Dr James Gilmour is a Research Scientist at the Australian Institute of Marine Science. He has been studying coral reefs for over 20 years, with a particular interest in their long-term changes and processes of recovery following natural and human disturbances. For the last 10 years, much of his research has been conducted at Scott Reef.

Dr Luke Smith is Environment Manager at Woodside Energy where he leads a team that develops and supports the sustainable development of the Woodside business. He has been participating in the ongoing research program at Scott Reef since 1994. His research interests are focussed on biodiversity assessment and conservation, coral reef ecology and environmental impact assessment.

Kylie Cook is an Experimental Scientist at the Australian Institute of Marine Science. She has studied temperate and tropical ecosystems throughout Western Australia, with Scott Reef being a particular focus in recent years.

Stephen Pincock is an author and journalist who has been writing about science for 20 years. His work appears in publications such as *Nature*, *The Lancet* and the *Financial Times*. He has written several books and edited *The Best Australian Science Writing 2011*.



VISCOVERING SCOTT REEF





ERING

DISCOVERING SCOTT REEF

Scott Reef is an isolated coral reef system that rises steeply from the depths of north-western Australia's continental shelf.

Over two decades, scientists from many organisations have studied the reef's physical environment and biological communities. The results have revealed important insights into a complex ecosystem – findings that are also relevant to the sustainable management of other coral reefs around the world.

This book presents an account of the research effort at Scott Reef, sharing new understanding of this remote and beautiful part of Australia.

DISC **OVERING** SCOTT REEF

Scott Reef is an isolated coral reef system that rises steeply from the depths of north-western Australia's continental shelf. Over two decades, scientists from many organisations have studied the reef's physical environment and biological communities. The results have revealed important insights into a complex ecosystem – findings that are also relevant to the sustainable management of other coral reefs around the world. This book presents an account of the research effort at Scott Reef, sharing new understanding of this remote and beautiful part of Australia.





JAMES GILMOUR, LUKE SMITH, KYLIE COOK, STEPHEN PINCOCK



DISCOVERING SCOTT REEF







20 YEARS OF EXPLORATION AND RESEARCH James Gilmour, Luke Smith, Kylie Cook, Stephen Pincock



Australian Government



Browse Joint Venture Participants



Chevron Australia Pty Ltd – Joint Venture Participant 1979 to 2012
BHP Billiton Petroleum (North West Shelf) Pty Ltd - Joint Venture Participant 1979 to 2013

© Woodside, Australian Institute of Marine Science, 2013

National Library of Australia Cataloguing-in-Publication entry

Author:	Gilmour, James.
Title:	Discovering Scott Reef : 20 years of exploration and research / James Gilmour, Luke Smith, Kylie Cook, Stephen Pincock.
ISBN:	9780642322654 (hbk.)
Notes:	Includes bibliographical references.
Subjects:	Reefs – Western Australia. Coral reef ecology – Western Australia. Reef animals – Western Australia. Reef plants – Western Australia. Coral reefs and islands – Monitoring – Western Australia. Scott Reef (W.A.) – History.

Other Authors/

Contributors:	Smith, Luke.
	Cook, Kylie.
	Pincock, Stephen.

Cover design by Tim Simmonds Printed by Scott Print, Perth, Western Australia



This publication is printed using vegetable based inks onto paper stock that is chlorine free and manufactured from paper pulp that is sourced from sustainable plantation grown timber. Both the paper manufacture and Scott Print are certified to the highest international environmental standards.

Foreword

This book tells the story of the spectacular Scott Reef off the coast of Western Australia and how the partnership between resources company Woodside and Australia's scientists has created an unprecedented understanding of the ocean environment.

The story begins in 1971, when Woodside discovered the Torosa gas field beneath Scott Reef. Scientific interest in the area soon followed and Woodside has since supported research expeditions to Scott Reef. Starting in 1993 with the establishment of a long-term monitoring program that continues today, the Australian Institute of Marine Science (AIMS) has co-invested in much of this work.

Accurate environmental assessments of marine ecosystems like Scott Reef rely on a thorough understanding of the system and the conditions influencing it. But long-term investigations of this kind require significant investment of time and resources. Working with Woodside has offered scientists a unique opportunity to study this remote and normally inaccessible atoll. The work has produced an exceptional baseline for future environmental assessments, which was recognised in 2011 with an Environmental Award from the Australian Petroleum Production and Exploration Association. It's an example of how partnership between industry and the scientific community leads to better outcomes.

As a nation surrounded by oceans, maintaining the health of Australia's marine environments is critical to our economy and the industries that rely on its health. Our 'blue economy' was worth over \$42 billion in 2009–10, and this is projected to double in size by 2025. That makes research in this field critical to securing Australia's future prosperity while conserving our unique marine ecosystems and biodiversity.

In this book, the authors share the discoveries and highlights of their research. It covers the early history of human visitation, through to the physical and biological oceanography, and the diversity of marine life that can be found at the reef.

The Scott Reef story will continue but the chapters here tell of the rich history of exceptional scientific research, the extraordinary remoteness of the reef system and its complex ecology and fascinating oceanography.



Professor Ian Chubb AC Australia's Chief Scientist

QLG.

Contents

FOREWORD	
ACKNOWLEDGMENTS	5

INTRODUCTION.....

PAST AND PRESENT

Geological History..... Human History..... Operational Challenges.....

ENVIRONMENTAL COND

Oceanography..... Disturbances.....

BIOLOGICAL COMMUNI

Biodiversity..... Habitats..... Deep Water Communities......

CORAL ECOLOGY

Coral Reproduction..... Larval Connectivity..... Coral Recruitment..... Coral Growth and Survival......

REEF MONITORING.....

Monitoring Corals..... Monitoring Fishes.....

MEGAFAUNA.....

Turtles..... Whales and Dolphins.....

CONCLUSIONS..... REFERENCES..... IMAGE CREDITS......

	••••••
ONS	
	••••••
-	
)	

Organisations contributing to the scientific research presented in this book

- Australian Institute of Marine Science (AIMS)
- Australian Marine Mammal Centre, Australian Antarctic Division
- Centre for Whale Research (Western Australia) Inc.
- Charles Darwin University
- Commonwealth Scientific and Industrial Research Organisation (CSIRO)
- Curtin University of Technology
- Environmental Resources Management Australia Pty Ltd
- RPS Environment & Planning Pty Ltd
- Sinclair Knight Merz Pty Ltd
- URS Australia Pty Ltd
- Western Australian Museum

Acknowledgments

Clarke advised on production.

of this book.

Finally, we dedicate this book to Dr Andrew (Smiley) Heyward - a pioneer of coral reef research at Scott Reef and throughout Western Australia.

This book was made possible by the AIMS Communication group. In particular, Tim Simmonds provided the aesthetic vision and made tireless revisions to the design and layout, and Steve

Olwyn Hunt deserves our special thanks, for her invaluable support throughout the production

Many people generously donated the photographs used in this book, and a list of the contributors of each image can be found on page 179. Nick Thake, James Eu, Wayne and Pam Osborn, Phil Mercurio and Matthew Wittenrich deserve particular recognition for their many outstanding photographs. Visual Jazz created conceptual illustrations that presented information in a way that photographs could not.

Numerous experts provided advice on the text, and we are grateful to Mark Taylor, Tim Cooper, Mike Travers, Clay Bryce, Barry Wilson, Lindsay Collins, Richard Brinkman and Nicole Patten for their scientific input. Thanks to Mark Case and Ben Radford for their help with mapping, and to Kathryn Markey and Nicole Grubb for sourcing information.

We thank James Kerry for providing editorial advice and valuable improvements to the text throughout the many chapter revisions. Thanks also to Julie Pegrum and Liz Tynan for their editorial improvements to the final version of the text.

We would also like to acknowledge the scientists and support staff from all the organisations involved in the research at Scott Reef, and the operators and crew of the many vessels that have transported them to Scott Reef and back again. The master and crew of the RV Solander deserve a special mention for their commitment to their vessel, its work and the safety of all those on board.



Introduction

Scott Reef has a long history of human visitors, from the Indonesian fishers who have visited for hundreds of years, to exploration and scientific personnel in more recent times. Nevertheless, its remote location has protected it from many of the pressures affecting other reefs around the world, giving researchers a rare and valuable opportunity to study a healthy coral reef and the range of organisms that inhabit it.

Over the years, the research at Scott Reef has evolved from a basic knowledge of the reef's organisms to a comprehensive understanding of a complex ecosystem. Early taxonomic surveys described the abundance of life at the reef, and then the introduction of a monitoring program documented how coral and fish communities varied across the reef and over time. More recently, the research was further expanded to include an intensive study of the reef's physical environment and the processes responsible for the changes in its biological communities. Together, scientists have created a detailed picture of Scott Reef - invaluable information when assessing how the reef may respond to future changes.

This book gives a first-hand account of the research conducted at Scott Reef. We hope it will allow the reader to embark on their own journey, and join us in celebrating the results of the collaborative research effort and the beauty and wonder of this isolated coral reef.

Scott Reef rises steeply from the depths, near the edge of north-western Australia's continental shelf, far from the mainland and other reefs. Created from the accumulated skeletons of countless corals and algae, the reef's history can be traced back to the organisms that laid its foundations millions of years ago. Today, it is teeming with life, ranging from tiny single-celled organisms to the largest animals on the planet, all of which depend on Scott Reef's structure and biodiversity.

Spanning almost 20 years, the research program at Scott Reef is one of the longest and most comprehensive investigations of a coral reef system in Australia. The work has largely been funded by Woodside Energy Limited and its joint venture participants, and the Australian Government through the Australian Institute of Marine Science (AIMS), but many other groups have also been involved. Scientists from more than 10 organisations have come together, spending hundreds of days at sea and thousands of hours under water. Their combined goal has been to better understand this unique ecosystem.