

THREATS OF FISHING GEARS ON TURTLES IN PROPOSED TUN MUSTAPHA PARK, KUDAT, SABAH

Jessie Beliku^{1*} & Ejria Saleh²

¹Department of Fisheries-Sabah,
Wisma Pertanian Sabah, Level 4, Block B,
Jl. Tasik Luyang (off Jln Maktab Gaya), 88624 Kota Kinabalu, Sabah, Malaysia.

²Borneo Marine Research Institute,
Universiti Malaysia Sabah, Jalan UMS, 88400 Kota Kinabalu, Sabah, Malaysia.
Email: Jessie.beliku@gmail.com

ABSTRACT. *The northern part of Sabah is largely within the waters of proposed Tun Mustapha Park (TMP). It is also as a part of Priority Conservation Areas (PCA) in the Malaysian side of Sulu-Sulawesi Marine Ecoregion (SSME) and known as Kudat-Banggi PCA. It has been recognized to be one of globally significant and outstanding in term of marine ecosystems, biodiversity and identified as a route for turtle from the South China Sea to Sulu Sea. Fisheries activities are among the important source of income to coastal communities and have contributed to higher fish and prawn landing in Sabah. The objective of this study is to assess fisheries activities and their impact on turtles. The study was carried out through a combination of survey interviews and observation field trips on fishing boats. Interviews were conducted to the main fishing gears (gill nets, shrimp and fish trawl net) used within this area from October 2007 to October 2008 (one year). Onboard observations on gill net fishing field trips near the main town of Banggi, Karakit and coastal villages were carried out between October 2008 and March 2009. As results, 79 fishers operating with gill nets were interviewed while 95 and 41 fishers working on board shrimp trawl net and fish trawl net boats, respectively. There was 116 gill net fishing field trips have been carried out. Turtles were sighted within the fishing grounds and an estimated maximum total of 1326.6 turtles per year are accidentally catch by fishers. Turtle bycatch was 66.1% from gill nets, 25.9% from fish trawl net and 8% by shrimp trawl. Most turtles reported to be bycatch by fishing gears were located in near shore waters of the islands which are important as fishing ground in TMP. The information gathered from this study support the establishment of the proposed TMP which is importance for the planning and future management plan of the area. Also, the information on status of the fishing gears used by the fishers is needed for marine resources conservation program to the coastal communities.*

KEYWORDS: Fisheries activities, turtles, bycatch, fishing ground, Tun Mustapha Park

INTRODUCTION

Sea turtle at high population levels had substantial effects on the marine systems they inhibited as consumers, prey and competitors; as hosts for parasites and pathogens; as substrates for epibionts; as nutrient transporters; and as modifiers of the landscape (Lutz *et al.*, 2003). However, populations of sea turtles have been drastically reduced since interactions between humans and sea turtles began. The challenges that sea turtles now face from human activities impact every life stage of their life cycle, from the loss of nesting beach and foraging habitat to mortalities on the high seas through intense pelagic fishing practices (Lutz & Musick, 1996). Of the seven species of sea turtles, six are considered endangered, three of which are critically endangered (the Australian flatback turtle is considered data deficient) by the International Union for the Conservation of Nature (IUCN). Four species (*Dermochelys coriacea* (leatherback), *Chelonia mydas* (Green turtle), *Eretmochelys imbricate* (hawksbill) and *Lepidochelys olivacea* (olive-ridley)) of sea turtles

out of the existing seven in the world found to be *Eretmochelys imbricate* nested along the sand beaches of Peninsular Malaysia, Sabah and Sarawak (SEAFDEC, 2011). The *Chelonia mydas* is the most extensively distributed species in Malaysia with about 10,000 nests recorded yearly in Sabah, 800 in Sarawak and 2,950 in Peninsular Malaysia. Whereas, there are approximately 500 *Eretmochelys imbricate* nests laid per year in Turtle Islands Park, Sabah

The proposed Tun Mustapha Park (TMP) encompasses the waters of Kudat, Kota Marudu and Pitas, which serves as the fishing grounds for thousands of fishermen who make a living through artisanal and commercial fishing. Moreover, the 50-plus islands of the Kudat-Banggi TMP provide suitable habitat a large population of *Chelonia mydas* and *Eretmochelys imbricate*. The park forms the southern boundary of the Balabac Straits, through which leatherbacks from Papua pass to approach the South China Sea and the beaches of Terengganu in west Malaysia (WWF, 2006).

Commercial and traditional fisheries co-exist in the waters of proposed TMP. Commercial gears that operating within the waters of TMP are trawl nets and seine nets while hook and line and gillnets are among the common traditional gears used by fishers in these waters. Most of the fishing grounds for traditional fishers are located in the near shore areas (Beliku *et al.*, 2012). The areas are sheltered by strong wind and nearer to the villages. Both commercial and traditional fisheries pose a threat to the survival of turtle population. The incidental capture of marine turtles is now recognized as one of the serious threats to the survival of the remaining sea turtles in Malaysia (Chan, 1991). Therefore, this study would access the fishing activities in TMP and investigate and compare the threats on turtles from gears of both commercial and traditional fisheries.

Research on sea turtle done by Hin, (2010) reported that the local people in Maliangin Island Sanctuary, Banggi Island, Kudat reported that about 7 to 10 sea turtles in a day surfing for air in that area. The main threats in the study area are, human, monitor lizard, illegal trawling, gillnets, purse seining, fish bombing and cyanide fishing activities. When turtle caught in their fishing nets, 60% release back to the sea because it was not of any use and 10% afraid to be caught by authorities. Sea turtle area among animals listed in the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) since 1981. However 50% of the respondents were not aware that sea turtle were endangered animals and were protected by law such as Fisheries Act 1985, Wildlife Conservation Enactment 1997 and Parks Enactment 1984 (Hin, 2010). Turtle preferred their habitat at shallow area due to food availability, shelter and protection.

MATERIAL AND METHOD

Study area

The Sabah State Government has proposed Banggi Island, along with neighboring Balambangan Island, Malawali Island, Balak-balak Island and Maliangin Island amongst others, for the gazettelement as the Tun Mustapha Park under the jurisdiction of Sabah Parks. This Kudat- Banggi conservation area forms the southern half of the Balabac Straits which separates Borneo from the Philippines and is bounded by the South China Sea to the west, and the Sulu Sea to the east (Figure 1). The Tun Mustapha Park being over 1 million hectares will be the biggest marine protected area in Southeast Asia (Aziz, 2011).

Most of traditional fisheries are operated by the fishers in the islands while commercial fisheries concentrated in Kudat. Therefore, gillnet interviews are conducted on the islands of proposed TMP, mainly Banggi Island, which are targeting gillnetting fishermen from fishing villages and docks on the islands of proposed TMP. Trawler interviews are conducted from mainland Kudat, targeting fish and shrimp trawlers at the fishing docks in Kudat. Figure 1 depicts the approximate interview location and the study site for the onboard observation.

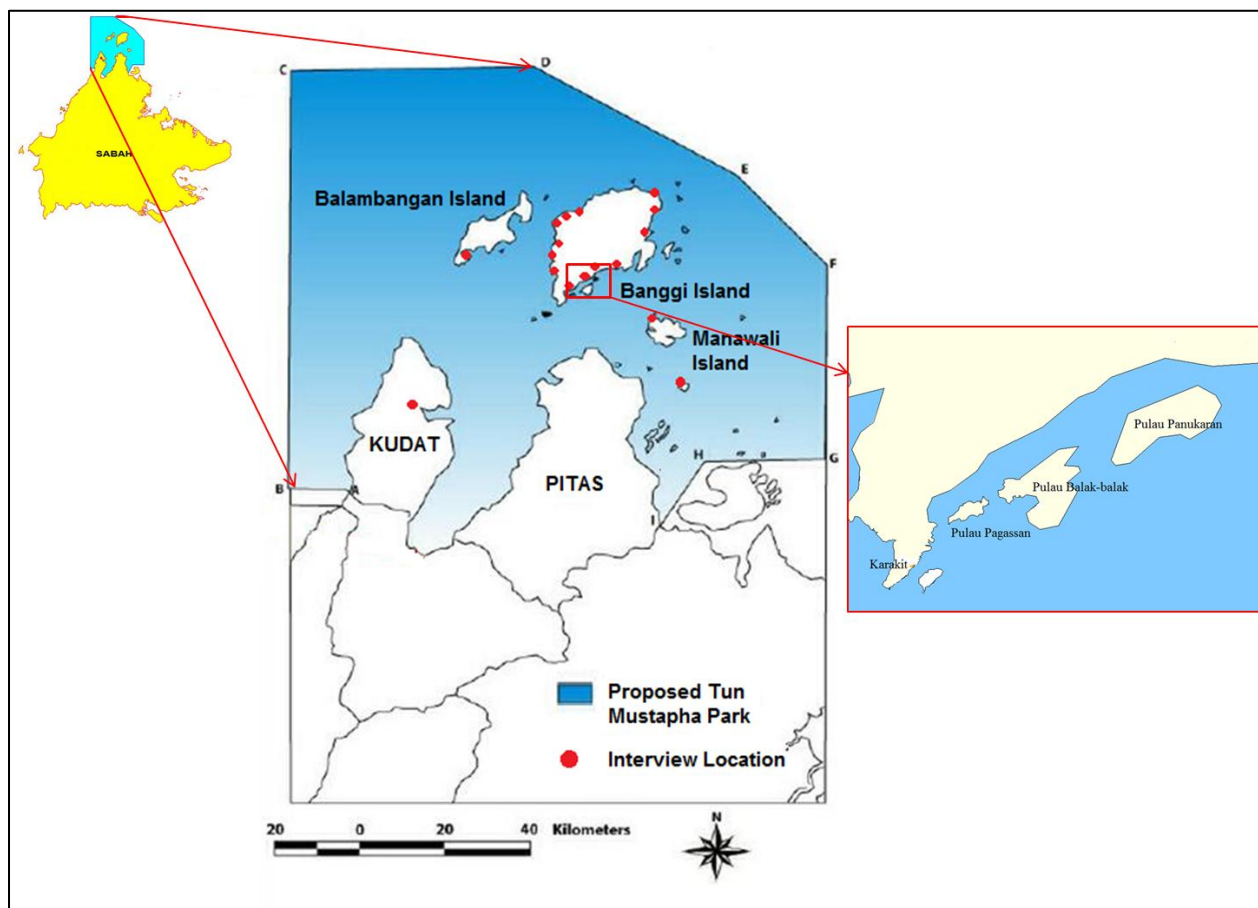


Figure 1. Proposed Tun Mustapha Park and Study Site.

Data collection

The study was carried out through a combination of survey interviews and observation field trips on fishing boats. The target groups for the interview processes are from the traditional and commercial fisheries sector. Gillnets were selected to represent the traditional fisheries while Shrimp and fish trawl nets were targeted to represent the commercial fisheries. The selection of shrimp and trawl nets as a representation of the commercial fisheries were based on extensive studies on the effects of trawls on sea turtles which has been documented on a world scale and has been recognized as the biggest cause of turtle mortality. While the selection of gillnets was because gillnets are ubiquitous fishing gears and likely to be found on every coastline, in every country. More, the impact of traditional fisheries on turtle mortality, mainly gillnets has always been overlooked and neglected.

The interview questionnaires used for the interviews are modified version of the interview forms used by Marine Research Foundation (MRF) during the bycatch rapid assessment conducted for the whole Sabah (A copy of the interview form is attached as

Annex 1). Interviews were conducted September 2007 to October 2008 (one year). In this paper, only data related to turtle was analysed and discussed from the questionnaires.

Onboard observations on gillnet fishing trips near the main town of Banggi, Karakit and coastal villages were carried out between October 2008 and March 2009 (6 months). The trips were done through observing gillnetting fishermen on their fishing activity. The fishing areas for the fishers from villages near Karakit are the waters around Balak-Balak Island to Panukaran Island (Figure 1). This fishing ground is important as the areas are near to the fishing villages and are shielded by strong wind, making it possible to fish all year long.

Data Analysis

The data collected was arranged in Excel. The results are then analyzed and interpreted through Excel and Surfer 10 Software.

RESULTS AND DISCUSSION

Interviews

A total of 16 villages in the islands of the proposed TMP and 6 fish landing docks in Kudat were visited. 79 interviews were conducted with the gill netting fishermen and 136 interviews were conducted with the shrimp and fish trawlers. The list of fishing villages and fish landing docks visited and the total number of interviews conducted in each village and fish landing dock are recorded in the Table 1. The major gill netting villages are Kg. Kaligau, Kg. Telutih, Kg. Dogoton, Kg. Maligu, Kg. Damaran and Kg. Limbuak Laut. The major landing docks for trawlers boats are located in Kudat where shrimp trawlers are in Fook Soon Esplanade (52 interviews) and Angkasa Lama (42 interviews) while the major landing dock for fish trawlers is Merak Hati. The approximate location of the gillnetting villages visited during the interview process and the location for the trawlers interview is depicted in Figure 2.

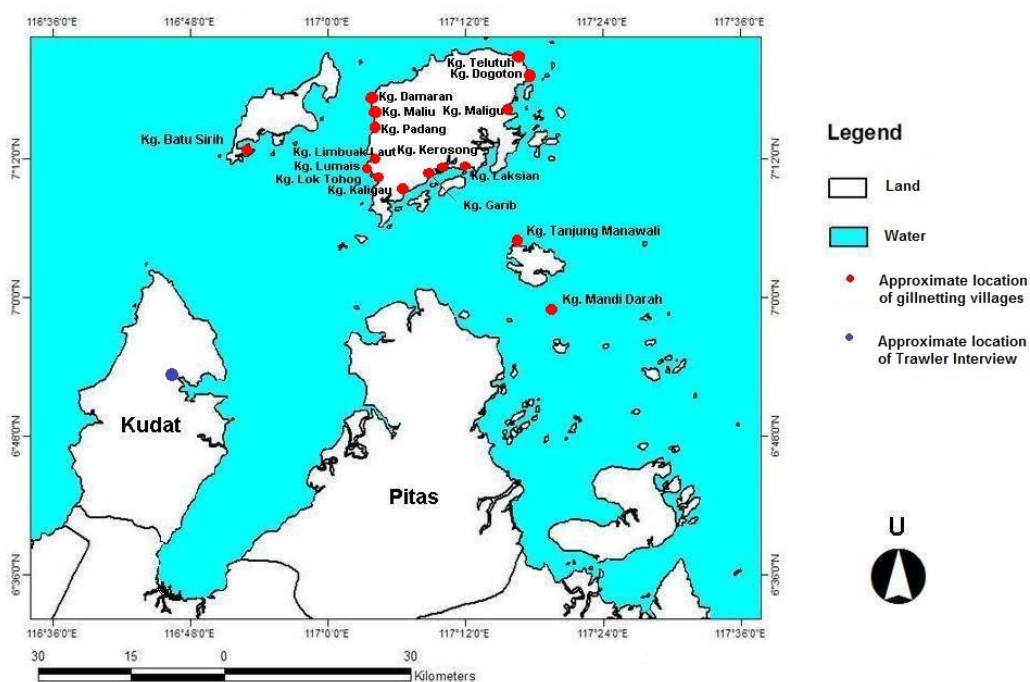


Figure 2. Approximate location of gillnetting villages and trawlers landing.

Hook and line and gill nets are two of the most important fishing methods in Banggi Island (Cooke, 2003). A clear reference on the number and type of gears operated by fishers on the islands of TMP, mainly Banggi Island could not be obtained due to the large number of them are still without licenses. According to the Department of Fisheries Sabah (2008), trawl nets and purse seines have the highest number of registered Fisheries Licenses in Kudat, 121 and 16 respectively. The high popularity of trawl nets may be due to the high catches of shrimp in Marudu Bay. It is estimated that Marudu Bay contributes up to 5 – 7.99% of the total catch of shrimps by trawlers in Sabah while the waters surrounding the Islands of Balambangan, Banggi and Mandi Darah contributes up to 1 – 4.99% of the total catch of shrimps by trawlers in Sabah (DOFS, 2008).

Table 1. The list of villages and ports landing docks visited for interviews.

Location	List of Villages	No. of Interviews
Balambangan Island	Kg. Batu Sirih	2
Manawali Island	Kg. Tanjung Manawali	5
Mandi Darah Island	Kg. Mandi Darah	5
Banggi Island	Kg. Lumais	0
	Kg. Lok Tohug	2
	Kg. Kaligau	5
	Kg. Telutuh	7
	Kg. Dogoton	8
	Kg. Maligu	9
	Kg. Laksian	0
	Kg. Garib	3
	Kg. Kerosong	6
	Kg. Damaran	12
	Kg. Maliu	7
	Kg. Padang	0
	Kg. Limbuak Laut	8
Total no. of gillnet interviews		79
Kudat	Merak Hati	23
	Fook Soon	7
	Ko-Nelayan	5
	Fook Soon Esplanade	52
	Angkasa Lama	42
	Angkasa Baru	5
Total no. of shrimp and fish trawler interviews		136

Turtle bycatch in proposed TMP

According to DOFS (2008), there are 76 registered under shrimp trawl net vessels and 34 registered fish trawl nets in Kudat. The total number of 137 gillnetting fishers in TMP was obtained during the interview. Through the interviews, it was recorded that 50.6 % gillnet fishers; 50% shrimp trawl net vessels and 80% fish trawl net vessels have reported turtle bycatch. Fish trawl nets have the highest total of turtles bycatch yearly, followed by gillnets and lastly shrimp trawl nets (Table 2), Turtle bycatch was 66.1% from gillnets, 25.9% from fish trawl net and 8% by shrimp trawl. The total turtles caught per year are 1326.6 where the number of *Chelonia mydas* and *Eretmochelys imbricate* caught yearly are 673.4 and 689.2, respectively (Table 2).

Table 2. Results on turtle bycatch of shrimp trawl nets, fish trawl nets and gill nets.

Item	Shrimp Trawl net	Fish Trawl Net	Gillnets
No. of Gears Registered (DOFS, 2006 / Results from interviews)	76	34	137
No. of Vessel / Fishers interviewed	58	30	78
Interviewed vessel / Fishers with bycatch	29	24	40
Total <i>Chelonia mydas</i> bycatch/ year (interview)	41	176	221
Total <i>Eretmochelys imbricate</i> bycatch / year (interview)	40	127	278
Average <i>Chelonia mydas</i> Bycatch / year	0.7	5.9	2.8
Average <i>Eretmochelys imbricate</i> bycatch/ year	0.7	4.2	3.6
Total <i>Chelonia mydas</i> bycatch / year	53.2	200.6	383.6
Total <i>Eretmochelys imbricate</i> bycatch/ year	53.2	142.8	493.2
Total turtle bycatch / year	106.4	343.4	876.8
% of contribution to bycatch	8.0%	25.9%	66.1%
Total turtle bycatch for all gears	1326.6		

Gillnetting fishers normally would have a few gillnets with different mesh sizes. Findings from the interview indicated that the most common mesh sizes used by gillnetting fishers are 2.5 inch and 4 inch. Fishers tend to use smaller mesh sizes under windy conditions, as larger mesh sizes get tangled more easily. The maximum number of turtle bycatch by gillnets are 2 -3 turtles per month. This was recorded in the interviews in Kg. Kaligau and Kg. Telutih, the gillnet mesh commonly used by fishers with high turtle bycatch are 2.5 inch, 3 inch and 4 inch. Through analysis of the interviews, it was recorded that fishers with high turtle bycatch most commonly fish in waters of Manawali Island, Mandi Darah Island, North East of Balambangan Island, waters in front of Kg. Maligu and Kg. Telutih (East of Banggi Island) and waters in front of Balak-balak Island (East of Banggi Island). It was also recorded that all turtle bycatch are released back, however, 23.1% of the turtle bycatch are dead when found in the nets.

The Fishery Act 1985 (Act 317) forbids trawlers from fishing in Zone A (5 miles from the shore reserved for small fishermen). This zone however is frequently encroached by trawlers and has created conflict between the traditional and commercial fisheries. Findings from the interview indicated that the mesh size of both shrimp and fish trawl nets have a minimum mesh size of 1 inch and a maximum mesh size of 2 inch. Smaller mesh sizes pose a threat for turtles as chances of escaping once caught are minimal, more, the long trawler hours would cause the turtles to drown in the nets.

For shrimp trawlers, the average number of bycatch is 1-2 turtles per month, however, there 1 interviewee indicated that they have 2 turtle bycatch per month. The mesh size used for this vessel is 2 inches. The fishing ground for this vessel is in the waters of southern and South West of Balambangan Island. The interviewee also admitted that they kill the turtles caught. Overall, 87.9% of the turtle bycatch are released alive.

The highest number of bycatch for fish trawl nets is 3-4 turtles per month. The fishing ground with high turtle bycatch according to the interviews are the waters of the North East region of Banggi Island and Northern Manawali Island. There is also a record where 2 interviewees admitted to catch up to 4-5 turtles per week and 11 turtles per month respectively. These vessels trawl in the waters of Western Balambangan Island, Eastern Banggi Island and Eastern Manawali Island. Mesh size for all the vessels with high bycatch

rates are 1 inch, 2 inch and 2.5 inch. It is also recorded that all turtle bycatch are released and 85.7% of the turtles are released alive.

Turtle Sightings in the waters of proposed TMP

The turtles are most commonly spotted in waters near the islands of proposed TMP. Higher turtle sighting probability located at shallow water surrounding the islands for example, Manawali Island, Banggi Island and Balambangan Island. A rough estimation of the area with turtle sighting probability for gillnets and trawlers are depicted as Figure 3. Operation of gillnet gear covers almost entire area of TMP but lower sighting probability in the East compared to the North. Trawlers registered in Kudat are mainly operated around islands North of Sabah.

A comparison between the fishing grounds (Beliku *et al.*, 2012) and the turtle sighting areas indicates that the fishing grounds are interlinked and thus might explain the issue of turtle bycatch in the waters of proposed TMP).

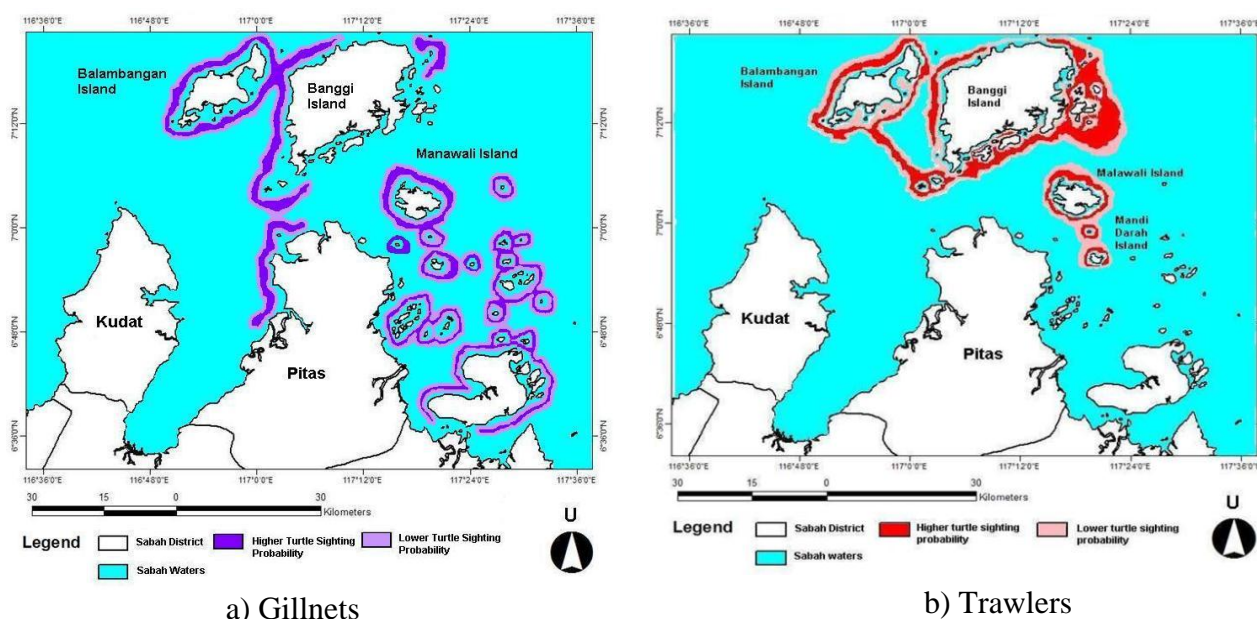


Figure 3. Approximate location of turtle sightings for a) gillnets and b) trawlers

Verification of turtle bycatch in gillnets

During the 116 gillnet fishing field trips, no bycatch were recorded, however, there were 18 turtle sightings. Most sightings were located at the waters of Balak-balak, Balak-Balak Kecil, Loktiki, Panukaran, Lok Keruing; 11 sightings during the night and 7 during day time. This indicates there are turtles in the fishing grounds.

CONCLUSIONS

The location of turtle sightings are also interlinked with the fishing ground, high probability of turtle sightings are mainly on the near shore waters of Manawali Island, Balambangan Island and Banggi Island. Turtle bycatch is recorded in both traditional and commercial fisheries.. Turtle bycatch was 66.1% from gillnets, 25.9% from fish trawl net and 8% by shrimp trawl. The total turtles caught is 1326.6 per year where the number of *Chelonia mydas* and *Eretmochelys imbricate* caught yearly are 673.4 and 689.2, respectively Most turtles reported to be bycatch by fishing gears were located in near shore waters of the islands which are important as

fishing ground in TMP. The information gathered from this study support the establishment of the proposed TMP which is importance for the planning and future management plan of the area. Also, the information on status of the fishing gears used by the fishers is needed for marine resources conservation program to the coastal communities.

ACKNOWLEDGEMENTS

We would like to take this opportunity to convey our thanks and appreciation to all the members of Borneo Marine Research Institute for providing the facility and venue to conduct this study. We would also like to express our deepest appreciation and sincere gratitude for all those involved directly in the course of making this paper smooth sailing. A special thanks to Ambak Raja for technical assistance during the field work of this study. The project was funded by World Wide Fund and Universiti Malaysia Sabah.

REFERENCES

- Aziz, A. A, 2011. *Feasibility Study on Development of a Wind Turbine Energy Generation system for Community Requirements of Pulau Banggi Sabah*. Universiti Teknologi Malaysia.
- Beliku, J., Saleh, E., and Dacho, N, 2012. Fishing Gear and Hot Spot Areas in Proposed Tun Mustapha Park, Kudat, Sabah in *International Seminar on Marine Science and Aquaculture Sustainable Development & Management of Aquatic Resources in a Changing Climate on 13-15 March 2012(abstract)*. Kota Kinabalu, Sabah.
- Chan, E. H, 1991. *Sea Turtle. The State of Nature Conservation in Malaysia*. Malayan Nature Society, Kuala Lumpur. P. 120-134
- Cooke, F. M. 2003. *Living at the Top End: Communities and Natural Resources Use in the Kudat/ Banggi Region of Northern Sabah*. WWF Malaysia, Kota Kinabalu.
- DOFS (Department of Fisheries Sabah), 2006. Kudat Department of Fisheries Data.
- DOFS (Department of Fisheries Sabah), 2008. *Annual Fisheries Statistics 2008*. Jabatan Perikanan Sabah. 11 – 134.
- Hin, C. L. K, 2010. *Status of Sea Turtle Resources and Coral Reefs of Maliangin Island Sanctuary, Kudat, Sabah*. Master Thesis. Universiti Malaysia Sabah.
- Lutz, P. L. and Musick, J. A, 1996. *The Biology of Sea Turtles*. Boca Raton: CRC Press.
- Lutz, P. L., Musick, J. A. and Wyneken, J, 2003. *The biology of Sea Turtle, volume 2*. Boca Raton: CRC Press.
- SEAFDEC (Southeast Asian Fisheries Development Center), 2011. *Regional Plan Of Action of Sea Turtles Foraging Habitats in Southeast Asian Waters Report*. SEAFDEC.
- WWF, 2006. *Banggi Environmental Awareness Centre (BEAC) – Turtle Project*. <http://www.panda.org/> accessed on 28 November 2012.

Annex 1

Tarikh: _____ Perlabuhan/ Kampung: _____ Nama: _____
 Jumlah Nelayan: _____ Jumlah Pemukat/tunda: _____ Jumlah Bot (Pukat/Tunda): _____
 Maklumat Sosioekonomi:
 Jumlah Tanggungan: _____ Taraf Pendidikan(Anak): 0 1 2 3 Isteri Kerja? Ya Tidak
 Badan Kebajikan: Ya _____ Tidak Hasil pendapatan sampingan: _____
 Pengkhususan Bot:
 Jenis: Kayu Fiberglass Panjang: _____ Kaki # orang ke laut: _____
 Berenjin?: tiada Enjin dalam Enjin sangkut pam bot _____ HP
 Tempat hantar ikan: Kampung Lain-lain _____ Hasil Tangkapan? Dijual Kegunaan sendiri

<p>Pukat _____ Saiz Mata: Panjang Pukat: Dalam Pukat: Terapung/ Tenggelam:</p>	<p>Pukat Tunda Saiz Mata: Panjang Hujung Pukat: Saiz Bukaan: Kelajuan semasa Menunda:</p>
---	--

Turun laut (sebulan): 0-5 6-10 11-15 16-20 21-25 26-30
 Tempoh di laut: 0-10 jam 10-24 jam 1-2 hari 3-5 hari >5 hari
 Jangka masa menunda/ rendam pukat: _____ Berapa kali turun pukat dalam 1 hari: _____
 Masa turun pukat: 1) _____ 2) _____ 3) _____ 4) _____
 Kawasan Memukat**:



I-Intermonsoon
 N-Musim Utara
 S-Musim Selatan
 T-Penyu
 1, 2, 3 - Kekerapan

Jarak tempat memukat dari pantai: _____ Kedalaman tempat memukat: _____
 Tempoh masa (bulan) pukat digunakan: 1 2 3 4 5 6 7 8 9 10 11 12
 Bulan/musim hasil tangkapan tinggi? 1 2 3 4 5 6 7 8 9 10 11 12
 Spesies: _____

Adakah Penyu boleh didapati di perairan ini? Ya Tidak
 Musim _____ Kawasan***
 Aktiviti? Ya Tidak (Mengawan Makan bertelur anak Penyu)
 Pernah tertangkap penyu? Ya Tidak

Species	Musim (Bulan)	Jumlah dalam setahun	Purata Saiz

Apa dilakukan:
 Simpan (hidup/mati) Buang (hidup/mati) Jual (hidup/mati) bunuh (buang/simpan/jual)

Komen Tambahan: