

ATOLL RESEARCH BULLETIN

NO. 589

PHOENIX ISLANDS

**ISSUED BY
NATIONAL MUSEUM OF NATURAL HISTORY
SMITHSONIAN INSTITUTION
WASHINGTON, D.C., U.S.A.
JUNE 2011**

ACKNOWLEDGMENT

The Atoll Research Bulletin is issued by the Smithsonian Institution to provide an outlet for information on the biota of tropical islands and reefs and on the environment that supports the biota. The Bulletin is supported by the National Museum of Natural History. This issue is partly financed and distributed with funds from Atoll Research Bulletin readers and authors.

The Bulletin was founded in 1951 and the first 117 numbers were issued by the Pacific Science Board, National Academy of Sciences, with financial support from the Office of Naval Research. Its pages were devoted largely to reports resulting from the Pacific Science Board's Coral Atoll Program.

All statements made in papers published in the Atoll Research Bulletin are the sole responsibility of the authors and do not necessarily represent the views of the Smithsonian nor of the editors of the Bulletin.

Articles submitted for publication in the Atoll Research Bulletin should be original papers in a format similar to that found in recent issues of the Bulletin. First drafts of manuscripts should be double-spaced and can be sent to any of the editors. After the manuscript has been reviewed and accepted, the author will be provided with a page format which will be used to prepare a single-spaced copy of the manuscript.

COORDINATING EDITOR

Ian G. Macintyre
(macintyr@si.edu)

National Museum of Natural History
MRC-121
Smithsonian Institution
PO Box 37012
Washington, DC 20013-7012

ASSISTANTS

William T. Boykins, Jr.
Jack Chapman
Kassandra D. Brockington

EDITORIAL BOARD

Stephen D. Cairns	(MRC-163)
Klaus Rützler	(MRC-163)
Mark M. Littler	(MRC-166)
Wayne N. Mathis	(MRC-169)
Jeffrey T. Williams	(MRC-159)
Warren L. Wagner	(MRC-166)
Nancy Knowlton	(MRC-163)
Roger B. Clapp	(MRC-111)

National Museum of Natural History
(Insert appropriate MRC code)
Smithsonian Institution
PO Box 37012
Washington, D.C. 20013-7012

National Museum of Natural History
National Biological Survey, MRC-111
Smithsonian Institution
PO Box 37012
Washington, D.C. 20013-7012

David R. Stoddart

Department of Geography
501 Earth Sciences Building
University of California
Berkeley, CA 94720

Bernard M. Salvat

Ecole Pratique des Hautes Etudes
Labo. Biologie Marine et Malacologie
Université de Perpignan
66025 Perpignan Cedex, France

TABLE OF CONTENTS

	PAGE
PREFACE TUKABU TEROROKO AND GREGORY STONE	IV
BASELINE MARINE BIOLOGICAL SURVEYS OF THE PHOENIX ISLANDS, JULY 2000 BY DAVID OBURA, GREGORY STONE, SANGEETA MANGUBHAI, STEVEN BAILEY, AUSTEN YOSHINAGA, CAT HOLLOWAY, AND ROBERT BARREL	1
CORAL REEF STRUCTURE AND ZONATION OF THE PHOENIX ISLANDS BY DAVID OBURA	63
REEF FISHES OF THE PHOENIX ISLANDS, CENTRAL PACIFIC OCEAN BY GERALD ALLEN AND STEVEN BAILEY	83
SEA TURTLES OF THE PHOENIX ISLANDS, 2000-2002 BY DAVID OBURA, SANGEETA MANGUBHAI, AND AUSTEN YOSHINAGA	119

**ISSUED BY
NATIONAL MUSEUM OF NATURAL HISTORY
SMITHSONIAN INSTITUTION
WASHINGTON, D.C., U.S.A.
JUNE 2011**

PREFACE

Atoll Research Bulletin, Special Issue – the Phoenix Islands Protected Area

This special edition of ARB, on the Phoenix Islands, summarizes the early science that set in motion a landmark initiative that has today become the Phoenix Islands Protected Area, the world's largest World Heritage Site and second largest marine protected area. The Phoenix Islands are an archipelago of remote coral islands and atolls in the very center of the Central Pacific, one of the three island groups of the Republic of Kiribati. As such they represent one third of Kiribati's land and sea area, though their isolation and the small size of the islands have meant they have never been permanently settled, setting the stage for what they have become today, one of the few archipelagos on the planet with low levels of local human threats.

The story has been one that shows how science works in tandem with policy and meeting societal goals in first expressing, then realizing, a grand dream in conservation. Through the initial expeditions that generated the findings reported here, a process of dialogue was established – between researchers and government, between peoples of different cultures, and between countries in the Pacific. The dialogue focused on the broader goals and values of natural heritage – what do unspoiled parts of the planet mean to local culture, to a national government, and to the international community? Through the early dialogue within Kiribati it became clear that the key value of the early science was to reveal the beauty of the underwater reefs in the Phoenix islands and be used as a communication tool in establishing the early phases of discussions within and between different arms of government, in presenting the reefs to the public through video, and to the world through publications such as National Geographic magazine.

Unfortunately for the Phoenix Islands, but perhaps fortunately for our understanding of conservation science, the process of establishing PIPA and the early coral reef surveys in the Phoenix Islands coincided with the signature symbol of coral reefs today – as the canary in the coalmine for global climate change impacts. The studies reported here document the reef community structure prior to a major coral bleaching event in late 2002 to early 2003. Even in this day of globalization, this bleaching event would have passed un-noticed if it weren't for the early expeditions to the Phoenix Islands. Despite fears that the bleaching event may have permanently damaged Phoenix Islands reefs, we fortunately now know that 6 years following that bleaching event the resilience and recovery potential of these otherwise unimpacted reefs was intact enough for rapid recovery – providing a baseline for understanding how reefs impacted by local threats have been undermined in populated parts of the planet. Of great importance to conservation management, this can provide targets for rebuilding the resilience of ecosystems to cope with future climate change and human population growth.

From these initial steps focused on coral reef ecology, PIPA science has now developed with the drafting of a 10-year research strategy that looks at continued exploration in the deep waters and seamounts that make up over 90% of PIPA's ocean area, cutting edge research on connectivity of marine communities including the coral reefs and tuna resources that are so important to island ecosystems and economies, serving as a global reference site for climate change impacts where there are no

conflicting local human impacts that undermine the resistance and resilience of nature, and as a model for studying the dynamics of human use and interactions with the environment, especially on populated islands such as in the rest of Kiribati.

In getting to this point there are some key people in the early generation of the science we would like to thank, without whom the first steps would never have been made. In particular it was Cat Holloway and Rob Barrel of Nai'a Expeditions who saw the potential for spectacular scuba diving who convinced a variety of their friends, including Greg Stone and Kandy Kendall, a primary funder of the first visit in 2000, that the islands needed to be visited by a marine science and conservation expedition. The initial dialogue within Kiribati, and the vision for what PIPA has become found support in three people we would also like to acknowledge – Kaburoro Ruaia, Tetabo Nakara and Martin Tofinga – their leadership fostered the initial idea of PIPA and how to present it to both the government and the country as part of Kiribati's heritage and that of the world. And the vision and leadership of the President of Kiribati, Anote Tong, made it possible for firm support to grow at all levels of government in carrying PIPA from an idea to an institution.

As a fledgling protected area, PIPA now depends on the able contributions of many more people, in the protected area office, the official Management Committee and the public sector in Kiribati supported by the office of the Minister for Lands and Agriculture Development, Amberoti Nikora. The initial leadership by the New England Aquarium and Conservation International has grown into broader support not just in science, but in institutional structures and sustainable financing through an Endowment Fund, the PIPA Trust, that will finance the operations of PIPA and contribute to Kiribati's national economy. Finally, in gaining World Heritage status in 2008, PIPA also benefitted from broader international collaborations and support, and in particular the establishment of Sister Site agreement in 2010 with the Papahaunomokeakea National Marine Monument in Hawai'i.

It is our pleasure to have worked together from the beginnings of PIPA to the iconic protected area it is today, and to have worked with all of these initiatives and partners in realizing our dream. We are happy to present this set of papers from the early science of PIPA and to acknowledge the many members of the first expeditions for their contribution to what is now the world's largest World Heritage Site.

April 2011

*Tukabu Teroroko
Director,
Phoenix Islands Protected Area, Tarawa*

*Gregory Stone
Chief Scientist for Oceans, Senior Vice President
Conservation International, Washington DC*

