



BUNGO RANGE

BIODIVERSITY AND COMMUNITY

EDITORS

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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 villagers 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

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Environmental Conservation
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Datu Hamden Haji Mohammad

Director
Forest Department Sarawak

INTRODUCTION

Sarawak government has voluntarily set aside more than 2.6 million hectares of lands and water bodies as conservation areas under the Heart of Borneo (HOB) Initiatives. The Sarawak's HOB area stretch from the north in Limbang Division to the south at Tanjung Datu that boundaries with Sabah, Brunei and Kalimantan, Indonesia. Of the total HOB area, approximately 441,000 hectares are totally protected area comprising national parks, wildlife sanctuaries and nature reserves. The southern part of the HOB contains 10 protected areas many of which are tourism hotspots such as Bako National Park, Kubah National Park, Gunung Gading National Park, Matang Wildlife Centre and Tanjung Datu National Park.

Bungo Range is located at 10° 16' latitude and 110° 9' longitude of the southern side of the HOB, about 500 meter above the sea level. The mountainous primary forest of the area was gazetted as Bungo Range National Park on 26th February 2009 covering 8,096 heactares (**Figure 1.1**). Bungo Range is an important water catchment area in the upstream of the Sarawak Kiri River and Sarawak Kanan River, where the Bengoh Dam is built to provide water supply for Kuching population. The southern end of the Bungo Range is the boundary of West Kalimantan, Indonesia.

In 2017, a multidisciplinary expedition to Bungo Range was conducted as one of the activities organized in conjunction with UNIMAS's Silver Jubilee Celebration. The Institute of Biodiversity and Environmental Conservation had led the expedition with the support of Forest Department Sarawak and other Institutes as well as Faculties within the university. The goal of the expedition was to increase the visibility of UNIMAS not just to the Tringgus community, but also to answer the call of the Sarawak government that wants to emphasise the implementation of Digital Biodiversity

in this state. The expedition was conducted for two weeks with the launching of the event held on 5th December 2017 at Tringgus settlement area.

Despite the earliest exploration in the area back to year 1880s, there is a lack of information pertaining to biodiversity and socio-economy, which are necessary to enhance biodiversity conservation, and boost local economic activities in the area. The expedition had produced substantial baseline data for the management of Bungo Range National Park, and highlight the area as a tourism destination, which eventually would benefit the local community in the area. The findings of the expedition are compiled herewith, comprising historical exploration in Bungo Range, water resource, aquatic biodiversity, floristics, mammals, birds, reptiles, amphibians, insects, and health and socio-economics of the locals. In summary, this book reported a total of 313 species of plants mainly orchids and zingers, and 298 species of wildlife among others are 105 birds, 39 mammals, 92 insects, 27 reptiles, 17 amphibians, and 59 aquatic lives. Additionally, the use of natural resources by local community in Tringgus is also presented in this book.

Because the expedition had only covered a small area of the southern section of the Bungo Range, gaps of information in this edition are expected, which suggest more explorations are needed in the near future. In this regard, the editors would like to acknowledge the contribution of the authors of each article in this edition. This edition may not stop here, and we wish to be working with you all again!

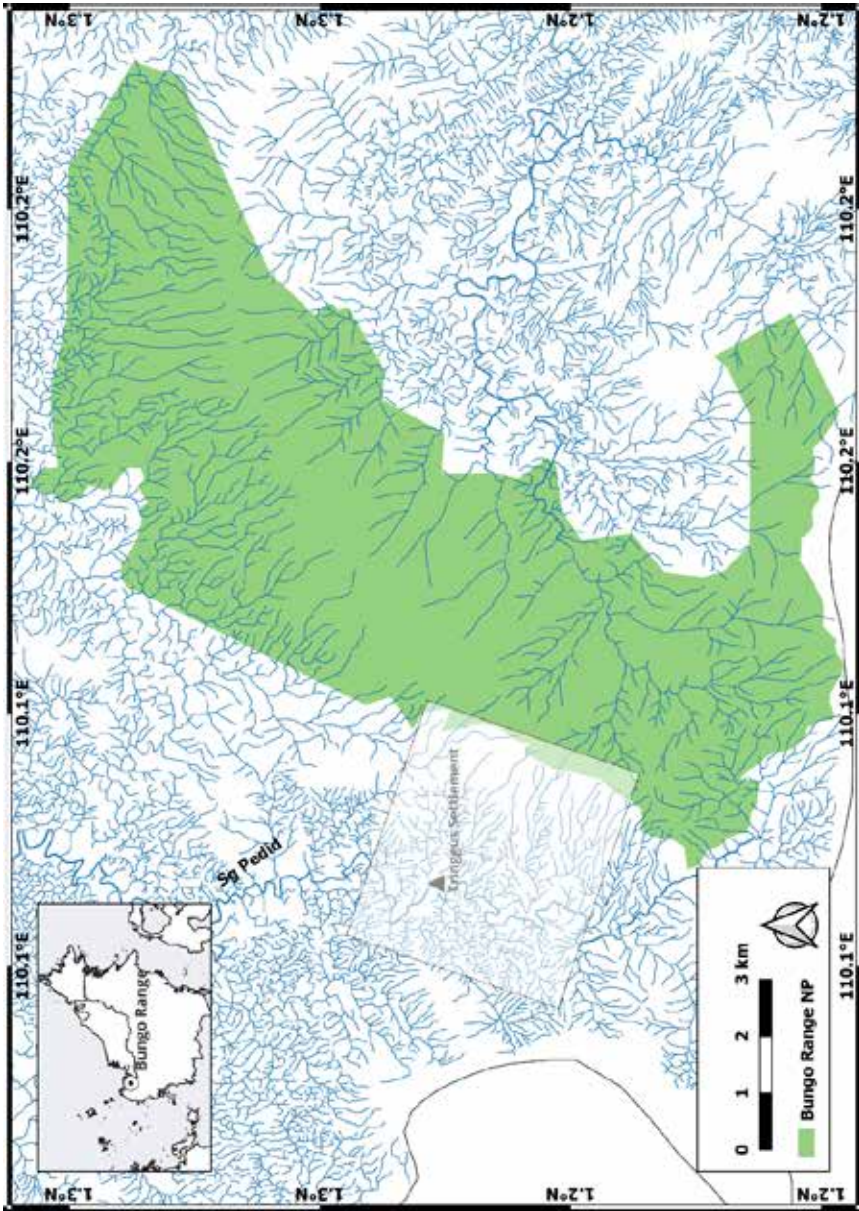


Figure 1.1. Map of Bungo Range National Park and the expedition area (shaded box).



THEME:
**GEOLOGICAL STUDY
AND ZOOLOGICAL
EXPLORATION**

FISH FAUNA OF PEDID'S TRIBUTARIES

Fazimah Aziz, Radin Azreena Radin Shahrom, Anisa Grace Robert Galang and Jongkar Grinang

Introduction

The freshwater habitats in Malaysia are made up of both natural and man-made water bodies, for example, riverine, lacustrine (natural lakes, oxbow lakes, reservoirs, former mining pools) and palustrine (freshwater, peat swamps, rice field bodies) habitats (WWFM, 2002). In general, freshwater bodies will be one of the main water sources for domestic usage. For instance, Bungo Range in Sarawak is the important water catchment area in the upstream of the Sarawak Kiri River and Sarawak Kanan River and it serves as the main water source for the nearby locals, mainly Bidayuh community. The Bungo Range is made up of primary forest which was gazetted on 26 February 2009 (Forest Department Official Website, 2017) and surrounded by the secondary forest which was cleared for logging and agriculture purposes. Although some of the forest structure had faced some alteration, the freshwater streams are considered as relatively less disturbed and expected to be home for many species of freshwater fish. Hence, this study aims to document fish species found from the selected tributaries of Sarawak Kanan river near the range. This study will provide information on the fish species occurring in the freshwater streams of the range and the reliable baseline data for constructing the measures to conserve a specific ecosystem.

Materials and methods

Sample collections were conducted from 8th to 9th December 2017. The main method used in this survey was electrofishing. Electrofishing was conducted based on the suitability of the study site areas and it covered 100 metres upstream from the starting point for all selected rivers. The voltage of the modified electroshocker used for this survey was ranged 200-300W. The samples collected were identified mainly based on Kottelat et al. (1993), Inger and Chin (2002) and rechecked the validity of the species at Eschmeyer's Catalog of Fish website. After being measured and identified, the live specimens were released back and dead individuals were brought back as voucher samples. These specimens were preserved in 10% formalin and later transferred to 75% ethanol solution for long term storage. All the samples caught were deposited at the Aquatic Museum UNIMAS.

Sampling sites

Five sampling sites were selected to represent all the freshwater streams in Bungo Range (**Figure 5.1, Table 5.1**). The habitats present near the Bungo Range vicinity is relatively similar, which is represented by foothill streams, fastflowing clear water with rock and gravel substratum and depth approximately 0.5 metre.

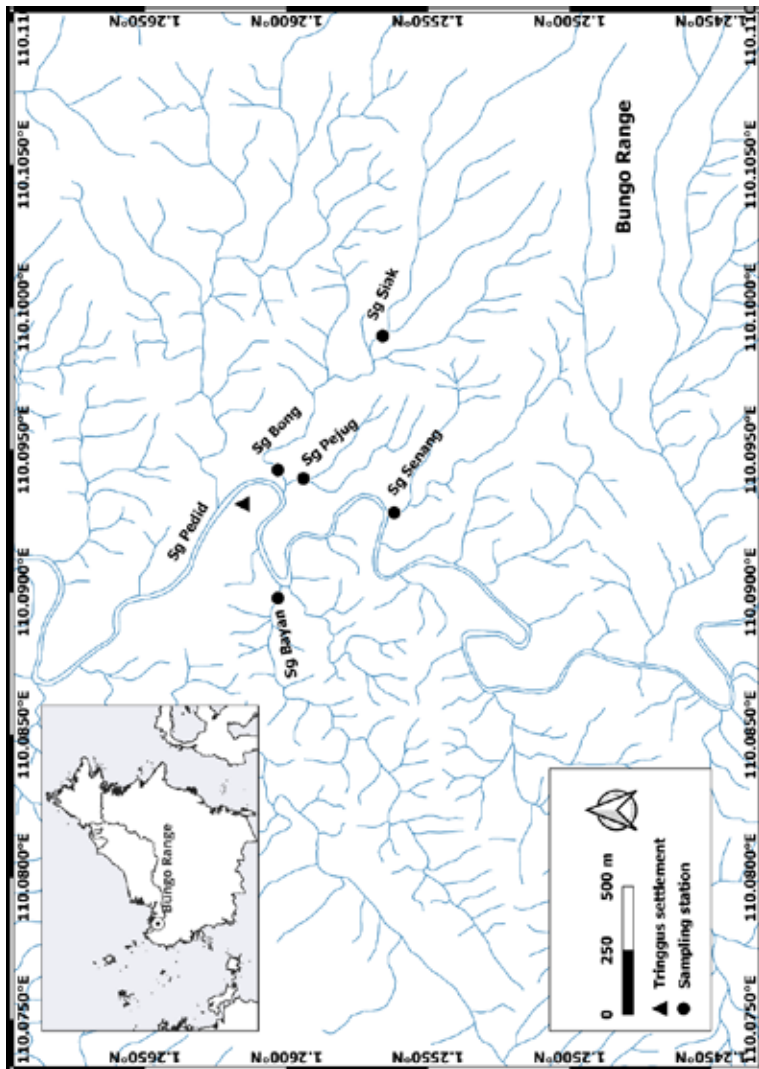


Figure 5.1. The map of sampling sites near Bungo Range National Park, Bau.

Table 5.1 Habitat descriptions of each sampling site.

Stations	Coordinates	Habitat descriptions
Sg Bong	N 1°15'37.1"; E 110°5'39.5"	The sampling sites are mainly fast-flowing clear water stream.
Sg Siak	N 1°15'23.8"; E 110°5'56.4"	
Sg Pejug	N 1°15'33.8"; E 110°5'38.4"	The bottom area of the stream is covered by sandy/gravel substrate.
Sg Senang	N 1°15'22.3"; E 110°5'34.1"	
Sg Bayan	N 1°15'37.1"; E 110°5'23.3"	

Results and discussion

A total of 209 fish specimens belonging to 12 genera and 19 species were collected from all five selected rivers. The most common species found in this study were *Barbodes kuchingensis* and *Barbodes sealei* that were found in all five rivers.

Species	Sg Bong	Sg Siak	Sg Pejug	Sg Senang	Sg Bayan
<i>Paracrossochilus vittatus</i>				+	
<i>Paracrossochilus acerus</i>	+	+			+
<i>Cyclocheilichthys apogon</i>	+			+	+
<i>Barbodes kuchingensis</i>	+	+	+	+	+
<i>Barbodes sealei</i>	+	+	+	+	+
<i>Barbodes everetti</i>			+		
<i>Barbodes banksi</i>				+	+
<i>Hampala bimaculata</i>	+	+		+	
<i>Hampala macrolepidota</i>				+	
<i>Rasbora sarawakensis</i>	+		+	+	+
<i>Rasbora calliura</i>	+			+	+
<i>Rasbora elegans</i>	+	+	+		

<i>Gastromyzon</i> sp.	+	+			
<i>Glyptothorax major</i>	+				
<i>Nemacheilus saravacensis</i>	+				
<i>Macrognathus maculatus</i>			+	+	+
<i>Hemirhamphodon byssus</i>			+	+	+
<i>Channa lucius</i>				+	
<i>Tor tambra</i>				+	

Based on the IUCN Red List of Threatened Species (2019), there are 5 species that were categorized as Least Concern including *Cyclocheilichthys apogon*, *Hampala macrolepidota*, *Channa lucius*, *Macrognathus maculatus*, and *Rasbora elegans* (**Figure 5.2D, F**). The other 11 species that are still not evaluated yet according to the IUCN Red List of Threatened Species are *Glyptothorax major*, *Nemacheilus saravacensis*, *Hampala bimaculata*, *Paracrossochilus vittatus*, *P. acerus*, *Barbodes sealei*, *B. everetti*, *B. banksi*, *B. kuchingensis*, *Hemirhamphodon byssus*, and *Rasbora sarawakensis* (**Figure 5.2A, B, C, E, G, H**). *Rasbora calliura* is assessed as Near Threatened although the population trend is unknown as this species inhabit habitat that are facing threats such as housing and urban area, agriculture, logging and harvesting aquatic resource and lastly pollution caused by domestic and urban waste water and agricultural effluents. However, *Rasbora calliura* occurred in at least one protected area despite its problematic distribution (Lumbantobing, 2019). *Tor tambra* is assessed as Data Deficient as the declination is not yet known. Although the population size and distribution is unknown however it is decreasing in population trend (Kottelat et al., 2018). This species is targeted in fisheries for human consumption. The alteration of rivers resulted by the human activities such as logging, deforestation and agriculture cultivation throughout the species range, associated with the aquatic impacts eventually may interrupt this species to repopulate (Kottelat, 2012). Although Bungo Range secondary forest is the product of logging activities during

1995 and currently slowly being shifted for local exploitation, the *Tor tambra* still can be found inhabiting the Bungo Range river indicating that this species is probably in the process of repopulating as the riverine system is less disturbed. Hence, it is better to construct a plan to conserve this specific ecosystem.

From previous study conducted at Rayu River, Sarawak, Borneo by Doi et al. (2001), they stated that *Channa lucius* was sampled alongside with *Barbodes everetti*, *B. kuchingensis*, *Rasbora sarawakensis*, *B. banksi*, *Hemirhamphodon* sp. and *R. sumatrana*. Hence, all the sampling sites which all the stated species found to occur, has high possibilities of occurrence of other sympatric species highlighted by Doi et al. (2001). Furthermore, all the sampling sites' substratum are composed of sand, pebbles and rocks with submerged woody debris and leaf litter which have the wide range of habitat for these species to occupy. In addition, the different number of species caught for each river is also affected by the activities of the local people, which comprise electrofishing and the most recent was two weeks before this present sampling was performed.

Conclusions and recommendations

A total of 19 species from 12 genera which are *Paracrossocheilus vittatus*, *P. acerus*, *Cyclocheilichthys apogon*, *Barbodes kuchingensis*, *B. sealei*, *B. everetti*, *B. banksi*, *Hampala bimaculata*, *H. macrolepidota*, *Rasbora sarawakensis*, *R. calliura*, *R. elegans*, *Gastromyzon* sp., *Glyptothorax major*, *Nemacheilus saravacensis*, *Macrogathus maculatus*, *Hemirhamphodon byssus*, *Channa lucius* and *Tor tambra* were recorded in Bungo Range throughout this survey. The sampling period for this study is not enough to provide reliable baseline data for conservation framework, and it is crucial to conduct several fields sampling seasonally to fully assess the fish composition at this area. Electrofishing wantonly and without proper supervision is a destructive practise in terms of indiscriminate use and harvest, but if performed properly and under proper supervision, it is the most efficient method of surveying aquatic biodiversity in riparian habitats for ecological

and baseline studies with minimal impact. And when electrofishing is properly conducted, fish can be revived and returned to the riverine habitat unharmed. In this survey, the voltage of the electroshocker used were very minimal (200-300 W) and most of the samples were still alive, and they were released back after being processed. The period for the next field sampling need to be carefully planned to give the fish species enough time to repopulate. Besides, it is also crucial to carefully monitor and choose the correct sites so that it can cover specific microhabitats that shelter specific fish species.

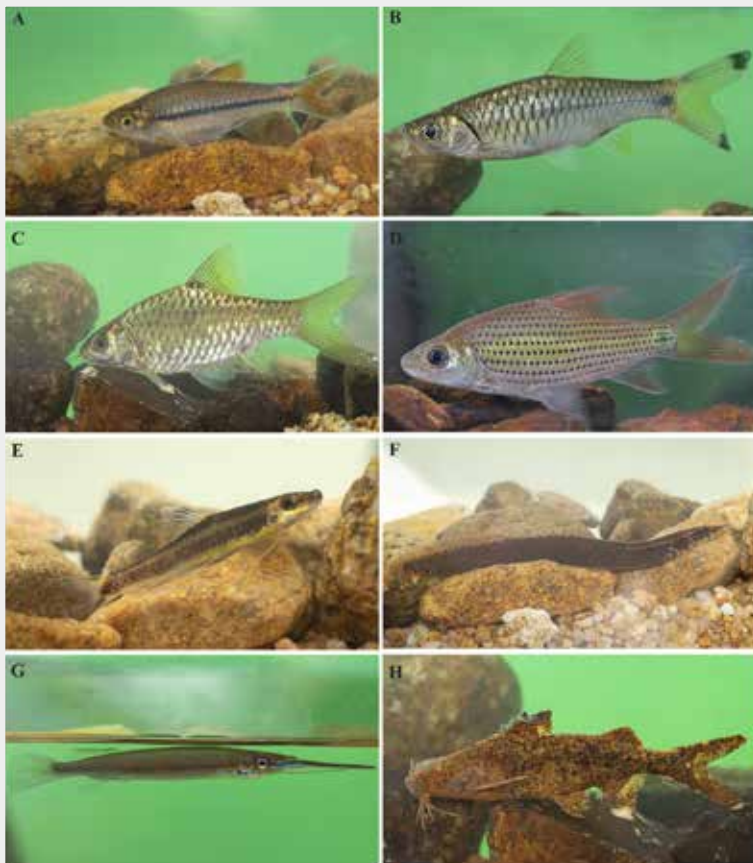


Figure 5.2. Fish species caught from streams in Bungo Range. A, *Rasbora sarawakensis*, B, *Rasbora calliura*, C, *Barbodes banksi*, D, *Cyclocheilichthys apogon*, E, *Paracrossochilus vittatus*, F, *Macrogathus maculatus*, G, *Hemirhamphodon byssus*, H, *Glyptothorax major*.

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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 serve as a useful reference for the development and management of Bungo Range National Park, and the communities living surrounding the area.