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**CENTRAL CARIBBEAN
MARINE INSTITUTE**

RETHINKING THE FUTURE FOR

Coral Reefs

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RETHINKING THE FUTURE FOR CORAL REEFS

An International Symposium Convened by His Royal Highness, The Earl of Wessex, Patron of the Central Caribbean Marine Institute, St James's Palace, London, June 6-7, 2016

HOST

HRH The Earl of Wessex KG GCVO

CHAIRS

Dr. Carrie Manfrino and Professor Terry Hughes

SYMPOSIUM DEPUTY DIRECTOR

Tim Ecott, CCMI-UK

PANEL DISCUSSION

Tom Frazer, Callum Roberts, Jerker Tamelander, Terry Hughes, Carrie Manfrino



PRESENTATIONS

DR CARRIE MANFRINO

Rethinking the Future for Coral Reefs

PROFESSOR JOSHUA CINNER

Uncovering bright spots among the world's coral reefs

PROFESSOR TERRY HUGHES

Can the World's Reefs be Saved?

PROFESSOR NICK GRAHAM

Degradation and Recovery of Indian Ocean Coral Reefs

DR RACHEL TURNER Good governance for complex ecosystems: Perceptions of coral reef-dependent communities in the Caribbean

JERKER TAMELANDER International Policy & Reef Management, UN Perspective

DR GARETH J. WILLIAMS

Drivers of natural variation in Coral Reef Ecosystem states

SYMPOSIUM PARTICIPANTS

TIM ECOTT CCMI Deputy Director London

DR CARRIE MANFRINO Director CCMI

PROFESSOR TERRY P. HUGHES James Cook University

DR JOSHUA E. CINER James Cook University

PROFESSOR TOM FRAZER University of Florida,
CCMI Board

PROFESSOR NICK GRAHAM University of Lancaster

DR SIMON HARDING Blue Marine Foundation

DR CHRISTINA HICKS Lancaster Environment Centre

PROFESSOR CALLUM ROBERTS University of York

MARK J SPALDING The Ocean Foundation

JERKER TAMELANDER United Nations Environmental
Program (UNEP) Director Marine Unit

DR KRISTIAN TELEKI International Sustainability Unit/
Ocean Unite

DR. RACHEL TURNER Environmental & Sustainability
Institute, University of Exeter

DR GARETH J. WILLIAMS Bangor University,
School of Ocean Science

PROFESSEUR DENIS ALLEMAND Centre Scientifique
de Monaco

JOANNA BENN The Nature Conservancy

ARIANE DART Central Caribbean Marine Institute

ILONA ECOTT CCMI, Assistant Event Coordinator

HENRY HARFORD Central Caribbean Marine Institute

MELISSA HAYDON-CLARKE St James's Palace

PHILIP WOUTER HAUPT Seychelles Island Foundation

PIA HALL Central Caribbean Marine Institute

LOUISE HEAPS WWF, Chief Adviser, Marine Policy

ABIGAIL LUCIE HINE CEO, Wise Oceans

DOMINIC MCCAHERILL CCMI UK

MR. EMRY OXFORD & MARY ELLEN HUGUS

HELEN PITMAN Chagos Conservation Trust

LINDSAY SULLIVAN Education Director Wise Oceans



REPORT SUMMARY

RETHINKING THE FUTURE FOR CORAL REEFS

Through the Symposium at St. James's Palace, HRH The Earl of Wessex helped gather together many of the most progressive and influential coral reef scientists to "*Rethink the Future for Coral Reefs.*" The Symposium was designed to start a discussion about the significant changes that need to take place for the survival of corals.

Confronting the global demise of coral reef ecosystems over the last few decades requires a rethink about our current strategies to prevent further loss.

Studies under discussion predict the end to coral reef systems as we know them by 2030. Coral communities are shifting away from massive coral colonies that measure several metres in diameter and represent hundreds of years of growth in most regions.



The Symposium was designed to start a discussion about the significant changes that need to take place for the survival of corals.



The symposium goal was not to highlight the failures (and rare successes) in current conservation or preservation strategies, but to bring together a cross section of scientists, social scientists, foundation leaders, NGO directors, policy makers, and interested members of the general public. The goal was to bring a broad perspective to focus attention on the need for a more progressive, ambitious, and innovative approach to both protection and prevention of further preventable losses. There was clear consensus that increasing protection and reducing emissions at the levels that are being promoted (by the global community, the UN's sustainable development goals and Paris COP21) will not result coral reefs surviving as we know them today. Public perceptions about coral health and the impact of coral reef degradation are still little known outside relatively niche groups.

KEY MESSAGES

THERE WAS AGREEMENT ON TOPICS:

- The current Sustainable Development Goals established by the UN and the Paris COP 21 plan to reduce carbon emissions are inadequate for reef survival
- Climate impacts to coral reefs, in particular the increases in sea surface temperatures under current scenarios would kill large areas of coral reefs. Corals would not be capable of recovering fast enough before further high temperature events took place
- Societal level changes that broadly lead to reduced local impact upon coral ecosystems and that reduce the human carbon footprint are required for coral reef ecosystems to continue functioning

The collapse of coral reefs has far reaching implications for the entire ocean and for people - as reefs are considered sentinel ecosystems



THERE WERE SURPRISES FOR MANY PARTICIPANTS AMONG THE GROUP, NOTABLY THAT:

- The pace of decline was so rapid and that reefs were disappearing even faster than current trajectories
- The 2030 Sustainable Development Goals will be too late to make a difference for reef ecosystems. Reefs would disappear before these goals were achieved
- Reefs of the future will be remarkably different in structure and composition than reefs today
- Public engagement with coral reefs in crisis is woefully low
- It was noted that activists and campaigners often targeted Ministries of Environment when proposing action aimed at protection when it was often more effective to target Ministries of Finance or Development with greater power and access to resources

THERE WAS DISAGREEMENT OVER:

- The effectiveness of Marine Protected Areas and whether 30% protection or indeed any level of protection would lead to better reef health
- Whether science and advocacy should be combined was up for discussion





OUTCOMES

The symposium created a dialogue and network of interested and committed individuals as well as news coverage from both Nature and the BBC World Service. Other coverage included a news article in the Challenger News, www.challenger-society.org and publications as follows:

HRH THE EARL OF WESSEX was invited to formulate a joint statement with HSH Prince Albert II of Monaco at the Centre Scientifique de Monaco's Fourth International Workshop: Bridging the Gap between Ocean Acidification Impacts and Economic Valuation.

MANFRINO 2017. UN Chronicle, Can Coral Reefs Be Saved? The journal was released to coincide with the United Nations NY Ocean Conference, June 2017

MANFRINO 2017 Rethinking Current Strategies to Prevent Further Loss of Corals. Current Climate Change Reports (Springer Nature)

TERRY HUGHES 2017. Nature published Global Warming and recurrent mass bleaching of corals which includes his discussion from the London Symposium.

JOSH CINNER presented results from his work, Bright spots among the world's coral reefs Nature 535, 416-419 (21 July 2016) doi:10.1038/nature18607

CALLUM ROBERTS is including some of the deliberations from the CCMI London Symposium, is a chapter in a new book, Coral Reef Odyssey (provisional title) written for a popular science audience.

JERKER TAMELANDER UNEP, co-authored, Local-scale projections of coral reef futures and implications of the Paris Agreement in Nature Scientific Reports. A model that identifies climate refugia and reefs that are likely to be lost to climate impacts sooner. The work suggests prioritization of coral reef management areas and offer a vulnerability assessment to aid in adaptation planning.

MARK SPALDING CEO, Ocean Foundation

- Blog: www.oceanfdn.org/blog/corals-need-relief
- The Ocean Foundation has engaged other coral reef funders to accelerate conservation and restoration efforts
- The Ocean Foundation has worked to make certain that climate and energy funders were well aware of how "Rethinking the Future of Coral Reefs" constituted a robust additive reason to address reduction in carbon emissions, as well as for efforts at carbon sequestration.

NEXT STEPS

1

Urgently establish an advocacy group/ institution to promote awareness of the problem

2

Become engaged as scientists in the climate discussion pushing for faster reductions in emissions

3

Engage leaders of industry, heads of state and financial ministers in the discussion so as to educate, inform and expand the dialogue

4

Be proactive when relevant issues impacting coral reef health attract media or governmental attention

5

Establish coalitions with select groups to increase action that will produce relevant solutions for the particular region. Focus on the diverse issues of particular regions

6

Establish a high profile movement that makes way for a shift in societal behaviour to reduce direct impacts to coral reefs and adopt a more sustainable lifestyle

7

Explore new innovative, scalable solutions that traverse the disciplines. This involves working across science disciplines, including management and policy solutions, and expanding the dialogue and awareness of the issues and solutions.



SYMPOSIUM PROGRAMME

JUNE 2016

CORAL REEFS: PROTECTING THEIR FUTURE, CARRIE MANFRINO, TERRY HUGHES, TIM ECOTT

For too long, there has been good scientific evidence about the dire state of the world's coral reefs. Current strategies to improve the health of most coral reefs are failing. Meanwhile, as global stressors intensify, debates about the future of coral reefs continue. Reefs provide critical ecosystem services such as food security, coastal protection and income from tourism to many millions of people, especially in developing countries. 'Rethinking the Future for Coral Reefs' is a symposium to bring together leaders whom we believe have the potential to create a transformative plan for reversing the decline of coral reefs, and to support the societies that depend upon them.

The London 2016 symposium follows up on scientific milestones dating back 40 years to the foundation of the Great Barrier Reef Marine Park, through to the Global Coral Reef Monitoring Network in 1994 and the latest Scientific Consensus Statement on Coral reefs and Climate Change of 2012. These - and other initiatives, have defined the need for greater understanding of the general state of coral reefs. Climate change, overfishing and destructive fishing practices, and coastal pollution are the key drivers of environmental degradation of coral reefs. But now, we urgently need creative, provocative, and unprecedented proposals and action that will end the current decline and lead to recovery through better policies, management and governance.

The "Rethinking the Future for Coral Reefs" symposium stimulated a fresh discussion among scientists, the media, heads of state, and foundation directors.

SYMPOSIUM PLAN

WHY

An urgent transformation in governance is needed to reverse the decline of coral reefs. What actions will make the difference in coral reef survival?

WHAT

Establish a dialogue, provoke discussion, and propose steps to improve the future for coral reefs. Identify actions that can lead to the emergence of healthy coral reefs. We need to build strategies that will reverse the global decline of reefs, learning from locations that are on a positive trajectory.

WHO

Participation in the Symposium is by invitation only. We will select twenty-five contributors including foundations interested in coral reef and ocean protection (foundation directors), scholars, media representatives, Heads of State. An equal number of attendees may participate in the open sessions and as observers.



ABSTRACTS

PROFESSOR NICK GRAHAM

Degradation and recovery of Indian Ocean coral reefs

The Indian Ocean spans extremes in human dependence on coral reefs, from heavily populated coastlines in East Africa, to remote, uninhabited atolls in the Chagos Archipelago. It was also the region most severely impacted by the 1998 mass coral bleaching event, with up to 90% coral mortality in some locations. My talk will identify targets for ecosystem based management of reef fisheries in the region. I will discuss the factors that predicted recovery of reefs from the 1998 coral bleaching event and how recovery varied spatially.

PROFESSOR JOSHUA CINER

Uncovering bright spots among the world's coral reefs,

Ongoing declines among the world's coral reefs require novel approaches to sustain these ecosystems and the millions of people who depend on them. A presently untapped approach that draws on theory and practice in human health and rural development is systematically identifying and learning from the 'outliers' - places

where ecosystems are substantially better ('bright spots') or worse ('dark spots') than expected, given the environmental conditions and socio-economic drivers they are exposed to. Here, we compile data from more than 2,500 reefs worldwide and develop a model to generate expectations of how standing stocks of reef fish biomass are related to 18 socioeconomic drivers and environmental conditions. Bright spots were characterised by strong socio-cultural institutions such as customary taboos and marine tenure, high levels of local engagement in management, high dependence on marine resources, and beneficial environmental conditions such as deep-water refuges. Alternatively, dark spots were characterised by intensive capture and storage technology and a recent history of environmental shocks. Our results suggest that investments in strengthening fisheries governance, particularly aspects such as participation and property rights, could facilitate innovative conservation actions that help communities defy expectations of global reef degradation.

DR RACHEL TURNER

*Measuring good governance for complex ecosystems:
Perceptions of coral reef-dependent communities in the
Caribbean*

Good governance is widely seen as a prerequisite for effective natural resource management in the context of coral reef decline and increasing anthropogenic pressures. We measured community members' perceptions of governance in twelve coral reef-dependent communities across four countries in the Caribbean, and find an empirical link between community perceptions and the local characteristics of reef governance arrangements. The results suggest that a combination of supportive structures and processes are necessary to achieve governance systems that are positively perceived by community members. These findings can inform the design of effective governance strategies to improve reef stewardship.

DR GARETH J. WILLIAMS

*Natural remedies: exploiting environmental drivers of
coral reef ecosystem health*

Coral reefs span a range of natural environmental gradients, such as variations in oceanic productivity and nutrient concentrations, wave energy and temperature. Certain combinations of these natural drivers act to promote dominance by reef-building benthic organisms, primarily hard corals and crustose coralline algae (CCA). A key opportunity exists, therefore, for reef managers to exploit such natural buffers in their attempts to support and reinstate coral reef resilience. Such an approach requires us to 1) identify natural drivers of desired reef ecosystem state, 2) determine how local human impacts may disrupt and alter such natural biophysical relationships on coral reefs, and 3) incorporate these ecosystem-scale biophysical relationships into modelling efforts that aim to predict the future trajectory of coral reef ecosystems in this era of rapid change.

JERKER TAMELANDER MSC

*International policy opportunities for sustainable reef
management*

In the past year countries have made significant environmental commitments, notably the 2030 development agenda and its 17 Sustainable Development Goals, the Paris Climate Change Agreement, as well as a resolution on coral reefs for the second session of the U.N. Environment Assembly. By cutting across economic, social and environmental dimensions of development these global policy decisions lower the barriers to sustainable coral reef management. The fate of coral reefs is determined by the ambition of such decisions, and by the pace of implementation and pressure reduction. I will consider recent policy developments in the context of current coral reef health trajectories, and seek to identify key pressure points for achieving governance and management conditions where reefs can remain functional and adapt.



BIOGRAPHIES SYMPOSIUM SPEAKERS AND COORDINATORS

DR CARRIE MANFRINO

Dr Carrie Manfrino, is the Founder and Research Director at the Central Caribbean Marine Institute. She is a Fulbright Scholar and marine geologist whose work has focused on coral reef resilience and climate change. She designed and developed the Little Cayman Research Centre in response to her concerns over the global losses to coral reefs after the 1998 El Nino event. Since 2005 she has established a vibrant facility that is the Caribbean's premier marine research and education centre. Through the Rethinking the Future for Coral Reefs Symposium she brings together many of the most progressive and influential coral reef scientists and leaders in conservation to continue a dialog that she hopes will be a catalyst for significant change in current ideas about what must happen for coral reefs to survive beyond 2030.

PROFESSOR TERRY HUGHES

Terry Hughes is Distinguished Professor of Marine Biology at James Cook University, Queensland Australian Research Council Laureate Fellow and Director of the Australian Research Council (ARC) Centre of Excellence for Coral Reef Studies. His research focuses on the linkages between the ecology of reefs and their importance for societies and economies. He has worked extensively in Australia, the Coral Triangle Region, and in the Caribbean. An important aspect of his research is understanding the dynamics and resilience of coral reefs, and translating this knowledge into innovative and practical solutions for improved reef management.

TIM ECOTT, UK TRUSTEE, CENTRAL CARIBBEAN MARINE INSTITUTE

Tim is the author of several non-fiction books including 'Neutral Buoyancy: Adventures in a Liquid World'.

His natural history writing and journalism appears internationally and he has been a trustee of CCMI UK since 2006.

PROFESSOR JOSHUA CINNER

Professor Cinner's research explores how social, economic and cultural factors influence the ways in which people use, perceive and govern natural resources, with a particular emphasis on using applied social science to inform coral reef management. His background is in human geography and he often works closely with ecologists to uncover complex linkages between social and ecological systems. He has worked on human dimensions of resource management in Jamaica, Mexico, Papua New Guinea, Kenya, Madagascar, Tanzania, Mauritius, Seychelles, Indonesia, Mozambique and the USA. Josh holds an ARC Australian Research Fellowship and is a recipient of the 2015 Pew Fellowship in Marine Conservation.

DR NICK GRAHAM

Professor Nick Graham is a Royal Society University Research Fellow based at the Lancaster Environment Centre, Lancaster University, UK. He studies large-scale ecological and social ecological coral reef issues under the overarching themes of climate change, human use and resilience.

JERKER TAMELANDER MSC, UNITED NATIONS ENVIRONMENT PROGRAMME

As Head, Coral Reef Unit, Jerker leads UNEP's work on coral reefs, implemented through a global partnership with Regional Seas conventions and action plans and focusing on climate change resilience, the use of ecosystem service values in public and private decision making, and assessment and reporting for ecosystem-based management. He also advises UNEP on nature-based adaptation and mitigation in coastal areas. He has 20 years of international experience in applied research, marine and coastal management and policy development, with the Government of Finland, the International Union for Conservation of Nature, and UNEP.

DR RACHEL TURNER, ENVIRONMENT AND SUSTAINABILITY INSTITUTE, UNIVERSITY OF EXETER

Rachel Turner is an environmental social scientist focusing on marine resource governance, small-scale fisheries and coastal communities. My research uses social science methods to understand how socio-economic and environmental contexts drive resource-use behaviour and responses to change. From 2010-2014 I was part of the social science team of the EU-funded Future of Reefs in a Changing Environment (FORCE) project, which explored the identification of supportive governance structures for Caribbean coral reef management.

DR GARETH J. WILLIAMS, SCHOOL OF OCEAN SCIENCES, BANGOR UNIVERSITY

Gareth is a quantitative ecologist specialising in coral reef ecology. His work focuses on the interaction of organisms with their environment, often with macro-ecological approach. He is particularly interested in how human activities and natural physical gradients interact to drive community patterns. Much of his work incorporates remote coral reefs free from direct human impact, providing key replication at the unimpacted end of an intact-to-degraded ecosystem spectrum.

PANEL CHAIR: PROFESSOR TOM FRAZER, DIRECTOR SCHOOL OF NATURAL RESOURCES AND ENVIRONMENT, UNIVERSITY OF FLORIDA

Professor Frazer is especially interested in the effects of anthropogenic activities on the ecology of both freshwater and marine ecosystems - from an interdisciplinary perspective and in addressing contemporary and emerging environmental issues.

PANEL, PROFESSOR CALLUM ROBERTS, ENVIRONMENT DEPARTMENT, UNIVERSITY OF YORK

Professor Roberts is a leading marine conservation biologist whose research focuses on human impacts on marine ecosystems. He is now working to gain acceptance for marine reserves more widely, including in Britain and Europe where he is helping fishers to promote the concept within the industry and to politicians. He is also the author of *The Unnatural History of the Sea*.

