NO. 496

# STATUS OF CORAL REEFS IN THE WESTERN ATLANTIC: RESULTS OF INITIAL SURVEYS, ATLANTIC AND GULF RAPID REEF ASSESSMENT (AGRRA) PROGRAM

#### **EDITED BY**

#### JUDITH C. LANG

SUPPORT FOR THE PUBLICATION OF THIS VOLUME PROVIDED BY THE BACARDI FAMILY FOUNDATION, NATIONAL CENTER FOR CARIBBEAN CORAL REEF RESEARCH AND OCEAN RESEARCH AND EDUCATION

ISSUED BY
NATIONAL MUSUEM OF NATURAL HISTORY
SMITHSONIAN INSTITUTION
WASHINGTON, D.C., U.S.A.
JULY 2003

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 and is produced by the Smithsonian Press. This issue was financed by the Bacardi Family Foundation, the National Center for Caribbean Coral Reef Research (NCORE), and the Ocean Research and Education Foundation (ORE). Distribution was accomplished 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 typewritten 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 with which to prepare a single-spaced camera-ready copy of the manuscript.

#### COORDINATING EDITOR

Tan	C	Macintyre
lan	G,	macintyre

ASSISTANTS

William T. Boykins, Jr. Kay Clark-Bourne Kasandra D. Brockington

### National Museum of Natural History

MRC-121

Smithsonian Institution PO Box 37012 Washington, DC 20013-7012

E-mail: macintyre.ian@nmnh.si.edu

National Museum of Natural History (Insert appropriate MRC code) Smithsonian Institution Washington, D.C. 20560

#### EDITORIAL BOARD

Stephen D. Cairns	(MRC-163)
Brian F. Kensley	(MRC-163)
Mark M. Littler	(MRC-166)
Wayne N. Mathis	(MRC-169)
Jeffrey T. Williams	(MRC-159)
Joshua I. Tracey, Jr.	(MRC-137)
Warren L. Wagner	(MRC-166)
Roger B. Clapp	

National Museum of Natural History National Biological Survey, MRC-111 Smithsonian Institution Washington, D.C. 20560

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

#### PUBLICATIONS MANAGER

A. Alan Burchell

Smithsonian Institution Press

# STATUS OF CORAL REEFS IN THE WESTERN ATLANTIC: RESULTS OF INITIAL SURVEYS, ATLANTIC AND GULF RAPID REEF ASSESSMENT (AGRRA) PROGRAM

NO. 496

	PAGES
FOREWORD  Robert N. Ginsburg and Judith C. Lang	vii
CAVEATS FOR THE AGRRA "INITIAL RESULTS" VOLUME  Judith C. Lang	XV
SYNTHESIS OF CORAL REEF HEALTH INDICATORS FOR THE WESTERN ATLANTIC: RESULTS OF THE AGRRA PROGRAM (1997-2000)  Philip A. Kramer (On behalf of the AGRRA contributors to this volume)	T T T T T T T T T T T T T T T T T T T
SURVEYS	
BAHAMAS A rapid assessment of coral reefs near Hopetown, Abaco Islands, Bahamas (stony corals and algae)  Joshua S. Feingold, Susan L. Thornton, Kenneth W. Banks, Nancy J. Gasman,  David Gilliam, Pamela Fletcher, and Christian Avila	58
Assessment of the Andros Island Reef System, Bahamas (Part 1: stony corals and algae)  Philip A. Kramer, Patricia Richards Kramer, and Robert N. Ginsburg	76
Assessment of the Andros Island Reef System, Bahamas (Part 2: fishes)  Philip A. Kramer, Kenneth W. Marks, and Timothy L. Turnbull	100
Assessment of coral reefs off San Salvador Island, Bahamas (stony corals, algae and fish populations)	
Paulette M. Peckol, H. Allen Curran, Benjamin J. Greenstein, Emily Y. Floyd, and Martha L. Robbart	124
BELIZE  Assessment of selected reef sites in northern and south-central Belize, including recovery from bleaching and hurricane disturbances (stony corals, algae and fish)	
Paulette M. Peckol, H. Allen Curran, Émily Y. Floyd, Martha L. Robbart, Benjamin J. Greenstein, and Kate L. Buckman	146
BRAZIL Rapid assessment of the Abrolhos Reefs, eastern Brazil (Part 1: stony corals and algae) Ruy K.P. Kikuchi, Zelinda M.A.N. Leão, Viviane Testa, Leo X. C. Dutra, and Saulo Spanó	172
Rapid assessment of the Abrolhos reefs, eastern Brazil (Part 2: fish communities) Ruy K.P. Kikuchi, Zelinda M.A.N. Leão, Cláudio L.S. Sampaio, and Marcelo D. Telles	188

CAYMAN ISLANDS	
Status of coral reefs of Little Cayman, Grand Cayman and Cayman Brac, British West Indies,	
in 1999 and 2000 (Part 1: stony corals and algae)  Carrie Manfrino, Bernhard Riegl, Jerome L. Hall, and Robert. Graifman	204
Status of coral reefs of Little Cayman and Grand Cayman, British West Indies, in 1999	
(Part 2: fishes)	
Christy $V$ . Pattengill-Semmens and Brice $X$ . Semmens	226
COSTA RICA	
A rapid assessment at Cahuita National Park, Costa Rica, 1999 (Part 1: stony corals and algae)  Ana C. Fonseca E.	248
A rapid assessment at Cahuita National Park, Costa Rica, 1999 (Part 2: reef fishes)  Ana C. Fonseca E. and Carlos Gamboa	258
CUBA	
Rapid assessment of coral communities of María La Gorda, southeast Ensenada de Corrientes, Cuba (Part 1: stony corals and algae)	
Pedro M. Alcolado, Beatriz Martinez-Daranas, Grisel Menendez-Macia, Rosa del Valle, Miguel Hernández, and Tamara García	268
Rapid assessment of coral communities of María La Gorda, southeast Ensenada de Corrientes,	
Cuba (Part 2: reef fishes)	
Rodolfo Claro and Karel Cantelar Ramos	278
MEXICO	
Rapid assessment of Mexico's Yucatan Reef in 1997 and 1999: pre- and post-1998 mass bleaching	
and Hurricane Mitch (stony corals, algae and fishes)  Robert S. Steneck and Judith C. Lang	294
Hotor of the heat and visually e. 24mg	2,
Condition of coral reef ecosystems in central-southern Quintana Roo, Mexico (Part 1: stony corals	
and algae) Miguel A. Ruiz-Zárate, Roberto C. Hernández-Landa, Carlos González-Salas,	
Enrique Núñez-Lara, and J. Ernesto Arias-González	318
Condition of coral reef ecosystems in central-southern Quintana Roo, Mexico (Part 2: reef fish	
communities)	
Enrique Núñez-Lara, Carlos González-Salas, Miguel A. Ruiz-Zárate, Roberto Hernández-Landa, and J. Ernesto Arias-González	338
Condition of selected reef sites in the Veracruz Reef System (stony corals and algae)  Guillermo Horta-Puga	360
Netherlands Antilles	
Condition of coral reefs off less developed coastlines of Curação (Part 1: stony corals and algae)  Andrew W. Bruckner and Robin J. Bruckner	
	370
Condition of coral reefs off less developed coastlines of Curação (Part 2: reef fishes)	204
Andrew W. Bruckner and Robin J. Bruckner	394
A post-hurricane, rapid assessment of reefs in the Windward Netherlands Antilles (stony corals,	
algae and fishes)  Kristi D. Klomp and David J. Kooistra	404

ST. VINCENT	
A rapid assessment of the Horseshoe Reef, Tobago Cays Marine Park, St. Vincent, West Indies	
(stony corals, algae and fishes)	
Alice Deschamps, André Desrochers, and Kristi D. Klomp	438
TURKS AND CAICOS ISLANDS	
Assessment of the coral reefs of the Turks and Caicos Islands (Part 1: stony corals and algae)	
Bernhard Riegl, Carrie Manfrino, Casey Hermoyian, Marilyn Brandt, and Kaho Hoshino	460
Assessment of the coral reefs of the Turks and Caicos Islands (Part 2: fish communities)	
Kaho Hoshino, Marilyn Brandt, Carrie Manfrino, Bernhard Riegl, and Sasha C.Ć. Steiner	480
United States	
A rapid assessment of the Flower Garden Banks National Marine Sanctuary (stony corals,	
algae and fishes)	
Christy V. Pattengill-Semmens and Stephen R. Gittings	500
VENEZUELA	
Rapid assessment of coral reefs in the Archipiélago de Los Roques National Park, Venezuela	
(Part 1: stony corals and algae)	
Estrella Villamizar, Juan M. Posada, and Santiago Gómez	512
Rapid assessment of coral reefs in the Archipiélago de Los Roques National Park, Venezuela	
(Part 2: fishes)	
Juan M. Posada, Estrella Villamizar, and Daniela Alvarado	530
VIRGIN ISLANDS	
A rapid assessment of coral reefs in the Virgin Islands (Part 1: stony corals and algae)	
Richard S. Nemeth, Adam Quandt, Laurie Requa, J. Paige Rothenberger, and Marcia Taylor	544
A rapid assessment of coral reefs in the Virgin Islands (Part 2: fishes)	
Richard S. Nemeth, Leslie D. Whaylen, and Christy V. Pattengill-Semmens	566
ADDITIONAL AGRRA DATA	
Assessment tables for Abaco, Bahamas (fishes), Lighthouse, Belize (corals, algae, fishes) and Bonaire,	
Netherlands Antilles (corals, algae, fishes)	
Philip A. Kramer and Baerbel G. Bischof	590
SUPPLEMENTAL INFORMATION	
Condition of coral reef ecosystems in central-southern Quintana Roo, Mexico (Part 3: juvenile	
reef fishes)	
Carlos González-Salas, Enrique Núñez-Lara, Miguel A. Ruiz-Zárate,	
Roberto C. Hernández-Landa, and J. Ernesto Arias-González	598
APPENDIX ONE	
The Atlantic and Gulf Rapid Reef Assessment Protocols: Former Version 2.2	
Patricia Richards Kramer and Judith C. Lang	611
APPENDIX TWO	
Fish biomass conversion equations	
Kenneth W. Marks and Kristi D. Klomp	625

### LIST OF PLATES

## Prepared by

## Patricia Richards Kramer, Robert N. Ginsburg, and Judith C. Lang

Plate 1.	Location of AGRRA sites assessed as of mid 2003.	xiv
Plate 2.	Caribbean reef crests: then and now.	56
Plate 3.	Caribbean coral reefs: past and present baselines.	57
Plate 4.	Reef coral condition.	123
Plate 5.	Stony corals: partial mortality.	145
Plate 6.	Stony corals: recent mortality.	247
Plate 7.	Stony corals: old mortality.	267
Plate 8.	Stony corals: disease.	359
Plate 9.	Stony corals: bleaching.	393
Plate 10.	Stony corals: predation.	403
Plate 11.	Reef algae.	459
Plate 12.	Diadema antillarum.	511
Plate 13.	Reef fishes.	629
Plate 14	AGRRA methods	630