



# Post-Tsunami Conservation and Sustainable Rehabilitation of Coral Reefs in Marine National Park, Thailand

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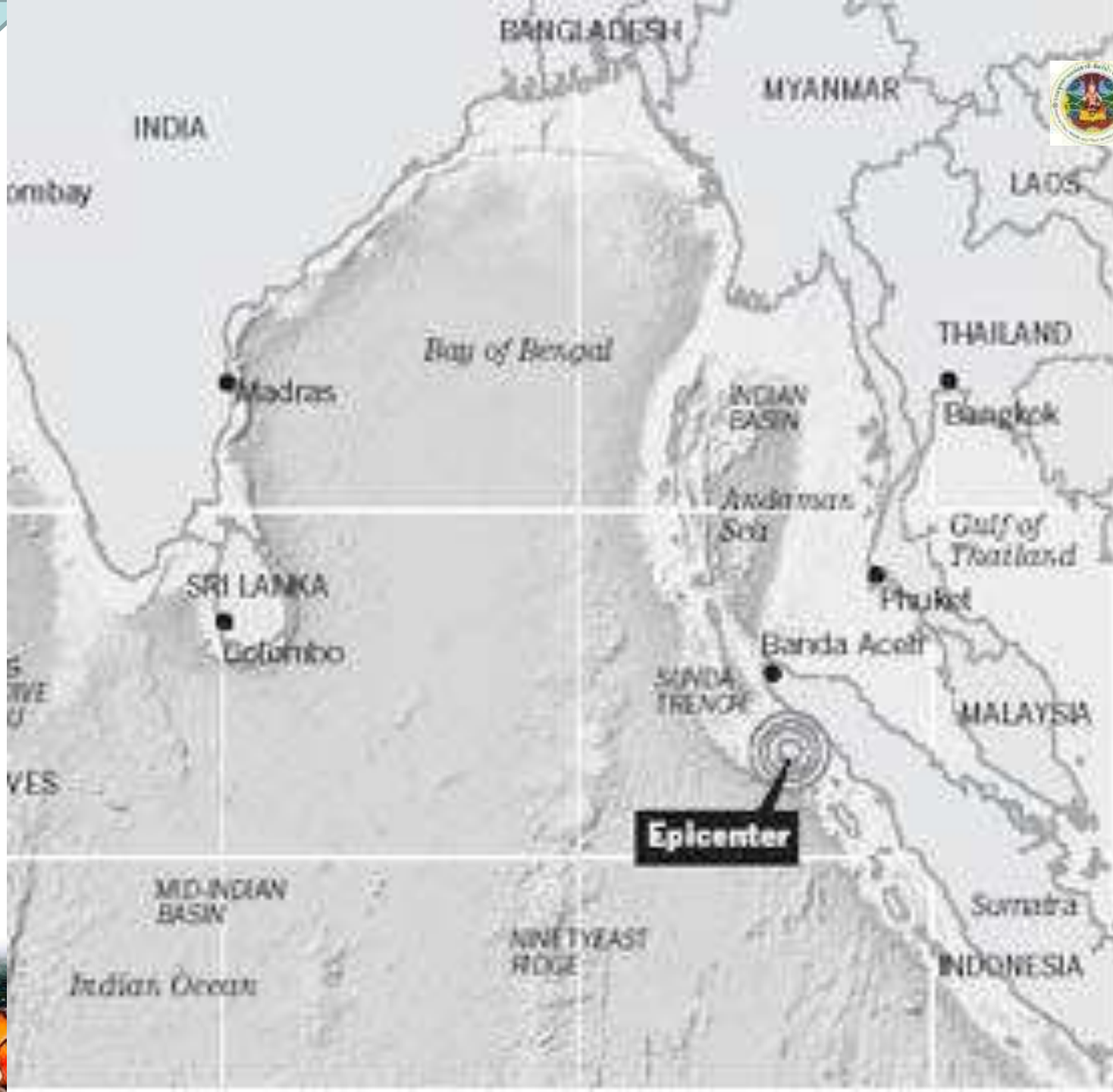
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*1<sup>st</sup> Asia Parks Congress, Sendai International Center, Sendai City,  
Miyagi Prefecture, Japan 13-17 November 2013*































# Debris impact

- Impacts from terrestrial debris, particularly in developed coastal areas and tourist destinations.
- debris, which were found, consisted of beach chairs, large umbrellas, boats, boat engines, furniture, kitchenware, rooftops, pieces of woods, and large amount of different materials.





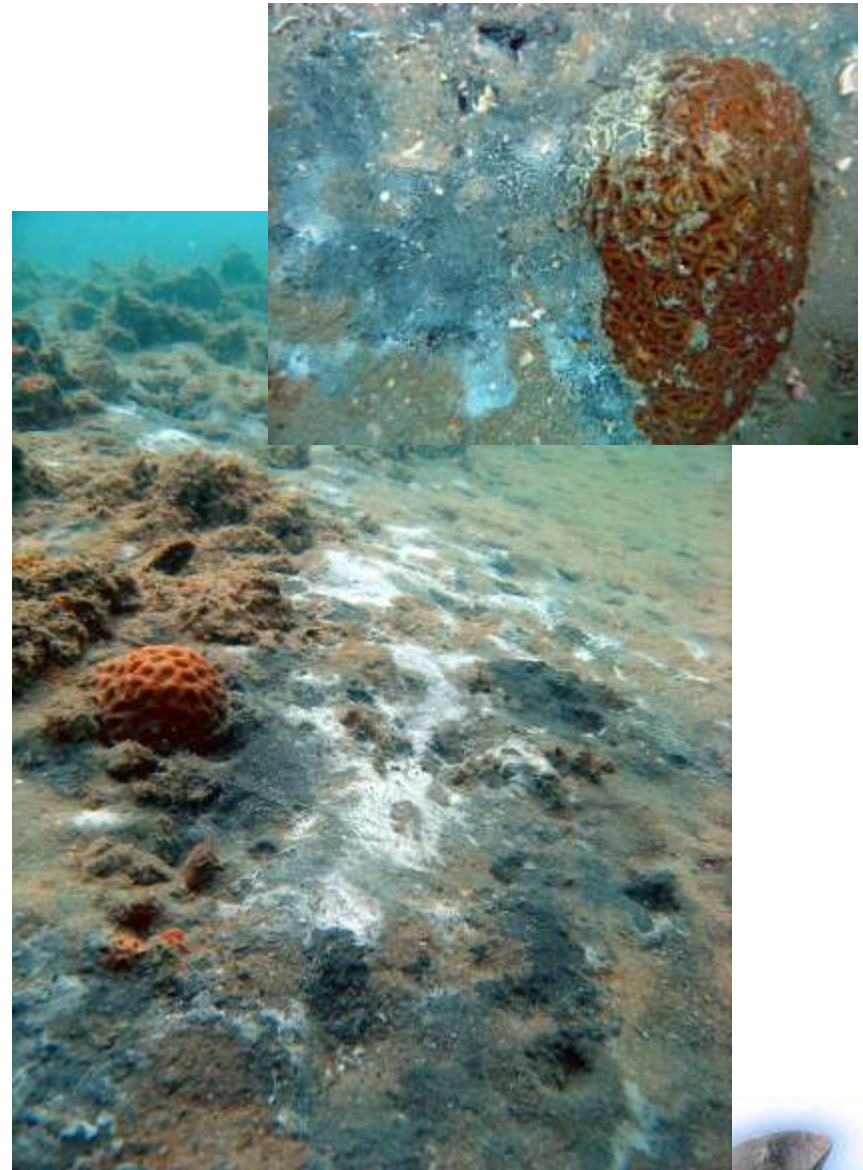








- Impacts induced by excessive sedimentation. Several shallow-water reefs were covered with sediments.
- After a period of approximately 1 week, traces of fungus were found on the sediment surface.
- Traces of fungus and bacteria on the sediment surface disappeared after 2 weeks.



Sediment covered benthic organisms, anoxic, bacteria colonization: rather severe at site 2 at Talibong, directly hit and greater slope





# Sediment cover



Cover all







# Recovery methods

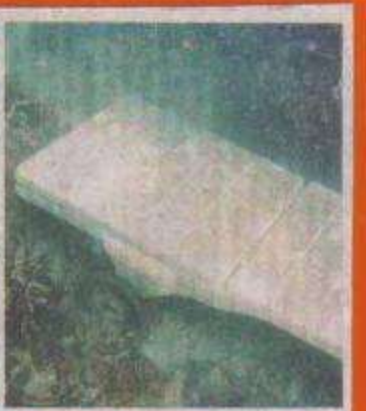
- Recovery efforts must be carried out immediately since results of past studies had indicated that overturned corals, which were left in the sand, died in period of less than one week.
- By restoring the corals immediately after they were overturned, the corals were given the chance to survive and reproduce.





# คม·สด·ลึก

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■ **จุดเปลี่ยน** ■ สภาพปะการังน้ำตื้นบริเวณชายหาดป่าตองถูกเลี้ยงจนอาบแดดของโรงเรียนพรุ และคืนมะพร้าวที่เคยขู่มขายหาดป่าตองกลับ สร้างความเสียหายแก่ปะการัง ซึ่งทางทีมสำรวจได้นำข้อมูลนี้ไปใช้ในการวางแผนพัฒนาพื้นที่





# Shallow-water reefs hardest hit

■ *Purnee Amornwiputpanich*  
*The Nation*

AN UNDERSEA SURVEY yesterday confirmed that deep-water reefs around Phi Phi Island survived the December 26 tsunami unscathed, but shallow water reefs were partially damaged.

Experts from various agencies, including the Marine and Coastal Resources Department and Prince of Songkla University, conducted the survey, which found many shallow-water reefs under piles of debris around Nui, Lohlana and Pai islands, as well as Tonsai Bay.

The partially damaged reefs would need time to recover, according to surveyors who used underwater cameras to photograph and record on video reefs around Nui, Lohlana, Yoong, Pai, Phi Phi Don islands, and Tonsai Bay.

The reef damage was most severe around Tonsai Bay, with debris covering at least 80 per cent of its shallow-water reefs. Nearly half of the reefs around Pai Island were over-

turned, but the reefs around Phi Phi Don and Yoong islands were only slightly damaged.

"The coral reefs can recover but we cannot say at this point how long it will take," said Nipon Pongsuwan, of Phuket's marine and coastal resource development institute.

Despite the damage, some tourists still visited Phi Phi yesterday but the crowds that used to overwhelm the once-beautiful islands during peak season were nowhere to be seen.

In a related development, Pitipong Puengboon na Ayutthaya, permanent secretary of the Natural Resource and Environment Ministry, said it might take more than Bt1 billion to rehabilitate natural resources in the areas hit by the waves.

"We have to clear debris from the sea, save the reefs, and rehabilitate beaches," he added.

Authorities would clean up 12 damaged national park offices, restore tourism-services, clean up

and restore beaches, fix sewage pipes and provide clean drinking water sources for local people.

Sirinart Nai Yang Beach National Park in Phuket and Laemson National Park in Ranong were the hardest hit, with damage to most offices, staff dwellings and holiday rooms, said Suwat Singhaphan, director-general of the National Park, Wildlife and Plant Conservation Department.

"The damaged national parks are closed until we can fix things up," he said, adding that the damage to the department's properties exceeded Bt200 million.

The tsunami damaged 3,000 fishing trawlers in Satun, Trang, Ranong, Phang Nga, Krabi and Phuket, said Agriculture Minister Wan Muhamad Noor Matha. He said the Agriculture Ministry would present the information to the Cabinet today and seek urgent assistance.

"We should also amend the figure of financial aid for damaged trawlers that have been around for more than



PART of a television set lies among shallow-water reefs. It was spotted during an underwater survey off Phi Phi Island yesterday.

10 years. The figure should be revised to match current circumstances," he said.

Under current regulations the government would give a maximum

of Bt200,000 to owners of large trawlers destroyed and Bt70,000 for small trawlers, he said.

"We should pay actual repair expenses," he said.





## Divers Help in Thailand's Tsunami Clean Up

### Divers Help in Thailand's Tsunami Clean Up

In the aftermath of the Indian Ocean Tsunami disaster, organizations such as the Tourism Authority of Thailand, the National Park Department, and dive associations in Phuket and Bangkok have been assessing the damage and volunteer divers called on to help repair damage to the ocean floor and in particular, the delicate coral reefs.

Making a preliminary inspection, Thai oceanographer **Sakanan Plathong recorded 20% destruction to the reefs around the Similan islands**, an archipelago with world-class dive sites. However, sand churned up by the tsunami on the ocean floor has removed the reef's foundations, causing about 60-percent of it to fall. Unless they are placed upright again within a month, they will not be able to survive and grow.

A United Nations Development Programme (UNDP) assessment found a more conservative figure but noted that the areas around Similan and Phi Phi islands were particularly hard-hit and stressed that the future of eco-tourism and fishing in the area will rely heavily on the restoration and protection of coral reefs.

Another problem facing the area is the amount of debris that has been dragged back into the ocean. From televisions to plastic chairs, non-biodegradable garbage now sits on the ocean floor and boatloads of volunteer divers have taken to waters of the Andaman Sea to clear away the tsunami debris littering Thailand's famed coral reefs.

"There's some damage to the coral, but not quite as much as I had expected," said Tony Clark, a British diving instructor working in Thailand. "But there is so much debris: crisp packets, sanitary products, plastic bottles, things which won't decay."

According to Reuters, around 300 volunteer divers, including foreign tourists, scoured the sea floor to clear debris around the tourist resort of Phuket on 17 January "If we leave this for too long, big pieces of logs and trees can damage the coral reefs," said Maitree Duangsawasdi of the government's Marine and Coastal Resources Department. "We have limited divers, so we asked for volunteer divers," he said, estimating that about 500 tons of debris was on the seabed in the area.





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## Thailand seeks divers to pick up fallen reefs

A Thai environmentalist says up to 200 volunteer divers are needed to help save coral reefs damaged by the December 26 tsunami.

Thai oceanographer [Sakanan Plathong](#) says a preliminary survey shows 20 per cent of the reefs examined around the Similan Islands, an archipelago with world-class dive sites, have been destroyed.

But more than half of the reefs were knocked over during the tsunami, which churned up sand on the ocean floor, removing reef foundations and causing them to fall.

Mr Plathong says if divers manage to move fallen reefs back into an upright position within a month, the coral should survive and keep growing.

"Based on the initial survey, we estimate that up to 20 per cent of reefs [in the Similan Islands] were destroyed, but some 60 per cent of reefs fell over and need to be turned upright," he said.

On Tuesday, the United Nations Development Program (UNDP) said a disaster assessment mission found that on average just 5 per cent of the coral reefs along the coast and around the main tsunami affected islands had been damaged.

UNDP said the reefs were littered with potentially deadly debris and needed to be cleaned.

It also determined that future development of sustainable eco-tourism and the recovery of fishing communities will rely heavily on the restoration and protection of coral reefs.

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## Nearly 200 volunteer divers needed to save Andaman reef hit by tsunami

BANGKOK (AFP) Jan 13, 2005

A Thai environmentalist Thursday called for up to 200 volunteer divers to help save coral reefs damaged by the tsunami last month.

Thai oceanographer Sakanan Plathong said a preliminary survey showed 20 percent of the reefs examined around the Similan islands, an archipelago with world-class dive sites, were destroyed.

But more than half of the reefs had been knocked over during the tsunami, which churned up sand on the ocean floor, removing reefs' foundations and causing them to fall.

If divers managed to move fallen reefs back into an upright position within a month, the coral should survive and keep growing, Sakanan said.

"Based on the initial survey, we estimate that up to 20 percent of reefs (in the Similans) were destroyed, but some 60 percent of reefs fell over and need to be turned upright," he said.



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## Nach Flutkatastrophe: Korallenriffe sollen durch Taucher gerettet werden

Die Korallenriffe im Andamanischen Meer, die durch die Flutkatastrophe beschädigt wurden, sollen nun von Freizeittauchern in Stand gesetzt werden.

Etwa 200 Taucher sollen die Riffe rund um die Similan-Inseln, wo etwa 20 Prozent der Riffe beschädigt wurden, retten, sagte der thailändische [Meeresforscher Sakanan Plathong](#).

Weiter sagte Plathong, dass mehr als 50 Prozent der Riffe nur umgefallen sind. Die Riffe könnten überleben, wenn sie wieder aufgestellt werden. Die Riffe gelten als Taucherparadies.

**Quelle:** [de.news.yahoo.com](#)  
 **WebReporter:** [hans\\_peter002](#)

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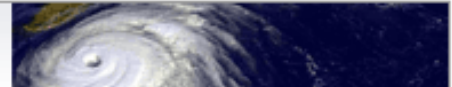
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## Special Report Tsunami disaster



### Divers needed to save reefs

13/01/2005 14:48 - (SA)

Bangkok - A Thai environmentalist on Thursday called for up to 200 volunteer divers to help save coral reefs damaged by the tsunami last month.

Thai oceanographer Sakanan Plathong said a preliminary survey showed 20% of the reefs examined around the Similan islands, an archipelago with world-class dive sites, were destroyed.

But more than half of the reefs had been knocked over during the tsunami, which churned up sand on the ocean floor, removing reefs' foundations and causing them to fall.

If divers managed to move fallen reefs back into an upright position within a month, the coral should survive and keep growing, Sakanan said.

#### Reefs littered with debris

"Based on the initial survey, we estimate that up to 20% of reefs (in the Similans) were

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## 西訪旅游 ～プーケット・ピピ島・諸々旅のブログ～

2004年12月26日にタイ南部ピピ島にてスマトラ沖地震・津波を体験し、現地の人々による温かい援助により、無事帰国することができました。以来、恩返しをする意味もこめて、ピピ島・プーケットのことを中心に主に旅行関係、サッカー関係のブログを書いています。

2006年02月03日

### プーケットの珊瑚への津波損害について専門家が議論

地元ダイバーとタイや日本の専門家は、シミラン海域の珊瑚礁を検査し、その結果を、昨日プーケットメルリンホテルで開かれたセミナーで報告した。

調査チームのリーダー、[Sakanan Plathong](#) はボランティアダイバーや、2004年12月30日から2005年1月15日の間、海底を調査したプリンス・オブ・ソクラー大学ハジャイキャンパスの生物学部海底生物調査組織(CRBRU)を率いている。

K. Sakananは、ダイブ場所として人気のあるシミラン諸島の一部で津波による珊瑚の被害が出ているとのこと。しかしながら、彼は、海洋公園の珊瑚の70%-90%は完全に被害もなく残存していると付け加えた。

彼は、珊瑚をできるだけ速く若返らせるために、CRBRUが暗礁からの残骸を清潔にするのにダイバーのチームを組織し、いくつかのダイビングスポットを閉鎖、海水の品質を監視し、人工岩礁を注入、珊瑚を保護することを含め、より長期的な段階の措置を取ったことを説明した。珊瑚を復活させるため、一部で作業を行い、まだ作業を行わなければならないエリアがあるとのことだが、シミラン国立公園の多くのダイビングスポットは、被害がなく、ダイバーに開放されているとのことである。

### [プーケットガゼッタ紙2/3を要約](#)

★[ブログランク参加中](#) [ピピ島の現状をもっと大勢の方々に知っていただくため、クリックにご協力をお願いします。](#)★

### [ピピ島の子供達が生きた絵本『みんなのピピ島』好評発売中](#)

[この本の売り上げは、昨年末被災したピピ島の子供達とその家族の生活支援に使われます。](#)

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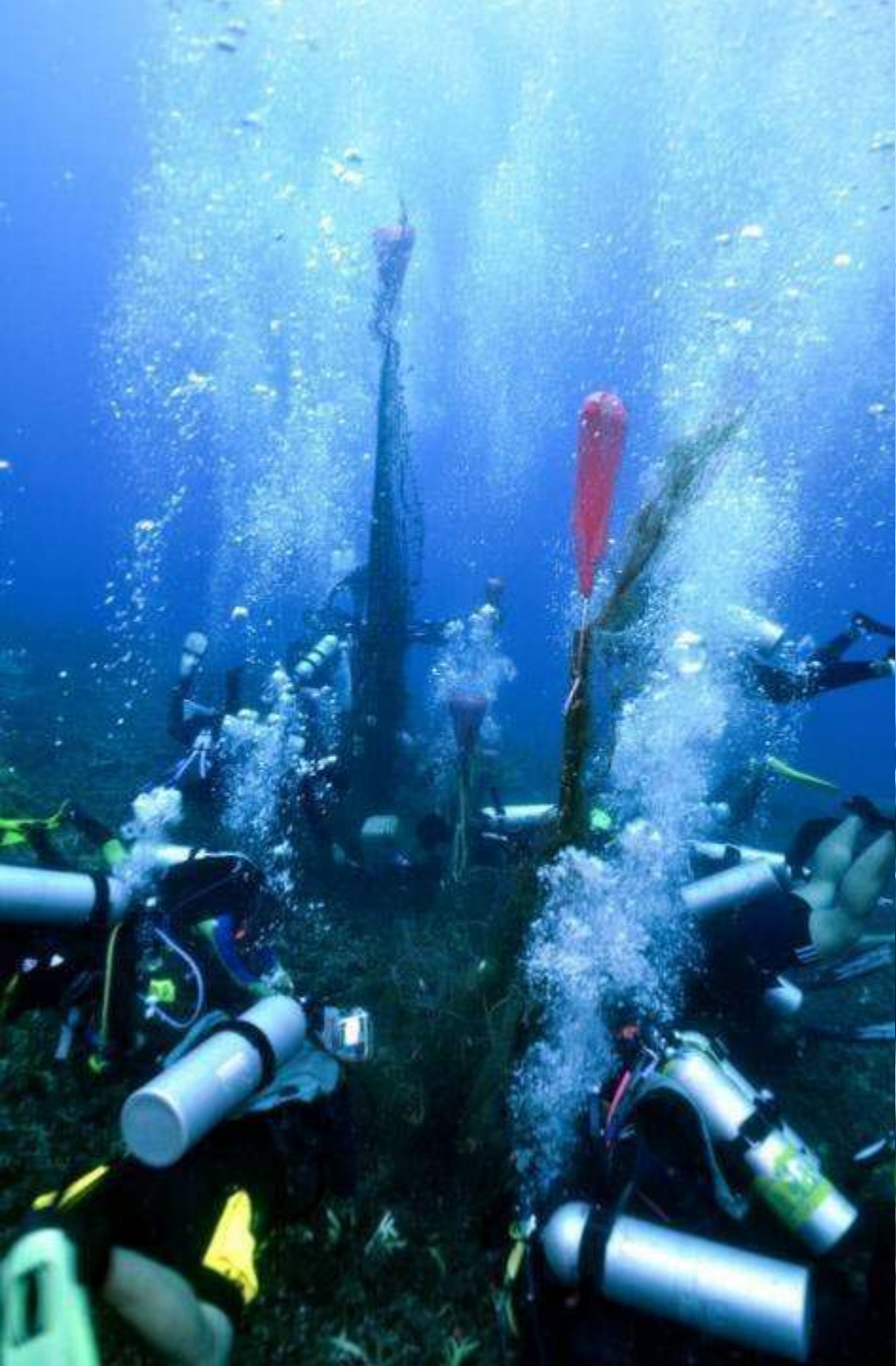




After the tsunami, Plathong realized he had to act fast to save any damaged corals. He brought a brigade of 136 volunteer divers to some of the worst places in the Similan Islands. The divers worked to right corals and were able to salvage those that hadn't slid beyond reach down the sloping sea floor. They propped up sea fans—a temporary fix until they could return with marine cement. They also removed debris, although heavy objects had to be left behind. The repair efforts benefited in one way from the tsunami's power: The wave was so strong that potentially lethal silt and mud washed far out to sea in many areas.









# GEOGRAPHICA

THE PEOPLE, PLACES, AND FEATURES OF OUR UNIVERSE



Mending tsunami damage, divers cement a sea fan into place near Thailand's Similan Islands, where waves snapped off hundreds of the fans. The hope: that reattached corals will survive. Otherwise it could take decades for new ones to grow.



## CONSERVATION

### After the Tsunami

*A team of scientist-divers predicts quick recovery for most reefs pounded by last year's killer waves*

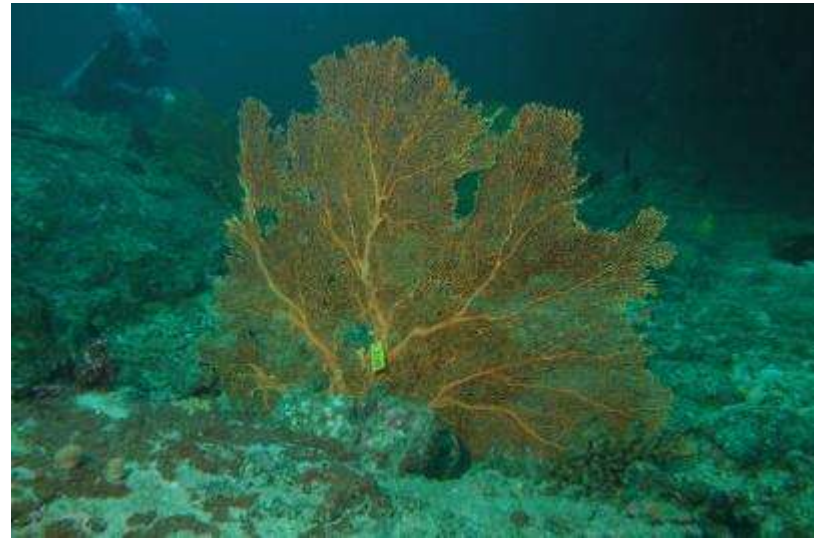
When a submarine earthquake sent monster waves surging through the Indian Ocean and Andaman Sea last December 26, there was no mistaking the toll on land: more than 225,000 people dead; homes, farms, fishing boats destroyed. Three and a half months later I joined seven other biologists and set off on a two-week research cruise along the coast of Thailand to survey a

less obvious toll—the damage to the coral reefs. Priceless for their biological diversity, Thailand's reefs are a lifeline for hundreds of thousands of people who catch fish spawned there or work in the dive-tourism industry. In some places the reefs may also have helped blunt the tsunami's force as it hit land.

After more than 500 dives at 56 sites, we found plenty of damage but even more reason for



- They were uprooted and detached from the hard substrates. The detached pieces of sea fans were larger than one meter.



- More than 300 sea fans were uprooted by the impacts of the tsunami. If left unattended, these sea fans would not be able to survive.







# ภารกิจฟื้นฟูปลวกัลปังหา

## Sea Fans Rehabilitation Mission - Similan Islands

เรือลำใหญ่สองลำที่ทอดสมอนิ่งอยู่เหนือน่านน้ำสิมิลันเป็นที่พักพิงของอาสาสมัครกว่า ๕๐ ชีวิต แต่ละวันของพวกเขาเดินทาง

Involving a whole host of representatives, from volunteer divers, officers from the Similan Islands National Park, and researchers from Prince of Songkhla University, the Sea Fans Rehabilitation Mission relied on a range of approaches to return the sea fans to their original positions with their branches secured to the sand by wires. However, this technique could be considered as a temporary measure because the foundation does not make a firm, holding ground, and swirling currents can easily uproot restraining wires.



เร่งรีบเพื่อทำการกักให้ส่วนก้นของปลวกัลปังหา

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Before the onset of the monsoon season in the Andaman in May, the rescue team of officers from the Similan Islands National Park and researchers from Prince of Songkhla University adopted two key methods to provide a lasting hold for the sea fans.



# Experiment of cement & Epoxy





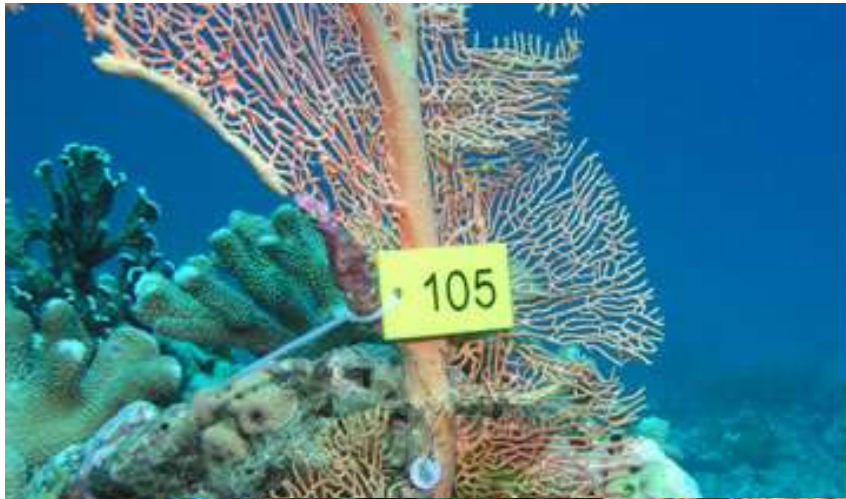


Dr. Fumihito IWASE, Biological Institute on Kuroshio.



Mr. Tadashi Kimura, recommend project to JICA









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# Seafan Recovery Project After the Tsunami, Similan Islands National park, Phang Nga.



Coral Reef and Benthos Research Unit, Centre for Biodiversity of Peninsular Thailand, Faculty of Science, Prince of Songkla University

Similan Islands National Park and Department of Marine and Coastal Resources

For Sea Foundation



## BACKGROUND



After the Tsunami on December 2004 struck the Andaman coast. Researchers team of CBPT have been surveying the extent of marine habitats. The Similan Islands were also affected by this phenomenon. The urgent survey showed many seafans were broken and fell down on the sea bed. Many of these seafans are still living but very soon these seafan will die if they were not returned to upside and replaced back in the moving current.



Initially the volunteer divers tried to stand up seafans with reinforced steel rod for temporarily but it is not enough stronger for long time.

The precipitate mission is to reattach seafans to hard substrate as fast as possible. (the required for proper material and technology apply for helping seafan alive).

## TARGET AREA



### A. STONE HEDGE

West side of the 4th Island - 40 seafans fell down

### B. DEEP SIX

North side of the 7th island - 50 seafan fell down

### C. PUSAR ROCK

South side of the 8th island - 40 seafans fell down

### D. TURTLE ROCK

West side of the 8th island - 50 seafan fell down

### E. NORTH POINT

North side of 9th island - 80 seafans fell down



4) Nails combined with steel discs.



Concrete nails with steel discs driven directly attached to hard substrate.



3) Underwater drilling with bolt attachments and plastic discs.



Air powered drill is needed attached to an air tank. This method is ideal for larger seafans and requires a strong substrate



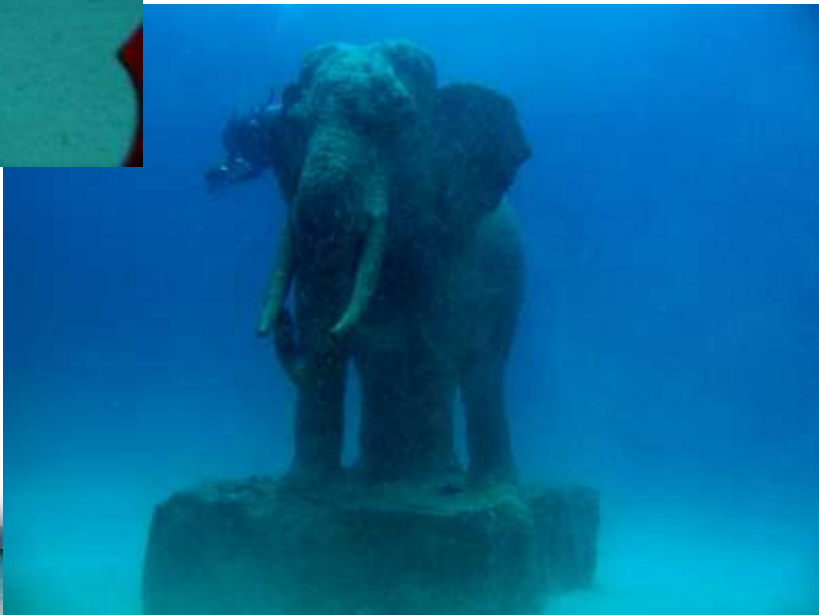


















แผนปฏิบัติการ

# รับขวัญอันดามัน

## Recovering the Andaman Spirit

ร้อยดวงใจ คืนความสดใส ให้ทะเลอันดามัน



รับขวัญ อันดามัน  
Recovering the Andaman Spirit

จากเหตุการณ์คลื่นยักษ์สึนามิพัดเข้าสู่ทะเลฝั่งอันดามันของไทยเมื่อเช้าวันที่ 26 ธ.ค. 2547 ซึ่งถือได้ว่าเป็นภัยธรรมชาติครั้งยิ่งใหญ่ ครั้งหนึ่งของโลก ก่อให้เกิดความเสียหายในวงกว้าง ซึ่งพื้นที่ในทวีปเอเชียใต้ และเอเชียตะวันออกเฉียงใต้ ได้รับผลกระทบ รวมถึง 6 จังหวัดทางภาคใต้ของประเทศไทย ก่อให้เกิดความเสียหายแก่ชีวิต ทรัพย์สิน และทรัพยากรชายฝั่งของประเทศไทย เช่น แนวปะการัง หาดทราย ป่าชายหาด และพรุ ทรัพยากรเหล่านี้มีความสำคัญยิ่งในแง่ของนิเวศวิทยาทางทะเล และชายฝั่งทะเล เช่น แนวปะการังเป็นที่หลบภัยอาศัยและวางไข่ของสัตว์น้ำ และมีความสวยงามเป็นแหล่งดึงดูดนักท่องเที่ยว นำรายได้เข้าประเทศจำนวนมาก ในขณะที่ระบบนิเวศ หาดทราย และสาหร่ายทะเลเป็นแหล่งอนุบาลสัตว์น้ำชายฝั่ง ป่าชายหาด และแหล่งน้ำริมฝั่งทะเลเป็นพื้นที่กักเก็บ และระบบนิเวศที่สำคัญของชายฝั่งทะเล







# Coral Reef Recovery After the Tsunami and Assessment of Coral Damage at Adang – Rawi, Tarutao National park, Satun Province (Coral fragments transplantation)

Coral Reef and Benthos Research Unit, Centre for Biodiversity of Peninsular Thailand, Faculty of Science, Prince of Songkla University  
Petra Islands National Park and Tarutao National Park  
UNOCAL Thailand Co., Ltd.



## BACKGROUND



The tsunami of December 2004 had extensive impacts on the coral reefs along the Andaman coast. The Adang–Rawi Island archipelago suffered damage by the tidal wave. The initial survey showed many branching corals were broken and scattered on shallow reef flat. Amongst the coral rubble there are so many living coral fragments, but these fragments are likely to be buried by the monsoon waves and will die if they're not replaced back in the moving current.



Our urgent mission is to save these broken corals and restore the worst affected reefs as much as possible.

## STUDY AREA for CORAL REEF RECOVERY



Koh Yang and Apple Bay in Adang – Rawi Islands, Tarutao National Park, Satun province were selected as the study area for coral reef recovery because this region is highly productive and has an extremely high diversity of coral species and the tsunami has damaged many of these reefs.

The recovery project aims to provide information on the extent of the damage caused to the coral reefs by the tsunami and help restore and recover as much as possible as well as collecting general data on species



Recovering the Andaman Spirit Day

The first trip on 1–4 April, 2005 started with a publicity launch. The second trip on 28–30 April, 2005 with participants from the government, UNOCAL and National Park Rangers.

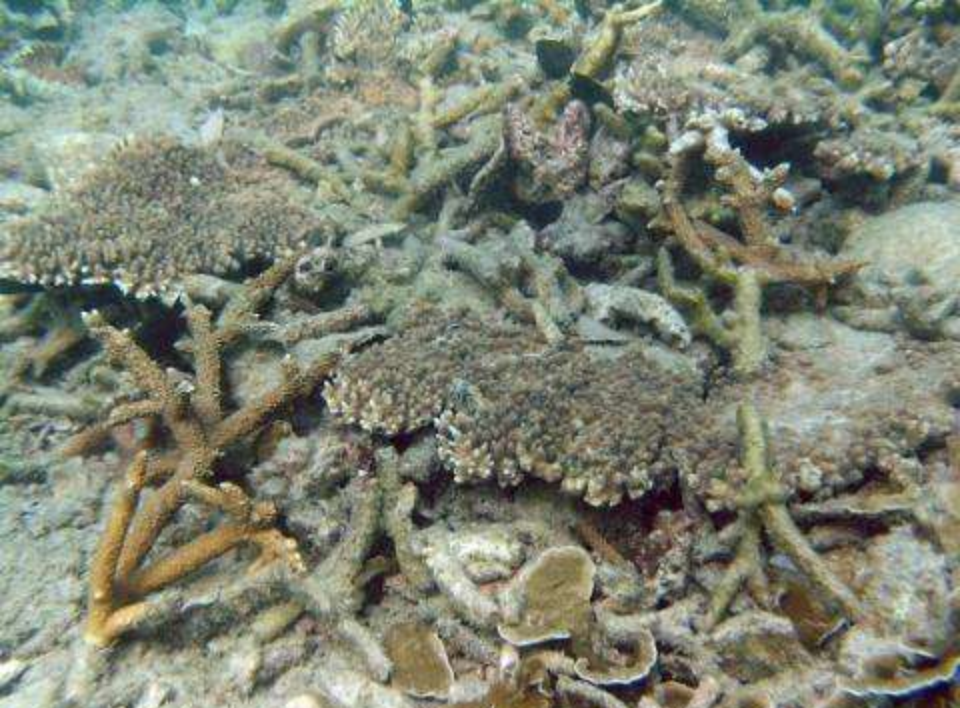


Materials and staff organization

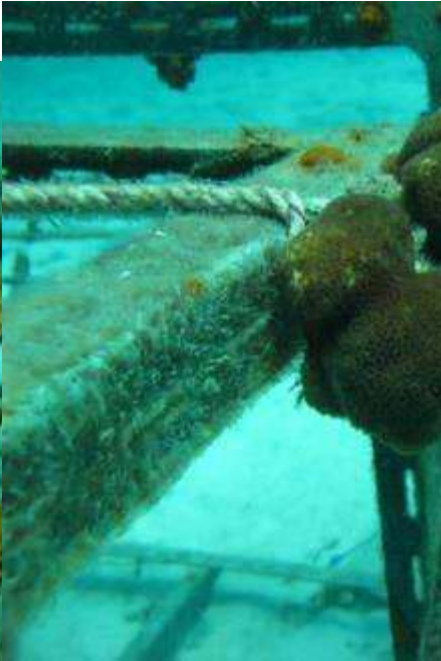
A large quantity of fast drying marine cement and materials were prepared to reattach corals fragments on to 200 cement blocks and 50 dead coral lumps.







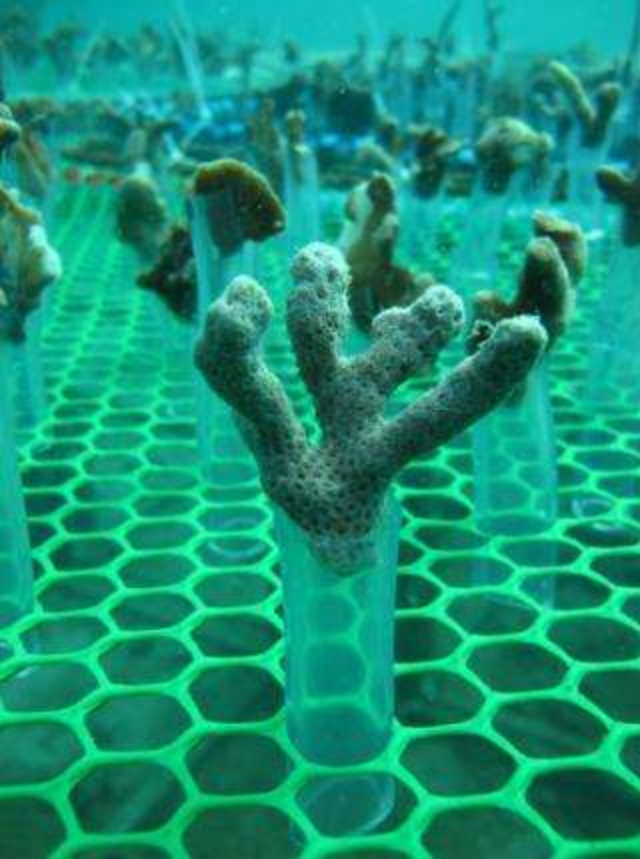








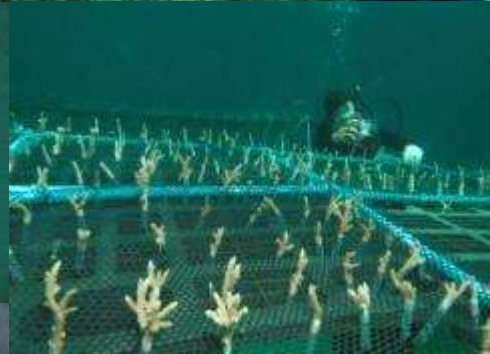




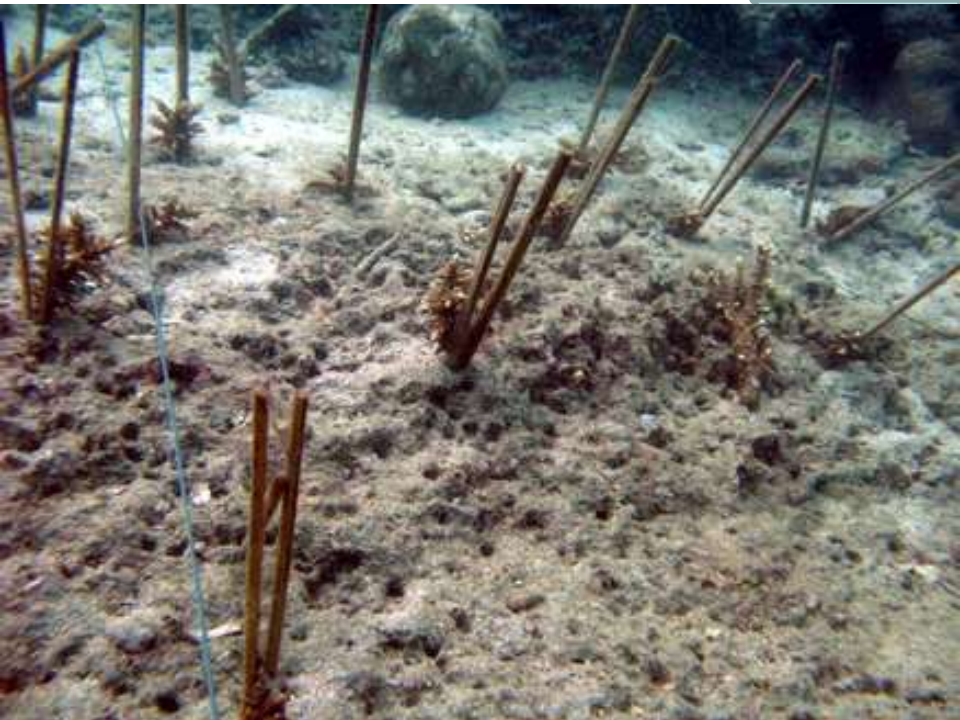








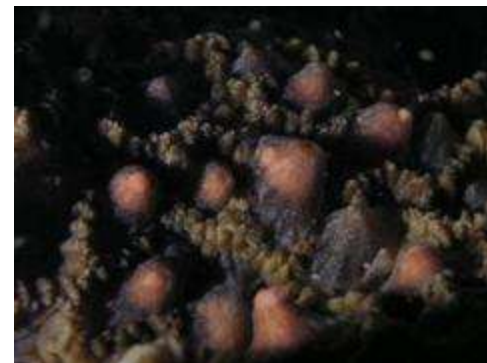
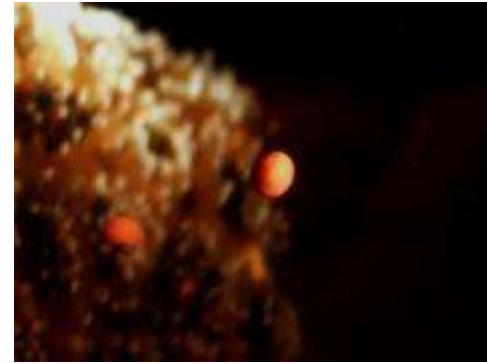






# Coral culture

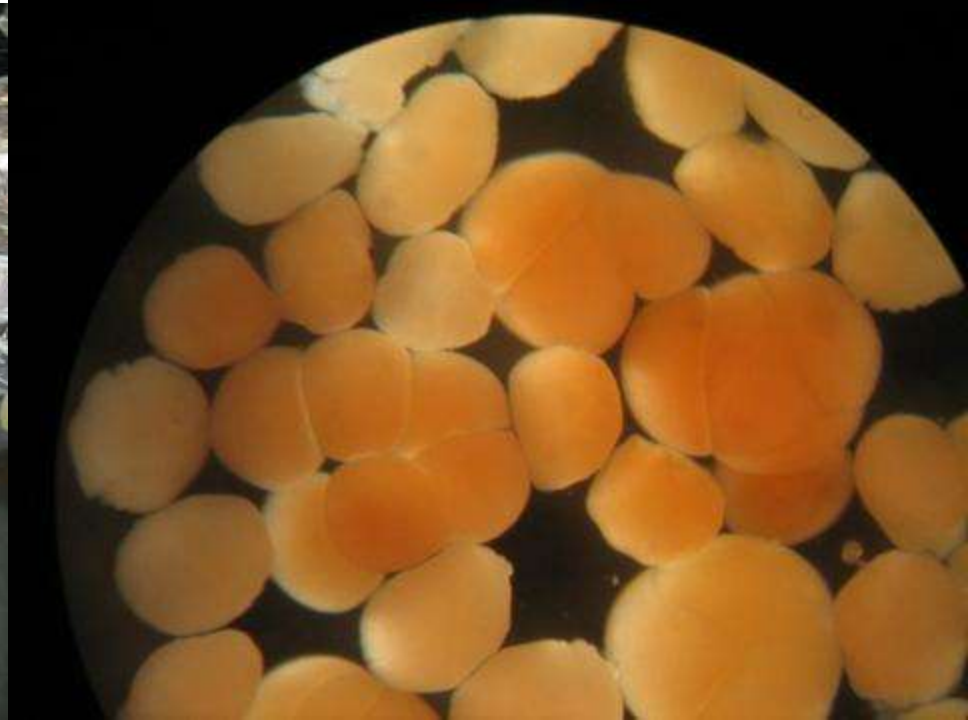
- Collecting eggs and sperms from the wild. After fertilization, they are reared in the laboratory until they develop into planula larvae.
- Thereafter, they are released back into the coral reef.
- It is also possible to maintain the culture and allow the planula to settle and develop into new colonies, which ensures high survival rate.













# Rationales and approaches in selecting suitable rehabilitation methods

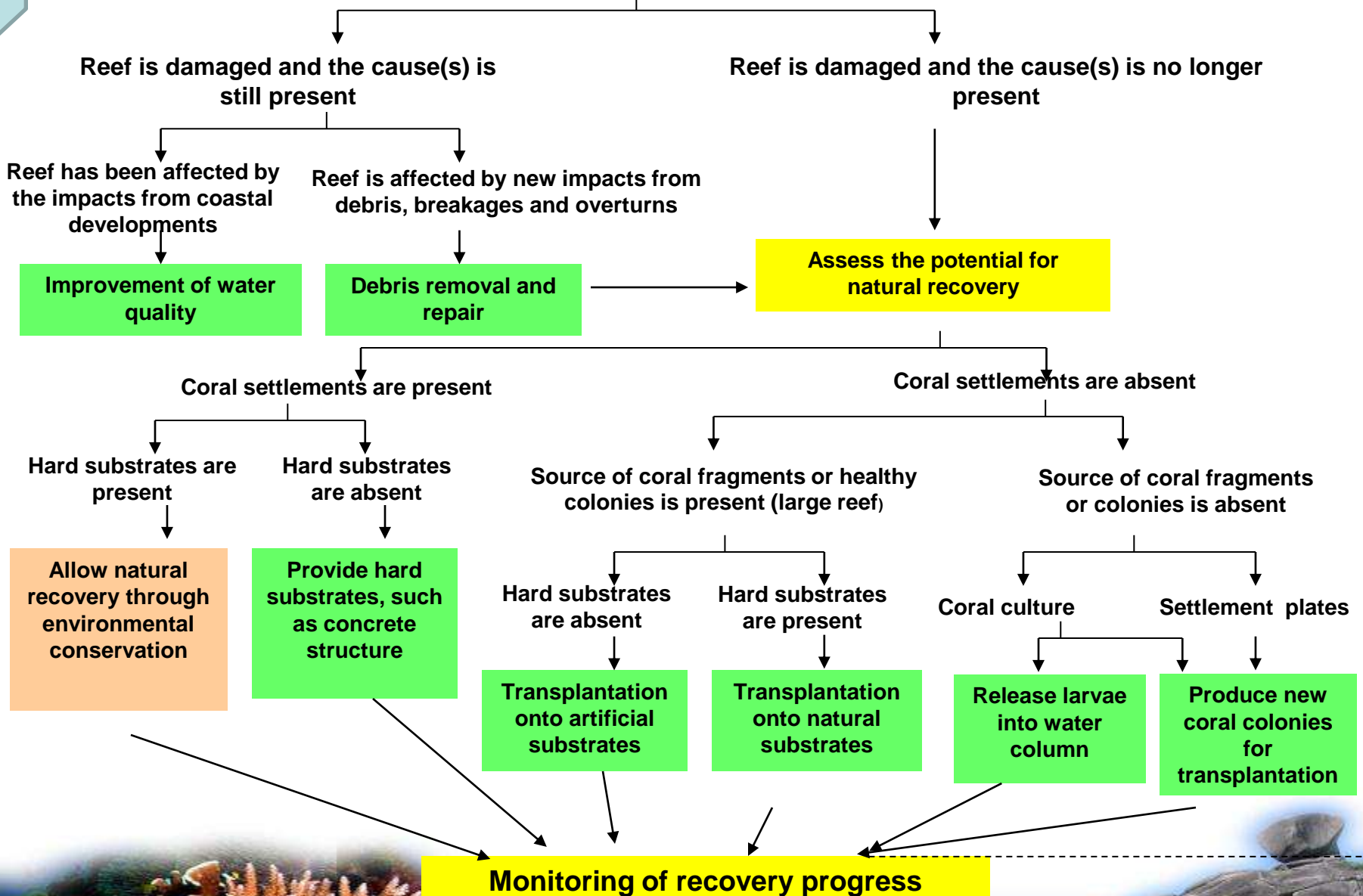
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- Although there are several approaches to rehabilitated coral reefs, which were damaged by the tsunami, each approach is suitable for a particular area and situation.
- No single rehabilitation approach can be considered suitable for all areas. The rationales for selecting a suitable rehabilitation method are as followed.





# Investigate the environmental conditions and the causes of coral reef degradation or damages



**Guideline for the selection of coral reef rehabilitation method.**



# Gap analysis

- Lack of well coordination between agencies
- Lack of long term monitoring
- Lack of knowledge and experiences
- Lack of public involvement





No words can describe the devastation that the Tsunami had caused to the lives lost and those who are affected both directly and indirectly by this disaster.

On the other hand, as quoting one of the volunteer divers,

***“The Tsunami has actually washed all of us to be here and work together”.***

We ourselves, as much as the Tsunami, have all, in one way, or another abused our sea in different ways.

It is the time now to start helping nature and give back to our sea.

We hope this phenomenon can be the start of our mission to recover and keep the sea as beautiful as nature intended for us and future generations.





# Special Thanks

Japan Fund for Global Environment  
Natural Environment Coexistence Technology  
Association (NECTA)



# NECTA

