

2025

ANNUAL REPORT

CHAKAR HUTAN PROJECT SITE
JANUARY - DECEMBER



PULIHARA



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ACKNOWLEDGEMENTS

The year 2025 has been a remarkably productive one for our team, not only in advancing sea turtle conservation efforts but also in strengthening our outreach and engagement programmes across schools, universities, and local communities. From the shoreline to the classroom, our work has continued to grow in both depth and reach.

Our team remains deeply grateful for the unwavering support behind our conservation efforts at Pantai Chakar Hutan. Our sincere appreciation goes to the Department of Fisheries, Terengganu (DOF), for their steadfast partnership and guidance, and to the Kemaman Municipal Council for their continuous support in enabling our beach outreach programmes.

A special shout-out goes to the CIMB Foundation, Yayasan Sime Darby and SEE Turtles for believing in us and funding this project, turning our vision into a reality. We truly appreciate your trust and commitment.

We are incredibly grateful to all our collaborators, including Turtle Conservation Society of Malaysia, Fuze Ecoteer, Perhentian Turtle Project, Inwater Research Group, TeamRakyat, Geng Plastik Ija, Universiti Malaysia Terengganu, ecoCare-MNS, Turtle Conservation and Information Centre, FRI Rantau Abang and Persatuan Khazanah Rakyat Ma'Daerah. Our sincere thanks also go to the licensed egg collectors who handled the turtle eggs with such care, ensuring they safely reached the hatchery.

The achievements reflected in this report are the result of the unwavering dedication and hard work of an incredible team: Wan Zuriana, Muhammad Mustaqim, Nusrat Adawiyah, Nurul Syahida, Wan Muhammad Aiman, Amira Hasanah, Azhar Muda, Hamezei Abdullah and the DoF Rangers. We also extend our heartfelt appreciation to our interns this season – Lim Hao Ren, Danish Daniel, Syaza Iman, Suhaida, Lista, and Maisarah whose passion and dedication have brought invaluable strength to our mission.

We are equally thankful to our local community volunteers especially *Kelas Penyu* facilitators, for their steadfast presence and generous spirit throughout the season. Their unwavering commitment has been the heart of our work, and we truly could not have achieved this without them.

We extend our deepest appreciation to our Chief Executive Officer, Rahayu Zulkifli, for her steady leadership and constant guidance, and to our Accounts and Administrative Coordinator, Mary Lowe, whose unwavering support from the KL office ensured seamless continuity behind the scenes. Their trust and commitment to the team on the ground have been instrumental to our progress. We also wish to recognise our team members from the Tanjong Jara and Lang Tengah project sites who readily stepped in whenever additional hands were needed – a true reflection of teamwork and shared purpose across all sites.

Last but certainly not least, we hold deep appreciation for the families of our team members. Their patience, quiet strength, and constant encouragement have been the wind beneath our wings, making long nights and time spent away from home possible. Though often behind the scenes, their support is the steady anchor that keeps this work grounded and moving forward.

As this report turns the page on the year past, it does so with the understanding that conservation is a marathon, not a sprint. The journey is often carried out away from the spotlight, shaped by shifting tides and unforeseen challenges. Yet it is through steadfast commitment season after season that small steps become lasting footprints. 2025 has been a great season for us, and we are so ready to weather whatever comes to continue safeguarding the species and shores.

Terima kasih, semua.



INTRODUCTION

Pantai Chakar Hutuan: Protecting Turtles, Inspiring People

The beach, a 1.4-kilometer stretch in Kerteh, Terengganu, is one of the mainland's most important nesting sites for green sea turtles, consistently recording up to 300 nests each year. Since 2022, our team at PULIHARA has been leading conservation efforts here in close collaboration with the Department of Fisheries Terengganu, working not only to protect the turtles but also to build awareness among visitors, local communities, and schoolchildren about the importance of sea turtle conservation.

In March 2025, we established a hatchery at Chakar Hutuan to safeguard nests laid on the beach and eggs sourced from licensed collectors at nearby beaches. Alongside DoF Rangers, our team conducted regular patrols, monitoring nesting populations and collecting biometric data to better understand the health and trends of the turtle population. Collaborations with universities and other organisations further strengthened our knowledge of sea turtle ecology and conservation strategies.

2025 also marks our third year of operations at the beach, our conservation work has gone beyond the beach. We expanded outreach programs for schools, local communities, and the wider public. Through educational activities and community engagement, we continue to promote sea turtle conservation while developing Pantai Chakar Hutan into a sustainable edu-tourism destination that benefits both turtles and the local community. With Chakar Hutan growing in popularity as a weekend retreat, more people are witnessing our work firsthand, building a community of conservation advocates.

Looking ahead, this beach remains a vibrant hub for conservation and public education. Each patrol, school visit, and hatchling release reflects the dedication, collaboration, and hope that drive our mission forward.



The view of PULIHARA Visitor's Hut, hatchery and signboard at Pantai Chakar Hutan

OBJECTIVES

The objectives of our conservation efforts are to:

1. Carry out ongoing conservation efforts and long-term monitoring to better understand and conserve the nesting and in-water sea turtle populations.
2. Educate and raise awareness among local communities, tourism operator and tourists through educational outreach programs as well as engagements in research and conservation efforts.
3. Support local community and empower local housewives from B40 group to generate income through sustainable turtle-based ecotourism.
4. Create awareness, build capacity and engage with the children and young generations in turtle conservation and research.



The project covers five components:

1. Turtle conservation
2. Nesting beach protection
3. Low impact turtle eco tourism
4. Educational outreach
5. Local communities empowerment

All the above components benefit **three** broad target groups:



**LOCAL
COMMUNITIES &
SCHOOL CHILDREN**



**TURTLE POPULATIONS
& NESTING HABITATS**



**LOCAL HOUSEWIVES &
B40 GROUP**



SUSTAINABLE DEVELOPMENT GOALS (SDG)

We are pleased to report that the project also contributes towards the following United Nation Sustainable Development Goals:



OUR TEAM



Wan Zuriana Wan Sulaiman
Project Manager



Muhammad Mustaqim
Marine Officer



Nusrat Adawiyyah Nasarudin
Liaison Officer



Nurul Syahida
Field Assistant



Wan Muhammad Aiman
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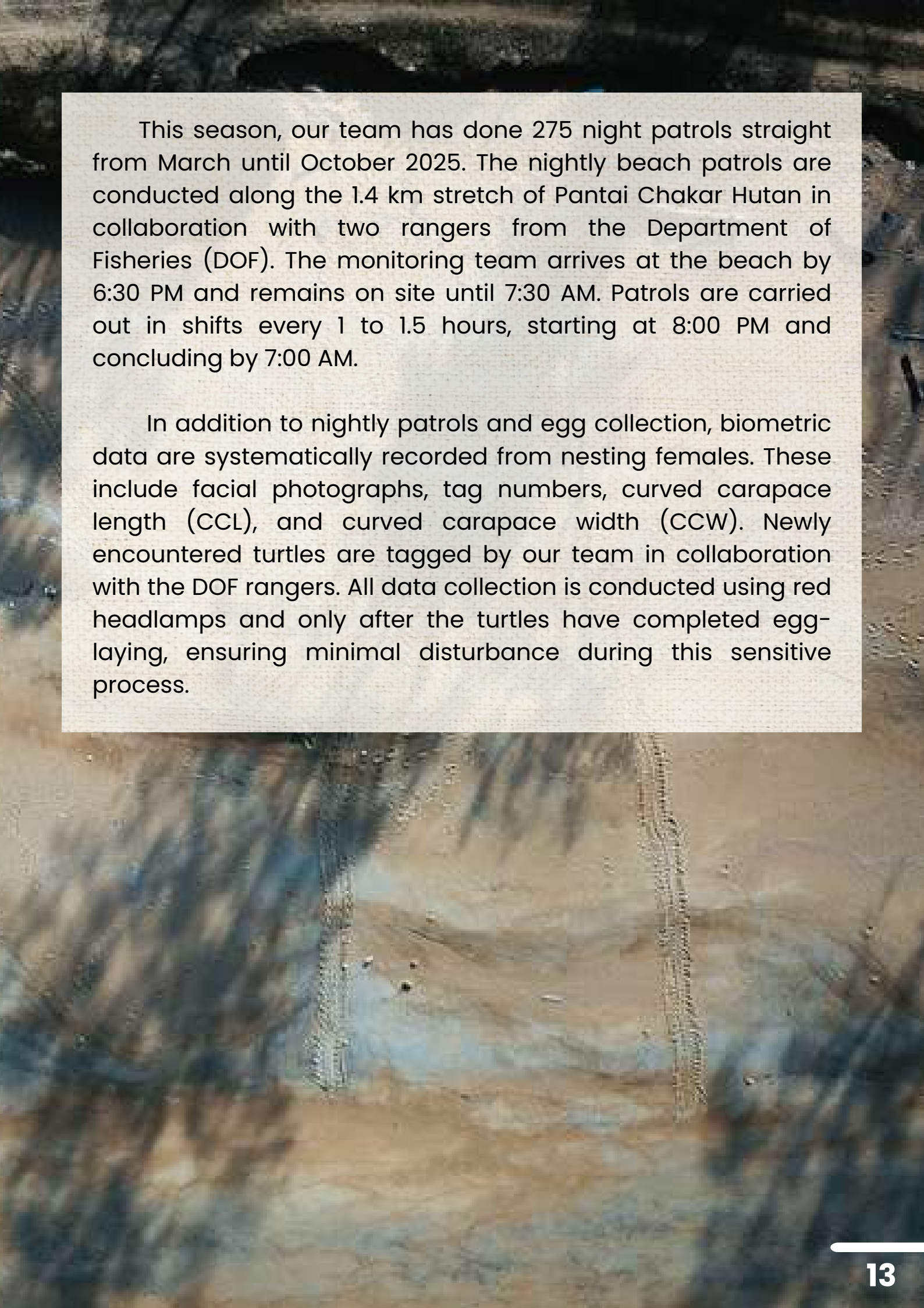
Lista Ilay Anak Usit
Universiti Malaysia
Sarawak

Maizatulfarizsya
Universiti Malaysia
Terengganu



An aerial photograph of a tropical coastline. In the foreground, a wide, sandy beach curves along a calm, turquoise sea. The beach is bordered by a dense, lush green forest that extends up a large, rounded mountain in the background. The sky is a pale, hazy blue. The text 'SEA TURTLE NESTING MONITORING' is overlaid in large, white, bold, sans-serif capital letters across the center of the image.

SEA TURTLE NESTING MONITORING

The background of the page is a photograph of a beach. In the foreground, there is a sandy area with some small debris. In the middle ground, there are several palm trees and other tropical vegetation. The background is slightly blurred, focusing attention on the text. A white rectangular text box is overlaid on the upper half of the image.

This season, our team has done 275 night patrols straight from March until October 2025. The nightly beach patrols are conducted along the 1.4 km stretch of Pantai Chakar Hutan in collaboration with two rangers from the Department of Fisheries (DOF). The monitoring team arrives at the beach by 6:30 PM and remains on site until 7:30 AM. Patrols are carried out in shifts every 1 to 1.5 hours, starting at 8:00 PM and concluding by 7:00 AM.

In addition to nightly patrols and egg collection, biometric data are systematically recorded from nesting females. These include facial photographs, tag numbers, curved carapace length (CCL), and curved carapace width (CCW). Newly encountered turtles are tagged by our team in collaboration with the DOF rangers. All data collection is conducted using red headlamps and only after the turtles have completed egg-laying, ensuring minimal disturbance during this sensitive process.

To supplement the tagging method, a photo-identification technique is used. This involves photographing the facial scute patterns on both the left and right sides of each turtle's face. Identification is performed through manual visual comparison by differentiating facial scale patterns, following the methodology described by Long & Azmi (2017). These two methods are complementary; in the event of tag loss, individuals can still be identified through photo-identification.

Upon completion of egg-laying, the eggs are carefully retrieved from the egg chamber. Once collected, the eggs will be relocated to our hatchery as soon as possible to ensure optimal incubation conditions and to increase hatching success. Our team will wait until the mother finishes her nesting process and returns to the ocean, to make sure the safety of the mother at the beach.

Due to ongoing beach erosion, certain sections of the shoreline have become steep and uneven, while other areas have widened as a result of sand deposition. These changing beach profiles influence nesting behaviour. To better understand this, our team records the high tide line and the precise nesting locations of each female. This allows us to identify patterns and preferences in nest site selection.

Typically, females choose to nest above the high tide line. However, when they encounter steep banks or unsuitable terrain, they may turn back to the sea. Such events are documented as false crawls or attempted to nest indicating an attempted but unsuccessful nesting.



Retrieving turtle eggs from the egg chamber, after the mother has laid the eggs.



Relocating sea turtle eggs into our hatchery right after retrieving the eggs from nest.



NESTING DATA

In 2025, a total of 78,071 eggs from 872 nests of two species, green turtles and painted terrapins, were saved from March to October of this year. A total of 67,678 green turtle eggs from 752 nests were recorded at Pantai Chakar Hutan, the **highest nesting number** recorded in the past three years. Additionally, 10,393 eggs from 120 nests of green turtles and painted terrapins were received from other beaches, including Kerteh, Kijal, Penarik, Tanjung Batu, and Teluk Batu.

Six painted terrapin nests containing a total of 76 eggs were successfully incubated in our hatchery, which were from Pantai Kerteh, where the nesting area is monitored by a licensed egg collector. Most of the nests were received from Pantai Kerteh and Pantai Kijal, in total of 39 and 38 nests, respectively.

Month	No. of nest laid at Pantai Chakar Hutan	No. of nest received from tendered beaches	Total of eggs
March	4	3	583
April	49	16	5,736
May	131	20	13,251
June	203	44	21,876
July	245	27	24,517
August	99	10	10,005
September	17	-	1,746
October	4	-	357
TOTAL	752	120	78,071

Table 1 - The number of nests laid at Pantai Chakar Hutan and the number of nests received from tender holders throughout the season, including green turtles and painted terrapins.

In Terengganu, the egg buy-back system serves as a conservation mechanism that allows licensed collectors, also known as tender holders, to legally collect sea turtle eggs from their tendered beaches and subsequently sell them to conservation organizations. This system was established to ensure that as many eggs as possible are diverted away from commercial or black markets and protected for incubation.

This is to support the Terengganu Turtle Enactment 1951 (amendment 2021) by prohibiting the sale of all species of turtle eggs. By purchasing these eggs directly, conservation NGOs are able to prevent them from entering the trade, maximise the number of eggs saved, and increase the chances of successful hatchling production. Through this collaborative approach, the system supports local livelihoods while simultaneously strengthening statewide sea turtle conservation efforts.

Beach Location	Total of nest
Kerteh	39
Kijal	38
Penarik	13
Tanjung Batu	13
Teluk Batu	17

Table 2 – The number of nests received from tendered beaches collected by licensed egg collectors.

HATCHERY MANAGEMENT



Our hatchery this year were full. There were more than 700 nests incubated in the hatchery, compared to last year it was only 312 nests incubated.

Our team conducted nest excavation and performed the Post-Emergence Inspection (PEI) on all nests in the hatchery to determine the hatching, emergence, and predation rates of each nest. During this activity, public engagement remains an integral component of conservation strategy. Thus, visitors are encouraged to take part in our hatchery tour program and participate in selected conservation activities. These sessions not only help visitors to learn about the fascinating biology of sea turtles but also provide opportunities for the members of the public for meaningful, hands-on involvement in sea turtle conservation works.

During the PEI sessions, participants observed the excavation of nest contents and assisted in the release of hatchlings, including stragglers discovered during excavation. These activities offer valuable insights into early-life survival and help the participants to understand sea turtle conservation efforts better.

A total of 67,576 hatchlings were successfully released into the ocean from Pantai Chakar Hutan during the 2025 nesting season, consisting of 67,539 green sea turtle hatchlings and 37 painted terrapin hatchlings.

Hatching and emergence success rate were calculated by counting the number of empty eggshells, unhatched eggs, live and dead hatchlings, and depredated eggs in each nest. For green turtles, the average hatching success recorded in 2025 was 87.04% (SD = 15.19), with an average emergence success of 83.61% (SD = 15.85). For painted terrapins, the six nests incubated in 2025 had an average hatching success of 56.57% (SD = 44.73) and an average emergence success of 46.57% (SD = 36.67).



Nest excavation session with participants inside the hatchery, conducted to assess hatching success and collect post-emergence data.



Predation rates averaged 37.07% (SD = 49.02), reflecting substantial variation among nests. Predation rate was assessed by recording eggs depredated by crabs, ants, termites, monitor lizards, maggots, and fungal infection in each nest. We observed that some of the nests in our hatchery were infested with maggots and fungus. In order to minimize fungal infection, turmeric and neem extracts were applied onto the sand and in the nest during the relocation process and upon PEI in our hatchery.

As for painted terrapin nests, we only received six nests in total, of which two recorded a predation rate of 100% due to predation by maggots and fungus. Our findings revealed that development halted at the third stage, but the nest later became infested with fungus because the team mistakenly used the previous plot that had been used to incubate the previous nest.

Usually, we will not use the same plot to incubate the nest because the sand may not recover from the fungal infection. (Chai et al., 2023). Thus, low oxygen contents in the nest, caused by competition between the fungus and the eggs, may reduce hatching success (Bézy et al., 2014).

DISTRIBUTION BY SECTION

In order for effective coordination among the patrolling team, the 1.4 km beach is divided into 28 sections, each measuring 50 meters in length. This segmentation facilitates the identification of nesting density and preferred nesting locations, thereby enabling more accurate and efficient monitoring.

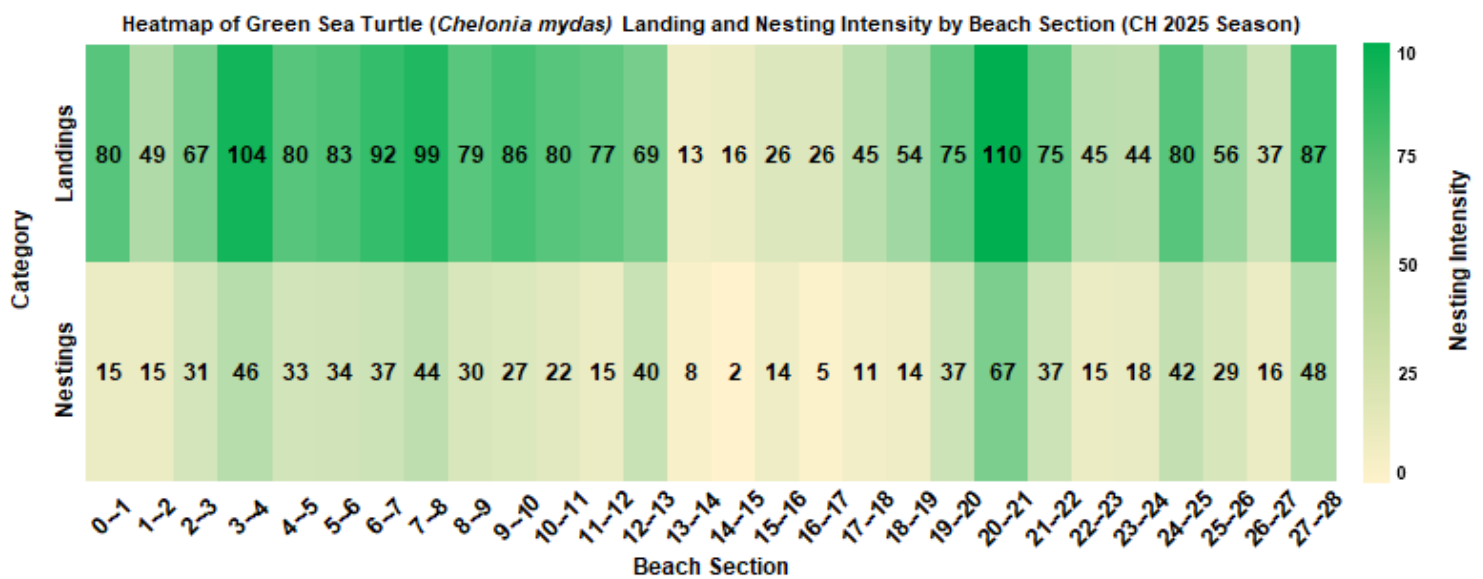
Additionally, it helps reduce bias and ensures consistent data collection across patrol teams. Understanding the distribution of nests along the beach also provides valuable information for potential conservation management. For example, it can help detect shifts in nesting preferences that might be influenced by climate patterns or changes in beach morphology.



In 2025, an analysis of the nesting distribution showed that Sections 20–21, 27–28, and 3–4 recorded the highest nesting densities, with 67, 48, and 46 nests, respectively. These areas seem to be preferred by nesting females, likely due to more favorable beach conditions, such as an optimal distance between the vegetation and the high tide line, and a gentle slope during the May–August peak season. These features make the sections more accessible for nesting females. In contrast, sections affected by beach erosion had steeper profiles, making it harder for turtles to reach suitable nesting areas, which resulted in lower nesting activity.



Conversely, Sections 14–15, 16–17, and 13–14, which are located near the visitor hut and commonly used as picnic areas during the daytime, exhibited the lowest levels of nesting activity. This reduced nesting frequency is likely influenced by the beach profile, which is the high slope in these sections that makes it more difficult for females to climb to suitable nesting sites.



A heatmap illustrating the distribution of green sea turtle landings and nesting across each section along Pantai Chakar Hutan for the 2025 nesting season. Darker shades indicate sections with higher turtle activity (hotspots), while lighter shades represent areas with less activity of the female turtles.



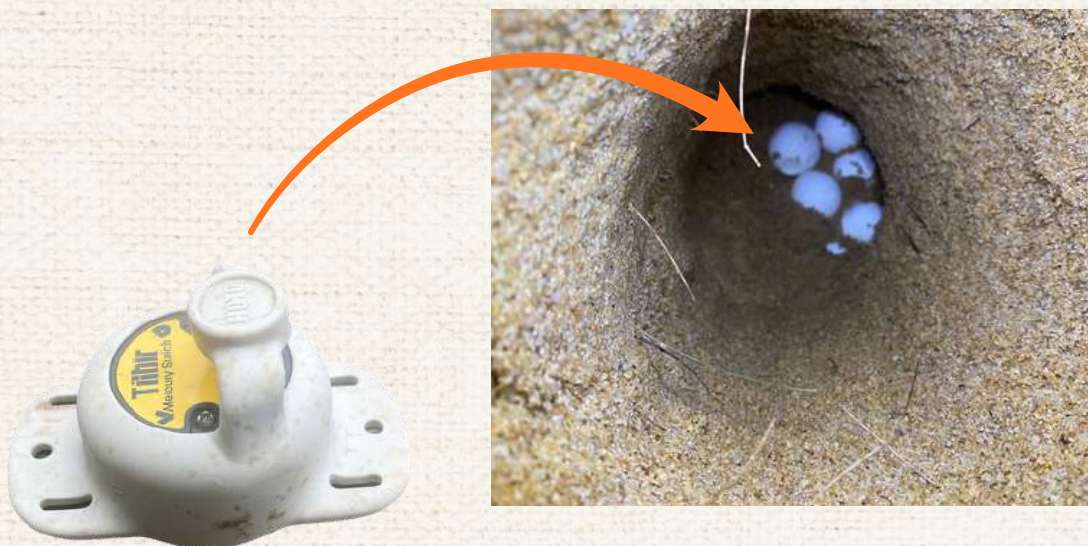
Section	Nest Frequency	Remarks
0-4	Low	The distance between the high tide line and the vegetation is quite far. There is a lowered beach Casuarina tree, which is the main hotspot for turtles to lay their eggs. Far from light pollution.
4-13,	Medium	An open sandy area that had a wide distance between the high tide line and vegetation. Directly exposed to the sunlight during the day.
22-26	Low	
13-15	Low	Got wavebreaker at section 14-15 with a length of approximately 50 metres from the shoreline. A slightly shaded area of vegetation that consists of the Merambong tree and the beach Casuarina tree along the beaches. A sand dune area.
15-19	High	An area of short distance between the high tide line and vegetation. A slightly shaded area of vegetation that consists of the Merambong tree and the beach Casuarina tree along the beaches. A sand dune area.
20-22	High	An open area located in front of the Petronas Oil & Gas Terminal (OGT) in Deer Park. Slightly exposed to light due to fire from OGT. An open sandy area which easily exposed during the day.
26-28	Medium	The nearest sections to the OGT and closest to the hill. The area is quite dark because the vegetation is primarily covered by sea pandan trees.

Table 3 – The possible reasons based on the beach profile in each section during the peak season of nesting season (May – July)

SEX RATIO ANALYSIS

The sex of sea turtle hatchlings is determined by the temperature of the surrounding sand during the incubation period, a process known as Temperature-Dependent Sex Determination (TSD). Howard, Bell, and Pike (2014) reported that for sea turtles, warmer incubation temperatures (generally above 31.0°C) tend to produce predominantly female hatchlings. In contrast, cooler temperatures (below 28.0°C) tend to result in a higher proportion of males.

The small range between those temperatures is called the pivotal temperature (28.0°C – 31.0°C) will produce an equally balanced gender ratio with 1:1 of males to females. (Howard et. al, 2014). However, previous studies have suggested that the pivotal temperature for Malaysian green turtles is 29.1°C (Chan & Liew, 1995; Reboul et al., 2021; van de Merwe et al., 2005).



HOBO MX TidbiT 400, a data logger device used to measure the temperature inside the nest.

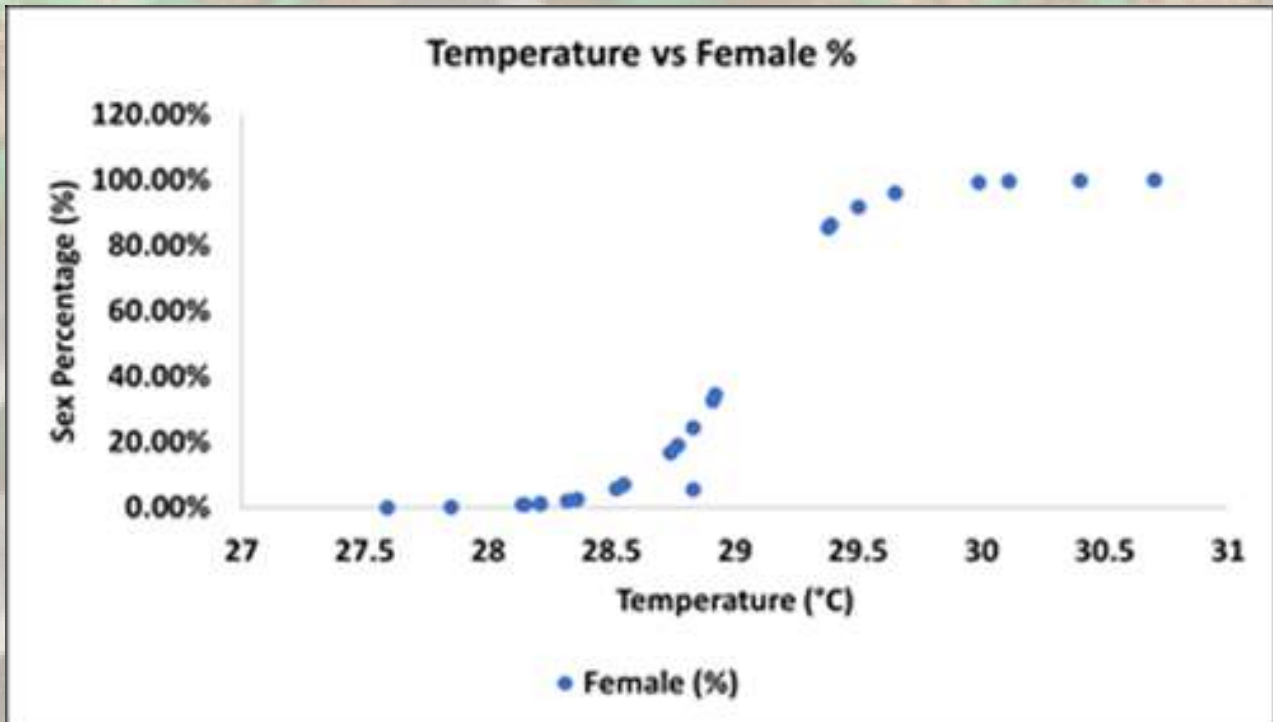


To assess the hatchling sex ratio, temperature data loggers (HOBO MX Tidbit 400) were installed in 24 randomly selected nests within the hatchery. These loggers recorded real-time incubation temperatures throughout the incubation period, which were later analysed to determine the male-to-female hatchling ratio. Nest temperatures retrieved from the data logger ranged from 27.59°C to 30.70°C, with an overall mean incubation temperature of 28.92°C.

The analysis revealed the following:

Eight of the 24 monitored nests produced more than 80% female hatchlings. 16 of the 24 nests produced predominantly male hatchlings (more than 50%). Overall, the sex of the green turtles was skewed toward male across 24 monitored nests.





Graph 1 above shows the relationship between temperatures and the female percentage in the monitored nest.

Graph depicts a strong relationship between incubation temperature in monitored nests and hatchling sex, where cooler nests produced mostly males and warmer nests produced mostly females. In this dataset, temperatures below about 28.5°C resulted in almost entirely male hatchlings, while temperatures above 29°C led to a sharp increase in female production. Nests incubating between 29.3°C and 30.7°C consistently produced more than 85% females, with several reaching nearly 100% females. This pattern reflects the well-known sensitivity of sea turtle sex determination to small temperature changes. (Howard et. al, 2014)



Interestingly, the nests that produced a higher proportion of males were located under shaded areas within the hatchery, where the temperature remained cooler due to reduced exposure to direct sunlight. This observation highlights the significant role that controlled environmental conditions, such as shading or natural canopy covers, can play in influencing and potentially balancing the sex ratio of hatchlings. By managing nest placement and shading with the hatchery, our team can mitigate the effects of high sand temperature, which often produces a female-biased sex ratio and promotes a more balanced population structure.



Recent global studies show that many sea turtle nesting sites are producing far more females than males, largely because rising temperatures are warming the sand. This trend poses a long-term risk because extremely female-biased populations may struggle with future breeding potential. In this context, a male-skewed season, such as the one observed in this hatchery, is not a “preference”, but it contributes positively to the global need for balanced sex ratios. Having more male hatchlings this season can support long-term population stability, especially since many other hatchlings are predominantly female.

These results highlight the potential for strategic shading management in hatchery operations. This study aligns with the findings of Howard, Bell, and Pike (2014), reinforcing that incubation temperature is the key driver of hatchling sex determination.



The photo above shows the variation of shades across our hatchery.

There were a few limitations in analysing this dataset. The most significant one is the small sample size. Out of 735 nests, only 24 nests were equipped with temperature data loggers. Because of this, the results do not fully represent the actual sex ratio of the entire hatchery. However, the data we did collect still clearly shows that temperature has a strong influence on hatchling sex. We also faced resource limitations, mainly the small amount of HOBO temperature loggers available. This sometimes caused delays, as some loggers were still buried in older nests when we needed them for new ones. In a few cases, battery failures caused complete loss of temperature records.

Nest No	Incubation date	Average Temperature ($\pm$ SD) During Temperature-Sensitive Period ($^{\circ}$ C)	Estimated Female Percentage (%)
CH1	Mar 2, 2025	28.74 $\pm$ 0.33	16.77
CH9	Apr 9, 2025	28.91 $\pm$ 0.37	32.75
CH44	Apr 28, 2025	28.32 $\pm$ 0.43	2.13
CH55	May 4, 2025	28.21 $\pm$ 0.30	1.21
CH96	May 15, 2025	28.92 $\pm$ 0.70	34.6
CH113	May 20, 2025	28.52 $\pm$ 0.48	5.84
CH168	May 30, 2025	27.59 $\pm$ 0.51	0.05
CH194	Jun 3, 2025	27.85 $\pm$ 0.30	0.19
CH229	Jun 11, 2025	28.15 $\pm$ 0.56	0.92
CH232	Jun 11, 2025	29.39 $\pm$ 0.53	86.36
CH265	Jun 16, 2025	29.38 $\pm$ 0.77	85.52
CH353	Jun 27, 2025	30.40 $\pm$ 0.51	99.92
CH369	Jun 29, 2025	29.65 $\pm$ 0.68	96.05
CH484	Jul 11, 2025	30.70 $\pm$ 0.37	99.98
CH505	Jul 16, 2025	29.99 $\pm$ 0.58	99.33
CH587	Jul 27, 2025	30.11 $\pm$ 0.60	99.63
CH644	Aug 7, 2025	29.50 $\pm$ 0.45	91.89
CH660	Aug 11, 2025	28.21 $\pm$ 0.53	1.24
CH683	Aug 17, 2025	28.36 $\pm$ 0.66	2.69
CH684	Aug 17, 2025	28.83 $\pm$ 0.59	5.62
CH700	Aug 22, 2025	28.83 $\pm$ 0.55	24.53
CH712	Aug 28, 2025	28.77 $\pm$ 0.62	19.03
52KJL	16 June 2025	28.55 $\pm$ 0.92	7.01
89KJL	16 July 2025	28.14 $\pm$ 0.56	0.87

Table 4 - Nests equipped with data loggers, showing the average temperature recorded during the incubation period together with the estimated percentage of females.

NESTING POPULATION

Female green turtles were identified using both metal flipper tags and photo identification, which relies on their unique facial scale patterns. These facial patterns are individually distinctive and remain stable over long periods (Tanangonan et al., 2025), making photo ID a reliable method for confirming identity even when physical tags are lost.

During the 2025 nesting season, a total of **162 individual** female green turtles were identified. There were 151 new individuals observed using photo ID, and 11 individual identified by tags on their flipper, while 73 of them were newly tagged for this season; the balance of the individuals recorded were unable to be tagged due to a lack of equipment, a short time during the nesting process, and bad weather conditions.

A total of 11 individuals had their old tags replaced due to poor attachment, and 10 individuals were recorded as returning mothers from previous seasons. The complementary use of photo identification alongside tagging enhances the accuracy of population monitoring and enables long-term tracking of individual turtles. This integrated approach provides critical data for assessing nesting trends and informing targeted conservation strategies.

78,071

TOTAL EGGS SAVED

67,576

TOTAL HATCHLINGS RELEASED

872

TOTAL NESTS SAVED

Based on our findings, we recorded that 75 individuals nesting at Pantai Chakar Hutan more than once. One notable observation was the return of Wiwid (CHG0001), the very first turtle tagged in 2022 and registered in our CH database, which nested three times and Juju (CHG0022F), the first turtle identified in 2023, which nested five times during the 2025 season. It is common for sea turtles to nest multiple times within a single season.

After completing their nesting season, they return to their foraging grounds, with the next nesting event occurring every 2–3 years, depending on the distance of the foraging area from their natal beach. Besides, a remarkable observation this season was the identification of Mega (CHG0280F), a turtle that nested 7 times, the highest number recorded for this season. This nesting behaviour of these individuals underscores the ongoing significance of Pantai Chakar Hutan as a safe nesting site for green turtles.

Turtle ID	Turtle Name	No. of nest for the season	Total eggs laid
CHG0280F	Mega	7	696
CHG0239F	Hilda	6	591
CHG0022F	Juju	5	457
CHG0340F	Viktwā	5	370

Table 5 – Nesting females that laid more than five clutches during the previous season, with the total number of eggs deposited.



Wiwid (CHG0001F)



Juju (CHG0022F)



Mega (CHG0280F)

STRANDING

In 2025, four cases of turtle strandings were reported near the nesting beaches, with three incidents occurring at Pantai Chakar Hutan and one at Pantai Ma Daerah. All stranded turtles were males, including two sub-adults and two adults. The condition of the carcasses varied, with three appearing freshly dead but bloated, while one was in a more decomposed state.

All four strandings occurred in the early part of the nesting season, specifically in March, suggesting that the males may have been preparing to mate during the early stages of the mating season. While the causes of death for three of the turtles remain unknown, one showed signs of being struck by a boat, as indicated by machete-like markings on its carapace. Other potential causes of mortality include disease, boat strikes, entanglement in fishing gear, plastic ingestion, or complications during nesting.

Due to a lack of official permits, post-mortem examinations (necropsies) could not be performed to determine the exact causes of death. Nevertheless, all carcasses were respectfully buried on-site, and a stranding report was completed for each case and submitted to the Department of Fisheries (DoF) for official documentation.



Team found stranded turtle at the Pantai Chakar Hutan during the night patrol.



The carcass was found at Pantai Chakar Hutan with machete-like markings on its carapace.

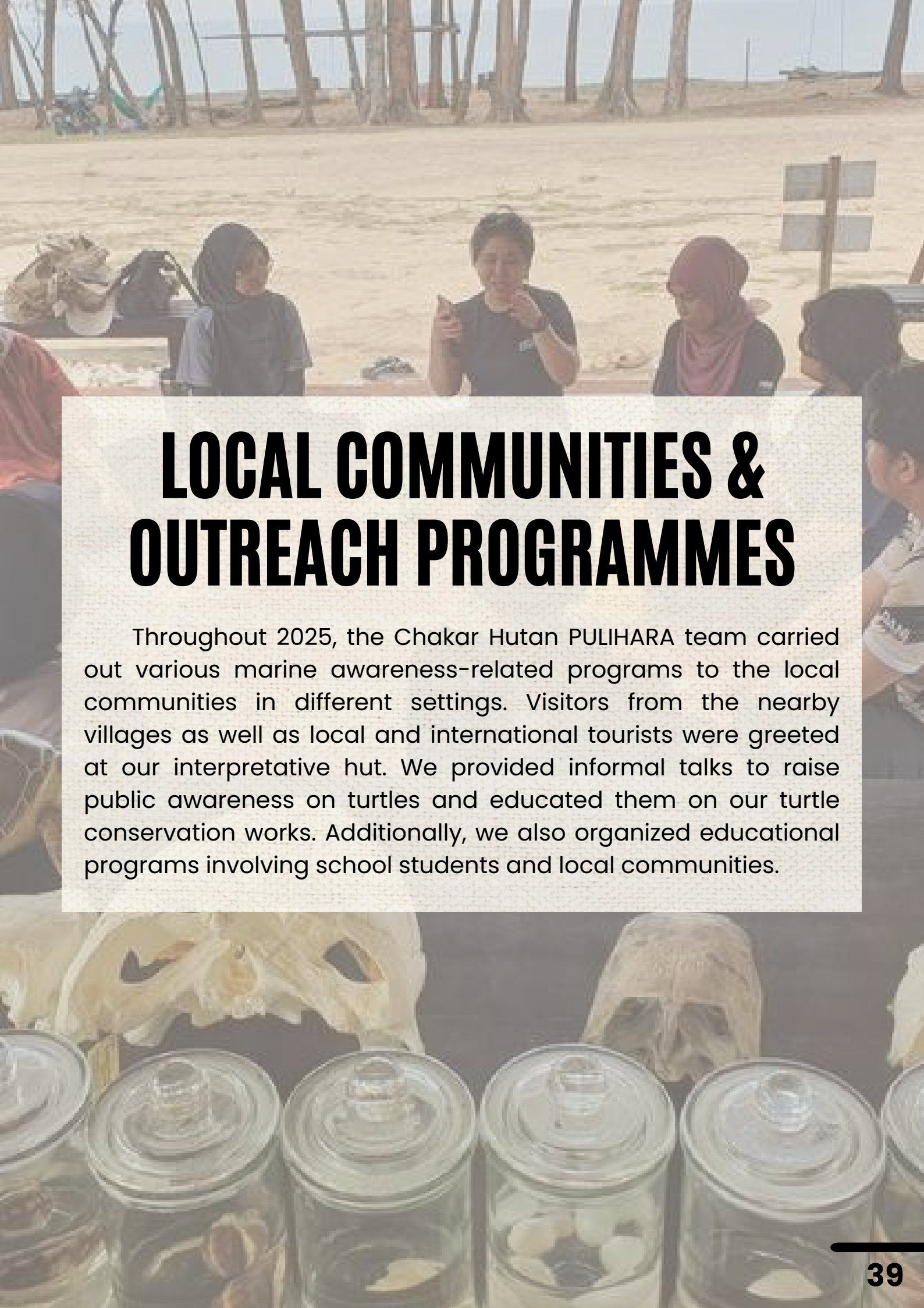
BEACH CLEAN UPS

Beach clean-up efforts were carried out from April to October 2025 at Pantai Chakar Hutan, bringing together more than 250 volunteers in a shared commitment to protect this important nesting site. Over the course of the season, a total of **595.15 kilograms** of marine debris was removed from the beach. Plastic bottles were the most commonly collected item, with a staggering 2,255 pieces recorded, followed by plastic foam and fragments (563 pieces), as well as nearly 100 items of discarded footwear. These findings highlight the persistent challenge of plastic pollution along our coastlines.

Beyond the visible waste, plastic debris poses a more insidious threat as it breaks down into microplastics over time. These particles can alter the physical properties of the sand, including increasing sand temperature. a critical factor that influences sea turtle egg incubation and hatchling sex ratios. Through these clean-up initiatives, we not only restore the beach environment but also contribute to safeguarding the delicate conditions required for successful sea turtle nesting.

Thank you to Miracle Spectrum for sponsoring the oxo-biodegradables rubbish bags and always supporting our beach clean up.





LOCAL COMMUNITIES & OUTREACH PROGRAMMES

Throughout 2025, the Chakar Hutan PULIHARA team carried out various marine awareness-related programs to the local communities in different settings. Visitors from the nearby villages as well as local and international tourists were greeted at our interpretative hut. We provided informal talks to raise public awareness on turtles and educated them on our turtle conservation works. Additionally, we also organized educational programs involving school students and local communities.



SCHOOL OUTREACH PROGRAMMES

As a part of our outreach programmes, we have organized turtle and terrapin awareness activities with **24 different schools** in Dungun and Kemaman and reached out to more than 1,500 students altogether. The primary goal of these programs is to nurture a generation of environmentally conscious, caring, and responsible youths who will take an active role in conserving the environment. We conducted all the sessions with students from various institutions by using different approaches.

This year, we visited **10 kindergartens involving 284 pupils in total**. These pupils, aged between 5 and 6 years had their interest, creativity and curiosity sparked when they coloured their favourite turtles from the highly interactive Turtle of Malaysia colouring book produced by Turtle Conservation Society (TCS).



Kindergarten children colouring Turtle of Malaysia books and learning about Malaysia's sea turtle species with turtle skull replicas.

Additionally, for the engagement with primary schools, we invited the students to visit our hatchery and interpretative hut at Pantai Chakar Hutan. In total, **247 students from 8 primary schools** visited us to learn more about our turtle conservation efforts while experiencing hands-on field activities. This included a hatchery tour and next excavation to perform Post-Emergence Inspection (PEI). The students had a fun-filled educational experience excavating sea turtle nests and examining the nest hatching success.



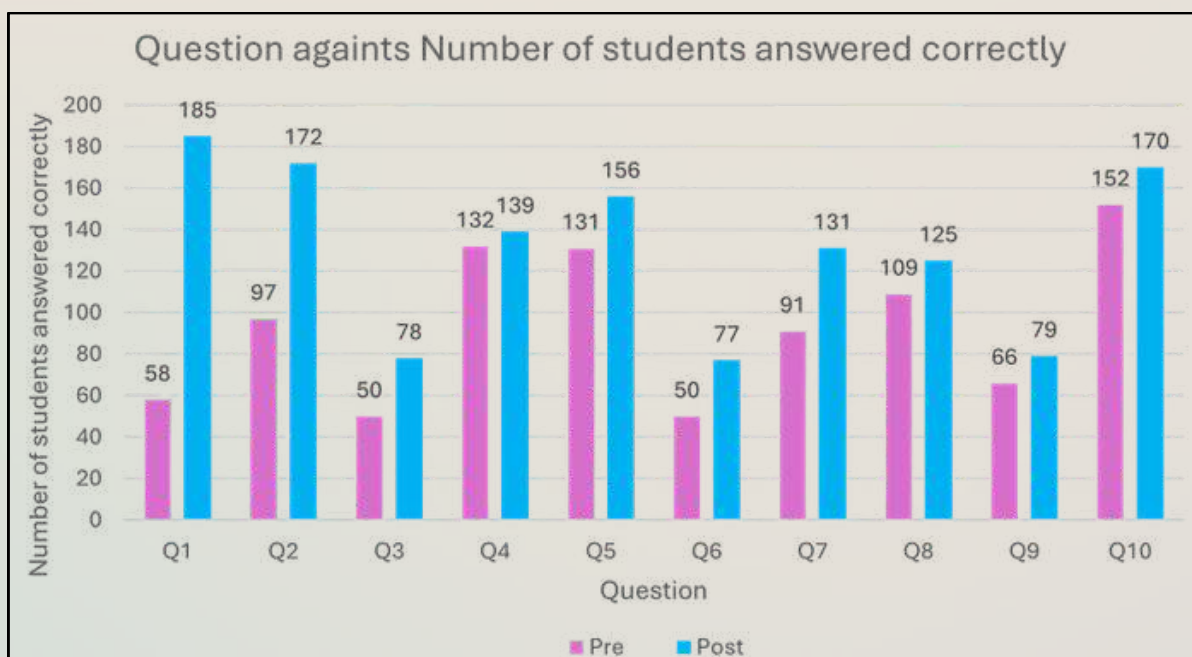
Some photo from activities with primary schools, namely, hatchling release, turtle talks, nest excavation and colouring Turtle of Malaysia Book.

Apart from that, we also conducted the Rehab and Release module activities, which were prepared by our partners, **International Sea Turtle Ambassadors (ISTA)**. These activities not only helped them to understand more about sea turtles but also allowed them to visualize the actual work of a marine biologist! In addition to that, the students were given turtle talks while colouring the Turtles of Malaysia, and finally, they each brought back a customized T-shirt, "Owoh Jeng", designed by our team member.

We handed out **194 pre-and post-questionnaires** provided by ISTA to the students to further gauge their understanding of the sea turtle lessons and the effectiveness of the program. Overall, post-test questionnaire results surpassed pre-test questionnaire indicating an **improvement in students' understanding** and success in delivering the material. 7 out of 10 questions posed were correctly answered by more than 50% of the students.

No.	Question
1	How many species of sea turtles exist in the world?
2	What is the largest sea turtle in the world?
3	What are some human threats that affect sea turtles?
4	True or false: Sea turtles are so skilled at navigating the oceans that they can travel from one continent to another without any problem. For example, a sea turtle observed by a turtle group in North America can also be observed at another time of the year in the south of the Asian continent.
5	What do green sea turtles eat?
6	The temperature of the sand is important because:
7	True or False: On the beach, holes and sandcastles can be a big obstacle for sea turtles.
8	True or False: Sea turtles use celestial lights (the light of the moon and stars) to return to the sea.
9	How can I help sea turtles, even if I live far from the sea?
10	True or False: It is important to take care of the beaches because female sea turtles return to the beach where they were born to lay their eggs.

Table 6 - Pre- and post-questionnaires prepared by the ISTA.



Bar Chart 1 - Shows number of students who answered correctly for pre and post surveys. Questions 1 and 2 had the most significant pre and post answers at 38% difference.



Photos of primary school students during "Program Kesedaran Penyu dan Tuntung" at our hatchery and interpretative hut conducting Rehab and Release Workshop, nest excavation and Turtles of Malaysia colouring session.



A total of **1,052 students from six secondary schools** participated in our activities. As for secondary schools, our team, alongside other NGOs including the Turtle Conservation Society and ecoCare – Malaysia Nature Society, visited the schools to deliver awareness talks and set up educational booths.

This Program Kesedaran Penyu, Tuntung dan Alam Sekitar, highlighted the difference between freshwater, marine and land turtles and emphasized the importance of protecting the various habitats of aquatic life, such as oceans, mangroves and rivers, and explored potential career paths in conservation. Pre and post surveys were conducted and collected from 501 students, out of which 23 questions were given asking about sea turtles and terrapin biology and ecosystems.

From the surveys, we observed an increase in understanding of about 18% on average from at least 7 questions, as the highest difference is 26.75%, a question discussing the invasive terrapin, the red-eared sliders. Around 93% of the students knew the four sea turtle species in Malaysia and can name the biggest turtle specie which is the leatherback turtle.

The students are now aware and able to differentiate the specific diet for the different species of sea turtles, especially for green sea turtles. Almost **400 students** are now able to define basic characteristics of turtles and differentiate between different turtle classes. Last but not least, 80% of the students are now aware of the prohibition against sea turtle and terrapin eggs trade and consumption, including the relevant law.



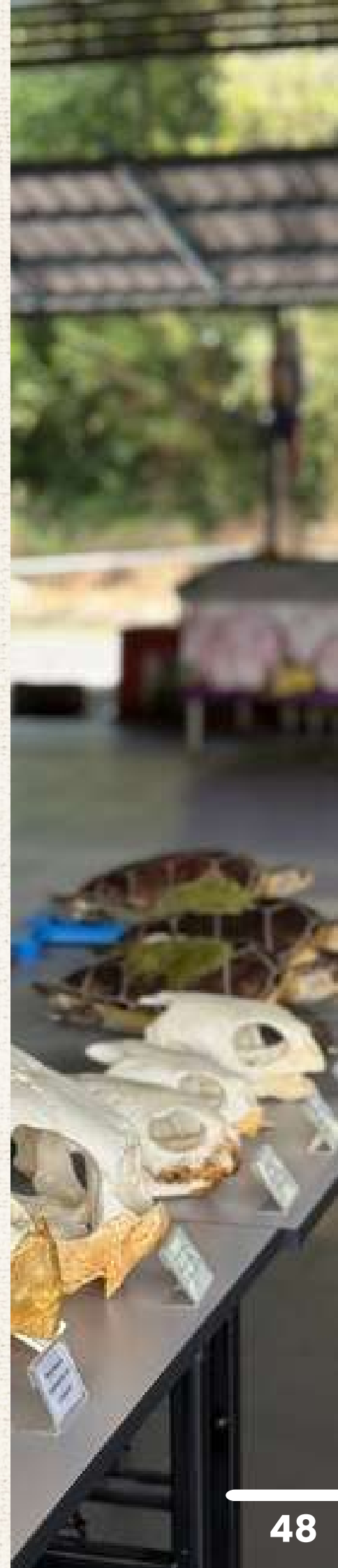


Some photographs of the Program Kesedaran Penyu, Tuntung dan Alam Sekitar with 6 secondary schools across Dungun and Kemaman.

LOCAL COMMUNITIES

To further raise awareness about sea turtles and marine life, we tried out a new method which is engaging the nearby communities in ***Meh Kite Ngopi Penyu*** (“Come Let’s Have Turtle Coffee Chats”). These chat sessions aimed to build stronger connections and encourage knowledge exchange with the local communities. We hosted **233 participants** from 15 villages/residential areas over 15 sessions. The local communities were from diverse backgrounds which included housewives, senior citizens, fishermen, their children and parent-teacher associations members. These sessions were not only meant as a turtle awareness activity, but to also to reach out and invite them to be part of our solution.

Discussions encompassed a wide range of topics from turtle biology to shifting coastal ecosystems, as well as personal recollections of turtle sightings to contemplations on ways to play their part in turtle conservation. Our team created a set of personalized flashcards as conversation starters to encourage deeper engagement in the group discussion.



Most of the participants were senior citizens, and we received diverse perspectives on turtle-related knowledge. For instance, some shared that they sought turtle eggs as an alternative remedy for asthma and joint problems.

Although turtle eggs were considered a rare local delicacy, several participants who had tried them expressed that they did not enjoy the slimy texture and foul, fishy smell. Several participants also recalled witnessing the giant leatherback turtles nesting on the beaches during their younger days, an experience and a privilege that cannot be replicated anymore in Malaysia now.

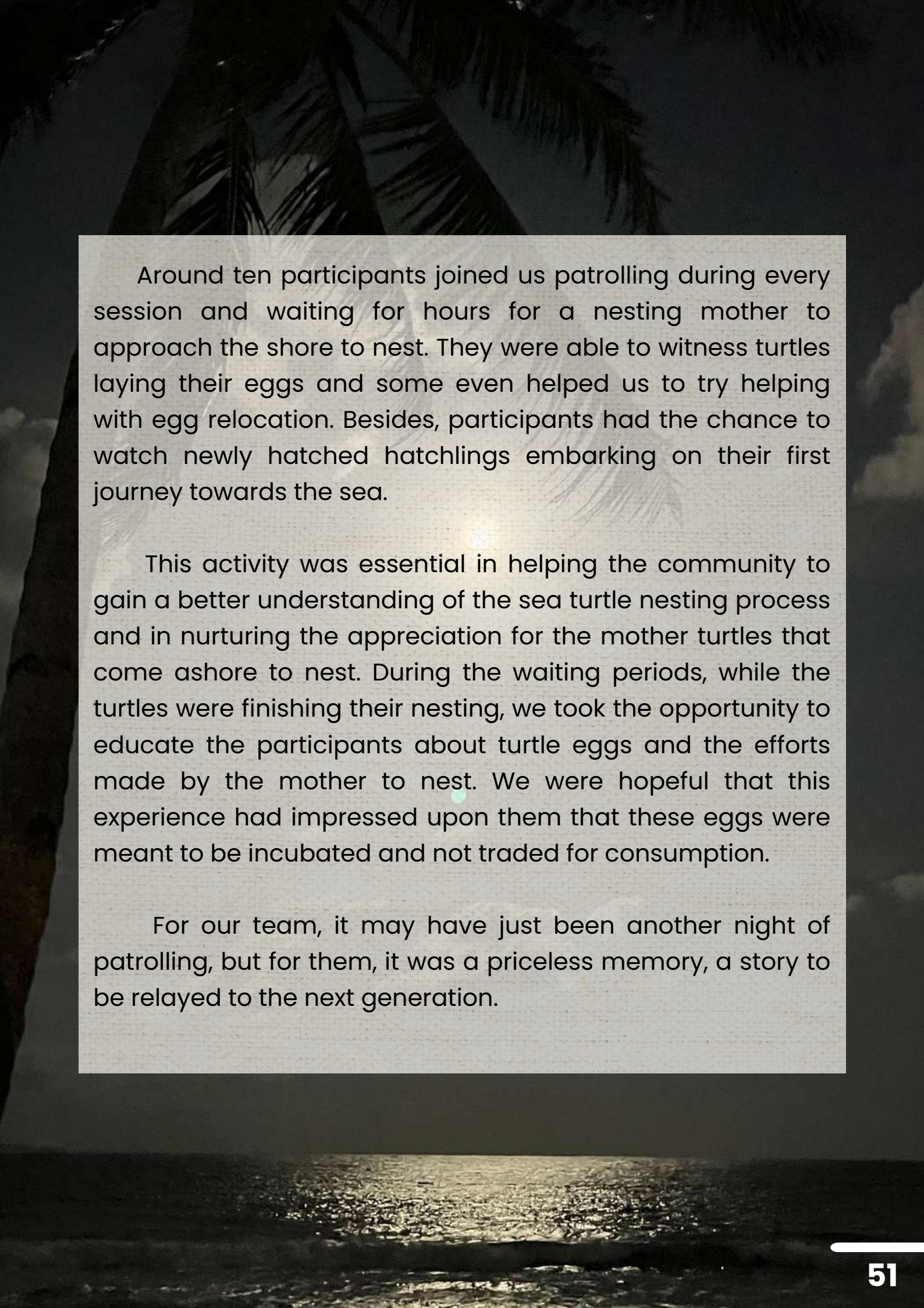




A group photograph of local community participants during Turtle Watching Session 9, taken alongside a nesting female that laid her eggs on 22 August 2025. The photo was captured using night mode.

Having the largest sea turtle nesting population among the three project sites has allowed us to organize free turtle watching sessions for nearby villagers, many of whom have never seen a sea turtle up close, despite living along the coastal area. These moments were long-awaited and appreciated especially for those who are from less affluent families.

From March to September of 2025, we conducted **12 sessions of guided eco-friendly turtle watching, with 112 participants** of various backgrounds and ages from 20 residential areas.



Around ten participants joined us patrolling during every session and waiting for hours for a nesting mother to approach the shore to nest. They were able to witness turtles laying their eggs and some even helped us to try helping with egg relocation. Besides, participants had the chance to watch newly hatched hatchlings embarking on their first journey towards the sea.

This activity was essential in helping the community to gain a better understanding of the sea turtle nesting process and in nurturing the appreciation for the mother turtles that come ashore to nest. During the waiting periods, while the turtles were finishing their nesting, we took the opportunity to educate the participants about turtle eggs and the efforts made by the mother to nest. We were hopeful that this experience had impressed upon them that these eggs were meant to be incubated and not traded for consumption.

For our team, it may have just been another night of patrolling, but for them, it was a priceless memory, a story to be relayed to the next generation.



Some photos of Turtle Watching participants with the nesting mothers that come up to nest during their session in May till August.

EMPOWERING LOCAL WOMEN THROUGH ECOTOURISM

In supporting the local community, particularly housewives from the B40 income group, and to empower them through sustainable turtle-based ecotourism, PULIHARA introduced a community-driven heritage craft initiative centered on locally produced merchandise.

We began by developing a series of custom batik motifs inspired by marine conservation. Two designs were created:

1. A motive of four sea turtle species found in Malaysia.
2. A marine-themed pattern featuring seashells, corals, and other marine elements.



Custom Batik blocks made from brass to produce Batik with marine inspired motives.

These designs were produced in collaboration with **Pn. Haniza Hashim from Nysakapas**, a traditional batik artisan based in Kampung Serada. Their handmade batik craftsmanship ensures that each piece carries authentic local identity while supporting the continuity of heritage batikmaking in Terengganu.



Our team with Pn. Haniza in Rumoh Batik Nysakapas.



The making of our Batik Penyu, featuring four species of sea turtle in Malaysia at Nysakapas Batik Studio in Kampung Serada.

Once produced, the batik fabrics were distributed to local **housewives in Dungun and Kerteh**, who transformed them into a variety of products such as **hair scrunchies, skirts, bandanas, tote bags, and drawstring bags**. The initiative not only provided these women with the opportunity to earn side income but also gave them pride in contributing to a conservation-themed product line that reflects their cultural and environmental landscape. Many expressed their appreciation for this opportunity as it offered flexible, home-based work that could support their household income.



Left: Our local ladies from Dungun with our Batiks.

Below: A collection of Batik products made by our local ladies from Kerteh and Dungun which includes: bandana, skirt, tote bag, drawstring bag, schrunchie/hair band and napkin.





In addition to the batik collaboration, we also worked with **Ombak Girang**, a small women-led business owned by **Ms. Juaraiah** from Kemaman. She produced a set of handcrafted wooden pins featuring the four Malaysian sea turtle species, adding another locally made conservation-themed product to our catalogue.



Wooden pins with four species of Malaysia's Sea Turtles, together with information about threats and some facts.

The development of these community-produced items has enabled PULIHARA to expand its range of merchandise while simultaneously uplifting local women and small-scale artisans. By integrating community-made products into our conservation outreach and ecotourism initiatives, we help create a sustainable micro-economy where environmental protection and community livelihood intertwine and strengthen one another.

THE *PONDOK* PULIHARA

Also known as the Visitors' Hut, this space became the heart of our outreach efforts, where engagement unfolded naturally and consistently. It serves as a key touchpoint, bridging the gap between ongoing conservation work and beach visitors, bringing both worlds together under one roof. Rather than merely telling, the Hut allows visitors to see and experience conservation firsthand, where actions speak louder than words.

Though humble in scale, it punches above its weight, playing a steady and meaningful role in fostering awareness and deepening public understanding through genuine interaction and meaningful exchanges.

From daytime visits to the Hut to late evening hatchling release sessions, we recorded a total of **5,673 visitors** over the course of the season. While many were from local communities, we also welcomed a notable increase in international visitors this year, representing a rich diversity of backgrounds and experiences.



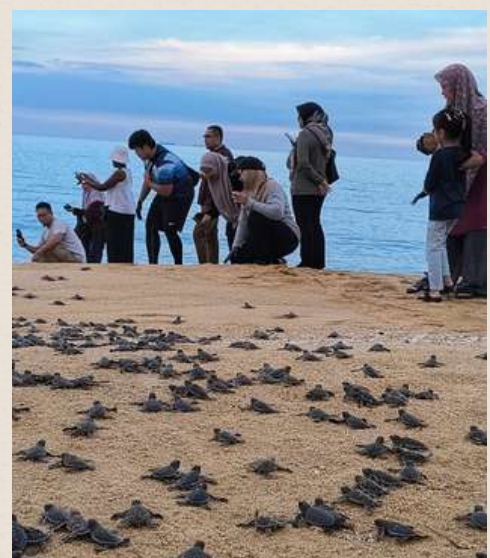
CONCLUSION

Our milestones in 2025 were made possible through the steadfast support of our funders and partners, whose contributions truly became the wind beneath our wings. With their support, we safeguarded thousands of sea turtle eggs from the illegal trade, strengthened our research and monitoring efforts, inspired young minds through school outreach programmes, and engaged hundreds of villagers through meaningful community initiatives.

This collective support also enabled us to create conservation-linked livelihood opportunities, particularly for local women, ensuring that protection efforts go hand in hand with community well-being. These achievements reflect what is possible when we work together with shared purpose and commitment. We extend our sincere appreciation to all who have placed their trust in PULIHARA and walked alongside us in our mission to safeguard Malaysia's sea turtles and the communities who share their shores.

REFERENCES

- Chan, E. H., & Liew, H. C. (1995). Incubation temperatures and sex-ratios in the Malaysian leatherback turtle *Dermochelys Coriacea*. *Biological Conservation*, 74(3), 169–174. [https://doi.org/10.1016/0006-3207\(95\)00027-2](https://doi.org/10.1016/0006-3207(95)00027-2)
- Howard, R., Bell, I., & Pike, D. (2014). Thermal tolerances of sea turtle embryos: Current understanding and future directions. *Endangered Species Research*, 26(1), 75–86. <https://doi.org/10.3354/esr00636>
- Reboul, I., Booth, D., & Rusli, U. (2021a). Artificial and natural shade: Implications for green turtle (*Chelonia mydas*) rookery management. *Ocean & Coastal Management*, 204, 105521. <https://doi.org/10.1016/j.ocecoaman.2021.105521>
- Van de Merwe, J., Ibrahim, K., & Whittier, J. (2005). Effects of hatchery shading and nest depth on the development and quality of *Chelonia mydas* hatchlings: Implications for hatchery management in Peninsular, Malaysia. *Australian Journal of Zoology*, 53(3), 205–211. <https://doi.org/10.1071/zo03052>



GALLERY