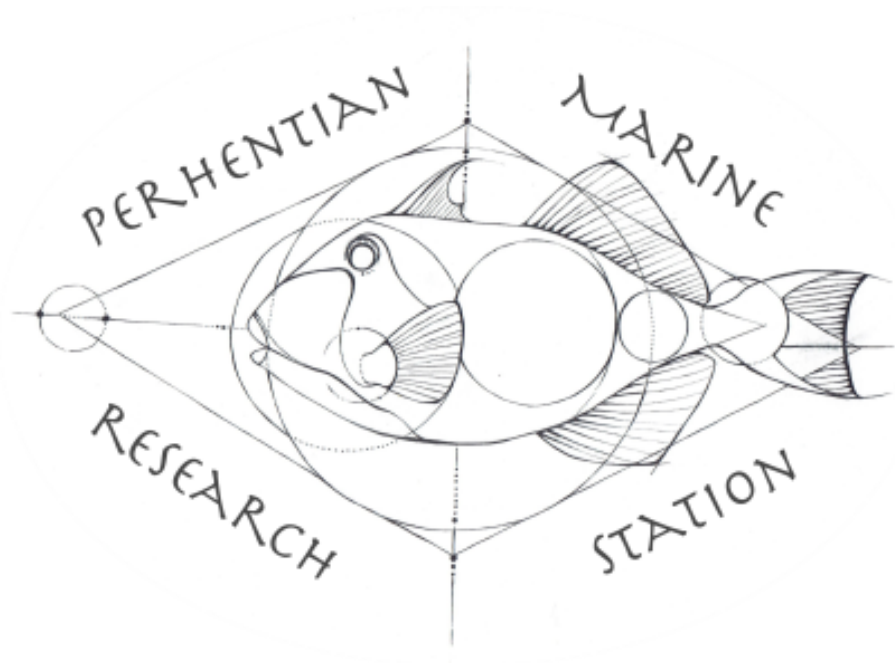


Perhentian Marine Research Station

Annual Report 2018

Prepared by Ramona Pfortner



Summary of Successes in 2018

1. Research

Coral reef surveys: 25 unbiased 100 m coral reef mapping transects completed in 2018 around Perhentian Besar. Therefore, all 68 initially determined transect sites except of two were surveyed and the coral reef surveys successfully completed. The two remaining sites were excluded due to heavy boat traffic in the channel between Perhentian Kecil and Besar. The data collected during the surveys were recorded on the PMRS database, transcribed on the backup notebook and are ready to be analysed.

Seagrass surveys: Two additional seagrass beds were identified in 2018, one at Petani Beach and one in front of Golden Sand/Coral Bay. The mapping surveys for Petani Beach, Mira Beach, D'Lagoon, Long Beach, Teluk Pauh, Tiga Ruang (two seagrass beds, a small and a big patch), and Susu Dara were completed; in 82 surveys a total of 319 data points were collected. In total, 9 out of 12 identified seagrass beds have been mapped in 2017 and 2018 (the seagrass bed in front of Romantic Beach was mapped in 2017).

Volunteer coral reef and seagrass survey training: 14 volunteers and two staff successfully completed SCUBA buoyancy training. Six volunteers successfully trained in benthic & invertebrate ID and PMRS adapted Reef Check methods. 12 volunteers completed their training in seagrass surveys based on Seagrass Watch. Three staff successfully trained in benthic & invertebrate ID and PMRS adapted Reef Check methods.

Coral Nursery Maintenance: PMRS started to maintain the coral nursery of Alunan Resort at Petani Beach. During June and September, several dives were carried out every two to four weeks to maintain the coral nursery structures with volunteers and PMRS staff. All fragments and the coral nursery structure itself were successfully cleaned to remove algal growth and sediment which had begun to settle. Pictures and regular updates were sent to Alunan Resort to keep them posted about the progress of their coral nursery. A total of 36 potted coral fragments were present on the structure by the end of the season. Dr. Gerald Gordon, the consultant of Alunan Resort for the coral nursery, was offering PMRS to conduct a research study on coral nurseries. A draft for the research concept was prepared and is planned to be proposed to the Marine Park.

Current Map: From April until September, a simple current map was created to provide a general overview of the estimated currents around Perhentian Island.

Pressure of Diving Activities on Local Coral Reefs around Perhentian Island : To better understand the threats of the coral reefs around Perhentian Island and get an overview about which dive sites are under high pressure of diving activities, several dive shops were visited or contacted and asked for their records of number of divers

going to the different dive sites throughout the season. Only one dive shop on Coral Bay was found which recorded these data properly. More data will be needed to get a clear picture of the pressure of diving activities on local reefs.

Temperature logger: To monitor the water temperature around Perhentian Island and investigate potential bleaching events a temperature logger was provided by Dr. James Tan from the University of Terengganu. The temperature logger was deployed on 21st March in front of Petani Beach next to Alunan Resort and retrieved in the end of September. Data will be analysed during monsoon.

Plastic-free Perhentian Survey for Tourists: As part of the Plastic-free Perhentian initiative, a survey was created to gain baseline data from tourists coming to Perhentian Island regarding their opinion about the cleanliness of the islands and desire for eco-friendly initiatives. 22 people responded and the results showed that almost 90% of all responders would want to have a refillable water bottle, 77% of all responders would be prepared to pay money that people are available to keep the islands clean and some of them would be willing to pay up to RM50 for that. The data are aimed to be given to resorts and dive shops to encourage eco-friendly behaviour.

2. Waste Recycling Project and Stakeholder Engagement

‘Plastic-free Perhentian’ map: A map marking water refill stations, recycling bins, eco-friendly bars and shops which are selling eco goods such as reusable water bottles or metal straws was implemented. In total, 31 stakeholders contributed to the ‘Plastic-free Perhentian’ map and received a printable split A3 map of Kecil and Besar via WhatsApp to display it around their shops. Three signboards of the ‘Plastic Free Perhentian’ Kecil map were successfully deployed between the 7th and 9th of June at the jetty of Long Beach and Coral Bay and in front of Alunan Resort at Petani Beach. During the preparations for the monsoon, all three signboards were recovered and stored at the Blue Temple Project House in the end of September. A brief feedback evaluation was sent to all contributing stakeholders to monitor the success of the initiative but no response was received by the end of the season. However, personal reports from stakeholders on the map said they are a success and they had tourists coming in asking for the water refills and making use of the recycling bins. Facebook post of stakeholder map very well received by public, reached unprecedented 51,096 people with 448 likes and 246 shares. A total of 50 metal straws were sold to dive shops and bars on the island (30 to Panorama Divers and 20 to Juja Bar). A sticker design was developed for Cocohut Long Beach Resort for their reusable water bottles which are given to all their customers and are available for purchase for anyone as well. Bottles offered for sale as of the 30th of May. Two businesses were named to the #TakNakStraw initiative and #TakNakStraw care-packages including all necessary information on how to reduce or discontinue

using plastic straws, including printable posters and signs for establishments to use to inform customers, were sent to 15 establishments.

Waste Recycling Project on Pulau Perhentian: A possible recycling strategy for Perhentian Island was developed by using jumbo bags. JAJ Group was found as suitable recycling company to pick up the recyclables from Kuala Besut. A meeting with business owners on Coral Bay and Long Beach was organised to communicate the jumbo bag idea but little attendance was achieved. Information booklets on working with the jumbo bag system and information on a bottle deposit system were handed out in printed copies to 30 stakeholders afterwards. With the support of PMRS the headmaster of the village school started to integrate recycling in his curriculum in 2018. Stakeholder list and flow chart prepared including contact details and degree of commitment to previous PMRS initiatives. Responsible Waste Management documents including information on how to initiate and maintain proper waste management programs were created and sent to businesses on Pulau Perhentian. The Responsible Waste Management Google Drive folder has been sent and shared with 36 stakeholders via WhatsApp. The 2018 Waste Management Report was finalised with handover information for the 2019 Waste Management Team.

To tackle the issue of polluted beaches on Perhentian Island, four sets of bins, general waste and recycling were distributed to Coral Bay, Long Beach and the village and 18 public general waste bins around Perhentian Islands. The bins have been seen to be used around the islands, and reports from our beach clean-ups where the bins are positioned claim the amount of trash on the beaches has been reduced. Positive feedback from Pulau Besar on the distributed bins, Mr. Bahaman from Dive Buddy at Teluk Keke was very pleased and thankful for his bins and is using them frequently. Bins on Flora Bay are also in use and being looked after. Stakeholders on Perhentian Islands began to show interest in public bins after the social media post of deploying bins at Long Beach. Due to many requests for bins, the sale of bins may be a viable option in the future.

Precious Plastic Recycling Machines: As potential on-site recycling system to counteract the accumulation of plastic debris in the Marine Park surrounding the Perhentian Islands, and therefore reducing anthropogenic stress exerted on local coral reefs, precious plastic recycling machines were targeted. The proposal to raise funds was rejected but collaboration with Carlos Steenland from The Sea Monkey Project was established and the machines arrived in October in Kuala Lumpur.

3. Reef and Beach Clean-ups

Reef clean-ups: five reef clean-ups were conducted around Perhentian Island; three were in collaboration with local dive shops (Panorama Divers, Monkey Dives and

Quiver Divers) and two reef clean-ups only with PMRS staff members and volunteers. Additionally, during all training and survey dives of PMRS, trash, fishing cages and entangled ropes were collected. In total, eight black bin bags, three mesh bags and one kayak full of trash were recorded.

Beach clean-ups: Throughout the 2018 season, 21 beach clean-ups were conducted in collaboration with local dive shops (Sea Voice Divers and Panorama Divers), other Ecoteer projects (Perhentian Turtle Project and Perhentian Community and Conservation Project), local authorities as well as other conservation organisations (Pulau Perhentian Police Department, the British High Commission, Reef-Check Malaysia, and members of the Kampung Pasir Hantu Community). A total of 103 bin bags (mostly large size, some of them even extra large sized), 550 kg trash and countless big ropes were recorded. Data of all big events were uploaded to Ocean Conservancy after cataloguing the trash.

A new beach clean-up card was prepared in order to acquire more useful data from beach cleaning activities. The new card was made to replace the OCC form which does not effectively catalogue large scale beach cleans.

Trash-free Tuesday: PMRS initiated weekly beach clean-ups at Long Beach in collaboration with Monkey Dives commencing on the 15th of May. Collaboration with JuJa Bar as part of Long Beach clean-up promotion, everyone who participated in the clean-up was eligible to purchase one discounted beverage on the evening of the event. After the closure of JuJa Bar, the discounted drinks for clean-up attendees were provided by Abas Bar or Beach Bar. The clean-ups were organised and carried out using duty roster between all three Fuze Ecoteer Perhentian projects which took turns in sending staff members and volunteers to the clean-up on a weekly basis. PMRS led eight of the Trash-free Tuesday clean-ups. A total of 47 bin bags plus one empty gas container were recorded. The clean-ups in-between were led by the Perhentian Turtle Project or the Community and Conservation Project.

4. Awareness / Cooperation

SK Pulau Perhentian: From the 10th until 16th of April, a booth for the International Science Week was set together with the Perhentian Community and Conservation Project and Perhentian Turtle Project at SK Pulau Perhentian. During that week, PMRS staff members and volunteers led several activities on different topics such as coral reefs, recycling and a beach clean-up. The unit about coral reefs included a play-based lecture and a snorkelling activity to point out what they have learned during the lecture. During the recycling unit, PRMS explained the importance of recycling and how trash is sorted in Malaysia. 35 students joined the beach clean-up at the village beach and six big bags of trash were collected. The students learned how to sort out trash in categories such as plastic bottles, cans, straws etc.

On the 29th and 30th of April, PMRS, Perhentian Community and Conservation Project and Perhentian Turtle Project conducted two “Fuze-Ecoteer Days” at the SK Pulau Perhentian. The first day was supervised by PCCP and PTP. The second day PMRS organized a lecture about the importance of coral reefs and their threats which was followed by a group activity to create a “Save our reef” board. 15 students of year 6 including kids of the “diving class” joined the activity and the final “Save our Reef” board was displayed in the school.

A recycling competition was performed between the students of the SK Pulau Perhentian to reduce the amount of waste in the village on Perhentian Islands, to educate the students about recycling and to provide PMRS with data regarding the storage and transport of recyclables. The event was organised and executed by PMRS, Perhentian Community and Conservation Project, and SK Pulau Perhentian. In total, 10 junior teams (7-9 years), 6 children each, and 10 senior teams (10-11 years), 3 children each, took part in the competition. In three weeks, a total of 395.6 kg of recyclable material (82.2 kg of plastic, 225.8 kg of paper/cardboard, 68.8 kg of aluminium and 5.65 kg of glass) with an estimated ringgit value of RM286.48 was collected. These information will inform future waste surveys in the hopes of generating a comprehensive mass balance. The winners of each age category were given prizes which were donated by local businesses on Perhentian Island, SK Pulau Perhentian and UMW Malaysia. 160 kg of recyclable materials was transported back to the mainland by Pok Li, JAJ Group picked up the load and paid RM160 which was given to Pok Li as a token of goodwill.

Turtle Camp at Cocohut Long Beach Resort: A turtle camp was held at Cocohut Long Beach Resort on the 22nd and 23rd of June with five children from a village near Jerteh and six kids from the fishermen village on Perhentian Kecil attending to educate them about turtles. The event was in collaboration with Cocohut Long Beach Resort, Perhentian Turtle Project, Perhentian Community and Conservation Project and PMRS. Activities included a snorkelling trip, beach clean-up, presentation, educational games on the turtle life cycle as well as a pledge to not eat turtle eggs. Each participant received a certificate in the end of the camp.

International Schools: For students of ISKL several activities on marine conservation took place in Cherating and on Perhentian Island. In Cherating, during a beach clean-up at the hatchery 11 black bags of rubbish were collected by 20 people within an hour which consisted of mainly plastic packaging, food wrappers, plastic bottle, single-use plastic utensils and diapers. During a night patrol the students were taught about the behaviour of landing turtles and the process of them laying the eggs. On Perhentian Island, several environmental games such as scavenger hunt and making suncatchers were played to create awareness about trash or recycleable items that can be upcycled to produce other useful and beautiful products. During the scavenger hunt, six small blue bin bags were collected by 10 people in 10 minutes and the students were taught on the increasing pollution around the world. On an

ecosnorkelling trip the kids were educated on the marine ecosystem and how to reduce the impact on the environment while snorkelling.

On the 21st of May, a presentation about plastic pollution and its consequences, solutions to reduce single-use plastic, recycling and the work of PMRS on a Plastic-free Perhentian was given to around 110 year six students of the Alice Smith School in Kuala Lumpur. PMRS was dropped down on the list of the school list as contact for future talks and activities regarding marine conservation.

On the 3rd of July, a lecture was given to 23 students and three teachers of BSKL on Perhentian Island regarding the importance of coral reefs. On the 3rd and 5th of July, PMRS led an eco snorkelling trip to guide the students throughout the trip.

Local Dive Shops: From the 27th until 29th of April, an underwater and beach clean-up three days event was organized by Monkey Dives in collaboration with Universiti Sains Malaysia Scuba Diving Club and Perhentian Turtle Project. PMRS led two activities including a presentation to 30+ people among USM scuba diving club and customers of Monkey Dives about coral reefs and their importance for the ecosystem as well as a beach clean-up.

An island wide reef and beach clean-up was organized on World Ocean's Day on the 8th of June in collaboration with any dive shops who wished to participate in order to both reduce plastic waste on the island and raise awareness. In total, six clean-ups were carried out, one by each of the Perhentian Ecoteer projects, one by Oh La La Divers, one by Leisure Divers and one by Anti Gravity Divers. PMRS did a reef clean-up of the area between the village and Petani Beach. Three large abandoned fishing cages were brought up and one ghost fishing net. Perhentian Turtle Project did a beach clean-up at Tiga Ruang, the government protected turtle nesting beach. They collected 24 bags of rubbish. Perhentian Community and Conservation Project worked with local students from SK Pulau Perhentian to clean the village beach. They collected four bags of rubbish. Oh La La Divers carried out a successful reef clean-up at Batu Nisan. Leisure Divers carried out a clean-up at the beach at Flora Bay. Anti Gravity Divers collected 5 mesh bags of rubbish at the reef at Kerma Laut.

American Express Malaysia: In conjunction with "The International Year of the Reef 2018", American Express Malaysia signed up to volunteer at four events on marine conservation, each event covering a different topic. On the 4th of May, the first event took place in Kuala Selangor at the Taman Alam Mangrove Project. Around 100 people of American Express planted around 150 mangroves, took down two wooden huts and several old signs, took footage for an awareness video on mangroves which was edited later on and collected eight big bin bags of rubbish in half a day.

On the 8th and 9th of July, the second event about corals took place in Tioman Island at along Kampung Paya Bay. Around 126 staff members of American Express collected nearly 140 kg of rubbish during a beach and forest clean-up. After the beach clean-up, a SCUBA diving refresher course was given to eight of the divers who had not been diving for over a year. On the 9th of July, 26 participants took part in a

buoyancy training, reef clean-up and fun dive under the supervision of the PMRS diving team and Sealantis Dive Shop marking the first time the American Express organisation worldwide has ever participated in SCUBA Diving activities. The remaining 100 individuals took part in an eco-snorkelling trip.

On the 4th and 5th of August, the third event about turtles took place in Cherating. The group of 200 staff members of American Express Malaysia and their children participated in a beach clean-up along the beach of the Rimbun Dahan Turtle Hatchery or in painting the turtle sanctuary. 85 bin bags and heavy construction material items were collected in less than one hour. An awareness talk on turtles was given by Pak Su and hatchlings were released. A talk about sea turtles was given by PMRS and a presentation about Terrapin Conservation was held by Chen Pelf Nyok, the founder and director of the Turtle Conservation Society of Malaysia.

The fourth event about recycling will take place on the 17th and 18th of November in Pangkor. Several talks such as from Reef Check Malaysia and a precious plastic talk by Carlos Steenland from The Sea Monkey Project and his daughter Sydney will be given. A beach clean-up will be performed and participants will join an eco snorkelling trip.

Research Project of UMT Malaysia and Heriot-Watt University in UK: A student of Heriot-Watt University who is collaborating with UMT Malaysia stayed from the 15th until 31st of May in the PMRS project house to collect data about snorkelling impacts on coral reefs for her MSc dissertation. The weeks before her arrival, PMRS advised the student and her supervisor about potential snorkelling sites for their study. Coral reefs with high and low pressure of snorkelers as well as control sites with similar depth profiles were chosen and site checks were performed on the 15th of May. The student completed the collection of her data with support of PMRS.

“A Thankyou from the Ocean” banner: A banner was designed for businesses that are offering snorkel tours around the island to be hung in their shops, educate tourists about their environment and encouraging them to follow certain rules while snorkelling. The banner tells why people should not step on corals, properly dispose their trash, and why people shouldn’t feed fish. All were translated into Malay and displayed in two languages to reach a wider audience. 10 banners were printed and distributed to several snorkelling operators as test trial. More banners will be printed and distributed in 2019 after getting some feedback of the snorkelling operators.

Deployment of Eco-consciousness Signs at Teluk Keke: Two small signs containing a message in the form of a poem, one in English and the other one in Malay, were painted and deployed at Teluk Keke, a popular tourist beach, to inspire responsible rubbish disposal by tourists.

PMRS website: In order to target an audience with a more scientific background and to help PMRS to become more independent in terms that stakeholders on the island can differentiate it from the other two Fuze Ecoteer Perhentian projects, an own project website for PMRS was created. The project website includes pages for the different projects of PMRS such as research, Plastic-free Perhentian but also to have a

platform to publish blogs, videos and enable people to send enquiries. On the 3rd of May the website was published under <https://www.perhentianmarineresearch.com/> Monthly Project Blogs: Seven Perhentian Heroes blogs and seven staff blogs were published on the PMRS website in 2018 to raise awareness on contemporary ocean environmental issues both specific to the Perhentian Island and globally and to acknowledge all people or businesses on Perhentian Island who put in extra effort to conserve Perhentian Islands.

5. Volunteers and Their Personal Projects

Volunteers: In 2018, PMRS had 14 volunteers joining the project. Eight male and six female volunteers were involved in the research part of PMRS and assisted in collecting data during coral reef and seagrass surveys. The majority of volunteers were British (8 out of 14 volunteers). Most volunteers were between 20- and 24-years-old (five volunteers), followed by below 20 and between 30- to 34-years-old (three volunteers each). Three volunteers each were in the age range 35-40, 45-49 and above 50-years-old. The majority has not had a diving certification before they came to the project (9 out of 14 volunteers). August and September 2018 showed the highest number of bookings throughout the season demonstrating five volunteers who stayed with the project in August and three volunteers in September. Two volunteers each stayed with PMRS in March, May and July, and no bookings were received for April and June. Half of the bookings from volunteers came through The Great Projects (7 out of 14 bookings), followed by ERT (four volunteers) and GoOverseas, Portsmouth Uni and Atlantis (one booking each).

Volunteer Personal Projects: Nine completed personal projects to optimise volunteer contribution by utilising skills and enthusiasm of long-term volunteers while creating an opportunity for individuals to produce work with tangible outputs and conservation impact. Personal projects were predominantly focused on awareness and community engagement. While preconceived ideas were discussed, volunteers were encouraged to develop their own project idea providing it was realistic in regards to time, experiences and available resources.

Volunteer Evaluation: To improve our program for volunteers, volunteers were asked to fill in an evaluation sheet at the end of their stay. 13 out of 14 volunteers gave their feedback in 2018. Assessing the experiences of the volunteers on a scale from 1 (poor) to 5 (excellent), the highest scores were given for knowledgeable staff (4.8) as well as explanations on expectations as a volunteer (4.5), followed by food (4.3), and briefing/orientation and organisation (4.2, each). The lowest score was given to accommodation (3.5). Assessing the project on a scale from 1 (poor) to 5 (excellent), the highest scores were given for Awareness and Water Confidence at Petani Beach for effectiveness and enjoyment (4.6 for effectiveness and 4.5 for enjoyment, each), followed by Malay Dinner (4.5 for enjoyment, 4.3 for effectiveness). The village tour was scored with 4.5 for effectiveness and 4.0 for enjoyment. Presentations were scored with 4.4 and 4 for effectiveness and enjoyment. Assessing diving and overall

experience which were rated by the volunteers on a scale from 1 (poor) to 5 (excellent), the dive course was scored the highest for effectiveness and enjoyment (4.8 and 5) followed by overall experience (4.4 for effectiveness and 4.8 for enjoyment). The PPB was scored with 4.6 for enjoyment and 4.3 for effectiveness. Research dives were scored with 4.5 for enjoyment and 4.3 for effectiveness. Summarizing the answers to the open question what volunteers enjoyed the most, very often besides them enjoying the research dives and improving their buoyancy skills, it was mentioned that they liked understanding about plastic pollution and recycling, as well as getting involved with the local community especially working with the kids. Activities on the recycling and waste management part of PMRS for volunteers were started in 2018 by practicing upcycling. Summarising the answers to the question what could be improved in the project, a lot of volunteers commented on the volunteer house especially that they weren't enough shelves and storage possibilities. Feedback was also provided on activities and that PMRS volunteers would like to have joined activities with the volunteers of Perhentian Turtle Project and Perhentian Community and Conservation Project. Based on that, joined beach clean-ups were started in 2018 every Saturday with all volunteers from all projects which was a success and is planned to be continued. Furthermore, PMRS volunteers liked the opportunity to join for a turtle night patrol on Saturday evening.

1 Perhentian Island

1.1 Site description

Located in the South China Sea, Pulau Perhentian is 21 km off the mainland of Terengganu State on the northeast coast of Peninsular Malaysia. The Perhentian Archipelago consists of two main islands Perhentian Besar (large) and Perhentian Kecil (small). There are also several smaller islands located close to Perhentian Kecil; Pulau Serenggh, P.Susu, Dara Besar and Kecil and Tokong Burung.



Figure SEQ Figure * ARABIC 1: Location of the Perhentian Islands

The Perhentian Islands were gazetted as a Marine Park under the Establishment of Marine Park Malaysia Order of 1994; it was then established as a no-take MPA where fishing was prohibited within two nautical miles from the lowest sea water level. The islands have a diverse coral reef ecosystem (predominately fringing) and inter-tidal habitats, providing breeding, nursing and feeding grounds for numerous fish species and sea turtles.

The small village, Kampung Pasir Hantu located in Perhentian Kecil supports a local Malay population of approximately 2,300 residents (Reef Check Malaysia, 2017). Prior to the establishment of the MPA the majority of residents were fishermen. In the last couple of decade's increased accessibility and developing infrastructure has facilitated rapid growth of the tourism sector. This has seen most of the villager's transition into tourism for improved income.

Tourism activities available from March to October on the islands include SCUBA diving, snorkelling, swimming and recreational fishing. There are around 46 resorts and 20 dive operators spread around the two main islands. Throughout the northeast monsoon season (November to February) the majority of locals participate in subsistence fishing as all tourism related activities are closed. Development on the islands continues but currently

there is no grid-supplied electricity, nor centralized sewage treatment; freshwater is supplied from the mainland.

1.2 Environmental pressures

Perhentian Island's shallow coral reef communities and seagrass beds are subject to a number of anthropogenic impacts, the main driver being the rapid expansion of the local tourism industry. Land-based infrastructure development, solid and liquid waste pollution and inadequate visitor management collectively put considerable pressure on these vulnerable ecosystems.

Construction on the coastal zone promotes the occurrence of local erosion and sedimentation that can smother both reefs and seagrass beds and can alter hydrological flows; increased tourist traffic (divers, snorkelers, boats) on reefs can directly damage corals; popular activities such as fish feeding can alter behaviour patterns and population dynamics (Orams, 2001); and demands of increased waste production exceeds capacities of existing facilities and management. Reef Check Malaysia has been conducting annual surveys around the Perhentian Islands for the last 10 years, and in their latest report they state that recorded high levels of nutrient indicator algae is indicative of raised levels of nutrients in the waters. A review of sewage treatment systems identified the inadequacy of sewage treatment systems at many resorts (Reef Check Malaysia, 2017).

Room for improvement is in the coordination between Marine Parks Department Malaysia (MPDM, under Federal jurisdiction and responsible for MPA management) and the state government, which directs all land based development activities (Nurul Islam et al, 2014). This is a notable constraint on the success of sustainable resource management and local threat mitigation. Furthermore, the MPDM is a role model for the local community on the island and an important tool to guide and interact with the local population.

Beyond local threats, the global threat of mass coral bleaching has become of increasing concern over recent years. The first significant mass coral bleaching event recorded in Malaysia was in 1998, an event that is very difficult to manage locally and can have potentially devastating outcomes (Reef Check Malaysia, 2017). It is expected these events will increase in frequency and scale in coming years. Thus there is the need to exercise effective management interventions and focus on improving resilience of coral reef communities.

2 Perhentian Marine Research Station – Project Overview

The Perhentian Marine Research Station, under the umbrella of Fuze Ecoteer, officially started in February 2017 taking over the former project 'Blue Temple'. Blue Temple primarily aimed to assess diver impact on coral reefs along with being involved in work to implement and encourage recycling and waste separation schemes around the islands. While PMRS aims to continue some of this work, there has been a shift in research focus.

Few recent and long term studies have been conducted on Perhentian marine park habitats, with the exception of Reef Check Malaysia's annual coral reef monitoring surveys (starting in 2007). Thus beyond the scope of this ongoing study, which surveys 10 coral reef sites around the main islands, to our knowledge, no comprehensive knowledge on the various habitat distribution (sand flats, seagrass and coral reefs etc), composition and health is available. With pressures from a flourishing local tourism industry concurrent with global climate change, MPDM needs current and collaborative research efforts to support informed resource management decisions. With this in mind, PMRS aims to conduct research that will complement and build on the existing work of Reef Check Malaysia while assisting MPDM on prioritizing management efforts in collaboration with Nottingham University, Malaysia.

PMRS hosted a maximum of four international/domestic volunteers at one time, throughout the season; this provides them with the opportunity to be involved in a phase of working projects in return for a financial contribution towards project costs. Volunteers undergo an intensive training program in marine life identification and underwater survey techniques, prior to acquisition of data. Through this scheme, volunteers contribute useful data for coastal zone management with little or no demand on the countries resources (CCC, 2003).

Further services that can be provided by PMRS, beyond data acquisition, assimilation and synthesis include; conservation education, coordination of recycling plan implementation and other capacity building programs.

For the 2018 season, project management was directed by Dr. Ramona Pfortner.

3 Research

3.1 Coral Reef Surveys

Objective

To understand the distribution, composition and relative health of coral reefs around Perhentian Island Marine Park and to create a low resolution map of coral reef composition and health around the islands.

Activities

To survey the Perhentian Islands, 68 transect sites were determined using Google Earth with coordinates pinned at 500 m intervals along the coast of both Perhentian Kecil and Besar. Modified Reef Check survey methods (point intersect transect) were used to collect data on habitat composition and coral reef health. Reef Check is an internationally accepted method which facilitates rapid assessment of reef health, specifically designed to accommodate non-specialist surveyors. The basis for modifying Reef Check methods was to align with the projects aims and objectives while also ensuring collected data can be utilized by other non-government and government organisations. SCUBA was used to collect the following:

- Nine benthic categories
- Eight indicator invertebrates
- Eight indicator fish families
- General abiotic data

Successes

25 unbiased 100 m coral reef mapping transects completed in April and August around Perhentian Besar.

All 68 initially determined transect sites except of two were surveyed and therefore the coral reef surveys successfully completed. The two remaining sites were excluded due to heavy boat traffic in the channel between Perhentian Kecil and Besar.

The data collected during the surveys were recorded on the PMRS database, transcribed on the backup notebook and are ready to be analysed.



Figure 2: Top left: Our first volunteer Stefanie happy and satisfied after their first coral reef survey. Top right: Our August volunteers after their last coral reef survey. Thank you to all our volunteers for completing the coral reef surveys with us. Bottom: All 68 transect sites determined by using Google Earth with coordinates pinned at 500 m intervals along the coast of both Perhentian Kecil and Besar.

3.2 Seagrass Surveys

Objective

To understand the distribution, species composition and status of seagrass beds in the Perhentian Island Marine Park and create a map of species composition, distribution, percentage cover and sediment type of seagrass around the islands.

Activities

Methods were adapted from those used by Seagrass Watch, an Australian based NGO that has published guidelines for seagrass surveying and mapping to be used by citizen scientists. SCUBA was used to collect the following data concerning sub-littoral seagrass beds in the Perhentian Island Marine Park:

- Depth
- Latitude and Longitude
- Percentage cover of seagrass
- Seagrass species present
- % algae cover over the entire quadrat
- % epiphyte cover on the seagrass present
- Dominant sediment type
- Qualitative observations i.e. any turtle cropping, goby holes, anemones, etc.

Successes

Two additional seagrass beds were identified, one at Petani Beach and one in front of Golden Sand/Coral Bay.

The mapping surveys for Petani Beach, Mira Beach, D'Lagoon, Long Beach, Teluk Pauh, Tiga Ruang (two seagrass beds, a small and a big patch), and Susu Dara were completed; in 82 surveys a total of 319 data points were collected.

In total, 9 out of 12 identified seagrass beds have been mapped in 2017 and 2018 (the seagrass bed in front of Romantic Beach was mapped in 2017).

The remaining three seagrass beds have not been finished due to a lack of volunteers in the first months of the season including the seagrass beds in the channel between Perhentian Kecil and Besar, one in front of the village, the other one in front of Coral View, as well as the seagrass bed in front of Golden Sand/Coral Bay.

3.3 Volunteer Coral Reef and Seagrass Survey Training

Objective

To train PMRS volunteers in SCUBA buoyancy, benthic, invertebrate and fish identification, seagrass identification and surveying methods to a standardized level.

Activities

- SCUBA Buoyancy: Volunteers were required to complete one dive focused on buoyancy skills (structured similarly to PPB adventure dive, Advanced Open Water), with staff delivering feedback on areas for improvement post dive. Buoyancy was consistently addressed throughout the whole training period. 'How to become an ecodiver' presentation was delivered to inform volunteers on how they can reduce their environmental impact as divers.
- Benthic training catered for volunteers with no background in biological sciences to those studying biology at university. Training consisted of:
 - 3 presentations: Introduction to coral reefs, Introduction to benthic taxonomy and identification, PRMS modified Reef Check survey methods.
 - Practice: minimum of one snorkel ID point out, four ID point out dives and four practice transects (laying out the transect tape, recording abiotic, benthic, invertebrate data and rolling back the transect tape) in order to get used to a correct technique and buoyancy during the survey.
 - Test: computer test, in-water test and two dives comparing answers on practice.
- Seagrass Training based on Seagrass Watch catered for volunteers with no background in biological sciences to those studying biology at university. Training consisted of:
 - Presentation about seagrass and survey methods.
 - Demonstration of the method of quadrat sampling on land.
 - Practice: Learning by doing. Training while assisting and watching trained staffs that are collecting the data on a seagrass survey.
 - Test: Computer test about seagrass species and estimating percent coverage.
- Fish identification training provided for volunteers with no background in biological sciences to those studying biology at university. Training consisted of:
 - Presentation: Indo-Pacific Fish ID presentation including eight fish families.
 - Test: computer test.

Successes

14 volunteers and two staff successfully completed SCUBA buoyancy training.

___Six volunteers successfully trained in benthic & invertebrate ID and PMRS adapted Reef Check methods.

12 volunteers completed their training in seagrass surveys based on Seagrass Watch.

Three staff successfully trained in benthic & invertebrate ID and PMRS adapted Reef Check methods.

Four staff completed their training in seagrass surveys based on Seagrass Watch.

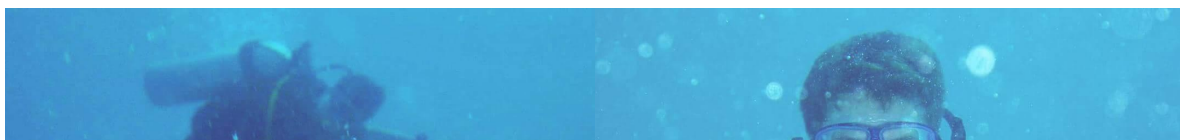
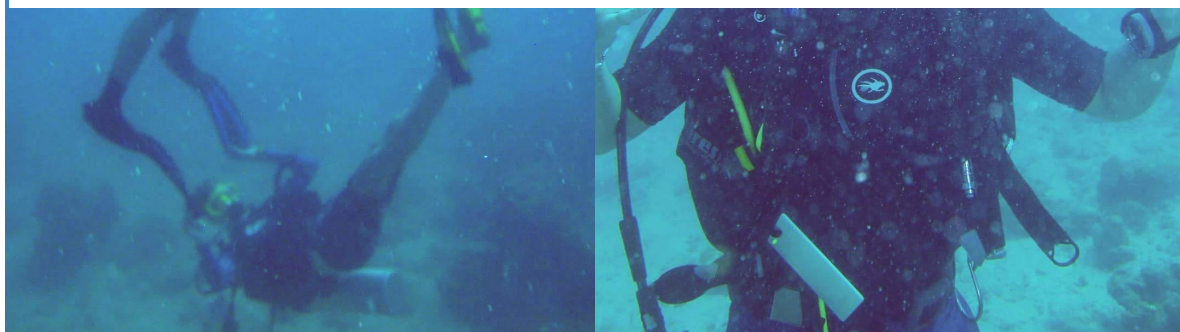


Figure 3: Top: Two volunteers, Stefanie and Robert, during their training for invertebrate and benthic survey. Bottom: Our volunteers Josh und Hugo having fun after finishing their training session.



3.4 Coral Nursery Maintenance

Objective

To restore degraded reefs and support local stakeholders in their efforts to conserve the coral reefs around Perhentian Island.

Activities

- In 2018, PMRS started to help maintaining the coral nursery of Alunan Resort at Petani Beach. Alunan Resort combines business and marine conservation by building coral nurseries to restore the degraded reef around Petani Beach to educate their customers about corals but also to generate money by attracting customers and sell conservation efforts to them.

- On the 3rd of May, PMRS joined the deployment of five concrete structures of coral nurseries in front of Petani Beach by Alunan Resort. Each structure contains several holes in which people can put concrete pots holding a coral fragment found around the attached reef. More structures are aimed to follow at different depths. The aim is to have structures at three different depths: A shallow one in which the customers can put their coral fragment pots, a row of deeper ones where the reef will be restored, and a row of structures in-between to give the corals time to slowly adapt to the different levels and temperatures. In July, Alunan Resort deployed one structure at a shallower depth at around 2 m.
- PMRS monitored the growth of the coral fragments and cleaned the fragments and coral nursery structure. The attached fragments were carefully cleaned to remove excess algal growth, and the structure of the coral nursery was cleaned of any sediment which had settled and any algae which had begun to grow.

Successes

During June and September, several dives were carried out every two to four weeks to maintain the coral nursery structures with volunteers and by PMRS staff.

All fragments and the coral nursery structure itself were successfully cleaned to remove algal growth and sediment which had begun to settle. Pictures and regular updates were sent to Alunan Resort to keep them posted about the progress of their coral nursery.

A total of 36 potted coral fragments were present on the structure by the end of the 2018 season.

Dr. Gerald Gordon, the consultant of Alunan Resort for the coral nursery, was offering PMRS to conduct a research study on coral nurseries. A draft for the research concept was prepared and is planned to be proposed to the Marine Park.

3.5 Current Map

Objective

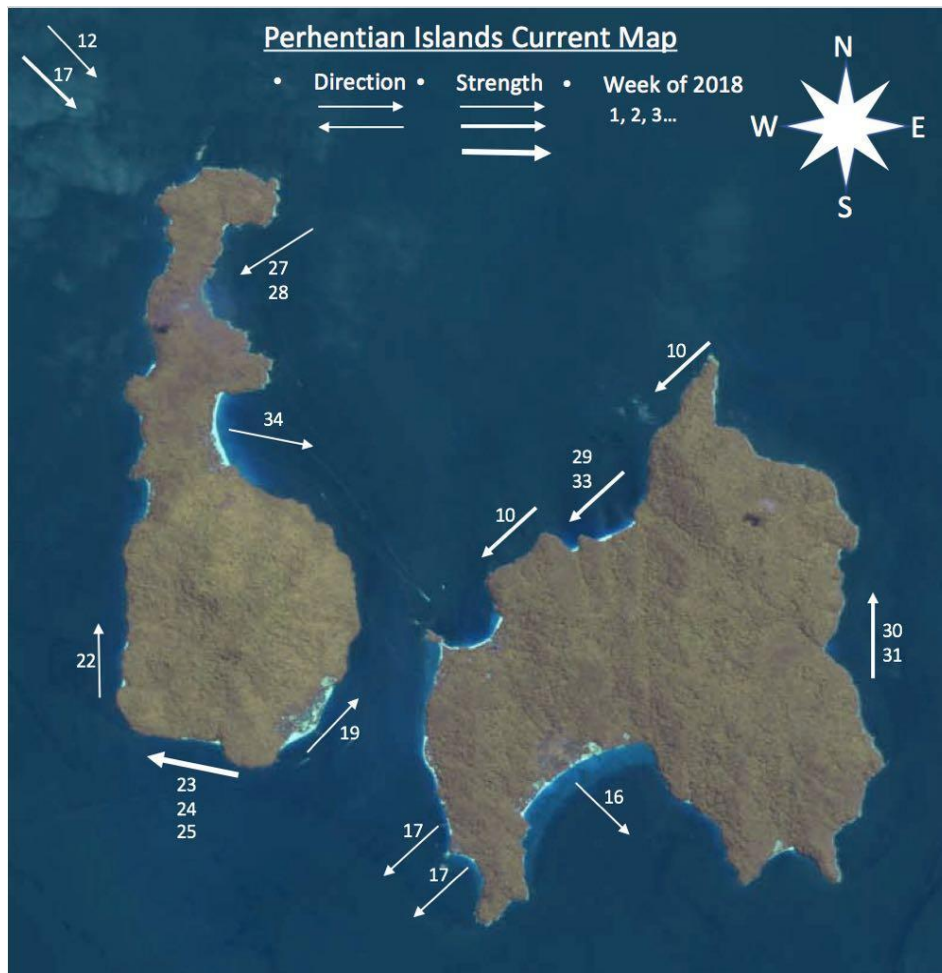
Create a map visualizing ocean current and strength and record their changes around the islands. These baseline data will help future research decisions such as the location for artificial reefs.

Activities

- During benthic and invertebrate as well as seagrass surveys, current headings and strength, when present, were noted for each site.

Successes

From April until September, a simple but useful map was created to provide a general overview of the estimated currents around Perhentian Island.



3.6 Pressure of Diving Activities on Local Coral Reefs around Perhentian Island

Objective

Understand the threats of coral reefs around Perhentian Island and get an overview about which dive sites are under high pressure of diving activities. These baseline data will help future management decisions within the Marine Park such as if some dive sites should be closed temporarily.

Activities

- Several dive shops were visited or contacted and asked for their records of number of divers going to different dive sites throughout the season.

Successes

Most of the dive shops stated they do not have time to record their diving activities. Some said they do it occasionally. Only one dive shop on Coral Bay was found which recorded these data properly. However, a bigger sample size from dive shops at different beaches around Perhentians is necessary to understand the threats of the corals reefs around Perhentian Islands and to get an overview about which dive sites are under high pressure of diving activities. It is known that dive shops on different beaches have different preferred dive sites, i.e. dive shops on Coral Bay tend to visit Romantic Beach and beaches on the North-West of Kecil more frequently whereas dive shops on Long Beach tend to visit Batu Nisan, Polis Wreck and Batu Layar more frequently due to the distance to their dive shop. Therefore, an even sample size of dive shops from all beaches around Perhentian Islands is necessary to get a clear picture of the pressure of diving activities on local reefs.

Table 1: Monthly number of divers going to different dive sites in 2018 (n = 1). Dive sites were sorted according their total number of divers in descending order. Data were obtained from one dive shop at Coral Bay.

| | March | April | May | June | July | Total |
|-------------------------|-------|-------|-----|------|------|------------|
| Romantic Beach | 150 | 173 | 129 | 89 | 124 | 665 |
| D' Lagoon | 54 | 11 | 68 | 71 | 74 | 278 |
| Polis Wreck | 75 | 42 | 54 | 46 | 58 | 275 |
| Tokong Laut | 67 | 12 | 34 | 48 | 49 | 210 |
| Batu Layar | 53 | 15 | 38 | 38 | 31 | 175 |
| Panglima Abu | 62 | 42 | 43 | 13 | 12 | 172 |
| Batu Tabir | 21 | 17 | 14 | 18 | 7 | 77 |
| Kerma Darat | 5 | 11 | 9 | 25 | 22 | 72 |
| Vietnamese Wreck | - | 4 | 24 | 19 | 21 | 68 |
| Shark Point | 17 | - | 6 | 23 | 20 | 66 |
| T3 | 10 | - | 14 | 18 | 19 | 61 |
| Seabell | 34 | 2 | 12 | 3 | 5 | 56 |
| Seabell Rock | 10 | 18 | - | 5 | 18 | 51 |
| Sugar Wreck | 9 | 13 | 3 | 8 | 6 | 39 |
| Serenggeh | 20 | - | 8 | - | - | 28 |
| Maritime Wreck | 15 | 12 | - | - | - | 27 |
| Batu Nisan | 9 | - | 4 | 7 | 4 | 24 |
| San Choi Wreck | - | - | - | - | 18 | 18 |
| Tika Masala | - | - | - | 16 | - | 16 |
| Teluk Keke | 3 | 4 | - | 5 | - | 12 |
| Susu Dara | 9 | - | - | 2 | - | 11 |
| Tanjung Buton | 6 | - | 3 | - | 1 | 10 |
| Golden Sand | 4 | 1 | - | 2 | - | 7 |
| Secret Reef | - | - | - | - | 6 | 6 |
| T2 | - | - | - | - | 5 | 5 |

| | | | | | | |
|---------------------|---|---|---|---|---|----------|
| Tiga Ruang | - | - | - | 1 | 1 | 2 |
| Karang Selat | - | - | 1 | - | - | 1 |
| Tanjung Basi | - | - | - | - | - | 0 |

3.7 Temperature logger

Objective

Pilot study to gain information about the water temperature and possible coral bleaching events around Perhentian Island.

Activities

- A temperature logger was provided by Dr. James Tan from the University of Terengganu to monitor the water temperature for a time period of 12 months starting from the 22nd March.
- A suitable location for the temperature logger was determined. The location was chosen based on a possible location for a coral nursery to monitor the water temperature as one potential factor influencing the success of coral restoration in that area.

Successes

The temperature logger was deployed on 21st March in front of Petani Beach next to Alunan Resort at a depth of 4 m (low tide). Data recording started on 22nd March.

The logger was retrieved in the end of September and data will be analysed during monsoon.

3.8 Plastic-free Perhentian Survey for Tourists

Objective

To create baseline data from tourists coming to Perhentian Island regarding their opinion about the cleanliness of the islands and desire for eco-friendly initiatives. The data are aimed to be given to resorts and dive shops to encourage eco-friendly behaviour.

Activities

- As personal project of one of our volunteers, a survey on SurveyMonkey was developed targeting the tourists coming to Perhentian Island to get their feedback on the cleanliness of the island. A printed and laminated announcement to take part in the survey was distributed to dive shops and resorts around the island.
- The 10 questions included:

1. What is the name of your hotel/accommodation?
2. Did your hotel/accommodation offer you a refillable water bottle?
3. If you answered `No` to question 2, would you like to have been given a refillable water bottle?
4. Out of 100, how clean would you rate the cleanliness of the island's paths?
5. On a scale of 1 to 10, where 10 is cleanest, how would you rate the cleanliness of the island's beaches?
6. On a scale of 1 to 10, where 10 is the cleanest, how would you rate the cleanliness of the island's reefs?
7. Would you be prepared to pay a modest supplement to your holiday, in order to ensure a dedicated team is available to keep the islands clean?
8. Assuming `Yes`, which of the following would you be willing to contribute to help achieve this goal?
9. Finally, what is your nationality?
10. Based on your assessment of the cleanliness of the islands, how likely would you be to recommend a holiday here to friends and family?

Successes

In total, 22 people responded to the survey from May until September. Five people responded in May, four in June, eight in July, two in August and three in September.

The most interesting results were:

- o Almost 90% of all responders would want to have a refillable water bottle (17 out of 22 responses). Two people denied and three people skipped this question. Surprisingly, it is not just international tourists; even 78% of the Malaysian responders would want a refillable water bottle (seven out of nine).
- o 77% of all responders would be prepared to pay money that people are available to keep the islands clean (17 out of 22 responses). 67% of the Malaysian responders would be willing to pay (six out of nine responses). Three people denied this question and two people who were undecided.
- o Of 77% who would pay money to keep the islands clean, four people stating they would pay less than RM10, two people to pay RM15, four people to pay RM30, five people to pay RM50 and even two people who would be willing to pay more than RM50. The results show a tendency of international people who are willing to pay higher amounts, RM30 or more, and Malaysians who stated to be willing to pay less than RM10, and two stating to pay RM15 and RM 30 each. Three people who answered in the question before that they wouldn't want to pay money, answered this question with less than RM10 (two people) and RM50. The two people who were undecided about paying money answered this question with less than RM10 and RM50.

- o The paths around Perhentians were rated the less clean, with 53 out of 100, followed by beaches and reefs with 7 out of 10. People who rated the cleanliness the highest stayed mostly at Alunan Resort, Coral View Resort, or Cocohut Long Beach Resort which are known to take care of their places. Lower rates came from hotels/accommodations on Long Beach, but occasionally from other places on Perhentian Kecil as well Perhentian Besar.

These results will be presented to resorts and dive shops to encourage them to replace plastic bottles with reusable water bottles, to offer more water refill stations and to keep their areas and beaches clean.

Table 2: Nationalities of the 22 responders who took part in the Plastic-free Perhentian survey.

| Nationality | Number of responses |
|--------------------|----------------------------|
| Malaysian | 9 |
| Irish | 1 |
| British | 3 |
| German | 1 |
| Czech | 1 |
| Danish | 1 |
| French | 1 |
| Australian | 1 |
| Polish | 1 |

| | |
|-----------|---|
| Austrian | 1 |
| Portugese | 1 |
| Dutch | 1 |

Table 3: Hotels/accommodations in which the 22 responders of the Plastic-free Perhentian survey stayed.

| Hotel/ accommodation | Number of responses | Island on Perhentians |
|-------------------------|---------------------------|--|
| The Aman Resort | 1 | Perhentian Kecil, 10 responses in total |
| Monkey Dives | 1 | |
| Matahari Chalet | 1 | |
| D'Rock | 1 | |
| Cocohut Long Beach | 1 | |
| Alunan Resort | 3 | |

| | | |
|--------------------------|---|--|
| Ombak Resort | 1 | |
| Turtle Bay Divers | 1 | |
| Tuna Bay Resort | 4 | Perhentian Besar, 11 responses in total |
| Coral View Resort | 3 | |
| Perhentian Island Resort | 2 | |
| The Barat | 1 | |
| Ayumni | 1 | |

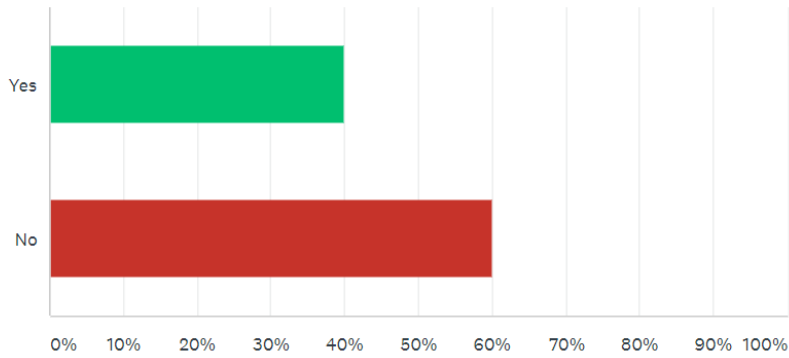


Figure 5: Responses to the question "Did your hotel/accommodation offer you a refillable water bottle?"

Answered: 20

Skipped: 2

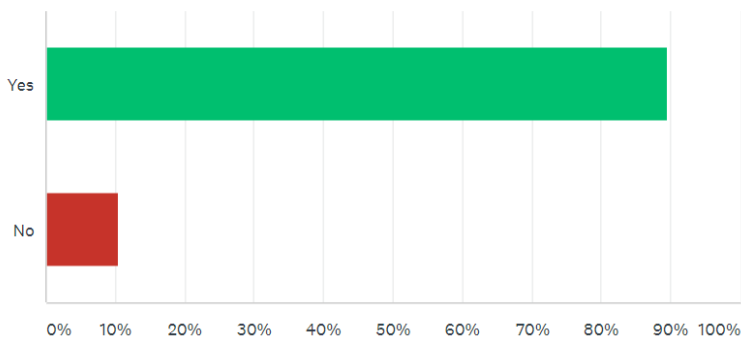


Figure 6: Responses to the question "If you answered 'No' to the previous question, would you like to have been given a refillable water bottle?"

Answered: 19

Skipped: 3

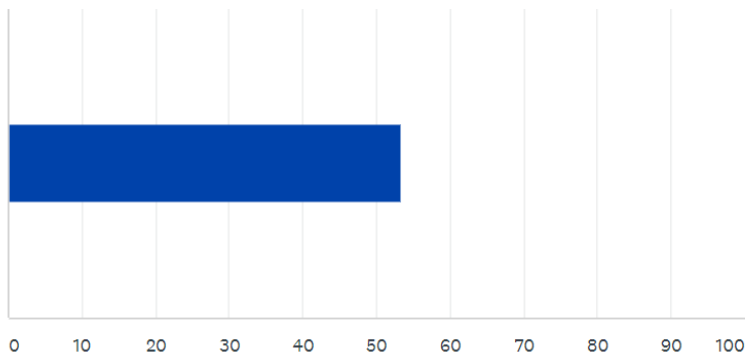


Figure 7: Responses to the question "On a scale of 1 to 100, where 100 is cleanest, how would you rate the cleanliness of the island's paths?"

Answered: 22

Skipped: 0

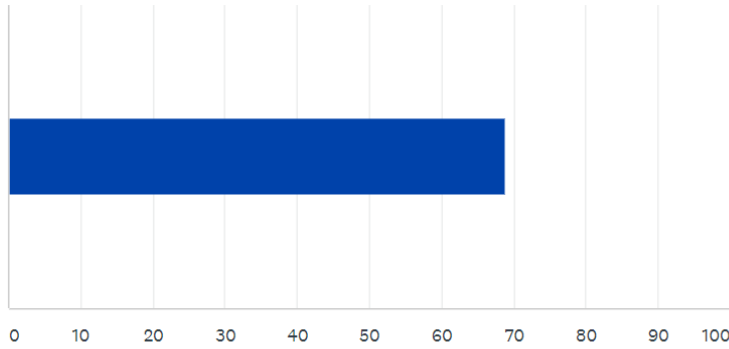


Figure 8: Responses to the question "On a scale of 1 to 100, where 100 is cleanest, how would you rate the cleanliness of the island's beaches?"

Answered: 22

Skipped: 0

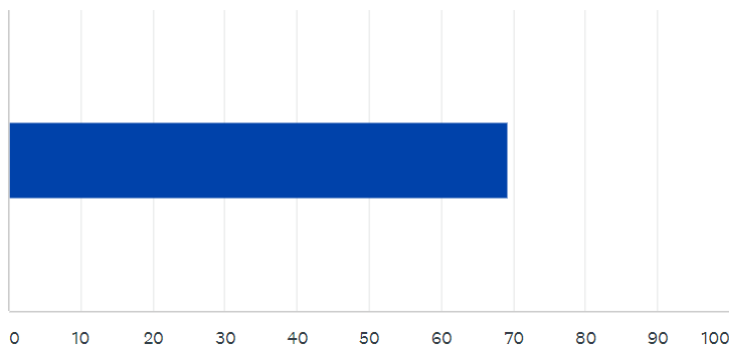


Figure 9: Responses to the question "On a scale of 1 to 100, where 100 is cleanest, how would you rate the cleanliness of the island's reefs?"

Answered: 22

Skipped: 0

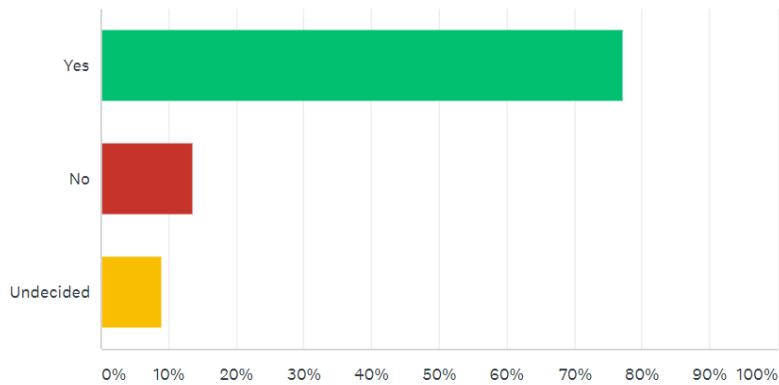


Figure 10: Responses to the question "Would you be prepared to pay a modest supplement to your holiday, in order to ensure a dedicated team is available to keep the islands clean?"

Answered: 22

Skipped: 0

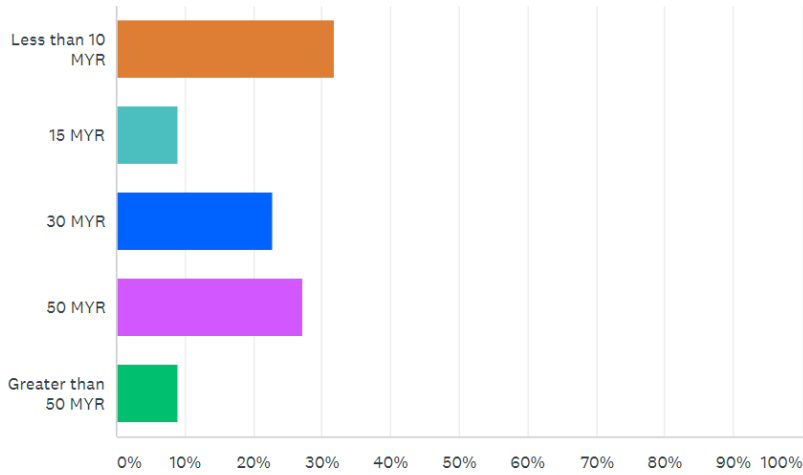


Figure 11: Responses to the question "Assuming 'Yes', which of the following would you be willing to contribute to help achieve this goal?"
 Answered: 22
 Skipped: 0

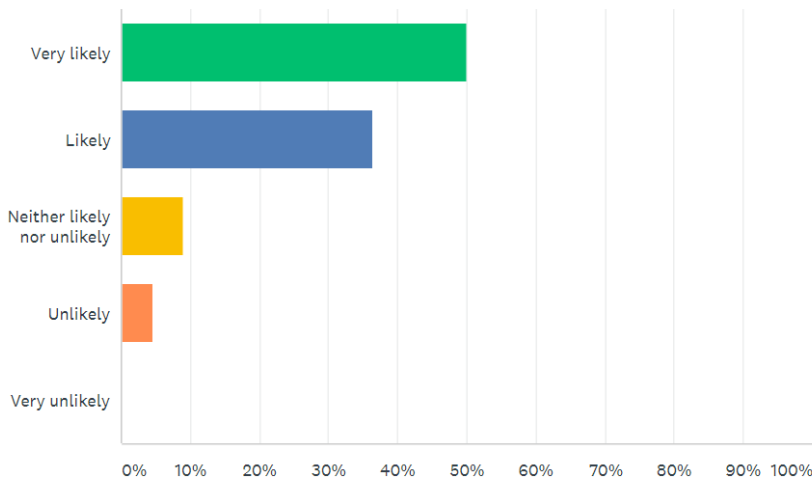


Figure 12: Responses to the question "Based on your assessment of the clean-liness of the islands, how likely would you be to recommend a holiday here to friends and family?"
 Answered: 22
 Skipped: 0

4 Waste Recycling Projects and Stakeholder Engagement

4.1 Plastic-free Perhentian Map

Objective

To reduce, reuse and recycle plastic waste, a map was created containing all stakeholders committed to minimise and exterminate the practice of single-use plastics on Perhentian Islands.

Activities

- In the 2018 season, all stakeholders on Perhentian Island were approached and asked about their willingness to contribute to the 'Plastic-free Perhentian' map marking water refill stations, recycling bins, eco-friendly bars and shops which are selling eco goods such as reusable water bottles or metal straws.
- Three signboards showing the 'Plastic-free Perhentian' map of Kecil were deployed at Long Beach, Coral Bay, and Petani Beach.
- The *#plasticfreeperhentian* initiative was promoted on Facebook and other social media channels.
- As part of *#plasticfreeperhentian* initiative, Cocohut Long Beach Resort asked PMRS for a sticker design for their reusable water bottles which are given to all their customers and are available for purchase for anyone as well.
- Stakeholders who provide refill stations were encouraged to sign up for Bali Refill My Bottle for data purposes and integration into refill app.
- Carolyn of SampahMenyampah, the founders of the *#TakNakStraw* campaign approached PMRS to inform about her campaign and requested assistance in locating straw-free establishments on Pulau Perhentian. PMRS were provided information and signs to be put up in various establishments. SampahMenyampah requested the names of straw-free establishments so that they can be added to their straw-free map of Malaysia.

Successes

In total, 31 stakeholders contributed to the 'Plastic-free Perhentian' map.

All 19 contributing stakeholders on Perhentian Kecil received an A3 hard copy of the Perhentian Kecil map to display it around their business. After finalizing the map for Besar, all 31 stakeholders received the printable split A3 map of Kecil and Besar via WhatsApp, as this has been requested as best contact method and to save paper and laminating sheets.

MDB gave their approval to put up 'Plastic Free Perhentian' signboards. After being produced in Kuala Besut, three signboards of the Perhentian Kecil map were successfully deployed between the 7th and 9th of June at the jetty of Long Beach and Coral Bay and in front of Alunan Resort at Petani Beach. During the preparations for the monsoon, all three signboards were recovered and stored at the Blue Temple Project House in the end of September.

A brief feedback evaluation was sent to all contributing stakeholders to monitor the success of the initiative but no response was received by the end of the season. However, reports from stakeholders on the map say they are a success and they had tourists coming in asking for the water refills and making use of the recycling bins.

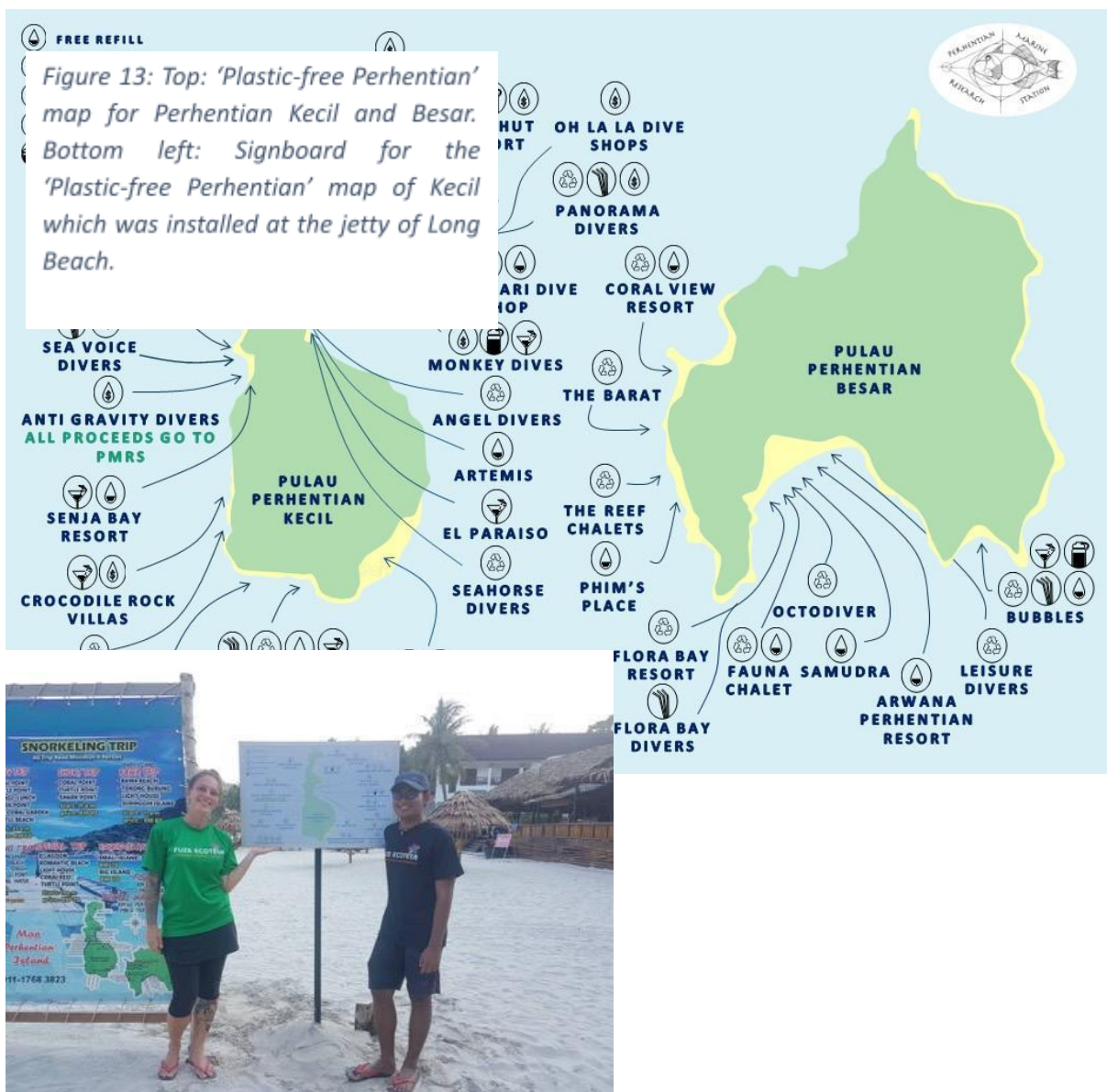
Facebook post of stakeholder map very well received by public, reached unprecedented 51,096 people with 448 likes and 246 shares.

A total of 50 metal straws were sold to dive shops and bars on the island (30 to Panorama Divers and 20 to Juja Bar).

Cocohut Long Beach Resort adopted sticker design. Bottles offered for sale as of the 30th of May.

Several stakeholders were encouraged to register at the Bali Refill My Bottle initiative to be included in their app. However, it is unknown how many businesses completed their registration.

Two businesses were named to the #TakNakStraw initiative and #TakNakStraw posters were distributed. Laminated #TakNakStraw initiative A4 information (in Malay and English) were delivered to stakeholders at Long Beach and Coral Bay. #TakNakStraw care-packages including all necessary information on how to reduce or discontinue using plastic straws, including printable posters and signs for establishments to use to inform customers were sent to 15 establishments.



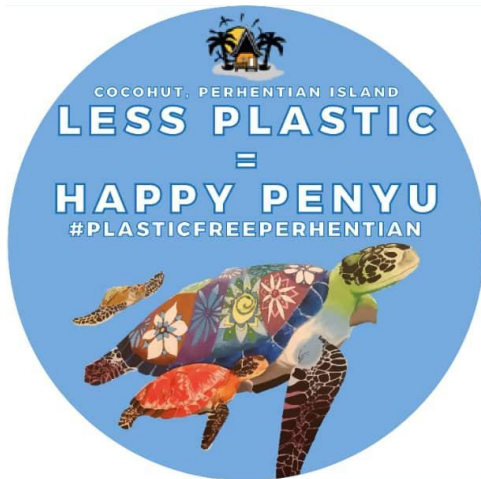


Figure 14: The sticker design on the left was prepared by PMRS for the reusable water bottles of Cocohut Long Beach Resort on the right picture.

4.2 Waste Recycling Project on Pulau Perhentian

Objectives

Develop and implement a basic recycling plan for Pulau Perhentian that is accepted as practical by stakeholders, immediately self-sustaining at starting scales and readily scalable. Furthermore, develop a 'network' with dive centres, resorts and interested parties to inspire environmental conservation on Perhentian Island.

Activities

- Several recycling companies were contacted to ask for their willingness to pick up the recycling waste of Perhentian Islands from Kuala Besut.
- After the initial plans of starting a Perhentian Island wide recycling strategy failed due to the issue of transporting and storing large amounts of recyclables, PMRS has suggested an alternative solution whereby collection, storage and transport of recyclables is managed on a smaller scale. Jumbo bags (Dimensions: 96cm X 96cm X 120cm) may offer a practical method for a resort (or multiple in coordination) to store recyclables in easy to move containers. These bags may be easier for resorts to bring to the mainland with their personal boats or be more practical for MDB contractors to handle.
- Several meetings were held between the headmaster of the village school on Perhentian Islands, the Fuze Ecoteer Community Project and PMRS to get SK Pulau Perhentian on board to integrate recycling in the curriculum.

- Constructing comprehensive stakeholder list including contact details and degree of commitment to previous PMRS initiatives.

Successes

RD papers Sdn. Bhd. in Gong Badak, Kuala Terengganu, was contacted to ask for their willingness to pick up the recycling waste of Perhentian Islands from Kuala Besut but stated that the distance between Gong Badak and Kuala Besut is very far and would cost a lot of money. Alternatives which are closer to Kuala Besut and more suitable are JAJ Group who even picked up the recyclables after the recycling competition (see chapter 6.1.3).

A meeting with business owners on Coral Bay and Long Beach was organized to communicate the jumbo bag idea (see chapter 4.2.1).

___The headmaster of the village school started to integrate recycling in his curriculum in 2018 (see chapter 6.1).

___Stakeholder list and flow chart prepared including contact details and degree of commitment to previous PMRS initiatives.

___The 2018 Waste Management Report was finalised with handover information for the 2019 Waste Management Team.



Figure 15: First meeting with SK Pulau Perhentian and the Fuze Ecoteer Community and Conservation Project to discuss about integrating marine conservation and recycling in the curriculum of the local primary school.

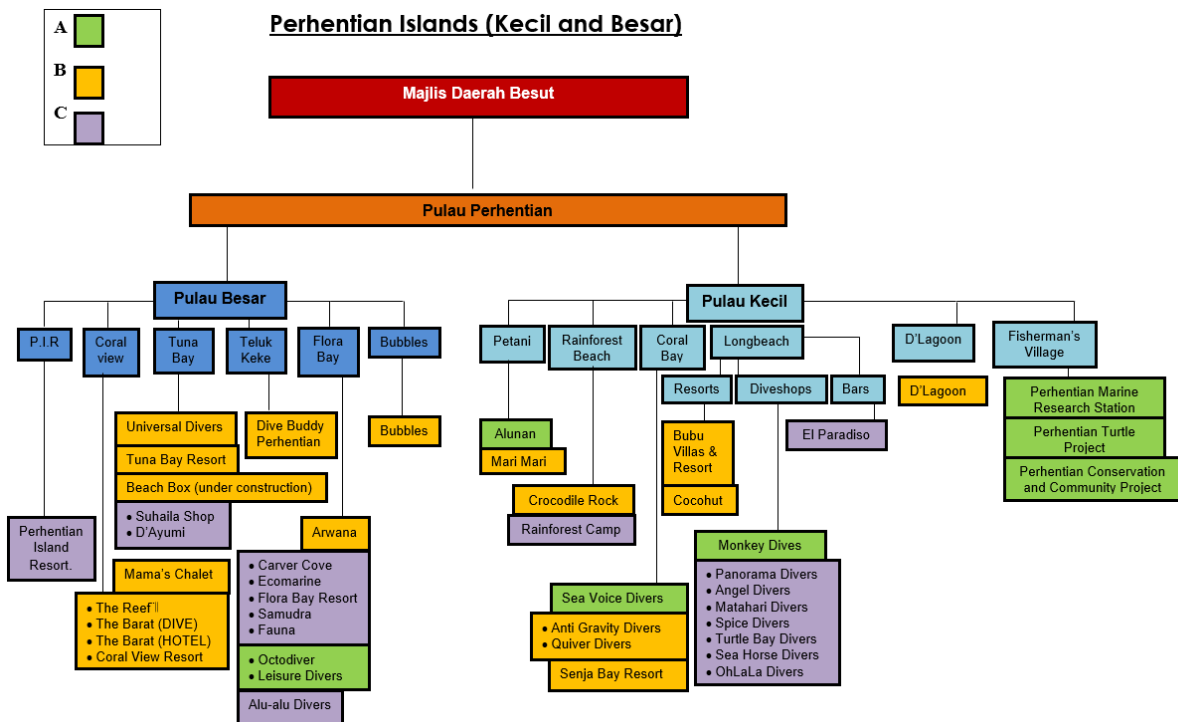


Figure 16: Flow Chart and Willingness-to-Cooperate Grade. Stakeholders are first divided geographically by island and then by beach. Each stakeholder is then graded on their willingness to cooperate; the grade is based on previous dealings with PMRS representatives. An A grade reflects a stakeholder that actively seeks to cooperate with PMRS, a B grade reflects a stakeholder that participates in PMRS initiatives although not fully. The C grade reflects a stakeholder that does not cooperate with PMRS or express any interest to do so.

4.2.1 Stakeholder Meeting with Business Owners of Long Beach and Coral Bay

Objectives

To bring stakeholders and Fuze Ecoteer representatives together to discuss possible solutions to tackle the waste issue on Pulau Perhentian. Two meetings were planned, one with stakeholders from Coral Bay and the other with stakeholders from Long Beach to encourage communication and collaboration between neighbouring businesses.

Activities

- Plans to initiate a Perhentian Island wide recycling strategy failed to address the issue of transporting and storing large amounts of recyclables. To address this issue, PMRS

have suggested an alternative solution whereby collection, storage and transport of recyclables is managed on a smaller scale. The jumbo bags (dimensions: 96 cm X 96 cm X 120 cm) may offer a practical method for a resort (or multiple in coordination) to store recyclables in easy to move containers. These bags may be easier for resorts to bring to the mainland with their personal boats or be more practical for MDB contractors to handle.

- Invitation letters for the meeting with Coral Bay and Long Beach business owners on the 20th and 21st of August respectively were prepared.
- Fuze Ecoteer brought the following key-suggestions to the meeting. The first was a recycling scheme utilising jumbo bags for storage and transport, the second suggestion was a bottle/plastic container deposit system to encourage proper disposal of said items and the third was the #TakNakStraw initiative. An information booklet was prepared explaining the details of each scheme. These bags may be easier for resorts to bring their recyclables to the mainland with their personal boats or be more practical for MDB contractors to handle. Fuze Ecoteer also hoped for suggestions, advice and feedback from stakeholders regarding past, present and future initiatives.
- Coral Bay: The first round of invitations was handed out personally on the 2nd of August followed by a second round on the 17th of August confirming the location of the meeting. The meeting was planned for the 20th of August to be held at Fatimah Chalet with 15 stakeholders invited.
- Long Beach: The first round of invitations was handed out personally on the 1st of August followed by a second round on the 15th of August confirming the location of the meeting. The meeting was planned for the 21st of August to be held at Cocohut Long Beach Resort with 30 stakeholders invited.
- Both meetings were held together with the Project Managers of the Perhentian Turtle Project, The Perhentian Community and Conservation Project and the Recycling and Waste Management Leader of PMRS.

Successes

Coral Bay

On the day of the meeting only two stakeholders attended. Puan Sharifah from Sea Voice Divers and Puan Fidiatun from Fatimah Chalet. All three key-suggestions were discussed and reception of jumbo bags and #TakNakStraw was positive. Puan Sharifah from Sea Voice Divers indicated interest in jumbo bag recycling scheme but raised concerns about arranging meetings with recycling companies at Kuala Besut. With no short-term storage location, her representatives might be forced to wait at the jetty - halting their operations. She suggests contacting Fisheries Department to ask for use their grounds as temporary loading bay.

Puah Fidiatun from Fatimah Chalet indicated interest in the #TakNakStraw campaign and jumbo bag scheme - but with no boat, admitted that it might not be feasible for them.

When asked for suggestions, both parties suggested installing public ash-trays/bins in front of every shop, these bins would be cared for and serviced by each shop. They were also keen on the idea of more awareness signage and would be willing to work with Fuze Ecoteer to design, purchase and deploy signs.

After the meeting, Fuze Ecoteer visited the other stakeholders to go through the points discussed at the meeting and inquire on issues faced by vendors and possible solutions. Majority of stakeholders cited being busy as their reason for not attending the meeting. Several shop owners were interested in the idea of the bottle deposit scheme but were reluctant arrange follow up meetings.

Antigravity Divers indicated their interest in the Jumbo Bag Scheme.

Shops interested in the #TakNakStraw campaign were sent a care-package containing information, signs and posters via what's-App.

Attendance levels were low but of those who attended (as well as those who consulted personally afterwards) willingness to communicate and share concerns was high. When asked if the meeting was beneficial and should be repeated, both attendees agreed. Overall it appears that Coral Bay stakeholders appreciate suggestions and have more potential to initiate waste-reducing strategies.

Long Beach

At the meeting no stakeholders attended. Instead, Fuze Ecoteer visited stakeholders personally to go through the points to be discussed at the meeting and inquire on issues faced by vendors and possible solutions. Most stakeholders cited being busy the day before Hari Raya Hajji as their reason for not attending.

Sharon from Panorama Divers voiced her interest in the jumbo bag recycling scheme and #TakNakStraw Campaign. She supported the suggestion to place more rubbish receptacles on the beach to be cared for by each shop. In addition, she brought up the issue of rubbish that is left behind and MDB hired cleaning team that should be cleaning Long Beach everyday but have not been seen for months. Sharon suggested looking into biodegradable cups and straws to be sold to the beach bar vendors.

Leonardo from BuBu Resort informed us that his resort transports their waste back to the mainland via cargo boat. When asked if any of the materials were sold/ recycled he admitted not knowing and would make inquiries. Both the jumbo bag scheme and the #TakNakStraw campaign appealed to him and he voiced his willingness to bring the issue to his superiors.

When asked about their views on the three key-issues, the smaller Malay-ran shops and cafes (Suhaila's Shop, Damilah Café, Awatif Café etc.) showed little enthusiasm. They cited a lack of resources, being content with the current system and a fear of losing customers as reasons not to participate.

Multiple shops were asked to provide contact details of enterprising individuals collecting aluminium cans. We hope these individuals may be receptive to the idea of expanding their business to include collecting plastic bottles and other recyclable materials with the assistance of Fuze Ecoteer.

Turtle Bay Divers voiced their concerns with bins placed on beaches citing that such areas become much dirtier and attract rodents and bad smells.

Shops interested in the #TakNakStraw campaign were sent a care-package containing information, signs and posters via what's-App.

The lack of attendance and enthusiasm among stakeholders suggests that planned meetings are not an effective way of assisting Long Beach stakeholders. Businesses appear to be isolationist and reliant on established systems with little time or interests to discuss new systems with outsiders.

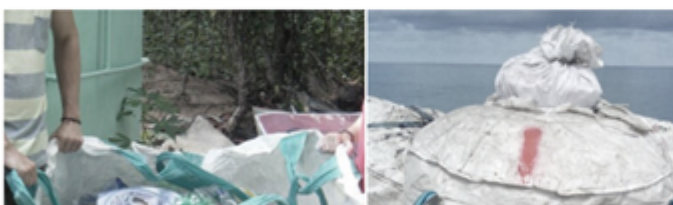
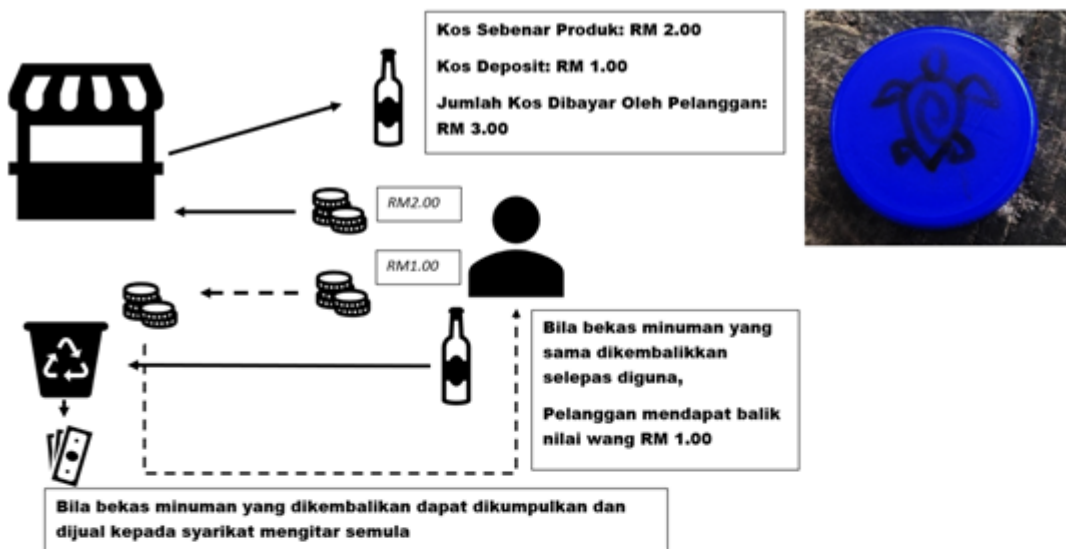
Overall

Communication established with many new stakeholders.

Information booklets on working with the jumbo bag system and information on a bottle deposit system were handed out in printed copies to 30 stakeholders.

#TakNakStraw care-packages including all necessary information on how to reduce or discontinue using plastic straws, including printable posters and signs for establishments to use to inform customers, were sent to 15 establishments.

Figure 17: Top: Sample from bottle/plastic container deposit system. Bottom: Sample from jumbo bag information booklet.



Big Bag Cross Corner Loop



4.2.2 Responsible Waste Management Documents

Objectives

To provide businesses on Perhentian Island with information on how to initiate and maintain proper waste management programs, several documents were prepared.

Activities

- Documents for the businesses on Perhentian Island were prepared including posters in English and Malay, a brief reader and a litter checklist.

Successes

Responsible Waste Management documents including information on how to initiate and maintain proper waste management programs were completed and sent to businesses on Pulau Perhentian. The Responsible Waste Management Google Drive folder has been sent and shared with 36 stakeholders via WhatsApp.



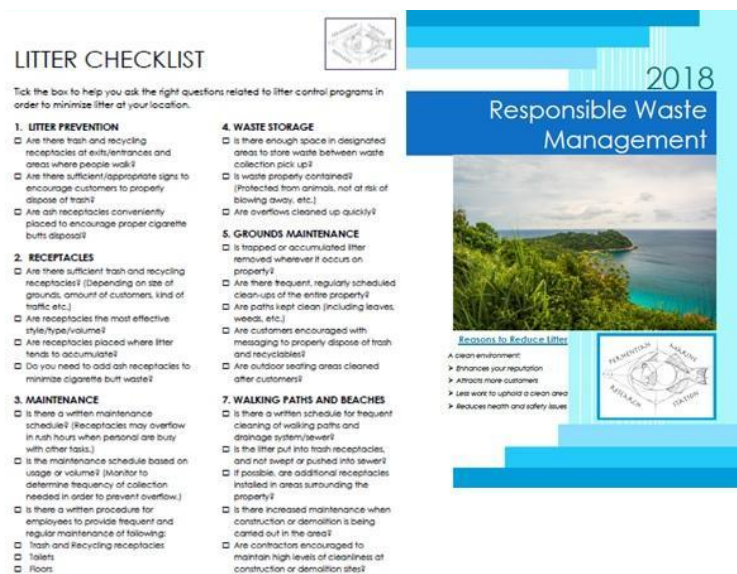


Figure 18: Examples of Responsible Waste Management documents sent: Posters in English and Malay, a brief (five page) reader in English, and a littering checklist.

4.2.3 Recycling and general waste bins

Objectives

To tackle the issue of polluted beaches on Perhentian Island, general waste bins were constructed and distributed to beaches with high pressure of tourism. In the course of the Plastic-free Perhentian initiative, recycling bins were also distributed to those businesses around the island who requested them in order to keep our beaches clean.

Activities

- Deployment of four sets of bins, general waste and recycling, to Coral Bay, Long Beach and the village.
- Deployment of 18 public general waste bins around Perhentian Islands.

- Monitoring the use and success of bins at Pulau Besar.

Successes

- ___ Four sets of bins, general waste and recycling, were placed in front of Sea Voice Divers at Coral Bay, Angel Divers and Seahorse Divers at Long Beach, and SK Pulau Perhentian in the fishermen village. The first set was distributed to Quiver Divers in the end of the 2017 season.
- ___ Mari-Mari started to build their own recycling bins.
- ___ Successfully deployed 18 public trash bins around Perhentian Island. 10 public bins were distributed among Long Beach to more efficiently reduce littering as well as to further increase awareness in the most touristic and vulnerable areas. Two bins were placed at Teluk Keke under the care of Mr. Bahaman from Dive Buddy Perhentian. Two bins were given to Kelvin Lim from Flora Bay Divers. Another bin was given to Fauna Chalets on Flora Bay and distributed along with a picture-manual describing the process of making them. One bin was given to Kak Aya, a local business woman of the fishermen village who has taken the initiative to start collecting aluminium cans to take to the recycling centre on the mainland after the season. It was a great success to be able to involve local business people in this initiative. Two additional bins were placed at Coral Bay under the care of Senja Bay Resort and Sharila Resort.
- ___ Stakeholders on Perhentian Islands began to show interest in public bins after the social media post of deploying bins at Long Beach. Due to many requests for bins, the sale of bins may be a viable option in the future. The cost price of each bin was calculated to be RM7 with two stakeholders voicing their willingness to pay RM15 for the bin providing PMRS with a potential RM8 of profit per bin which could be used for further conservation initiatives.
- ___ The bins have been seen to be used around the islands, and reports from our beach clean-ups where the bins are positioned claim the amount of trash on the beaches has been reduced. Positive feedback from Pulau Besar on the distributed bins, Mr. Bahaman from Dive Buddy at Teluk Keke was very pleased and thankful for his bins and is using them frequently. Bins on Flora Bay are also in use and being looked after.





ong Dawai
leh dibeli di Kuala
Besut
ong = RM 10

Figure 19: Top Left: Recycling and Waste Management Leader Irfan and Nick distributed public trash bins at Long Beach. Top Right: Recycling and Waste Management Leader David deployed bins at Fauna Chalets. Bottom left: Instructions for self-made chicken wire bin.

4.3 Precious Plastic Recycling Machines

Objectives

Introduce an on-site recycling system to counteract the accumulation of plastic debris in the Marine Park surrounding the Perhentian Islands, and therefore reducing anthropogenic stress exerted on local coral reefs. Raise funds to purchase an on-site plastic recycling machine that enables the whole island community to recycle their plastic waste.

Activities

- A proposal was prepared and sent to the National Fish and Wildlife Foundation (nfwf) as well as to the directors of the Marine Park to raise funds for the on-site plastic recycling machine for PMRS.
- The proposal was also sent to the local parliament member through the school to raise fund in financing another recycling machine for the SK Pulau Perhentian. PMRS agreed to train staff of the school in using the machine and the Fuze Ecoteer Community Project will help them during their classes.
- Donation boxes with short information about the recycling machines were placed at different stakeholders and have been rotated monthly.

- On the 29th of June, a meeting with Carlos Steenland from The Sea Monkey Project who is constructing the precious plastic machines was held on Perhentians to discuss about the machines.

Successes

The proposal which was sent to the National Fish and Wildlife Foundation (nfwf) was rejected and no response was received from the Marine Park.

The proposal which was sent to the local parliament member through the school was rejected after the political member lost the election.

Donation boxes were placed at Sea Voice Divers, Senja Bay, Matahari Divers, Alunan Resort, Universal Divers, Antigravity Divers, Quiver Divers, Monkey Dives and the food court at the village jetty. In total, only RM109 have been raised. RM50 came from the donation box at Sea Voice Divers, RM22 came from Antigravity Divers, RM5 from Quiver Divers and RM32 from Monkey Dives.

Carlos Steenland came to Perhentian Islands to talk about the recycling machines. The machines arrived in November in Kuala Lumpur and the first test out happened on the 6th of November. Workshops will be conceptualized.



5 R *Figure 20: Left: Principle of the precious plastic recycling machines. Top right: The Sea Monkey Project and Fuze Ecoteer is sorting plastics. Bottom right: First go on the machines.*

Objective

Clean the reefs and beaches of Perhentian Islands and show leadership in the campaign against marine debris to tourists and the local community.

Activities

- Reef clean-ups: were conducted in collaboration with local dive shops and by PMRS staff and volunteers alone.
- Beach clean-ups: were conducted on a weekly basis with volunteers as well as in cooperation with local dive shops.

- Trash-free Tuesday: PMRS initiated weekly beach clean-ups at Long Beach in collaboration with Monkey Dives. Collaboration with JuJa Bar as part of Long Beach clean-up promotion, everyone who participated in the clean-up was eligible to purchase one discounted beverage on the evening of the event. After the closure of JuJa Bar, the discounted drinks for clean-up attendees were provided by Abas Bar or Beach Bar. The clean-ups were organized and carried out using duty roster between all three Fuze Ecoteer Perhentian projects which took turns in sending staff members and volunteers to the clean-up on a weekly basis.
- A new beach clean-up card was prepared in order to acquire more useful data from beach cleaning activities. The new card was made to replace the OCC form which does not effectively catalogue large scale beach cleans.

Successes

Reef clean-ups: Throughout the 2018 season, five reef clean-ups were conducted around Perhentian Island; three were in collaboration with local dive shops (Panorama Divers, Monkey Dives and Quiver Divers) and two reef clean-ups just with PMRS staff members and volunteers. Additionally, during all training and survey dives of PMRS, trash, fishing cages and entangled ropes were collected.

In total, eight black bin bags, three mesh bags and one kayak full of trash were recorded.

Table 4: Results of reef clean-ups in 2018.

| | Location | Number of people | Number of bags collected (mostly large size if not stated differently) |
|-------|--------------|-----------------------|--|
| 19/03 | Batu Nisan | 4 + Panorama Divers | 2 full mesh bags |
| 04/04 | Village Reef | 4 | n.a. |
| 06/04 | Village Reef | 6 | One kayak full of trash |
| 28/04 | Batu Nisan | 2 + Monkey Dives | 8 bin bags |
| 21/07 | Golden Sand | 9 incl. Quiver Divers | 1 mesh bag |

Figure 21: Reef clean-ups in 2018. Left: PMRS staff and Panorama Divers after a reef clean-up at Batu Nisan. Top right: Reef clean-up at Batu Nisan. Bottom left: PMRS at PADI Women's Day reef clean-up initiated by Quiver Divers.



Beach clean-ups: Throughout the 2018 season, 21 beach clean-ups were conducted in collaboration with local dive shops (Sea Voice Divers and Panorama Divers), other Ecoteer projects (Perhentian Turtle Project and Perhentian Community and Conservation Project), local authorities as well as other conservation organisations (Pulau Perhentian Police Department, the British High Commission, Reef-Check Malaysia, and members of the Kampung Pasir Hantu Community). A total of 103 bin bags (mostly large size, some of them even extra large sized), 550 kg trash and countless big ropes were recorded. Data of all big events were uploaded to Ocean Conservancy after cataloging the trash. Data from beach clean-ups with corporate are not included and are listed in chapter 6.

The new PMRS beach clean-up card and associated data sheet was uploaded to the Waste Management Folder on Google Drive under the beach clean-up data folder.

Table 5: Results of beach clean-ups in 2018.

| | Location | Number of people | Number of bags collected (mostly large size if not stated differently) |
|-------|--|--------------------------|--|
| 03/03 | Coral Bay, Golden Sand and Pantai Acing | 9 incl. Sea Voice Divers | Number of bags not assessed but countless heavy ropes and plastics covered in tar were collected or burnt. Trash was catalogued (detailed information in March project report) |
| 24/03 | Path from village to Coral Bay | 4 | 7 |
| 30/03 | Windmill | 5 | 1.5 |
| 13/04 | Path from village to turtle statue (way to Long Beach) | 4 | 5 |

| | | | |
|-------|--|--|--|
| 26/05 | Path from village to turtle statue (way to Long Beach) | 3 | 4 |
| 28/05 | Romantic Beach | 15 incl. Sea Voice Divers and Panorama Divers | 8 + huge piles of fishing ropes which needed to be burnt |
| 07/06 | Pinang Seribu | 10 incl. Panorama Divers | 15 |
| 07/07 | Path from village to turtle statue (way to Long Beach) | 2 | 2 |
| 13/07 | D' Lagoon | 5 | 3 |
| 20/07 | Village Beach | 4 | 1 extra large back |
| 27/07 | Path from village to Coral Bay | 3 | 1 extra large back |
| 04/08 | Tanjung Buton | 12 incl. PTP | 15 |
| 17/08 | Tiga Ruang | 6 | 3, estimated weight 20 kg |
| 18/08 | Beach behind mosque and path from village to turtle statue (way to Long Beach) | 8 incl. PTP and PCCP | 55-60 kg |
| 24/08 | Turtle Beach (Pulau Kecil) | 5 | 2 |
| 25/08 | Path between Long Beach and Coral Bay | 8 incl. PTP | 24 |
| 08/09 | Pasir Aci | 8 incl. PTP and PCCP | 7 |
| 15/09 | Tiga Ruang Meninggis | 11 incl. PTP and PCCP | 118 kg |
| 21/09 | Village Beach | 80 incl. Pulau Perhentian Police Department | 160 kg |
| 22/09 | Teluk Keke | Together with the British High Commission, Reef-Check Malaysia, PTP, PCCP and members of the Kampung Pasir Hantu Community | 214 kg |

| | | | |
|-------|-----------------------------------|--------------|---|
| 29/09 | Path from village to Petani Beach | 4 incl. PCCP | 4 |
|-------|-----------------------------------|--------------|---|



Joined beach clean-up at Pantai Acing with Sea Voice
 up at Pinang Seribu with Panorama Divers. Middle
 on with PMRS, PTP and PCCP. Bottom: Joined beach
 Commission, Reef-Check Malaysia, PTP, PCCP and
 ty on the International Coastal Clean-up Day.



PERHENTIAN MARINE RESEARCH STATION CLEANUP CARD


This card is to assist PMRS in collecting data about the accumulation of waste here on Pulau Perhentian. Far from being a 'waste' of time, the data you provide will inform our waste management strategies!

If you would like to assist us, take a copy of this card on your next beach-clean up and fill in as much as you can. We would appreciate it if you gave us an honest account of the impact your clean had in terms of coverage and gave us an estimation of the mass of materials you collected.

Once completed, you may email a picture of the filled-in card to us at Perhentianmarineresearch@gmail.com.

Good-luck, thank you, & take care!

Any remarks, questions or suggestions are appreciated





PERHENTIAN MARINE RESEARCH STATION CLEANUP CARD

| Clean-up Location Date: | | Coverage (%): | | | |
|---------------------------|--------------------------------------|-----------------|----------------------------------|-----------------------|----------------------------|
| Last-cleaned: | | Pax Duration: | | | |
| Material Category | Type | Item Count | Description (Identity/condition) | Mass (Kg) (* approx.) | Total Mass (Kg) (*approx.) |
| Plastic | Beverage Bottle | | | | |
| | Food Wrapper | | | | |
| | Take-Out Container | | | | |
| | Plastic Bag | | | | |
| | Straws | | | | |
| | Eating Utensils | | | | |
| Aluminum | Tiny (less than 2.5cm ²) | | | | |
| | Other | | | | |
| | Beverage Can | | | | |
| Glass | Food Can | | | | |
| | Other | | | | |
| | Beverage Container | | | | |
| | Food container | | | | |
| Polystyrene | Tiny (less than 2.5cm ²) | | | | |
| | Other | | | | |
| | Food/Drink Container | | | | |
| | Industrial Packaging | | | | |
| Smoking | Flotation Aid | | | | |
| | Tiny (less than 2.5cm ²) | | | | |
| | Other | | | | |
| Personal Hygiene | Filters | | | | |
| | Lighters | | | | |
| | Packaging | | | | |
| Other | Diapers | | | | |
| | Toothbrushes | | | | |
| | Other | | | | |
| | Fishing/boating Equipment | | | | |
| Total (kg): | Toys/Recreational Items | | | | |
| | Apparel | | | | |
| | Construction | | | | |

Figure 23: New PMRS beach clean-up card.

Trash-free Tuesday: PMRS found Monkey Dives as partner for the weekly beach clean-ups at Long Beach and initiated the clean-up series commencing on the 15th of May. An announcement poster was provided to get the initiative started. PMRS led eight of the Trash-free Tuesday clean-ups. A total of 47 bin bags plus one empty gas container were recorded. The clean-ups in-between were led by the Perhentian Turtle Project or the Community and Conservation Project.

Table 6: Results of Trash-free Tuesdays in 2018, a collaboration with Monkey Dives.

| | Location | Number of people | Number of bags collected (mostly large size if not stated differently) |
|-------|--------------------------------------|------------------|--|
| 15/05 | Long Beach | 4 | 5 bin bags + 1 empty gas container |
| 22/05 | Long Beach | 12 | 6 |
| 29/05 | Teluk Keke | 20 | 11 |
| 05/06 | Long Beach | 13 | 6 |
| 26/06 | Long Beach | 6 | 2 |
| 17/07 | Path from Long Beach to the windmill | 20 | 14 |
| 13/08 | Long Beach | 7 | 3 |
| 25/09 | Long Beach | n.a. | n.a. |



*ster for the Trash-free Tuesday beach clean-ups in collaboration
with clean-up participants in front of Monkey Dives after the*

6 Awareness / Collaboration

6.1 SK Pulau Perhentian

Objective

To raise awareness about marine conservation and to educate the children on Perhentian Island about the benefits of recycling, having healthy coral reefs and maintaining the cleanliness of the island.

6.1.1 International Science Week

Activities

- From the 10th until 16th of April, a booth for the International Science Week was set together with the Perhentian Community and Conservation Project and Perhentian Turtle Project at SK Pulau Perhentian. During that week, PMRS staff members and volunteers led several activities on different topics such as coral reefs, recycling and a beach clean-up.

Successes

- ___ Coral Reefs: Students were taught about coral reefs with a proactive game. After a play-based lecture, kids were taken snorkelling at the coral reef in front of the village

beach to see different types of corals, to learn differentiating healthy and bleached corals, dead corals, differences between rocks and corals as well as learned about the butterfly fish. Each PMRS staff and volunteer was responsible for a small group of 3-4 kids.

___ Recycling: PMRS staff explained the importance of recycling and how trash is sorted in Malaysia.

___ Beach clean-up at the village beach: Under the supervision of PMRS, SK Pulau Perhentian students were given the task to collect trash and sort it by categories and subsequently counted it. 35 students joined the beach clean-up at the village beach and six big bags of trash were collected. The students learned how to sort out trash in categories such as plastic bottles, cans, straws etc.

___ As part of a competition among schools in Malaysia, the students of SK Pulau Perhentian prepared a 3D model of Perhentian Island of the future.



Figure 25: Activities during the International Science Week. Top left: Staff from PMRS, PTP, PCCP in front of the booth. Top right: PMRS with the kids after the lecture and snorkelling activity about coral reefs. Bottom left: The students presented their 3D model of an island of the future which they prepared as one of the activities during the International Science Week.

6.1.2 Fuze Ecoteer Days

Activities

- On the 29th and 30th of April, PMRS, Perhentian Community and Conservation Project and Perhentian Turtle Project were invited by the headmaster of SK Pulau Perhentian to join two “Fuze-Ecoteer Days” at school. The first day was supervised by PCCP and PTP. The second day PMRS organized two activities:
 - Lecture about the importance of coral reefs and their threats.
 - Group work “Save our reef”. A board was designed by PMRS and Perhentian Community and Conservation Project and the children were asked to work in

groups on signs how to protect coral reefs based on information they got in the previous lecture.

Successes

___15 students of year 6 including kids of the “diving class” joined the. After the lecture, the students were asked to brainstorm about possible ways to save our reefs and draw signs for it. The five groups with three children each chose different topics and designed the signs which were stucked on the “Save our Reef” board and displayed in the school.



Figure 26: Activities during the “Fuze Ecoteer Days”. Top left: PMRS lectured the year 6 including children of the “diving club” about coral reefs and their threats. Bottom left and right: The students posing with their creation and the final “Save our Reef” board.

6.1.3 Recycling competition

Objectives

In order to reduce the amount of waste in the village on Perhentian Islands, to educate the students about recycling and to provide PMRS with data regarding the storage and transport of recyclables, a recycling competition with the local school was performed. The event was organized and executed by PMRS, Perhentian Community and Conservation Project, and SK Pulau Perhentian.

Activities

- Division of tasks and labours between Perhentian Community and Conservation Project and PMRS:
 - Acquisition of prizes.
 - Preparation of time-line and all necessary documents.
 - Acquisition of storage bags (jumbo bags).
 - Acquisition of weighing scales and other necessary tools.
 - Communication with Majlis Daerah Besut (local council) and waste collectors.
- Registration to form recycling teams for the competition opened on the 1st of August.
- Briefing for the students was held on the 15th of August on how to identify recyclable materials, how to sort and clean materials and how to store materials in the correct way according to the jumbo bag system.
- First successful collection and separation of recyclables on the 23rd of August.
- Second collection and separation of recyclables on the 30th of August.
- MDB rubbish boat operator was approached to transport bags. Pok Li, cargo boat operator was approached to transport bags. JAJ Group was contacted to collect bags from Kuala Besut Fisherman Jetty.
- Materials from the SK Pulau Perhentian recycling competition were transported back to Kuala Besut to be sold to JAJ Group.

Successes

- ___ Communication established with MDB (Puan Nurul) and collection contractor (Puan Hamanee) which collected the jumbo bags in the end of the competition.
- ___ Six jumbo bags sourced from RD papers (96cm X 96cm X 120cm) for RM 20 ringgit each.
- ___ Registration was held on the 1st of August starting a two-week registration period where recycling teams were formed. In total 10 junior teams (7-9 years), 6 children each, and 10 senior teams (10-11 years), 3 children each, were formed.
- ___ Briefing was held on the 15th of August marking the close of registration and more additional information was given by Fuze Ecoteer in presentations on which materials can be recycled, how to collect these items, where and how to store them properly and the competition rules.
- ___ First successful collection and separation of recyclables was held on the 30th of August with 11 teams showing up (fluctuated at all collections) which recovered 37.3 kg of plastic, 80.8 kg of paper/cardboard, 24.7 kg aluminium and 9.7 kg glass.
- ___ In three weeks, a total of 395.6 kg of recyclable materials (82.2 kg of plastic, 225.8 kg of paper/cardboard, 68.8 kg of aluminium and 5.65 kg of glass) with an estimated ringgit value of RM286.48 (RM41.1, RM67.74, RM172 and RM5.64 respectively) was collected. These information will inform future waste surveys in the hopes of generating a comprehensive mass balance.

- ___ For the winners of the senior category the following prizes were given: Bicycle (sponsored by UMW Malaysia), watch (sponsored by SK Pulau Perhentian) and a Bubble Blower course (sponsored by Sea Voice Divers). For the junior category: Scooter (public donation), watch: sponsored SK Pulau Perhentian and Bubbles Resort), snorkelling trip to Rawa Island (sponsored by Joju).
- ___ 160 kg of recyclable materials was transported back to the mainland by Pok Li, JAJ Group picked up the load and paid RM160 which was given to Pok Li as a token of goodwill.

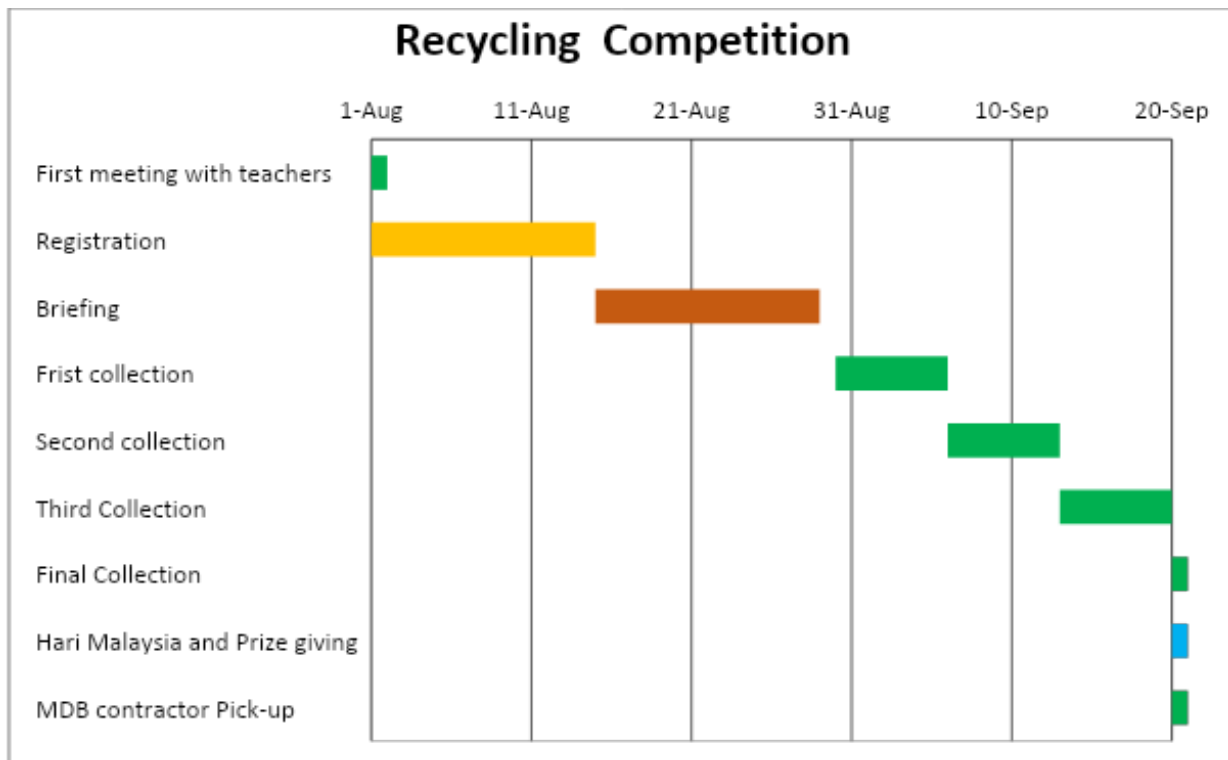


Figure 27: Top: Gantt chart for SK Pulau Perhentian recycling competition. Bottom: First session of collection and separation of recyclables.

6.2 Turtle Camp at Cocohut Long Beach Resort

Objective

To raise awareness and educate children about sea turtles, a joined event between Cocohut Long Beach Resort and the three Fuze Ecoteer projects was held.

Activities

- The Manager of Cocohut Long Beach Resort approached PMRS and asked for an event to educate children from a village near Jerteh about turtles.
- The 1.5 day event took place on the 22nd and 23rd of June at Cocohut Long Beach Resort together with Perhentian Turtle Project, Perhentian Community and Conservation Project and PMRS.

Successes

The turtle camp was successfully run on the 22nd and 23rd of June with five children from a village near Jerteh and six kids from the fishermen village on Perhentian Kecil attending.

Activities included a snorkelling trip, beach clean-up, presentation, educational games on the turtle life cycle as well as a pledge to not eat turtle eggs.

In the end of the camp, each participant received a certificate.



Figure 28: Turtle Camp at Cocohut Long Beach Resort. Top left to bottom right: Educational games at the beach about sea turtles, a beach clean-up and a pledge to not eat turtle eggs were part of the event. Bottom right: Participants with their certificates.

6.3

International Schools

Objectives

To raise awareness among students of international schools to love and care about nature. For those events happening on Perhentian Island also promoting the interactions between the local kids and international children.

6.3.1 ISKL

Activities

CHERATING

- Beach clean-up at the hatchery in Cherating to spark awareness among the ISKL students on the threat of pollution that turtles are facing and to maintain the cleanliness of the beach area for nesting turtles.
- Night Patrol to teach about the behaviour of landing turtles and the process of them laying the eggs.
- Hatchery visit with the student to see functionality of the turtle hatchery and the importance of having hatcheries.

PERHENTIAN

- Several environmental games such as scavenger hunt and making sun catchers were played to create awareness about trash or recyclable items that can be upcycled to produce other useful and beautiful products.
- Water confidence at Petani Beach to boost their morale and confidence in water related activities.
- Ecosnorkelling trip to educate the kids on the marine ecosystem and how to reduce the impact on the environment while snorkelling, to be more aware of pollution and its impact on the coral ecosystem and creating a sense of responsibility inside the student to conserve and protect beautiful marine creatures.
- Jetty jump at the village jetty as a tradition for all Fuze Ecoteer volunteers.

Successes

In Cherating, around 11 black bags were collected by 20 people within an hour which consisted of mainly plastic packaging, food wrappers, plastic bottle, single-use plastic utensils and diapers. This action created awareness in the student to dispose their rubbish responsibly and to engage them more in recycling activities.

During the scavenger hunt, six small blue bin bags were collected by 10 people in 10 minutes and the students were taught on the increasing pollution around the world.

6.3.2 Alice Smith School Kuala Lumpur

Activities

- The year six students of the Alice Smith School in Kuala Lumpur had a marine conservation week at their school. On the 21st of May, a presentation about plastic pollution and its consequences, solutions to reduce single-use plastic, recycling and the work of PMRS on a Plastic-free Perhentian was given to the students.

Successes

Around 110 students of the year six were educated on plastic pollution and its solution, recycling and the work of PMRS on their Plastic-free Perhentian initiative.

___PMRS was dropped down on the list of the school list as contact for future talks and activities regarding marine conservation.

6.3.3 BSKL

Activities

- On the 3rd of July, a lecture was held on Perhentian Islands regarding the importance of coral reefs.
- On the 3rd and 5th of July, two PMRS staff led an eco snorkelling trip to guide the students throughout the trip.

Successes

A total of 23 students and three teachers joined the lecture and the eco snorkelling trip to Coral Garden, PIR, Shark Point and Fish Point on Perhentian Island.

6.4 Local Dive Shops

Objectives

To reach as many people as possible, especially in the tourism industry, and educate them on marine conservation, PMRS collaborated with local dive shops and joined their events.

6.4.1 Project Ocean Awareness

Activities

- ___ From the 27th until 29th of April, an underwater and beach clean-up three days event was organized by Monkey Dives in collaboration with Universiti Sains Malaysia Scuba Diving Club and Perhentian Turtle Project. PMRS led two activities:
 - ___A presentation to USM scuba diving club and customers of Monkey Dives about coral reefs and their importance for the ecosystem.

o__A beach clean-up which was already mentioned in chapter 5.

Successes

30+ people among USM scuba diving club, Monkey Dives staff and customers joined the presentation about coral reef awareness.

6.4.2 Island Wide Clean-Up for World Ocean's Day

Objective

To organise an island wide reef and beach clean-up to take place on World Ocean's Day on the 8th of June in collaboration with any dive shops who wished to participate in order to both reduce plastic waste on the island and raise awareness.

Activities

- A doodle poll was created where dive shops could register their interest in cleaning a certain beach or reef on the day of the clean-up. The aim was to make sure as many areas as possible were cleaned.

Successes

In total, six clean-ups were carried out, one by each of the Perhentian Ecoteer projects, one by Oh La La Divers, one by Leisure Divers and one by Anti Gravity Divers. Though this was not as many as anticipated, this was put down to short notice as the doodle poll was only created the week before the clean-up.

PMRS did a reef clean-up of the area between the village and Petani Beach. Three large abandoned fishing cages were brought up, and one ghost fishing net.

Perhentian Turtle Project did a beach clean-up at Tiga Ruang, the government protected turtle nesting beach. They collected 24 bags of rubbish.

Perhentian Community and Conservation Project worked with local students from SK Pulau Perhentian to clean the village beach. They collected four bags of rubbish.

Oh La La Divers carried out a successful reef clean-up at Batu Nisan.

Leisure Divers carried out a clean-up at the beach at Flora Bay.

Anti Gravity Divers collected 5 mesh bags of rubbish at the reef at Kerma Laut.



Figure 29: Top left to bottom right: PMRS poster design to promote World Ocean's Day, Anti Gravity Divers after Kerma Laut clean-up, Oh La La Divers after Batu Nisan reef clean-up and PMRS team after village to Petani reef clean-up.

6.5 American Express Malaysia

Objective

In conjunction with “The International Year of the Reef 2018”, American Express Malaysia voiced their interest in getting involved with marine conservation. The company signed up to volunteer at four events, each event covering a different topic. The overall concept is ‘Everything is Ocean’ and that water connects all ecosystems. Hence, to conduct marine conservation the key is to act locally but think globally.

6.5.1 Mangroves – Kuala Selangor

Activities

- On the 4th of May, the first out of four events took place in Kuala Selangor at the Taman Alam Mangrove Project. After a presentation about mangroves, the group joined different activities such as planting mangroves, making an awareness video about mangroves, taking down some old huts and signs to recycle them as well as performing a clean-up.

Successes

Around 100 people of American Express joined the first event in the Mangrove Project at Taman Alam. During the half-day event, the groups successfully planted around 150 mangroves, took down two wooden huts and several old signs, took footage for an awareness video which was edited later on and collected eight big bin bags of rubbish.



6.5.2 Corals – Tioman Island

Activities

- On the 8th of July, the second event took place in Tioman Island at along Kampung



Figure 30: Group of American Express on their first event about mangroves in Kuala Selangor. A group of 100 people joined different activities such as planting mangroves, taking down wooden huts to recycle the wood and build something new, and a clean-up.

Paya Bay. The group participated in several activities under the supervision of Fuze Ecoteer representatives.

- In the afternoon of their arrival, 126 participants were divided into five groups and tasked with a stretch of beach, forest path or waterfall to clean.
- After the beach clean-up, a SCUBA diving refresher course was given to eight of the divers who had not been diving for over a year.

- That evening, a short presentation about coral biology and conservation was given by the project manager of PMRS.
- On the 9th of July, 26 participants took part in a series of diving related activities under the supervision of the PMRS diving team and Sealantis Dive Shop.
- The remaining 100 individuals took part in an eco-snorkelling trip. The participants were divided into six groups and were each under the supervision of a Fuze Ecoteer representative.

Successes

Around 126 staff members of American Express attended the event in Kampung Paya, Pulau Tioman.

Beach and forest clean-up was successful; details are documented in the table below. Nearly 140 kg of rubbish was collected and documented before proper disposal.

The diving activities were carried out successfully marking the first time the American Express organisation worldwide has ever participated in SCUBA Diving activities. The participants were briefed on Saturday and carried out two dives on Sunday. The first dive was either a refresher dive followed by buoyancy training or buoyancy training followed by a short reef clean-up session. The second dive was a fun dive for everyone carried out at Pulau Renggis, a small coral island.

The ecosnorkelling trip with 100 participants was successful. All participants were given safety and environment briefings. The groups were first brought to the Marine Park and then to Pulau Renggis.

Table 7: Results of the clean-up at Tioman with American Express Malaysia.

| Item | Material | Beach North | Rock Fall | Rock Fall & Beach | Beach South | Total Forest | Total Beach | Total | Approximate Weight (Kg) (total 255kg) |
|----------------------------|----------------|-------------|-----------|-------------------|-------------|--------------|-------------|------------|--|
| Beverage Containers | <i>Plastic</i> | 18 | 33 | 56 | 175 | 33 | 249 | 282 | 5.6 |
| | <i>Glass</i> | 0 | 20 | 30 | 36 | 20 | 66 | 86 | 12.9 |
| | <i>Cans</i> | 35 | 100 | 55 | 148 | 100 | 238 | 338 | 5.0 |
| | <i>Paper</i> | - | 1 | 5 | 53 | 1 | 58 | 59 | 0.5 |
| | <i>Foam</i> | 15 | - | - | - | - | 15 | 15 | 0.2 |
| | <i>Plastic</i> | 4 | 24 | 18 | 4 | 42 | 46 | | |



Figure 31: Top left: Separation of rubbish after beach clean-up. Top right: Ecosnorkelling briefing. Bottom: 1st American Express SCUBA diving excursion.

6.5.3 Turtles – Cherating

Activities

- On the 4th and 5th of August, the third event took place in Cherating. The group of 200 people participated in several activities under the supervision of Fuze Ecoteer representatives.
- On the afternoon of their arrival, 200 participants were divided into six groups and tasked with a beach clean-up among the beach of the Rimbun Dahan Turtle Hatchery or to paint the turtle sanctuary.
- After the beach clean-up, an awareness briefing was given by Pak Su and hatchlings were released.
- That evening, a night turtle watch was planned at Monica Bay but needed to be cancelled due to bad weather conditions.
- On the 5th of August, a talk about sea turtles was given by PMRS and a presentation about Terrapin Conservation was held by Chen Pelf Nyok, the founder and director of the Turtle Conservation Society of Malaysia.

Successes

Around 200 staff members of American Express Malaysia and their children attended the event in Cherating.

Beach clean-up was successful, 85 bin bags and heavy construction material items were collected in less than one hour.

Hatchlings were released from a bucket to prevent that they were touched by too many people. Some of the hatchlings needed to be brought back to the hatchery due to a lack of energy and problems in swimming. The staff of the Rimbun Dahan Turtle Hatchery planned to release them on the following day.

The talks about sea turtles and terrapins were successful and participants showed a high interest. After the talks, some of the participants stated that they learned a lot and heard new facts about sea turtles and terrapins.

6.5.4 Recycling – Pangkor

Activities

- On the 17th and 18th of November, the fourth and last event will take place in Pangkor. A group of 118 people will participate in several activities under the supervision of Fuze Ecoteer representatives. On the 17th, several talks such as from Reef Check Malaysia and a precious plastic talk by Carlos Steenland from The Sea Monkey Project and his daughter Sydney will be given followed by a beach clean-up. On the 18th, participants will join an ecosnorkelling trip.

6.6 Research Project of UMT Malaysia and Heriot-Watt University in UK

Objectives

To support universities in their research and build up relationships, PMRS offered a student of Heriot-Watt University who is collaborating with UMT Malaysia to stay at the PMRS project house for two weeks to collect data about snorkelling impacts on coral reefs for her MSc dissertation.

Activities

- The weeks before her arrival, PMRS advised the student and her supervisor about potential snorkelling sites for their study. Coral reefs with high and low pressure of snorkelers as well as control sites with similar depth profiles were chosen.
- On the 15th of May, PMRS joined the site check with the MSc student and her supervisor from UMT to snorkel around the chosen sites and double-check the suitability regarding coral cover, depth, and snorkeler impact.

Successes

During the site check on the 15th of May, Teluk Keke and Fish Point were chosen as high pressure sites, the reef between the two of them and the one in front of the village was chosen as low pressure site and the reef in front of Panglima Abu as control site. The data were based on observations of people during their snorkelling activities, head counts and benthic data to assess the physical damage on the reef. The student stayed from the 15th until 31st of May in the PMRS project house and completed the collection of her data with support of PMRS.

6.7 “A Thankyou from the Ocean” Banners

Objective

To design banners for businesses that are offering snorkel tours around the island to be hung in their shops, educate tourists about their environment and encouraging them to follow certain rules while snorkelling.

Activities

- A banner was designed telling why people should not step on corals, why people should properly dispose their trash, and why people shouldn't feed fish.
- All were translated into Malay and displayed in two languages to reach a wider audience.

Successes

10 banners were printed and distributed to several snorkelling operators as test trial. Three banner were given to Long Beach and Coral Bay each, one banner to Coral View, another one to Tuna Bay and one banner was given to MJ's, a snorkelling operator in the village. The last banner was planned to be placed at the village jetty since there are a lot of people feeding the fish. It is planned to print and distribute more banners in 2019 after getting some feedback of the snorkelling operators.



Figure 32: "A Thankyou from the ocean" banner, explaining why we shouldn't litter, not step on corals or feed fish.

6.8 Deployment of Eco-consciousness Signs at Teluk Keke

Objective

In order to design, prepare and deploy small signs at the popular tourist beach Teluk Keke to inspire responsible rubbish disposal by tourists.

Activities

- Two volunteers designed, painted and deployed two small signs at Teluk Keke. Each sign containing a small message in the form of a poem, one in English and the other one in Malay.

Successes

The signs were deployed at the far end of Teluk Keke (close to the rocky outcrop).



Figure 33: Left: PMRS volunteers present proudly their signs. Right: Design of the awareness signs.

6.9 PMRS website

Objectives

In order to target an audience with a more scientific background and to help PMRS to become more independent in terms that stakeholders on the island can differentiate it from the other two Fuze Ecoteer Perhentian projects, an own project website was created.

Activities

- The project website was designed including pages for the different projects of PMRS such as research, Plastic-free Perhentian but also to have a platform to publish blogs, videos and enable people to send enquiries.

Successes

On the 3rd of May, the PMRS website was published under <https://www.perhentianmarineresearch.com/>

The website includes the following pages:

- About PMRS (Meet the Team / Volunteer With Us)
- Research (Coral Reef Research / Seagrass Mapping)
- Plastic-free Perhentian (Plastic-free Perhentian Map / Recycling System)
- Blog
- Media (Videos / Images)
- Eco snorkelling trips
- Dive packages
- Contact

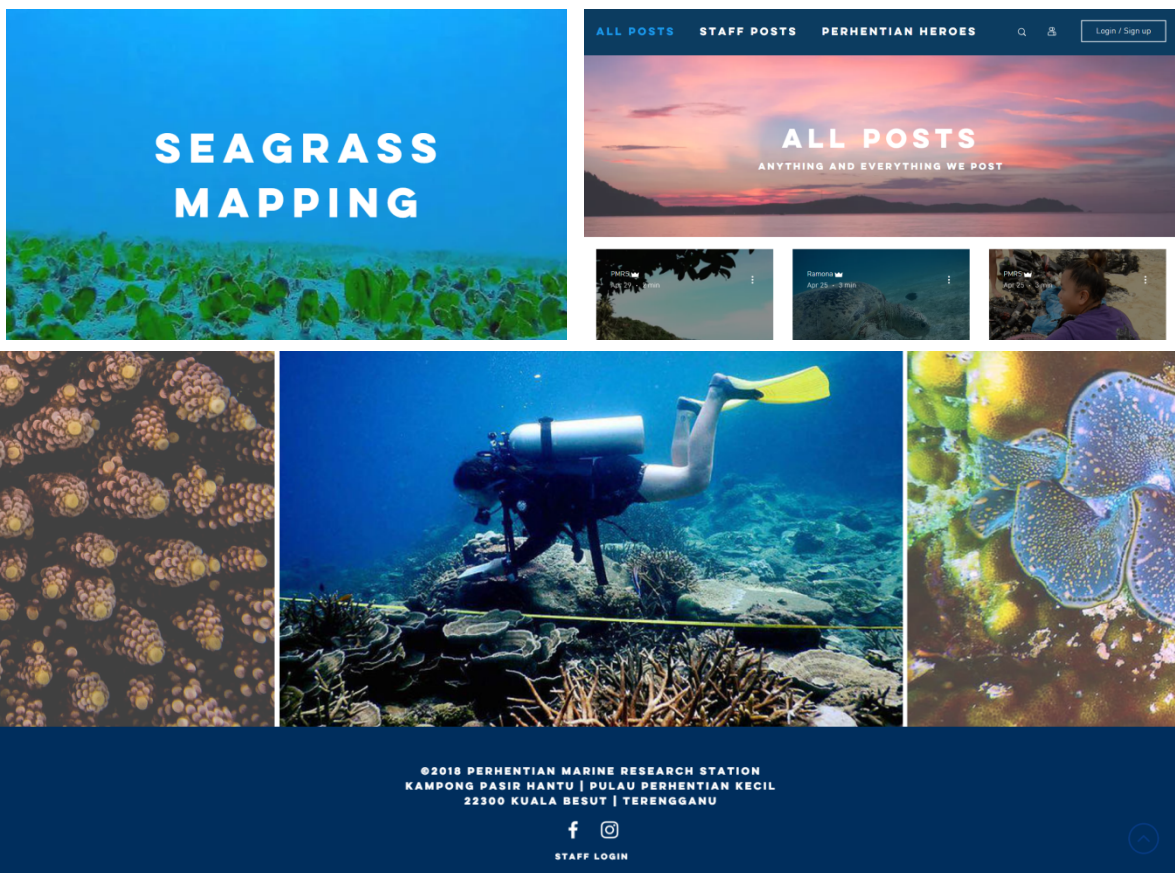
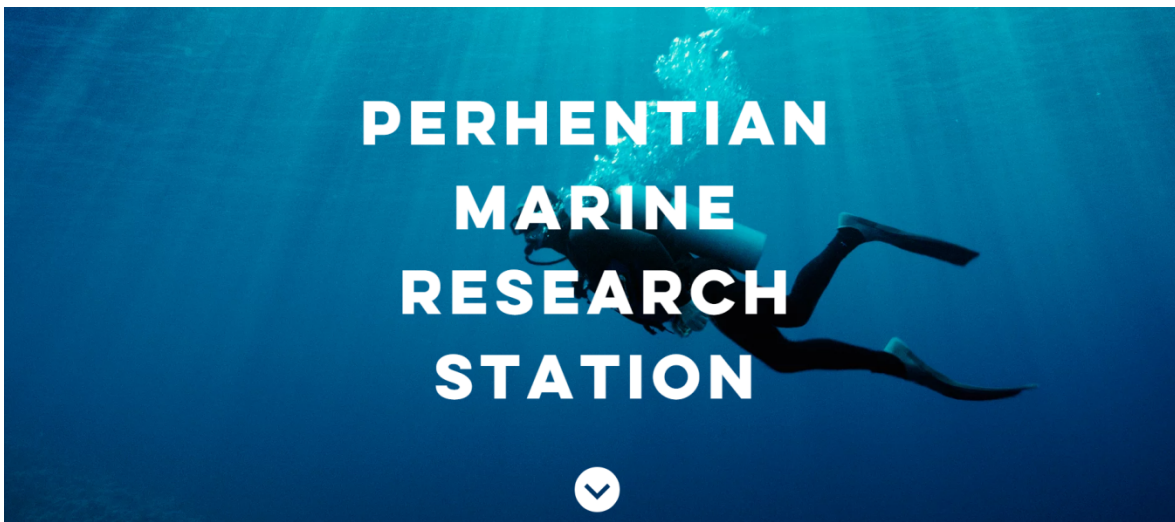


Figure 34: Extractions of the PMRS website. Different pages give an overview about the different projects and the work of PMRS.



6.10 Monthly Project Blogs

Objective

To raise awareness on contemporary ocean environmental issues both specific to the Perhentian Island and globally, monthly blogs were created by PMRS staff.

Activities

- To acknowledge all people or businesses on Perhentian Island who put in extra effort to conserve Perhentian Islands and to raise awareness, a Perhentian Heroes blog was started in March 2018 and appeared on a monthly basis.
- Staff blogs were written on any topic related to the project, from marine life until plastic pollution and recycling.

Successes

Seven Perhentian Heroes blog were published on the PMRS website in 2018.

Seven staff blogs were also published on the PMRS website in 2018. Topics included “The Importance of Seagrass and how Hungry Sea Turtles help to Maintain a Healthy Ecosystem”, “#Internlife”, “Plastic Pollution”, “Stepping Out The Comfort Zone – Try To Live A Zero-Waste Life”, “The Ecological Importance of Sharks and Why We Need Them Not Just on Perhentian Islands”, “The impact of cigarette-associated litter on the marine environment” and an end of the season blog.

7 Volunteers and Their Personal Projects

7.1 Analysis of Volunteers

In 2018, PMRS had 14 volunteers joining the project. The majority of volunteers were British (8 out of 14 volunteers) with several other nationalities such as Austrian, Dutch, Australian, Belgium, American and Norwegian joining. Eight male and six female volunteers were involved in the research part of PMRS and assisted in collecting data during coral reef and seagrass surveys.

Nationality

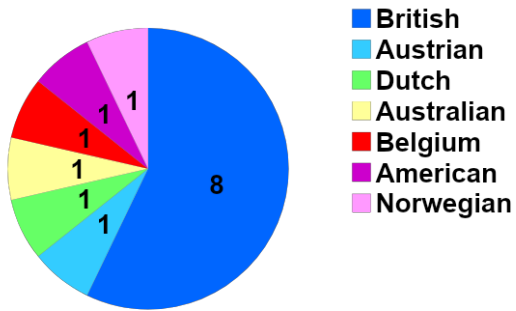
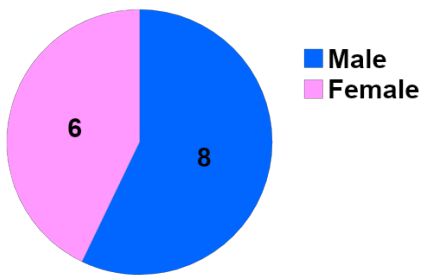


Figure 35: Left: Nationality of PMRS volunteers in 2018. Right: Proportion of male and female volunteers.

Gender



The majority of the volunteers were between 20- and 24-years-old (five volunteers), followed by below 20 and between 30- to 34-years-old (three volunteers each). Three volunteers each were in the age range 35-40, 45-49 and above 50-years-old.

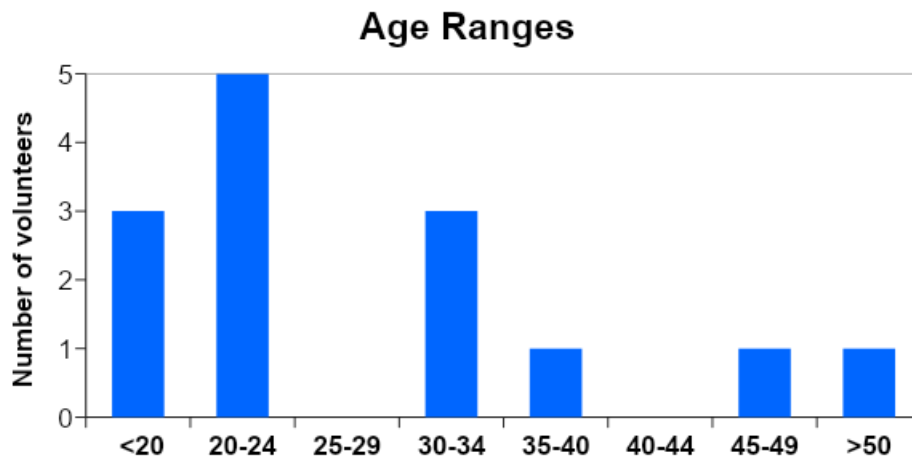


Figure 36: Age range of PMRS volunteers in 2018.

In 2018, most of the volunteers haven't had a diving certification before they came to the project (9 out of 14 volunteers, or 64%), one person was already certified as Open Water Diver, three as Advanced Open Water Diver and one as Divemaster.

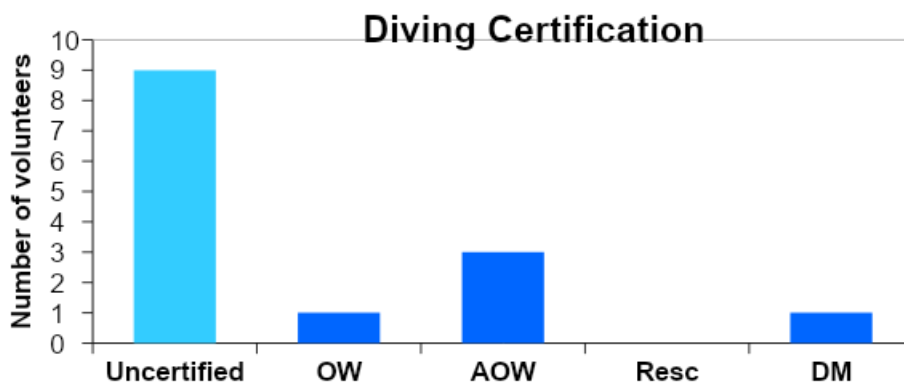


Figure 37: Diving certifications of PMRS volunteers before their arrival.

August and September 2018 showed the highest number of bookings throughout the season demonstrating five volunteers who stayed with the project in August and three volunteers in September. Two volunteers each stayed with PMRS in March, May and July, and no bookings were received for April and June.

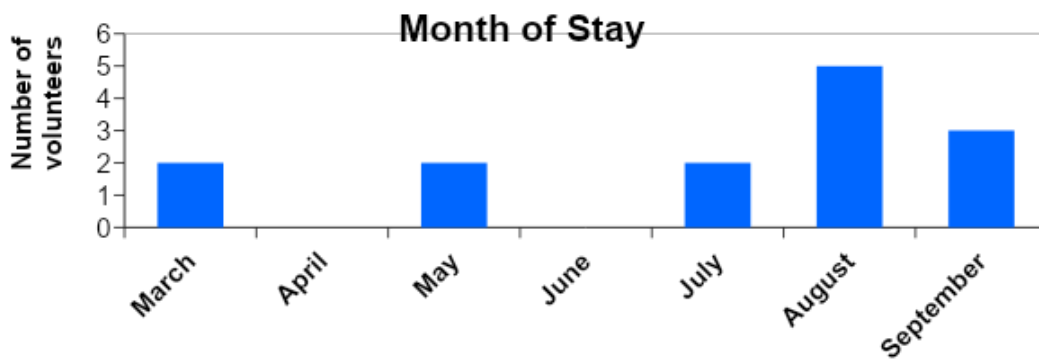


Figure 38: Months in 2018 in which volunteers joined PMRS.

Half of the bookings from volunteers came through The Great Projects (7 out of 14 bookings), followed by ERT (four volunteers) and GoOverseas, Portsmouth Uni and Atlantis (one booking each).

Booked through

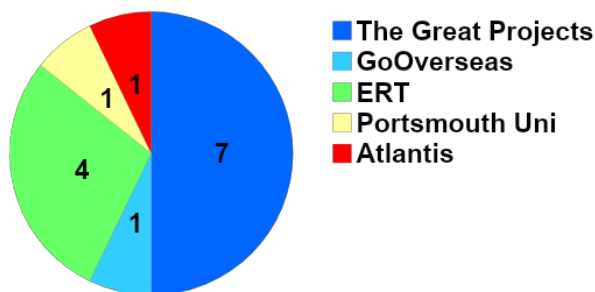


Figure 39: Agencies through which PMRS volunteers booked in 2018.

7.2 Volunteer Personal Projects

Objective

To optimise volunteer contribution by utilising skills and enthusiasm of long-term volunteers while creating an opportunity for individuals to produce work with tangible outputs and conservation impact.

Activities

- 2018 personal projects were predominantly focused on awareness and community engagement. While preconceived ideas were discussed, volunteers were encouraged to develop their own project idea providing it was realistic in regards to time, experiences and available resources.

Successes

___ Nine completed personal projects (some volunteers worked in pairs and the last three volunteers helped to clean and prepare the house and equipment for monsoon instead of a personal project).

___ Topics of the personal projects included:

- Lesson plan about marine life and ocean conservation which was handed over to Perhentian Community and Conservation Project to educate the students of the local primary school.
- Plastic-free Perhentian survey targeting the tourists coming to Perhentian Islands to gather information about how they judge the cleanliness on Perhentian's beaches, reefs and pathways.
- Series of short clips filmed around the island and during beach clean-ups, giving positive conservation messages as captions.
- Script written for a short animation of a green turtle hatchling getting swept up in ocean plastic and losing its family and what it learns on its way back to find them.
- Presentation about human impact on the marine environment to be presented to future volunteers or stakeholders.
- Presentation and leaflet about the impact of recreational diving on the marine environment and ways to reduce them.
- Promotional video for PMRS for social media.
- Presentation on marine microbes to be used to educate future volunteers.
- Handout on feasibility of solar power for Perhentian Island to be handed over to resorts on Perhentian Island.



Is Solar energy something for you?

Solar energy has been growing exponentially in the last few years.

What started as a niche and expensive market has now become a widely known source of energy which can be used and afforded by everybody.



The Sunny side

A solar system separated from the energy grid still provides energy during a blackout.
It's an immediate result because it saves on the energy bill.
It increases the value and resale value of the property.



Still not sure

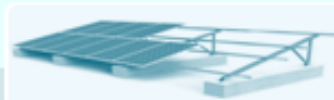
The prices of solar power have been steadily declining for several years.
Solar energy installers have become very experienced in building efficient solar systems.
A properly installed system has little to no maintenance requirements or costs.



12 hours of daylight means hours of energy production each day. (Solar panels will still work during cloud cover).



Enough solar energy reaches the island to, with just 4 solar panels, power a television 24 hours a day for two years straight.



All you need for an solar system is a flat roof or one with a low angle towards the south, east or west.

A solar system that lasts for 20 years and halves the energy use of a hotel room costs around 4000 dollars.

You can install the solar panels on: the roof, the walls, the ground, even in the water.

There are solar energy suppliers relatively close. Such as: **Synergy** in Sungai Tong, or **SolarTIF** in Terengganu.

Why not ask for advice on: Installation, lighting diversion, replacement parts, etc.



Solar panels keep getting prettier, you can customize the shape, size and colour.



Show others that you care for the environment, the coast and the coral reefs.



If people don't take better care of the environment most of the beautiful beaches and coral reefs in this area will be gone in the next 25 to 30 years.

By reducing your energy and environmental footprint you help reduce global warming, rising sea-levels, acidification of the ocean, loss of marine habitat and many other factors.

Figure 40: Example of volunteer personal projects. This infographic about the feasibility of solar power for Perhentian Island is the result of the personal project of our volunteer Pim.

7.3 Volunteer Evaluation

Objective

To improve our program for volunteers, volunteers were asked to fill in an evaluation sheet at the end of their stay.

Activities

- Questions in the evaluation form included:

Their experience, rated on a scale from 1 (poor) to 5 (excellent)

- Did you feel your briefing/orientation was beneficial?
- Were expectations as a volunteer clearly explained to you?
- Did you feel the program was well organized?
- Were the program staffs knowledgeable and able to answer questions?
- How was your food throughout the program?
- How was your accommodation throughout the program?

The project: Please rate your feeling of the effectiveness and enjoyment of the following activities that you participated in (rated on a scale from 1 (poor) to 5 (excellent) for effectiveness and enjoyment respectively):

- Village tour
- Water confidence (Petani)
- Presentations
- Dive course (if suitable)
- PPB
- Research diving (coral reef or seagrass surveys)
- Leisure diving
- Malay Dinner
- Awareness campaigns
- Overall experience

Open questions as follows:

- What did you enjoy or benefit from the most through your volunteer experience?
- What do you feel could be improved to make your experience more effective & enjoyable?
- Any additional comments

Successes

___13 out of 14 volunteers gave their feedback in 2018.

___Assessing the experiences of the volunteers on a scale from 1 (poor) to 5 (excellent), the highest scores were given for knowledgeable staff (4.8) as well as explanations on

expectations as a volunteer (4.5), followed by food (4.3), and briefing/orientation and organisation (4.2, each). The lowest score was given to accommodation (3.5).

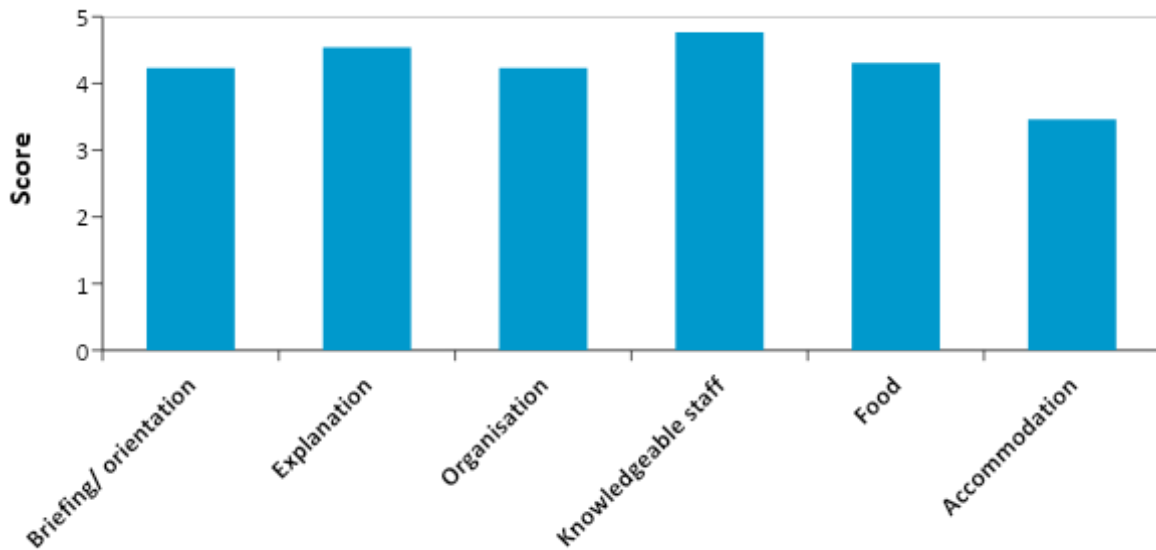


Figure 41: Feedback of volunteers regarding their experiences during their stay on a scale from 1 (poor) to 5 (excellent). N = 13.

Assessing the project on a scale from 1 (poor) to 5 (excellent), the highest scores were given for Awareness and Water Confidence at Petani Beach for effectiveness and enjoyment (4.6 for effectiveness and 4.5 for enjoyment, each), followed by Malay Dinner (4.5 for enjoyment, 4.3 for effectiveness). The village tour was scored with 4.5 for effectiveness and 4.0 for enjoyment. Presentations were scored with 4.4 and 4 for effectiveness and enjoyment.

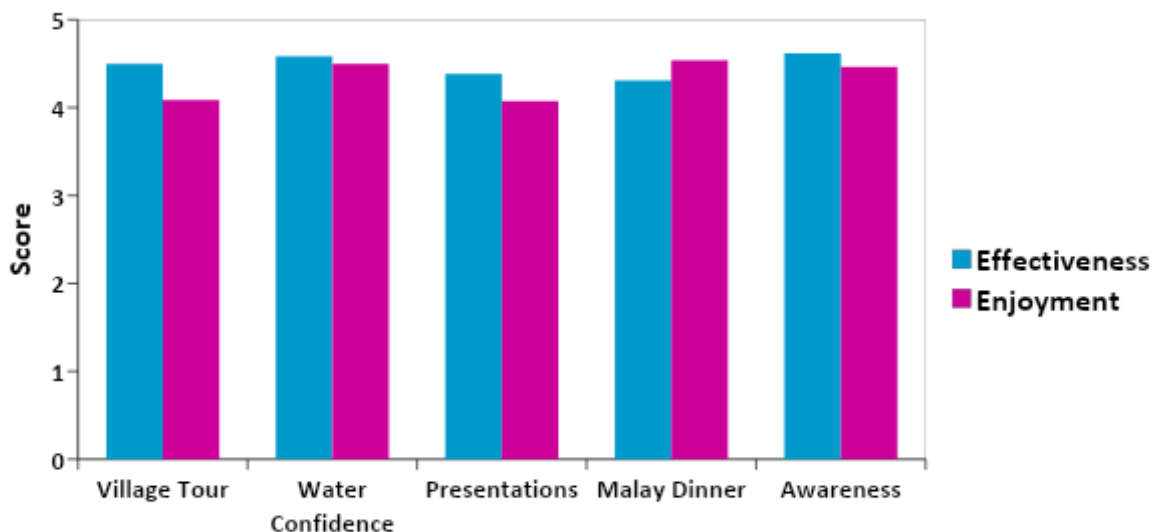


Figure 42: Feedback of volunteers regarding the project on a scale from 1 (poor) to 5 (excellent). N = 13.

Assessing diving and overall experience which were rated by the volunteers on a scale from 1 (poor) to 5 (excellent), the dive course was scored the highest for effectiveness and enjoyment (4.8 and 5) followed by overall experience (4.4 for effectiveness and 4.8 for enjoyment). The PPB was scored with 4.6 for enjoyment and 4.3 for effectiveness. Research dives were scored with 4.5 for enjoyment and 4.3 for effectiveness.

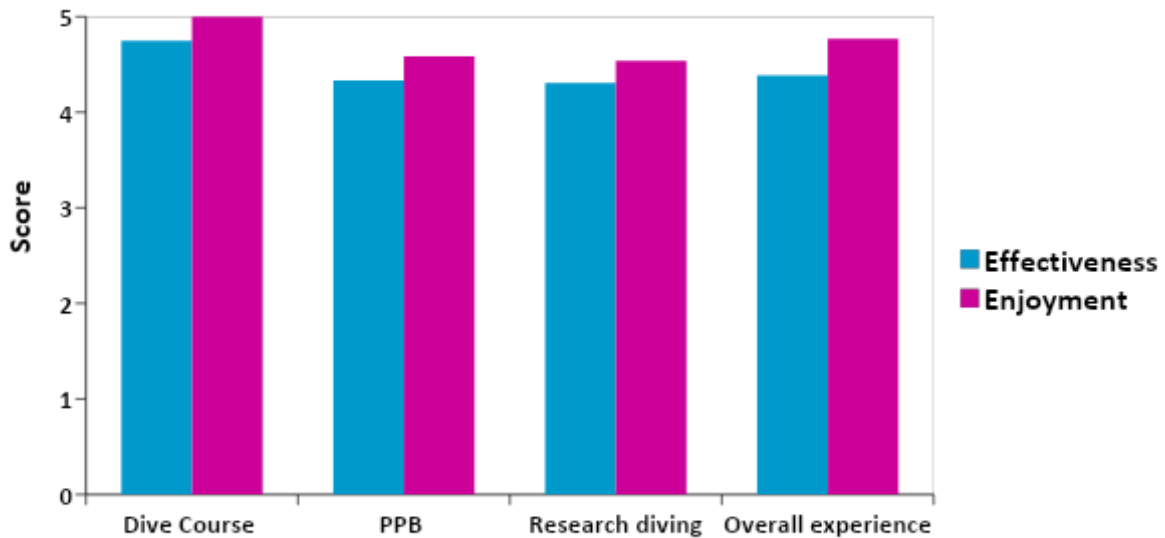


Figure 43: Feedback of volunteers regarding diving and their overall experience on a scale from 1 (poor) to 5 (excellent). N = 13.

Summarizing the answers to the open question what volunteers enjoyed the most, very often besides them enjoying the research dives and improving their buoyancy skills, it was mentioned that they liked understanding about plastic pollution and recycling, as well as getting involved with the local community especially working with the kids (for more detailed answers please see appendix). Activities for volunteers on in the recycling and waste management part of PMRS were successfully started in 2018 by practicing upcycling.

Summarising the answers to the question what could be improved in the project, a lot of volunteers commented on the volunteer house especially that they weren't enough shelves and storage possibilities. Feedback was also provided on activities and that PMRS volunteers would like to have joined activities with the volunteers of Perhentian Turtle Project and Perhentian Community and Conservation Project. Based on that, joined beach clean-ups were started in 2018 every Saturday with all volunteers from all projects which was a success and is planned to be continued. Furthermore, PMRS volunteers liked the opportunity to join for a turtle night patrol on Saturday evening.

For more detailed information and further comments of volunteers please see appendix.

8 Conclusion and Recommendations

8.1 Research

8.1.1 Coral Reef Surveys

During the 2017 and 2018 season, all 68 determined transect sites except of two were surveyed and the coral reef surveys successfully completed. The two remaining sites were excluded due to heavy boat traffic in the channel between Perhentian Kecil and Besar. The data collected during the surveys were recorded on the PMRS database, transcribed on the backup notebook and are ready to be analysed to be presented to the Marine Park and other stakeholders. However, the data of four transect sites are missing, T65 until T68, which is the area around Teluk Pauh, PIR. It is very likely that these data went missing when the project laptop broke down. Hence, it is important to immediately transfer all collected data on soft and hard copy to prevent any data loss.

Since coral reef research is completed and the focus for 2019 on seagrass only, the coral reef data should be finalised including data analysis, graphs and a final report which can be presented to the Marine Park and other related stakeholders. It is important to mention that the fish data which have been collected as part of the coral reef research should only be presented partially to villagers of Perhentian Island. Even though it is a Marine Park area, illegal fishing activities take place almost on a daily basis and the collected data on areas with high and low numbers of fish will encourage them to start fishing in areas showing high numbers. Hence, the only information which should be given out is about the general amount of fish around the island, trends and implications for the villagers.

8.1.2 Seagrass Surveys

During the 2017 and 2018 season, 9 out of 12 identified seagrass beds have been mapped. The remaining three seagrass beds could not be finished due to a lack of volunteers during some weeks of the season. The mapping of seagrass beds is considered as baseline data before starting monitoring and investigating seasonal effects such as caused by the monsoon. However, since the collection of these baseline data took place in different months and even different years, the surveyed seagrass beds can only be roughly compared with each other. Hence, the project concept was adjusted and seagrass surveys will now take place in April and September every year, starting in 2019, to collect valid data and be able to study seasonal effects such as caused by the monsoon.

Seagrass surveys only require two divers plus one person at the surface collecting the GPS data. Thus, with more than two volunteers it is logistically difficult to provide roles for everyone on the survey. If it is planned to send out more than one team to perform seagrass surveys, a second set of equipment would be needed including GPS device, camera, surface

marker, etc. Hence, it is recommended to not take more than two volunteers for the research period of seagrass surveys.

8.1.3 Survey Training

Interns should arrive 3-4 weeks prior to the arrival of volunteers. This allows plenty of time for preparation including unpacking the house after monsoon, research and site training for interns so that they are confident to go on dives and train volunteers, research on potential projects for the season, introduction to stakeholders and designation of tasks.

Set realistic and achievable research goals – training demands a significant amount of both effort and time. Outlining expectations to volunteers at the start of their training should help keep to the planned timeline.

8.1.4 Coral Nursery Maintenance

The coral nursery at Alunan Resort is doing well and the coral fragments are growing. However, so far only branching corals are present on the structures and PMRS recommended to Alunan Resort to also include other coral types. This collaboration is planned to be continued in 2019 and a research study on coral nurseries around Perhentian Island is targeted.

PMRS was also approached by Antigravity Divers which would like to collaborate with PMRS on restoring the reef around Coral Bay starting in 2019. Since the project concept for 2019 will have weekly slots for the maintenance of coral nurseries it is highly recommended to support stakeholders which approaching PMRS because personal experiences showed that there is often a lack of a general understanding about corals, i.e. how does a coral look when it is bleached, how often does a nursery need to be cleaned from algae, which is the optimal depth of a nursery, etc.

8.1.5 Current Map

The current map which was created from April until September can be useful when deciding locations for artificial reefs. However, it has to be mentioned that the 2018 season was quite untypical because it was raining frequently, storms were frequently present and the sea was much choppier than the two seasons before. Hence, it is recommended to collect these data again in 2019, compare them and record similarities and differences.

8.1.6 Pressure of Diving Activities on Local Coral Reefs around Perhentian Island

It was aimed to create an overview about which dives sites around Perhentian Island show a high pressure of diving activities to compare these data with data from Reef Check and PMRS. A potential temporarily closing of these dive sites could be one solution if data are showing a degraded reef due to high diving and/or snorkelling activities. Unfortunately, most of the dive shops around the island do not record these data constantly or even at all. If it is planned to collect these data in 2019, it is recommended to contact dive shops in the beginning of the season, ask for their willingness to assist and to record these data throughout the season.

8.1.7 Temperature Logger

Dr. James Tan offered to provide more temperature loggers for PMRS in 2019 to monitor more areas around Perhentian Island. It should be aimed to record temperatures at different areas frequently since mass bleaching events in Malaysia were reported in 1998 and 2010 (Reef Check Annual Report 2017). If Dr. James Tan cannot provide temperature loggers for PMRS it is recommended to purchase them for the project or ask for funding.

8.1.8 Plastic-free Perhentian Survey for Tourists

The collected data are planned to be presented to resorts and dive shops around Perhentian Island to encourage them to increase their eco-friendly behaviour. Some businesses on Perhentians do not show an awareness of environmental issues yet but most of them are interested to increase the profit of their business. By demonstrating them that tourists would prefer eco-friendly initiatives such as reusable water bottles and refill stations and that they value clean beaches and areas and hence are more likely to book or come back we hope we can convince these businesses. These data will complete the Recycling and Waste Management Guide which was prepared for stakeholders on Perhentian Island.

8.2 Waste Recycling Project and Stakeholder Engagement

8.2.1 Plastic-free Perhentian Map

In 2018, 31 stakeholders committed to the Plastic-free Perhentian map and joined this initiative. However, there are still a lot of businesses on Perhentian Island who rejected to be involved. It is recommended to monitor the success of the map in 2019 and check if the

contributing businesses still offering their advertised service. If not, the map has to be updated. Further promoting the map might help to convince more businesses to join this initiative. One way of promoting is via social media, the other one is by erecting more signboards. The idea is to have signboards showing the full map of Perhentian Kecil and Besar already at the jetty of Kuala Besut to introduce it to all tourists coming to the island, as well as to most beaches and even pathways such as the village, Petani Beach, Coral Bay, Long Beach, the pathway between Long Beach and the village, Teluk Pauh (PIR), Coral View, Tuna Bay, Teluk Keke and Flora Bay. MDB agreed to provide the signboards for us (they want to produce them) and deploy them if we send them the final version of the Plastic-free Perhentian map until January since that is the time when they have to set their annual budget. Convincing more businesses to register at the Bali Refill My Bottle initiative will also be beneficial because tourists will find all registered businesses on their app which will further increase awareness and might increase the reputation or even profit of the businesses around Perhentian Island. All #TakNakStraw documents are on GoogleDrive and should be further promoted in 2019 especially in the fishermen village and local businesses around Perhentian Island.

8.2.2 Waste Recycling Project on Pulau Perhentian

The jumbo bag system was discussed in detail with Sea Voice Divers who were keen to adapt it for 2019. All information was given to businesses on Coral Bay and Long Beach but a follow-up should be done in the beginning of the 2019 season to remind and support them. Businesses on other beaches have not been approached yet and should also be included in 2019. After starting this system, PMRS should monitor the success and support businesses with problems which might occur. The headmaster of SK Pulau Perhentian is very keen on recycling and the cooperation on that with the local school should be continued next season as well.

The Responsible Waste Management Documents have been sent to 36 stakeholders around the island but a follow-up should be aimed for 2019. After getting feedback of the stakeholders on the feasibility of these documents, they might need to be updated to make them as easy to use as possible. The most interesting and important results from the Plastic-free Perhentian Survey for Tourists should be added in here as well.

The deployment of public bins around Perhentian Islands was very successful. People started to immediately use them and the feedback from stakeholders was very positive. The idea behind was that stakeholders in a short proximity to the bins take care of them and empty them once they are filled. This worked for most of the bins but unfortunately not for all of them. Especially on Long Beach were some bins often overflowing. Hence, monitoring of this initiative is necessary.

8.3 Reef and Beach Clean-ups

Beach and reef clean-ups are a never ending mission and it is important to frequently conduct them to reduce as much litter as possible from the beaches and reefs. After monsoon it is especially important to focus on uninhabited beaches around Perhentian Islands such as Romantic Beach, Pantai Acing, turtle beach in the north-west of Kecil, Tanjung Buton and Pinang Seribu as well as Tiga Ruang. On these beaches, the amount of rubbish which is washed on land during monsoon is incredible high and usually several clean-ups are necessary to improve the situation. Reefs are highly polluted especially after monsoon but ghost fishing nets are present throughout the whole season. In the 2019 project concept will be a weekly slot for reef clean-ups and it is recommended to focus first on the northern reefs which are exposed to the open sea. It is recommended to team up as often as possible with local dive shops to increase awareness and strengthen collaborations. Sea Voice Divers and Panorama Divers are mostly very keen to team up as they need manpower and we can use their boats.

The number of people attending the Trash free Tuesday clean-ups was much higher than in 2017 when a weekly clean-up was conducted in collaboration with Matahari Divers. Reasons for that might be due to the good promotion of Monkey Dives which announced the clean-up weekly on their Fb page and included most of their customers in the clean-up but might be also due the discounted beverage for every participant afterwards. It is recommended to find another partner on Long Beach for the 2019 season that is willing to conduct weekly beach clean-ups with the support of the Fuze Ecoteer Perhentian projects. Oh La La Dive Shop was very interested in 2018 and can be approached for 2019. Abas Bar or Beach Bar can be asked again for offering the discounted drinks afterwards.

8.4 Awareness / Cooperation

The 2018 season was determined by a strong relationship with the local school on Perhentian Islands. The new headmaster of the school has made considerable movements towards building relationships with Fuze Ecoteer. The values and ethos of the school linked directly to our organisation and therefore strong links need to be pursued next year. Several activities with the local students took place this season and highlights for the students such as the recycling competition and the snorkelling activity with point outs at the village reef during the International Science Week should be repeated next year. Other stakeholders such as Cocohut Long Beach Resort also showed a high interest in collaborating with Fuze Ecoteer and this relationship can be further strengthened in the future.

The “A Thankyou from the Ocean” banners were designed based on a feedback from a stakeholder on Long Beach, Jordan Costa, who suggested educational posters to be displayed at businesses that offer snorkelling trips. After a feedback on the success of the banners which were distributed it is aimed that they are provided to all businesses next season. Furthermore, posters on the individual topics on the banners are planned to be printed and distributed to all resorts and dive shops to be displayed and encouraging tourists (and locals) to follow eco-friendly behaviour.

8.5 Volunteers and Their Personal Projects

Volunteer evaluation often contributes to improve the project and should be taken seriously. A joined beach clean-up between all volunteers from all three Fuze Ecoteer Perhentian projects was started in 2018 and took place every Saturday due to the feedback of our volunteers. Furthermore, a weekly cleaning rota for the volunteer house was started to ease communication between all projects and clarify responsibilities due to the feedback from our volunteers as well. It is recommended to continue these initiatives since volunteers from all projects stated to be happy with it. The volunteer evaluation also showed that PMRS volunteers enjoyed the understanding about plastic pollution and recycling. Activities including practicing of upcycling were successfully started in 2018 and should be also continued.

Additionally, volunteer opportunities in the recycling and waste management part of PMRS could be opened in the future once this part is more established. Volunteers also stated their involvement with the local community especially working with the kids as their highlight if suitable. Hence, stronger collaborations between the Perhentian Community and Conservation Project and PMRS on recycling initiatives within the local communities should be pursued and volunteers get involved. Finally, PMRS volunteers pointed out that they liked the opportunity to join for a turtle night patrol on Saturday evening. Overall, the feedback of PMRS volunteers showed clearly that overlapping activities between all three Fuze Ecoteer Perhentian projects are highly enjoyed by volunteers.

9 Objectives for 2019

9.1 Research

- ___Data analysis of coral reef surveys and final report.
- ___Monitoring of all identified seagrass beds in April and September, respectively, to investigate seasonal effects such as caused by the monsoon over the next years.

Continue assisting Alunan Resort in maintaining their coral nursery. Start research project on coral nurseries on Perhentian Island (see research proposal and masterplan for artificial reefs). Start to assist more stakeholders on Perhentian Island with their coral nurseries (Antigravity Divers approached PMRS in 2018 and wants to collaborate in 2019).

Create current map for 2019 and compare to 2018.

Collaborate with dive shops around the island to collect data about the pressure of diving activities on coral reefs. Aim to collect data from at least two dive shops per beach, i.e. Coral Bay, Long Beach, Flora Bay and Coral View or Tuna Bay.

Collaborate with Dr. James Tan or raise funds to purchase more temperature logger.

Integrate the data of the Plastic-free Perhentian Survey into the Recycling and Waste Management Guide and communicate the results to resorts and dive shops around Perhentian Island.

9.2 Waste Recycling Project and Stakeholder Engagement

___ Monitor and promote the Plastic-free Perhentian map and encourage more businesses to join the initiative. Contact MDB and send them the final version of the Plastic-free Perhentian map to retrieve signboards around Perhentian Island. Encourage stakeholders who offer a water refill station to register at Bali Refill My Bottle as well as display materials of the #TakNakStraw initiative.

___ Follow-up the jumbo bag system and help interested parties in starting it. Monitor the success and support with trouble shooting. Previous experiences showed that some stakeholders are very keen on recycling and eco-friendly initiatives but lacking time and motivation to work things out. Hence, PMRS has to make the start for them as easy as possible and assist them to keep up the motivation. The Responsible Waste Management documents were prepared to reach a wider audience and establish a general understanding of the importance of recycling and how to achieve this goal. Get feedback of stakeholders on these documents, update them if necessary and promote their implementation. Update stakeholder information and flow chart regularly which will help decisions about future initiatives and approaching them as well. Set up a meeting with the headmaster of SK Pulau Perhentian and the Community and Conservation Project in the beginning of the season to discuss vision and activities for the season and introduce yourself.

___ Check which of the public bins are still present in the beginning of the season. If necessary, distribute new bins at Long Beach and remind stakeholders to take care of them. Promote this initiative on social media and see which areas need bins as well. If you are short on money you can ask stakeholders to pay for them. Important part is that they are taking care of the bins since PMRS does not have the capacities, financial and staff wise to look after the bins every other day. This also increases their

awareness and empowers them to be part of it. As soon as the recycling system is established, look for possibilities to provide recycling bins or support stakeholders in building them for themselves to further push recycling on the island.

Several stakeholders on Perhentian Island showed interest in having their own plastic recycling machines such as Alunan Resort and Senja Bay. After an easy and successful handling of the machines is guaranteed, get in touch with different stakeholders, give them a demonstration on the machines and see how they feel about purchasing them. A future goal is to have an on-site recycling system consisting of several machines which reduces the amount of plastic ending up in landfills and the sea. Additionally, the plastic machines might change the perception of plastic just as rubbish. Instead, they could see it as potential to create something new and even make profit out of it.

9.3 Reef and Beach Clean-ups

- ___ Conduct weekly beach and reef clean-ups and team up with local dive shops when possible. Also, as started in 2018, team up with the Perhentian Turtle Project and Perhentian Community and Conservation Project every Saturday since volunteers really enjoyed joined activities between all projects.
- ___ Find new partner on Long Beach to conduct weekly beach clean-ups with the support of all three Fuze Ecoteer Perhentian projects. Approach Oh La La Dive Shop as potential partner. Assist in promoting the event if necessary via creating an announcement poster and advertising it on social media.
- ___ Use the new beach clean-up chart for all beach clean-ups and catalogue the trash. Transfer the data to the Ocean Conservation website to help collect data on a global scale.

9.4 Awareness / Cooperation

Pursue to strengthen the relationship to the local school on Perhentian Islands. Integrate activities on marine conservation as often as possible in the curriculum of the school and PMRS. Include PMRS volunteers in these activities to support you since they loved it in 2018 and often stated this as one of their highlights.

Approach Cocohut Long Beach Resort for a follow-up event of the turtle camp. Angeline, the manager of the resort, is very keen to repeat the event with a higher number of students.

Carry out an island wide beach and reef clean-up on World Ocean's Day on the 8th of June. Create a doodle poll where dive shops can register their interest in cleaning a

certain beach or reef on the day of the clean-up to cover as many areas as possible. Aim to send out doodle toll at least two weeks in advance.

Get feedback from snorkelling operators on the “A Thankyou from the Ocean” banners, modify banner if necessary and provide a banner for every snorkelling operator on Perhentian Island. Print posters on individual topics on the banner and distribute them to all resorts and dive shops to be displayed in their shops, receptions, toilets, etc. Monitor this initiative.

Continue writing blogs about environmental topics and Perhentian Heroes and publish them on the PMRS website on a monthly basis.

9.5 Volunteers and Their Personal Projects

Distribute the infographic on solar power to resorts on Perhentian Island and encourage solar power on the island. Focus first on bigger businesses which might be able to realize this initiative.

Continue joined beach clean-ups between all three Fuze Ecoteer projects every Saturday and find more possibilities of overlapping and possibilities for volunteers to join other projects such as turtle night patrol when the Perhentian Turtle Project needs assistance as well as activities on recycling within the local community.

Appendix

Volunteer Evaluation

Detailed answers to the question, what did you enjoy or benefit from the most through your volunteer experience:

- *Get to know/ see environmental issues from a local perspective. See coral reefs with new eyes -> focus on the "small" things. School, awareness day + concept (private project) -> being able to bring in personal experience/knowledge & of course spend some time with the team :)*
- *I enjoyed the opportunity to impact on the school children during science week. Enjoyed seeing the reality of plastic pollution, and taking part in clean-ups.*
- *Understanding recycling and plastic in village was a benefit. I enjoyed diving the most.*
- *The beach clean-ups were exhausting but the results were worth it.*
- *Meeting new people and learning more about ways I can help the environment. I can now pass on knowledge to my friends and family. I loved the diving and working alongside an amazing team of interns and staff.*
- *Learning to dive and practice via surveys. Learning to cook variety of dishes. Experiencing local culture by living within community.*
- *Interacting with other volunteers, interns and staff.*
- *Diving skills, research skills, eco awareness to reduce consumption and plastic waste, etc, eating veggie, beach clean-ups such as Tiga Ruang, etc, great instructors.*
- *The dive course and research diving. It helped me become good at diving relatively fast.*
- *Scientific diving skills. Bonding with fellow eco people.*
- *Learning about the waste management system. Gathering data and learning about research approaches for seagrass.*
- *Enjoyed learning about the culture in the village and working with people with different ways of thinking and action.*

Answers to the question, what do you feel could be improved to make your experience more effective & enjoyable:

- *Introduction vs. actual doing -> not enough time to apply learning -> maybe prolong time or change role of volunteer/try to reduce training effort.*

- *Timing could be improved, different volunteers told different times. Better accommodation and just for volunteers. We had a lot of strangers come and go with no or little warning.*
- *Maybe more Malay-style activities – like the meal.*
- *I would love to do dive clean-ups more-*
- *Nothing! PMRS project was awesome.*
- *Rota to clean volunteer house. Provide costs/rough estimates of extra activities as should have brought extra as money is super hard to get out when here.*
- *Accommodation would benefit from storage space - just some simple shelving would help.*
- *A bit more fun diving - maybe Friday or Saturday? More hammocks!!! Working fridge would have made a big difference. Maybe a couple of nights doing turtle patrol at Tiga Ruang?*
- *At the volunteer house, some extra shelves on cupboards would help with storage.*
- *I liked the possibility to interact with the volunteers of other projects at the house. Although it can be a little annoying because the schedules didn't align (leaving, entering at different times).*
- *A point out dive for corals, corals underwater. Better feel for how the data collected is going to improve the items we are monitoring. Ensure communicate the data collection is not going to waste.*
- *Would notify volunteers going in the last weeks more about the cleaning, a lot of tension in the house the last days. Since a lot of the people had gone and we had to clean after them.*
- *The staff on site seemed to get little support from management.*

Additional comments:

- *I really enjoyed my time here, it was a great opportunity to give my travels a "sense". However, I do not feel enough I contributed to naive research, more to school awareness. Thank you :)*
- *Running out of food is never fun. Forewarn volunteers of personal projects, perhaps giving them options of what to choose from a list. Overall, I feel as though I've had a genuine volunteer experience and it's been great to be part of a team doing something so positive. Though my benthic training over 1.5 weeks was never used, I do feel as though actually my only real contribution was paying for this experience. My diving and buoyancy control would never have been so good without my time here. I love the way Ramona has integrated herself into the community and it was so nice to have the opportunity to interact with villagers on a day to day basis. Asking for help with the wheelbarrows or seeking out ingredients from the bakery. I've come away with a very positive experience and some wonderful memories and*

some new ways of incorporating cabbage and carrot into every meal! Thanks guys, and keep up with the excellent work you're doing here.

- *It was great, thank you for the experience ☺ + Team was amazing*
- *Very friendly, amazing staff. Good team.*
- *The only comment/recommendation would be a rota that is split between projects for cleaning responsibilities. Turtle team was in and out but didn't do much cleaning. Found myself cleaning the bathroom a lot and felt like other projects left the bathroom messy and didn't take any notice, even when the waste bin needed changing or the toilet paper ran out!!! Would also recommend doing more things with the projects together so everyone gets to know each other. Better communication between the projects may help solve the cleaning issue (volunteers).*
- *All interns very helpful e.g. to show how to use washing machine. Great atmosphere.*
- *Increase communication with the villagers, particularly with respect to littering. If the locals treat the area as a dumpsite (they do) the tourists will follow. But if they treated the environment with more respect tourists would do the same.*
- *I wasn't the biggest fan of the personal projects, maybe specific tasks, activities to do with the school or community would have been cool.*
- *I liked the possibility to interact with the volunteers of other projects at the house. Although it can be a little annoying because the schedules didn't align (leaving, entering at different times).*
- *Good fun, keep it up. Good staff.*
- *Had a really good time learning more about conservation! Would not use volunteers the last week to clean the house without letting them know.*
- *Glad I got to spend my holidays here!*