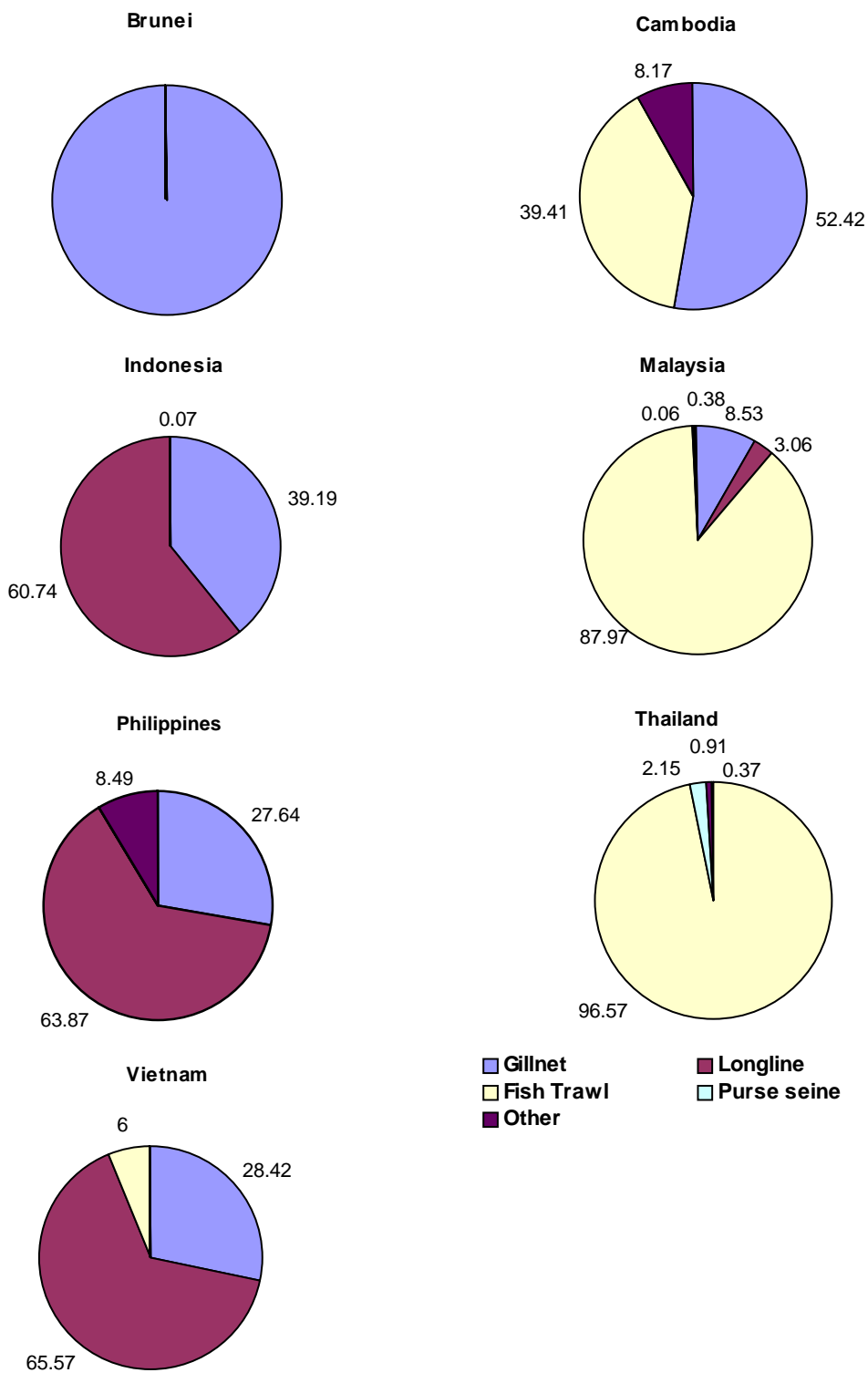
Figure 2. Weight Composition of Fishing Gear Catching Shark (in %) in each country during the 1-year data collection

2.2.3 Species composition and biology of dominant species captured

From the sampling conducted during the study period, there are around 69 species found (Table 7) in the Southeast Asian region. Nevertheless, only around 10 species were dominantly found in each country, as shown in table 8. The study shows that most of the sharks studied for biological parameters were juveniles, but this might be biased by the fact that most researchers couldn't afford to purchase larger sharks from fishermen, thus getting only smaller size specimens.

Table 7. List of Shark Species found in the ASEAN Region

Shark Species	Found in	Shark Species	Found in
1. *Alopias pelagicus*	INA, PHP, VIET	23. *Carcharhinus plumbeus*	INA, MAS, MYM
2. *Alopias superciliosus*	PHP, THA	24. *Carcharhinus sealei*	MAS, MYM
3. *Alopias vulpinus*	THA	25. *Carcharhinus sorrah*	CAM, INA, MAS, MYM, THA, VIET
4. *Alopias sp.*	MAS		
5. *Atelomycterus marmoratus*	CAM, MAS, MYM	26. *Cetroscymnus crepidater*	INA
6. *Carcharhinus albimarginatus*	INA, NYM, PHP	27. *Chaenagaleus microstoma*	
7. *Carcharhinus altimus*	PHP, THA	28. *Chiloscyllium griseum*	CAM, MAS, MYM, THA, VIET
8. *Carcharhinus amblyrhynchoides*	MAS, MYM, THA		
9. *Carcharhinus amblyrhynchos*	INA, MAS, THA	29. *Chiloscyllium hasselti*	MAS, THA
		30. *Chiloscyllium indicum*	MAS, THA
10. *Carcharhinus amboinensis*	MYM, PHP, THA	31. *Chiloscyllium plagiosum*	MAS, THA, VIET
11. *Carcharhinus borneensis*	MAS, MYM	32. *Chiloscyllium punctatum*	CAM, MAS, MYM, PHP, THA
12. *Carcharhinus brachyurus*			
13. *Carcharhinus brevipinna*	INA, MAS, MYM	33. *Eugomphodus taurus*	PHP
14. *Carcharhinus cautus*	INA	34. *Eusphyra blochii*	MYM
15. *Carcharhinus dussumieri*	CAM, INA, MAS, MYM, THA	35. *Galeocerdo cuvier*	INA, MAS, MYM, PHP
		36. *Glyphis gangeticus*	MYM
16. *Carcharhinus falciformis*	INA, MYM	37. *Halaelurus buergeri*	VIET
		38. *Halaelurus canescens*	MYM
17. *Carcharhinus fitzroyensis*	INA	39. *Hemigaleus microstoma*	MAS, MYM
18. *Carcharhinus galapagensis*	MYM	40. *Hemipristis elongatus*	INA, MAS, MYM, THA
19. *Carcharhinus leucas*	CAM, MAS, MYM, PHP, THA		
		41. *Heptranchia perlo*	INA, VIET
		42. *Heterodontus zebra*	MAS, VIET
20. *Carcharhinus limbatus*	CAM, INA, MAS, MYM, PHP	43. *Hexanchus gresius*	PHP
		44. *Isurus oxyrinchus*	INA
		45. *Lamiopsis temmincki*	MAS
21. *Carcharhinus longimanus*	INA	46. *Loxodon macrorhinus*	MAS, MYM
		47. *Mustelus griseues*	VIET
		48. *Mustelus manazo*	INA
22. *Carcharhinus melanopterus*	CAM, INA, MAS, MYM, THA	49. *Mustelus sp.*	MAS, INA
		50. *Mustelus sp.B*	THA
		51. *Negaprion acutidens*	PHP

Shark Species	Found in		Shark Species	Found in
52. *Nebrius ferrugineus*	PHP		63 *Sphyrna lewini*	INA, MAS, MYM, PHP, THA, VIET
53. *Orectulobus ornatu*	PHP			
54. *Prionace glauca*	INA			
55 *Pseudo komoharai*	INA		64 *Sphyrna Mokarran*	CAM, MAS, MYM
56 *Rhiconodon typus*	CAM			
57 *Rhina ancylostoma*	MYM, PHP		65 *Squaliformis sp*	PHP
58 *Rhinubatus sp.*	PHP		66 *Squalus megalops*	INA, PHP
59 *Rhizoprionodon acutus*	MAS, MYM, PHP, THA		67 *Squalus sp.*	MYM
			68 *Stegostoma fasciatum*	CAM, INA, MAS, MYM, VIET
60*Rhizoprionodon oligolix*	MAS, MYM			
61*Rhyncobatus djiddensis*	PHP			
62 *Scoliodon laticaudas*	MAS, MYM		69 *Triaenodon obesus*	MAS, MYM, PHP, THA

Note: CAM = Cambodia; INA = Indonesia; MAS = Malaysia; MYM = Myanmar;
         PHP = Philippines; THA = Thailand; VIET = Vietnam

Table 8. The ten dominant species in the specific composition of shark catch in each country

Country/ Species	Percentage (%)		Total length (cm)		Average Weight (kg)	Average maturity stage *
	Number	Weight	Mean	Range		
INDONESIA						
1. Carcharhinus falciformis	33.71	31.78	122.89	**-**	26.63	Immature
2. Carcharhinus almbiyrhynchos	16.85	13.25	130.4	-	22.21	-
3. Prionace glauca	8.99	14.56	206.13	-	45.75	-
4. Alopias pelagicus	5.62	14.00	258.78	-	70.40	-
5. Carcharhinus longimanus	5.62	3.38	108.12	-	31.08	-
6. Carcharhinus sorrah	4.49	0.37	74.5	-	2.33	Immature
7. Sphyrna lewini	4.49	14.00	133.95	-	88.00	Immature
8. Squalus megalops	4.49	0.31	64.6	-	1.93	-
9. Carcharhinus brevpinna	4.49	4.08	111.73	-	25.65	Mature
10. Mustelus sp.	3.37	0.67	108.67	-	5.58	Mature
Others	7.87	3.60	-	-		-
MALAYSIA						
1. Scoliodon laticaudus	27.74	3.58	38.47	26.6-51.5	0.46	Mature
2. Chiloscyllium punctatum	26.76	21.75	65.37	26.7-98	1.70	Immature
3. Carcharhinus sorrah	7.97	16.66	84.37	37.8-150	3.67	Immature
4. Chiloscyllium hasselti	7.63	6.02	59.20	38.3-82.6	1.12	-
5. Carcharhinus sealei	7.29	3.55	55.11	31.5-85	1.07	Immature
6. Sphyrna lewini	5.48	10.66	58.9	46.4-89.4	4.20	Immature
7. Rhizaprionodon acutus	3.63	2.2	68.70	36-95	1.40	Immature
8. Carcharhinus amblyrhyncoides	2.61	14.72	91.1	90.2-100	11.51	Immature
9. Hemigaleus microstoma	2.34	1.96	62.72	38.3-90.4	1.63	Mature
10. Carcharhinus griseum	1.74	0.89	62.56	44.6-80	1.13	-
Others	6.81	18.01	-			-

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PHILIPPINES						
1. Triaenodon obesus	43.11	33.83	*-*	*75-167*	5.07	-
2. Squalus megalops	27.27	7.56	-	40-105	1.79	-
3 Rhinabatus sp.	10.41	2.36	-	70-93	1.46	-
4. Chiloscyllium punctatum	7.48	4.16	-	89-121	3.59	-
5. Rhyncobatus djiddensi	2.20	6.77	-	120-210	19.87	-
6. Carcharhinus limbatus	1.91	3.41	-	140-220	11.54	-
7. Negaprion acutidens	1.91	1.41	-	120-187	4.77	-
8. Alopias pelagicus	1.76	14.15	-	273-320	51.92	-
9. Galeocerdo cuvier	0.88	17.26	-	200-290	126.67	-
10. Carcharhinus albimarginatus	0.73	2.61	-	210-240	23.00	-
Others	2.34	6.48				
THAILAND						
1. Chiloscyllium punctatum	50.44	21.87	63.37	16.4-98	1.30	Immature
2. Chiloscyllium plagiosum	14.78	3.65	60.21	33-93	1.04	-
3 Chiloscyllium griseum	5.89	2.37	63.16	38.8-80	1.19	-
4. Carcharhinus sorrah	5.78	8.21	85.18	40.135	3.21	Immature
5. Sphyrna lewini	5.33	6.08	83.53	26-180	3.53	Immature
6. Carcharhinus melanopterus	3.78	3.53	88.22	35.5-124	3.47	Immature
7. Carcharhinus leucas	1.67	2.17	101.15	62-185	3.93	-
8. Atelomycterus marmoratus	1.67	0.26	57.23	47-69	0.46	-
9. Carcharhinus amblyrhyncos	1.33	5.6	79.79	76-95	3.53	-
10.Alopias vulpinis	1.11	15.46	252	130-322	46.67	-
Others	8.22	30.8	-	-	-	-
VIETNAM						
1. Carcharhinus sorrah	66.10	55.13	115.38	93-130	3.34	Immature
2. Chiloscyllium griseum	20.22	19.31	67.82	43-107	1.60	-
3. Chiloscyllium plagiosum	4.68	1.72	52.97	32.5-78	0.60	-
4. Atelomycterus marmoratus	3.00	0.29	36.96	27.2-59	0.21	-
5. Stegostoma fasciatum	2.62	1.68	52.95	35-88	0.66	Immature
6. Heterodontus zebra	0.94	1.88	69	59-81	3.78	Mature
7. Halaelurus buergeri	0.75	0.30	58	50-62	0.65	-
8. Sphyrna lewini	0.56	0.47	61	59-69	3.03	Immature
9. Alopias pelagicus	0.37	10.62	59	59-59	15	-
10. Carcharhinus brachyurus	0.19	0.06	78	78	2.47	-
Others	0.57	8.54	-	-	-	-

* Maturity stage was compared to standardized maturity length (see box below)

Standardized matured length for some common species

Determining the maturity stage of sharks on the field is difficult exercise. The following matured lengths can help observations by providing standardized maturity stage related to the length of the shark species mentioned as the Commercial sharks of Malaysia and Brunei Darussalam. This matured length of shark species is very useful to determine the maturity stages of the sharks at the landing sites.

Species name	Local name	Sex	Matured length (cm)
Eusphyrna blochii	Wing head shark	♂	108
		♀	120
Spyhrna lewini	Scalloped hammer head shark	♂	140-160
		♀	200
Heterodontus zebra	Zebra horn shark	♂	64-84
Galeocerdo cuvieri	Tiger shark	♂	300
		♀	330
Stegostoma fasciatum	Zebra shark	♂	147-183
		♀	169-171
Carcharhinus amblyrhynchoides	Graceful sharks	♂♀	110-115
Carcharhinus brevipinna	Spinner shark		Varies between region
Carcharhinus falciformis	Silky shark	♂♀	200-210
Carcharhinus galapagensis	Galapagos shark	♂	210-230
Carcharhinus limbatus	Common blacktip shark	♂	135-180
		♀	120-190
Carcharhinus malcloti	Hard nose shark	♂♀	70-75
Carcharhinus melanopterus	Black tip reef shark	♂♀	95-110
Carcharhinus plumbeus	Common black tip shark	♂	130-180
		♀	145-185
Carcharhinus sealei	Black spot shark	♂♀	70-80
Carcharhinus sorrah	Spot tail shark	♂♀	90-95
Loxodon macrorhinus	Slit eye shark	♂♀	60-80
Rhizoprionodon acutus	Milk shark	♂♀	75
Rhizoprionodon digolinx	Grey sharp nose shark	♂♀	35-40
Scoliodon laticaudus	Spade nose shark	♂	24-36
		♀	33-35
Triaenodon obesus	White tip reef shark	♂♀	105
Chaenogaleus macrostoma	Hook tooth shark	♂	68-97
Hemipristis elongatus	Fossil shark	♂	110
		♀	120
Hemigaleus microstoma	Weasel shark	♂	60
		♀	65
Chiloscyllium puntatum	Grey carpet shark	♂	68-76
Musteus mosis	Arabian smooth hound	♂	63-67

In the case of Cambodia, there are only 9 species of shark found during the study period namely, *Stegostoma fasciatum, Chiloscyllium punctatum, Chiloscyllium griseum, Atelomycterus marmoratus, Sphyrna mokarran, Carcharhinus leucas, Carcharhinus dussumieri, Carcharhinus melanopterus, and Rhicondon typus*. Unfortunately, no species composition of catch neither biological data could be reported. Meanwhile, in Myanmar, the lack of knowledge on taxonomy causing serious problems in shark identification, while the vast majority of sharks were landed already cut into pieces, adding to the difficulty for local enumerators to identify the species.

Several species can be found in many countries in the region, even among the dominant species, such as *Chiloscyllium punctatum* that is widely reported by Malaysia, the Philippines and Thailand.

2.2.5 Other biological aspects

Besides biological parameters such as length and weight that has been collected during the study, other important biological aspects have been recorded such as sex ratio and the maturity level of the shark caught. Results are however very disparate from country to country and impossible to summarize regionally.

In Cambodia, biological parameters were only observed for a few shark specimens, due to lack of experience at local level. The maturity stage was only observed for female sharks and it was found that some sharks were mostly caught immature, such as from the species of *Chiloscyllium griseum* and *carcharhinus melanopterus*.

Malaysia recorded juvenile & sub adult stage catches of several species (*C. sorrah, C. sealei, C. dussumieri, C. limbatus and C. amblyrhynchoides).* In Thailand and Vietnam, juvenile sharks were reported the most but this is probably due to the difficulty to have access to big size sharks for biological study (they are simply too expensive) whereas in Vietnam there were difficulties in carrying out biological studies as most sharks were landed in a dried form.

2.3 Shark Utilization and Marketing

The utilization and market destination of shark product for most species can be summarized in the region as represented in Figure 3 and summarized in Table 8. Almost all participating countries reported that shark catch was fully utilized and that there was nearly no discard for any part of the body. Fining is thus a complete alien concept in the region. In fact, in some countries like Myanmar, the locals even directly consumed certain internal organs of shark. Under certain circumstances, Vietnam reported that during a rainy weather, only the shark fins were processed while the meat was discarded as it couldn't be dried properly. Shark meat is in fact popular food throughout the region although not in every community. Value added process also take place for certain species and products as summarize in Table 9. It is important to note that even a small daily shark catch by a fishing unit provides substantial economic return to the fishing household, shark fins being preserved and processed backyard until sold.

Although almost all countries have clearly reported that sharks are both sold on local and export markets, it is nonetheless clear that certain shark products are highly marketable and either sold to an urban elite through expensive restaurants or exported to countries ready to pay a premium prices for these. For instance, the Philippines report that while almost all shark parts are sold at the local market (e.g. meat, smaller fins), larger shark fins are exclusively for sale at the international market.
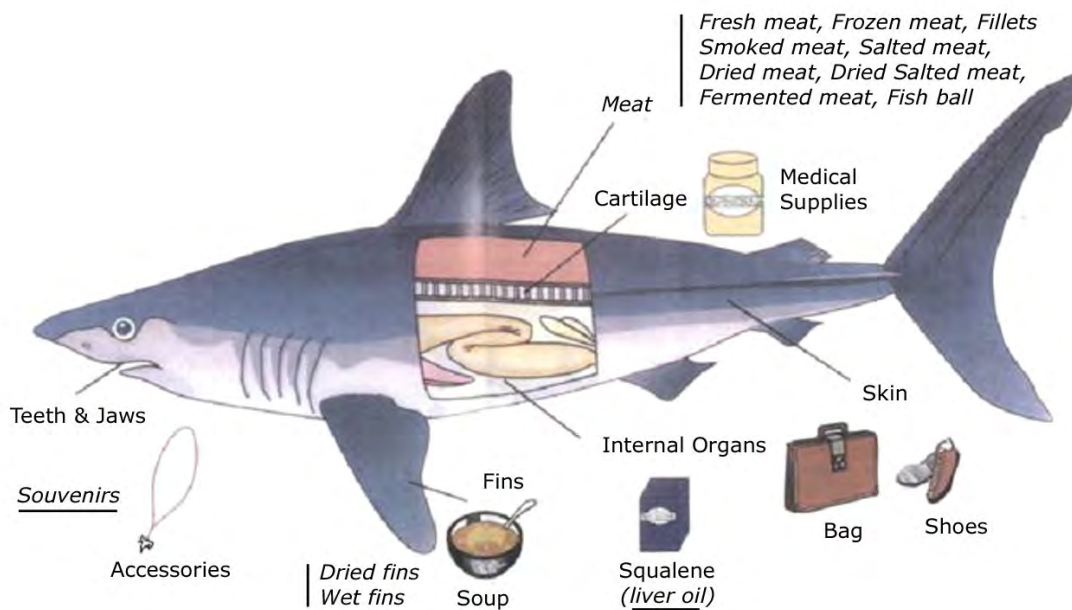
Figure 3. Utilization of shark in Southeast Asia
(figure courtesy of the Global Guardian Trust, Japan).

Table 9. Summary of Utilization of shark products in the Southeast Asian Region

Part	Product type after processing	Market Destination
Meat	Fresh meat, frozen meat, smoked meat, salted meat, dried mead, dried salted meat, fermented meat (pindang), fish ball	Mostly local market
Fin	Dried fin, wetfin flesh	Mainly export market (at least for the larger ones)
Bones	Dried cartilaginous bone (Chinese medicine)	Mainly export market
Liver	Liver oil extracted by heating	Mainly export market
Jaw	Dried jaw (souvenir)	Mostly local market
Teeth	Dried teeth (souvenir)	Mostly local market
Skin	Dried and fried or making leather product	Mainly export market

Complete information on shark utilization and marketing in the region is summarized in Table 10.

Table 10. Species, Part, Usage and market destination of shark fisheries (for all national landing sites and quarters reported)

Country	Species	Part	Usage Locally consumed (C), Discarded (D), Traded (T), Processed (Type of processing)	Market Destination
Cambodia	*S. fasciatum*	-	-	-
	C. punctatum, C. griseum, C. melanopterus	Whole and fins	Locally consumed and traded	Local and City markets
	A. marmoratus, S. mokarran, C. leucas, C. dussunieri	Whole	Locally consumed	Local and City markets
	Rhinconodon typus	whole	-	-
Indonesia	*C. amblyrynchos, C. melanopterus, C. brevipinna, C. cautus, C. fitroyensis*	Meat, stomach, skin	Dry salted, head and stomach are used in feeding aquaculture, dried cartilage	Local market
	C. plumbeus, A. superciliosus, A. pelagicus, I. Oxyrinchus, P. galuca, G. cuiver, S. lewini	Meats, fin Tomach, skin	Dry salted, dried fins, head and stomach are used in feeding aquaculture, dried cartilage	Local market, dried find exported to Taiwan, Hong Kong, China and Japan
	S. megalops	Meat, liver, stomach, skin	Dry salted, dried fins, head and stomach are used in feeding aquaculture, dried cartilage, liver oil	Local market
Malaysia	*C. sorrah, C. punctatum, R. acutus, C. sealei, H. microstoma, C. dussumieri*	whole	C, T, fresh whole shark, shark fin, frozen shark meat, salted meat, shark bone, shark skin, fish ball	Local Markets, Singapore, Hong Kong, Taiwan, China
	C. hasselti,	Whole	C, T	Local Markets, Hong Kong, Taiwan China
	S. lewini, C. griseum, S. fascianatum	Whole	C, T, fresh whole shark, shark fin, salted meat, shark bone, shark skin	Local Markets, Singapore, Hong Kong
	C. leucas	Whole	C, T, wetfin Flesh	Local Markets, Singapore
	S. laticaudus	Whole	C, T, shark fin, salted meat, fish ball	Local Markets, Hong Kong, Taiwan, China
	L. macrorhinus	Whole	C, T, fresh whole sharks, shark fin, frozen, shark meat, & fish ball	Local Markets, Singapore
	S. mokarran	Whole	C, T, fresh whole shark, shark fin, salted meat	Local Markets
	G. cuvier	Whole	C, T, fresh whole shark	Local Markets, Singapore
	T. obesus	Whole	C, T	Local market, Hong Kong, China
	C. indicum	Whole	C, T	Local Market, Singapore
	C. amblyrhynchoides	Whole	C, T, frozen shark meat, fish ball	Local Market
Myanmar	Shark (no species identification)	All part are valuable	Fresh meat, dried meat, internal organ such intestine and liver are also locally consumption, dried fins and skins are used for trading, shark cartilage processed as medical and foods products	Most of shark product are exported to China, jaws are exported to Thailand

Philippines	*C. punctatum, T. obesus, E. taurus, N. acutidens*	Meat	Traded	Local Market
	S. megalops	Meat	Traded	Local Market
		Liver	Extract liver oil (cooked process)	Local Market
	R. acutus, R. djiddensis, Rhinobatos sp, A. pelagicus, Isurus oxyrinchus, S. lewini, C. falciformes, C. dussumieri, C. melanopterus	Meat	Mainly locally consumed and traded	Local Market
		fins	Traded	Local Market
	C. amboinensis, C. leucas	Meat	Locally consumed	Local Market
		Fins	Traded	Local Market
		Jaws	Traded	Local Market
Thailand	*C. punctatum, C. plagiosum, C. sorrah, C. dussumieri, A. marmoratus, C. amblyrhynchos, C. melanopterus, C. griseum, C.indicum S. lewini, C. amblyrhynchoides, T. obesus, R. acutus, C. hasselti, A. vulpinus, C. altimus, C. leucas, H. elongates, S. fascinatum, C. amboinensis, Mustellus sp.B A. superciliosus*	Whole	Mainly locally consumed and traded	Local Market in Thailand
Vietnam	*A. pelagicus, C. brachyurus, C. falciformes, C. sorrah, M. griseues, S. fasciatum, H. zebra, H. perlo, C. plagiosum, H. buergeri, A. marmoratus, and S. lewini*	All part (Meat, fins, bone, skin, liver)	Shark oil (extracted liver by heat), dried meat (depend on the weather), frozen meat, gut and stomach are discarded	Fresh and dried meat is sold locally, skin, bone or liver oil marketed in China

According to the 1-year data collection of shark, market process varies from one country to another country, in Malaysia, sharks products generally will be sold directly to traders. Meanwhile, in Vietnam sharks products will be landed or sold to a middleman before being sold to next buyers and in Indonesia sharks products will undergo an auction process before reaching the traders. Meanwhile in other countries, the shark market can be combined among the mentioned market patterns.

In general pattern of shark trade, as reported during the study, can be synthesized as represented in Figure 4.
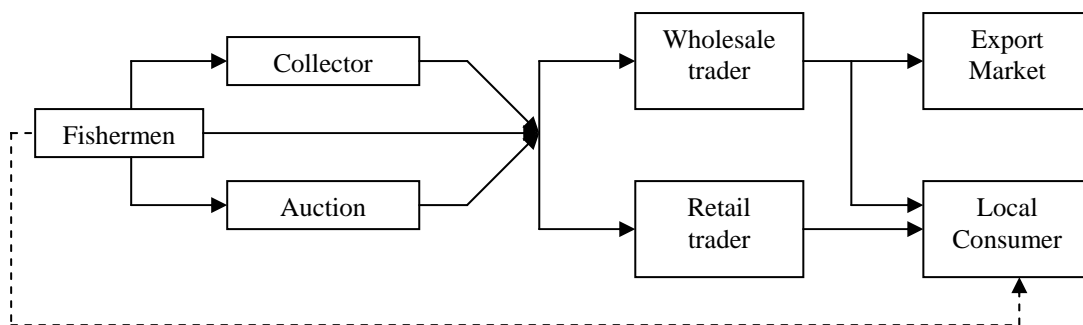

Figure 4. General pattern of shark trade in Southeast Asia

2.4   Problems and Constraint during the Regional Study

Many limitations have been observed during the course of the study, and certainly many lessons have been learnt through conducting these ad-hoc activities. Many areas for improvement were also identified. In some countries, it was found that when external assistance will be available, comprehensive data collection on shark resources can be continued in the future. In the context of the study itself, serious flaws and lack of training resulted in constraints in obtaining quality data and information. The reports submitted by the member countries show a wide range of variety, especially in terms of quality, reflecting the very different available human and financial capacity of the respective ASEAN countries.

In conducting the regional study, it was noted that the following common constraints were encountered by most of the participating countries:

- Insufficient knowledge and experience in data collection for sharks particularly on conducting biological research including taxonomy and determination of maturity;
- Limited financial support which hindered optimal data collection;
- Limited cooperation with fishers and landing site owners in data and specimen collection; and
- Access to samples of large-size sharks as they are usually cut into smaller parts due to limited fish hold capacity of fishing vessels, or landed headless, finless, gutted or dried.

The participating countries made several suggestions for possible improvement of data collection in the future:

- Regular cross checking of the collected information with relevant secondary information when available
- Preparation of elaborated guidelines for data and information collection on sharks
- Training for researchers on shark taxonomy and identification of maturity stages;
- Development of methods for estimation of the actual size (weight and length) of sharks as often landed already separated in parts;
- Need for technical cooperation on species identification of sharks by observation of denticles;
- Possible expansion of shark trade study into other member countries; and
- Future activities focus on streamlining routine and non-routine data collection methodologies to ensure their sustainability.

The problems and constraints faced by the member countries during the regional ad-hoc study on sharks are summarized for the region in Table 11. The Table also highlights means to resolve these issues, as suggested by the national project coordinators during the second Regional Technical Consultation on Sharks.

Table 11. Problems and constraints faced during study and suggestions of member countries

Country	Problems & Constraint	Suggestions for future action
1. Catch & Biological Data	- Sharks non-targeted species: by- catch or incidental catch	- Develop rapid appraisal methods or tools for shark identification such as species identification based on fin/dermal denticles
	- Sharks landed in different places at various time (depend on season or climate), landing schedule not consistent	- Keep record of fisher's landing schedule - Study shark behaviour and distribution to find out the fishing ground & spawning season of shark and hinder the catch of immature shark - Need lasting research activities to know the seasonal fluctuation of shark catches - Need to expand study areas beyond the project sites to cover all sites where sharks might be potentially landed
	- Shark landed incomplete (headless, finless or gutted), already cut into pieces, or in dried forms (such as dried meats, skins and bones) resulting in difficulties to determine their actual length, weight and maturity stage	- Study to determine the whole weight of sharks that are landed with missing body parts: develop conversion factors to get the whole weight of the fish based on the weight of some parts - Develop standardized method to determine maturity stage - Need research on board: collect biological data when fishers are processing sharks
	- Not enough samples for certain species due to high demand (most of them sold directly to middlemen) while big size sharks are expensive to purchase for biological study, resulting in that the only small sized sharks are available for biological study (normally immature stage)	- Take photo for huge specimens then refer to expert for validation - More fund should be allocated for future research, covering this kind of purchase for biological studies
	- No cooperation from fishermen, owners & skippers in providing sample/data (misunderstanding on the purpose of the study)	- Need of interpersonal dialogue with all level of stakeholders, awareness building on the purpose of NPOA-Sharks, and organization of national stakeholder workshops - Work closely and strengthen cooperation with the fishers, owners and skippers - Cooperation with the other national resource survey projects as well as other local projects for getting more scientific information on shark

	- Inadequate capacity for both researchers and enumerators in species and biological identification	- Provide technical or on-site training courses on data collection (biological/ taxonomy identification) - Provide appropriate formats or guidelines for data collection and analysis on shark biology. - Produce field guides for shark identification
	- Lack of existing biological data, e.g. species, spawning season, maturity size, distribution and abundance	- Data collection must be carried-out continually, both using the national system and ad-hoc studies, to provide sufficient baseline information on the status of sharks
2. Utilization and marketing data	- No cooperation from fish merchants, middlemen, sellers , traders and processors in providing data	- Same suggestions as with the problem mentioned above with no cooperation from fishermen, owners & skippers - Be friendly with small traders and assure them of the confidentiality of the data collected (e.g. do not take their name and address)
	- Lack of information on existing shark marketing channels as traded shark is normally not reported to the relevant local authority	- Cooperate with other resource survey to include collected data on shark
	- Shark products are traded in different markets (possibly exported) resulting in the difficulty to gather trade data. In addition, normally shark are traded in a large number of small operations, as it is an irregular by-catch (difficult to report)	- Expand surveys in all local markets and cooperate with traders and custom agencies - Interview middlemen for getting data and information
3. Secondary information and other statistical data	- Normally, structure of national statistical data collection do not include sharks and if it does, there is no break down by species (except in Indonesia, which started having specific information in 2002)	- Reorganize data collection and data processing methods to include sharks - set up suitable data collection and data processing format - Train all levels of people with responsibility in data collection and processing, especially enumerators - Facilitate shark research and fishery monitoring at national and regional levels and encourage the sharing of data - Ensure uniform approaches at the national and regional level for shared stocks - Catches of shark should be broken down by species and include information on location and date of catch - Shark by-catch, either retained or discarded should be recorded
	- Only little research has been done dealing with sharks and it is difficult to trace down. Inconsistency in compilation of data/information. Some data only exist as hard copies available at local offices.	- Conduct survey or inquires possible data sources, maybe through national network and contacts - Conduct national workshops on sharks and invite researchers, line agencies, NGOs, and especially local people who use/trade shark resources.

4. Other	- The guidelines provided for the SEAFDEC study were not always easy to understand. For some, this shark study is the first experience in collecting shark data, thus only 1-year data collection is not enough to get accurate data and experience	- Provide a regional suitable format of data entry - Provide training to produce quality reports as well as other relevant important things
	- Limited financial support and fund	- More fund should be provided for a comprehensive study
	- Shark, in developing countries, normally is a less priority issue when considering national issues, even within fisheries	
	- Need to produce NPOA-Sharks	- Need financial and expertise support from SEAFDEC and other organizations