

The background of the cover is a vibrant landscape photograph. At the top, a blue sky is filled with large, white, fluffy clouds. Below the sky, a range of dark, forested mountains stretches across the horizon. In the middle ground, a dense, green forest covers the slopes of the mountains. On the left side, a waterfall cascades over large, grey rocks. On the right side, a small village with colorful houses and a winding road is visible, partially obscured by a layer of white mist or low clouds. The title 'BUNGO RANGE' is prominently displayed in the center. 'BUNGO' is in large, white, bold, sans-serif capital letters. 'RANGE' is in large, black, bold, sans-serif capital letters, with a detailed illustration of a bird perched on a branch integrated into the letter 'A'.

BUNGO RANGE

BIODIVERSITY AND COMMUNITY

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BUNGO RANGE

BIODIVERSITY AND COMMUNITY

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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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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!

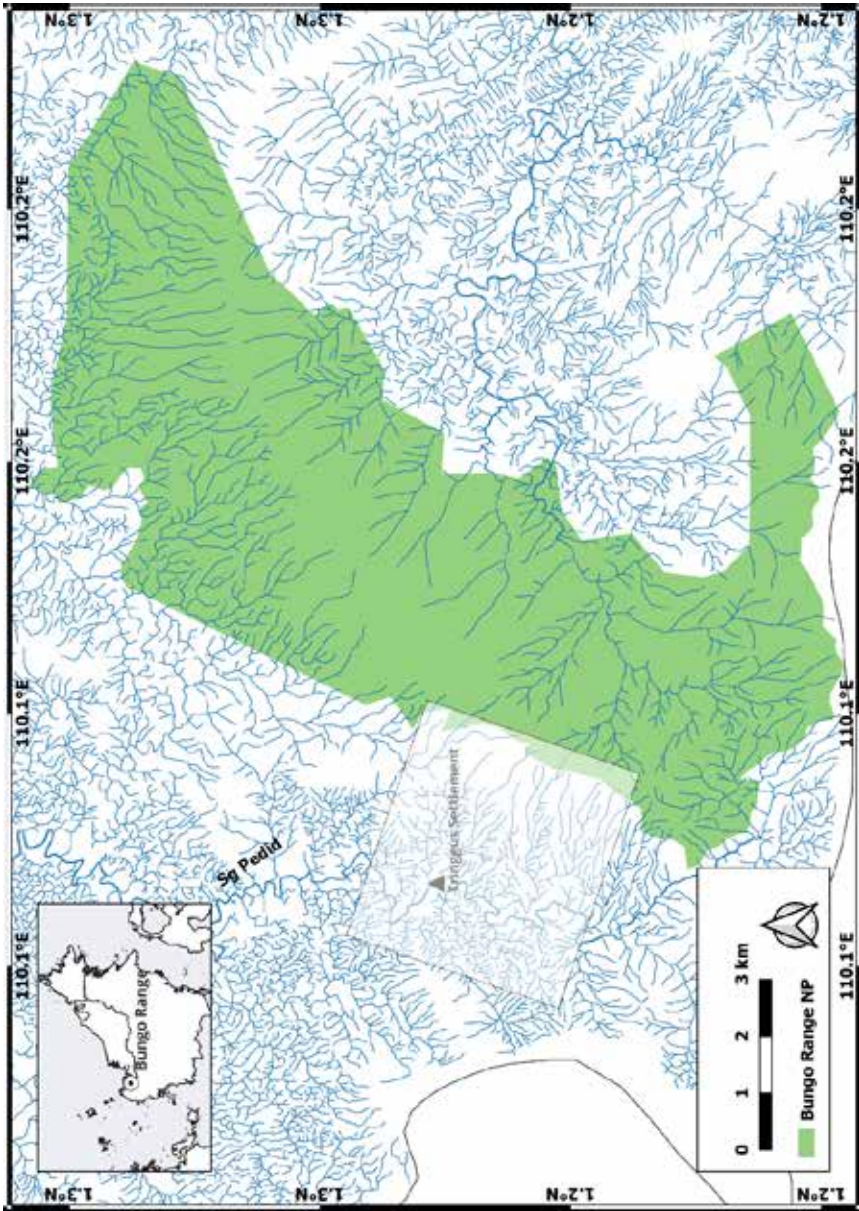


Figure 1.1. Map of Bungo Range National Park and the expedition area (shaded box).



THEME:
**GEOLOGICAL STUDY
AND ZOOLOGICAL
EXPLORATION**

ORCHIDS OF BUNGO RANGE

Meekiong Kalu, Mohd Akmal Mohd Raffi, Hashimah Elias and Mogeret Sidi

Orchids, which belong to the large angiosperm family of Orchidaceae, are valued for their unique floral morphological features and ecological services owing to their sensitivity towards changes in the surrounding environment along with complex interactions with other biotic components. Orchids are widely distributed in Malaysia, from the coastal forests to the mountain peaks, where its highest diversity has been documented predominantly in the mixed dipterocarp forests type (Wood, 1984). It is estimated that the present number of orchids are an astonishing 28,000 species worldwide from 763 genera (the number is most likely to exceed 100,000 species if all the hybrids are accounted for) (Otero, 2012). Approximately 10% of the total species are recorded from the Borneo Island, of which 1,200 species can be found in Sarawak (Beaman et al., 2000). However, it is expected that more species are yet to be documented from this species-rich region as Sarawak is blessed with vast and unexplored forested areas.



Plate 9.1. *Bulbophyllum corolliferum*



Plate 9.2. *Bulbophyllum lasianthum*



Plate 9.3. *Bulbophyllum mirum*



Plate 9.4. *Claderia veratrifolia*



Plate 9.5. *Coelogyne cf. monilirachis*



Plate 9.6. *Malaxis nummularifolia*

This study is carried out in considering the absence of an orchid section in the floristic accounts of Bungo Range National Park that encompasses 8096 hectares in total area. Thus, botanical surveys were conducted to provide an inventory of composition of the orchid species within the national park and its close vicinity; in its southwest region (Kg Tringgus) and its northern part (*via* Bengoh Dam Resettlement Area).

A provisional documentation of orchids in the Bungo Range National Park has resulted in the discovery of 78 orchid species from 26 genera. One-third or approximately 30% of the total number was contributed by two genera, *Bulbophyllum* and *Dendrobium* with 15 and 12 species respectively. Three genera, viz. *Agrostophyllum*, *Coelogyne* and *Eria* shared the same number of representatives totaling five species each. This is followed by another three genera namely, *Dendrochillum*, *Oberonia* and *Trichotosia* each with three species respectively. *Apostasia*, *Liparis*, *Malaxis*, *Neuwiedia*, *Thrixspermum* and *Vrydagzynea* were represented by two species while the remaining genera consisted only a species for each genus.



Plate 9.7. *Aerides odorata*



Plate 9.8. *Arundina graminifolia*

With a list of 2500 species, the genus *Bulbophyllum* is undoubtedly the largest genus within Orchidaceae. It is a pantropical genus, occurring throughout the tropical countries with New Guinea as the epicentre with more than 400 species reported (Schuiterman, 2013). The island of Borneo is probably the second *Bulbophyllum* hotspot with approximately 200 species, with the number increasing dramatically in recent years (Vermeulen, 1991). This genus is the most commonly found throughout Sarawak and frequently recorded as the most specious orchid genus for every surveyed area. Among the recorded *Bulbophyllum* species in Bungo Range National Park, *Bulbophyllum medusae* and *Bulbophyllum uniflorum* are more commonly found as compared with the other sighted species such as *Bulbophyllum lasianthum*, *Bulbophyllum macranthum* and *Bulbophyllum mirum*. All of the *Bulbophyllum* species are either epiphytes or lithophytes.



Plate 9.9. *Bulbophyllum macranthum*



Plate 9.10. *Coelogyne swaniana*

The genus *Dendrobium* is the second largest genus in Orchidaceae with approximately 1,800 species registered throughout the world (Wood, 2013). Its species distribution is centred in Southeast Asia. *Dendrobium* is among the more appreciated orchid genus in the floriculture industry owing to its large, showy and long-lasting flowers. In the surveys, *Dendrobium crumenatum* or the pigeon orchid is the most common species and found frequently in exposed areas; particularly on the trunks and branches of fruit trees in settlement areas. Other *Dendrobium* species recorded were *Dendrobium anosmum*, *Dendrobium secundum* and *Dendrobium leonis*.

Another important finding during the survey is the documentation of terrestrial orchids which exhibit striking leaf colourations leading them to be popularly known as *jewel orchids*. The genera recorded were composed of *Macodes*, *Malaxis*, *Goodyera*, *Kuhlhasseltia* and *Vrydagzynea*. *Macodes* is a monotypic genus that is endemic to the Southeast Asia region (Beaman et al., 2000). The leaves of *Macodes petola* are easily confused with another jewel orchid genus, *Dossinia* (also a monotypic genus) which is a calcicolous species, restricted only to the limestone habitat. According to IUCN, *Macodes petola* is assessed as vulnerable (VU) owing to the risk of over-collection and its use as a stimulant in Borneo traditional herbal medication. Two species each from the genus *Vrydagzynea*, (*Vrydagzynea albida* and *Vrydagzynea tristriata*) and *Malaxis* (*Malaxis nummularifolia* and *Malaxis latifolia*) are noted as common occurrence in the Bungo Range National Park.



Plate 9.11. *Calathea sylvatica*



Plate 9.12. *Cleisostoma discolor*

Apart from the jewel orchids, there were several other terrestrial species reported during the field excursions namely *Apostasia nuda*, *Apostasia wallichii*, *Habenaria* sp., *Neuwiedia borneensis*, *Neuwiedia veratrifolia*, *Plocoglottis acuminata* and *Spiranthes* sp. The genus *Apostasia*, also known as *grass orchid*, is a small primitive genus with tiny star-like flowers and barely recognizable as an orchid. The taxon has only nine species recorded in Asia (Stern et al. 1993). The presence of *Apostasia* signifies that the forests within Bungo Range National Park are olden forests. Commonly mistaken as *Pandanus* or a member of Cyperaceae, *Neuwiedia veratrifolia* and *Plocoglottis acuminata* are common along the trails. They are easily recognized as the plants are frequently found with flowers.

The diversity of the orchids in the national park is broadened by the enumeration of a holomycotrophic orchid. The specialized group in Orchidaceae is sometimes mistakenly called as saprophytic orchids, although the correct usage of the term is only subjected to fungi as they can directly utilize dead organic material. The holomycotrophic plants are partly or entirely non-photosynthetic and obtains food from mycorrhiza fungi that grows on its roots. This group is solely represented by the small (about 30 cm in height) *Aphyllorchis montana* and was abundantly distributed along the ridge and gully below the large trees in the studied area.

The number of orchid species recorded is considered insignificant when proportioned to its vast natural landscape and its neighbouring area, the Dered Krian National Park with more than 200 orchid species listed. It is estimated that the number of orchids in Bungo Range National Park might exceed 150 species if more field excursions are conducted, especially in areas never visited by botanists before.



Plate 9.13. *Neuwiedia veratrifolia*



Plate 9.14. *Nephelaphyllum pulchrum*



Plate 9.15. *Plocoglotis acuminatum*



Plate 9.16. *Thrixspermum centipeda*

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.