2021 ANNUAL REPORT

LANG TENGAH TURTLE WATCH

TANJONG JARA RESORT

CONTENTS

SUMMARY

- For the second year running, Lang Tengah Turtle Watch at Tanjong Jara Resort was comprised of a completely Malaysian team.

- We are proud to announce that we have saved the greatest number of turtle eggs and nests since we started operating at Tanjong Jara Resort in 2016. This record-breaking season has seen us save a whopping 249 endangered green turtles and critically endangered painted terrapin nests with a grand total of 21,552 eggs saved.

- Nest inspections had the highest attendance amongst all our activities this year, with a total of 371 guests in attendance from mid-September to end-October when the resort reopened to the public.

- In 2021 we were able to release 16,745 endangered green turtle hatchlings and 205 critically endangered painted terrapin hatchlings, with 335 guests attending our hatchling release activities. To date, Lang Tengah Turtle Watch at Tanjong Jara Resort has been able to release over 56,000 endangered turtle hatchlings back to the sea.

- A grand total of 352.8 kg of waste, of which 103.4 kg was recyclable material, was removed from the beaches surrounding Tanjong Jara Resort.

- We were able to transition to a completely digital school outreach project, with the target audience being local students in Dungun, Terengganu, with 81 students attending our outreach activities.

- We are pleased to announce that we successfully completed the construction of our brand-new Visitors' Hut in March 2021, funded by a generous supporter of Lang Tengah Turtle Watch.

- 18 of 24 guests surveyed (75%) rated Lang Tengah Turtle Watch 5/5 and for the overall experience of the activities offered by us during their stay, with 24 of 24 guests (100%) giving a rating of 4/5 or over.

OUR TEAM

Long Seh Ling
Principal Officer

Seh Ling graduated with an MSc in Conservation & Biodiversity from the University of Exeter. She is currently pursuing a Ph.D. at Universiti Malaysia Terengganu, focusing on the sustainability of local community livelihoods and sea turtle conservation in Terengganu marine parks. She has over 10 years of experience working in sea turtle conservation and joined the team in July 2020.

Nur Abidah Zaaba
Site Co-Manager

Abidah graduated with a BSc (Hons) in Marine Science from University Malaysia Sabah. Before joining the LTTW team in June 2019, Abidah worked in turtle conservation with Reef Guardian Malaysia, based in Sabah.

Jason Gan
Site Co-Manager

Jason graduated with a BSc (Hons) in Tropical Environmental Biology from Monash University. Jason joined LTTW as site co-manager in July 2020 and oversees all outreach and fundraising activities.

Research Assistant Interns









From left to right:
Top row: Noor Aqilah, Sharifah Nur Shafiqah, Sam Yap
Second row: Lye Kit Wing, Ginny Cheok, Amelin Bhullar
Third row: Amirah Syakirah, Nurul Yusma, Alif Fahmi

	Internship period	Nationality	Current/Past Study	Comments
Noor Aqilah	March - October	Malaysian	BSc in Marine Science, National University of Malaysia (UKM)	Previous experience working in water quality studies
Sharifah Nur Shafiqah	March - October	Malaysian	BSc (Hons) in Marine Science, Universiti Sabah Malaysia	Previous experience monitoring water quality at shrimp farms
Sam Yap	March - May	Malaysian	BSc (Hons) in Medical Biotechnology, Sunway University	Previous experience working with an environmental awareness organisation, EcoKnights
Lye Kit Wing	March - May	Malaysian	BSc in Marine Biotechnology, Xiamen University Malaysia	Previous experience studying salinity on blood cockles
Ginny Cheok	May - October	Malaysian	BSc Conservation Biology, Universiti Malaysia Sabah	Previous experience as a field research assistant that focused on the restoration of logged rainforests
Amelin Bhullar	May - August	Malaysian	Degree in Psychology, Monash University Malaysia	Previous experience volunteering at several conservation organisations
Amirah Syakirah	July - October	Malaysian	BSc (Hons) in Marine Science, Universiti Malaysia Sabah	Previous experience studying species diversity in Southeast Asia
Nurul Yusma	August - October	Malaysian	BSc in Animal Resource Science and Management, Universiti Malaysia Sarawak	Previous experience working with marine megafauna
Alif Fahmi	August - October	Malaysian	BSc in Animal Resource Science and Management, Universiti Malaysia Sarawak	Previous experience volunteering at zoos and currently working with Irrawaddy dolphins

Our all-Malaysian team in October 2021.

For the second year running, Lang Tengah Turtle Watch at Tanjong Jara Resort was comprised of a completely Malaysian team. This was in part due to the closure of Malaysia's international borders and an increase in the organisation's popularity amongst local people.

Recruiting on-site interns was not an issue throughout the season as Lang Tengah Turtle Watch is considered an essential service and thus allowed to operate even through strict lockdowns.

THE BEACHES AROUND TJR

In 2021, the two beaches surrounding Tanjong Jara Resort, Tahu Tiga and Kuala Abang beaches, were under our supervision and as such, we were responsible for the protection of all turtles and turtle eggs that ended up on these beaches.

We collaborated with a local ranger, En. Rani, patrolled the beaches every night looking for nesting turtles. En. Rani and his team of experienced rangers would contact the Lang Tengah Turtle Watch team if a nesting turtle was found during their patrols.

We would then proceed to collect data on the nesting turtle, ensure their safety during the nesting process and their return to the sea, and promptly collect the freshly laid turtle eggs to be incubated and kept safe in our hatcheries. With the help of our rangers, we successfully relocated 81 and 12 turtle nests from Tahu Tiga and Kuala Abang beaches respectively into the safety of our hatcheries next to the Nelayan restaurant. This is the highest combined nesting figure recorded from these two beaches since we started operating at Tanjong Jara Resort in 2016.

A green sea turtle covering her nest after laying a clutch of eggs.

NEST ADOPTION PROGRAMME

We are proud to announce that we have saved the greatest number of turtle eggs and nests since we started operating at Tanjong Jara Resort in 2016. This record-breaking season has seen us save a whopping 249 endangered green sea turtle and critically endangered painted terrapin nests with a grand total of 21,552 eggs saved.

Of these 249 nests, 125 were adopted, predominantly by guests staying at Tanjong Jara Resort or via our Online Adoption Programme. The number of nest adoptions was heavily affected by the movement control order and total lockdown in Malaysia from May to September 2021, which occurred during peak turtle nesting season. This meant that guests could not physically visit us at our Visitors' Hut and hatcheries for a vast majority of the turtle nesting season.

Nevertheless, the Nest Adoption Programme was well received after guests were allowed back to the resort. Despite being unable to obtain any new funds to buyback turtle eggs from local tender holders and rangers, we had sufficient leftover funds from Tanjong Jara Resort guests last year and an injection of funds from the Penjana Social Impact Matching (SIM) Grant, administered by the Ministry of Finance, to allow us to continue saving as many turtle eggs as possible, even during strict lockdown conditions.

Tanjong Jara Resort guests have historically always shown the upmost support towards our Nest Adoption Programme, and this year was no different. We have already garnered a waiting list for future adopters, and these adopters will receive updates when we adopt a nest for them when the turtle nesting season begins again in mid-March next year.

A photo to be sent to a nest adopter, notifying them that some of their painted terrapin hatchlings have hatched.

A picture updating a nest adopter on the success of their nest.

NEST INSPECTIONS

Nest inspections allow us to engage resort guests and provide them with front-row seats to witness our sea turtle conservation work in person. Nest inspections allow us to explain the conservation process to guests, as well as the context of turtle conservation in Malaysia, turtle biology and their life cycle. Nest inspections are conducted on both green turtle and painted terrapin nests within our hatcheries.

Continuing from last year, we have strived to conduct nest excavations with guests. Nest excavations allow us to assess the overall success rates of each nest and provide opportunities for guests to see sea turtles at every stage of their development, from the egg stage stage all the way up to hatchlings.

In previous years, nest inspections typically took place at 10 a.m. This year, however, we trialled a new time slot at 5 p.m. and we are pleased to say that this time slot has been received well by resort guests. This could be due to favourable weather conditions at 5 p.m. instead of 10 a.m., and more guests being awake at 5 p.m. as compared to 10 a.m.

In fact, nest inspections had the highest attendance amongst all our activities this year, with a total of 371 guests in attendance (Figure 1). Given the warm reception of nest inspections this year, we will continue to carry out this activity at 5 p.m. moving forward.

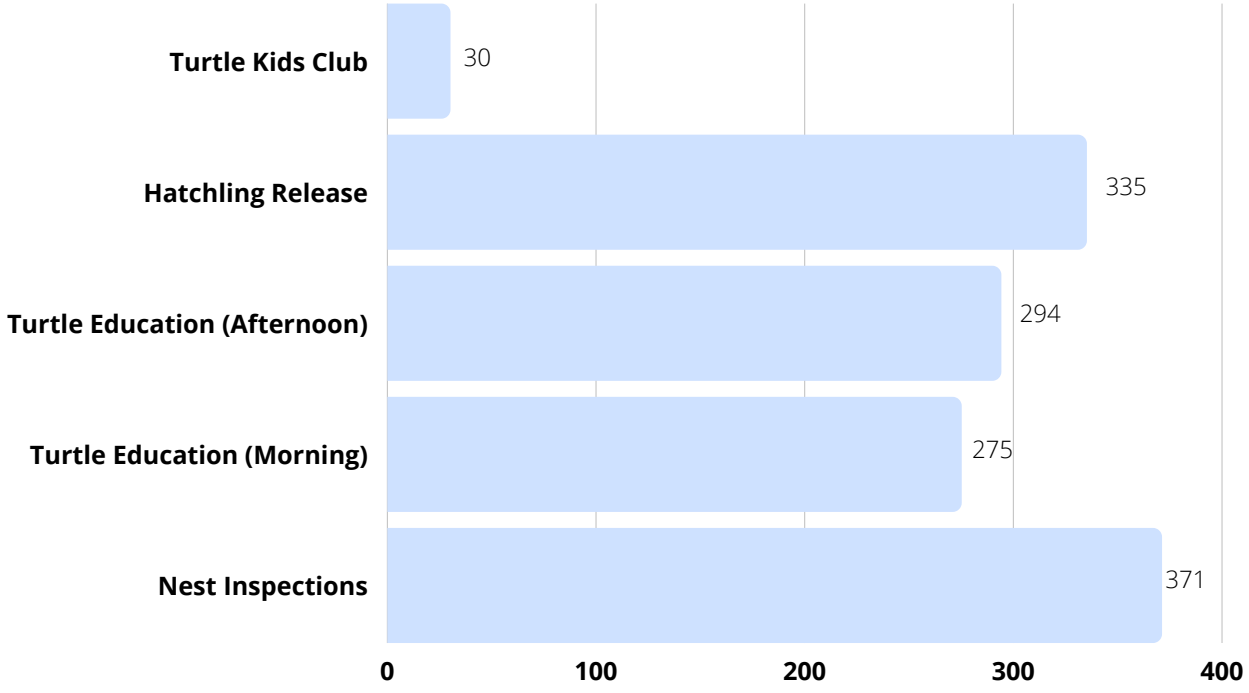


Figure 1. Number of visitors to Lang Tengah Turtle Watch's activities in Tanjong Jara Resort in 2021.

A Tanjong Jara Resort guest looks on as one of our staff members handles a green turtle hatchling during a nest inspection.

Children curiously inspect a green turtle hatchling during a nest inspection.

HATCHLING RELEASES

Nest inspections are integral for us to assess the development stage of the nest and to know when a nest is likely to emerge. During these inspections, if we find hatchlings that appear ready to emerge later that evening, we will contact reception staff who inform guests of a scheduled hatchling release to take place at 10 p.m.

We invite guests to join us at our Visitors' Hut shortly before 10 p.m., to allow us to informally chat about the project and show a video outlining some of the work being done by the organisation. At 10 p.m. we then give a comprehensive briefing about the release, to ensure that it is carried out in a manner that avoids causing unnecessary stress to the hatchlings.

The hatchling release is carried out about 300 m away from the resort, at a location that minimises light pollution, as white light can be confusing for the hatchlings. The guests are safely guided down the beach to the release site under red light to ensure minimal disturbance to potential nesting mothers.

Continuing from last year, hosting these hatchling release activities with guests proved especially tricky in 2021 due to restrictions placed on group sizes. Fortunately, we were able to continue carrying out this popular activity at the resort while respecting social distancing guidelines and group limits. A total of 335 guests attended our hatchling release activities, making it the second most popular activity this year (Figure 1, page 9).

However, by the time the resort reopened in mid-September, most of the eggs incubating within the hatcheries had already hatched, with the hatchlings being released to the sea. If restrictions had allowed the resort to reopen during peak turtle nesting season (June – Aug), the number of hatchling release activities conducted with guests would possibly have been much greater.

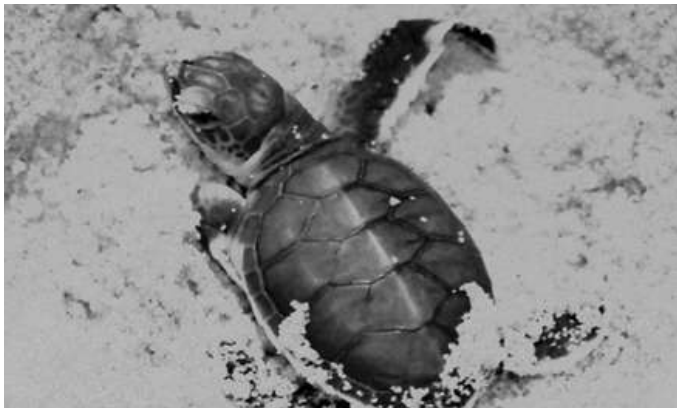
Guests watch a video before being briefed for the hatchling release activity.

Hatchlings making their way to the sea with Lang Tengah Turtle Watch staff and Tanjong Jara Resort guests looking on.

A critically endangered painted terrapin hatchling.

To date, Lang Tengah Turtle Watch at Tanjong Jara Resort has been able to release over 56,000 endangered turtle hatchlings back to the sea. The support received from Tanjong Jara Resort and YTL Hotels in 2021 has allowed us to continue to carry out our sea turtle conservation work. We hope to increase our capacity to save even more eggs in the coming years as we look to achieve our mission of saving endangered turtle populations on the east coast of Malaysia.

In 2021, we were able to release:



16,745

ENDANGERED GREEN TURTLE HATCHLINGS

205

CRITICALLY ENDANGERED PAINTED TERRAPIN HATCHLINGS

THE VISITORS' HUT

Last year saw our long-standing Visitors' Hut in disrepair due to wear and tear and extreme weather conditions over the years. We are pleased to announce that we successfully completed the construction of our brand-new Visitors' Hut in March 2021, funded by a generous supporter of Lang Tengah Turtle Watch.

The Visitors' Hut was constructed using traditional Terengganu methods with the use of screws and nails almost non-existent. The Hut mainly consisted of salvaged chengal wood, giving it a grand appearance. This is very much in line with Tanjong Jara Resort's traditional Malay architecture aesthetic. The hut has always been a great place for us to conduct our education and outreach activities. The added size and functionality of the new Visitors' Hut gives Tanjong Jara Resort guests another space within the resort that welcomes them with open arms.

The Visitors' Hut was extremely well received by guests of Tanjong Jara Resort, with many remarking at the expert craftsmanship on display. Children particularly enjoyed spending many afternoons at our Hut, playing turtle-themed games and filling up colouring books.

While the opening of the new Visitors' Hut was at an unfortunate time, with precious few guests allowed to visit the resort, we are nevertheless ready to host even larger groups in the coming seasons. With the quality of craftsmanship and material used, we hope that our Visitors' Hut will continue to be a mainstay in Tanjong Jara Resort's rich history.

The construction of the new Visitors' Hut.

The new Visitors' Hut next to the Nelayan Restaurant.

Children enjoying an afternoon at the Visitors' Hut.

GUEST SATISFACTION

In 2021, 24 guests completed feedback forms after visiting the Visitors' Hut for nest inspections, hatchling releases or informal visits during our operating hours.

Analysis of this feedback highlighted the following results:

- 100% of the six returning guests surveyed felt that the turtle project enhanced their stay at the resort.
- 7 of 24 guests surveyed (29%) had been recommended to stay at the resort specifically to experience the turtle conservation activities on offer.
- 18 of 24 guests surveyed (75%) rated Lang Tengah Turtle Watch 5/5 and for the overall experience of the activities offered by Lang Tengah Turtle Watch during their stay, with 24 of 24 guests (100%) giving a rating of 4/5 or over.
- 18 of 22 guests surveyed (82%) said they would return to the resort specifically to visit the turtle project again.
- 23 of 23 guests surveyed (100%) would recommend Lang Tengah Turtle Watch at Tanjong Jara Resort to friends/family/colleagues.
- Guests surveyed often complimented the extensive knowledge of sea turtle conservation issues and the friendly demeanour of the Lang Tengah Turtle Watch team.

Based on the results of our feedback forms and verbal feedback from resort guests, Lang Tengah Turtle Watch at Tanjong Jara Resort continues to be a major attraction for guests. A total of 1,305 guests attended our activities this season, with the breakdown of the number of visitors presented in Figure 1 (page 9).

The overall number of visitors this year is especially encouraging when we consider that the resort was closed to guests for long periods of the year, with mid-September to end-October being one of the only times the resort was open to the public during the turtle nesting season. We will continue to review our protocol and methods, to build on the feedback we receive from guests, to ensure that we are achieving the highest standards possible in both our sea turtle conservation efforts and our education and guest engagement initiatives.

Guest Review at Tripadvisor

"Relaxing Beach Holiday"
Reviewed January 2021

"[...] They have a turtle conservation centre at the beach which is educational for both kids and adults alike. [...]"

"A Perfect Hideaway"
Reviewed September 2021

"[...] Although not many activities were possible, my child enjoyed her time at the Turtle Hatchery (Lang Tengah Turtle Watch) with Jason the biologist. Jason is a dedicated young man true to the cause of turtle and environment conservation. [...]"

"Superbly Wonderful"
Reviewed October 2021

"[...] they even had the chance to witness a baby turtle excavation & did a simulation practice. Cool!. [...]"

COMMUNITY ENGAGEMENT

Beach clean-ups

The Lang Tengah Turtle Watch team after a beach clean-up at Tahu Tiga Beach (next to Tanjong Jara Resort).

Following last year's successful International Coastal Clean-Up (ICC) Day 2020, where 40 participants including Lang Tengah Turtle Watch staff, Tanjong Jara Resort staff and guests worked together to remove 442 kg of waste of which 119 kg was recycled, Lang Tengah Turtle Watch endeavoured to carry out even more beach clean-ups. While we were unable to carry out beach clean-ups with local schools, universities and members of the public due to Covid-19 restrictions, we were still able to conduct 11 beach clean-up activities this year. These clean-ups involved Lang Tengah Turtle Watch staff members and research assistant interns.

A grand total of 352.8 kg of waste, of which 103.4 kg was recyclable material, was removed from the beaches surrounding Tanjong Jara Resort. Most of the recyclable material consisted of glass and plastic bottles. Working together with local communities on beach waste management is of paramount importance in the work that we do, as local support is needed to ensure the longevity of sustainable initiatives. We hope to involve local communities heavily again in the work that we do as soon as restrictions allow us to do so, with a greater focus on communities nearby Tanjong Jara Resort. Improved beach cleanliness will not only benefit marine life such as sea turtles but improve the health and wellbeing of local communities and guests who visit Tanjong Jara Resort.

School Outreach Project

A screenshot of the "Hatchery Visit" section of the video.

Due to ongoing Covid-19 restrictions, we were unable to conduct our in-person school outreach programmes as in previous years. However, we were able to transition to a completely digital school outreach project, with the target audience being local students in Dungun, Terengganu.

A total of 81 students have attended these educational sessions, with the students ranging from ages 13 to 16. The students filled up a pre-survey form to assess their knowledge on marine conservation and waste management issues. Afterwards, the students filled up a post-survey form assessing their knowledge gained from the virtual session and how they rated the session. Of these 81 respondents, 74 (91.36%) rated the educational program above 4, with 37 (45.68%) giving it the highest rating of 5/5.

A section on proper recycling methods that can be done at home.

Showing students first-hand turtle data collection.

Building on that, we were also able to conduct virtual turtle and marine conservation awareness sessions with international schools and organisations at our hatcheries next to the Nelayan restaurant. Some of the organisations that worked with us on educational programmes including virtual talks this year are listed below:

- Dulwich College Singapore
- Garden International School Kuala Lumpur
- The British International School of Kuala Lumpur
- Monash University Malaysia
- University of Nottingham Malaysia Campus
- YTL
- Asia Youth Speakers

We have every intention to continue our outreach and education programmes in the coming years and to involve even more local schools and international organisations. We also intend to resume in-person school visits to our hatcheries as soon as restrictions allow us to do so.

Nevertheless, Lang Tengah Turtle Watch has still managed to successfully reach out to thousands of school children this year, albeit virtually, educating them on marine conservation issues, waste management initiatives and the role that all of us play to protect our precious marine ecosystems.

A screenshot of a virtual session conducted with refugee children from Myanmar and Indonesia with AIESEC University of Nottingham Malaysia.

RESEARCH

Nest Temperature and Sex-Ratio Study

Sea turtle embryos undergo temperature-dependent sex determination (TSD), with warmer incubation temperatures producing higher proportions of female hatchlings and cooler temperatures producing more males (Mrosovsky, 1994). We deployed temperature loggers in 14 nests to track respective nest temperatures during incubation and used a logistical equation to estimate hatchling sex ratio in each nest (see Booth & Freeman, 2006; Tolen et al. 2021) with a proposed pivotal temperature of 29.1°C for the Malaysian green turtle population (Chan & Liew, 1995; Reboul et al., 2021; van de Merwe et al., 2005). The pivotal temperature is the point at which a balanced sex ratio occurs (Wibbels, 2003).

We found that our nests have been producing primarily female hatchlings (Table 1), as also seen in other places (Wibbels, 2003), except for Nests 236 and 250. Nest 250, unfortunately, did not have any successful hatchings and as such we do not have data on the number of days of incubation. The percentage of female hatchlings for Nest 250 is a theoretical estimate had any hatchlings survived.

This year, we acquired 24 more Onset HOBO TidbiT 400 data loggers to obtain even more data points for our nest temperature and sex ratio studies in the future. With the information we have gathered from this data, we can better inform our conservation decisions in terms of providing shading to our hatcheries. We will endeavour to increase shading over our hatcheries, using natural materials such as palm leaves, to reduce the female-biased sex ratio within our hatcheries.

Table 1. Nest temperature and sex ratios of 14 nests in our hatcheries.

Nest	Days of incubation	Shading	Average temperature during temperature-sensitive period (°C)	Percentage of female hatchlings (%)
3	49	Unshaded	31.72	100.00
4	54	Unshaded	30.76	99.99
6	51	Unshaded	31.23	100.00
10	49	Shaded	31.02	100.00
57	51	Shaded	30.85	99.99
101	59	Shaded	29.46	89.80
104	54	Shaded	29.88	98.78
155	56	Shaded	29.22	71.59
191	58	Shaded	29.22	72.20
218	57	Shaded	29.33	81.63
236	63	Shaded	28.97	40.50
237	56	Shaded	29.73	97.38
248	60	Shaded	28.62	9.49
250*	NA	Shaded	26.75	0.00

* The nest did not hatch.

Fungal Study

In collaboration with Dr. Siti Nordahliawate Mohamed Sidique from Universiti Malaysia Terengganu (UMT), we began fungus studies this year with the aim of determining the fungi species present in the hatchery and the prevalence of fungi infection the nests in order to mitigate the threat of fungal infection and increase hatching success. Naturally, fungi exist in the soil. Fungal infections can cause egg mortality based on studies conducted in Malaysia (Hoh et al., 2020; Sidique et al., 2017) and the rest of the world (Gleason et al., 2020; Sarmiento-Ramírez et al., 2010).

Before we relocated nests to the hatchery, we sent sand samples to the UMT lab to determine the species of fungus present in the soil naturally. The analysis results showed several species of *Aspergillus* and *Fusarium* isolated from the sand as presented in Table 2 below.

Table 2. Species of fungus present in the soil in the hatchery.

Sand sample	Species of fungus present in the soil in the hatchery
1	1 species of *Aspergillus*
2	1 species of *Aspergillus*, 1 species of *Fusarium*
3	1 species of *Fusarium*
4	1 species of *Aspergillus*
5	1 species of *Aspergillus*, 1 species of *Fusarium*
6	1 species of *Fusarium*
7	2 species of *Aspergillus*, 1 species of *Fusarium*
8	2 species of *Aspergillus*
9	1 species of *Aspergillus*
10	2 species of *Aspergillus*, 1 species of *Fusarium*
11	2 species of *Aspergillus*, 1 species of *Fusarium*
12	2 species of *Aspergillus*, 1 species of *Fusarium*
13	1 species of *Aspergillus*, 1 species of *Fusarium*
14	2 species of *Aspergillus*, 2 species of *Fusarium*
15	1 species of *Aspergillus*

Nest inspection showed that on average the fungal infection rate was 12.6% in green sea turtle nests (n=216) and 16.7% for painted terrapin nests (n=33). Several nests had a healthy 0% fungal infection rate while the worst nest had 97.1% of its eggs infected by fungus. *Aspergillus* and *Fusarium* fungi are commonly found in soil and vegetation (Suga & Hyakumachi, 2004; van den Bossche et al., 2013) and as such are prevalent around the areas of our hatchery.

To further understand the species and prevalence of the infection, we collected sand samples for every nest after the hatchlings had emerged. The lab analysis for these samples is currently being conducted in the UMT lab. The information gained from this study will enable UMT to develop a treatment that can reduce the prevalence of fungi in sea turtle nests.

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