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Why Reefs Matter

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Why Reefs Matter

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Last Updated: 24 July 2008



A hawkfish explores branching coral. [Supplied, Chuck Savall]

The beautiful underwater landscape of a healthy coral reef is an unforgettable sight. The colourful gardens of delicate fronds, ridged boulders and broad dinner plates are home to thousands of fish, crabs and other marine life, many of them just as brilliantly coloured.

But as the earth's climate changes, the oceans are warming up and becoming more acidic. Cities and towns pump sewage and industrial pollution into the seas, and soil from land-clearing and erosion is also going into the ocean. As a result, the world's reefs are slowly dying, with huge implications for the estimated 400 million people worldwide who rely on coral reefs for their food, income, and homes.

Every four years, the latest reef research is presented at the International Coral Reef Symposium. At this year's meeting in Florida, nearly 3,000 scientists and conservationists met to look at what's happening to the world's reefs, and how they might be saved from extinction. Radio Australia's **Corinne Podger** was there.

Hundreds of coral species face extinction

A landmark global survey of coral reefs released this month found a third of all coral species are at risk of extinction.

Carried out by an international team of scientists, the survey was published in the prestigious journal, Science and announced at the recent International Coral Reef Symposium in Florida.

As **Corinne Podger** reports, the findings mean that coral reefs have joined the unenviable ranks of life forms most likely to vanish permanently from the earth.

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Can corals adapt to global warming?

The latest research on the effects of climate change on coral reefs suggests rising temperatures and changes in ocean chemistry could kill off many of the world's reefs within 50 years.

In a series of presentations at the recent International Coral Reef Symposium in the United States, scientists from Australia and the US rejected previous reports that reef systems might adapt to the amount of carbon dioxide being absorbed by the world's oceans.

They say CO2 levels are rapidly approaching a critical limit, beyond which reef systems simply won't survive, as **Corinne Podger** reports.

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Caught on film - the best approaches to saving reefs

Participants at the recent International Coral Reef Symposium agreed that a major challenge for reef conservationists is the sharing of effective techniques and practices.

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That means cutting back pollution from soil run-off and sewage, and for local communities to move away from destructive fishing methods like trawl nets, dynamite and poison.

Corinne Podger spoke to representatives from Pacific island NGOs, who're using video to share good ideas on reef management between countries separated by thousands of kilometres of ocean.

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Hidden overfishing threatens Pacific food security

A new study by the Canadian research organisation, The Sea Around Us, has found fish catches from Pacific island nations are vastly under-reported. The research was presented at the recent International Coral Reef Symposium in Florida, and covers half a century of fishing - from 1950 to 2004 - in 20 island nations.

The researchers say that in some cases, unreported catches by local fishing communities are nearly 20 times higher than the official statistics collected by governments and handed to the Food and Agricultural Organisation.

They say the findings have worrying implications for regional food security, as **Corinne Podger** reports.

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Spotted starfish on hard pink coral. [Supplied, Chuck Savall]

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The survey took in virtually every coral reef on the planet,

from Indonesia to Kenya, Hawaii to eastern Australia. It found that all over the world, coral reefs are dying off at a significant rate - the victims of a brutal combination of climate change, ocean acidification, and pollution from run-off and human activity.

One of the lead authors, Dr Greta Aeby, of the Hawaii Institute of Marine Biology in Honolulu, says the team of scientists were horrified by what they discovered.

"Using information about population sizes, geographic range and also the susceptibility of these different coral species to bleaching, disease, or predation by crown of thorns, we wanted to determine how many species were at risk of being lost, and from our study we found that approximately one third of our coral species are at risk," she said.

"This makes corals the most threatened group of animals on this earth, second only to frogs and related amphibians for risk of extinction."

Dr Aeby says the progressive loss of coral reefs also threatens the survival of the 25 percent of

all marine life which relies on reefs for food and shelter.

"Corals make up the very framework of the coral reef ecosystem. If these corals are lost, then the entire ecosystem is at risk of collapse, and so we can expect not only to lose coral species, but also the fish and crabs and other little critters that depend on these corals for food and shelter," she said.

Even the most remote coral reef systems, located in the midst of oceans thousands of miles from human settlements, are being affected by human activity to some extent. However the survey found the region with the highest proportion of vulnerable species is the so-called "Coral Triangle", which covers waters off Indonesia, Malaysia, the Philippines, Papua New Guinea, the Solomon Islands and East Timor.

Conservation International, one of the agencies that commissioned the study, says it has profound implications for millions of people who derive their food and income from reef systems.

"We all need to do our part institutionally and individually to reduce carbon emissions but there is a consensus now that no matter what we do, we are going to see some impacts that are simply not reversible at this point," said Roger McManus, Vice-President of Marine Programs at Conservation International.



Red Gorgonian Coral [Supplied, Juan Cuetos, OCEANIA]

Another researcher, Kenyan-based scientist David Obura, says that while some of the damage being done to reef systems is slow and steady, such as increasing ocean acidity due to carbon dioxide being taken up by the planet's oceans. Other factors, such as El Ninos and severe weather events, do short, sharp bursts of damage, further reducing the ability of reef systems to survive.

Dr Obura says there is evidence that coral reefs can recover from short-term events of this kind, if they don't have to contend with pollution from sewage and soil run-off. He says this information is being used to help scientists make better choices in where to locate Marine Protected Areas (MPAs) and in how these sites are managed.

"We are finding that reefs can recover quite well (from these short-term events)," he said.

"These generally tend to be in fairly remote areas, where water quality is very good, where

there's low fishing impact and things like that.

"Some species are also more tolerant and resilient than others, but it depends a lot on the quality of the environment, and the quality of different places, and so we try to find the places that have high resilience and maximise the benefits there."

However Dr Obura says that when and where coral recovery does take place, some species do better than others, so the way a reef will look, and the species it can support, may be very different to its original state.

Given the importance of reef systems both to coastal communities around the world, and to science, the researchers involved in the study have urged governments to take urgent action to reduce greenhouse gas emissions.

"The results of the GMSA will help ensure that we highlight the urgency and need to improve stewardship of the ocean," said Roger McManus of Conservation International.

"We have to adjust to a new world in which we have to manage for change. We cannot manage to conserve or preserve the past or the present, we also have to be concerned about what's going to happen in the future, and how we're going manage and conserve biodiversity and productivity of the ocean in that light."

These programs were made possible thanks to a Media Fellowship from the non-profit ocean conservation group, SeaWeb. Thanks also to the scientists at the International Coral Reef Symposium 2008 who shared their research and insights.

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One-third of world's coral species face extinction

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Dr Greta Aeby, Hawaii Institute of Marine Biology, USA

Dr David Obura, Coral Reef Degradation in the Indian Ocean, Kenya

Roger McManus, Vice-President of Marine Programs at Conservation International, USA

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Implications for Pacific states - On the Mat

Coral reef extinction has serious implications for tens of thousands of people across the Pacific, where fish are vital to local food supplies and livelihoods, and where the reefs themselves protect countries like Kiribati from tidal surges and storms. That's the view of two of the authors of a landmark global reef survey who are based in the Pacific.

Edward Lovell, University of the South Pacific, Fiji

Doug Fenner, Department of Marine & Wildlife Resources, American Samoa.

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Coral jewellery - too precious to wear?

Conservationists say the pink and red coral used in jewellery and home fish-tanks should be added to the list of endangered species covered by international law. The Convention of International Trade in Endangered Species (CITES) already limits or bans trade in products like rhinoceros horns and ivory. The campaign group Too Precious to Wear says coral is just as threatened, and say it's being removed from the sea, particularly in Indonesia, faster than it can regrow.

Too Precious to Wear campaign spokesman Andrew Baker

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The latest research on the effects of climate change on coral reefs suggests rising temperatures and changes in ocean chemistry could kill off many of the world's reefs within 50 years.

In a series of presentations at the recent International Coral Reef Symposium in the United States, scientists from Australia and the US rejected previous reports that reef systems might adapt to the amount of carbon dioxide being absorbed by the world's oceans.

They say CO2 levels are rapidly approaching a critical limit, beyond which reef systems simply won't survive, as **Corinne Podger** reports.



Bleached corals on the south of the Great Barrier Reef [Supplied, Ove Hoegh-Guldberg]

For decades, the idea that oceans might absorb some of the carbon dioxide associated with greenhouse gas emissions was seen as a bonus. But two years ago, it emerged the extra CO2 was making the world's oceans more acidic, causing corals to crumble and deteriorate, and impeding new growth.

Now, an Australian scientist believes he's identified the point of no return. Professor Ove Hoegh-Guldberg is the director of the Centre for Marine Studies at the University of Queensland. He says 500 parts per million will reached within half a century - and when that happens, most reefs will die.

"The rise of carbon dioxide in the atmosphere has two consequences for coral reefs. The first is,

through its effect on the global temperature, causing essentially thermal stress, and this manifests itself through mass bleaching events," he says.

"The second problem is that CO2 going into the atmosphere also goes into the ocean in increasing amounts, and that's causing an acidification of the oceans, and the effect of that is that it drops the concentration of something called carbonate - which happens to be the crucial molecular building block for the limestone skeletons that corals put down."

At the same time as changing ocean chemistry, greenhouse gases are warming the oceans up, contributing to mass bleaching in the Indo-Pacific in 1998, and the Caribbean two years ago. While reefs can recover to some extent, these events are becoming more frequent, giving reefs little chance of fighting back, according to Mark Eakin, of Coral Reef Watch in the US.

"These are severe events that caused the bleaching of a lot of corals and more importantly the death of a lot of corals," Dr Eakin says.

"When the temperatures get too high, the relationship between the plant and animal breaks down and the corals expel the algae that live in their tissues. That results in the coral starting to starve to death, and if it's a short event, they can recover the algae. But if the temperature stays warm for too long, then the corals are going to die."

Professor Hoegh-Guldberg says some scientists had hoped that coral reefs could adapt to the earth's changing climate, but says evolution can't keep up with rapid shifts in ocean acidity and temperature.

"What we're planning to inflict on the earth is about 100 to 1,000 times faster than the Ice Age transitions that transformed the entire planet," he says.

"Evolution takes time, and what we are seeing is a mismatch between the rate at which evolution can adapt to change, and the rate of change. Coral reefs can't keep up, and we're seeing an increased rate of coral degradation as a result."



Erosion and bleaching takes its toll on a reef. [Supplied, Ove Hoegh-Guldberg]

Professor Hoegh-Guldberg says efforts to preserve coral reefs have been undermined by a lack of

consensus on how much damage climate change is causing.

"I think it's very important that the scientific community puts out consensus statements, the best of which have come from the Intergovernmental Panel on Climate Change, which has released really clear statements.

"Often we see a sole voice that comes out and says 'I don't believe', and the media will pick that up and that will have as much coverage as perhaps the consensus of thousands of scientists.

"On this point, we've been seeing headlines saying coral reefs can adapt, but they've been based on almost no science - and our challenge is to come up with clear statements about where things lie."

Professor Hoegh-Guldberg says governments must act quickly to reduce greenhouse gas emissions, or even the world's best-managed coral reefs, such as Australia's Great Barrier Reef, will be irreparably damaged within a few decades. He warns that inaction will have a "disastrous" effect on the lives of around 400 million people who rely on reefs for their food and income.

"We can't take 375,000 square kilometres of the Great Barrier Reef and dust it with chemicals to somehow fix the acidity problem or somehow cool the water," he says.

"We've got to deal with the root cause of the problem, and that is emissions of CO2. Now, there is pain with this, but at the end of the day there's going to be less pain for people if we deal with it now, as opposed to not put the effort into controlling emissions and have really quite disastrous futures."

These programs were made possible thanks to a Media Fellowship from the non-profit ocean conservation group, SeaWeb. Thanks also to the scientists at the International Coral Reef Symposium 2008 who shared their research and insights.

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Climate change 'killing' coral reefs

Research presented at the recent International Coral Reef Symposium under way in Florida suggests climate change could kill off many of the world's reefs within 50 years. Scientists at the meeting from Australia and the United States rejected previous reports that coral reefs might adapt to the amount of carbon dioxide being absorbed by the world's oceans. They say CO2 levels are rapidly approaching a critical limit, beyond which reef systems simply won't survive.

Professor Ove Hoegh-Guldberg, Centre for Marine Studies, University of Queensland, Australia

Mark Eakin, Coral Reef Watch, USA

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Award-winning scientist says reefs 'not doomed'

The world's coral reefs are not doomed - provided governments and communities take the urgent and necessary actions to preserve them. That's the message from the director of the Centre of Excellence for Coral Reef Studies, and recipient of this year's Darwin Medal, Professor Terry Hughes in his keynote address to the 11th International Coral Reef Symposium in Florida.

Professor Terry Hughes, director, Australian Research Council Centre of Excellence for Coral Reef Studies, James Cook University, Australia

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Caught on film - the best approaches to saving reefs

Participants at the recent International Coral Reef Symposium agreed that a major challenge for reef conservationists is the sharing of effective techniques and practices.

If any reefs are to survive the impact of climate change, the symposium heard, they need as few other forms of stress as possible.

That means cutting back pollution from soil run-off and sewage, and for local communities to move away from destructive fishing methods like trawl nets, dynamite and poison.

Corinne Podger spoke to representatives from Pacific island NGOs, who're using video to share good ideas on reef management between countries separated by thousands of kilometres of ocean.



In addition to climate change, pollution poses a major threat to the world's reefs. [Supplied, Keoki Stender]

The Coral Reef Symposium heard many research papers • Listen: <u>Related Audio</u> showing clear links between involving local communities in reef management, and the health of coral reefs.

One organisation working to identify and share best practice is the Locally Managed Marine Area (LMMA) Network. It links communities in countries with coral reefs, including Pacific island states, and Asian countries like the Philippines.

Sharing information between these countries faces several challenges, including the vast distances between them, and poor access to facilities like the internet to research good methods being used elsewhere. The symposium also heard from many Pacific delegates, who say they have too few trained scientists and reef managers to utilise in designing marine protection programs.

The LMMA network has been working to overcome these various programs by filming local communities who've come up with novel and effective ways of looking after their coral reef, and then making DVDs which can be shown in other countries with similar challenges.

"We produced a video last year called "Lessons Learned", where we interviewed community members from several different countries who work with the network, speaking to community practitioners and leaders - to get their story in their own voice about the work they're doing at their marine sites," says Toni Parras, the LMMA spokeswoman.

"The DVD meant we could share lessons learned at one site, with the target audience for these videos being practitioners and leaders in other countries facing similar circumstances.

"They may tell us, 'well we're just fishermen, what can we possibly do to better our situation and manage our marine resources?', and then they hear these stories from people who are also 'just' fishers who were able to go through a community planning process, draw up a management plan -

obviously with some outside assistance with technical elements and project planning, which is what the LMMA network provides.

"But the input is coming from the people who are carrying it out, so their experience really motivates and inspires communities in different places and countries altogether, who feel that if they can do it, we can do it."

Ms Parras says many traditional methods of looking after reefs are in danger of being lost, so LMMA is now working to produce new videos, particularly targeting Pacific youth.

"Traditionally there have been connections and practices with the sea in the Pacific, and they're losing that connection, so community leaders said they needed videos to show not only lessons learned but also traditional practices," she says.

"We're asking community leaders to relate traditional management techniques that perhaps have been revived or are coming back into play. Because youth especially are into this kind of technology, if they can see videos from on the ground showing traditional practices, maybe it will revive some of them and get them connected again."



A fishing line tangled in coral. [Supplied, Keoki Stender]

As part of activities for this year's International Year for Coral Reefs, the Secretariat for the Pacific Region Environment Program (SPREP) is also using video, with the idea of teaching children how to look after the reef systems they will inherit as adults.

"We organised a competition for the secondary schools of the region, and we asked them to select a reef and come up with an action plan to save it, including a budget and timeline," said Caroline Vieux, SPREP's coral reef management officer, who is based in Samoa.

"We had planned originally to fund the five best action plans but there were so many good ideas that we ended up funding 11 of them in various countries of the region."

"We have asked all of the winners to film the implementation of their plan, and we will put together a DVD from that and distribute it to Pacific schools, so children everywhere can see what was done by kids in New Caledonia, in Kiribati, in Solomon Islands. It's a great way of networking for the children because kids in New Caledonia do not know anything about what it looks like on other islands and what some of the other kids are doing."

Ms Vieux says she was particularly impressed by a reef management plan developed by children in Solomon Islands, which will help protect local reefs from the damaging effects of soil and sewage run-off.

"The children there are involved in planting corals and mangroves, and even putting in compost toilets, which shows they really understood the impact of land-based pollution on the ocean. At first you might not relate a compost toilet to a coral reef but sewage is a major problem, so the idea of better toilets was really impressive."

As well as using videos, SPREP gets Pacific islanders with effective ideas on reef management talking, through a system of community exchanges.

"A few months ago, the tribes of New Caledonia of the Northern Province visited the Fiji local managed marine area network, and they had a tour for 10 days, and it has been great for them, because they have gone back to New Caledonia knowing what to do, and really feeling they can do it," Ms Vieux said.

These programs were made possible thanks to a Media Fellowship from the non-profit ocean conservation group, SeaWeb. Thanks also to the scientists at the International Coral Reef Symposium 2008 who shared their research and insights.

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Cutting edge science meets traditional knowledge - On The Mat

The latest thinking in reef management calls for scientists tackling problems like climate change and pollution to work closely with local communities, particularly in small island states in the Pacific. Corinne Podger spoke to three experts who are finding new ways of making that happen.

David Wachenfeld, Australia's Great Barrier Reef Marine Authority

Caroline Vieux, South Pacific Regional Environment Program, Samoa

Australia Ken Mackay, University of the South Pacific, Fiji

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Sharing great ideas on film

Participants at the International Coral Reef Symposium this year agreed that a continuing challenge for reef conservationists is sharing "best practice". If coral reefs are to survive the impact of climate change, they need protection from other forms of stress, including pollution from soil run-off and sewage, and an end to destructive fishing methods such as trawl nets, dynamite and poison.

In the Pacific, the Locally Managed Marine Area Network (LMMA) is finding new ways of sharing the best ideas on reef management between communities separated by vast stretches of ocean.

Caroline Vieux, Secretariat for the Pacific Region Environment Program, Samoa

Toni Parras, LMMA Network, USA

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Indigenous knowledge fills in gaps for scientists

Coral reef experts now recognise the importance of joining up the latest science with the ancient knowledge and traditional practices of local communities living near reef systems. In Australia, scientists at the Great Barrier Reef Marine Park Authority are working with around 70 indigenous groups spread along hundreds of kilometres of eastern Australia, who are helping to fill in knowledge gaps spanning tens of thousands of years.

David Wachenfeld, Great Barrier Reef Marine Protection Authority, Australia

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Hidden overfishing threatens Pacific food security

A new study by the Canadian research organisation, The Sea Around Us, has found fish catches from Pacific island nations are vastly under-reported. The research was presented at the recent International Coral Reef Symposium in Florida, and covers half a century of fishing - from 1950 to 2004 - in 20 island nations.

The researchers say that in some cases, unreported catches by local fishing communities are nearly 20 times higher than the official statistics collected by governments and handed to the Food and Agricultural Organisation.

They say the findings have worrying implications for regional food security, as **Corinne Podger** reports.



[Supplied, Chuck Savall]

Small-scale fishing in the Pacific is an essential source of • Listen: <u>Related Audio</u> protein, and for that reason the FAO needs reliable annual reports on how many fish are caught in a given area, to know whether fish stocks are remaining steady or declining over time.

But these reports are expensive to prepare, and in developing countries they're often patchy. Researcher Dirk Zeller says that can lead to problems because the data sent by the FAO to to the United Nations and donor agencies regarding the state of food security in a particular country may be wrong.

"The FAO has no mandate to collect data itself. Its mandate is to accept reports from each member country, and report on that data, so the responsibility for the data's accuracy rests with member countries and the governments of member countries," Dr Zeller says.

"While most countries make a strong effort to report what they consider to be the catch by their own fisheries organisations, in most instances, this mandate is restricted to commercial fisheries and, as a result, economic activities that are not directly related to the commercial market get left out of the books."

As well as providing accurate information about the amount of fish being caught in the present, annual reports build up a reliable picture of how much fish has been caught in the past, enabling conservationists and food security experts to see if a particular species is being overfished, and to encourage that to be factored in to national policies on conservation and food supply.

Realising there were significant gaps in Pacific fish catch reports, the Canadian researchers pulled together evidence from global databases, fishing agreements and marine protected areas, to give a rough snapshot of 50 years of fishing in the Pacific.

They found vast under-reporting of catches. In the worst case of American Samoa, they found the real amount of fish and shellfish caught was 17 times higher than what had been reported.

They also found that many key species to the health of coral reefs, such as parrotfish which harvest superfluous algae which can otherwise suffocate a reef, were being overfished.

"Parrotfish, and other smaller reef fishes, are often only reported as mixed fish, or are never listed among the catch," says lead author Daniel Pauly.

"These are not what we call 'noble fish' - the fish that you report catching, which the guys usually do - but the small fish and little invertebrates caught by women and children, which is usually what goes into the cooking pot.

"Without this information, you can't have a clear appreciation of the importance that reef fish play in the rural economy of the countries of the South Pacific."



Spade fish on the reef. [Supplied, Chuck Savall]

The implications for food security become obvious, Dr Pauly says, by looking at fish conservation policies already in place in the Pacific. Many island policies emphasise conserving only those fish species for which there are reliable figures, such as tuna.

"The concentration in the South Pacific on tuna means that fisheries divisions will look only at tuna problems, and will not look at the production and the sustainability of reef fishes, which means these resources can be lost without anyone noticing," he says.

As they collected their data, the researchers identified a worrying downward fall in total fish catches across the Pacific region over the past half a century, which had not previously been recognised. Dr Pauly says the finding is of great concern.

"You can see that if reef fishes disappear and the food they represent is lost, there will be an enormous need for substitutions, in the form of imports," he says.

Dirk Zeller says Pacific governments need to allocate more of their national budgets towards getting a clearer picture of total local catches. Although it is expensive to do, it will be cheaper in the long run than being forced to import food if a key local species is fished out.

"Food security in the Pacific is already becoming an increasing problem, with climate change, rising sea levels, increasing temperatures, and more recently we've experienced a phenomenal increase in oil prices. This is impacting heavily on all imports to Pacific islands because shipping costs are going through the roof," he says.

"That's only going to increase, and so will the price of food. So being able to rely on local food sources becomes crucial for food security, and these countries need to know their baseline of what they have and what they can utilise in order to develop sustainable management plans for the future."

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Pacific fish catches 'vastly' under-reported

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nations, the researchers found that unreported catches by local fishing communities are nearly 20 times higher than official figures collected by governments and handed to the Food and Agricultural Organisation.

Dr Daniel Pauly and Dr Dirk Zeller, Fisheries Centre, University of British Columbia, Canada.

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Micronesian communities help researchers track fish - Sebastian Marino

Fisheries researchers in the Pacific often complain they have neither the funding nor enough trained staff to monitor fish and coral species across vast stretches of ocean. A novel solution to the problem has been developed by the International Coral Reef Centre in Palau, which monitors more than 30,000 square kilometres of ocean around Micronesia, taking in Kosrae, Pohnpei, Yap, Palau and the Marshall Islands. The Centre's scientists are training NGOs, local government officials and fishing communities across the region to identify individual species, take samples and run experiments, and to feed their data back to the global scientific community.

Sebastian Marino, Palau International Reef Centre

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