

PERHENTIAN
TURTLE PROJECT

2017 REPORT

By

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Acknowledgements

This is our third year collaborate with Terengganu State Department of Fisheries (DoF) and Department of Marine Park Malaysia in conducting sea turtle photo identification research. The project seeks to build a sea turtle photo database and movement map within the Perhentian Islands Marine Park. We would like to express our gratitude to Durham University Charities Kommittee (DUCK) for their financial assistance that made this research possible and also to our volunteers that helped to support our financial.

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Introduction

Perhentian Turtle Project has been established for three years, starting in 2015. Our bases are in the Perhentian Islands, on Perhentian Kecil and Perhentian Besar. The Perhentian Islands is a marine protected area as well as a very famous tourist destination. It is home to various marine animals including corals, fish and sea turtles. It is also the nesting and foraging grounds for two sea turtle species, namely green turtle (*Chelonia mydas*) and hawksbill turtle (*Eretmochelys imbricata*). The islands are the second highest nesting ground in the Terengganu's Island Archipelago, recording at least 250 nests annually.

The conservation plan on the islands focuses on protecting sea turtle nesting beaches from poachers by collecting eggs each night and relocating them to the main hatchery at Pantai Tiga Ruang (Some resorts have their own smaller hatcheries). Other than nesting data, we also focus in sea turtles identification to study the population of sea turtles living in and around the Perhentian Islands.

2017 was our third year running the project with the objectives to better understand the turtle population using the Perhentian islands and to encourage the community at Perhentian Islands to contribute to sea turtle conservation. We use a non-invasive photo identification method to identify individual turtles. Every individual turtle has unique facial scale patterns and other distinct features which help researchers to identify them. Photo identification has been widely used to identify individuals of various species, such as manta rays (Courutier et al., 2015), leopard sharks, dolphins, zebras, Tigers, and etc. We used manual visual comparison and various automated pattern matching softwares, including I³S, Hotspotter and NaturePatternMatch, to recognise individual sea turtles in the water and on the nesting beaches. Apart from that, we recorded the stranded turtles found at Perhentian Islands

Photo identification is a non-invasive and reliable method for long term monitoring, whereby trained and untrained villagers and tourists can directly engage in the research and conservation of sea turtles in the Perhentian Islands. The global tagging method mainly focuses on nesting female turtles when they come ashore to lay eggs, however photo identification serves as an alternative to include not only the nesting females but also adult males and juveniles of both sexes whilst in the water.

The community at the Perhentian islands including villagers, boatmen, divers from dive centers, and resort staffs were briefed and explained about the information how to take suitable photos in order to contribute to the sea turtle data collection. We have distributed banners and posters around the islands and at snorkel boats, resorts, dive centres, cafes, the jetty and shops to inform the public about the project. It provides guidelines to photograph sea turtles and submit to us as well as awareness about sea turtles. During the weekly awareness campaign sessions and turtle awareness talk, we spread the knowledge and engaged tourists in the project through photo

submissions via email and social media, such as Facebook and Instagram, and at the same time raise awareness and educate them.

The project also worked with the DoF staff to collect nesting data and sufficient data collection can help to estimate the population size, sex ratios, distribution and movements of sea turtles in the Perhentian Islands Marine Park.

Project Aims

The project aims to:

1. Establish the general population size and sex ratios of turtles using the Perhentian Islands Marine Park by creating a sea turtle photo database and identifying individual juveniles, male and female adults.
2. Record data on stranded turtles to identify threats found around the Perhentian Islands
3. Educate and raise awareness among the local community and tourists through awareness activities and engage them in conservation efforts.
4. Collaborate with relevant stakeholders to maximise conservation efforts.

Sea Turtle Photo Identification Research

Underwater Sightings of Green Turtles

A total of 138 snorkel surveys were conducted at five locations around the Perhentian Islands between 13 March and 4 October, 2017. A total of 647 turtle sightings of 54 different individuals were collected. Figure 1 shows the number of total sightings and number of individuals from 2015 to 2017. This season marked the lowest amount of total sightings since the project began in 2015. Additionally, 2017 also recorded the lowest number of snorkel surveys at the major sea grass bed at Teluk Pauh. This is due to increased survey efforts at other sites such as Petani Beach, Tiga Ruang Beach, Teluk Keke, Teluk Aur and Pasir Karang to identify new foraging sites, and unlike Teluk Pauh, the number of turtles was notably lower at these sites and turtle sightings were by chance. However, the number of sighted individuals was almost the same as in 2016 which is 33 individuals indicating that the lower numbers of total sightings is due to reduced number of surveys instead of reduced sea turtle number at the survey areas.

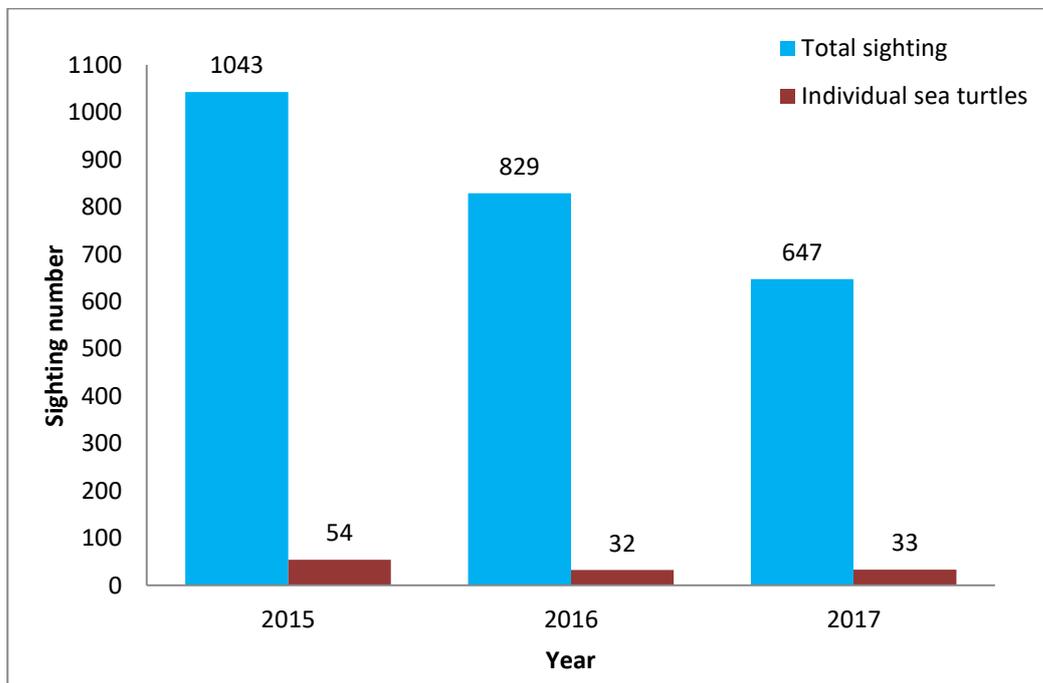


Figure 1. The number of sightings and individuals sea turtles identified between 2015 and 2017 seasons.

Even though the number of snorkel surveys varied from month to month, the average monthly number of sightings was except in March and October where less surveys were conducted due to poor weather conditions. Figure 2 shows the total number of turtle sightings throughout the season. With the exception of March and October all months showed similar numbers of sighted individuals varying between 21 and 25. Since every month yields similar data varying between 85 and 117 sightings based on 19 to 21 individuals it could be suggested that roughly the same number of turtles are feeding every month and there is no popular/peak time of the year for the turtles to feed.

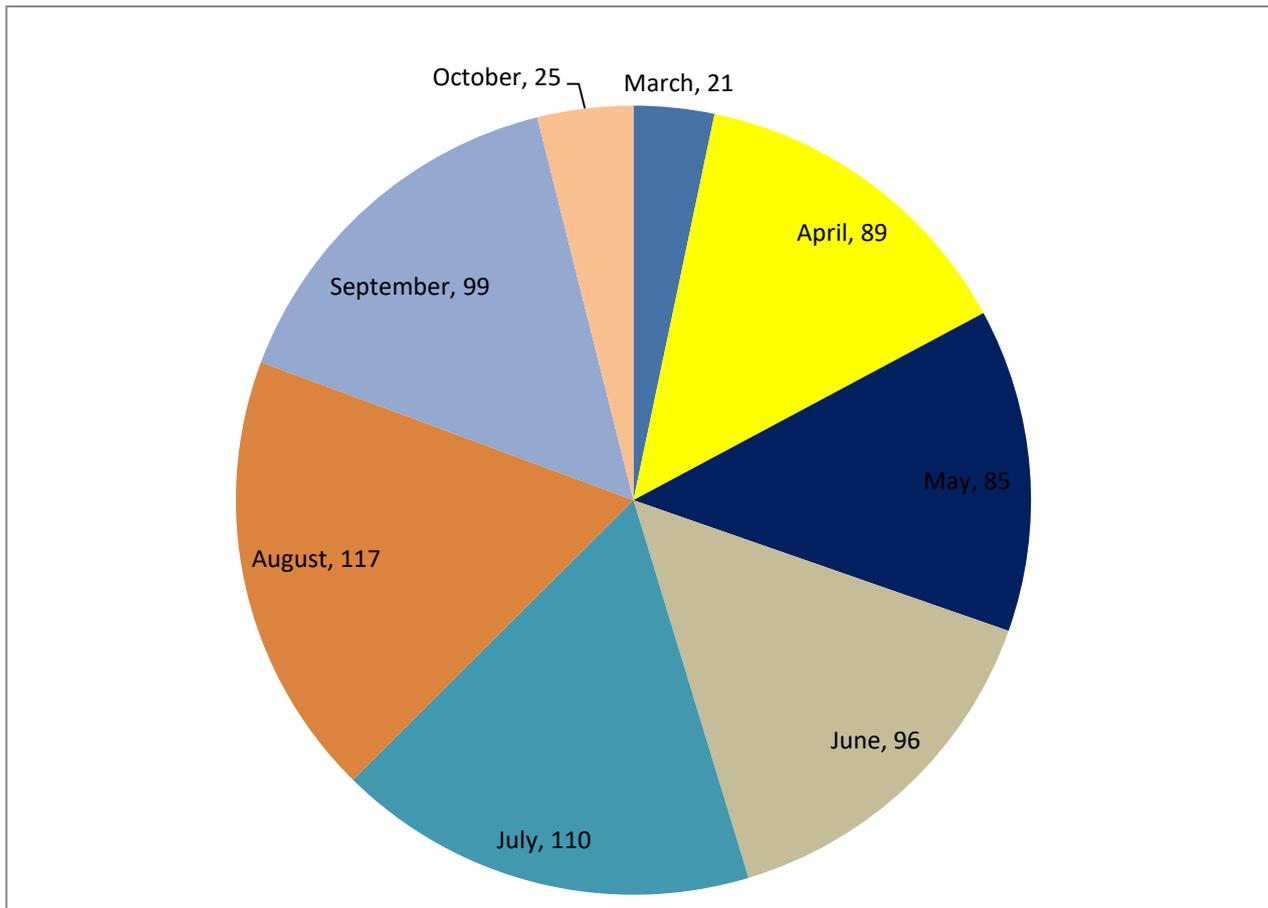


Figure 2. Number of turtle sightings each month throughout the season.

In our database, there is one green turtle that we have identified and monitored since 2009 and feeds at Teluk Pauh. The turtle was Polly with the ID number PG0002F with 60 sightings through the 2017 season refer Figure 3. The most sightings for Polly was recorded in July and August with 13 and 15 sightings respectively. The most sighted male turtle was Long Dragon the ID number PG0003M with 54 sightings in 2017, he was frequently present in July, August and April. Polly was first identified in 2009 and Long Dragon in 2014, since then both of them show almost every year and are the highest sighted turtles classing them as resident turtles at Teluk Pauh. The only exception is during Polly’s nesting season when she migrates to Vietnam for nesting season. We know Polly is from Vietnam because of the tag on her flipper.

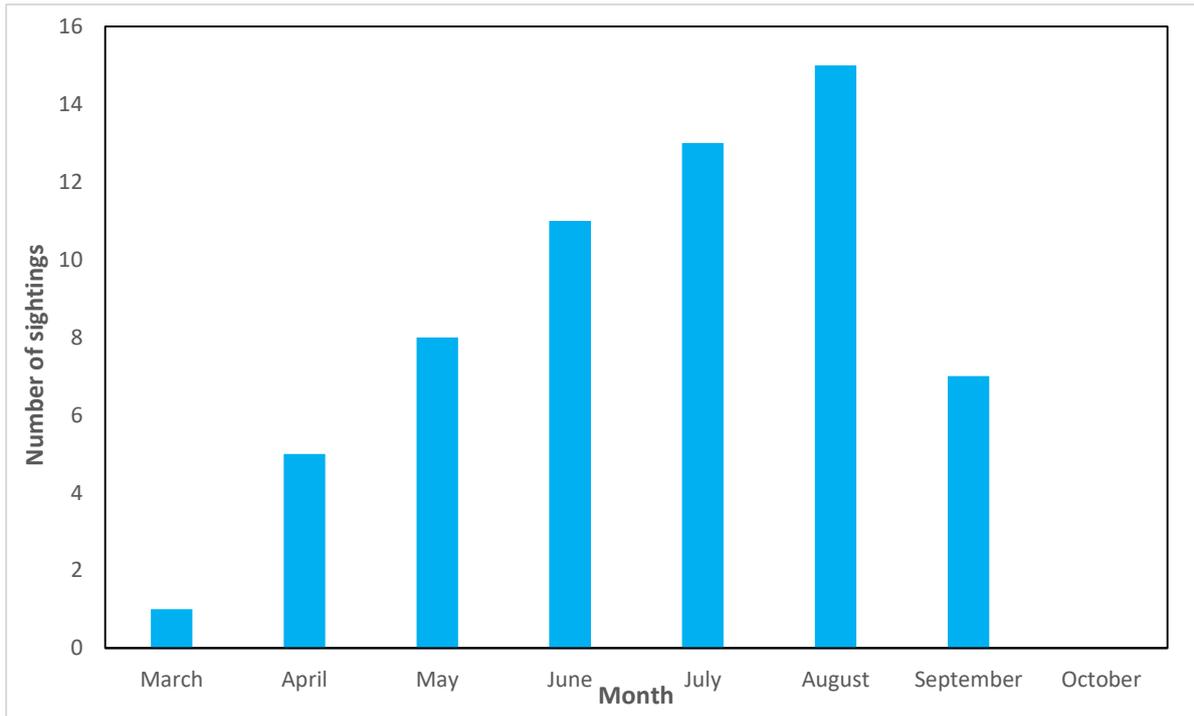


Figure 3. Sightings of Polly at Teluk Pauh in 2017. The number of sightings continuously increases from March to August and decreases in September. Polly was not sighted in October.

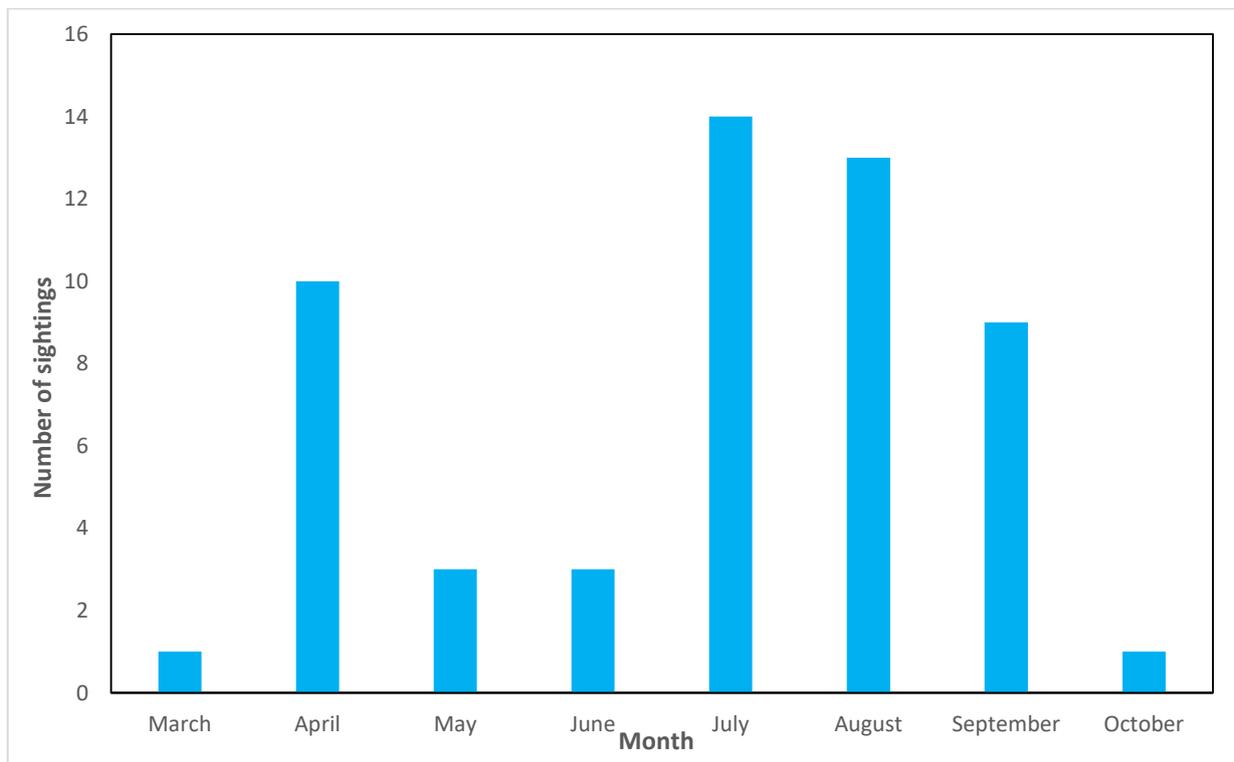


Figure 4. Sightings of Long Dragon at Teluk Pauh in 2017. Number of sightings for Long Dragon varied through the year with higher sightings being in April, July, August and September and lower number of sightings in March, May, June and October.

Number of Individuals and Sex Ratios

The majority of turtle sightings in 2017 were females (53% of the sightings) followed by juvenile/unknown (29%) and male turtles (13%). The category 'other' includes sightings which could not be identified due to unclear pictures or potential new turtles with pictures of just one facial side.

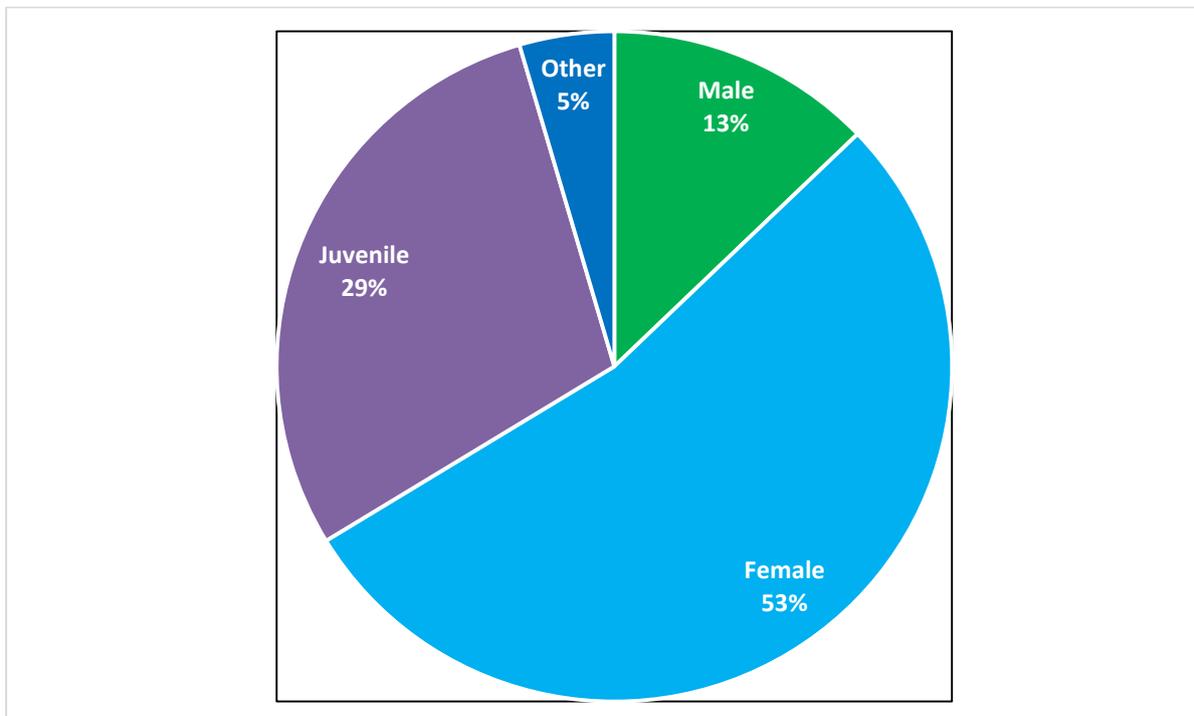


Figure 5. Percentage distribution of in-water sea turtle genders for found throughout the entire season with female turtles dominating the number of sightings.

When looking at the sex ratio of identified individuals in the whole database which includes nesting turtles, it is evident that 83% of the turtles are female, 11% are juvenile and only 6% are male. Even though this does not represent the sex ratio of turtles in the Perhentian Islands as a whole, it provides a rough guideline as to what the ratio is like.

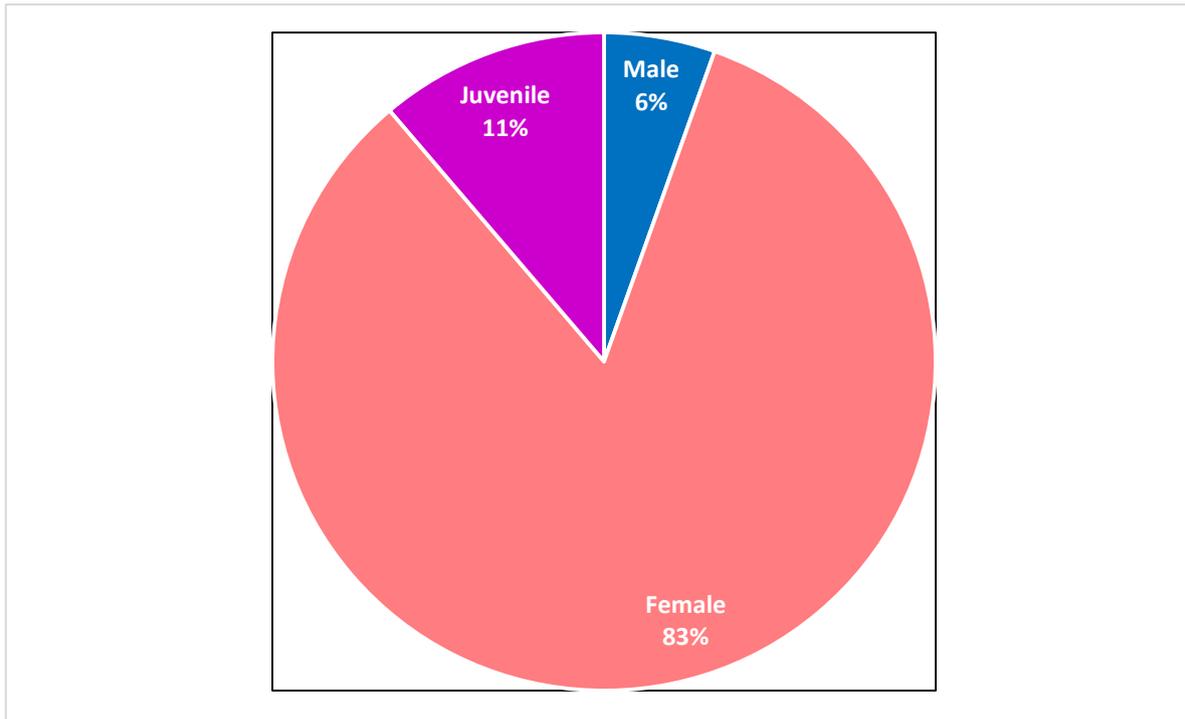


Figure 6. Sex ratio of identified turtles in our database including underwater and nesting turtles.

It is known that green turtle populations are often female-biased and can still sustain with roughly 75% females. Concerns should be raised if populations show less than 25% males such as on Perhentian Islands. Hence, studies on sex ratios of hatchling of the hatchery on Tiga Ruang are urgently necessary to prevent a further increase in females. Previous studies showed that a male:female sex ratio of hatchlings of 1M:4F (i.e. 80% females) is alarming (Poloczanska et al. 2009).

Impacts of Tourists on the In-water Behaviour of Green Turtles at Teluk Pauh

To understand the impacts of tourists on the behaviours of green turtles at Teluk Pauh, the number of tourists found close or nearby to individual sea turtles was recorded, this number includes tourists that were swimming, those that were in boats and also the turtle project staff. Figure 7 shows the average number of tourists surrounding a turtle for each month of the season. It is evident from the graph that the summer months of July, August and September showed the highest number of tourists due to increased public holidays in many countries. The highest number of tourists found surrounding a green turtle during the season was 252 tourists and this was recorded on the 9th of September during our survey in the morning 10AM – 11.30AM. The data for March and October is unrepresentative due to the fact that only 14 days were recorded in March and only 4 were recorded in October, this results in the average number being higher than expected and should be taken into consideration when trying to look at an overall trend for tourist numbers.

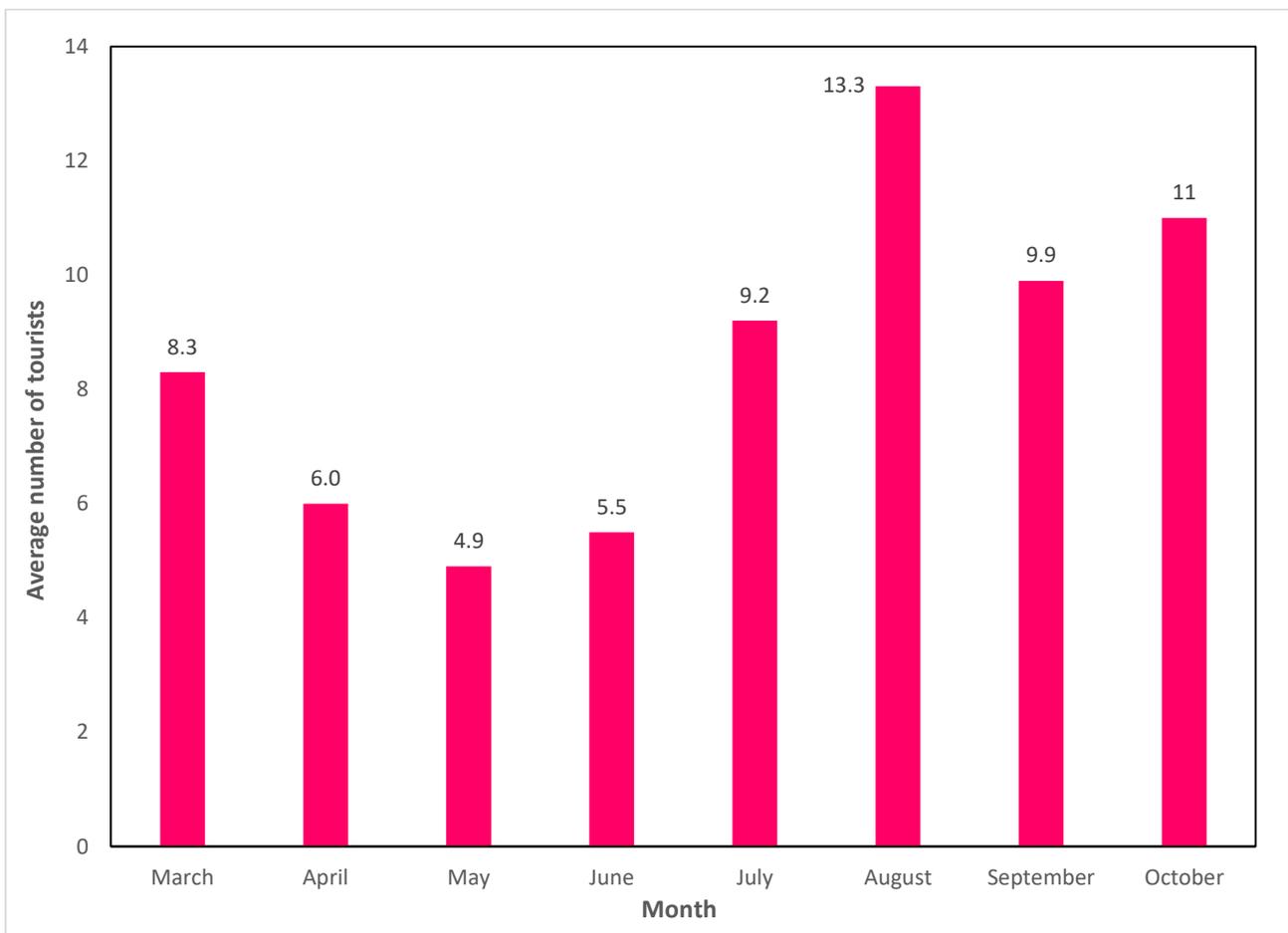


Figure 7. Average number of tourists found close to foraging turtles throughout the season.

Other than recording the tourist number swimming turtles, the behavioural response of green sea turtles in relation to disturbance by snorkelers was investigated. A study have showed that green turtles come to the surface to breathe after being disturbed by snorkelers, start swimming rapidly or flee to the nearest neighbour post-disturbance (Griffin et al. 2017). Boat

accidents are identified as one of the significant threats for sea turtles in the Perhentians (Long & Azmi, 2017). Hence, stress induced by snorkelers leads to more frequent surfacing of the turtles, which can lead to more boat accidents and therefore an increased mortality rate. It is a major concern to determine if the green turtles at Teluk Pauh show signs of disturbance.

In order to observe the behavioural response without presence of tourists, data was collected during the early morning when no snorkelers were present at Teluk Pauh (between 7.00 am and 9.30 am in May). The behaviour was categorized in surfacing, swimming, resting, assisted resting and foraging. Individuals were identified as male or female, if the sex was known. Tag numbers, injuries and abnormalities were recorded, if any. The pre-disturbance behaviour was recorded for five minutes as described by Meadows (2004). After the pre-disturbance observation, the observer applied a standardized stimulus meant to mimic a tourist diving down to approach a turtle. This disturbance involved the observer diving to the seafloor approximately 3 m from the turtle and taking a picture without flashlight. The reaction of the turtle was then recorded and the level of disturbance was categorized as follows: (1) high: abandonment, (2) moderate: turtle swims away, but able to follow, (3) slight: calm, but avoiding movements, (4) no: no disturbance at all. The depth was recorded as well. Boats that appeared during the observation period were counted, and whether or not the turtle reacted to the passing boats was recorded.

At Teluk Pauh, eight sightings of green sea turtles were recorded, but differences in behaviour could not be observed because six sightings showed exclusively foraging and partially swimming behaviour in that time period whereas just two sightings were surfacing in that interval. Applying the stimulus, the most dominant behaviour among all individuals was no disturbance. Five of eight individuals showed no disturbance at all while taking pictures, one individual showed a slight disturbance and two turtles showed a moderate disturbance. A comparison of these data to the behavioural response in the presence of tourists was not investigated because our results showed insufficient data in the five-minute observation period suggesting to extend the observation period to 15 minutes.

The behavioural response of four sightings was recorded for 15 minutes showing that three individuals were surfacing at least once during this period. One turtle was lifting her head six times while surfacing, another one three times and the third sighting was surfacing twice lifting her head first twice and then one more time. Two sightings showed no disturbance and the other two turtles showed a moderate disturbance. A comparison of this data to the behavioural response in the presence of tourists was not performed yet.

The data we collected in 2017 is considered to be a pilot study. Behavioural studies should be continued in 2018 using a 15-minute observation period. After recording the behaviour of more individuals, the same methods should be applied to a time when snorkelers are present to investigate the influence of tourists on their behaviour (between 10 and 11.30 am, as well as 3 and 4 pm).

Nesting Data

During the 2017 nesting season DoF staff incubated 142 nests from ten different beaches into the hatchery (Table 2). In total, they incubated 12,546 eggs, which produced 10,442 live hatchlings. Data from DoF shows a hatching success rate of 82.86% for eggs relocated to the Tiga Ruang Hatchery. 61% of nests relocated to the hatchery were originally laid by turtles on the beaches of Tiga Ruang Besar and Tengah (Figure 8). These beaches were patrolled nightly to ensure all nests are protected from local poachers. The remaining 39% of nests were relocated from various other beaches including Tiga Ruang Menangis, Teres and Pinang Seribu on the big island, as well as to a series of nesting sites along the northern shore of the small island including Tanjung Butong and Panglima Abu. These beaches were patrolled sporadically by DoF staff, hence it is possible that some nests from these beaches were either poached or left undiscovered.

Table 2. Hatchery statistics derived from DoF staff 2017 data records

2017 Tiga Ruang Hatchery	
Total Number of Nests	142
Total Number of Eggs	12,546
Average Clutch Size	88
Number of Live Hatchlings	10,442
Hatching Success Rate	82.86%

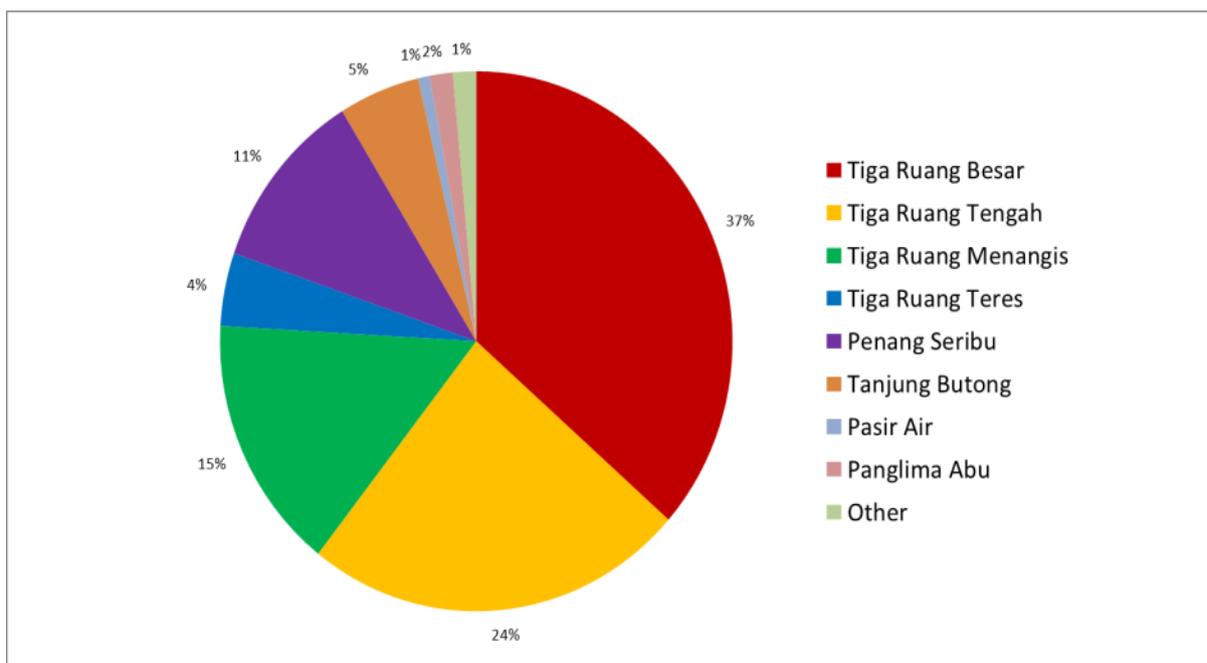


Figure 8. Percentages of egg clutches relocated into the hatchery from various nesting beaches.

During the 2017 nesting season 27 new individual turtles were identified (see figure 9.). Naturally the size of nesting populations fluctuate between annual nesting seasons, this explains the large difference in the numbers of 135 female turtles identified in 2016 compared to 36 identified in 2015, and the 27 identified this season. To date, no individual turtles have yet to be identified returning or re-immigrating to the nesting beaches of Tiga Ruang and Tanjung Tukas in any subsequent year after they were first identified during their respective nesting season.

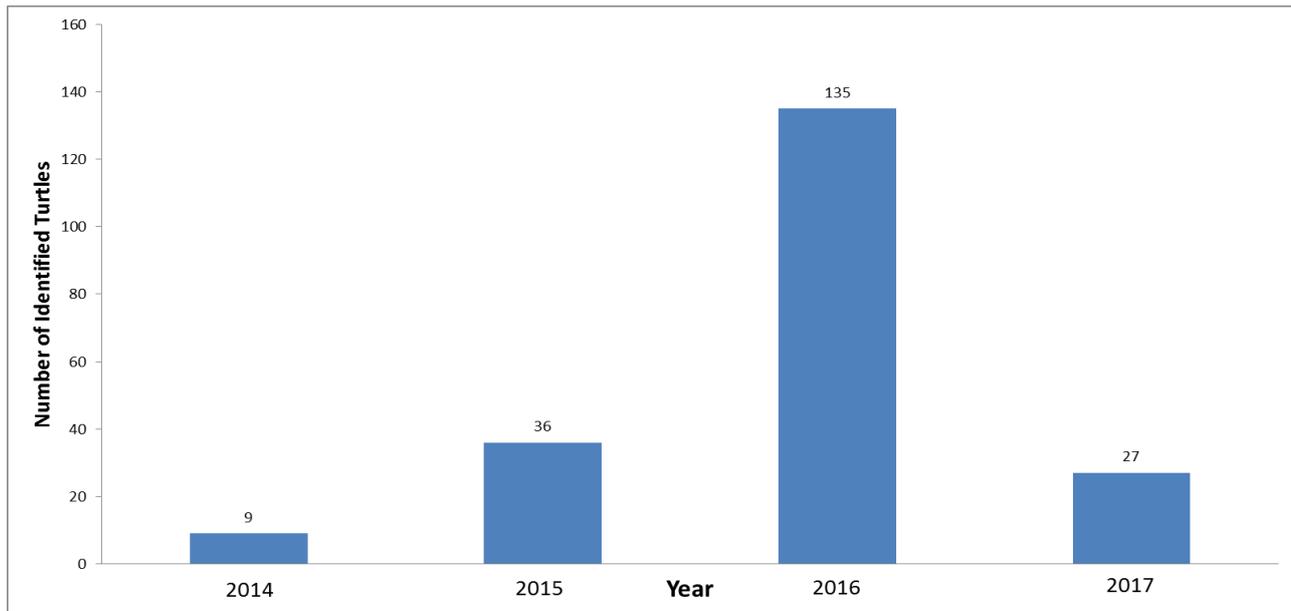


Figure 9. Comparisons between the numbers of individual female turtles identified nesting on the beaches of Tiga Ruang and Tanjung Tukas over four consecutive nesting seasons, 2014 through 2017.

During the 2017 nesting season, a total number of 83 nests were laid by 27 individual identified turtles on the nesting beach Pantai Tiga Ruang (Figure. 10). The graphed data shows a natural bell curve for nesting density over the four month nesting period. No turtles emerged to nest on the beaches of Tiga Ruang during March, April, September or October 2017. The month of July 2017 had the highest number of nests laid at Tiga Ruang and the highest density of individual turtles nesting during the season. This is followed closely by June with 15 individuals laying 29 nests, and by August and May, with 14 nests laid by 11 individuals and 6 nests laid by 3 individuals respectively.

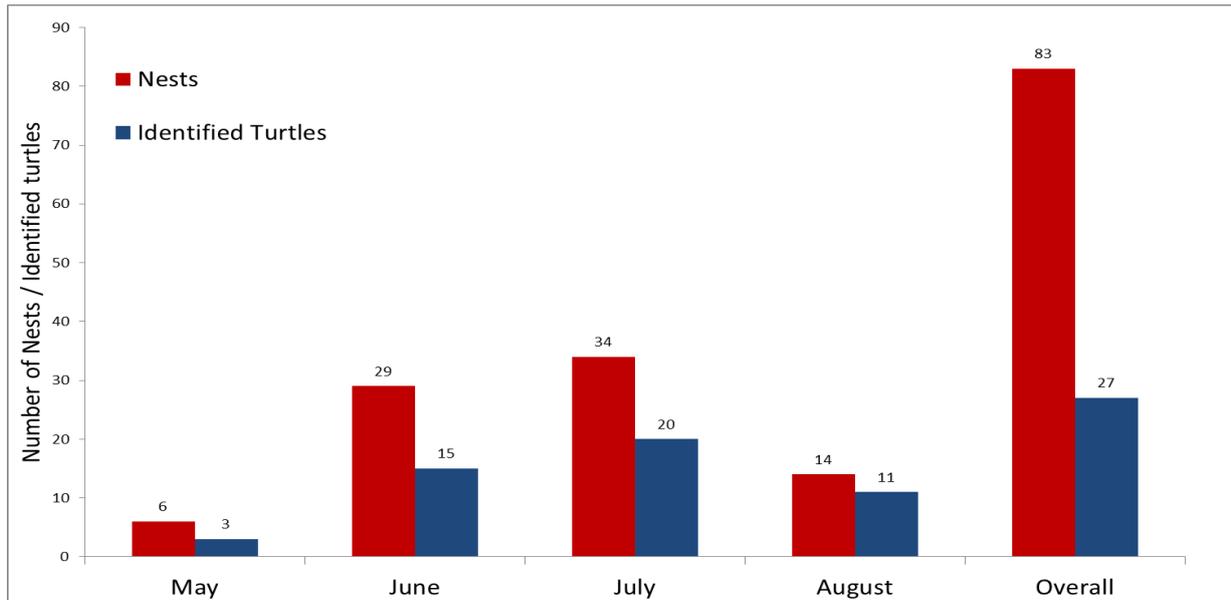


Figure 10. Comparisons between the total number of nests laid and number of individual turtles identified on the beaches of Tiga Ruang over the course of the 2017 nesting season.

A natural bell curve is still apparent with the addition of attempted nests and false crawls to the number of successful nests recorded by Perhentian Turtle Project staffs on the nesting beaches of Tiga Ruang (see Figure 11.). During the nesting season, June and July had the highest number of recorded activities followed by August and May. Out of the total number of nesting activities recorded on the beaches of Tiga Ruang, 50% were successful nests, while 32% were false crawls and remaining 18% were attempted nests.

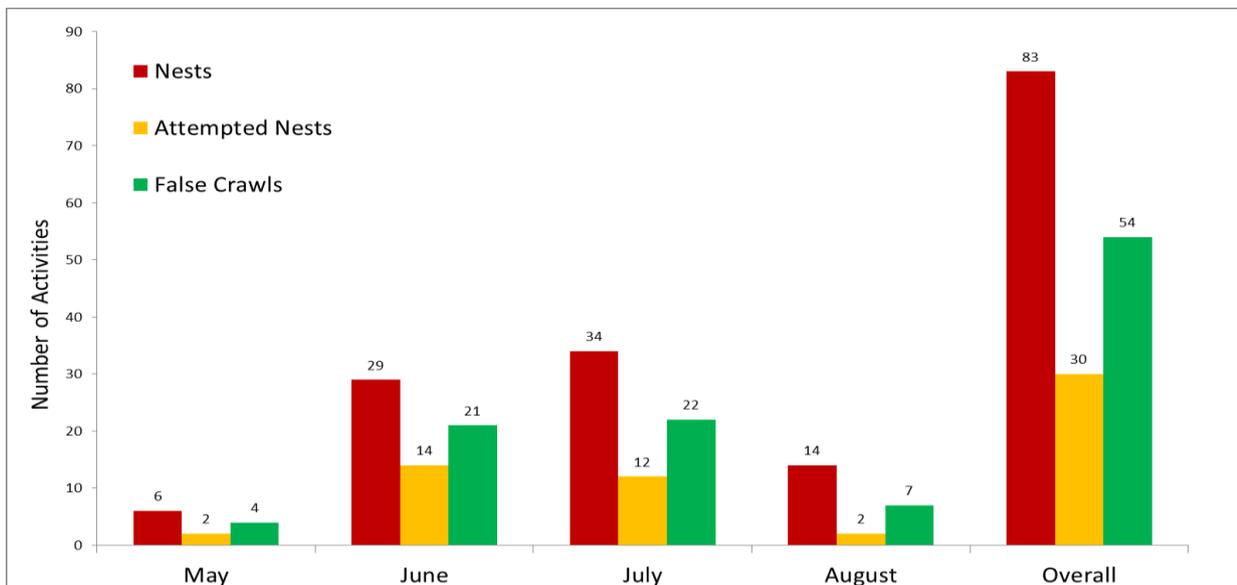


Figure 11. Comparisons between the total number of nesting activities (Nests, Attempted Nests, and False Crawls) recorded on the beaches of Tiga Ruang over the course of the 2017 nesting season.

Nest Site Preference

This year our project began to investigate whether female turtles exhibited nest site preference. Markers were placed every 10 m along the entirety of both Tiga Ruang beaches, Besar and Tengah, where turtle project staff surveyed nesting green turtles. The 10-m section where a nest was found was recorded as the location of the activity. When a nest was not successfully laid, the location of the last attempted nest (a body pit or an egg chamber) was recorded. For false crawls which spanned across several sections, the section with the most significant proportion of tracks was used. Tiga Ruang Besar encompassed 0-180 m and Tengah from 190-310 m. The small section of beach between the two rocky outcrops which separates Besar and Tengah lies between 180 and 190 m. As only 180-190 m occurred exclusively within this middle section, we can be certain that the activities recorded here were from this area.

Overall, our results show some signs of nest site preference along the beach (Figure 12). In terms of successful nesting activities there was an average of three turtles nesting per 10m section. Section 190-200m on Tiga Ruang Tengah had the highest nesting rate, with eight nests laid there over the course of the season in comparison to sections 30-40m, 60-70m, 180-190m, 210-220m, 280-290m and 290-300m which had no successful nests which means most the turtles just attempted to nests maybe due to a lot of coral rubber, rocks and roots in the sand.

However, overall there does not seem to be significant preference for nest site location when just examining the data for successful nests. In contrast, the location of unsuccessful nesting attempts and false crawls indicates a strong selection against one area, section 180-190m which lies between the two beaches, as indicated by the green background on Figure 12. It is likely that the turtles are selecting against this area as there are many rocks and there is no vegetation present for them to nest under, which is characteristic of green turtle nesting behavior. It is interesting that this section also has the highest total number of activities (Figure 13) despite all of them being either unsuccessful nesting activities or false crawls. It therefore appears that when in the shallow water, many turtles select this site and choose to land on the beach here, however, once on shore the section is selected against and all turtles return to the water having not laid any eggs.

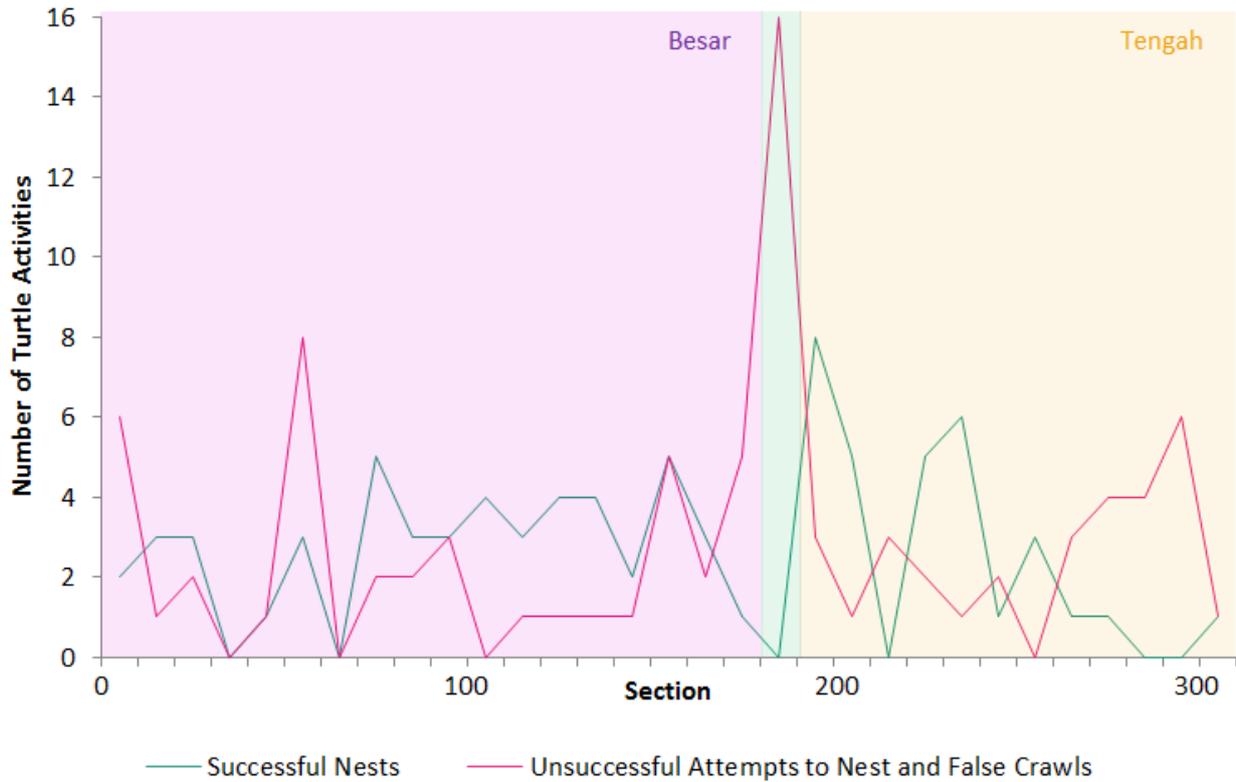


Figure 12. Location of both successful and unsuccessful/false crawl nesting activities at Pantai Tiga Ruang during the season. Each marker represents a 10m section. 0-180 m is Tiga Ruang Besar as indicated by the purple background, 190-310 m is Tiga Ruang Tengah as indicated by the orange background. The green background represents the rocky area between the two beaches.

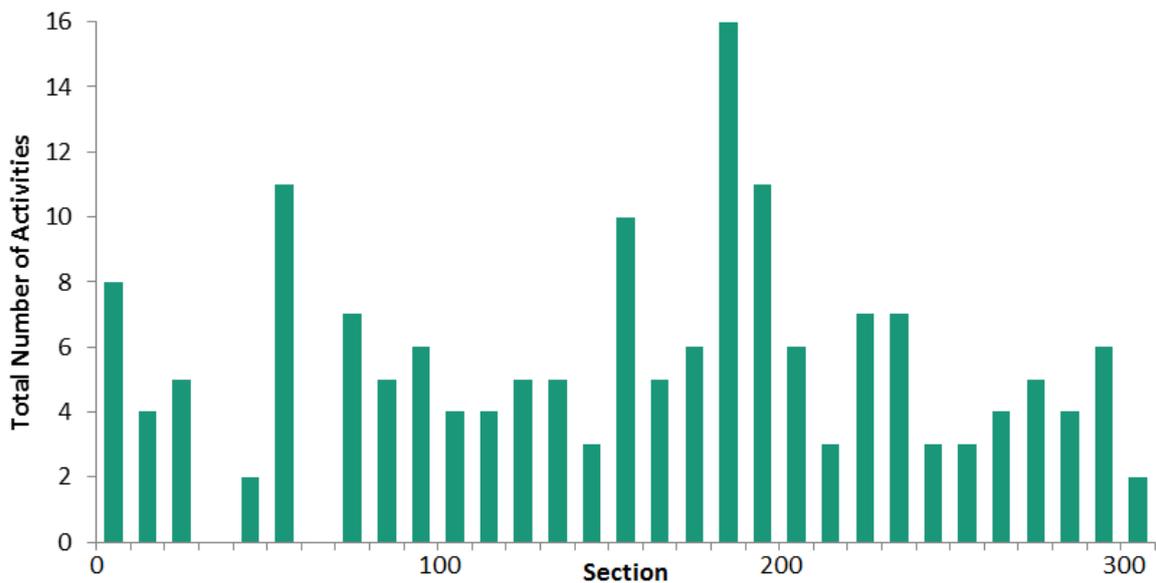


Figure 13. Location of all turtle activities at Tiga Ruang during the season. Each marker represents a 10m section. 0-180m is Tiga Ruang Besar, 190-310m is Tiga Ruang Tengah.

Stranded Turtles & Identified Threats

Nowadays, Perhentian Islands are getting more famous and popular among local and international tourists, especially during the peak season and national public holidays. Due to the rapid tourism development, the number of speed boats, big boats and ferries around the Perhentian Islands is increasing annually. Turtle eggs poaching, boat strikes, marine pollution and fishing lines are becoming greater threats to sea turtles in the Perhentian Islands, contributing to the mortality of sea turtles. Over three years from 2015 until 2017, Perhentian Turtle Project has become a platform where people at the islands report sighting of stranded sea turtles as we have made a significant effort to distribute our contact details and banners around the islands to encourage people to report stranded turtles to us. We then reported all cases to the Terengganu Fisheries Research Institute (FRI), Terengganu State Department of Fisheries and Department of Marine Park.

Between 2015 and 2017, the number of deceased turtles reported to the project has increased from four mortalities in 2015 and to 16 in 2017 (Figure 14). In 2017, we received a lot of reports about stranded turtles at Perhentian Islands from villagers, boatmen and other stakeholders. In 2017, a total of 16 dead turtles (15 green turtles and one hawksbill turtle) were reported, all with sighting photos except for one individual turtle. Four of the green turtles reported with photos showed injuries from boat collisions (Figure 15). We performed necropsy on two of the green turtles as the carcasses were still fresh. One of them matched an individual in our database named Vicky, a male adult green turtle that was always seen feeding at Teluk Pauh since 2015. Vicky was reported stranded on 17 June this year by Mr. Tan, the General Manager of Perhentian Island Resort (Figure 15C). According to Mr. Tan, one of his guests witnessed a boat that was speeding really fast towards the shoreline had stopped abruptly before arriving to the beach, and a moment later, a guest found a stranded turtle at the bottom of the boat incident. Vicky was found dead when our team arrived at the scene. Necropsy report showed that Vicky was very healthy with a lot of dark green fat, and nothing was found in his stomach other than a small piece of fishing line along with a lot of seagrass. The carcass was then buried (Figure 16).

Meanwhile, the only juvenile hawksbill was found entangled in a ghost net, and the cause of mortality might be due to suffocating which led to drowning (Figure 15A). Suffocation can occur when sea turtles are trapped in fishing nets or fishing gear or when they have problem with ingestion that might be due to marine debris, causing indigestion. Many turtles either drown before they can be removed from the net, or are killed by fishermen to avoid from damaging the nets and usually the carcasses are dumped in the sea (Mortimer 1989). The cause of mortality is unknown for the remaining 11 green turtles either because no external injuries were found or the carcass has already decomposed.

The reported stranded cases in 2017 showed that the majority of dead turtles found around Perhentian Islands were male turtles. This may have resulted in more turtle deaths being reported to us, but may represent an increased mortality of turtles around the islands.

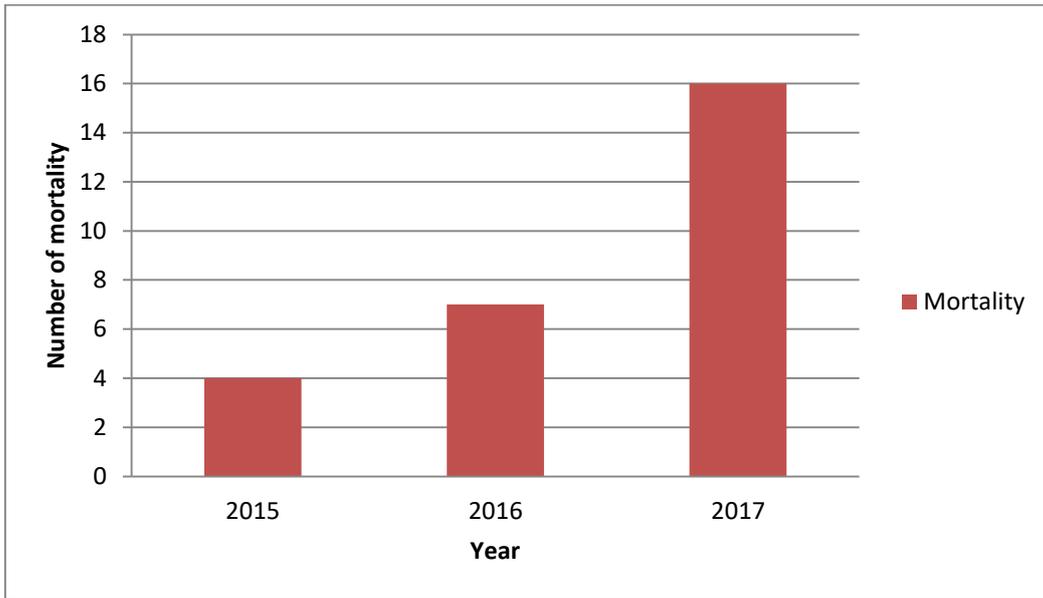


Figure 14. Mortality cases in three years.

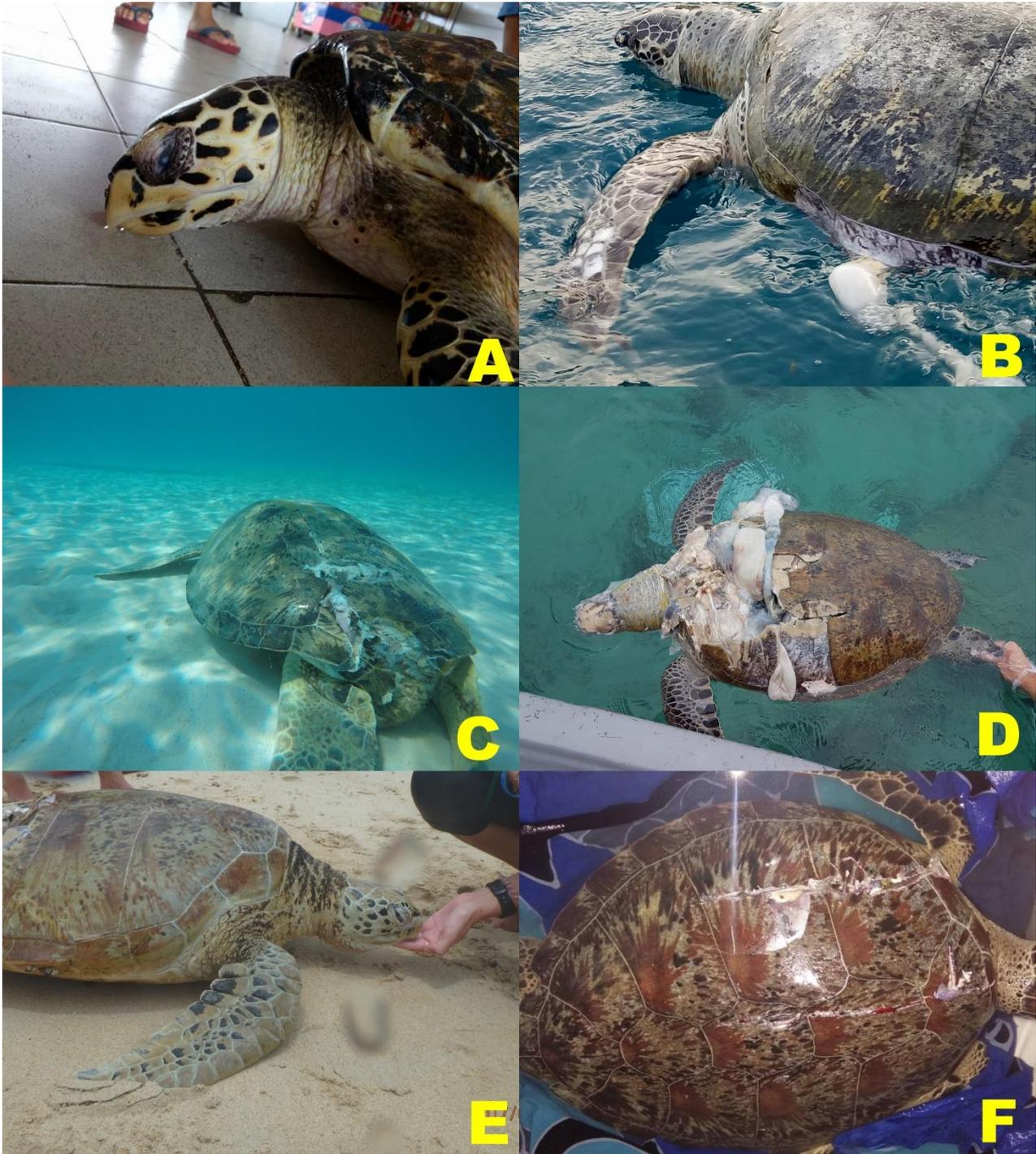


Figure 15. Recorded injuries and mortalities: a juvenile hawksbill turtle found died entangled with a ghost net in front of Kampung Nelayan Jetty (A); a dead adult male green turtle in front of Perhentian mosque without any physical injury (B); a dead adult male green turtle died because of boat strike at Teluk Pauh – Vicky (C); a dead female green turtle found dead in front of Mira Beach, most possibly cause by boat strike (D); a dead female green turtle found dead with injuries near the rear flipper, the crack on the carapace most possibly cause by boat collisions (E); a small female green turtle , possibly sub-adult died because of hit by boat at Teluk Dalam, it was rescued but a few hours later died, the strike hit near the lungs and in the middle of carapace (F).

A few nesting beaches like Teluk Keke, Pantai Tiga Ruang, Pulau Rawa, Pasir Panjang and Tanjung Butong are popular beaches for tourists. There were a lot of plastics, polystyrene, styrofoam, bottles and fishing nets along the beach. This situation is worsening during peak season which is June and July. Littering caused by sources inside the marine park is a big problem in the Perhentian Islands. Turtles mistaken drifting plastic bags and other rubbish as food and may eat them, and thus causing digestion problems which may lead to suffocation. Furthermore, litter and discard food waste on the beaches can disturb nesting turtles, obstacles to dig egg chamber, increase food sources and hence attract higher ant population, monitor lizards, ghost crabs and may directly harm hatchlings and turtle eggs.

Perhentian Islands is one of the famous islands in Malaysia. Many local and international tourists visit the islands. However, the number of tourist has been increasing over the years, and not many of them are aware of the marine park rules. Some people do not follow eco-friendly practices when they are in the water. Irresponsible snorkelling/diving behaviours, including chasing and/or touching sea turtles in the water, using flash or approaching the turtles too close to take photos, can cause stress or disturbance to the turtles. Sometimes, when a sea turtle came to nest at long beach, a lot of people approached and taking photos with flash. Villagers and boatmen have being responsible and guide the tourist to behave appropriately in the water. Some boatmen are certified Eco-Snorkel Guide by Reef Check and Marine Park.



Figure 16. Teluk Pauh (Turtle Bay), a popular stop for turtle watching, is always crowded especially during the peak tourist season. During the peak season, more than 15 boats where each boat carries 10-15 tourists stop at one time to watch turtles. A lot of people would crowd around a turtle, and even chase and touch the turtle. Some boatmen cross the buoy line, driving into designated areas for snorkellers and swimmers, which is very dangerous.

Conservation Programmes

Beach Clean-Up

Throughout this season, we did beach clean at different beaches around the Perhentian Besar and Perhentian Kecil at least twice a week. We tried to choose locations where there are less resorts, this is because as we as a project we do not want to get relied on to clean up the beaches. During each clean up, around three to 8 volunteers joined to collect as much rubbish as possible in trash bags, which were disposed of properly after the clean up.

This season we have completed at least 35 beach cleans in total at 13 beaches around Perhentian Islands (Figure 17). In the beginning of the season, we spent most of our time cleaning up the nesting beaches as huge amounts of rubbish was washed ashore during the monsoon. Our most common beach visited being Teluk Keke on the Big Island, which we visited 8 times. This is also the location that the most amount of rubbish was collected in one visit, comprising of 26 big trash bags. The overall total of rubbish collected is 271 trash bags, with Tanjung Butong and Teluk Keke being the two major contributors (Figure 20). The rubbish was mostly left behind by the visitors or washed up ashore.

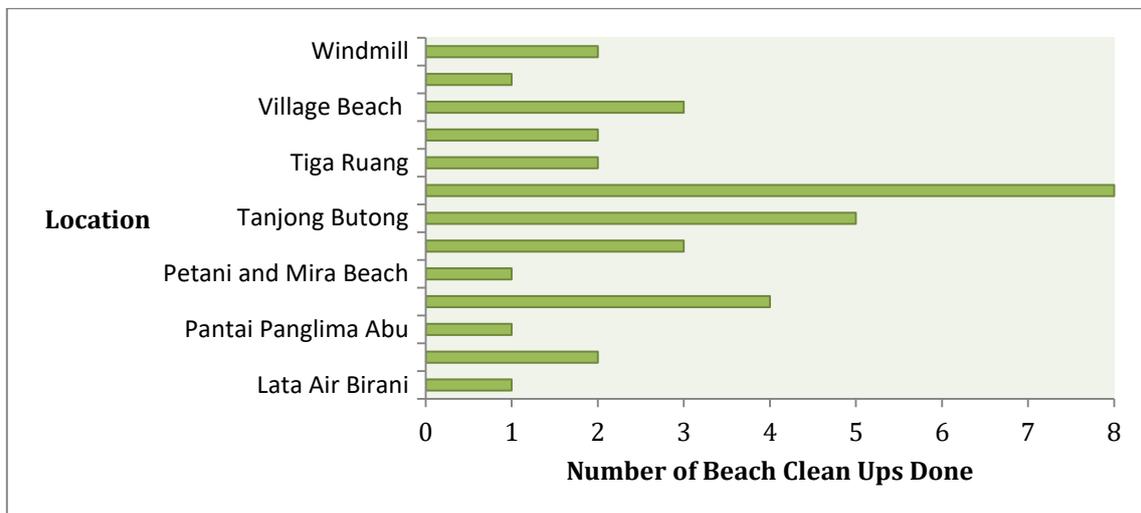


Figure 17. Total number beach clean ups conducted Perhentian Turtle Project during 2017 season around Perhentian Islands.

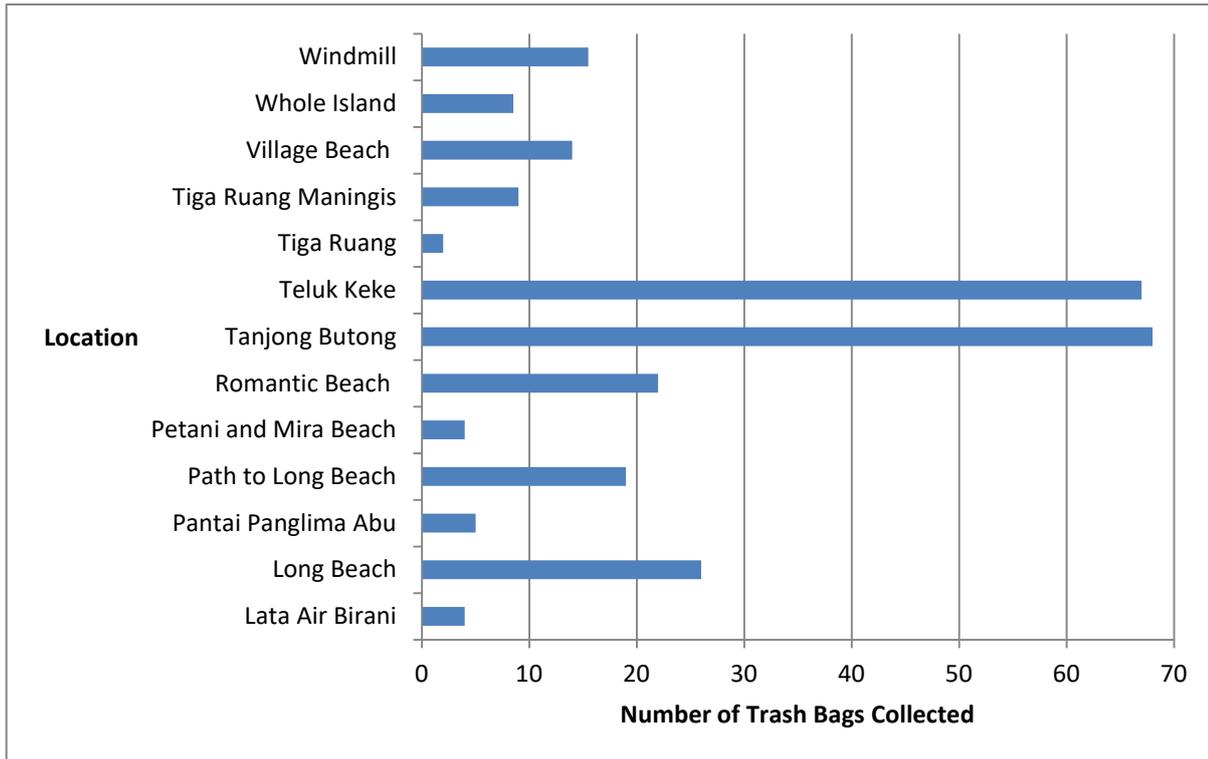


Figure 20. Total number of trash bags collected by the project around Perhentian Island in the 2017 season.



Figure 19. Beach clean-up pictures around Perhentian Island; beach clean-up at Pantai Tiga Ruang (A); beach clean-up at Teluk Keke with our volunteers (B); managed to collect 22 bags of rubbish at Tanjong Butong (C); more than 10 bags of rubbish collected along the pathway/trek from Kampong to Long Beach (D); collected drift bamboos at Pantai Tiga Ruang and some rubbish collected underwater (D); a plastic bottle took from a beach filled with 1111 cigarette butts collected at Teluk Keke for the cigarette butts challenge.

Towards the end of the season, we have started to use the Clean Swell application to record the different types of rubbish collected, which contributed to a larger database which looks at what kind of waste is the most common. Besides that, we started the Cigarette Butt Challenge, which involved spending 30 minutes collecting cigarette butt ends and filling them up in a plastic bottle. This was often done during beach cleans and free time.

In the middle of the season, our team started to use Clean Swell application on smart phone. Despite only using it four times it gives an overall look at what proportion of waste we are finding at the Perhentian Islands. The three most common items collected were small bits of plastic/polystyrene 35%, Plastic Bottles 17% and Fishing Gear 12%.

REALLY NO CIGARETTE BUTTS?

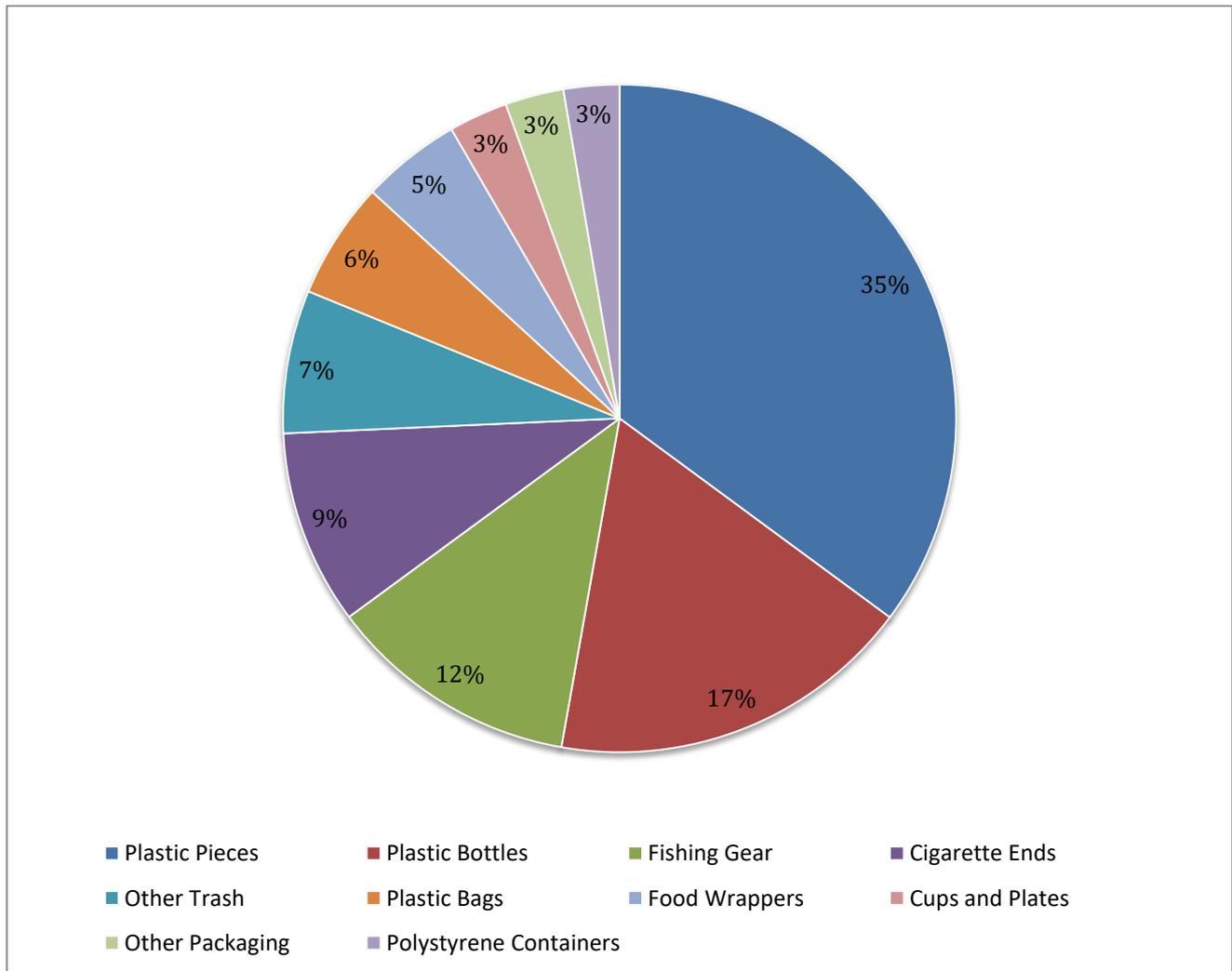


Figure 21. Top 10 types of rubbish collected by our team during beach clean ups using Clean Swell application on smartphone.

Cigarette ends were the fourth most collected piece of rubbish from the four beach clean ups using the Clean Swell app. Cigarette butts have always been commonly found at Perhentian Islands, this is what made us start the cigarette butt challenge. Perhentian Marine Research Station team started the challenge and then it was our turn and in 40 minutes we collected 1,111 cigarette butts. This set off a viral trend with other projects like Ecoteer Community project and Sea Voice Divers getting involved and then us doing it again collecting 850 cigarette butts the second time. With our international school group Uplands there were three teams totalling 61 students and

between them they collected over 11,000 cigarette ends in 3 days. Overall, we collected more than 15,000 cigarette butts.

Looking at the kind of waste we are cleaning up here at the Perhentians we can now look at what effect this rubbish has on the environment. Here are a few examples of litter we collect and the time it takes for it to break down (The Balance, 2017):

- Paper/Cardboard- 2-6 weeks
- Plastic Bags- 10-20 years
- Foam Cups/Tin Cans- 50 year
- Aluminum Cans- 80 years
- Plastic Bottles- 450 years
- Glass bottles- 1 million years

This just shows how much of a problem littering is, with it taking this long for each of these materials to break down it only builds up unless people take responsibility and dispose of their waste properly. It takes 18 months to 10 years for a cigarette filter to decompose and the filters contain tar and other toxic chemicals that are trapped so they don't reach the smokers lungs, by carelessly discarding these filters pollutants get into our soils causing severe damage to the environment (Longwood.edu, 2017).

This is why the cigarette butt challenge was such a success and good idea to promote. It doesn't take long to do but the impact it can have on the local area and it doesn't have to be done at beaches, wherever people happen to be, it can be done. Cigarette Butts also effect wildlife, many have been found in the stomachs of birds, sea turtles and other marine and terrestrial animals. This is where they have mistaken the filters for food resulting in digestive problems and even death. Teluk Keke our most visited site, is a popular beach for picnics and snorkelling amongst tourists along with locals living nearby. At this beach there is no waste management or bins available, due to lack of facilities to dispose of their waste many of the people leave their rubbish on the beach or bordering tree line.

This is also the case for Tanjong Butong the second most visited site, there is no waste facilities around for any tourists visiting. However, Tanjong butong isn't as common a tourist site it still gets a lot of rubbish washed up due to ocean currents and winds. Many of the resort beaches do have bins available however, they often cannot deal with the sheer quantity of waste or people do not use them, this is especially a problem at Long Beach.

Awareness Campaign

This season, twice a week our team went to resorts and dive centres to raise awareness amongst tourists. We briefed the tourists about how to practice eco snorkelling and respecting the Marine Park rules. In fact, there are many tourists came to the islands without knowing or being aware about the Marine Park rules. They pay marine park fees, but do not know how to obey the rule at the reserved areas. Apart from that, we incorporate with boatmen, resorts and chalets in order to give safety briefing to their guests and customers before they get in the water. The safety briefings covered subjects such as the importance of life jackets, swimming within the buoy line areas, no fish feeding, degradation of marine debris, also photo identification research as well as not disturbing marine wildlife around the Perhentian Islands. Additionally the kayaks we use to conduct snorkel surveys were painted “Please Do Not Touch The Turtles” and “Please Do Not Step on Corals”.

Earlier in the season in April, our team went around the islands to distribute posters, coral and turtle banners. There were more than 40 resorts that been given the banners. At the same time, we try to make them understand how they can support and contribute their effort to conserve sea turtles at the Perhentian Islands. Not many stakeholders thought to report stranded turtles, but once the banner were distributed, almost every month, we received reports about turtle egg poaching, turtles landing to nest, sea turtles photo donation, injured turtles and also dead turtles. This is proof that the community at Perhentian Islands are concern about the marine life. The awareness campaigns are a good medium to approach the general public to raise awareness indirectly and educate the public about marine conservation. Besides, doing awareness campaigns we can engage the public by encouraging them to contribute to conservation and citizen science.



Figure 22. Our distributed banners and posters and a group photo with our awareness board after a turtle conservation talk with a group of divers.

Recommendations & Conclusion

Perhentian Turtle Project has been running since 2015 with 2017 being the third year of carrying photo-identification research, as well as conducting outreach activities to raise public awareness. The project has enabled us to better understand both in-water and nesting sea turtle populations, such as the population size, sex ratio, movement patterns, distributions, habitat use and major threats in the Perhentian Islands Marine Park.

Our project aims to establish an online database (free source) to share data collected at Perhentian Islands. The data collected might be helpful for people who want to do further research or study in the marine park areas. This season, we have signed a MoU with Lang Tengah Turtle Watch and started sharing our photo-identification database. This enables us to cover more study areas and exchange knowledge about sea turtles around Malaysian islands. We discovered one green turtle that has been feeding at Teluk Pauh and nested at Lang Tengah. The movement and distribution of sea turtles helped us to understand better about sea turtles.

Apart from that, this project has identified a few major threats to the turtles at Perhentian Islands. The finding is essential in order for us to reduce the threats that threaten the turtles and save more turtles in the future. Season 2017 showed that the majority of the dead turtles found around Perhentian Islands were male turtles which further increases concern for the population.

Some recommendations for conserving sea turtles at Perhentian Islands include:

- i) Improving the management of the hatchery regarding temperature and fences to avoid monitor lizards and ants invasions into the hatchery. If the temperature in the hatchery at Tiga Ruang is too high, significantly more females will be produced. We aim to study nest temperature for the 2018 season in order to understand better about the hatchery at Pantai Tiga Ruang.
- ii) Restricting access to Pantai Tiga Ruang after 3 pm, and providing new signboards about the protected and restricted beach.
- iii) Regular enforcement and imposing fine for harassing turtles or marine animals in the marine park.
- iv) Providing more dustbins at popular beaches for tourists like Pantai Tiga Ruang, Teluk Keke, Lata Air Berani and Windmill at Perhentian Islands.

The project was set up to collaborate with relevant stakeholders, including governmental agencies, NGOs, local villagers, business entities and tourists, to conserve sea turtles and protect their habitats. The Perhentian Turtle Project can serve as a platform to bring different stakeholders

around the islands to work together in conservation efforts. For example, through the weekly awareness campaign and beach clean-up, resorts, chalets and dive centres started to inform us on sea turtle related issues, such as reporting sighting of nesting turtles, dead turtles, incidents of turtles being disturbed in the water, etc. They also contributed turtle photos to increase data collection for our photo identification research. All the information reported were recorded and reported to the authority. Indeed, it is more efficient with the involvement of all the stakeholders in the Perhentian Islands in order to achieve conservation objectives.

We would like to thank and congratulate the Fisheries team who did a wonderful job in collecting turtle eggs and managing the hatchery and allowing us to assist and collect data since 2015. In 2018, we would like to propose continuing its photo identification research by covering more survey areas around the islands. Firstly, conducting sea turtle necropsy to better understand the cause of death of any dead turtles found. NGOs around Malaysia and government agencies were invited to join the necropsy workshop co-organised with FRI and DoF , which was really helpful for people like us working on the ground to improve our knowledge and skills. Secondly, to investigate the sex ratios of hatchlings by measuring nest temperatures.

Lastly, the Perhentian Turtle Project welcomes other interested stakeholders to establish photo-identification research at their project sites with collaborative possibilities for joint databases to improve understanding of sea turtles in a wider geographical scale. This will help us to understand better about sea turtles in Malaysia and discover more about their behaviour and movements by fully utilize the photo identification method.

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