

JUARA TURTLE PROJECT

FINAL REPORT OF THE 2017 SEA TURTLE NESTING SEASON ON TIOMAN ISLAND, MALAYSIA

Submitted to Juara Turtle Project, Marine
Fisheries Department of Malaysia and Marine
Park Malaysia

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Juara Turtle Project
Tioman island,
Malaysia

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1. INTRODUCTION

Juara Turtle Project (JTP) is an NGO that started as a Government (Fisheries Department Malaysia, FDM) operated hatchery in 2001. FDM has and does operate many hatcheries around Malaysia since the 1970's. The Juara hatchery only had a 5 year operation contract, so in 2006 as it was closing down, John Amos adopted it into his Riverview & Lagoon chalet locations and immediately he got the support from United World College SEA (UWCSEA) in Singapore. In 2008 after getting some involvement from the Royal Family of Pahang State via their conservation initiative TAT, a new center for the turtle project was conceived and constructed by John Amos, Charles Fisher, and Tom Wuebbens. Since 2009 the project has been involving volunteers and student groups.

Since 2006 we have been striving to improve our methods and techniques. Many of these improvements are for hatchery operation and community relations. Operating staff in 2017 consisted of Operations Manager: Nur Izzati Roslan (Malaysia), Assistant Manager: Daniel Yap (Singapore), Hatchery Manager: Alberto García (Spain) and Community Officer: Nur Asfarlela Mohd Basir (Malaysia), with the addition of seasonal staffing, long term volunteers, and University student interns.

The objectives of this report are to summarize and discuss the results of the 2017 Sea Turtle Program, evaluate the achievements and deficiencies of the program and provide recommendations for future conservation efforts and sea turtle research activities in Tioman Island.

2. METHODOLOGY

The nesting season on the east coast of peninsular Malaysia is highly influenced by the monsoon season. This phenomenon occurs every year from November until February and is during this period when sea turtles are not able to lay their eggs. The monitoring was conducted from March to October along several beaches on Tioman Island, and including Coral Island. In total, seven beaches were surveyed in 2017, four around the east coast of Tioman and three in Coral Island.

2.1. The study area

Tioman Island, or Pulau Tioman, is a small island (39 km long and 12 km wide) located off the east coast of peninsular Malaysia (see Figure 1). It is the biggest island out of the whole archipelago, and also one of the nesting locations with a higher number of mother turtles on this area.

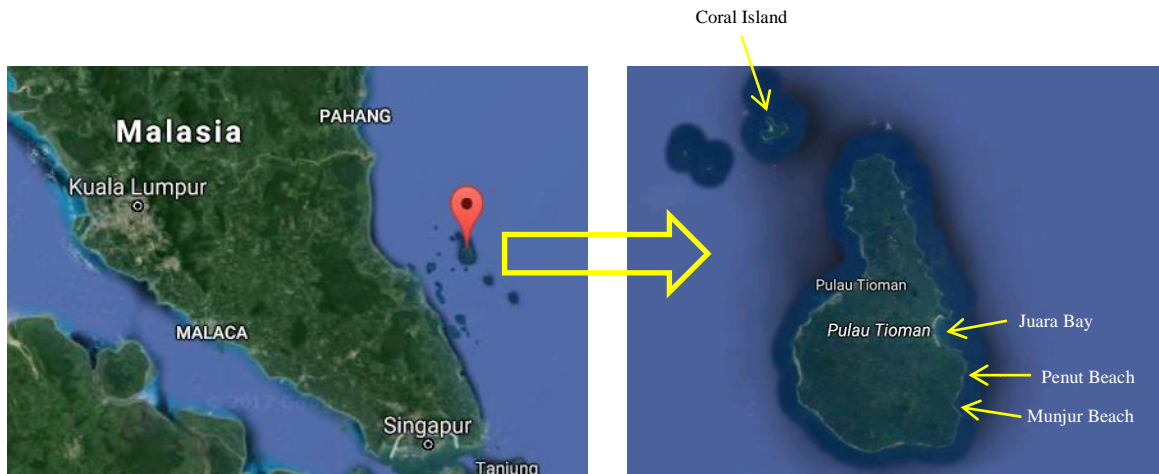


Figure 1. Map of Peninsular Malaysia and detail of Tioman Island

In Tioman, nesting used to occur all around the island, but now only 4 significant nesting beaches remain: Munjur, Penut, Mentawak and Barok. However, their nesting counts are catastrophically lower comparing with the past. Additionally, Tioman used to receive the four species of sea turtles that nest in Malaysia: Leatherback (*Dermochelys coriacea*), Green turtle (*Chelonia mydas*), Hawksbill (*Eretmochelys imbricata*) and Olive Ridley (*Lepidochelys olivacea*, but in the last 20-30 years has been reduced to only two: the endangered Green turtle and the critically endangered Hawksbill turtle (listing by IUCN & CITES). Tioman is quickly losing its turtles: their nesting sites, arriving species, and overall population count. JTP is now conducting night surveys and morning boat surveys in 7 nesting locations: four in Tioman Island and three in Coral Island.

Kampung Juara, where the hatchery was based to protect the eggs 11 years ago, is divided in two beaches: Barok and Mentawak. For many years, Barok has been developed along the beachfront with a standard amount of lighting, cleared vegetation, and noise pollution. Due to this disruption of habitat turtles do not nest on Barok like years ago, just a few hawksbills and green turtles still nesting. Mentawak is the longest beach (one kilometer long) and, conversely, has had considerably less development and activity; thus continuing to record a small, but comparatively, significant number of nesting females each year. Mostly green turtles, but also hawksbills, approach to this beach to lay their eggs.

Penut and Munjur are two beaches located on the south of Juara, between Juara and Mukut, and both are inhabited remote locations, so sea turtles are more able to nest here because there is not light pollution. Penut, a beach under 100 meters, receives only hawksbill turtles, whereas Munjur, a shorter beach, receives mainly green turtles, and the reasons are unknown, but probably it is related with the shore morphology.

Coral Island, or Pulau Tulai, is a small island located on the north-west of Tioman. Like other islands on the east coast of peninsular Malaysia, is known that Coral Island receives some nesting turtles.

There are not enough data about the number of nests found in Pulau Tulai in the past, but based on fisherman interview there were estimated between “at least 20 nest per year” to “15 nests per month during the season”. Nowadays, there are three potential nesting beaches that still receiving turtles: Teluk Bakau, Pasir Panjang (the common name used to refer the beach in front of Batu Malang Tikus) and Teluk Genting.

2.2. Monitoring and egg collection

Depending on the location, the monitoring was conducted walking or by boat, and because the inter-nesting period of the sea turtles is known (10 days approx. for green turtle and 14 days approx. for hawksbill), it is possible to predict when the nesting turtles will return. Here is described the survey protocol carried out in each beach.

Mentawak was patrolled walking every night from March to October during high tide (it was demonstrated most of the turtles emerged at high tide), and also every morning at 5:30 to check that there were not more turtle activities. Barok, however, was only patrolled when it was expected to receive a turtle. In this situation, the number of patrols was increased in both beaches until the turtle was found, trying to collect the eggs as soon as possible to relocate them immediately into the hatchery.

The monitoring on Penut and Munjur was completely different. It was carried out every morning by boat and sometimes at night. It takes around 20 minutes to get there (depending on the weather conditions) and, depending on how was the tide, it was possible to approach to the beach with the boat or not. The tracks could be visualized from the sea; what means, only when there was a track the beach was checked walking. When it is low tide, a reef barrier emerges out of the surface; for this reason, if a nest was found, the only way to reach the beach is swimming. Therefore, during 2017, JTP conducted night surveys when a nesting turtle was expected to collect the clutch as soon as possible and to tag the turtle, and it was only possible at high tide.

In Coral Island, the surveys consisted in morning patrols at 5 am or night patrols when a nest was expected. During the first half of the season, the location was monitored twice or three times a week, whereas during the second half, June-September (it corresponds with the peak nesting season), every day. If a turtle was expected, JTP staff spent sometimes more than 5 or 6 hours on the beach waiting for the nesting turtle.

Then, the protocol for the egg collection was the same for all the nesting locations. The eggs were always collected by JTP staff and transported to the hatchery using a box, to minimize the impacts on the eggs. Despite the amount of night surveys increased during the present year, sometimes the nests were found a few hours after having been laid, what means the embryo development started before the eggs were collected. For this reason, it is very important to transfer the eggs into the box with no rotation. Sand was deposited on top of the clutch to prevent the movement of the eggs.

2.3. Hatchery management and egg relocation

Several threats affect negatively the populations of sea turtles around the world, being human threats the most destructive, such as light pollution, poaching, fishing nets, boat traffic, etc. Two important threats still affecting to the sea turtle conservation efforts in Tioman: poaching and natural predators, making the necessity of having a sea turtle hatchery.

The hatchery was located on the highest part of the beach, protected from the high tides, and controlled by JTP staff. It was 25 meters long and 10 meters wide, having capability for around 100 nests, and divided in four different areas (see figure). Each area had a different shade, representing the natural location for the nesting turtles. The gender of sea turtles, like in other reptiles, is determined by the temperature. In Tioman, most of the turtles nest under shady areas; but each nesting location has a different light time, inducing a different temperature in each location.

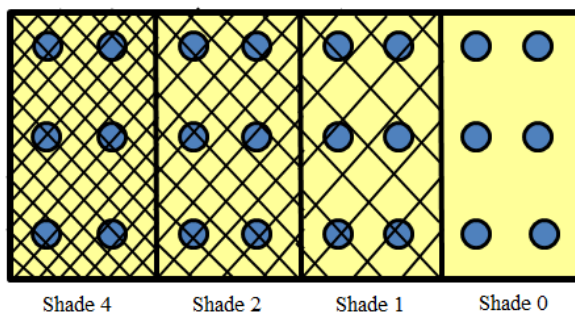


Figure 2. Diagram of the 2017 hatchery

The hatchery was surrounded with a mesh to avoid the entry of any kind of predator or human, and each nest was also fenced to prevent the escape of the hatchlings. It was checked by visual observation multiple times per day, and when hatchlings were found outside they were immediately released.

When a nest was found, it needed to be relocated into the hatchery to guarantee a total protection. Measurements were taken from the bottom and top of the eggs to the surface in the original nest, trying to reproduce the same nesting conditions into the hatchery, what means we relocated the eggs at the same depth than the original nest. The eggs were transferred one by one into the hole with no rotation by JTP staff and the help of volunteers.

2.4. Biometric data collection

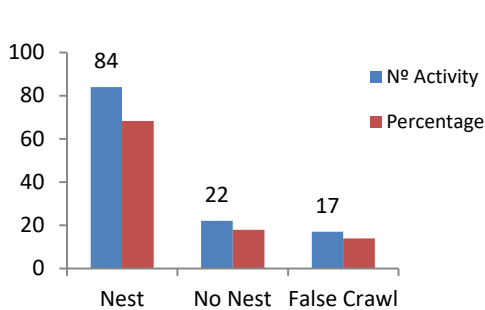
In order to estimate the size of the nesting turtle population, biometric data of nesting females and their nest are recorded during night patrols. These data include nest collection time, nest relocation time, date, width of the track, specie, tag number if existing or new, dimensions of the shell (length and width) and a body check to determinate any damage or distinctive features of the turtle. Other data included nest depth, number of eggs, and beach zone (shade or sun).

After a nest hatched into the hatchery, 10 hatchlings were measured (length and width), and three days after that, the nest was excavated. The aim of an excavation is, first of all, to determinate the hatching success rate (HSR) and emergence success rate (ESR), and second to evaluate why some eggs didn't hatch.

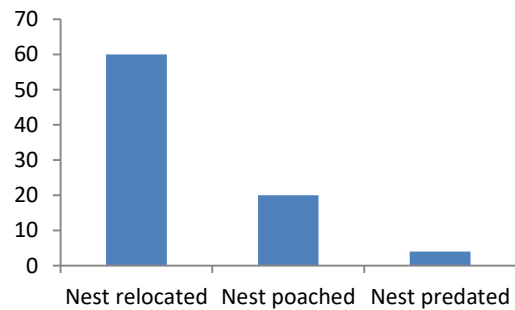
3. RESULTS

3.1. Summary of activities and nests

During the 2017 season, 123 crawls were recorded in all the different nesting locations. 84 were nests, but only 60 of them could be collected by JTP staff; 4 were nests predated and the remaining 20 were poached. "No nest" refers to those activities when the nesting turtle tried to nest, but before laying she turned back to the water, and False crawl corresponded to those activities in which the nesting turtle came out from the water but it went back immediately, before digging a body pit.

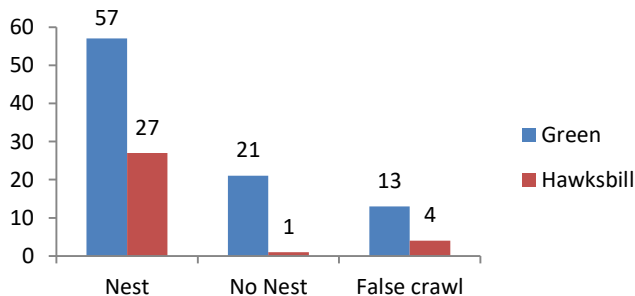


Graphic 1. Number of turtle activities in 2017



Graphic 2. Relation between nests collected, nests poached and nests predated in 2017

Comparing the turtle activities of the two species that still nesting on Tioman (green and hawksbill), the number of green turtle nests was notably higher than hawksbill nests (see Graphic 3). The number of "No nest" was notoriously high due to the presence of a green turtle with internal problems, causing every time she tried to nest it was impossible for her.



Graphic 3. Sea turtle species activities in 2017

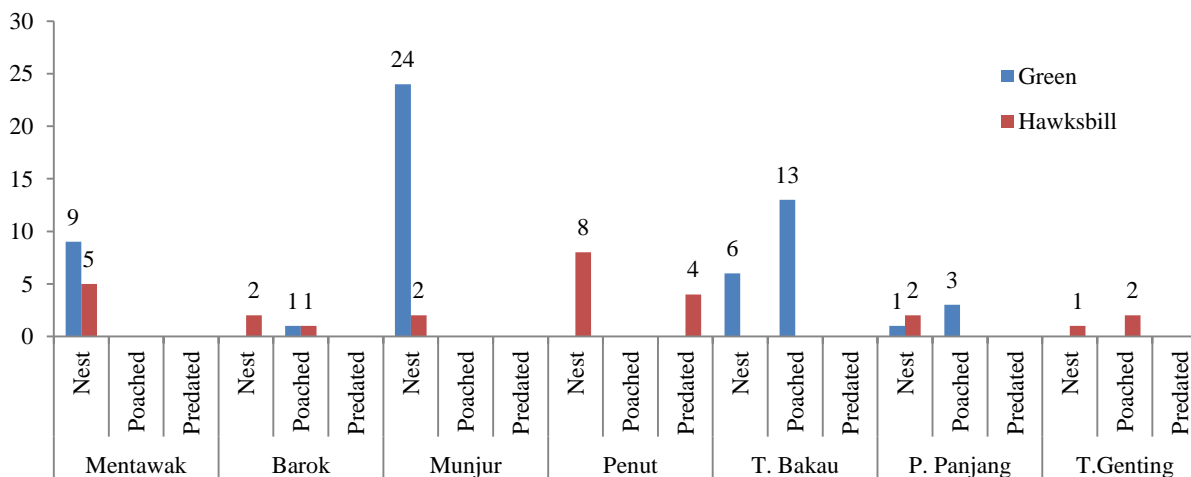
The number of false crawls and “no nest” are significantly lower than the number of nests (see Graphic 3). The Graphic 4 is a comparison between the number of nests collected with the number of nests poached and predated. JTP staff collected 60 nests out of a total of 84 during 2017. The number of nests poached, 20 (24%), was significantly big, especially in those beaches around Coral Island, due to the higher presence of villagers and fishing boats.

Over a total of seven nesting beaches, four belong to Tioman Island and three to Coral Island. Considering Juara Bay as a whole nesting location, compounded by Mentawak and Barok beaches, 21% of the total nests were found there. Munjur received the largest number of nests, mostly green turtle nests, whereas Penut received 12 hawksbill nests. Coral Island was persistently monitored for the first time in 2017 and, if it is considered as one nesting location, 28 nests (33%) were found there, but only 10 could be collected.

Table 1. Nests found and nests collected in each nesting location in 2017

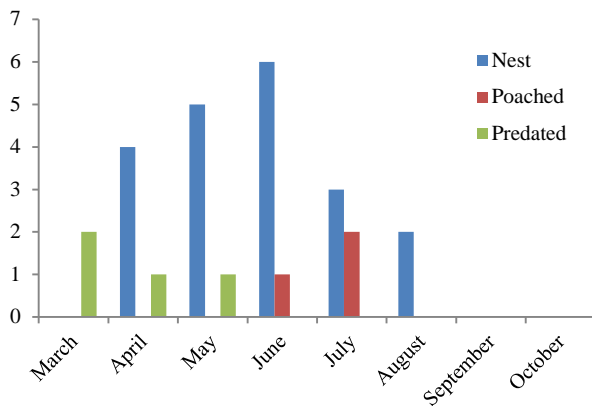
	N° Nests	%	Nests collected	%
Juara Bay	18	21,43	16	19,05
Munjur	26	30,95	26	30,95
Penut	12	14,29	8	9,52
Coral Island	28	33,33	10	11,90
TOTAL	84	100	60	71,43

The following graphic analyzes the number of nests collected by JTP, nests poached and nests predated in every beach with respect to the previous table. Whereas in Munjur all the nests found were collected, in Penut four nests were predated at the beginning of the season. Mentawak received considerably more nests than Barok; however, two nests were poached in this beach. It should be noted that Coral Island groups the largest number of nests, but Teluk Bakau turned out to be the beach which received most of the nesting turtles. Nevertheless, many nests were poached, especially on this beach.

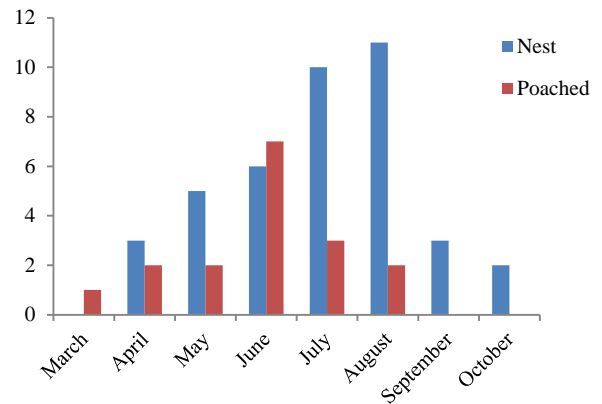


Graphic 4. Relation between nests collected, poached and predated in each location

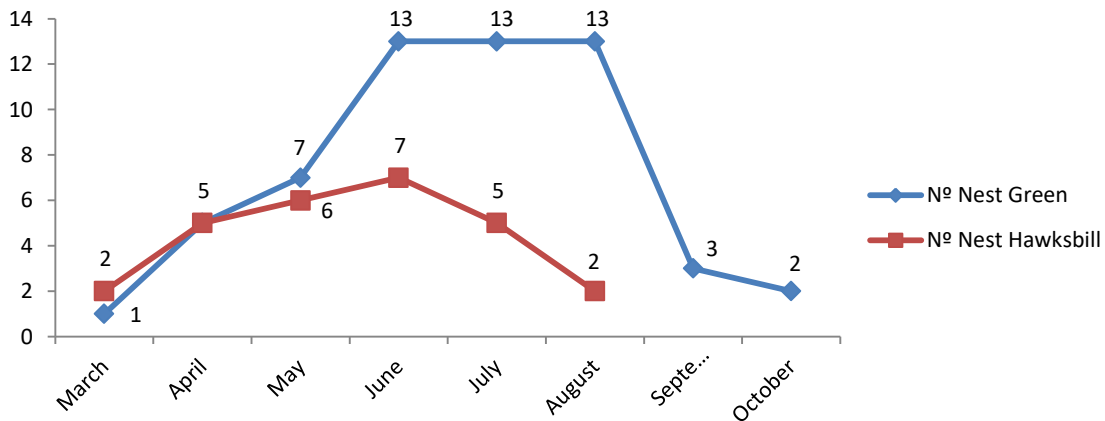
Due to the longer monsoon season in 2017, the first turtles appeared late on March. But was in June when a considerable amount of nesting turtles was received. Considering both species separately, the nesting peak for hawksbill turtle corresponded to June, whereas for green turtle corresponded to August. The nesting season for hawksbill started earlier (7 nests during the first two months) than for the green, but it also finished two months before. It is important to highlight the number of poached nests, especially in June. As is showed in the previous graphic, most of the nests poached occurred in Coral Island, specifically in Teluk Bakau. 4 hawksbill nests were predated by monitor lizard early in the season, they all in same beach.



Graphic 5. Hawksbill nests collected, poached and predated per month in 2017



Graphic 6. Green turtle nests collected and poached per month in 2017



Graphic 7. Total nests collected per month along 2017

3.2. Female nesting turtles and population size

Over a total of 123 activities recorded in 2017, only 41 encounters were registered, of which, 34 corresponded to green turtles and 7 to hawksbills. 5 green turtles and 3 hawksbill turtles were newly tagged and only 1 hawksbill was previously tagged. Due to the remoteness of the beaches, there was a very low chance of spotting a nesting turtle and thus making the tagging process quite difficult.

34 encounters were registered in Mentawak beach (30 corresponded to green turtle and 4 to hawksbill), whereas the 7 remaining were registered along the other different locations: 2 in Penut, 1 in Teluk Bakau, 2 in Pasir Panjang, 1 in Munjur and 1 in Barok.

Despite 84 nests were recorded, the nesting female population size is estimated between 17-22 individuals, meaning the population size is consider small.

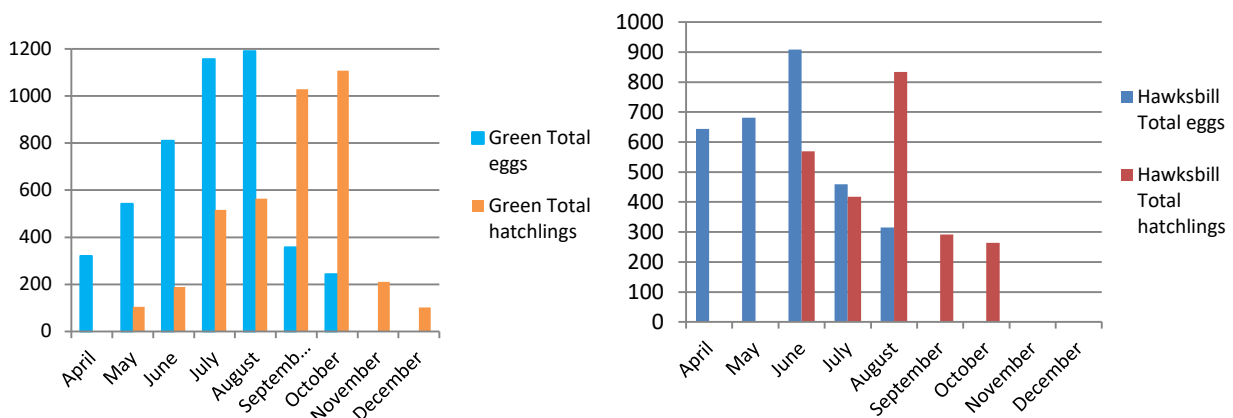
3.3. Determination of hatching success rate (HSR) and emergence success rate (ESR)

During 2017, a total of 7628 eggs were collected and 6201 hatchlings were released into the ocean, of which, 4620 eggs and 3824 hatchlings corresponded to green turtle, and 3008 eggs and 2377 hatchlings to hawksbill turtle. The HSR, which corresponds with the number of hatched eggs over the total eggs, was 82.5; whereas the ESR, or the number of hatchlings emerged from the nests, was 78%.

The HSR was a bit different for green than for hawksbill, being 83.67% for green turtle and 80.14% for hawksbill.

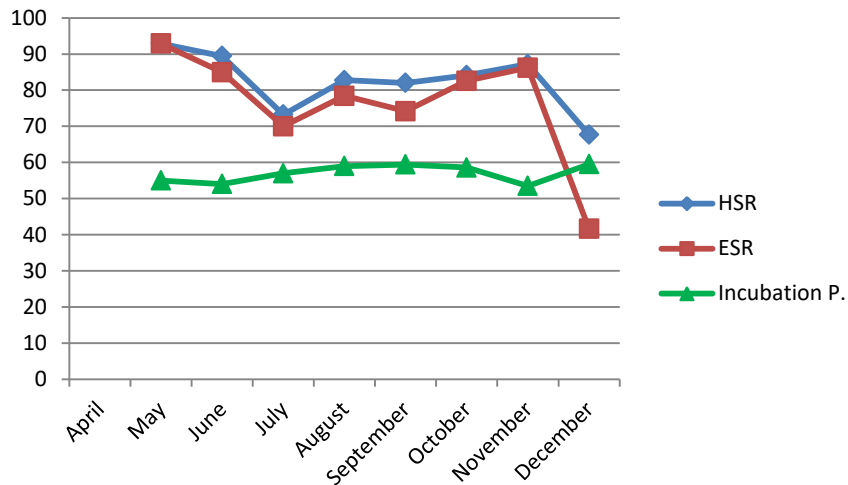
Table 2. Summary of eggs collected, hatchlings released and HSR and ESR per month in 2017

Month	Eggs	Hatchlings	HSR	ESR	Incub. Period
April	965	-	-	-	54
May	1223	105	92,92	92,92	57
June	1719	758	89,44	84,98	59
July	1615	935	73,24	69,99	59,4
August	1506	1398	82,75	78,41	58,6
September	357	1321	82,03	74,16	53,5
October	243	1372	84,15	82,6	59,5
November	-	210	87,21	86,23	-
December	-	102	67,64	41,61	-
TOTAL	7628	6201	82,4927	78,0253	57



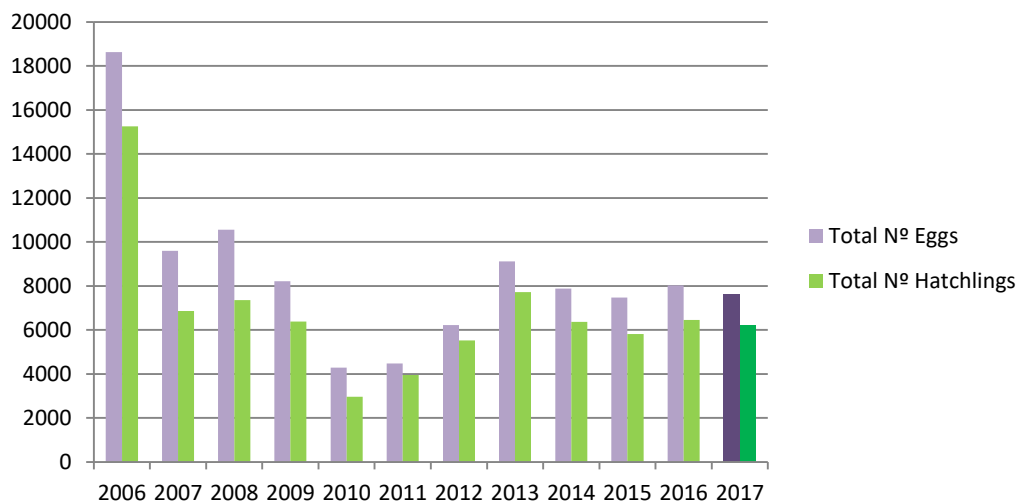
Graphic 8 and 9. Number of green turtle and hawksbill eggs collected and hatchlings released per month in 2017.

The nest incubation period was around 57 days, but for those nests laid in April and September, it was significantly lower due to shortage of rainfall. The average HSR and ESR were within the normal parameters, but specifically the HSR was the highest since 2013. The ESR, or number of hatchlings that can reach the water by themselves, was quite similar to the HSR, except for those nests hatched in December because they were attacked by red ants.



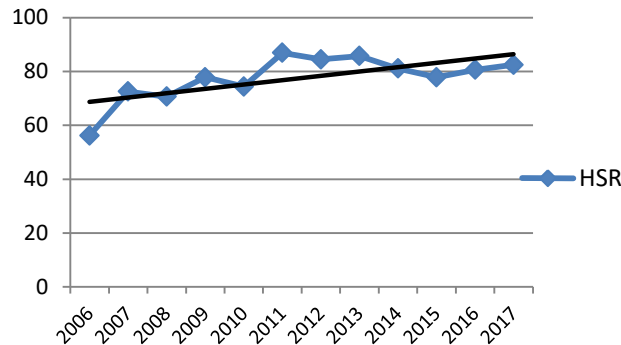
Graphic 10. Variation of HSR, ESR and incubation period along 2017 season

Comparing these data with the past, we observed that the number of eggs collected and hatchlings released in 2017 corresponded with the average since 2012. Nevertheless, during the previous years (2006-2009), it is important to highlight the remarkable difference between these two parameters, due to the different origin and handling of the eggs.



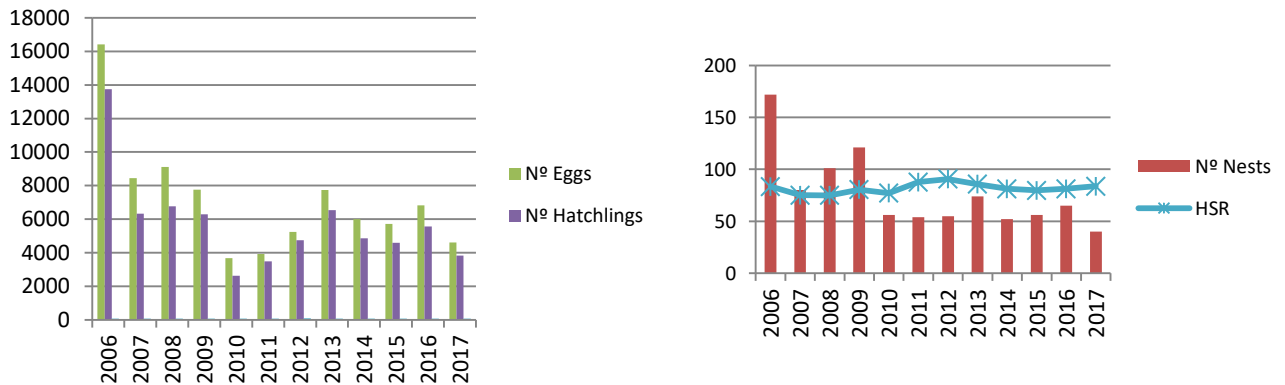
Graphic 11. Summary of eggs collected and hatchlings released since JTP was created

The following Graphic shows the increment of the average HSR along the different years since JTP is protecting sea turtle eggs. There was an increase of more than 20% in last 10 years, and the trend is positive for the future.

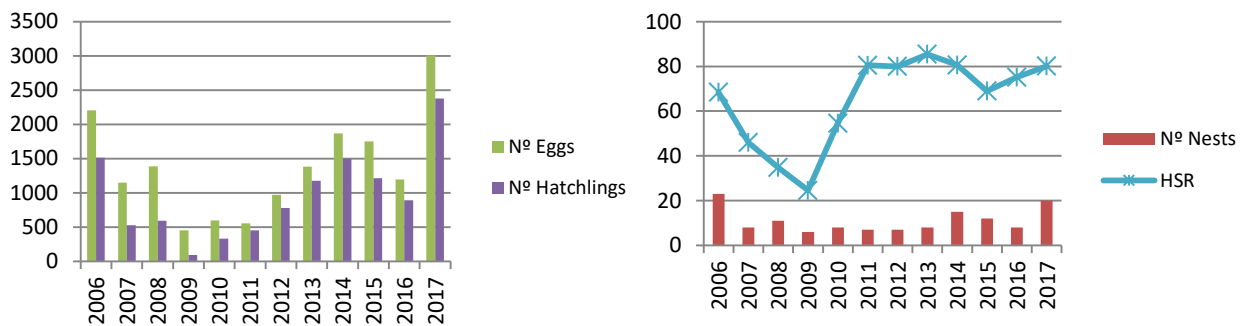


Graphic 12. Variation and trend of the HSR since JTP was created

Analyzing these data between the two different species, we observe some differences. The number of nests and eggs has decreased in last eleven years for green turtle but has increased significantly for hawksbill turtle. The HSR is quite similar for green turtle but for hawksbill, was especially higher in 2017 than in the previous years, considering the higher number of nest collected this year.

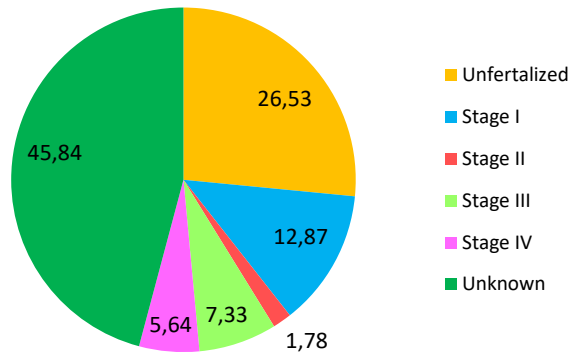


Graphic 13. Summary of Green turtle eggs collected, hatchlings released, and nests collected and HSR



Graphic 14. Summary of Hawksbill turtle eggs collected, hatchlings released, and nests collected and HSR

Some eggs didn't hatch due to multiple reasons, which could be natural, like predation or excess temperature, or caused by humans, like rotation of the eggs. These causes triggered the stop of the development at some point. In the following graphic, we present what was the percentage of unhatched eggs in each stage.



Graphic 15. Summary of data from nest excavations in 2017

Some predators, like fungi or bacteria, were very often present on the unhatched eggs, whereas others, like crabs or maggots, appeared temporally.

Table 3. Summary of egg predation in 2017

Predator	N° eggs predated
Fungi/bacteria	755
Crab	456
Ants	38
Maggots	478

4. DISCUSSION

During 2017, a total of 123 turtle activities were registered by JTP staff. 60 of them were nests collected and successfully relocated, of which, 40 corresponded to green turtle and 20 to hawksbill. Besides that, 20 nests were poached and 4 were predated. Almost half of the nests collected were found in Munjur beach, which is the most important nesting location in terms of nest density on this area. In Coral Island, Teluk Bakau received the highest number of turtles, although many of these nests were poached. Furthermore, Mentawak received in 2017 nesting season a considerable number of mother turtles, especially hawksbill, compared to last few years.

Juara Turtle Project started protecting sea turtles in 2006. Nevertheless, after eleven years the way of working is quite different. We observe in Graphic 13 the number of eggs collected has decreased notably in 10 years, because of the different egg harvesting techniques and the different precedence

of those eggs. Between 2006 and 2009, local collectors harvested eggs from multiple locations and they sold them to JTP. Sometimes, these eggs were relocated after long periods of have been collected and that is why, during this period, we observe the highest number of eggs but the lowest HSR, what means the handling and techniques were not effective enough. Conversely, between 2010 and present, local collectors have harvested eggs exclusively from Tioman Island, and these eggs are immediately relocated by JTP staff. Hereby, the number of eggs and the HSR has increased significantly from 2009, especially of hawksbill turtle, going from 600 eggs in 2010 to 3008 in 2017. The trend for green turtle nests between 2010 and the present is more or less uniform.

Notably, the green turtle nests in 2017 are lower than in the past. We have observed that in previous years, the nesting season for green turtles started early in the year, sometimes in January or February. This year, the green turtle nesting season started very slowly; the level of nesting in March and April was very low, and started to improve during May. It could be due to the longer monsoon season the first turtle arrived later than other years.

On the other hand, hawksbill nesting season started before the green turtle season, receiving 7 mother turtles in the first 2 months, but it is also late according to last year, for example. The number of total nests have increased considerably in 2017, but it is necessary to wait a few years more to establish a positive balance in terms of population size. Although the number of green turtle nests has decreased this year, the number of total nests, eggs collected and hatchlings released corresponds with the average of previous years.

Unfortunately, one of the biggest problems JTP found throughout this year was the illegal harvesting of eggs or poaching, especially in those beaches around Coral Island. During the weekly surveys there was an increase in the number of nests poached as the season progressed, with 8 nests taken just in July. 20 nests out of 84 were collected illegally, what represents a 24% of the total. Some fishing boats and local boats from Salang and Tekek were seen approaching to the different beaches, and sometimes people spent nights on the beach waiting for the mother turtle.

The period during which night patrols were conducted, from March to the end of October, covers the totality of turtle nesting at Tioman Island and it is suggested that they continue during the same period in the future. Nevertheless, Coral Island was not possible to survey, periodically, after August due to weather inclemency.

The number of green and hawksbill encounters was higher than in the past due to night boat surveys were conducted to Coral Island and Munjur and Penut beaches. The majority of nesting turtles encountered didn't have tags when first observed.

5. CONCLUSION

The data presented here shows the importance of Tioman Island for the nesting period of green and hawksbill turtles on the South-East Coast of Peninsular Malaysia. With eleven years of data compilation, we can conclude the number of nests collected and the number of hatchlings released into the ocean are increasing every year.

Although during the 2017 nesting season the number of green turtle nests collected were slightly lower than the previous years, the higher amount of hatchlings released involves a higher number of nesting turtles in the future. The effort that JTP is making in the protection of sea turtles is already shown in the increase of hawksbill population.

For the other hand, the poaching rate during the 2017 nesting season (24% of nests) was excessively high. It should note that, most of these poached nests were reported from Coral Island, and due to the remoteness of this location from Juara, it was complicated to get the nests before the locals. We will try to find the best solution to get as many nests as possible in 2018, especially from this location. There is not enough data from the past to conclude if, during this season, the poaching rate was higher or lower than in the past, but probably it was lower because of Coral Island was not even monitored persistently before.