2010

Reef Check Malaysia

ANNUAL REPORT

CONTENTS

TRUSTEE'S MESSAGE

Ruth Yeoh
Executive Director
of YTL Singapore Pte Ltd
Director of Investments,
YTL Corporation Berhad

Dear Friends of Reef Check Malaysia,

Globally, it can be observed that the world's biggest companies are attempting to make their businesses more sustainable despite the worst recession since the 1930s. A report for the United Nations in June 2010 showed that 93% of the world's top chief executives view sustainability as important to their company's future success. Green campaigners also welcomed the findings in the new report, which show that businesses are forging ahead of governments when it comes to environmental issues. Hence, we observe that sustainability has moved on from a marginal exercise in public relations five to ten years ago to become an essential item in the boardroom. More companies now see sustainability as a commercial imperative. Corporate commitment to environmentalism has indeed reached a tipping point because businesses are making money from making themselves green, with a new generation of green-minded managers suggesting companies' enthusiasm for environmentalism will only grow.

At YTL, I am pleased that sustainability is our core and business as usual. Our focus on sustainability and the environment has never wavered, in spite of the recession, and it remains at the heart of what we do at our Organisation

In addition to investing in green technology, we are continuing our support towards our long-term conservation partners. As stewards of our good earth, YTL has long supported conservation through international groups like The Nature Conservancy and Rare Conservation, as well as the Malaysian Nature Society (MNS), WWF-Malaysia and Treat Every Environment Special (TrEES). This year is earmarked as the *United Nations Environment Programme's International Year of Biodiversity 2010* and we are proud to continue our support for Reef Check Malaysia and other environmental organisations which we have been long-term supporters of.

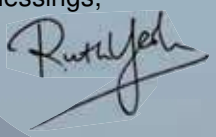
YTL's support for Reef Check Malaysia (RCM) also continues with marine conservation work focused on both the East and West coasts of Malaysia. With climate change and rising temperatures causing increasing levels of coral bleaching on the reefs in coastal areas of Malaysia, we believe it is our duty to protect the reefs and its biodiversity the best we can despite the harrowing news and reports on the state of our reefs. Hence, we organised a second reef clean-up at both our Pangkor Laut Resort and Tanjong Jara Resort (part of YTL Hotels) earlier this year, and coral transplanting work at Pangkor Laut Resort specifically.

In September 2010, YTL's Starhill Gallery organised an Arts Festival Gala Night with a "Starfish Artwork Auction", which saw guest of honor Dato' Sri Dr Ng Yen Yen, Minister of Tourism Malaysia, Tan Sri (Dr) Francis Yeoh, Group Managing Director of YTL Corporation Berhad, Dato' Jimmy Choo, Malaysian Tourism Ambassador, several prominent Malaysian Celebrities and Julian Hyde, General Manager of Reef Check Malaysia, getting together in the name of art and conservation. I personally contributed towards fundraising for RCM on the Evening as my Starfish artwork was auctioned, together with art pieces from local celebrities, to collectively raise funds for RCM. The successful Auction saw more than RM130,000 raised to assist RCM in various projects to help conserve the diverse natural resources in Malaysia.

Personally, I am proud to be a Trustee at RCM in my own capacity, dedicated to protecting reefs and coral life in Malaysia and the Southeast Asian region. I am pleased that our collaboration with Reef Check Malaysia is growing from strength to strength, as my Organisation and I work with RCM to do more to further marine, reef and coral conservation in the near future.

May God bless each and every one of you in all your positive endeavours.

Blessings,



BOARD OF TRUSTEES

Reef Check Malaysia Bhd is registered in Malaysia as a Company Limited by Guarantee. The Board of Trustees currently comprises the following individuals.

Dr Sasekumar

Served on the teaching staff of the Institute of Biological Sciences, University of Malaya, as lecturer and associate professor for 30 years. Now retired and attached to University of Malaya's Museum of Zoology as curator.

Taught subjects Animal Diversity, Invertebrate Zoology and Marine Ecology. Has published 60 scientific articles on the ecology of mangrove animals and mangrove-fisheries relationships.

Ruth Yeoh

Executive Director of YTL Singapore Pte Ltd and Director of Investments at YTL Corporation Bhd. She currently leads the environmental division at YTL, where she reports on her organisation's environmental activities through writing its award-winning Sustainability Reports. Ruth also pioneered YTL's highly successful "Climate Change Week", an educational campaign designed to raise awareness on the important issue of climate change in her nation of Malaysia and globally. She is a member of the Institute of Corporate Responsibility Malaysia (ICRM) and is an investment committee member of both the Asian Renewable Energy and Environment Fund (AREEF) and Renewable Energy and Environment Fund (REEF), investing in clean technology and renewable energy. Ruth was appointed to be the youngest Board Member of Rare Conservation in 2008, with responsibilities in the Governance Committee of this US-based conservation organisation.

Ruth graduated with a degree in Architectural Studies (Hons) from the University of Nottingham UK and an MSc in Management from Cass Business School in the City of London. In 2007, she authored and co-edited a book on climate change entitled "Cut Carbon, Grow Profits: Business Strategies for Managing Climate Change and Sustainability" (published in early 2007). She was appointed as a Trustee of Reef Check Malaysia in 2009.

Ning Baizura

Popularly known as Ning, she got into the commercial scene in 1992 and has since became a recording artiste under various international labels. Her love for the ocean started with the hobby her husband, Omar Sharif Christopher Layton Dalton, has - SCUBA Diving. After trying out SCUBA diving in 2007, she was amazed at the beauty of the underwater environment and realised that the marine ecosystem is being threatened by human activities. Since then, she got involved in activities that support the cause to protect Malaysia's marine resources, including volunteering herself to be the spokesperson for Reef Check Malaysia.

Gordon Reid

Gordon was formerly the Director of UK Trade and Investment at the British High Commission, Kuala Lumpur, Malaysia. After working in Malaysia for over five years, he decided to take early retirement and remained in Malaysia under the "Malaysia My Second Home" programme.

An avid diver, he became a trustee of RCM in 2009, after completing the EcoDiver training course, with the goal of helping RCM to expand its conservation activities.

Introduction: Coral Reefs - Rainforests of the Sea

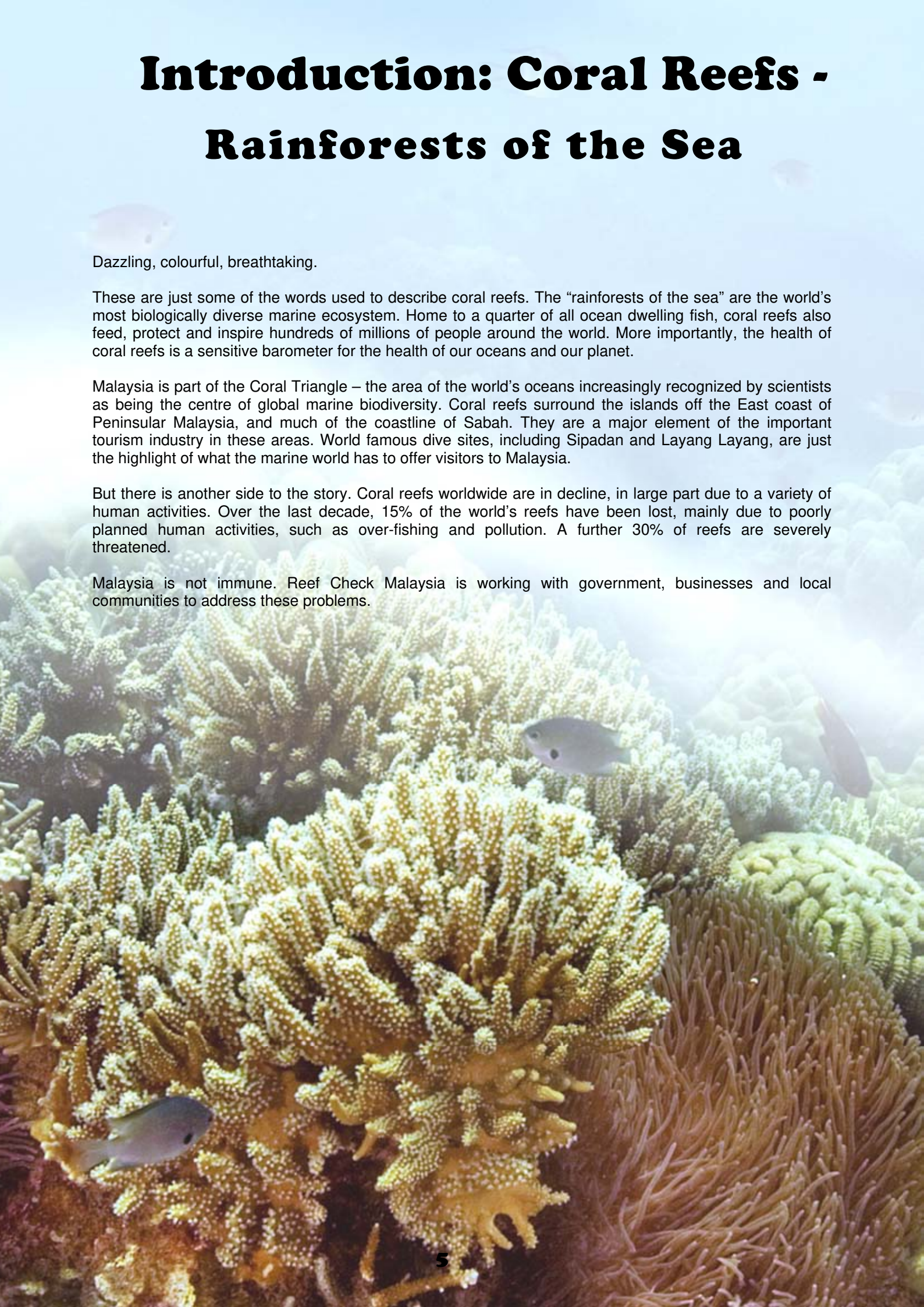
Dazzling, colourful, breathtaking.

These are just some of the words used to describe coral reefs. The “rainforests of the sea” are the world’s most biologically diverse marine ecosystem. Home to a quarter of all ocean dwelling fish, coral reefs also feed, protect and inspire hundreds of millions of people around the world. More importantly, the health of coral reefs is a sensitive barometer for the health of our oceans and our planet.

Malaysia is part of the Coral Triangle – the area of the world’s oceans increasingly recognized by scientists as being the centre of global marine biodiversity. Coral reefs surround the islands off the East coast of Peninsular Malaysia, and much of the coastline of Sabah. They are a major element of the important tourism industry in these areas. World famous dive sites, including Sipadan and Layang Layang, are just the highlight of what the marine world has to offer visitors to Malaysia.

But there is another side to the story. Coral reefs worldwide are in decline, in large part due to a variety of human activities. Over the last decade, 15% of the world’s reefs have been lost, mainly due to poorly planned human activities, such as over-fishing and pollution. A further 30% of reefs are severely threatened.

Malaysia is not immune. Reef Check Malaysia is working with government, businesses and local communities to address these problems.



Reef Check Malaysia

In 2001, the Reef Check Foundation appointed a National Coordinator for Malaysia, to contribute to improving management of this important economic resource. Reef Check Malaysia Bhd was registered as a non-profit company in August 2007.

Despite all the work that has been done to date, coral reef management in Malaysia needs better information and support if it is to be more effective. A key focus for Reef Check Malaysia (RCM) is therefore to develop training programmes for Reef Check trainers and Reef Check divers, under the EcoAction programme. Once trained, these EcoDivers are able to participate in survey programmes, providing valuable information to coral reef managers.

Over the last three years, Reef Check Malaysia has trained over 200 people as EcoDivers, and has completed some 160 surveys, mainly at sites on the East coast of Peninsular Malaysia. Many more surveys have been completed by our partners in different parts of Malaysia. Our goal is to establish a comprehensive National survey programme covering the main diving destinations in both Peninsular and East Malaysia.

In addition to training and surveys, RCM organizes outreach programmes, designed to raise awareness among stakeholder groups of the importance of coral reefs and the threats facing them. Our Outreach programmes focus on the following key target groups:

- schools: in association with the Marine Parks authorities, RCM is delivering an awareness programme for schools on Marine Park islands
- divers: promoting involvement in coral reef conservation through Reef Check training and surveys

Reef Check Malaysia aims to educate Malaysians about the value of coral reefs and to build up a constituency of citizens who are knowledgeable and supportive of marine conservation.

This, our fourth annual report, summarises the results of our 2010 Survey Programme and highlights the other activities RCM has undertaken over the last 4 years.. Our on-going monitoring programme is the first of its kind in Malaysia, and helps managers and other stakeholders to make better decisions about how best to protect coral reefs. More importantly, and for the first time, this report outlines the range of problems affecting coral reefs and highlights some opportunities for action by key decision makers in Federal and state government and the tourism industry itself. Reef Check Malaysia is keen to work with these stakeholders to identify solutions to some of these problems.

Value of Coral Reefs:
Identifying the Problems

Coral reefs are among the most diverse and productive communities on Earth. Reefs have functions ranging from providing food and shelter to fish and invertebrates, to protecting the shore from erosion. They are found in the warm, clear, shallow waters of tropical oceans around the world, though their distribution is uneven.

The Coral Triangle: Epicentre of Global Marine Biodiversity

Southeast Asia's coral reefs have the highest biodiversity of all the world's reefs. A greater number of coral species can be found around a single island in Southeast Asia than can be found in the entire Caribbean. This is particularly true for the Coral Triangle. This diversity has developed over thousands of years, and is maintained through a wide variety of conditions which vary throughout the region (salinity, temperature, storm activity, etc.).

The region contains more than 600 of the nearly 800 reef building coral species found worldwide. But this diversity is not limited to corals. Over 1,650 fish species have been recorded in parts of Indonesia alone, most associated with reefs. Similar diversity is found in related coastal ecosystems, including mangroves, which harbor 75% of the world's mangrove species and 45% of seagrass species.

Coral reefs of the western Pacific are much more diverse than those of the Atlantic and Caribbean. There are up to 75% more genera and 85% more species of corals in Pacific waters.

Malaysia has an estimated 4,000 km^2 of coral reefs, 75% of which are found around Sabah and Sarawak in East Malaysia. Coral diversity is highest in East Malaysia, estimated at over 550 species. Peninsular Malaysia has over 360 species of coral. According to the Department of Marine Parks Malaysia SyMBiosIS

A valuable Resource Being Squandered?

Coral reefs are a valuable economic and biological resource. They have important ecosystem functions that provide crucial goods and services to hundreds of millions of people, mostly in developing countries. They are the foundation of a significant proportion of the global tourism industry, and are a major source of biodiversity. Among the services that coral reefs provide to human society are:

- **Food:** coral reefs are a key source of protein for coastal communities in Malaysia and around the world
- **Fisheries:** reefs are a nursery and breeding ground for an estimated 25% of all marine animals, and home to one third of all fish species found worldwide
- **Tourism:** reefs attract millions of tourists annually, creating jobs and bringing revenue to local economies

Within Southeast Asia in particular, the potential sustainable economic value of coral reefs is substantial, as is the potential economic loss if these resources are degraded. One estimate puts the potential economic value of well-managed coral reefs in South East Asia at around US$ 12.7 billion per annum. Malaysia's share of this is around US $ 635 million.

Sadly, this resource is being damaged by a variety of human activities. The problem is that once coral reefs are degraded, they lose their value because they are less productive, providing fewer goods and services than healthy reefs. For example, a healthy reef might provide a sustainable fishery yield of some 20 tonnes per year. However, if the reef is damaged, for example by destructive fishing practices, the yield will be much lower – even zero in some cases. Even if they are only partially destroyed, coral reefs are slow to return to maximum productivity levels. Some scientists estimate that it can take up to 50 years before a destroyed reef is half as productive as it was in its original state.

The range of activities that cause significant damage to coral reefs – such as dynamite fishing and cyanide fishing – can be lucrative to individuals in the short term. Unfortunately, this benefit is small compared to the long term losses to society of damaged reefs. For example, dynamite fishing might yield US $ 15,000 per km^2 – but it is a one-off gain. Once destroyed, the losses from sustainable coral reef use can be up to US $ 700,000 per km^2.

Imagine a world without reefs. No fisheries, no tourism, and no jobs in vulnerable local economies. We need to raise awareness of their value. Everyone has a role to play.

Identifying the Problems

Scientists now recognize that coral reefs around the world are under threat from a variety of pressures. The damage to reefs caused by occasional natural phenomena is far outweighed by growing human impacts. Worldwide, the key threats facing reefs are:

- Coastal development, particularly for tourism
- Destructive fishing practices that degrade and destroy the habitat itself
- Overexploitation of resources for subsistence and commercial fishing
- Increasing coastal populations, which are expected to double in the next 50 years
- Poor land use practices and runoff of pollutants, sediments and nutrients
- Disease outbreaks, which may be associated with poor water quality and pollutants
- Coral bleaching, associated with increasing seawater temperatures
- Removal of coastal mangrove forests.

These direct and indirect human activities pose significant threats to coral reef ecosystems, and the human populations that depend on them.

Threats to Reefs in Malaysia

In Peninsular Malaysia, reefs are most affected by tourism and development. High-traffic shipping lanes run along the western coast of Peninsular Malaysia through the Straits of Malacca. Reefs in this area can be subject to oil spills and anchor damage. Development of tourism facilities, particularly on the East coast islands, is resulting in coral reef degradation on the islands. Agriculture and plantation activities have caused increased sediment and nutrient runoff. Some west coast reefs are now damaged by seasonal macroalgae blooms.

In East Malaysia, reefs are subject to different threats. Both blast and cyanide fishing methods are widespread around Sabah and have ruined formerly pristine reefs like those surrounding the islands off Semporna. In damaged sites like Boheydulang and Bodgaya Island (near Semporna), abundance and size of fish are markedly decreased. River sedimentation is also an important threat and surveys show that reefs near the Miri River have 20–30 percent live coral cover and large amounts of algal growth.

What is RCM Doing?

RCM is contributing to coral reef conservation in Malaysia in three ways:

- **Monitoring:** the RCM annual survey programme highlights various conservation issues facing coral reefs around Malaysia. Working with coral reef managers in the Department of Marine Parks Malaysia, Sabah Parks and other government stakeholders, we are helping to raise awareness of the status of coral reefs and how they are being damaged
- **Education:** coral reefs are a valuable resource in Malaysia. RCM is helping to raise awareness of this, and how coral reefs can be preserved, through education and outreach programmes targeted at various stakeholder groups, including island schools and tourism-related businesses
- **Community:** coral reef conservation will not be effective if the communities that rely on them are not involved in decision making. RCM is working with local populations and business communities in two islands to help them play a greater role in managing their key asset – the coral reefs.

These topics, and the threats facing coral reefs in Malaysia, are further explored in subsequent sections of this report. Each section includes key recommendations to support coral reef conservation in Malaysia.

RCM: Status of Coral Reefs in Malaysia 2010

The wide geographic range that Malaysia covers means that coral reefs can be found in varied locations across the country. Little reef development occurs along the west coast of Peninsular Malaysia. The east coast has some fringing reefs and there are many fringing reefs around the offshore islands. In East Malaysia, reef development around Sarawak is limited, partly because of high sedimentation levels due to the natural conditions of the coastline that supports mangroves. However, Sabah contains more than 75 percent of all Malaysian reefs and has high levels of coral diversity, including fringing reefs and deep drop offs at locations such as Sipadan and Layang Layang. Overall, more than 350 coral species have been recorded in Peninsular Malaysia and over 500 in East Malaysia.

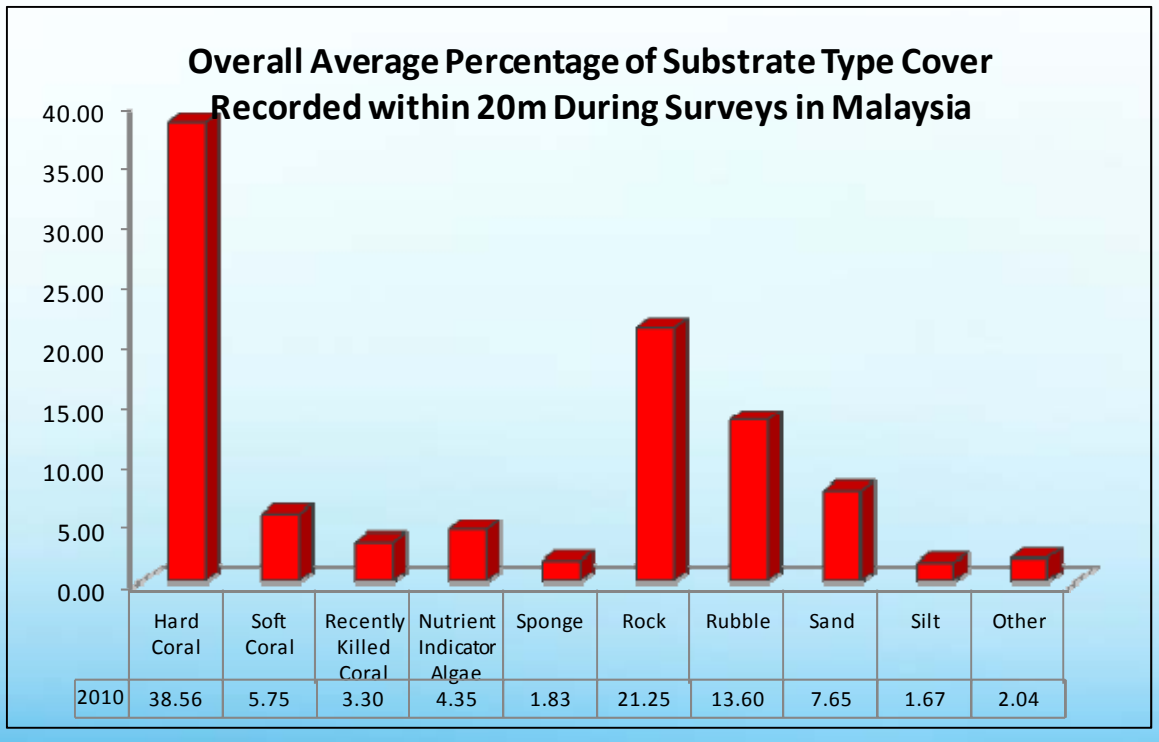
This report summarises the results of surveys carried out in 2010 by RCM or its partners. Even though this is the fourth year of an extensive survey programme, new sites are still being added, including for 2010 Kapas and Yu Islands in Peninsular Malaysia, and Kapalai and Mataking in East Malaysia.

Many of these sites are popular dive sites which are frequently visited by divers and snorkelers. However, there are still many areas, especially off the coasts of Sabah, which are unexplored, but are facing threats from destructive fishing methods such as fish bombing.

Substrate

According to widely accepted criteria, the general condition of Malaysia's coral reefs can only be categorised as "fair", based on the average live coral cover (Hard Coral + Soft Coral) from all the surveys of 44.31%. The average masks a wide range of health at different sites, from just 3% to over 80%.

The low percentage of Recently Killed Coral (3.30 %) indicates that recent damage to reefs due to natural or human factors is relatively low, despite an increase from 2009. Some of this increase can be attributed to the mass bleaching that affected reefs in South East Asia during 2010, and some from predation from various species including Crown-of-thorns. The percentage of Rock is relatively high (over 21%), a large proportion of which is old, dead corals. This is considered to be an acceptable level, given that most of the reefs surveyed are in areas affected by monsoon and strong waves during certain times of the year.



It is also encouraging that the average level of Nutrient Indicator Algae is relatively low at 4.35%. However, this is a slight increase from 2009 of 0.7%. Although algae is a natural component of coral reefs, increasing or high levels of algae can indicate influx of nutrients into the water, which in turn can lead to a proliferation of algae to a level that is above the ability of herbivorous organisms to keep it in check. This results in algae smothering and killing corals, and reduces the surface for recruitment of new corals on rock and old dead corals, hindering the recovery of reefs over time.

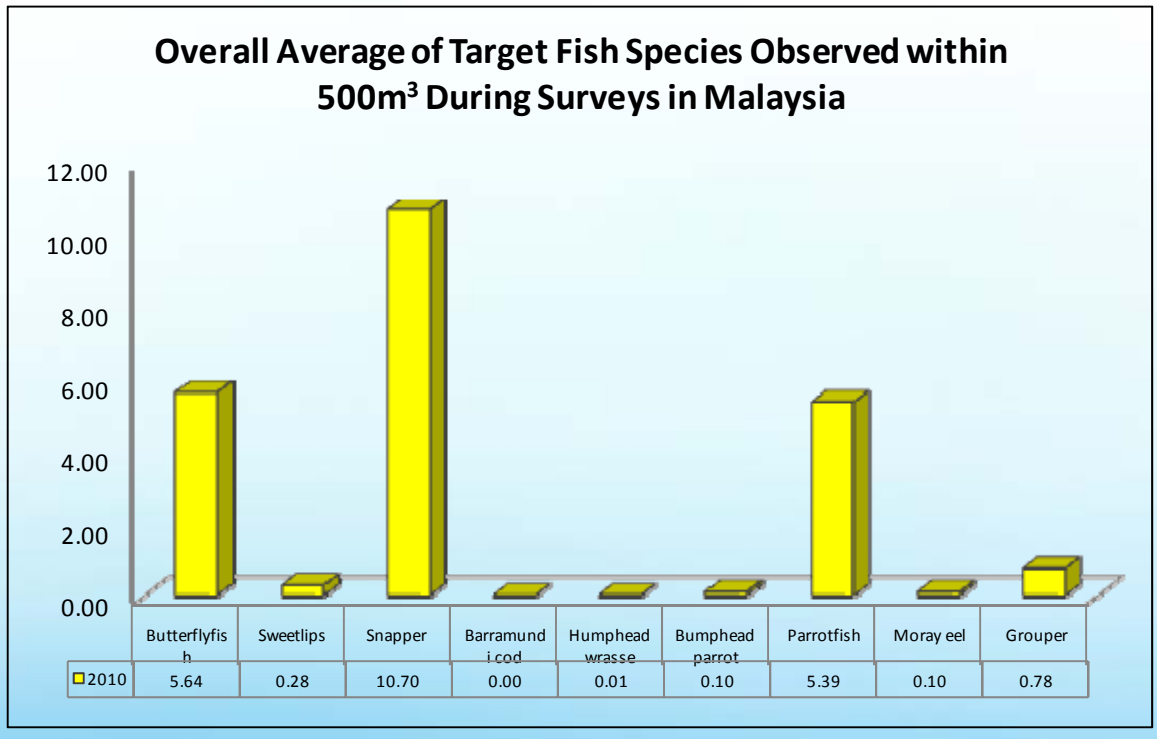
Even though the average live coral cover of the reefs from the surveys indicates that the reefs in Malaysia are in reasonable condition, there is still room for improvement. A range of issues such as development, sedimentation, pollution and tourist activities need to be managed so that impacts on coral reefs are minimised, creating the conditions for improvements in the future.

Fish

One criterion used to select Reef Check indicator fish species is the degree to which they are targeted by fishermen. Abundance of those varieties that are targeted for the food trade is low in most of the areas where surveys have been conducted. These include groupers and parrotfish, where only adult-sized fish are counted during the survey. The low figure of less than 1 grouper observed per 20 m long replicate transect indicates heavy fishing pressure for such fish.

Numbers of other prized fish, such as Barramundi cod, Sweetlips and Humphead wrasse, were also very low and rarely sighted during the surveys. In particular, the high value of a single large Humphead wrasse (which can be worth up to US$ 10,000 on live fish markets), results in targeted fishing effort for this particular species. Greater enforcement of Marine Park regulations will be necessary to aid recovery of populations of this iconic species, and on-going monitoring will help to track recovery in populations.

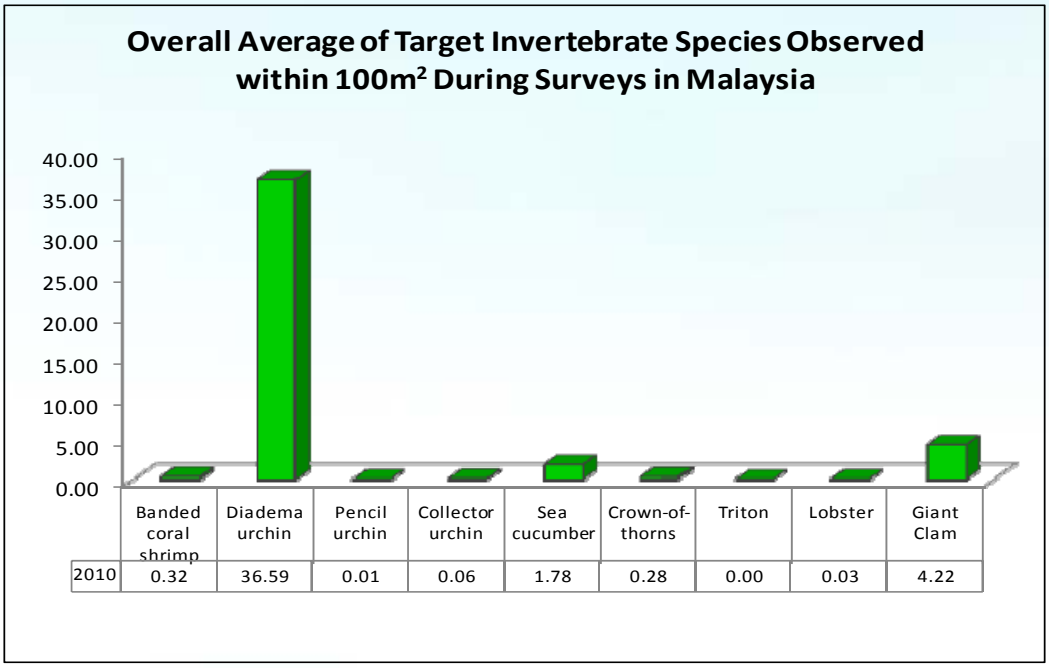
On a more positive note, the relatively high abundance of butterflyfish and parrotfish in most survey sites is a good indication that there is low collection pressure for these fish, a popular item in the aquarium (butterflyfish) and food (parrotfish) trade. Furthermore, the high numbers of butterflyfish at some survey sites also reflects the fairly healthy status of reefs around Malaysia, as they thrive on reefs with healthy corals because they mainly feed on coral polyps. Parrotfish will also act as a control against proliferation of algae, as they are herbivores.



Invertebrates

Reef Check invertebrate indicators were selected on the basis either that they are high-value target organisms for fishing and/or collection, or indicators of an imbalance of the ecosystem. Highly sought-after invertebrates such as collector urchin, triton shell, lobster and pencil urchin were largely absent from all surveys. These invertebrates are prized either as food, as decorative "curio" pieces at home or for the aquarium trade. Older fishermen in survey areas tell stories of previously high numbers of lobster on some reefs now being substantially depleted due to over-harvesting.

The low numbers of Crown-of-thorns starfish (COT), which feeds on corals, is a positive indicator, as COTs can destroy large areas of reef over a short period of time. On the islands off the East coast of Peninsular Malaysia as well as around East Malaysia, efforts have been made by Marine Park authorities, Sabah Parks and local dive centres to control COT numbers by organising COT removal activities to reduce the threat posed by these creatures.



	Banded coral shrimp	Diadema urchin	Pencil urchin	Collector urchin	Sea cucumber	Crown-of-thorns	Triton	Lobster	Giant Clam
2010	0.32	36.59	0.01	0.06	1.78	0.28	0.00	0.03	4.22

The abundance of long-spined sea urchins *(Diadema sp.)* at some sites, particularly Tioman Island and a few sites in Sabah, is a concern. When the reef ecosystem is in balance, the numbers of *Diadema* urchins, in combination with herbivorous fish, keep algal growth in check. However, these urchins can reproduce rapidly in conditions in which their main food source (micro- and macroalgae, which proliferate in nutrient rich water) is abundant. Thus, high or increasing numbers of *Diadema* could indicate above normal levels of nutrient, causing algae to grow.

High numbers of *Diadema* can cause another problem. The spines which the urchins use to move scrape living corals as they move over the surface of the reef. Very high numbers of *Diadema* can damage the reef structure, degrading the reef if this bioerosion rate exceeds the rate of coral growth. Having a balance of *Diadema* and herbivorous fish such as parrotfish, surgeonfish and rabbitfish is important as a control for algal growth. Even with this balance, the fertilizing effect of nutrient pollution is something that needs to be addressed to prevent further degradation of reefs from algal proliferation.

Improving the Data: Reef Check Malaysia

Despite the fact that this is our fourth year of surveys, information about the health of coral reefs in Malaysia is still somewhat patchy. Other survey data is available (eg. from universities) but it is fragmented and distributed among numerous institutions. There is no single database of information on coral reefs from surveys, and much of the information that is available is old.

Furthermore, most of the sites surveyed to date are easily accessible dive sites. Many other unexplored sites around Malaysia still need to be surveyed to provide a better overall picture of the condition of reefs in Malaysia.

Nonetheless, this 4th Annual Report contributes further to the growing database of information on the status of coral reefs in Malaysia. Continued monitoring is essential to assist coral reef managers to make informed decisions. This report highlights a number of management issues that RCM would like to explore with relevant partners from Government, academia and local communities.

RCM: Rainforest to Reef – Educating the Young

"Rainforest to Reef" (R2R) is an outreach programme designed to raise awareness among school children about their role in protecting their environment. In 2008, at the request of the Department of Marine Parks Malaysia, RCM developed and piloted a "Coral Reef Camp" educational programme for schools on five marine park islands. The programme was subsequently extended into the Rainforest to Reef (R2R) programme and launched in 2009, comprising a 3-day Coral Reef Camp and two Supporting Activities (SAs).

Alstom Foundation – Island Schools Programme

The Alstom Foundation was set up in 2008 by Alstom HQ in France to provide funds for projects supporting the environment, youth and education. In late 2008 the R2R Programme was accepted as one of the first projects to be funded by the Foundation, for a three-year period running from 2009-2011. The funding received will support the R2R Programme on three Marine Park islands: Perhentian, Redang and Tioman.

In 2009, the first Coral Reef Camps and Supporting Activities were held on each of the three islands. The programme continued successfully in 2010, with a total of 6 SAs (2 on each of the three islands) and 4 Coral Reef Camps (2 on Tioman and 1 each on Redang and Perhentian) conducted between March and October. After two years of running the programme, most, if not all, of the Standard 5 and 6 students on these three islands have participated in this programme, a total of 180 students, with assistance from more than 30 teachers. 70 Alstom staff and officers from the Department of Marine Parks Malaysia have also contributed time to the programme.

In the first SA, held between March and April 2010, participants went for a jungle-walk on their respective islands and played environmental games in different stations located along the jungle trail. The various games taught the students important lessons about the environment and how their actions can impact their environment both positively and negatively. They also conducted a beach cleanup to remove litter, especially plastic and polystyrene trash that may end up in the ocean. A simple poster drawing competition based on environmental themes was also held to allow them to express themselves creatively. Selected students were also given tasks to be completed over 5 months under the new "Island-Ocean Discovery Project" (IODP), introduced this year by Alstom Malaysia.

The second SAs were held in September and October 2010, focussing on International Coastal Cleanup Day. This international effort sees nearly half a million people participating worldwide to protect the oceans from harmful marine litter. During the SA, several games were also conducted to remind participants of their responsibility to protect the environment around them, challenging them to take care of their surroundings which are important for their future livelihoods. The students involved in the IODP also presented their work to the other students as part of the programme.

In between these two SAs, Coral Reef Camps were held on each island, involving 11 and 12 year old students. The students, together with facilitators from Alstom, spent three days and two nights camping at the Marine Park Centre on the respective island, where they learned lessons about the various ecosystems found on the island. Activities included discussions, classroom teaching, snorkelling, object lessons, environmental games, and role-play. Feedback from students and parents was encouraging – some parents even found themselves being told off by their children for littering! Some students from the previous year's programme joined the snorkelling activity during the Camp to help pick up trash from the reefs.

The R2R Programme with the island schools will continue under the Alstom Foundation funding for 2011. Alstom staff will also begin to take a bigger role in implementing some of the programmes on the islands as part of ensuring the sustainability of this programme.

KPMG – Urban School Programme

In 2010, RCM continued to work with KPMG, who are funding an R2R Programme at a school in KL. The Financial Advisory Services (FAS) Department raised funds through their Community Day event and channelled the money to RCM's R2R Programme. Sekolah Kebangsaan Taman Tun Dr. Ismail (2) was selected as the school where the programme will be implemented.

The 2010 was similar to the 2009 programme, with two activities in the school to introduce environmental issues to over 80 students. A Coral Reef Camp was held in Tioman for 25 students who travelled to the island to learn and experience the various ecosystems found there.

An additional element for the programme in 2010 was to extend the existing recycling programme in the school, to include all pupils and their parents, rather than just older children, as it had been previously. RCM collaborated with Recycle and Reward, a company specialising in establishing rewards-based recycling programmes.

CIMB – Urban School Programme

In an attempt to extend the reach of the R2R programme to the mainland, in 2010 RCM received funding from CIMB to develop a programme specifically for urban schools.

Initially targeted at six secondary schools in the Klang Valley, the programme incorporated successful elements of the island-based programme (multiple visits, hands-on activities) but was adjusted to be more relevant to the urban environment, covering issues such as solid waste management, electricity and water management and littering. The programme comprised four activities, including basic environmental education, 3Rs workshop and a visit to a local aquarium (at Zoo Negara).

Although not as successful as initial reactions suggested it would be, mainly due to the time constraints on the target audience – form 5, 16 year olds, important lessons were learned from the programme that are now being applied to a re-designed education programme for urban schools. This will be based on a "Road Show" that will visit schools for a day to allow children to participate in activities and games designed to teach them about the environment around them and to learn about conservation.

RCM: Community Programmes – Stakeholder Involvement

During 2007 and 2008, the majority of our effort was put into training and certifying EcoDivers and conducting Reef Check surveys to collect baseline data on the condition of coral reefs in Malaysia, particularly in Peninsular Malaysia.

As the training and survey programme developed its own momentum, the focus shifted towards using the data to identify projects which would address some of the problems facing coral reefs. In 2009, RCM started two new projects with this objective in mind, first in the Perhentian islands and subsequently in Pangkor Island. The key goal is to involve stakeholders in efforts to conserve marine resources in the respective areas. RCM continued to build on these efforts and expand its work on these islands in 2010.

Perhentian Island Project

Started in February 2009, this two year project is funded by the GEF-Small Grants Programme. Throughout 2009 and 2010, RCM has visited the islands to undertake projects with various stakeholders, including resorts, dive operators, restaurants, shop owners, snorkel guides, taxi boatmen and villagers. One on one consultations and group discussions addressed the range of environmental issues facing the islands, how these will affect their businesses in the long term and how they can be addressed.

The culmination of early consultations was the formation of the Persatuan Pengusaha-pengusaha Pulau Perhentian Terengganu (Association of Perhentian Island Operators), to provide a vehicle to address common problems in discussions with relevant authorities, as well as providing a forum to improve communication between members. The association will also be pushing the agenda of Responsible Tourism to all its members and in 2010 RCM designed and distributed information sheets on “Do’s and Don’ts” in the Marine Park to every chalet operator, which are now displayed in most rooms on the islands.

A training programme on eco-friendly snorkel guiding was launched in 2009, and assessments and certifications were completed in 2010. Over 80 snorkel guides participated in the initial training sessions, with some 75 eventually receiving certifications. The main objective of the training was to teach snorkel guides about their role in protecting their own marine resources, which are the source of their livelihood. The training included in-water practical sessions as well as role-play in presenting briefing sessions to customers. We are now working with Department of Marine Parks to replicate the programme on other islands.

RCM also continued its “Anti-littering Programme”, conducted with the children (5 to 12 years old) on the islands. The aim of the programme is to create awareness of how trash can affect marine life around the islands, which will in turn affect the livelihood of their parents who depend on marine resources as their source of income. RCM also created a human-sized “Snakes & Ladders” game, with environmental messages painted on the canvas, which serves as the board. The children learned about ways to take care of the environment as they read these messages while playing the game.

The Association successfully applied to the GEF-SGP for funding to extend its programmes on the Perhentian islands, focusing on improving solid waste management on the island through capacity-building programmes, small-scale investments and local participation. RCM will continue to support and assist the Association through monthly beach cleanups, involving operators and their guests in an on-going programme to address one of the main problems on the islands – solid waste disposal. We will also continue to distribute newsletter and flyers about the conservation efforts taking place on the island.

Through the Association, the voice of Perhentian’s local community is starting to receive more attention, as Government agencies are starting to involve the Association in discussions and consultations.

Pangkor Conservation Programme

The project around Pangkor, funded by YTL, aims to improve the marine environment around Pangkor Island and Pangkor Laut. In late 2008, RCM planned a number of programmes to be implemented with resort staff and the local community on Pangkor.

As part of ongoing efforts by Pangkor Laut Resort management to educate their staff on environmental issues, RCM conducted environmental talks for staff, outlining the importance of the environment and practical ways they can contribute to conservation. Staff were also involved in reef and beach cleanups organised around Pangkor Laut Island in November 2008, December 2009 and November 2010.

In May 2009, RCM launched a school education programme with local children from SK Sri Pangkor on the main Pangkor Island. About 50 students were involved in the programme, gaining knowledge on coral reef ecosystems as well as learning how to practice the 3Rs. RCM also held consultations with representatives of the local fishermen's association to better understand their activities and how they might be impacting the marine environment.

In November 2009, RCM organised the first snorkel guide training programme for local snorkelling guides. 25 guides attended the initial two days of training, which continued in 2010. As well as building local skills and capacity, this programme also identifies ways to improve snorkelling activities on the island and ways boatmen and guides can reduce impacts on the remaining reefs around the islands.

Pangkor Coral Transplanting Programme

One of the issues arising from discussions with the snorkelling guides at Pangkor concerned the poor condition of their main snorkelling site, Pulau Giam. Over time this site has been heavily degraded due to poor operating procedures (boat anchoring, damage by poorly supervised tourists) and we were asked to help to rehabilitate it.

RCM arranged a visit to Pangkor with scientists from Malaysia National University (UKM) and National University of Singapore (NUS) to assess the best way to rehabilitate the site. As a result, a coral transplanting programme was designed. The first phase, establishment of a coral nursery (with live coral fragments taken from nearby healthy reefs), was implemented in September 2010 by RCM and UKM scientists. This is being monitored twice a week to ensure coral fragments remain healthy, and to keep it free of algae, which would smother and kill the new colonies.

Once the fragments have recovered from the stress caused by the initial handling and transportation, and have re-established normal growth, they will be transplanted to the snorkelling site at Pulau Giam, in early 2011. RCM is now engaging in a community consultation exercise with local snorkelling guides, to gain support for closing off boat access to the site in order to protect the rehabilitated area from damage. This will also provide an excellent opportunity to educate tourists visiting the site, who will be able to see the transplanted reef, with the newly-trained snorkelling guides acting as guardians of the site. We also plan to raise awareness of the programme among the local community, including schools, to more widely raise awareness on the island of the importance of marine ecosystems.

2011 – Extending the Programme

These projects have both demonstrated the importance of involving local communities in decisions about resource use and management. There is an urgent need to extend these programmes to other communities in both Peninsular and East Malaysia.

The YTL Group's Environmental Vision

Tan Sri Dato' (Dr.) Francis Yeoh
PSM, FICE, CBE, SIMP, DPMS, DPMP, JMN, JP

Managing Director,
YTL Corporation Berhad

We are fully committed to being a responsible corporate citizen. Energy plays an essential role in ensuring quality of life for people everywhere, for us and for future generations. Supplying energy reliably is critical to helping people maintain and improve their standard of living. However, this brings with it significant challenges - for example, the very real threat of climate change means that we need to continue to provide and deliver energy in a way that minimises the impact our emissions have on the environment. We recognise the importance of sustainable development, taking account of the impact of our operations on society and understanding the dire consequences of global warming. At YTL, I am pleased that we have adopted the "Four Cs" of corporate environmental stewardship:

(1) Conserve Energy
(2) Convert to Lower Carbon Energy
(3) Choose Quality Offsets
(4) Call for Action

One of our "Calls for Action" comes in the form of our flagship educational campaign, Climate Change Week, which we pioneered and have been hosting yearly since 2007. It has been designed to educate and raise public awareness towards the critical issue of global warming.

In addition to investing in green technology, we are also continuing our support towards our long-term conservation partners. As stewards of our good earth, YTL has long supported conservation through international groups like The Nature Conservancy, as well as WWF-Malaysia and Rare Conservation. Our support for Reef Check Malaysia also continues with marine conservation work focused on both the East and West coasts of Malaysia. With climate change and rising temperatures causing increasing levels of coral bleaching on the reefs in coastal areas of Malaysia, we believe it is our duty to protect the reefs and its biodiversity the best we can despite the harrowing news and reports on the state of our reefs.

2010 is recognised as the United Nations Environment Programme's International Year of Biodiversity and we are proud to continue our support for RARE Conservation, Reef Check Malaysia, and other environmental organisations which we have been long-term supporters of.

For more information, please visit our YTL Climate Change Week website at www.ytlcommunity.com/climatechange

Coral Bleaching:

Causes, Impacts and Appropriate Responses

In 2010, higher than normal sea temperatures caused mass bleaching of coral reefs around South East Asia, including Malaysia, with the peak of bleaching occurring between July and August. Surveys showed that coral reefs around Peninsular Malaysia suffered up to 90% bleaching during the period.

Although most of Malaysia's coral reefs survived this event (estimates suggest mortality rate was between 10-15% on those reefs affected), scientists agree that tropical seas will continue to warm in future years, increasing both the probability and severity of mass bleaching events. This is a particularly challenging problem for coral reef managers, not least because the main cause of mass coral bleaching – unusually high sea temperatures – is largely beyond their control. Yet, managers can play a critical role in helping reefs survive the threat of coral bleaching.

During the 2010 bleaching event, Reef Check Malaysia worked together with the Department of Marine Parks Malaysia and representatives of the tourism industry (principally dive operators) to attempt to monitor the extent of bleaching and to take simple steps to help to protect coral reefs from damage. Given the importance of coral reefs to Malaysia's economy, and the expected recurrence of bleaching events, RCM is recommending that the experience gained in 2010 needs to be formalised into a **Bleaching Response Plan** to ensure that managers are in a position to respond appropriately to future bleaching events with timely information and interventions.

What is coral bleaching?

The great majority of "reef-building" corals live in a symbiotic relationship with colourful, photosynthetic algae that live inside the coral itself and provide up to 90% of its' food.

Bleaching is a stress response that results when the coral-algae relationship breaks down. The term 'bleaching' describes the loss of colour that results when the algae are expelled from the coral hosts, revealing the white calcium carbonate skeleton of the coral. On a small scale, many stressors (including disease, sedimentation, cyanide fishing, pollutants and changes in salinity) may cause corals in a small area to bleach. However, mass bleaching affects reefs at regional to global scales and cannot be explained solely by such localised stressors. Mass bleaching events are associated with large-scale, unusually high sea surface temperatures. Temperature increases of only 1-2ºC can trigger mass bleaching events because corals can only survive in a narrow temperature range.

Once the food-producing algae have been expelled, corals are effectively on a "starvation diet", and can survive for only short periods of time (usually several weeks, depending on species) before they die. If temperature conditions return to normal within that period, however, the coral will survive, albeit in a weakened state for some time after the bleaching has finished.

Impacts on Reefs and People

Coral reefs provide a range of “eco-system services” to communities, including fisheries, tourism and coastal protection. Once the coral reef ecosystem is degraded, its ability to continue to provide these services is also degraded. While coral reefs are unlikely to be eliminated globally because of mass bleaching events, predicted declines in reef condition have serious implications and scientists and managers are becoming increasingly concerned about the effects of deterioration in reef condition on the human communities and industries that have come to rely on healthy ecosystems for their livelihood and lifestyle.

1. Impacts on fisheries.

Changes in coral reefs resulting from bleaching are expected to translate into shifts in fish species composition and, possibly, reduced fishery catches. Coral reef ecosystems support fisheries by providing food and habitat for a diversity of species. Coral mortality from mass bleaching events leads to loss of reef structure and habitat, as dead coral skeletons erode and break down. Where significant coral mortality occurs, coral bleaching can result in dramatic decreases in the amount of habitat available for fish and other mobile reef species that depend on the structure provided by healthy coral reefs.

Strongly coral-dependent fish species are expected to be the most affected by bleaching-induced coral mortality. Several species of fish are reliant on coral as a primary food source, and many other species use coral for shelter from predators.

In turn, these coral-dependent fishes are important prey for larger species. Therefore, bleaching events that result in widespread loss of physical habitat would be expected to have 'flow-on' effects to species that are targeted in large scale capture fisheries.

2. Impacts on tourism.

Changes in coral reef ecosystems resulting from bleaching are expected to translate into economic losses to the tourism industry.

The islands off Malaysia’s East coast are popular destinations for divers and snorkelers, as are numerous locations around the coasts of Sabah and Sarawak. The economies on Islands such as Tioman, Redang and Perhentian rely solely on tourism and without healthy coral reefs these destinations will become less attractive to tourists, with resultant economic impacts.

Appropriate Responses

Minimising the impacts of mass coral bleaching will require action in two areas:

- Implement management plans to respond to mass coral bleaching
- Build long-term resilience.

Management Responses to Mass Coral Bleaching

Managers will increasingly need to be prepared to deal with coral bleaching events, and a comprehensive Bleaching Response Plan should include:

- Monitoring relevant climatic sources to provide an “early warning system:
- Procedures to assess ecological impacts through surveys
- Procedures to assess social and economic impacts
- Management measures that can be implemented to reduce other stressors during bleaching events
- Communication.

An important part of any bleaching response plan includes actions that help managers develop and communicate reliable information about the impacts of a mass bleaching event. This does not provide a 'cure' to mass coral bleaching. However, experience shows that implementing these actions during and after bleaching events can improve the overall effectiveness of coral reef management. Specifically, managers can gain and maintain critical support from decision-makers and other stakeholders by raising awareness and advancing scientific understanding about the patterns and impacts of coral bleaching and the importance of ecosystem resilience to the future of coral reefs.

By way of example, the Great Barrier Reef Marine Park Authority's (GBRMPA) Coral Bleaching Response Plan has been developed to provide an early warning system for conditions that cause coral bleaching, and to document the extent and severity of coral bleaching events through surveys. The information collected under this Response Plan can be used to compare and analyse the frequency and patterns of bleaching events and to develop forecasting tools. It is also used in communications programmes. The key elements of the Plan are:

- On-going monitoring programmes
- Early Warning System, including climate and sea temperature monitoring
- Bleaching assessment protocols and sites
- Communications strategy
- Implementation schedule, including routine and responsive tasks.

RCM recommends that DMPM develop a similar comprehensive Response Plan for coral reefs in Malaysia.

Building Long-term Resilience

Ecosystem resilience relates to the ability of an ecosystem to maintain key functions and processes in the face of external stresses or pressures by either resisting or adapting to change.

In the context of mass bleaching, resilience can be considered as the capacity of the coral community to resist, survive, or recover after recurrent bleaching events. A resilient reef may suffer significant coral mortality during a bleaching event, but will maintain key system characteristics (structure and function) through rapid recovery and reorganisation, relative to less resilient reefs. The capacity of coral reefs to recover from disturbances will become increasingly important if the frequency and severity of bleaching events increases. Reefs with lowered resilience are more likely to suffer serious and long-lasting impacts from coral bleaching events.

Managers can take active steps toward restoring and maintaining the long-term resilience of coral reef ecosystems in two ways:

- By incorporating existing resilient areas into management design
- By implementing strategies to either reinstate or protect factors that confer resilience, such as good environmental conditions, biological diversity, and connectivity.

Growing coastal populations and anticipated increases in sea temperatures will continue to increase pressures on coral reefs and the need for effective coral reef management has never been greater. Management efforts that increase reef resilience will make an important contribution to coral reef health, enabling reefs to adapt and adjust to changing conditions.

RCM recommends that DMPM work with local universities and NGOs to develop a better understanding of reef resilience and to incorporate the concepts of reef resilience into management programmes.

Reference

Marshall, P.M. and H.Z. Schuttenberg, 2006. *A Reef Manager's Guide to Coral Bleaching*. Great Barrier Reef Marine Park Authority. Townsville, 165pp.

Role of the Department of Marine Parks Malaysia: MPAs in Coral Reef Management

The establishment of marine protected areas (MPAs) has become a standard tool in improving management of coral reefs. The general idea of MPAs is to locally stop all extractive uses, and MPAs can address a number of issues, including:

- Conservation: MPAs can protect individual species that are sensitive to fishing; improved habitat can lead to increased biodiversity
- Tourism: Many MPAs are established to attract tourists and the economic benefits of this may far outweigh those gained from fishing. Increases in abundance, size and diversity of reef-associated fishes in reef MPAs can be more valued by divers than the condition of the reef itself
- Fisheries: MPAs can provide benefits both inside the MPA (eg., lower fishing mortality, higher density of target species, higher mean size and age of target species) and outside the MPA (eg., export of adult fishes to fished areas and export of eggs and larvae to fished areas. It is therefore hoped that MPAs will promote recovery of stocks and ecosystem functioning within the area and provide for sustainable yield through spillover and larval export outside of it

Scientists accept that action to conserve reefs is now urgent and MPAs will have a significant role to play in managing coral reefs in the future. The report "Status of Coral Reefs of the World, 2008", highlights a number of actions required to conserve coral reefs, including the following relating to MPAs:

- **Include more reefs in MPAs** – a proven and effective governance approach for conserving coral reefs and promoting sustainable use is to include them in effectively managed MPAs; preferably containing a significant proportion as fishery reserves or no-take areas, linked into a network of MPAs, and embedded within a larger governance framework. Developing countries will need assistance in expanding their MPA networks and establishing integrated coastal management (ICM) governance frameworks.

- **Improve enforcement of MPA regulations** – enforceable governance systems will be required to deal with the formidable problem of regulating access to managed ecosystems (including types and rates of resource exploitation). Many countries will need assistance to establish effective enforcement systems that function in different marine coastal and marine environments and do not undermine local cultural values and practices.

- **Scale up management of protected areas** – there is a need to improve the management of existing marine protected areas (MPAs) to accelerate restoration of depleted fish stocks and protect coral reef goods and services that underpin coastal economies and livelihoods. This includes managing adjacent catchment areas to prevent nutrient and sediment pollution to create buffer areas that will reinforce MPA management activities.

- **Help improve decision making with better ecological and socioeconomic monitoring** – there is an urgent need to upscale monitoring, especially with increasing threats of climate change, to ensure that this information is provided to natural resource managers and decision makers so that appropriate actions can be taken to reduce threats to reefs and coastal communities.

- **Maximise coral reef resilience** (by minimising direct human pressures on reefs) – the second major threat to reefs derives from direct human activities: over-fishing and destructive fishing; sediment pollution from poor land use; runoff of nutrients and other pollution; and habitat loss through unsustainable development. Control of these threats, which are damaging reefs around the world especially in developing countries including small island developing states, will improve the resilience of coral reefs in the face of climate change. These countries need assistance to improve local catchment and coastal management by upgrading capacity and providing funds to implement community-based management and develop alternative livelihoods to take pressures off reefs.

- **Protect remote reefs** – there are many coral reefs remote from continental land masses and human populations that, if they are protected, will be able to act as reservoirs of biodiversity to replenish depleted reefs. We recommend establishing more MPAs to include many of the remote island reefs, like those to the west of Hawai'i, in Kiribati, and the Coral Sea east of the Great Barrier Reef. Developed countries may have the best resources in governance and enforcement to conserve large remote areas in their territorial waters.

Role of RCM

In Malaysia, the Department of Marine Parks Malaysia (DMPM – part of the Ministry of Natural Resources and Environment) is responsible for managing Marine Parks in Peninsular Malaysia, and Sabah Parks in Sabah.

RCM has good working relationships with both these government agencies, and has conducted training for staff and carried out survey programmes with both institutions. We are keen to establish further joint programmes, including:

- Extending monitoring programmes, to cover more sites in existing Parks
- Training additional Park staff to conduct Reef Check surveys
- Assisting with the establishment of further MPAs (for example at the Sembilan islands in Kedah)
- Conducting research on issues such as resilience and connectivity, together with local academic institutions, leveraging our contacts with dive operators on the islands to enlist their support in providing logistics and manpower
- Assisting with the preparation of Bleaching Response Plans, including a comprehensive monitoring programme to assess the impact of predicted future mass coral bleaching events.

Opportunities for Action

In addition to the above specific programmes, RCM recommends that Marine Park managers consider the following actions to improve the effectiveness of Malaysia's Marine Parks:

- Enhance enforcement of marine park regulations through increased patrols, monitoring of tourism activities (diving and snorkelling), and greater visibility of regulations and Marine Park officers (eg. more signs on jetties and at resorts; officers to increase frequency of visits to operators)

- Introduce Zoning to temporarily close heavily used areas to allow them to recover, increasing resilience of coral reefs

- In collaboration with dive operators, carry out coral reef monitoring programmes to improve information available to managers

- Improve relationships with local communities in coral reef areas by appointing community management representatives, increasing opportunities for stakeholder consultation and feedback, and raising the profile of Marine Parks through increased visits of officers to stakeholders

- Introduce liaison visits to resorts and dive operators to improve communication and information exchange and give operators an opportunity to provide feedback to Marine Park management

- Improve information available to tourists by installing more signs in public areas, and by encouraging resorts to display information for tourists on what Marine Parks are, conservation issues, "do's and don'ts" for tourists (room information, arrivals briefings, etc)

- Train snorkelling guides in ecofriendly guiding procedures and promote trained guides through websites, resorts, etc

- Collaborate with relevant organisations (eg., NGOs) to introduce monthly conservation awareness activities for schools in coral reef areas

- Build capacity of Marine Park staff to enable them to better communicate with tourists and local stakeholders

- Improve communications with other relevant government agencies (fisheries, tourism, state planning departments)

- Involve wide range of stakeholders in activities such as monitoring programmes and outreach activities to increase awareness of conservation issues in Marine Parks

- Improve management of user fees by ensuring part of funds raised is invested in local facilities.

Role of State Governments:

Impacts of Coastal Development on Coral Reefs

The coastal zones of tropical countries are some of the most dynamic environments on earth. Worldwide, almost half a billion people live within 100 km of coral reefs, where they benefit from fisheries, wave and storm surge protection, and tourist income. In Malaysia, the majority of the population lives in coastal areas.

Complex and Valuable

Coastal zones are unique: daily tides, mangrove forest, storm waves and tidal flats are found only on the coast. The strip of land that straddles the coastline contains some of the most productive and valuable habitats of the world. Coastal zones are also very sensitive ecological systems with great value in economic, recreational, aesthetic, social, and environmental conservation terms.

Coastal resources are governed by a number of different agencies and organisations who all have a vested interest in the resources available in the coastal zone. However, the management of the coastal zone is characterised by:

- great complexity and variety due to the combination and interaction of land and sea;
- the variety and importance of the resources that the zone contains;
- the importance of coastal ecosystems in themselves, and in their interaction with other terrestrial and marine ecosystems;
- the variety and extent of social and economic demands on the zone, and the increase in these demands;
- insufficient coordination and communication between legislative and administrative structures sharing the responsibility of the coastal zone.

This can lead to unplanned coastal development projects, which not only damage coral reefs, but also local economies that are supported by tourism. Coral reefs are a significant driver of coastal tourism, which represents 85 percent of tourism worldwide and provides potential annual net benefits of US $9.6 billion. Unplanned, high-impact development compromises the sustainability of coral reefs, their tourist business, and the communities they support.

Impacts

Ecological impacts of unplanned coastal development include:

- Construction projects, such as piers, dikes, channels, and airstrips kill corals directly. Habitat degradation causes a decrease in fish populations, as fish have fewer places to live and breed.
- Removal of sections of reef can indirectly cause sand erosion, land retreat, and sedimentation.
- Unforeseen impacts of development—such as changed water flows and runoff, chronic sedimentation, sewage effluent, and industrial discharge—impact coral immune systems, growth rates, and reproductive abilities, and can kill corals.

Socioeconomic impacts of unplanned coastal development include:

- The degradation of coral reef ecosystems results in a less marketable travel destination and the decline of the tourism industry, leading to a loss in revenue.
- The mining of coral for construction materials leads to long-term economic losses. Indonesia produces US $121,000 of coral per km (per 0.6 miles) of reef while causing net losses of US $93,600 in fisheries value, US $12,000-260,000 in coastal protection and US $2,900-481,900 in tourism value (plus unknown costs due to loss of food security and biodiversity) for a maximum total loss of US $835,500 per km of reef.

With the worldwide coastal population expected to double by 2050, coral reefs will be facing increased pressure from unmanaged development along coasts.

The Bigger Picture

Away from the immediate coastal zone, a number of factors can affect coral reefs. Population growth and urban development currently rank among the greatest threats to coral reefs. Development activities cause erosion, resulting in the run-off of sediments which eventually reach the reefs. Stormwater runoff carries trash, fertilizers and sewage into the ocean, damaging coral reefs. Run-off from agriculture and plantation activities, as well as deforestation, add to this burden. Increase of nutrient concentrations within the reef environment is followed by increase of algae, which may smother corals. Whether it is from direct sedimentation or an increase in turbidity from nutrient-loading, the amount of sunlight reaching the corals is reduced.

Small Islands

A large proportion of coral reefs in Malaysia are found around the small islands off the East coast of Peninsular Malaysia, and around the coast of East Malaysia. A number of issues specific to small islands can have an impact on coral reefs in these locations, including:

- Limited fresh water supplies: often requires large volumes of water to be transported onto the island
- Limited flat land for development: restricted space for infrastructure
- Solid waste disposal: since space is not available for landfill, waste has to be taken off the island for disposal
- Sewage treatment/disposal: as above, no space is available for integrated treatment plants, and sewage treatment relies on simple systems that may not be able to cope with large volumes and varying waste streams.

Given these limiting factors, fragile island environments face severe challenges if tourism develops into a larger-scale activity. Many coral reef areas in Malaysia popular with tourists are in such environments, highlighting the need to develop these areas with care.

Opportunities for Action

State governments are encouraged to consider the following actions to reduce impacts on coral reefs and increase stakeholder involvement in decisions affecting coral reefs:

- State governments are encouraged to recognise the economic value of coral reefs as a tourism asset and commit to implementing projects in a way which minimises impacts on coral reefs
- Improve sewage treatment in coral reef areas to minimise release of effluent into rivers and sea
- Improve solid waste management in coral reef areas to eliminate pollution from solid waste
- Increase recycling facilities in coral reef areas
- Promote ecotourism to reduce impacts of tourism on coral reefs
- Assess carrying capacity of coral reef areas and manage visitor numbers to minimise impacts of tourism on coral reefs
- Improve stakeholder involvement in planning process by initiating discussions with stakeholders on development plans and improving transparency on development proposals
- Detailed EIAs on development proposals to be made public and improve stakeholder consultation process
- Give greater consideration to coral reef conservation in planning decisions
- Improve communications with other relevant government agencies (fisheries, tourism, state planning departments).

Role of Tourism Industry:

Sustainable Tourism

Tourism is one of the world's largest industries. For developing countries it is also one of the biggest income generators. Growth in the global tourism industry over the past half century has been exponential. 25 million international tourists in 1950 grew to an estimated 650 million people by the year 2000.

Travel, tourism and related activities contributed approximately 12% of the world's GDP in 2010. It is the world's largest employer, accounting for more than 255 million jobs, or 10.7% of the global labour force. Tourism is an important export for a large number of developing countries, and the principal export for about a third of these.

But the huge infrastructural and resource demands of tourism (e.g. water consumption, waste generation and energy use) can have severe impacts upon local communities and the environment if it is not properly managed. In recent years, growing awareness of the impact of tourism has fostered the development of various standards and codes of conduct to protect vulnerable communities and ecosystems.

Tourism: "Sustainable" or "Eco"?

There are a myriad of definitions for Sustainable Tourism, including eco-tourism, greentravel, environmentally and culturally responsible tourism, fair trade and ethical travel. The most widely accepted definition is that of the World Tourism Organisation. They define sustainable tourism as:

> *"Tourism which leads to management of all resources in such a way that economic, social and aesthetic needs can be fulfilled while maintaining cultural integrity, essential ecological processes, biological diversity and life support systems."*

In addition they describe the development of sustainable tourism as a process which meets the needs of present tourists and host communities whilst protecting and enhancing needs in the future.

A more recent alternative approach is Ecotourism, which is defined by The International Ecotourism Society as:

> *"Responsible travel to natural areas that conserves the environment and improves the well-being of local people".*

Ecotourism unites conservation, communities and sustainable travel, and those who implement and participate in ecotourism activities should follow a number of principles, including:

- Minimise impact
- Build environmental and cultural awareness and respect
- Provide positive experiences for both visitors and hosts
- Provide direct financial benefits for conservation
- Provide financial benefits and empowerment for local people
- Raise sensitivity to host countries' political, environmental and social climate.

Towards a Common Understanding

An industry body, The Tourism Sustainability Council (previously the Partnership for Global Sustainable Tourism Criteria) developed a set of baseline criteria organised around the four pillars of sustainable tourism:

- Effective sustainability planning
- Maximizing social and economic benefits to the local community
- Enhancing cultural heritage
- Reduction of negative impacts to the environment.

The Criteria are intended to:

- Serve as basic guidelines for businesses of all sizes to become more sustainable, and help businesses choose sustainable tourism programs that fulfil these global criteria;
- Serve as guidance for travel agencies in choosing suppliers and sustainable tourism programs;
- Help consumers identify sound sustainable tourism programs and businesses;
- Serve as a common denominator for media to recognize sustainable tourism providers;
- Help certification and other voluntary programs ensure that their standards meet a broadly-accepted baseline;
- Offer governmental, non-governmental and private sector programs a starting point for developing sustainable tourism requirements;
- Serve as baseline guidelines for education and training bodies such as hotel schools and Universities.

The 37 Criteria are accompanied by Indicators that allow measurement of compliance with the Criteria, and are applicable to businesses large and small.

In Malaysia, a number of organisations have attempted to promote sustainable or responsible tourism, including the government and the private sector. To date, few of these initiatives have achieved wide scale support and implementation of sustainable tourism initiatives on the ground has been limited.

RCM recommends that DMPM work with local universities and NGOs to develop a set of guidelines for Sustainable or Eco Tourism on Marine Park islands, and provides assistance to small resort operators to implement the guidelines.

Opportunities for Action

The tourism industry has a significant role to play in reducing impacts to coral reefs. In addition to the above recommendation, the industry is encouraged to consider the following actions:

- Commit to promoting responsible tourism in all aspects of tourism industry, from transport companies through tour operators to resort and dive operators
- The industry should develop and promote ecotourism and products
- Tourism operators commit to reducing impacts from their operations by improving management of resources, using green technology and reducing waste
- Resort operators commit to improving sewage treatment facilities to minimise pollution from effluents into water courses and the sea
- Improve communication among operators through tourism Associations to provide a vehicle for various tourism operators to address common issues and develop Codes of Conduct and Best Practice procedures
- Tourism operators (particularly resorts and dive operators) commit to participating in relevant environmental programmes such as Green Badge, Green Fins
- Tourism operators (particularly resorts and dive operators) commit to developing and implementing Responsible Tourism guidelines to reduce the impact of their activities on coral reefs and other ecosystems
- Tourism operators to implement good management practices such as 3Rs, energy efficiency programmes
- Tourism industry to review carrying capacity of islands and commit to managing numbers of visitors to reduce impacts on fragile ecosystems (both terrestrial and marine)
- Tourism operators to participate in conservation programmes such as beach clean-ups, and anti-littering campaigns; contribute to local communities by investing in improved waste management schemes
- Provide additional conservation-related information products (posters, room information, briefings) for tourists on “do’s and don’ts” in coral reef areas
- Dive and snorkelling operators to commit to managing access to sites to keep diver and snorkeler numbers within guidelines and to agree to voluntary closure of heavily used sites to allow sites to recover
- Boat operators commit to participating in programmes to install and manage permanent moorings and eliminate damage to coral reefs caused by boats and boat anchors
- Tourism operators commit to eliminating collection of souvenirs from the marine environment and stopping activities such as fish feeding, which have multiple impacts on marine life
- Snorkelling guides to participate in training programmes to minimise snorkeler impacts through improved in-water supervision and controlling group numbers
- Dive operators to commit to improving in-water supervision to minimise diver impact on coral reefs by controlling group numbers and improving dive briefings
- Tourism operators commit to collaborating with Mark Park managers to enhance Marine Park management and contribute to improving coral reef conservation.

ROLE OF EDUCATION:

RAISING AWARENESS, CHANGING HABITS

Education is one of the most important aspects of environmental conservation, and perhaps one of the most overlooked. A common problem we have encountered over the last three years is a lack of deep understanding of how human activities damage the environment, and how this in turn affects individuals.

This stems from a lack of education in environmental issues. People have the opportunity to either protect or damage their environment according to the choices they make and their actions. These in turn are dictated by their level of understanding and awareness of the natural world, their knowledge of the impact they have on it and their perceived ability to do something about it.

Environmental Education is a process in which individuals gain awareness of their environment and acquire knowledge, skills, values, experiences, and also the determination, which will enable them to act - individually and collectively - to solve present and future environmental problems. It is a learning process that increases people's knowledge and awareness about the environment they live in and associated challenges, develops the necessary skills and expertise to address the challenges, and fosters attitudes, motivations, and commitments to make informed decisions and take responsible action. The ultimate goal of environmental education is to create responsible environmental behaviour.

Barriers to Environmental Education

Some of the reasons for the slow development of a greater environmental consciousness in Malaysia are:

- Environmental education is done on an ad-hoc basis, without proper monitoring and evaluation programmes to gauge its effectiveness
- Environmental education is not compulsory and as such depends entirely on individual teachers and principals of schools to support and design programmes
- No allocations are provided to train teachers in the skills of incorporating environmental education into teaching
- There is a lack of clarity and understanding of the environmental education discipline at institutional level.

These barriers must be overcome if Malaysians are to raise their understanding of the environment surrounding them and how they can manage their impacts on it.

Objectives of Environmental Education

Environmental education programmes have the following objectives:

- Participation: to provide individuals, groups and societies with opportunities to be actively involved in exercising their skills of environmental citizenship and be actively involved at all levels in working towards sustainable development.
- Knowledge: to help individuals, groups and societies gain a variety of experiences in, and a basic understanding of, the knowledge and action competencies required for sustainable development
- Values: to help individuals, groups and societies acquire feelings of concern for issues of sustainability as well as a set of values upon which they can make judgements about appropriate ways of acting individually and with others to promote sustainable development
- Skills: to help individuals, groups and societies acquire the action competence or skills of environmental citizenship - in order to be able to identify and anticipate environmental problems and work with others to resolve, minimise and prevent them
- Awareness: to create an overall understanding of the impacts and effects of behaviours and lifestyles - on both the local and global environments, and on the short-term and long-term.

Opportunities for Action

Education is key to raising awareness about the need to conserve the environment. Relevant institutions – Ministry of Education, State Education Departments and other educational bodies, are encouraged to consider the following actions:

- Incorporate environmental education into the national school curriculum
- Establish a national programme to train teachers to establish environmental education as a co-curricular activity
- Encourage schools to include environmental education programmes as part of co-curriculum activities
- Invite NGOs to participate in school environmental education programmes to increase the number of schools with programmes
- Establish a national school recycling campaign to raise awareness of environmental issues, in association with Alam Flora and relevant NGOs

FINANCIAL HIGHLIGHTS

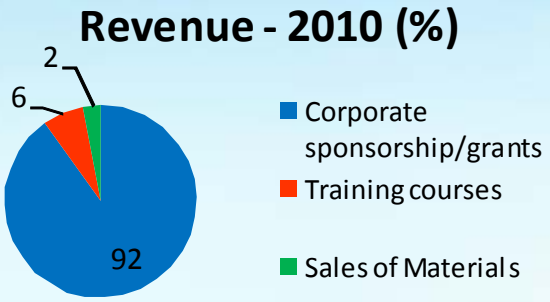
Revenue

The majority of our funding (92%) continues to come from either corporate sponsors or grants. As in previous years, a small amount of income is generated from sales of training, training materials and promotional items.

The table below shows a breakdown of source of funds.

Table 1: Sources of Revenue

Source	2010 (%)
Corporate sponsorship/grants	92
Training courses	6
Sales of Materials	2

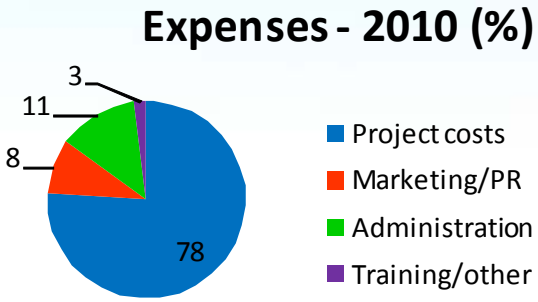


Expenses

RCM strives to maximise effective use of its revenues, keeping administrative costs to a minimum. The proportion of total expenditure on Project related costs increased slightly in 2010 to 78% (2009 – 76%). These are essentially the costs of implementing programmes (staff costs, travel, materials, etc). Marketing and PR activities account for a further 8% of expenses, giving a combined total of 86% of expenses directed towards conservation activities and communications to promote conservation, with only 11% going to non-project related administration.

Table 2: Expenses

Category	2010 (%)
Project costs	78
Marketing/PR	8
Administration	11
Training/other	3



RCM employs four full time staff, all of whom have been with us since 2008.

Application of Funds

Funds have been applied to three main activities.

Table 3: Application of Funds

Activity	2010 (%)
Training & surveys	28
Outreach	43
Community programmes	29

The Survey programme remains a central part of our work, and 2010 marks the fourth year of a regular survey programme covering coral reefs in Malaysia. In 2010, we worked with the Department of Marine Parks Malaysia to conduct some of our survey programme, with DMPM paying some of the costs. This has resulted in a lower proportion of expenditure being applied to training & surveys in 2010 of only 28% (2009 – 38%). Expenditure on outreach and community programmes have both increased, reflecting the growing importance of these programmes.

Priorities for 2011-2013

During the next three years our priorities will be:

- Extending the survey programme, particularly in East Malaysia
- Raising public awareness of the threats to coral reefs, particularly the impact of mass bleaching events
- Promoting the concepts of Sustainable Tourism, to reduce impacts from the tourism industry
- Educating the young, through a new Rainforest to Reef Roadshow programme.
- In addition, we are hoping to raise funds for technology demonstration and implementation as we continue to identify projects to reduce impacts to coral reefs (eg. waste composting; sewage treatment).

SPONSORS

, We are grateful to the following sponsors for their support during 2010:

- **YTL:** Contributed the proceeds from an auction of starfish art by Malaysian artists and celebrities, to Reef Check for various programmes over the next two years, including training and surveys, as well as a community outreach programme on Perhentian Islands.

- Alstom Power: through Alstom Foundation, is funding our Rainforest to Reef Programme, targeted at school children from the Marine Park Island schools. The funding will cover the cost of implementing the programme over the next three years.

- SGP: funding a two year programme of work on the Perhentian Islands to involve the local community in managing the marine resources around the islands

- KPMG: donated funds raised by staff as part of KPMG community activities; established a Corporate Reef Check team and adopted a reef in Tioman Island; funding a Rainforest to Reef programme for a school in KL.

- CIMB: funding an extension of the Rainforest to Reef Programme for schools in urban areas.

- Jendela Batik is raising funds for RCM through a donation from sales of its new collection, to be launched in early 2011.

- Russell Bedford LC & Company: provides *pro bono* company secretarial services for RCM.

Acknowledgements

Reef Check Malaysia cannot work in isolation. We continue to maintain a close working relationship with the Department of Marine Park Malaysia, Ministry of Natural Resources and Environment, and are grateful to En. Abdul Rahim Gor Yaman and En. Kamarruddin for their support, assistance and encouragement.

We work through a small network of dive centres, who continue to support our work. These include:

- Watercolours Dive Centre, Perhentian
- Redang Kalong, Redang
- Tioman Dive Centre and Fishermen Dive Centre, Tioman
- Scuba Zone, KL
- Reef Dive Resort, Mataking
- Kapalai Resort
- Lankayan Island Resort
- Piasau Boat Club, Miri.

We have also received considerable support from the following in East Malaysia: Helen Brunt, Salha Alban and Sofia Johari in Kota Kinabalu.

Our work is supported by a number of scientists, who bring much needed technical knowledge. In particular we would like to thank Kee Alfian at University Kebangsaan Malaysia, for his regular contributions to our discussion, for adding to our own understanding of the science of coral reefs, and for assisting in our coral transplanting project in Pangkor.

To these, and the many volunteers who have participated in our surveys, we are grateful.

REEF CHECK MALAYSIA

Julian Hyde, General Manager
Julian is British, but has been living overseas since 1992. He is a scientist by training, with a degree in biochemistry. He worked for over 10 years as a management consultant, including six years in Russia managing a variety of environmental consulting programmes. He moved to Malaysia ten years ago, initially managing an environmental consulting company in KL before moving to Tioman Island to pursue his dream of running his own dive centre – which is how he became involved in Reef Check Malaysia.

Having relocated back to KL four years ago, he became involved in a project to establish a sustainable Reef Check centre in Malaysia, and now operates as its General Manager.

Ummi Haslinda Mohd Rosli, EcoAction Programme Manager
Ummi is an Accountancy graduate from University Putra Malaysia. She has been diving for 5 years and was certified as an EcoDiver in April 2008. After 7 years working in a bank, she decided to leave and pursue her passion in coral and marine conservation. She started working full time with Reef Check Malaysia on October 2008. Now, she is an EcoDiver trainer and conducts Reef Check surveys with the volunteers and dive operators on various islands in Peninsular Malaysia under the EcoAction Programme.

Daniel Lee, Outreach Programme Manager
Daniel, originating from the Kuantan, Pahang, graduated with a degree in Ecology and Biodiversity from University Malaya. His final year project was a comparative study between the coral communities in Port Dickson and Pulau Tioman, under the supervision of En. Affendi Yang Amri. After graduating, he worked with Reef Check Malaysia following the recommendation by En. Affendi. He has been involved in the EcoDiver trainings and Reef Check surveys but is now focusing on the outreach programmes conducted by Reef Check Malaysia.

Ruth Yap, Outreach Programme Manager
Ruth graduated from UMS with a bachelor's degree in Marine Science. Prior to joining Reef Check Malaysia, she did a stint of work in WWF, Kudat and was a volunteer in a marine program held for Japanese students in Bunaken, Sulawesi. She is currently Reef Check Malaysia's Outreach Programme Assistant Manager. Together with the team, she coordinates and runs educational programs for children on the Islands as well as liaisons with the local community and the government on efforts to improve the island's environmental health and its people.

REEF CHECK MALAYSIA

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