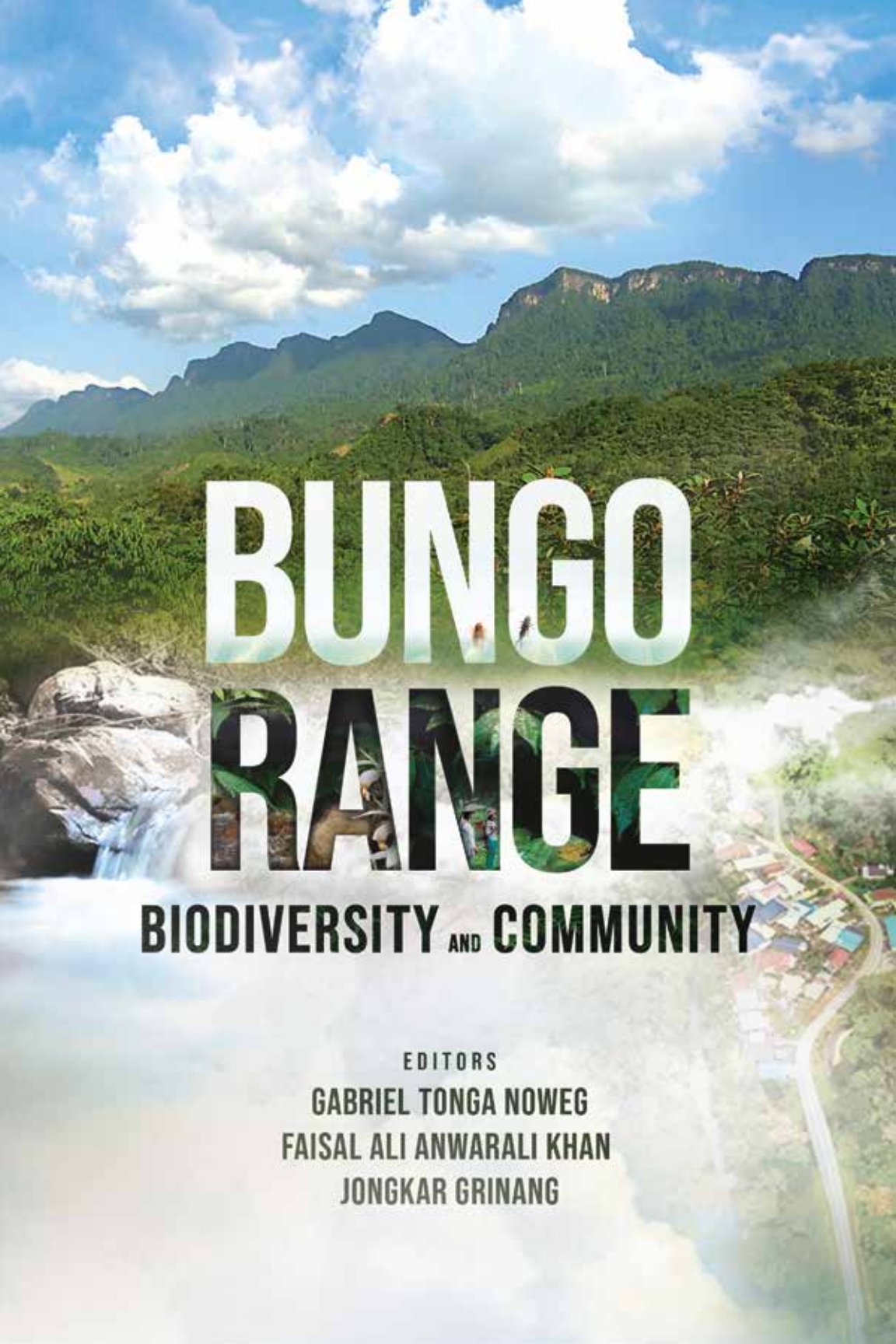

EDITORS
GABRIEL TONGA NOWEG
FAISAL ALI ANWARALI KHAN
JONGKAR GRINANG

BUNGO RANGE

BIODIVERSITY AND COMMUNITY

BUNGO RANGE

BIODIVERSITY AND COMMUNITY

EDITORS

GABRIEL TONGA NOWEG
FAISAL ALI ANWARALI KHAN
JONGKAR GRINANG

SUPPORTING EDITORS

CINDY PETER
RUNI SYLVESTER PUNGGA
ANDREW ALEK TUEN

UNIVERSITI MALAYSIA SARAWAK

BUNGO RANGE

BIODIVERSITY AND COMMUNITY

Published in Malaysia by
UNIMAS Publisher,
Universiti Malaysia Sarawak,
94300 Kota Samarahan,
Sarawak, Malaysia.

Printed in Malaysia by

Perpustakaan Negara Malaysia Cataloguing-in-Publication Data

CONTENTS

FOREWORD

I am glad to note that this publication is another excellent milestone from Universiti Malaysia Sarawak through the Institute of Biodiversity and Environmental Conservation, in particular exploring and documenting the rich biodiversity and community in Sarawak. The biodiversity and environmental conservation is one of three niche areas of the university, which recognise the need to balance the biodiversity, habitats and human development. As such, the Research Innovation and Enterprise Centre, the university's centre responsible for research and innovation, has actively facilitated and supported research activities, and publications in various platforms available to scientific communities and the public.

I would like to thank staff of the Institute of Biodiversity and Environmental Conservation for continuously conducting good research and documenting crucial information that benefits many users including scientists across the region. It is well in line with the Institute's vision to become a leading center for research in tropical biodiversity and environmental conservation in Borneo and Southeast Asian region. I would like to congratulate the editors for their efforts in compiling and editing the data resulted from a multidisciplinary expedition in Bungo Range in December 2017 into a well indexed research book. I do believe that each article in this book serves its purpose as an important reference to academics, policy makers as well as public audiences. In particular, the findings would be a useful reference for the management plan of Bungo Range National Park that was gazetted on 26 February 2009.

To materialise the multidisciplinary expedition and the publication, the Institute had collaborated with various state agencies and local communities. Therefore, I am acknowledging their support and contribution (both financial and in-kind) to this project. They are Forest Department Sarawak, Sarawak Forestry Corporation,

Sarawak Biodiversity Centre, Sekolah Kebangsaan Tringgus, Pejabat Pendidikan Daerah Bau, Bau District Office, Bau District Council, Klinik Kesihatan Krokong, Bau District Police, Bau Fire and Rescue Station, Bau Hospital, and villagers from Tringgus settlement namely, Kg Bong, Kg Rotan and Kg Nguan. I hope similar collaborative efforts will be pursued in the near future to other protected areas in Sarawak.

To the authors, UNIMAS Publisher, and those who are involved in this publication, keep up with the good team spirit.

Finally, thank you for inviting me to pen my message in this great reading material.

Prof. Dr. Wan Hashim bin Wan Ibrahim
Deputy Vice Chancellor (Research and Innovation)
Universiti Malaysia Sarawak

PREFACE

This publication marks another significant output of the collaborative works between Universiti Malaysia Sarawak and Forest Department Sarawak on biodiversity study and conservation in the State.

In this book, the findings of multidisciplinary expedition to Bungo Range in December 2017 were compiled into 24 chapters covering biodiversity, environment and community under the theme "Bungo Range - Biodiversity and Community". The theme signifies the importance of the pristine mountainous forest of the Bungo Range that supports rich species of flora and fauna, and the uniqueness of community and their customs as well as cultures. The involvement of academics, researchers and the villages in the expedition has enhanced the exchange of knowledge, skill, and experience among the stakeholders, which are reflected in this book. In particular, the participation of the villagers in the expedition had indirectly conveyed the message of the Forest Department Sarawak on the importance of conserving the forest of Bungo Range and preserving local cultures. Ironically, the Bungo Range is becoming a popular tourism destination due to the outstanding sceneries such as mountains, waterfalls, reservoir, and the cultures (e. g., the last ring ladies). Indeed, this book will serve as a useful reading material for researchers, scientists and non-government organization in their research endeavour.

We would like to congratulate the editors, authors and those who contributed to the production of this book. We wish similar outputs shall be achieved from future collaborative work between Universiti Malaysia Sarawak and Forest Department Sarawak. Specifically, we would like to thank the community leaders and heads of department in Bau District for their support throughout the project. Yang Berhormat Miro Simuh for his strong supports of the expedition and launching of the event on 5th December 2017.

We hope this book serves the needs of the audiences either as academic reference or reading material in leisure time. Happy Reading!

Prof. Dr. Mohd Azlan Jayasilan

Director
Institute of Biodiversity and
Environmental Conservation
Universiti Malaysia Sarawak

Datu Hamden Haji Mohammad

Director
Forest Department Sarawak

MACROINVERTEBRATES OF PEDID RIVER AND THE TRIBUTARIES

Jongkar Grinang, Anita Muli, Muhammad Ashiq Muzakkir bin Ahmad Thani, Gabriel Tonga Noweg and Cindy Peter

The stream's drainage of Bungo Range constitutes first to third orders, fast flowing water and rocky substrates. The water of the streams is tea-coloured in appearance during dry period due to tannin contain which is associated with kerangas forest in the catchment. Sg Pedid is the main drainage system in the upstream feed by numerous second and first orders before discharge to Sarawak Kanan River – main basin in Kuching Division.

Our surveys for macroinvertebrates by using a kick-net (30 × 32 cm, 400-micron mesh size) at six stations of Sg Bong and tributaries, and Sg Pedid in December 2017 (**Figure 6.1**) recorded a total of 40 species from 29 families and 10 orders, comprising snails, crabs, shrimps and aquatic insects in both adult and larvae forms (**Table 6.1; Figures 6.2–6.13**). All crabs and some taxa of aquatic insects are endemic to Borneo. Distribution range of crabs, *Isolapotamon bauense*, *I. grusophallus* and *Ibanum pilimanus* is restricted, thus protection of Bungo Range will conserve the species that are currently categorized in the IUCN Red List.

Several taxa of macroinvertebrates are important as source of food to local community living around the area. The taxa include snail (*Sulcospira pageli*), crabs (*Isolapotamon bauense*, *I. consobrinum*, *I. grusophallus)* and shrimps (*Macrobrachium pilimanus*, *M. scabriculum*).

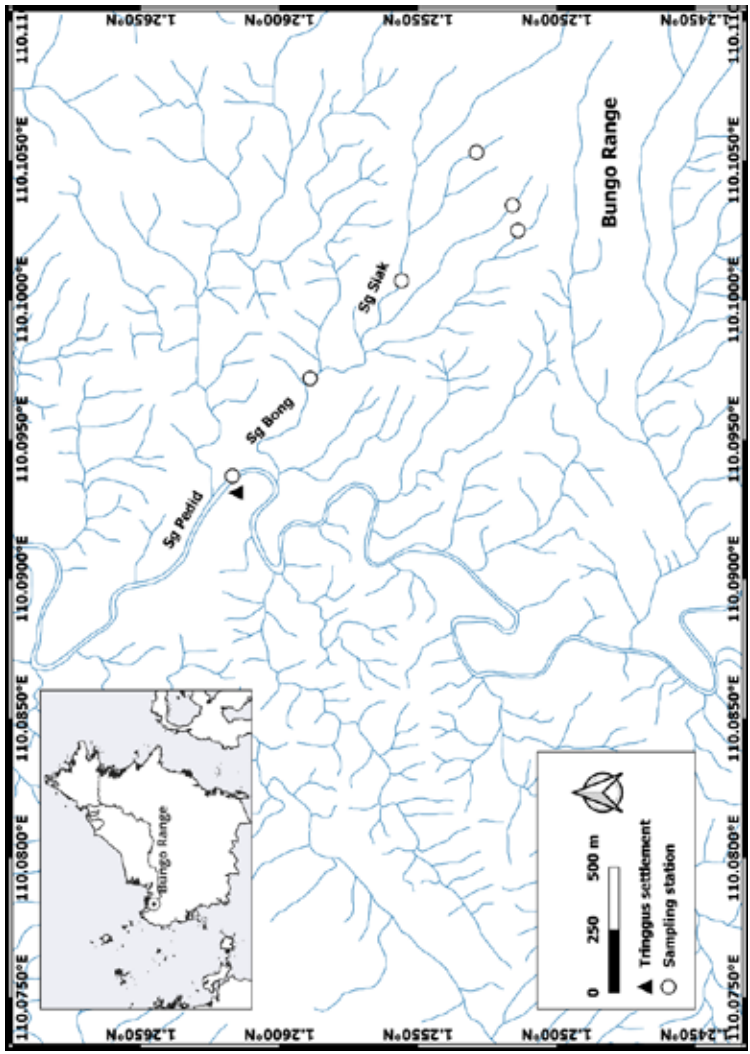

Figure 6.1. Stations of macroinvertebrate sampling.

Table 6.1. A checklist of the macroinvertebrates caught from Sg Bong and Sg Pedid in the Bungo Range, Sarawak.

Class/Order/Family	Species
MOLLUSCA	
Gastropoda (snails)	
Pachychilidae	*Sulcospira pageli* (Thiele, 1908)
MALACOSTRACA	
Decapoda (crabs and shrimps)	
Gecarcinucidae	*Terrathelphusa aglaia* Grinang & Ng, 2015
Potamidae	*Ibanum pilimanus* Ng & Grinang, 2004
	Isolapotamon bauense Ng, 1987
	Isolapotamon consobrinum (De Man, 1899)
	Isolapotamon grusophallus Ng & Yang, 1986
Palaemonidae	*Macrobrachium pilimanus* De Man, 1879
	Macrobrachium scabriculum (Heller, 1862)
INSECTA	
Odonata (damselflies and dragonflies)	
Calopterygidae	Indetermined (1 morphospecies)
Euphaeidae	*Euphaea* sp. (1 morphospecies)
Corduliidae	*Macromia* sp. (1 morphospecies)
Gomphidae	*Sieboldius* sp. (1 morphospecies)
	Indetermined (1 morphospecies)
Libellulidae	*Zygonyx* sp. (1 morphospecies)
Ephemeroptera (mayflies)	
Baetidae	*Baetis* sp. (1 morphospecies)
	Platybaetis sp. (1 morphospecies)
Heptageniidae	*Campsoneuria* sp. (1 morphospecies)
Heptageniidae	*Thalerosphyros* sp. (1 morphospecies)
Neoephemeridae	*Neoephemeropsis* sp. (1 morphospecies)
Plecoptera (stoneflies)	
Perlidae	*Phanoperla* sp (1 morphospecies)
Peltoperlidae	Indetermined (1 morphospecies)
Trichoptera (caddisflies)	
Hydropsychidae	*Hydropsyche* sp. (2 morphospecies)
Philopotamidae	Indetermined (1 morphospecies)

Hemiptera (aquatic bugs)	
Aphelocheiridae	*Aphelocheirus* sp. (1 morphospecies)
Gerridae	*Amemboa brevifasciata* Miyamoto, 1967
Gerridae	*Limnometra insularis* Hungerford & Matsuda, 1958
Gerridae	*Ptilomera chinai* Hungerford & Matsuda, 1965
Gerridae	*Ventidius malayensis* Hungerford & Matsuda, 1960
Nepidae	*Cercometus asiaticus* (Amyot & Serville, 1843)
Veliidae	*Rhagovelia sondacia* Polhemus & Polhemus, 1988
Coleoptera (aquatic beetles)	
Elmidae	Indetermined (1 morphospecies)
Eulichadidae	*Eulichas* sp. (1 morphospecies)
Gyrinidae	*Orectochilus* sp. (1 morphospecies)
Gyrinidae	*Porrhorrhynchus marginatus* Laporte, 1835
Psephenidae	*Eubrianax* sp. (1 morphospecies)
Megaloptera (alderflies and fishflies)	
Corydalidae	*Protohermes* sp. (1 morphospecies)
Diptera (true flies)	
Athericidae	*Atherix* sp. (1 morphospecies)
Blephariceridae	*Philorus* sp. (1 morphospecies)
Simulidae	*Similium* sp. (1 morphospecies)
Tipulidae	*Tipula* sp. (1 morphospecies)

Figure 6.2. Drainage system of Sg Bong, tributary of Sg Pedid. It is in nature state and serves as important habitats for macroinvertebrates.

Figure 6.3. Physical characteristics of Sg Pedid, the main drainage feeds Sarawak Kanan River.

Figure 6.4. *Sulcospira pageli*, a common freshwater snail consumed by local community in Bungo Range.

Figure 6.5. *Isolapotamon consobrinum*, a common crab. It also consumed by the local community.

Figure 6.6. *Isolapotamon grusophallus*, a montane crab (> 200 m asl) that is currently found only at high altitude of Gunung Penrissen and Gunung Singai.

Figure 6.7. *Isolapotamon bauense*, the biggest freshwater crab in Southeast Asia. It is endemic to Kuching area.

Figure 6.8. *Terrathelphusa aglaia*, a semiterrestrial montane crab that lives in burrows.

Figure 6.9. A pair of river shrimp, *Macrobrachium pilimanus* with the smaller is ovigerous female.

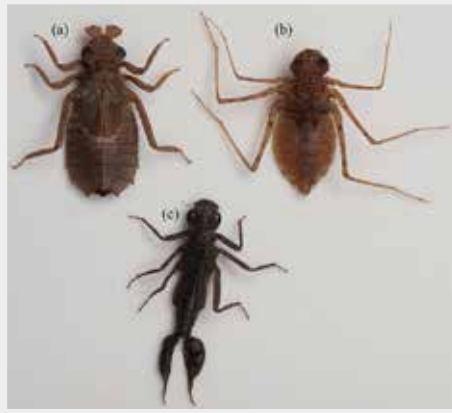

Figure 6.10. Nymphs of three odonates. (a) *Sieboldius* sp. (b) *Macromia* sp, (c) *Euphaea* sp. All odonate nymphs are predators.

Figure 6.11. *Baetis* sp., a mayfly nymph. It is abundant in Sg Bong and important scrapers for nutrient cycle in river system.

Figure 6.12. *Protohermes* sp., a fishfly larva. It preys on other aquatic insect larvae, tadpoles and fish larvae.

Figure 6.13. *Eubrianax* sp., an aquatic beetle larva.

EDITORS INFO

Gabriel Tonga Noweg is a professor in Natural Resource Management and is a Principal Fellow at the Institute of Biodiversity and Environmental Conservation. He teaches Natural Resource and Environmental Management. Most of his research works are in the areas of ecology, terrestrial biodiversity, natural resource utilization including ethnobotany and environmental management. His consultancy works are mostly related to forest biodiversity assessment and management, forest inventory and biomass assessment as well as environmental impact assessments.

Faisal Ali Anwarali Khan is lecturer at the Faculty of Resource Science and Technology, Universiti Malaysia Sarawak. He is interested on the systematics and molecular evolution of Southeast Asian mammals, particularly bats. Currently his lab is working on the evolution of several groups of bats, rodents, shrew and primates by looking at multiple genetic transmission line, including paternal, maternal and autosomal markers along with behavioural characteristic (echolocation) and geometric morphometric technique to identify taxonomic unit. He hope this will provide a better understanding on their mode

of evolution and diversification in Southeast Asia. Their lab is also moving forward with the advancement of genomic field by incorporating bioinformatics tools to better utilize natural history collection. Their lab have now embarked into the metagenomics of Primates' and Bats' gut microbiome to learn on the different factors that shaped the microbial diversity in mammals.

Jongkar Grinang is a Senior Lecturer at the Institute of Biodiversity and Environmental Conservation, Universiti Malaysia Sarawak. He also teach undergraduate students at the Faculty of Resource Science and Technology. His interest focused on research questions pertaining to fundamental aspects such as taxonomy and systematics of crabs and fish, community ecology, biological indicators, and conservation assessment. His research team also do ex-situ breeding trials for threatened species to support conservation. His team run research activities with support from private agencies (Sarawak Energy Berhad, Malaysian Palm Oil Board, Sarawak Oil Palms Berhad), public sectors (Natural Resources and Environmental Board) and international grants (Mohamed bin Zayed Species Conservation Fund, Linnean Society of London and the Systematics Association).

A marine biologist by training, **Cindy Peter** has studied coastal marine mammals in Sarawak extensively for more than a decade. The work she and the Sarawak Dolphin Project do has seen the Kuching Bay and Similajau-Kuala Nyalau coastlines being identified as Important Marine Mammals Areas by the IUCN Marine Mammal Protected Areas Task Force. Winner of the Stephen J. Leatherwood Memorial Award at the 21st Biennial Conference on the Biology of Marine Mammal in San Francisco, California, USA Cindy Peter is currently a lecturer at Universiti Malaysia Sarawak (UNIMAS) and is the Project Coordinator of the Sarawak Dolphin Project (www.facebook.com/SarawakDolphinProject), a research project run under Universiti Malaysia Sarawak.

Runi Anak Sylvester Pungga is currently the Senior Assistant Director and the Head of Research and Development (R&D) in the Forest Department Sarawak. She has been with the Forest Department for 30 years and involved in many research projects such as, Project on Development of Management Systems for Multiple Utilization of Biodiversity in the Tropical Rainforests at the Protected Areas in Sarawak (SATREPS), Tree Flora of Sabah & Sarawak (TFSS), The International Tropical Timber Organisation (ITTO), Heart of Borneo (HoB) and Sustainable Forest Management (SFM). Her expertise is in the field of botany (plant taxonomy), forest ecology, ethnobotany, orchid diversity and biodiversity conservation policy. Thus, numerous articles, scientific papers, proceedings and books were

published. During her appointment as the Head of International Affairs Division (2020 - 2022) she has been engaging in many international discussions and meetings on forestry and biodiversity including the Conference of Party (COP) for Convention on Biodiversity (CBD), Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem (IPBES), Asia Pacific Biodiversity Observation Network (APBON), ASEAN Senior Officials on Forestry (ASOF) and International Tropical Timber Council (ITTC).

Andrew Alek Tuen is a retired Professor from the Faculty of Resource Science and Technology, Universiti Malaysia Sarawak. He is currently a Research Associate to the Institute of Biodiversity and Environmental Conservation, and continues his research on the ecology of small mammals and birds. He had served as Director of the Institute for 10 years (2004 – 2014) and published numerous scientific books and journal papers.

BUNGO RANGE

BIODIVERSITY AND COMMUNITY

This book highlights the significant findings from the Multidisciplinary Expedition in Bungo Range conducted on 5-10 December 2017. The expedition was organized by the Institute of Biodiversity and Environmental Conservation, UNIMAS with support from the Forest Department Sarawak. This volume is illustrated in 24 chapters covering the historical exploration of Bungo Range, a geological feature of the mountain, water resources, aquatic biodiversity, floristics, mammals, birds, reptiles, amphibians, insects, and health and socio-economics of the Tringgus community. It is reported herewith in the book that there are a total of 313 species of plants mainly orchids and zingers, and 298 species of wildlife, among them 105 birds, 39 mammals, 92 insects, 27 reptiles, 17 amphibians, and 59 aquatic lives. Additionally, the use of natural resources by the local community in Tringgus is also presented. This book can serves as a useful reference for the development and management of Bungo Range National Park, and the communities living surrounding the area.

UNIMAS
UNIVERSITI MALAYSIA SARAWAK

ISBN

UNIMAS PUBLISHER