

Deployment of Electronic Monitoring Cameras on Fishing Trawlers in Sabah

**Annual Report No. 3
(March 2020 – August 2022)**



Project Title:

**Conservation of Large Marine Megafauna in
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YAYASAN

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1.0 INTRODUCTION

Accidental capture of Elasmobranch species (shark, ray, and wedgefish) is among the greatest threats faced by these species in Sabah. There are 11 Elasmobranch species protected under legislation in Malaysia, but the other species are still retained and sold in markets. To address the accidental captures of Elasmobranchs, there is a need to determine where and when these capture events occur. To fill this knowledge gap, this project aims to identify precise occurrences of Elasmobranch captures in trawl fisheries. Where it occurs, accidental capture of other endangered species is also recorded.

While this is the third in a series of annual reports, this document outlines the results of MRF's work in the Sabah Shark and Rays Initiative from March 2020 to August 2022. In this report we have updated the bycatch maps by species and month, identified the latest areas of high fishing intensity by district, pinpointed new hotspot areas for additional species, and revised the priority areas for the conservation of critically endangered species.

2.0 METHODOLOGY

For data collection, electronic monitoring cameras were installed on trawl vessels throughout Sabah. Details on the deployment of these cameras on fishing vessels and the methods of data analysis can refer to **MRF Shark & Ray Bycatch Report 2021-2022**.

3.0 RESULTS AND DISCUSSION

3.1 Field trips to Different Ports

Between March 2020 and August 2022, we travelled to Sandakan, Kudat, Lahad Datu, Tawau, and Semporna to install cameras on trawlers and retrieve data from them. We began deploying our self-built cameras on trawlers in Sandakan in 2020. In Kota Kinabalu, we installed three cameras and started collecting images in 2020. Additional cameras were deployed on the east coast of Sabah, specifically in Tawau and Semporna, starting in 2020. In 2021, we secured more vessels in Kudat for camera installation. In Lahad Datu, we began installing cameras on four trawlers in 2021. **Table 1** summarizes the number of cameras installed in each district in Sabah.

Ports	No of cameras installed
Kota Kinabalu	3
Sandakan	10
Kudat	5
Lahad Datu	4
Semporna	6

Tawau	5
Total	33

Table 1. Number of cameras installed in each district.

3.2 Database of Elasmobranch Bycatch

As of 26th September 2024, we have collected 640 weeks of data and images from 33 cameras fishing from Sandakan, Kota Kinabalu, Kudat, Tawau, Lahad Datu and Semporna. We have processed all of the images collected until August 2022, which is 466 weeks of images, or 72.8% of the total number of images collected. The remaining images will be completed by mid-2025, given the time it takes to manually review each image. From the images we processed, we have identified 7,396 incidences of shark, ray, wedgefish and turtle bycatch. To date we have managed to identify 5,967 of these individuals, which is 80.7% of the total number of bycatch events, to genus or species level,.

3.3 Data Analysis for Elasmobranch Bycatch

3.3.1 Commercial Trawler Fishing Grounds and Fishing Intensity

Overall fishing intensity is depicted in **Figure 1**, while the locations and intensity of commercial trawler fishing by district are illustrated in **Figures 2-7**. Fishing areas were determined by filtering the speed of the vessels to between 1.5 and 2.5 knots, which corresponds to the typical travel speed of vessels during trawling.

There are three vessels from Kota Kinabalu that trawled along the west coast, from Kota Kinabalu to Kudat. According to the analysis, these trawlers exhibited the highest fishing intensity in the western region of Tun Mustapha Park (TMP) (**Figure 2**). The trawlers in Kudat did not travel far, and mostly operated within the TMP area (**Figure 3**). Additionally, ten vessels from Sandakan trawled along Sabah's east coast, with the area of highest fishing intensity for Sandakan trawlers located near Jambongan Island (**Figure 4**).

Trawlers on the east coast of Sabah did not travel far from the port. The trawlers in Lahad Datu primarily fished near Sakar Island, including Darvel Bay and the east coast of Lahad Datu (**Figure 5**). Trawlers from Semporna mostly operated to the south of Semporna (**Figure 6**), while trawlers from Tawau fished on the west side of Tawau (**Figure 7**).

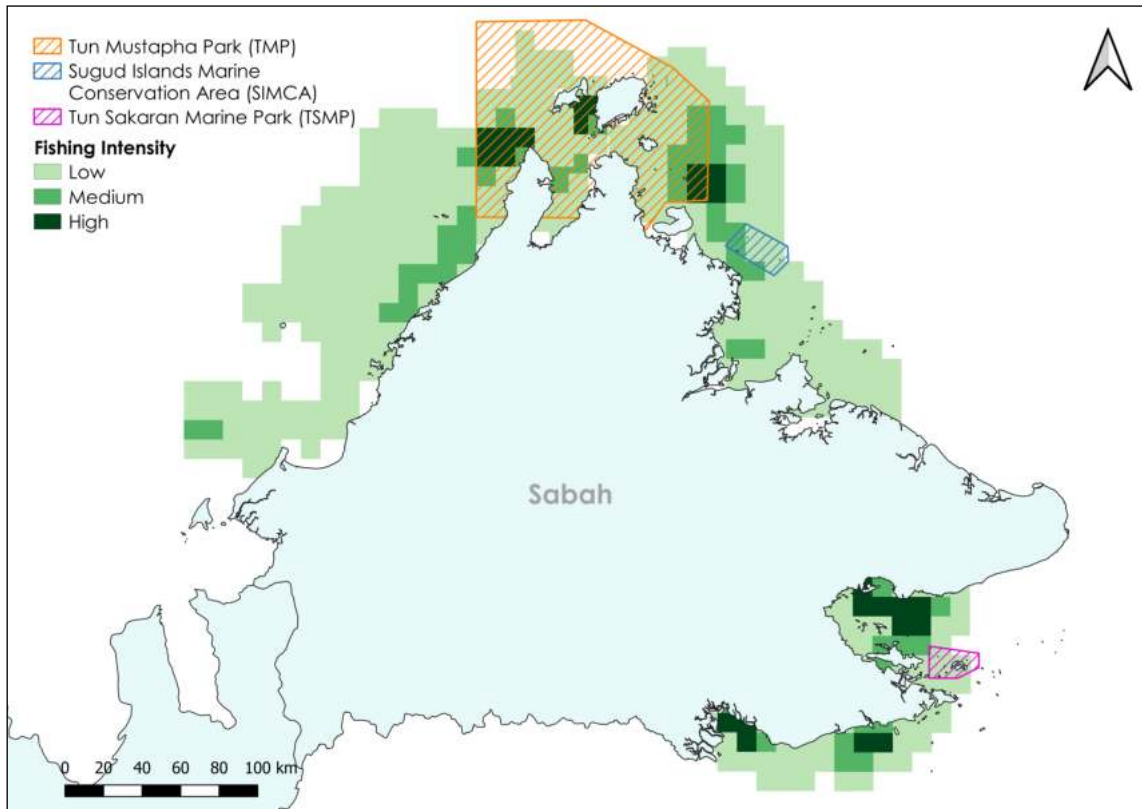


Figure 1. Fishing intensity of all 35 commercial trawlers across Sabah.

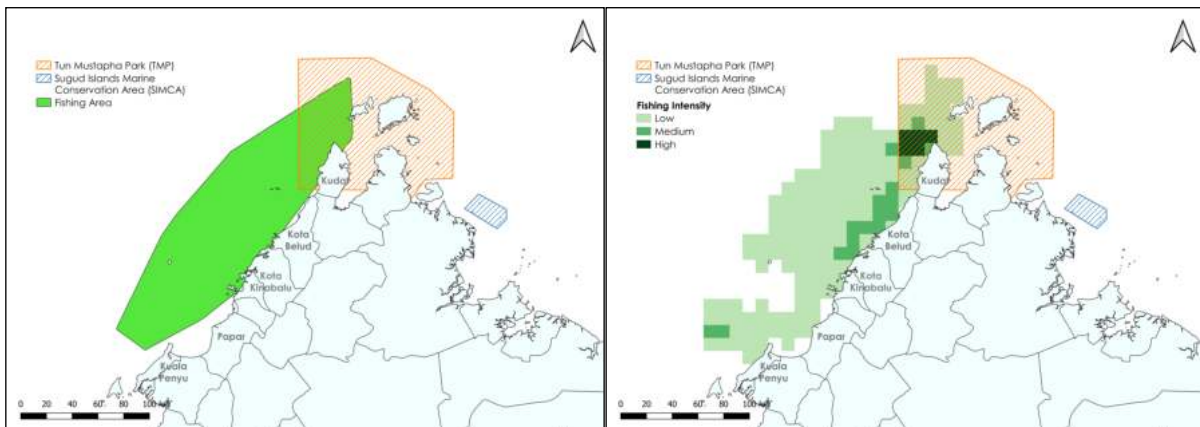


Figure 2. Fishing ground and fishing intensity of trawlers from Kota Kinabalu.

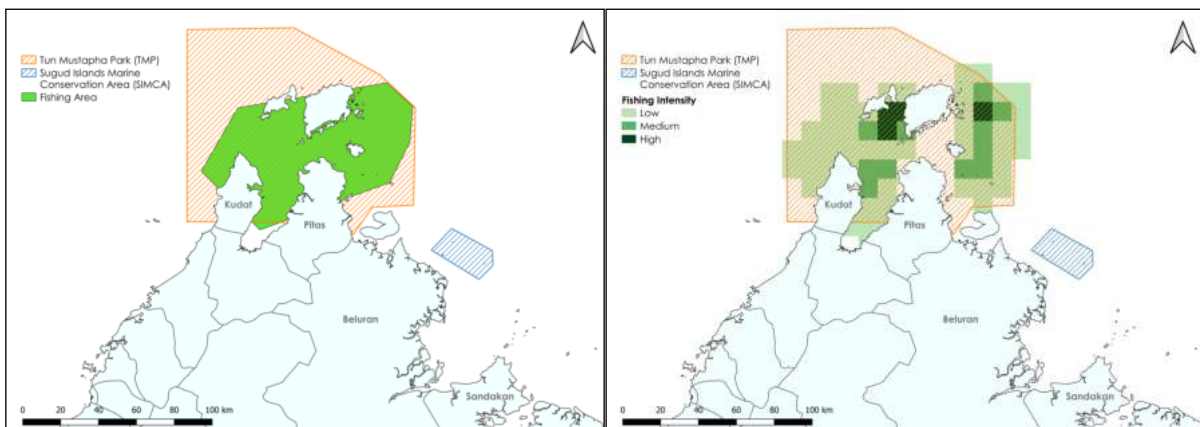


Figure 3. Fishing ground and fishing intensity of trawlers from Kudat.

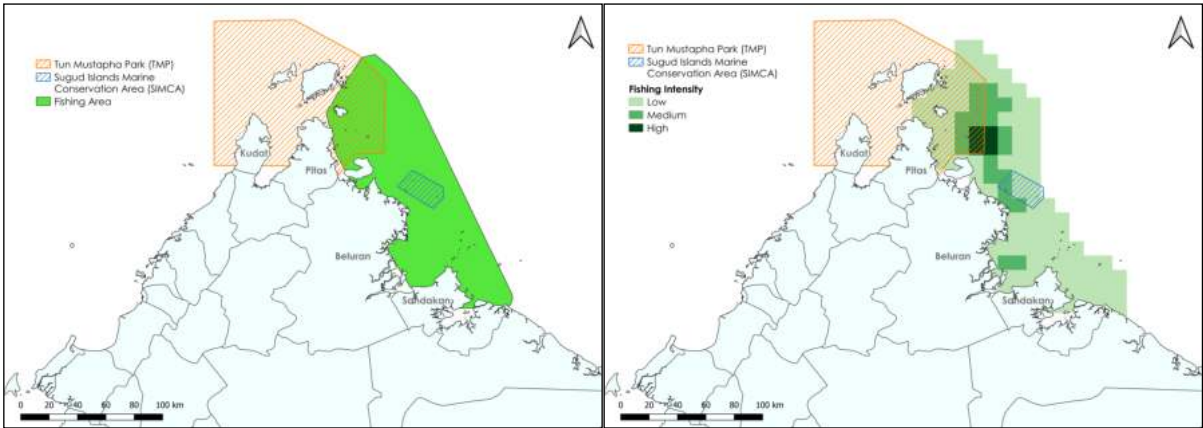


Figure 4. Fishing ground and fishing intensity of trawlers from Sandakan.

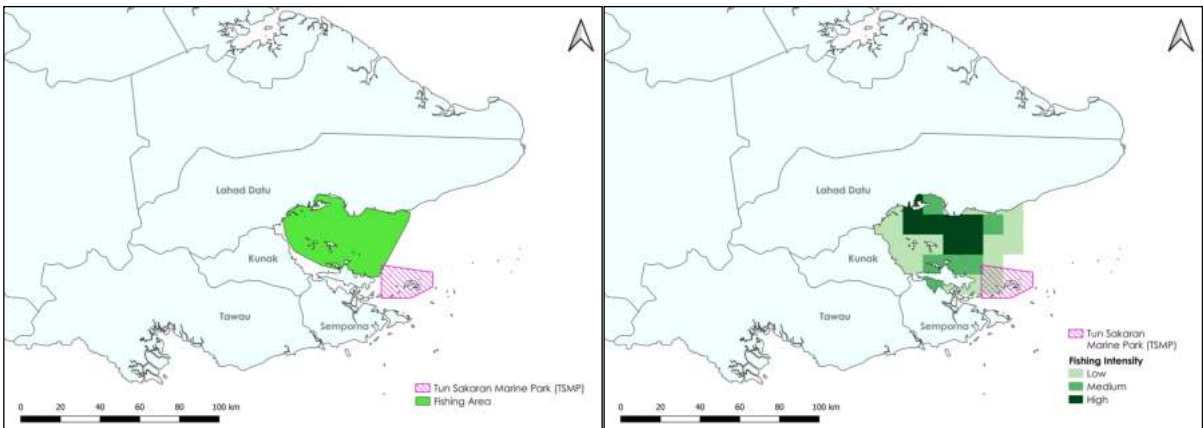


Figure 5. Fishing ground and fishing intensity of trawlers from Lahad Datu.

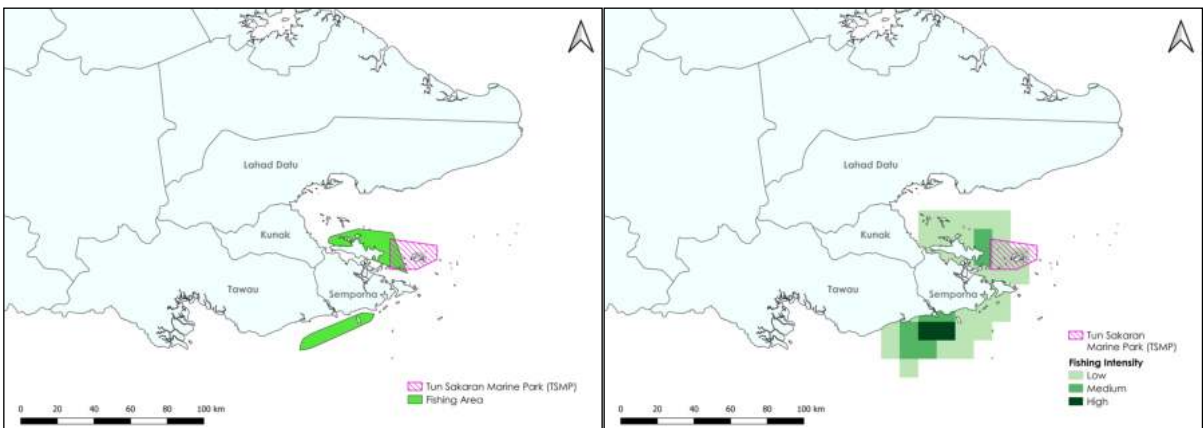


Figure 6. Fishing ground and fishing intensity of trawlers from Semporna.

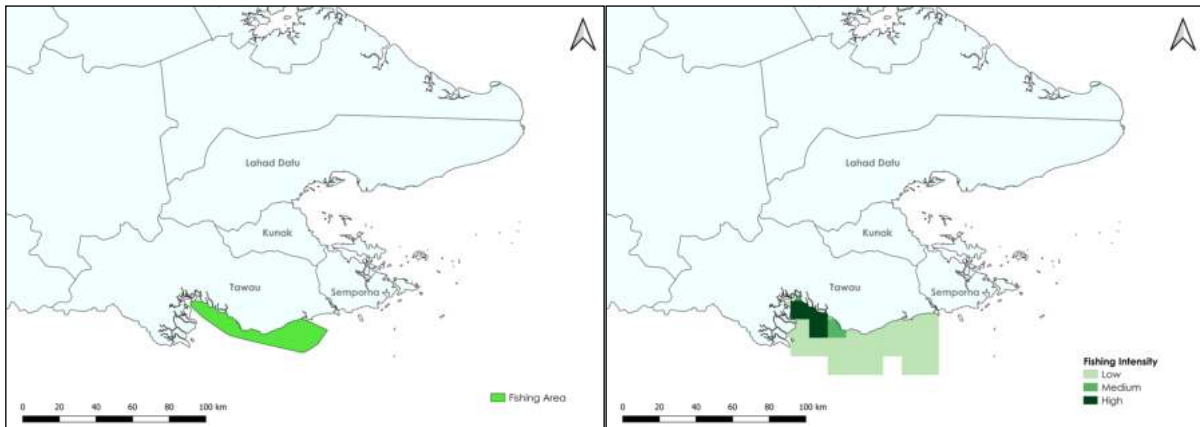


Figure 7. Fishing ground and fishing intensity of trawlers from Tawau.

3.3.2 Overall Findings of Elasmobranch Bycatch Incidences

Figures 8-12 illustrate the locations of all bycatch events for each Elasmobranch group, along with hotspot analyses of the findings. Note that these figures include all bycatch events and are not broken down temporally. **Figure 9** shows the bycatch of sharks, excluding the Whitespotted Bambooshark (*Chiloscyllium plagiosum*), and **Figure 11** shows the bycatch of rays, excluding the low-commercial-value Indonesian Sharpnose Ray (*Telatrygon biasa*), across the state. Fishermen discarded both species as they held little market value.

There were 29 shark species that were caught by trawlers, which consisted of 2,509 individuals in total. The most common shark species were the Whitespotted Bambooshark (*Chiloscyllium plagiosum*), Grey Carpetshark (*Chiloscyllium punctatum*), and the Coral Catshark (*Atelomycterus marmoratus*). Other shark species were Scalloped Hammerhead Sharks (*Sphyrna lewini*), sharks from Genus *Carcharhinus*, and Milk Shark (*Rhizoprionodon acutus*). The hotspot area for shark bycatch, excluding the Whitespotted Bambooshark, is located in the eastern region of TMP (**Figure 9**). A total of 405 individuals were caught within TMP, representing 16% of the total number of sharks caught in Sabah. Additionally, 40.1% of the total shark captures occurred in the East Coast Zone, with 38.7% of these captures taking place in the Tawau Zone.

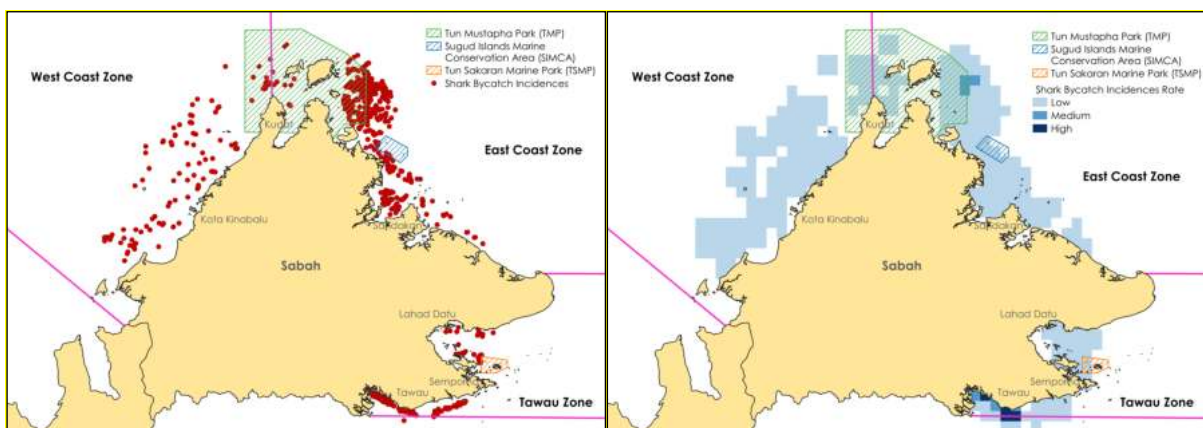


Figure 8. Locations of all species of shark bycatch across Sabah state.

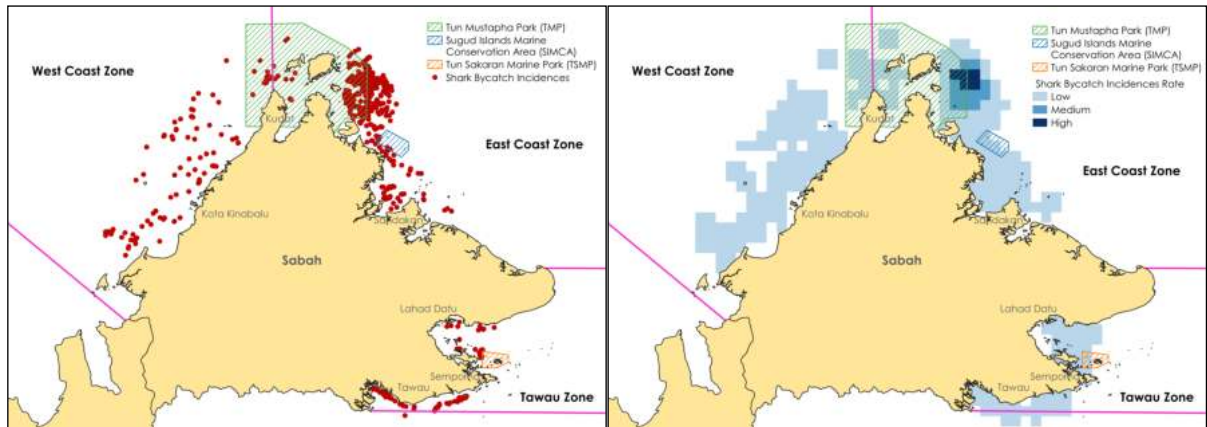


Figure 9. Locations of shark bycatch excluding Whitespotted Bambooshark across Sabah state.

For rays, there were 36 species caught by trawlers, which consisted of 4,747 individuals in total. The most common species were Whitespotted Whiprays (*Maculabatis gerradi*), Indonesian Sharpnose Ray (*Telatrygon biasa*), and the Maskray (*Neotrygon* spp.). Other ray species including Broad Cowtail Stingray (*Pastinachus ater*), Spotted Eagle Ray (*Aetobatus ocellatus*), and the Coach Whipray (*Himantura uarnak*). There were no obvious hotspot areas for ray bycatch after excluding the bycatch data of the Indonesian Sharpnose Ray (**Figure 11**). However, areas with higher bycatch incidences included those near Tetabun Island and Kanawi Island, as well as the area near Jambongan Island, which is situated within TMP. A total of 975 individuals were caught within TMP, accounting for 21% of the total number of rays caught in Sabah. A subset of 61.2% of the total ray captures occurred in the East Coast Zone, while 13.4% were recorded in the West Coast Zone.

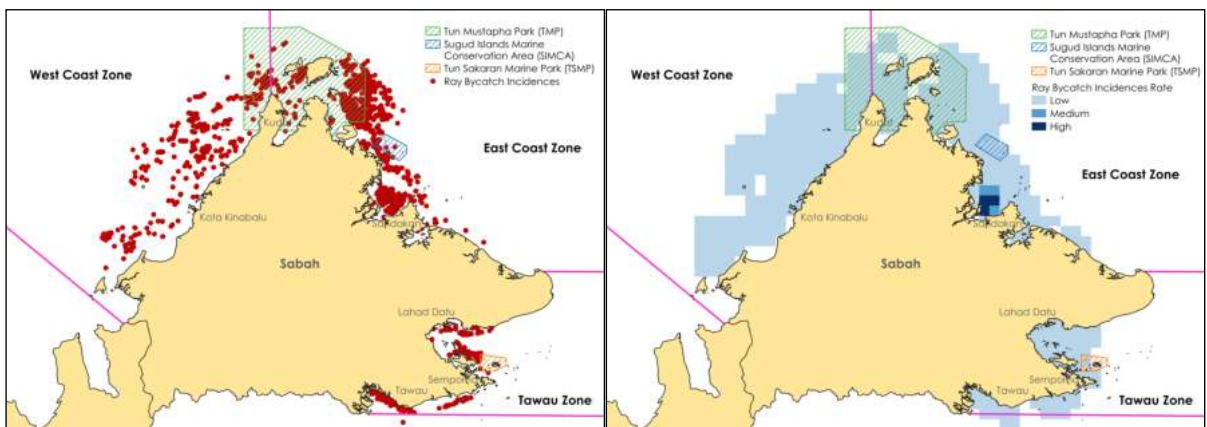


Figure 10. Locations of all species of ray bycatch across Sabah state.

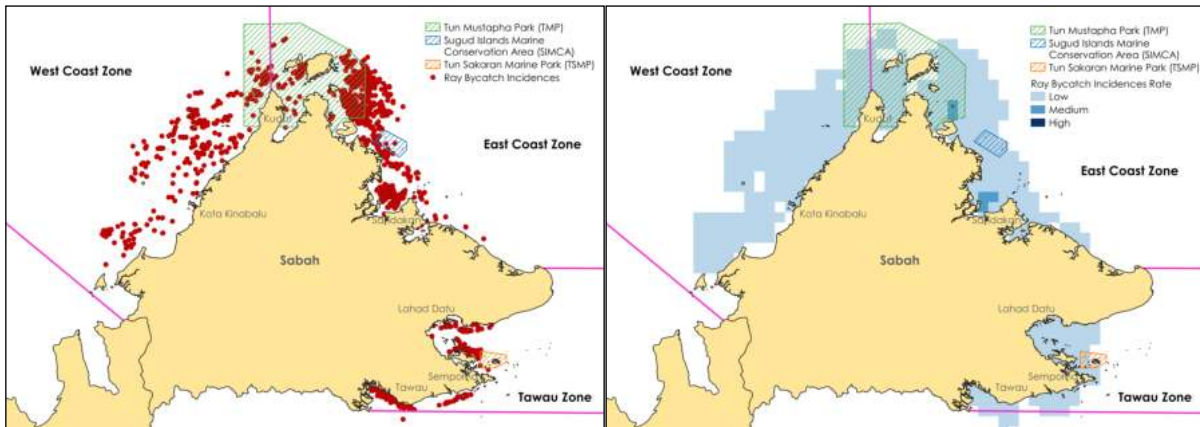


Figure 11. Locations of ray bycatch excluding Indonesian Sharpnose Ray across Sabah state.

Other than sharks and rays, 97 individuals from seven species of wedgefish / guitarfish were accidentally caught, all of which are listed as Critically Endangered on the IUCN Red List. The most commonly caught species was the Bottlenose Wedgefish (*Rhynchobatus australiae*). Most of the wedgefish / guitarfish were caught along the west coast of Sabah and in the northeast of TMP (**Figure 21**). The majority of captures occurred in the West Coast and East Coast Zones. In total, 21% of the wedgefish/guitarfish captures, or 20 individuals, were recorded within the TMP area.

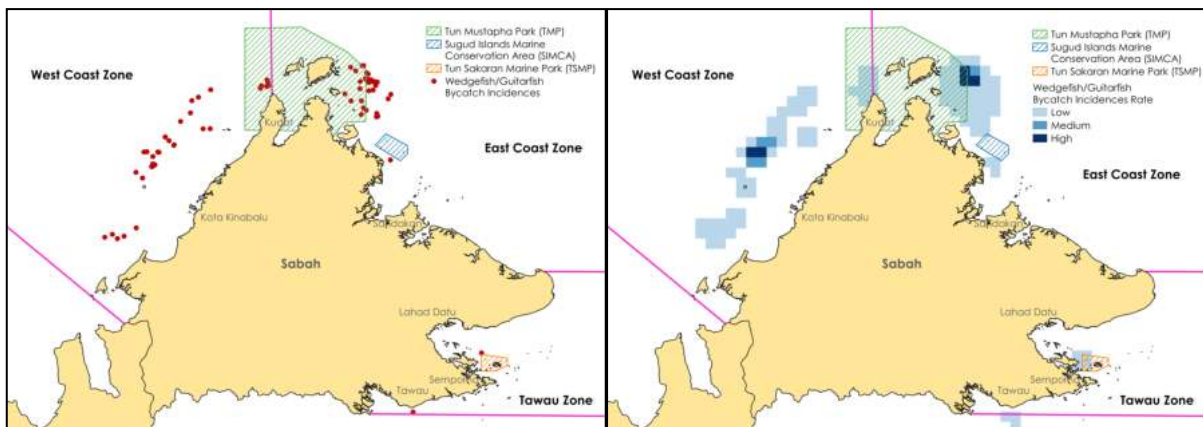


Figure 12. Locations of wedgefishes / guitarfishes bycatch across Sabah state.

The species identified from the captures is presented in **Table 2**.

Elasmobranch Group	Common name	Genus	Species	Total captures in Sabah
Shark	Coral Catshark	<i>Atelomycterus</i>	<i>marmoratus</i>	159
	Blackspot Shark*	<i>Carcharhinus</i>	<i>sealei</i>	131
	Blacktip Reef Shark*		<i>melanopterus</i>	
	Borneo Shark*		<i>borneensis</i>	
	Common Blacktip Shark*		<i>limbatus</i>	
	Hardnose Shark*		<i>macloti</i>	
	Indonesian Whaler Shark*		<i>tjutjut</i>	
	Silky Shark*		<i>falciformis</i>	
	Spinner Shark*		<i>brevipinna</i>	
	Spottail Shark*		<i>sorrah</i>	
	<i>Carcharhinus</i> spp.*		<i>spp.</i>	
	Grey Carpetshark		<i>Chiloscyllium</i>	
	Slender Bambooshark	<i>indicum</i>		2
	Whitespotted Bambooshark	<i>plagiosum</i>		1288
	<i>Chiloscyllium</i> spp.	<i>spp.</i>		81
	Tiger Shark	<i>Galeocerdo</i>	<i>cuvier</i>	1
	Sicklefin Weasel Shark	<i>Hemigaleus</i>	<i>microstoma</i>	16
	Snaggletooth Shark	<i>Hemipristis</i>	<i>elongata</i>	10
	Borneo Broadfin Shark	<i>Lamiopsis</i>	<i>tephrodes</i>	1
	Sliteye Shark	<i>Loxodon</i>	<i>macrorhinus</i>	4
	Tawny Nurse Shark	<i>Nebrius</i>	<i>ferrugineus</i>	1
	Straight-tooth Weasel Shark	<i>Paragaleus</i>	<i>tengi</i>	14
	Blue Shark	<i>Prionace</i>	<i>glauca</i>	1
	Milk Shark	<i>Rhizoprionodon</i>	<i>acutus</i>	27
	New Spadenose Shark	<i>Scoliodon</i>	<i>macrorhynchus</i>	9
	Great Hammerhead	<i>Sphyrna</i>	<i>mokarran</i>	100
	Scalloped Hammerhead		<i>lewini</i>	
	Western Highfin Spurdog	<i>Squalus</i>	<i>altipinnis</i>	2
	Longnose Spurdog		<i>blainville</i>	5
	Zebra Shark	<i>Stegostoma</i>	<i>tigrinum</i>	6
	Whitetip Reef Shark	<i>Triaenodon</i>	<i>obesus</i>	1
	Unknown spp.	<i>Unknown</i>	<i>Unknown</i>	274
Total				2509
Ray	Spotted Eagle Ray	<i>Aetobatus</i>	<i>ocellatus</i>	6
	Brown Stingray	<i>Bathytoshia</i>	<i>lata</i>	13
	Dwarf Whipray	<i>Brevitrygon</i>	<i>heterura</i>	171
	Roughback Whipray	<i>Fluvitrygon</i>	<i>kittipongi</i>	1
	Longtail Butterfly Ray	<i>Gymnura</i>	<i>poecilura</i>	6
	Red Stingray	<i>Hemitrygon</i>	<i>akajei</i>	2
	Dwarf Black Stingray		<i>parvonigra</i>	101
	Leopard Whipray	<i>Himantura</i>	<i>leoparda</i>	2
	Coach Whipray		<i>uarnak</i>	14
	Honeycomb Whipray		<i>undulata</i>	2

	Whitespotted Whipray	<i>Maculabatis</i>	<i>gerrardi</i>	674
	Sharpnose Whipray		<i>macrura</i>	
	Round Whipray		<i>pastinacoides</i>	14
	<i>Maculabatis</i> spp.		<i>spp.</i>	2
	Smalleye Stingray	<i>Megatrygon</i>	<i>microps</i>	4
	Spinetail Devil Ray	<i>Mobula</i>	<i>mobular</i>	1
	Shortlip Numbfish	<i>Narcine</i>	<i>brevilabiata</i>	34
	Brown Numbfish		<i>brunnea</i>	13
	Chinese Numbfish		<i>lingula</i>	1
	Smallspot Numbfish		<i>maculata</i>	2
	Numbfish	<i>Unknown</i>	<i>Unknown</i>	23
	Maskray	<i>Neotrygon</i>	<i>spp.</i>	751
	Sulu Ring Skate	<i>Okamejei</i>	<i>jensenae</i>	5
	Broad Cowtail Ray	<i>Pastinachus</i>	<i>ater</i>	14
	Narrowtail Cowtail Ray		<i>gracilicaudus</i>	1
	Roughnose Cowtail Ray		<i>solocirostris</i>	4
	<i>Pastinachus</i> spp.		<i>spp.</i>	2
	Pink Whipray	<i>Pateobatis</i>	<i>fai</i>	27
	Jenkins' Whipray		<i>jenkinsii</i>	36
	Whitenose Whipray		<i>uarnacoides</i>	148
	Javan Cownose Ray	<i>Rhinoptera</i>	<i>javanica</i>	1
	Shorttail Cownose Ray		<i>jayakari</i>	1
	Borneo Leg Skate	<i>Sinobatis</i>	<i>borneensis</i>	2
	Bluespotted Lagoon Ray	<i>Taeniura</i>	<i>lymma</i>	44
	Blotched Fantail Ray	<i>Taeniurops</i>	<i>meyeni</i>	1
	Indonesian Sharpnose Ray	<i>Telatrygon</i>	<i>biasa</i>	1450
	Mangrove Whipray	<i>Urogymnus</i>	<i>granulatus</i>	2
	Tubemouth Whipray		<i>lobistoma</i>	3
	Giant Freshwater Whipray		<i>polylepis</i>	2
	Unknown spp.	<i>Unknown</i>	<i>Unknown</i>	1167
	Total			4747
Wedgefish/ Guitarfish	Sharpnose Guitarfish	<i>Glaucostegus</i>	<i>granulatus</i>	4
	Giant Guitarfish		<i>typus</i>	7
	Bowmouth Guitarfish	<i>Rhina</i>	<i>ancylostoma</i>	2
	Brown Guitarfish	<i>Rhinobatos</i>	<i>schlegelii</i>	17
	Bottlenose Wedgefish	<i>Rhynchobatus</i>	<i>australiae</i>	33
	Whitespotted Wedgefish		<i>djiddensis</i>	3
	Broadnose Wedgefish		<i>springeri</i>	1
	<i>Rhynchobatus</i> spp.		<i>spp.</i>	6
	Unknown spp.	<i>Unknown</i>	<i>Unknown</i>	24
	Total			97

*Suspected species for genus *Carcharhinus*

Table 2. Summary of Elasmobranch species caught in Sabah.

3.3.3 Hotspot Areas Each Elasmobranch Species

For cases in which we have more than 30 bycatch events (about the minimum needed for good GIS analysis), we have developed heatmaps to illustrate their hotspot areas (**Figures 13-27**).

3.3.3.1 *Carcharhinus* Shark

We found it difficult to identify sharks from the genus *Carcharhinus* to the species level, so they were recorded collectively as bycatch. A total of 131 individuals were caught by trawlers, with most captured near the area between Banggi Island, Malawali Island, and Jambangan Island. (**Figure 13**).

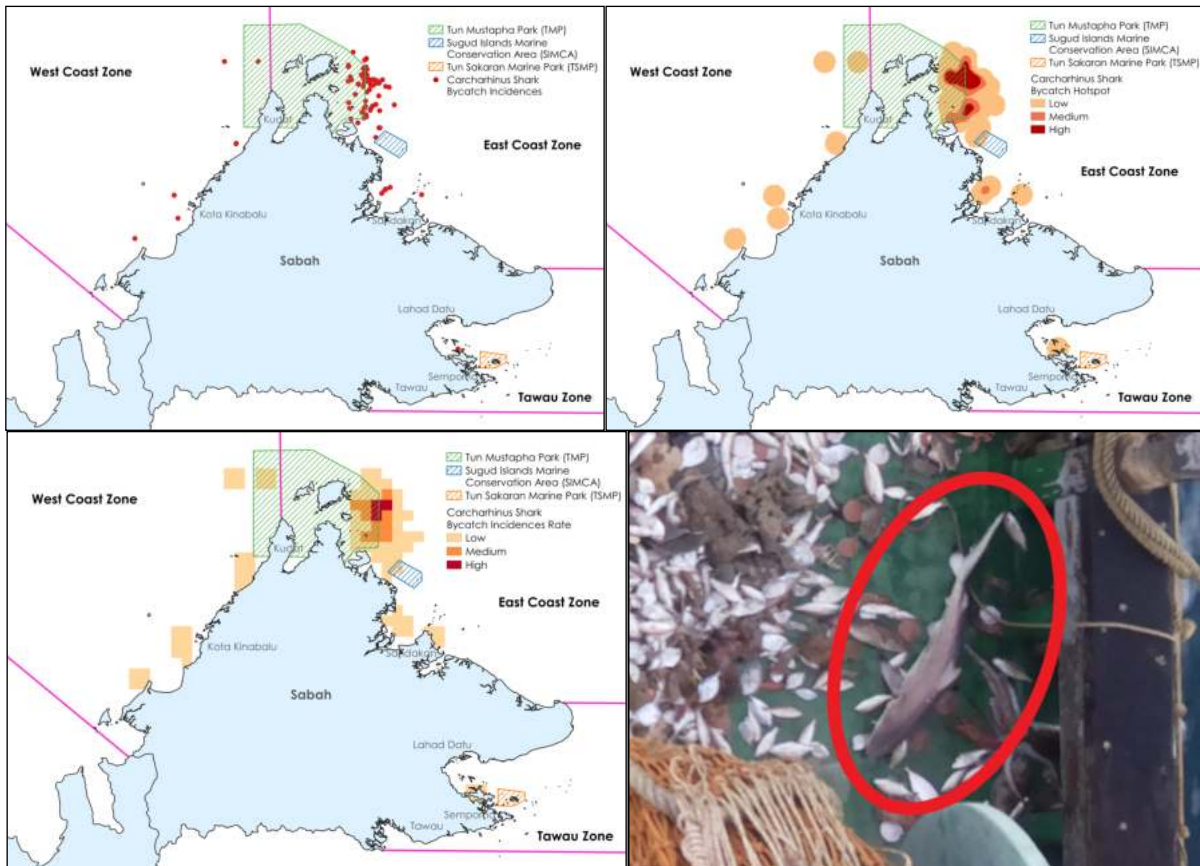


Figure 13. Locations of *Carcharhinus* shark bycatch across Sabah state. Top left: raw sightings data. Top right: bycatch heatmap. Bottom left: Bycatch heatmap by 0.5° cells. Bottom right: Example species image.

3.3.3.2 Coral Catshark (*Atelomycterus marmoratus*)

A total of 159 Coral Catsharks were caught by trawlers, with most captured near Banggi Island and Malawali Island (**Figure 14**). The Coral Catshark is listed as Near Threatened on the IUCN Red List.

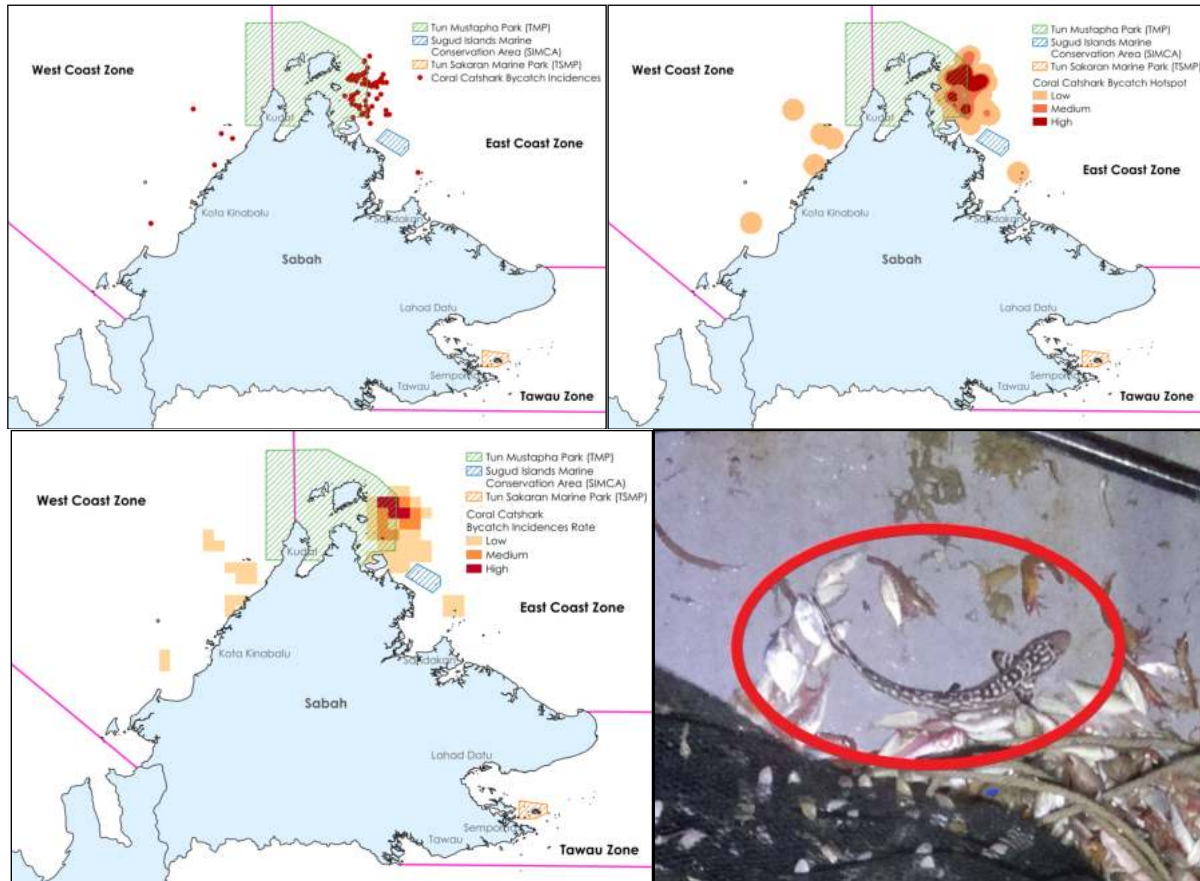


Figure 14. Locations of Coral Catshark bycatch across Sabah state. Panel breakdown as per Figure 13.

3.3.3.3 Hammerhead Shark (*Sphyrna mokarran* and *Sphyrna lewini*)

A total of 100 hammerhead sharks were caught by trawlers around Sabah, with the majority captured near the Tun Mustapha Park (TMP) (**Figure 15**). A subset of 46 hammerhead sharks, representing 46% of the total caught in Sabah, were caught within TMP. Most of these were juveniles, indicating that this area may serve as a potential pupping or nursery ground for hammerhead sharks. Both the Great Hammerhead (*Sphyrna mokarran*) and Scalloped Hammerhead (*Sphyrna lewini*) are listed as Critically Endangered on the IUCN Red List.

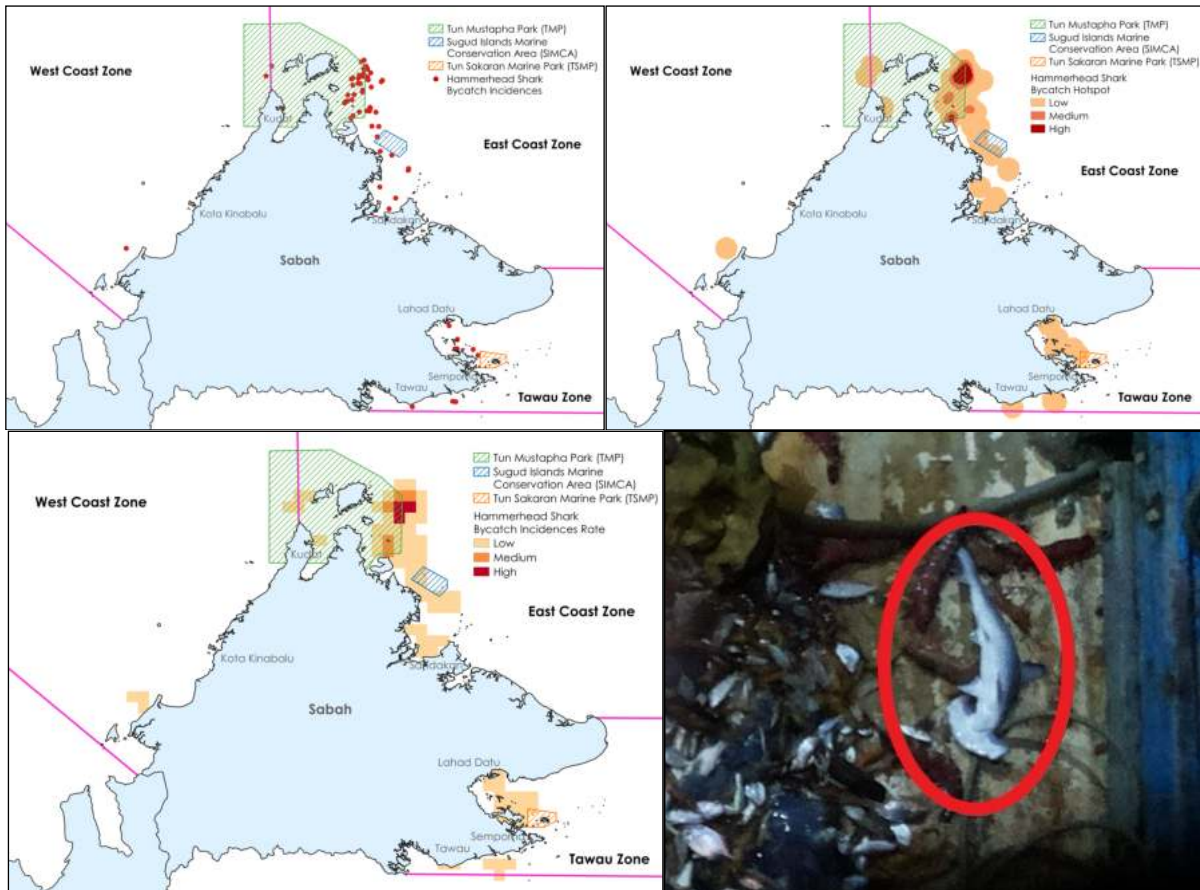


Figure 15. Locations of Hammerhead shark bycatch across Sabah state. Panel breakdown as per Figure 13.

3.3.3.4 Grey Carpetshark (*Chiloscyllium punctatum*)

A total of 376 Brownbanded Bamboosharks were caught by trawlers across various locations in Sabah, with a hotspot near Malawali Island and Banggi Island (**Figure 16**). The Brownbanded Bambooshark is listed as Near Threatened on the IUCN Red List.

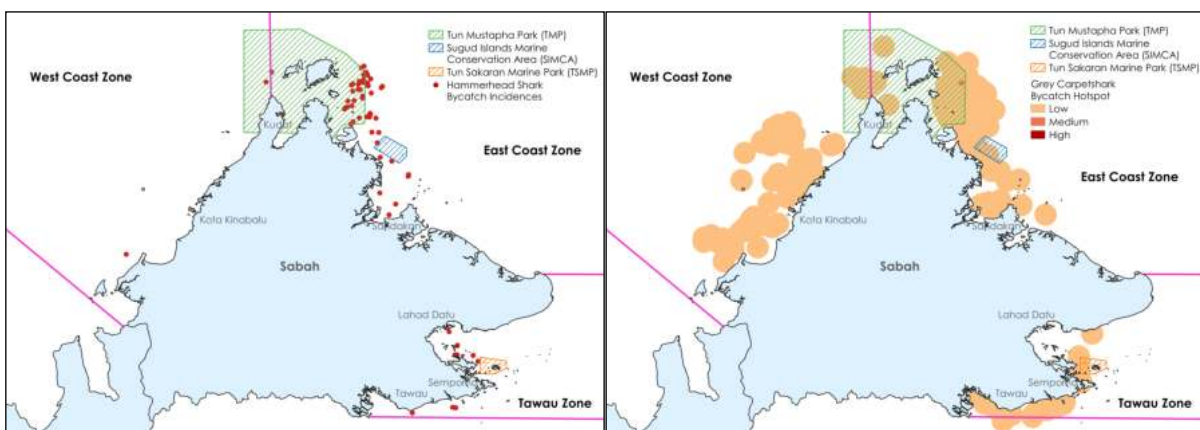




Figure 16. Locations of Grey Carpetshark bycatch across Sabah state. Panel breakdown as per Figure 13.

3.3.3.5 Whitespotted Bambooshark (*Chiloscyllium plagiosum*)

The Whitespotted Bambooshark had the highest number of bycatch incidences compared to other shark species. A total of 1,288 individuals were caught by commercial trawlers, with most captured near Tawau (**Figure 17**). Fortunately, at Tawau fishers released some of these sharks back into the sea, and a number of them were still alive. The Whitespotted Bambooshark is listed as Near Threatened on the IUCN Red List.

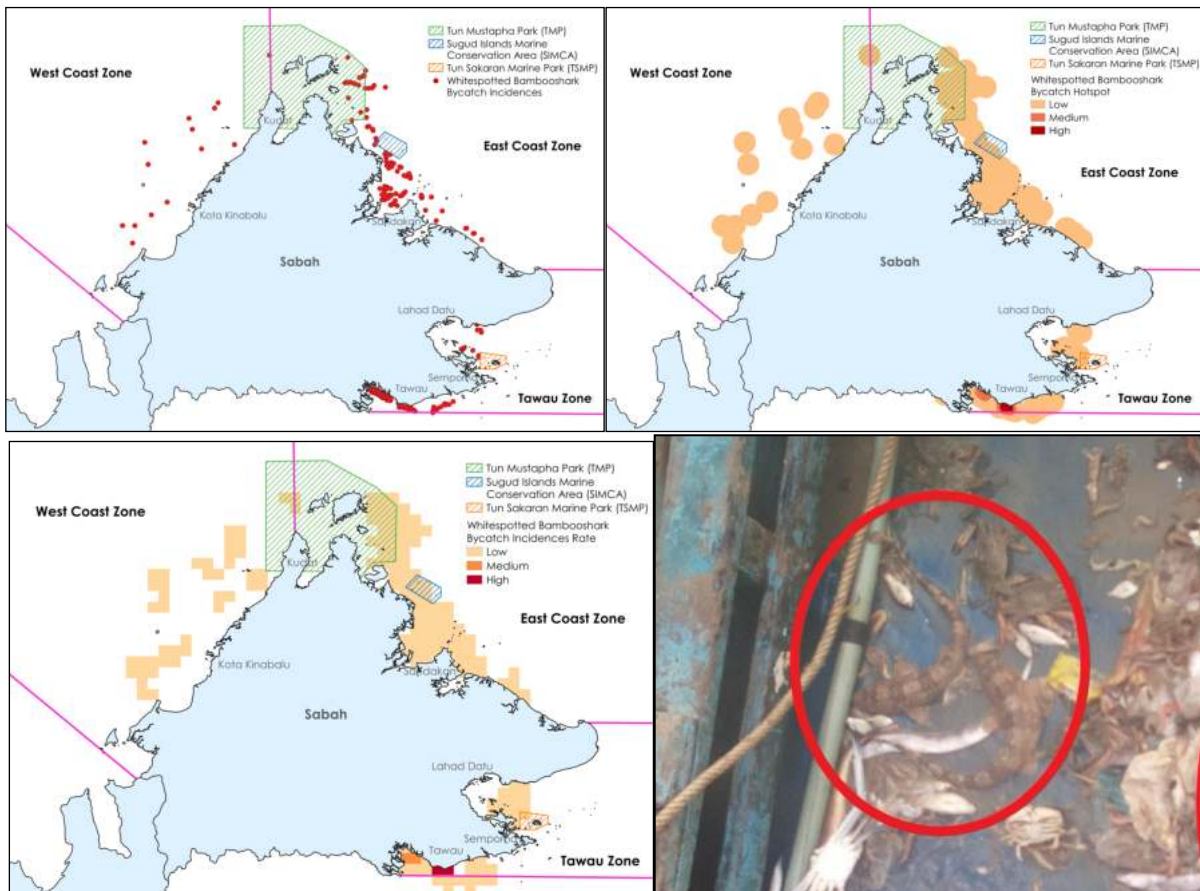


Figure 17. Locations of Whitespotted Bambooshark bycatch across Sabah state. Panel breakdown as per Figure 13.

3.3.3.6 Whitenose Whipray (*Pateobatis uarnacoides*)

A total of 148 Whitenose Whiprays were caught, with most captured near Tetabun Island and Kanawi Island (**Figure 18**). The Whitenose Whipray is listed as Endangered on the IUCN Red List.

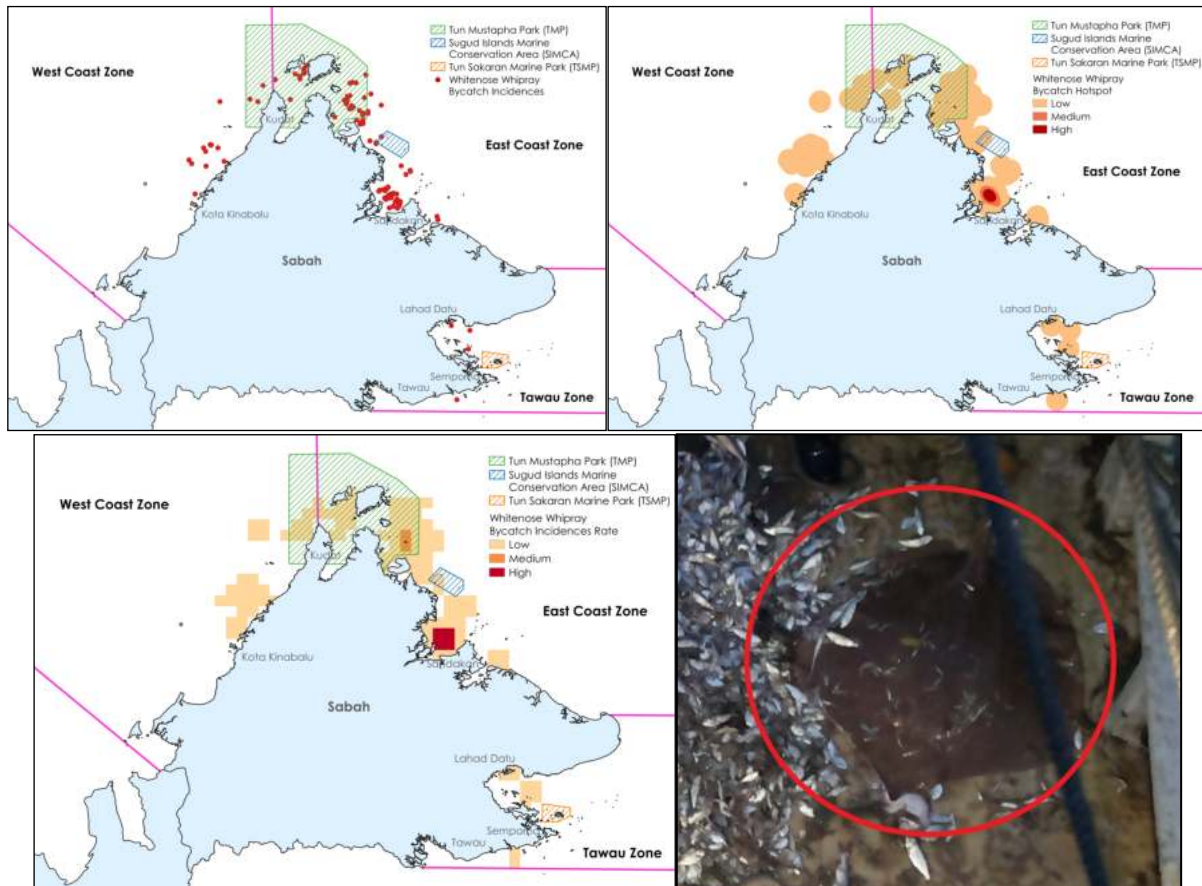
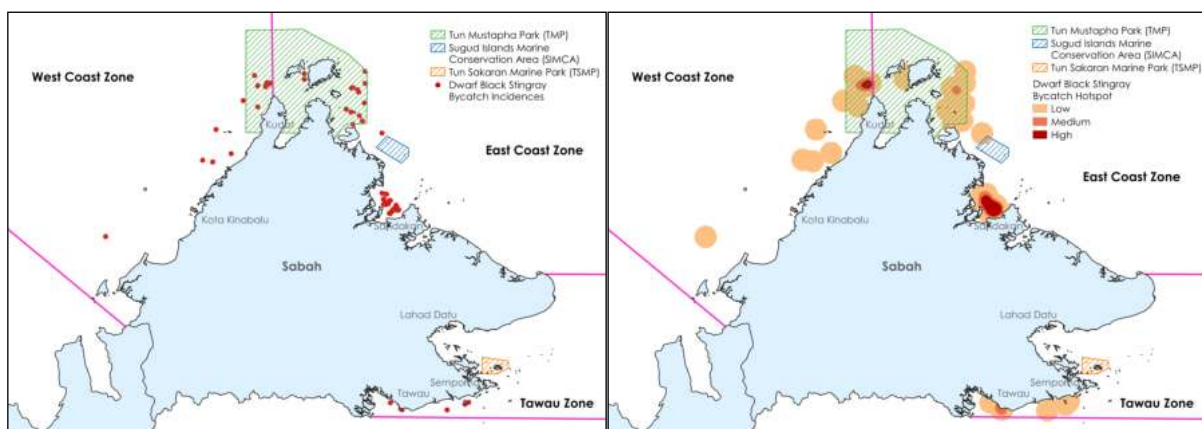


Figure 18. Locations of Whitenose Whipray bycatch across Sabah state. Panel breakdown as per Figure 13.

3.3.3.7 Dwarf Black Stingray (*Hemirhynchus parvonigra*)

A total of 101 Dwarf Black Stingrays were caught, with most captured near Tetabun Island and Kanawi Island, and some near the Tip of Borneo, Kudat (**Figure 19**). The Dwarf Black Stingray is listed as Data Deficient on the IUCN Red List.



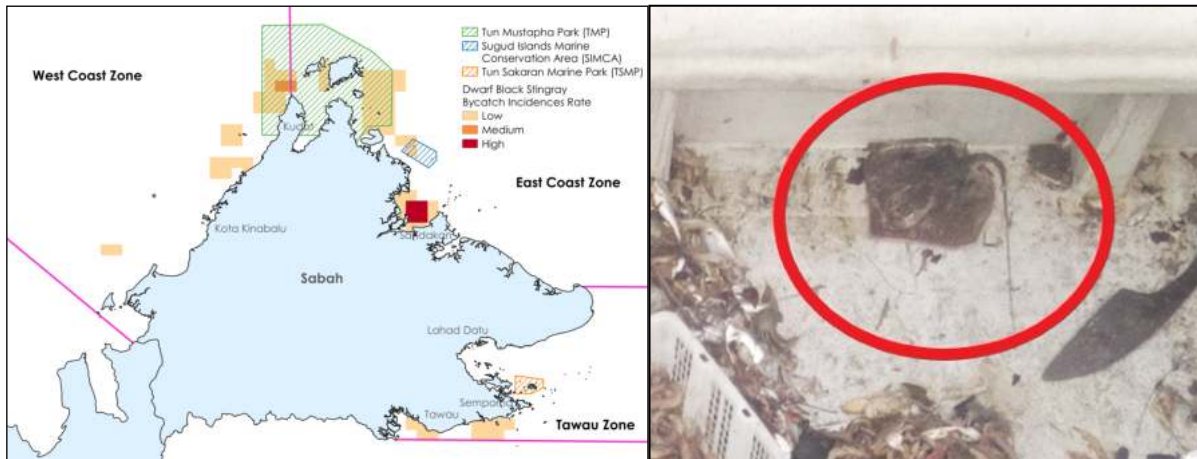


Figure 19. Locations of Dwarf Black Stingray bycatch across Sabah state. Panel breakdown as per Figure 13.

3.3.3.8 Dwarf Whipray (*Brevitrygon heterura*)

A total of 171 Dwarf Whiprays were caught by trawlers, with most captured near the Tip of Borneo and Jambongan Island (**Figure 20**). The Dwarf Whipray is listed as Vulnerable on the IUCN Red List.

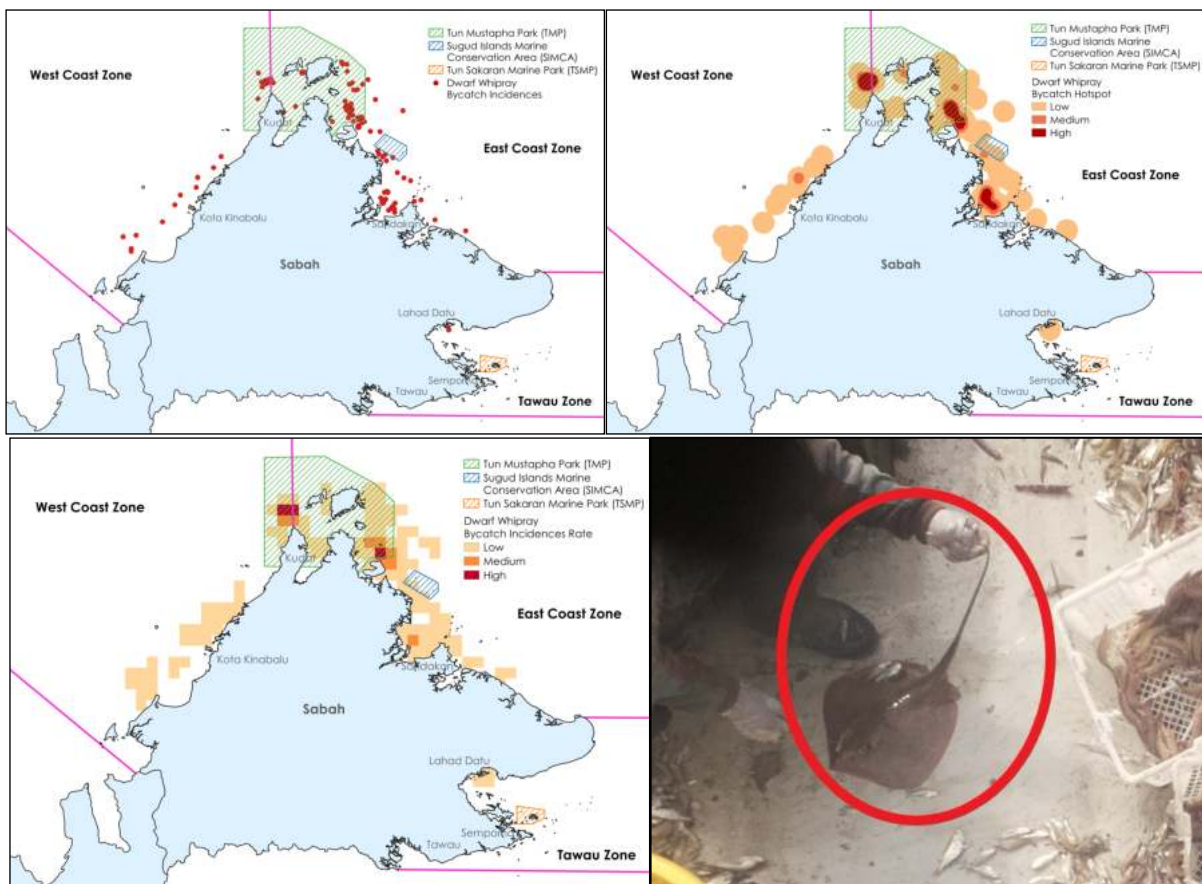


Figure 20. Locations of Dwarf Whipray bycatch across Sabah state. Panel breakdown as per Figure 13.

3.3.3.9 Maskray (*Neotrygon spp.*)

The Maskray was one of the most common ray species caught by trawlers across all six districts, with no specific hotspot areas (**Figure 21**). A total of 751 individuals were caught throughout Sabah.

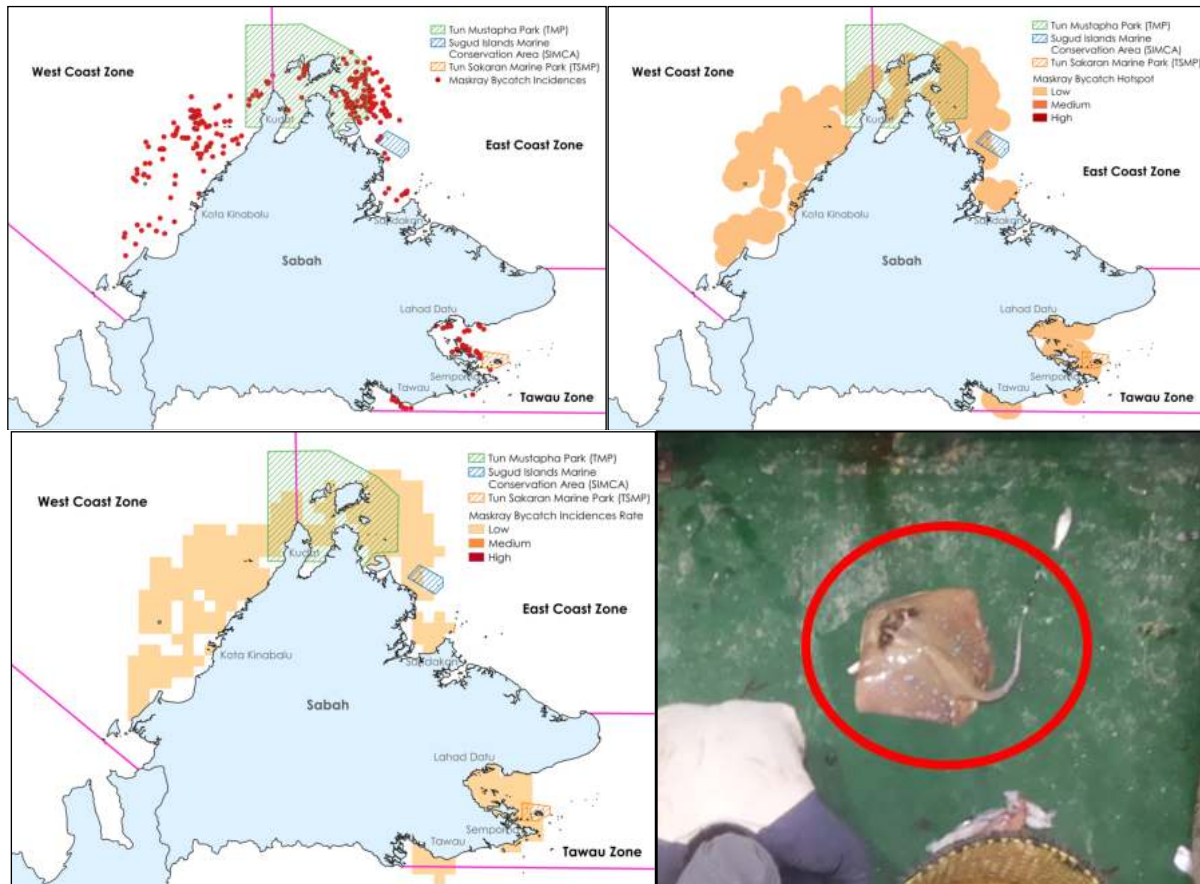


Figure 21. Locations of Maskray bycatch across Sabah state. Panel breakdown as per Figure 13.

3.3.3.10 Whitespotted Whipray/Sharpnose Whipray (*Maculabatis gerrardi*/*Maculabatis macrura*)

Due to the species-complex nature of the two species within the *Maculabatis* genus, which presents challenges in distinguishing them, we grouped them into a single category. A total of 674 individuals were caught by trawlers across all six districts, with most captured near the inshore areas of Tawau and the eastern region of TMP (**Figure 22**). Both the Whitespotted Whipray and Sharpnose Whipray are listed as Endangered on the IUCN Red List.

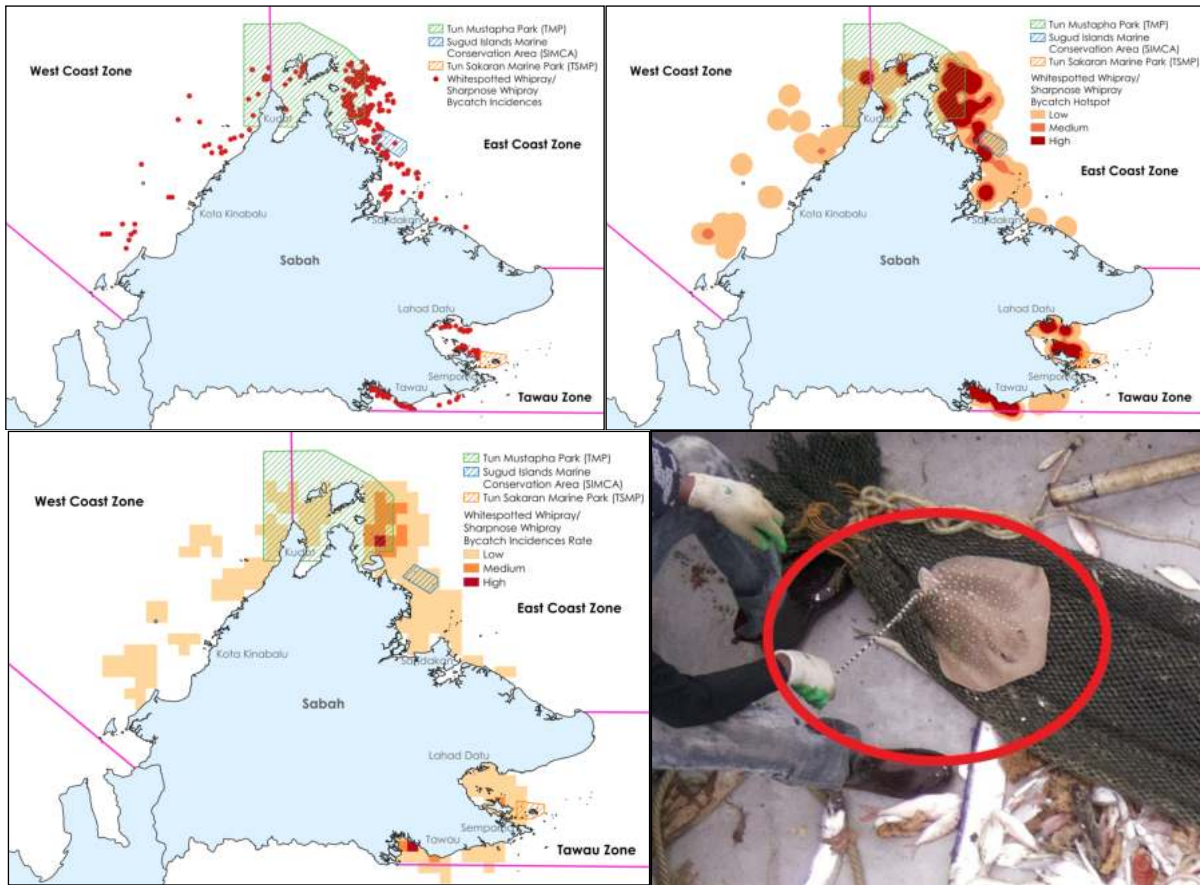
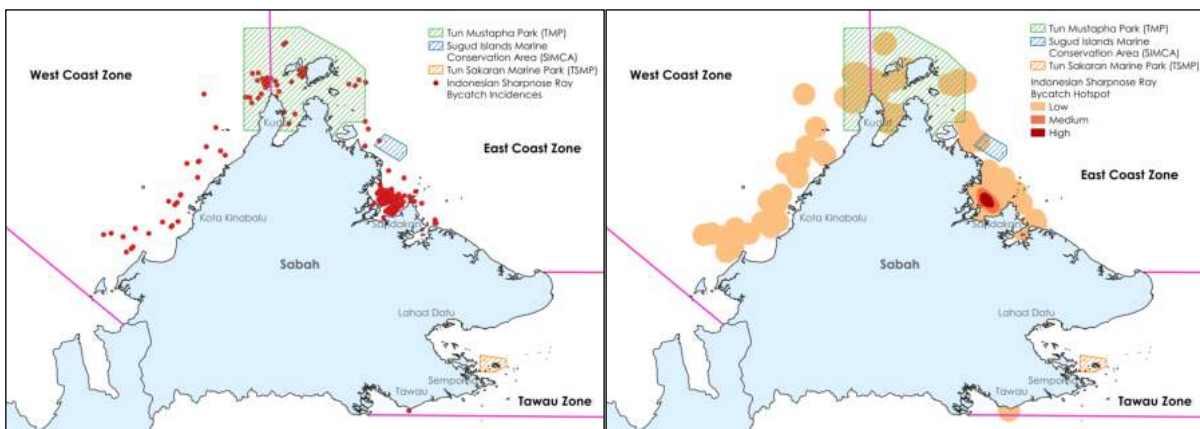


Figure 22. Locations of Whitespotted Whipray/Sharpnose Whipray bycatch across Sabah state. Panel breakdown as per Figure 13.

3.3.3.11 Indonesian Sharpnose Ray (*Telatrygon biasa*)

Telatrygon biasa had the highest bycatch incidences among all elasmobranch species. A total of 1,450 Indonesian Sharpnose Rays were caught, with most captured by trawlers near Tetabun and Kanawi Islands (**Figure 23**). This species is listed as Vulnerable on the IUCN Red List.



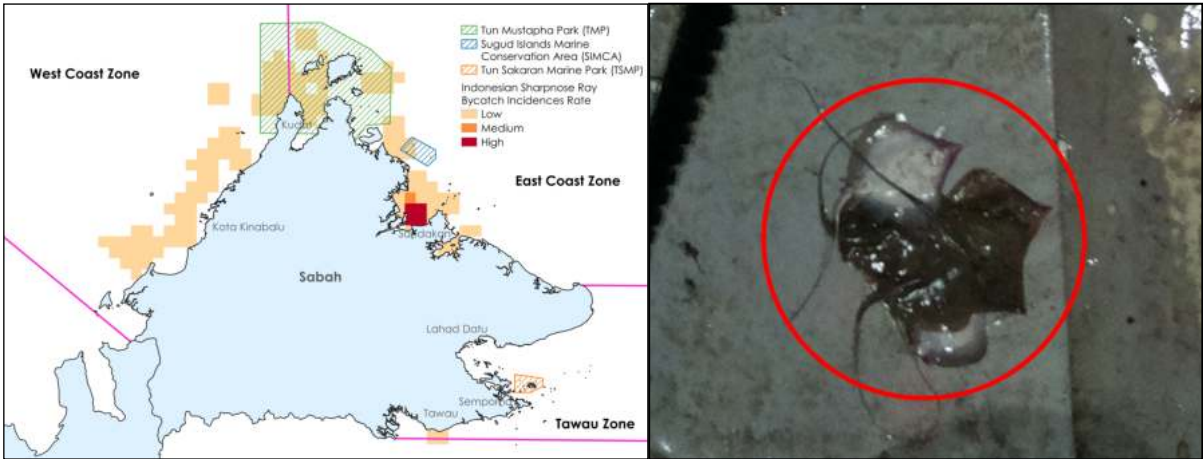


Figure 23. Locations of Indonesian Sharpnose Ray bycatch across Sabah state. Panel breakdown as per Figure 13.

3.3.3.12 Bluespotted Lagoon Ray (*Taeniura lymma*)

A total of 44 Bluespotted Lagoon Rays were caught, with most captured by trawlers near the inshore areas of Tawau and the eastern region of TMP (**Figure 24**). The Bluespotted Lagoon Ray is listed as Least Concern on the IUCN Red List.



Figure 24. Locations of Bluespotted Lagoon Ray bycatch across Sabah state. Panel breakdown as per Figure 13.

3.3.3.13 Jenkins' Whipray (*Pateobatis jenkinsii*)

A total of 36 Jenkins' Whiprays were caught, with most captured by trawlers near Tetabun and Kanawi Islands (**Figure 25**). The Jenkins' Whipray is listed as Endangered on the IUCN Red List.

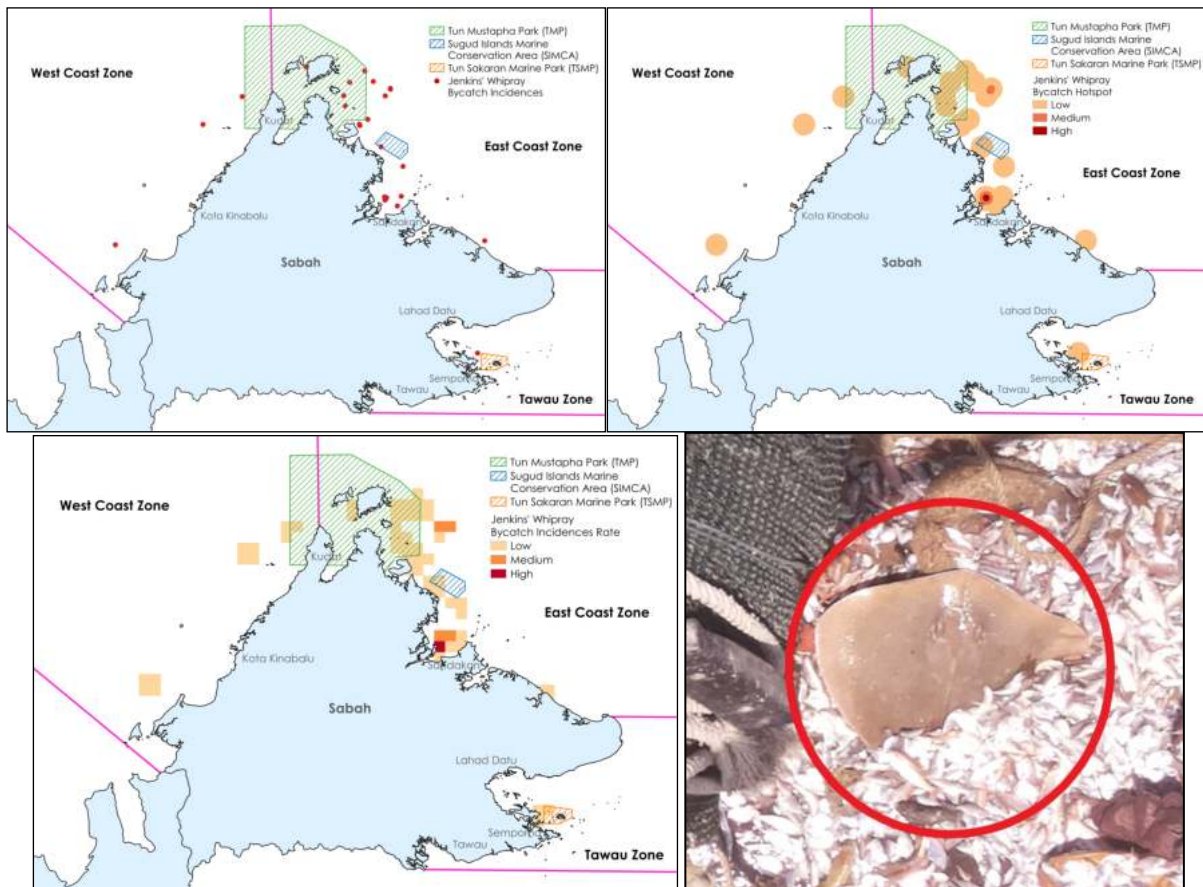
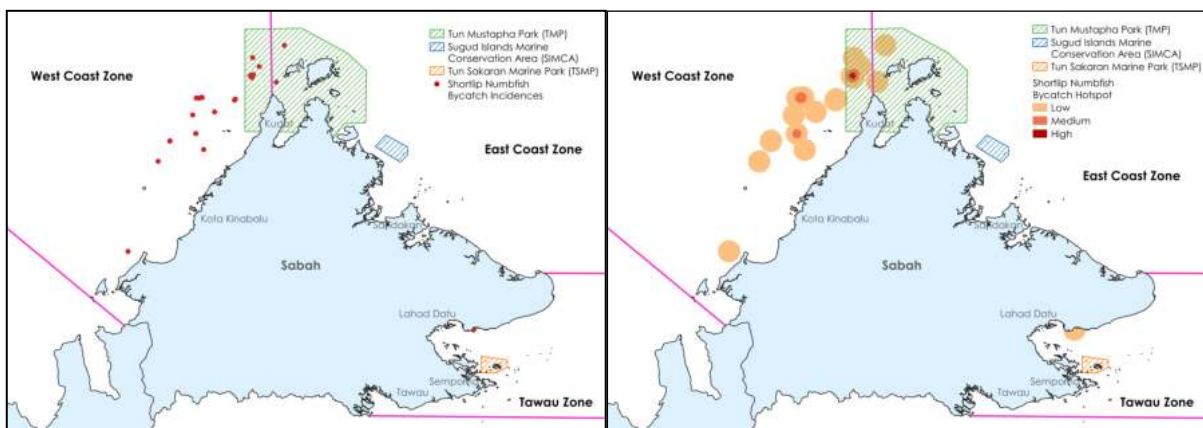


Figure 25. Locations of Jenkins' Whipray bycatch across Sabah state. Panel breakdown as per Figure 13.

3.3.3.14 Shortlip Numbfish (*Narcine brevilabiata*)

A total of 34 Shortlip Numbfish were caught, with most captured by trawlers from Kota Kinabalu along the west coast of Sabah (**Figure 26**). The Shortlip Numbfish is listed as Vulnerable on the IUCN Red List.



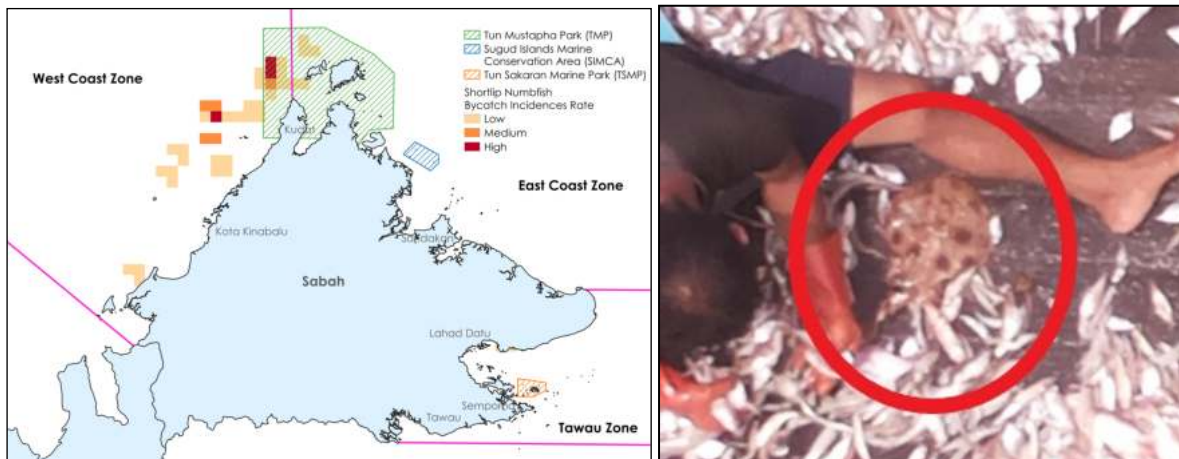


Figure 26. Locations of Shortlip Numbfish bycatch across Sabah state. Panel breakdown as per Figure 13.

3.3.3.15 Bottlenose Wedgefish (*Rhynchobatus australiae*)

A total of 33 Bottlenose Wedgefish were caught across Sabah, with most captured near the eastern region of TMP (**Figure 27**). Of the 33 individuals, 12 were caught inside TMP, accounting for 36.4% of the total number of Bottlenose Wedgefish captured in Sabah. The Bottlenose Wedgefish is listed as Critically Endangered on the IUCN Red List. Most of the captured individuals were juveniles, indicating that this area could serve as a potential pupping or nursery ground for them.

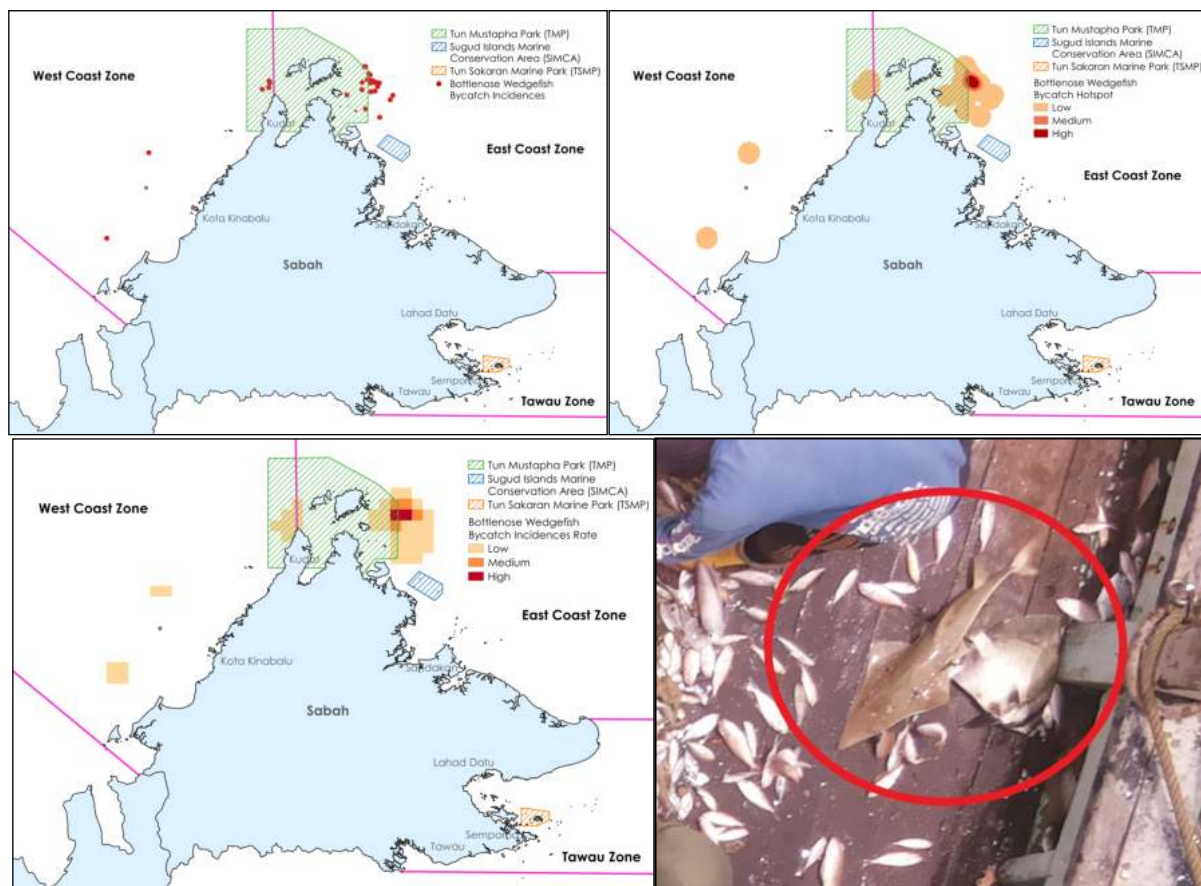


Figure 27. Locations of Bottlenose Wedgefish bycatch across Sabah state. Panel breakdown as per Figure 13.

3.3.4 Hotspot Areas for other Marine Megafauna

3.3.4.1 Turtle (*Chelonia mydas* and *Lepidochelys olivacea*)

A total of 43 individuals from two species of turtles were caught across Sabah, with no obvious hotspot areas identified (**Figure 28**). However, East TMP exhibited a slightly higher rate of turtle bycatch compared to other areas. The Green Turtle (*Chelonia mydas*) is listed as Endangered on the IUCN Red List, while the Olive Ridley Turtle (*Lepidochelys olivacea*) is listed as Vulnerable.

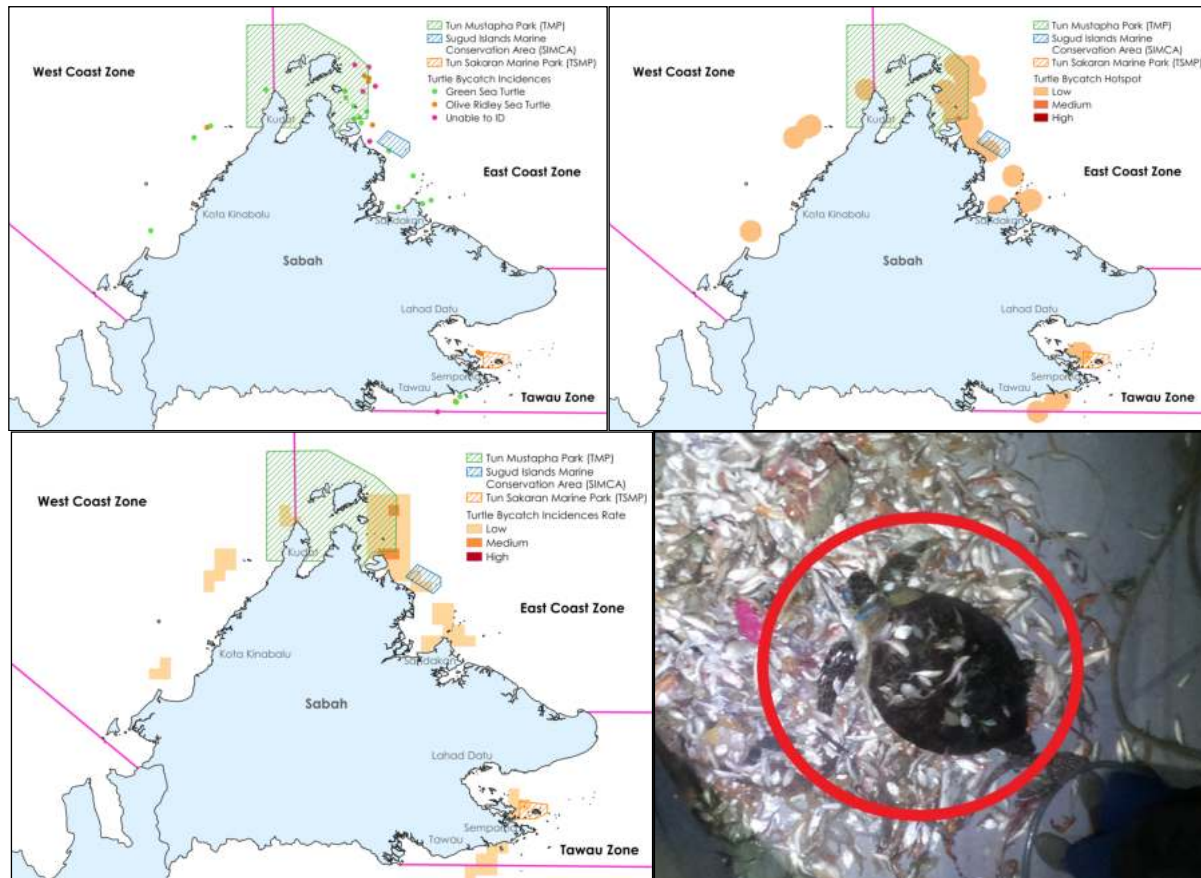


Figure 28. Locations of turtle bycatch across the state.

3.3.5 Monthly Comparison of Bycatch Incidences for Critically Endangered Species

3.3.5.1 Hammerhead Shark (*Sphyrna mokarran* and *Sphyrna lewini*)

Figure 29 presents a monthly comparison of hammerhead shark capture events between September 2020 and August 2022. Interestingly, most hammerhead sharks caught between December and April were captured by trawlers from the east coast of Sabah (Tawau and Lahad Datu). From May to October, hammerhead sharks were caught in nearly the same area by trawlers from Sandakan, which is close to TMP. September recorded the highest number of bycatch incidences in this area.

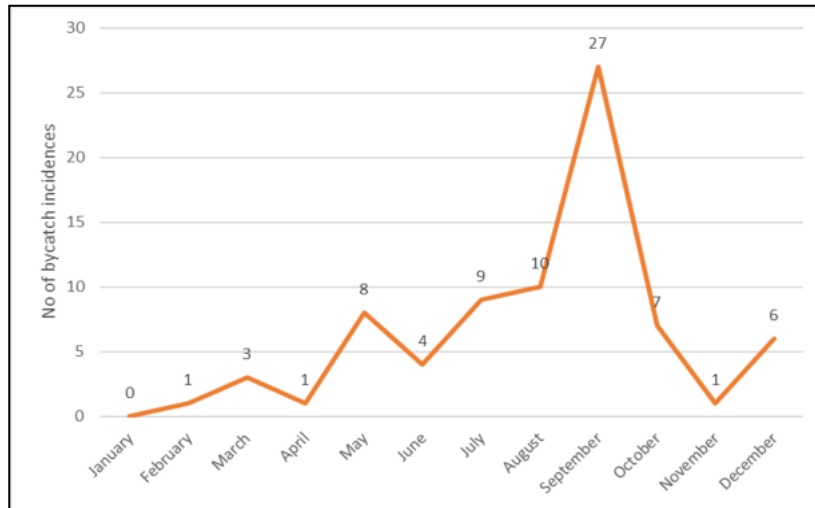


Figure 29. Monthly comparison of hammerhead shark bycatch incidences.

3.3.5.2 Bottlenose Wedgefish (*Rhynchobatus australiae*)

Figure 30 shows the monthly comparison of bottlenose wedgefish capture events. Between November and February, there were no record of bottlenose wedgefish bycatch. Similar to the hammerhead shark, September recorded the highest number of bycatch incidences.

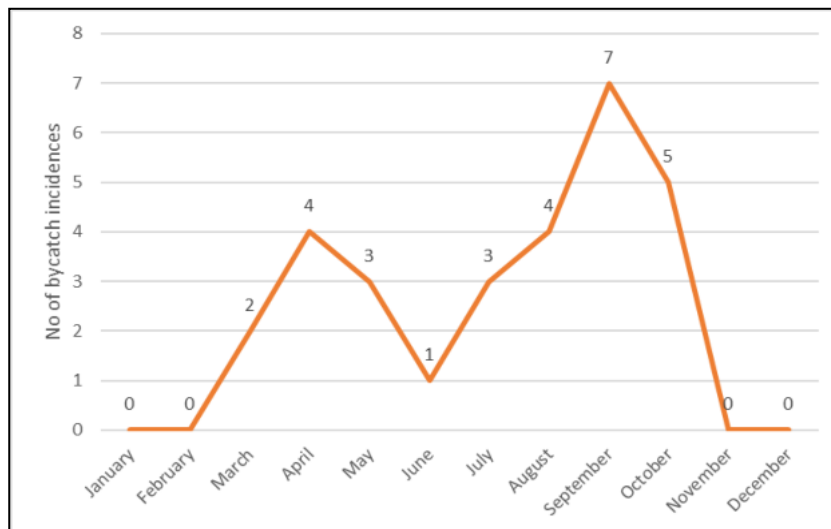


Figure 30. Monthly comparison of bottlenose wedgefish bycatch incidences.

3.3.6 Priority Area for Conservation of Critically Endangered Species

3.3.6.1 Hammerhead Shark (*Sphyrna mokarran* and *Sphyrna lewini*)

Figure 31 shows the priority area for conserving hammerhead sharks, while **Figure 32** provides a higher resolution view, focusing on the areas with high overlap values. The total size of the priority area is 200 km², located between 7.2°N, 117.61°E in the northeast and 7.03°N, 117.52°E in the southwest. This priority area has shifted slightly to the south compared to the analysis in the previous annual report.

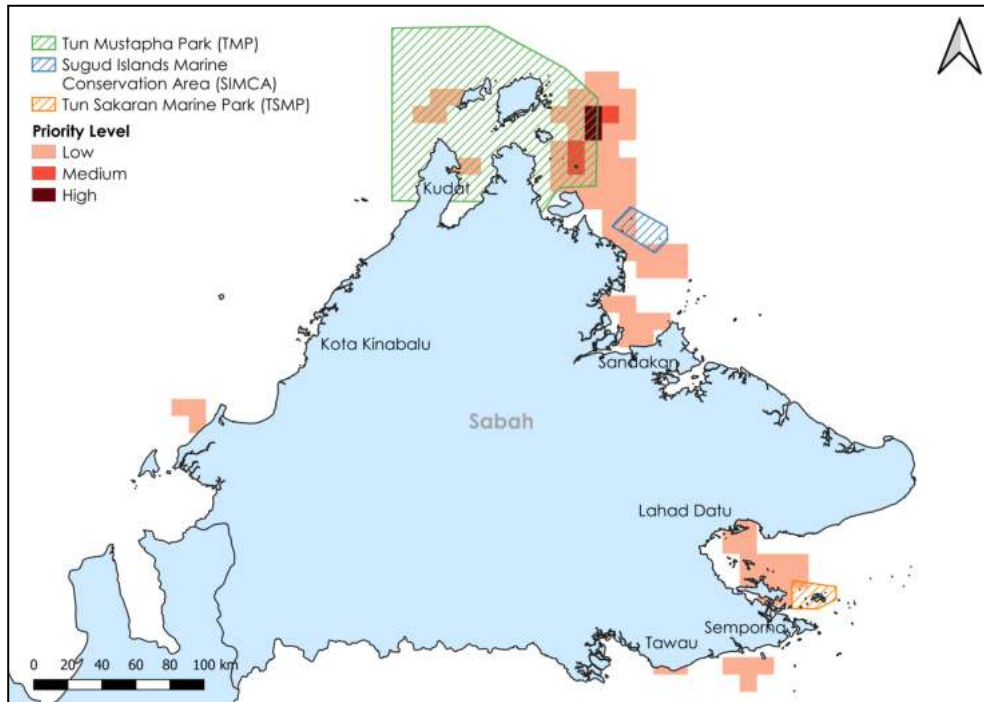


Figure 31. Priority area for conservation of Hammerhead Shark.

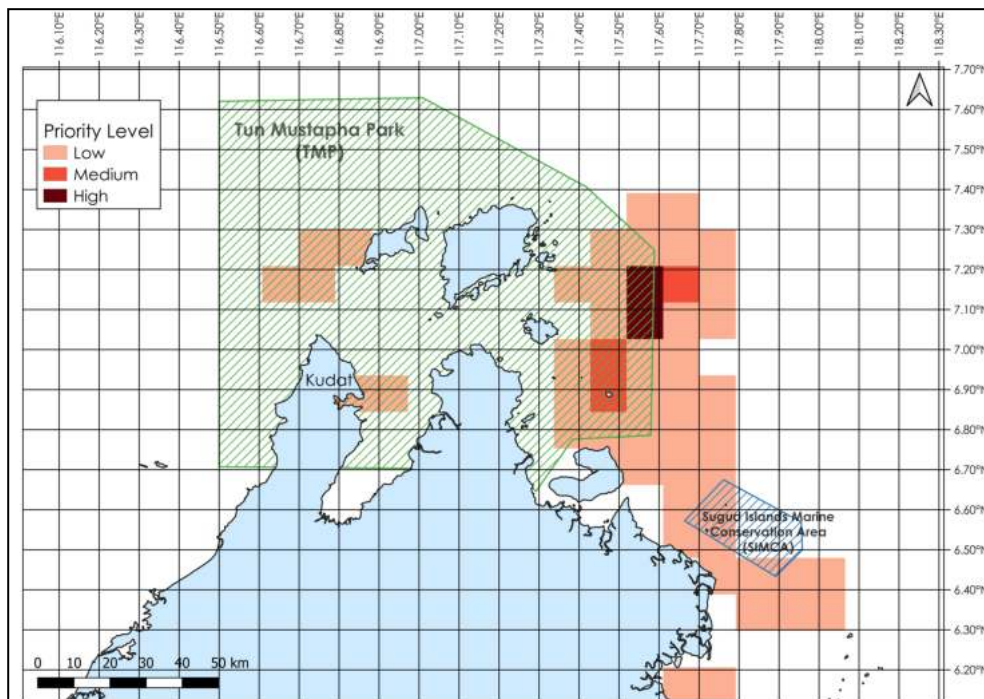


Figure 32. Priority area illustrated at a greater resolution.

3.3.6.2 Bottlenose Wedgefish (*Rhynchobatus australiae*)

Similar to the hammerhead shark, **Figure 33** depicts the priority area for conserving bottlenose wedgefish, while **Figure 34** shows this area in greater resolution. The total size of the priority area is 200 km². The GPS coordinates for the priority area are between 7.20°N, 117.70°E in the northeast and 7.10°N, 117.53°E in the southwest. This priority area remains the same as the one analysed in the previous annual report.

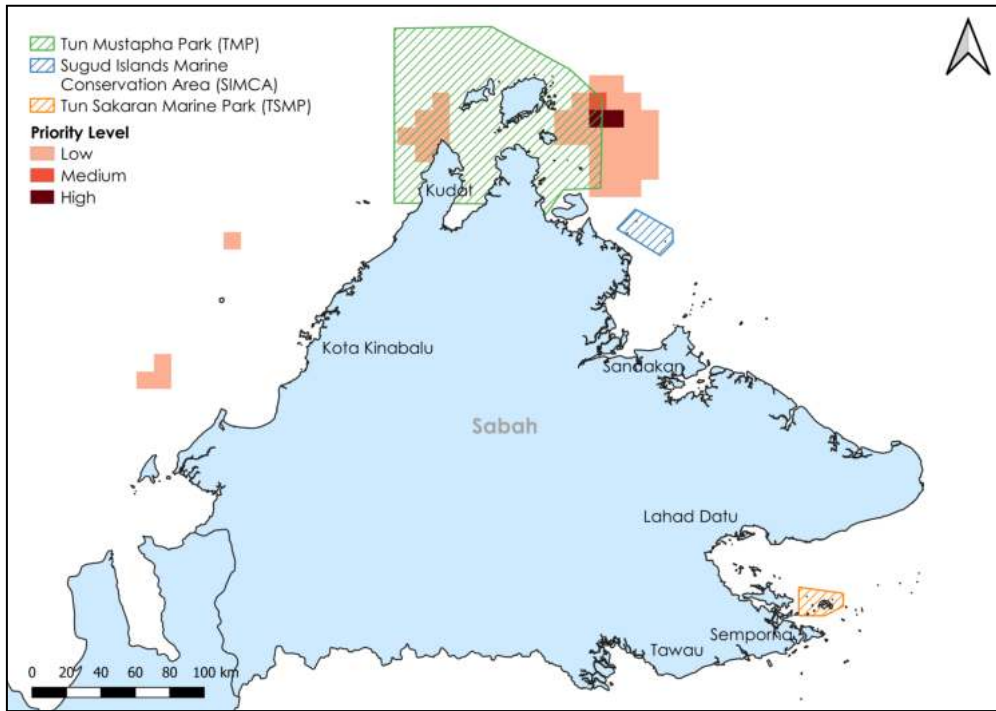


Figure 33. Priority area for conservation of Bottlenose Wedgefish.

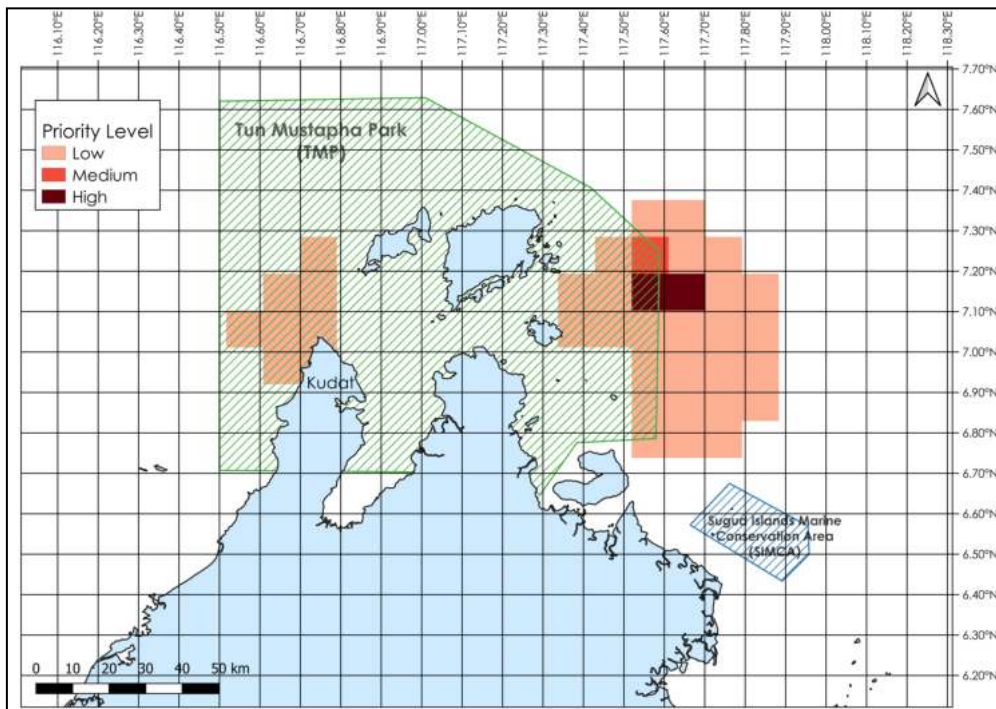


Figure 34. Priority area illustrated at a greater resolution.

4.0 FOLLOW-UP ON MITIGATING ELASMOBRANCH BYCATCH

Based on our latest analysis, the key area for conserving endangered elasmobranch species in Sabah, particularly the hammerhead shark and bottlenose wedgefish, remains nearly the same as in results in previous annual reports. To address the issue of elasmobranch bycatch in Sabah, a time-area closure for the key area was approved by the Department of Fisheries Sabah

(DOFS) in May 2024 as part of the mitigation measures. In addition, DOFS readjusted the fishing zones for Sabah's trawlers, resulting in the prohibition of trawlers from Sandakan operating within the TMP.

The approved area for the time-area closure is shown in **Figure 35**, with a total size of approximately 384 km². The GPS coordinates of the priority area are between 7.3°N, 117.63°E in the northeast and 7.12°N, 117.45°E in the southwest. Based on our latest results, the key conservation area for both species remains nearly the same but has shifted slightly to the south, as shown in **Figure 36**.

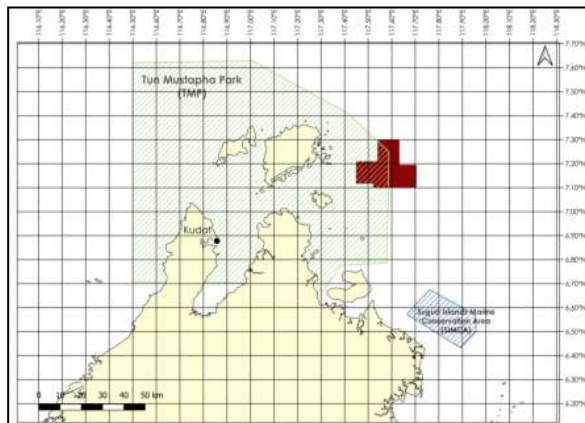


Figure 35. Key area to implement time-area closure between May and October.

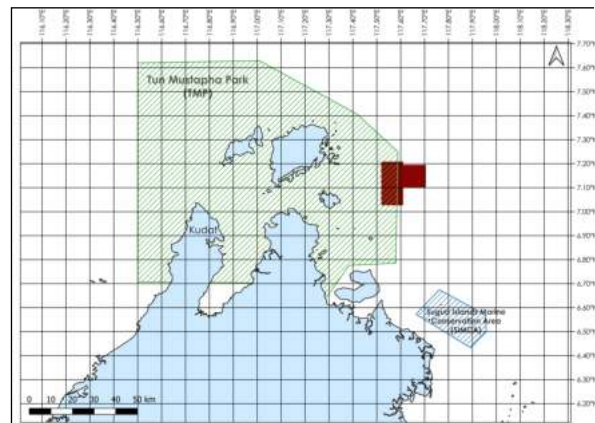


Figure 36. Updated key conservation area for the hammerhead shark and bottlenose wedgefish.

By protecting this hotspot area from fishing activities, many elasmobranch species, particularly the Scalloped Hammerhead Shark and Bottlenose Wedgefish, can be conserved without compromising the fishing operations of commercial vessels, which can still operate in other fishing areas. However, effective implementation of these measures requires stringent enforcement and regular monitoring of trawl operations within this area.

In addition to the time-area closure, this key area is also recognized as one of the Important Shark and Ray Areas (ISRAs), specifically named East Tun Mustapha ISRA (**Figure 37**). This area is significant for the conservation of the Scalloped Hammerhead Shark and Bottlenose Wedgefish. ISRAs are critical habitats for one or more shark species that are delineated for potential conservation management. The identification of ISRAs follows a science-based process that utilizes specific criteria supported by the best available evidence. Additionally, another area in Sabah, recognized as Beluran ISRA (**Figure 38**), is important for the Indonesian Sharpnose Ray, as a high number of these rays have been caught in this region.

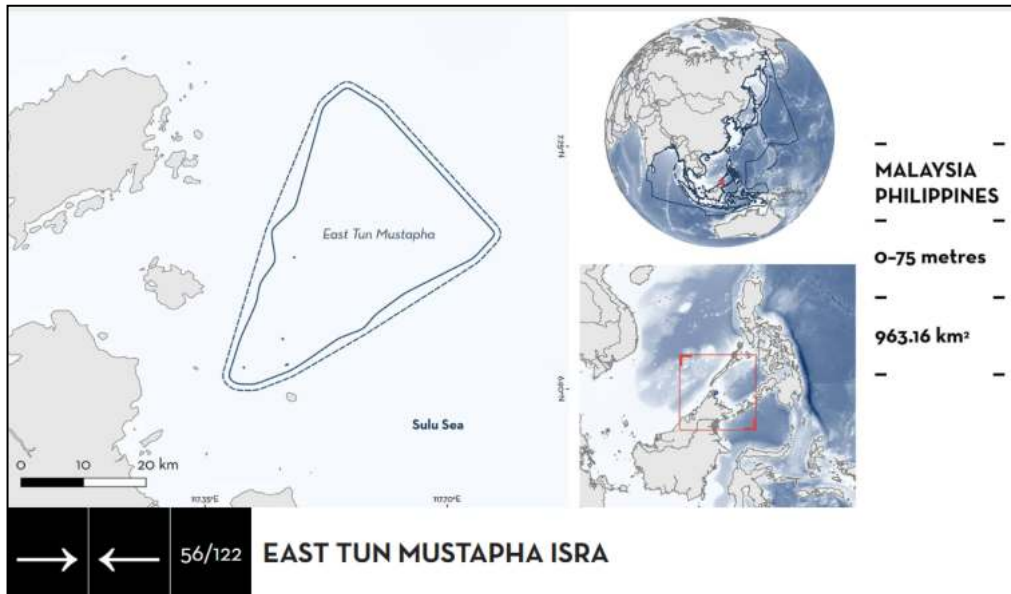


Figure 37. East Tun Mustapha ISRA.

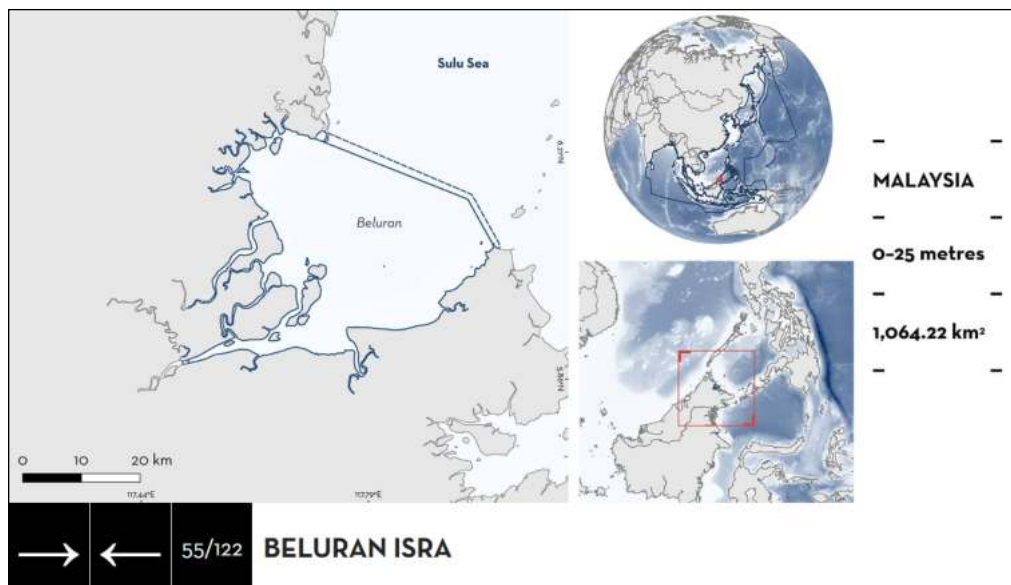


Figure 38. Beluran ISRA.

5.0 CONCLUSION

Between March 2020 and August 2022, there were 7,396 incidents of bycatch involving sharks, rays, wedgefish, and turtles, equating to 211 captures per vessel over 30 months, or approximately 7 captures per vessel per month. According to official statistics from the Department of Fisheries Malaysia in 2020, there were 1,515 trawl vessels operating in Sabah, which leads to an estimated total of 127,260 elasmobranch bycatch events per year. This estimate does not include landings from other fishing gear, such as gillnets and purse seine vessels. The landing rate of elasmobranchs should raise concerns among authorities due to their slow growth, late maturity, and low fecundity.

To prevent a drastic decline in the elasmobranch population in Sabah, effective fisheries management strategies need to be implemented and monitored regularly, as bycatch represents one of the greatest threats to these species in the region.