



BAKO — Biodiversity Between Land and the Sea

Edited by Mohd-Azlan, Suaidi & Das

Life from Headwaters
to the Coast

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Biodiversity
Between Land
and the Sea

Edited by

Jayasilan Mohd-Azlan
Mohamad Kadim Suaidi
Indraneil Das

UNIMAS
UNIVERSITI MALAYSIA SARAWAK

UNIMAS PUBLISHER



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Natural History
Publications (Borneo)

2023

Published by

UNIMAS Publisher

Universiti Malaysia Sarawak
94300 Kota Samarahan
Sarawak, Malaysia.
Website: www.unimas.my

in association with

Natural History Publications (Borneo) Sdn. Bhd. (216807-X)

A913, 9th Floor, Wisma Merdeka Phase 1
P.O. Box 15566, 88864 Kota Kinabalu, Sabah, Malaysia.
Tel: 088-233098 Fax: 088-534502
Website: www.nhpborneo.com

Life from Headwaters to the Coast:

Bako. Biodiversity Between Land and the Sea

Edited by Jayasilan Mohd-Azlan, Mohamad Kadim Suaidi and Indraneil Das

ISBN 978-967-0054-16-2

First published 2023.

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Copy Editor: Genevieve V. A. Gee

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Half-page: Sea Stack. Photo: Hans Hazebroek

Front cover: Silvered Langur. Photo: Chien C. Lee

Frontispiece: Sandstone gate at Telok Tajor. Photo: Hans Hazebroek

Printed in Taiwan

Perpustakaan Negara Malaysia

Cataloguing-in-Publication Data

Life from Headwaters to the Coast : BAKO : Biodiversity Between Land and the Sea / Edited by Jayasilan Mohd-Azlan, Mohamad Kadim Suaidi and Indraneil Das. ISBN 978-967-0054-16-2

1. Biodiversity--Malaysia--Sarawak.
2. National parks and reserves --Malaysia--Sarawak.
3. Taman Negara Bako (Sarawak, Malaysia).
4. Government publications--Malaysia.

I. Jayasilan Mohd-Azlan. II. Mohamad Kadim Suaidi. III. Indraneil Das.
333.950959522

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FOREWORD

Sarawak retains some of the richest biodiversity in the world. It is home to many endemics and species of conservation importance. Some of the best examples can be found in the State's extensive network of protected areas. Many of us here in the Ministry continuously explore the exquisiteness of biodiversity in the hopes of harnessing and sharing of information with the general public, to appreciate such elements present in our protected areas. This book represents but a sample of the work done by academics in the realm of biodiversity from Universiti Malaysia Sarawak and experts from various other agencies. I would like to commend the efforts by these researchers who supported us in collecting information on the biodiversity in such species-rich areas as Bako, which forms the material for the book.



The work is also expected to be important for local communities, to enhance their understanding, appreciation and perhaps eventually, guide their use of such resources sustainably, acting as an interpretation tool to guide ecotourists and naturalists.

As will be evident to the readership, a variety of approaches have been taken by the authors of the volume. Sections, starting with reminiscences from the early days by the Earl of Cranbrook, and on geology and geomorphology, are divided along taxonomic and thematic lines. These include a general account of the tree flora and selected herbaceous flora, a review of carnivorous plants and one on the mushrooms. The faunal accounts include both invertebrates and vertebrates, ranging from mosquitoes to monkeys. A section highlights the biology of Bako's charismatic species, that attract so many tourists to the Park. Finally, the section on human dimensions round up the volume, with a chapter on ecotourism in Bako National Park.

FOREWORD

It is my hope that this book will contribute in a significant way by encouraging more people to appreciate nature, explore our biodiversity and win more supporters. I anticipate that this volume will be useful to stakeholders to whom we remain connected through our common views on biodiversity conservation for the future generation.



Yang Berhormat Dato Sri Haji Abdul Karim Rahman Hamzah
Minister of Tourism, Creative Industry, Performing Arts;
Minister of Youth, Sports & Entrepreneur Development Sarawak



BUTTERFLIES

Pang Sing Tyan, Ratnawati Hazali and Wan Nurainie Wan Ismail

Well-known for their ecological role as pollinators, butterflies are universally admired as possibly the most beautiful of insects. In addition, butterflies are indicators of habitat types, on account of their host plant-dependency.

Despite its relatively small size, Bako National Park is home to seven distinct types of forests: beach forest, heath forest, open shrubland, mangrove forest, mixed dipterocarp forest, cliff vegetation and riverine forest- each with its distinct butterfly community. Observations of butterflies took place mostly in the vicinity of the Park Headquarters, where representatives of several forest types can be accessed. Both active and passive methods were used, such as aerial nets and traps baited with ripe pineapples. Sampling took place for seven and six consecutive days, respectively, in August (dry season) and November (beginning of wet season) 2005.

A total of 109 species of butterflies from 57 genera, representing five families, namely Papilionidae, Pieridae, Nymphalidae, Lycaenidae and Hesperiiidae, were recorded. These represent approximately 12% of the butterfly fauna documented from Malaysian Borneo. Nymphalidae, with 49 species, was the most represented in this survey, followed by Lycaenidae, Papilionidae, Pieridae and Hesperiiidae, represented by 36, 10, eight and six species, respectively.



Fig. 1. *Parantica agleoides borneensis* feeding on nectar. Photo: Cynthia Lobato.



Fig. 2. *Mycalesis fusca adustata* possesses eyespots on wing undersides. Photo: Cynthia Lobato.

BUTTERFLIES

The Common Birdwing (*Troides helena mosychlus*) and the Malay Birdwing (*Troides amphrysus flavicollis*), which belong to the Papilionidae, are listed in Appendix II under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). *Troides helena mosychlus* is the most common Birdwing species. It is strikingly patterned, with uniformly black forewings in males, while the hindwings are rich golden yellow edged in black. Another Birdwing, the Great Helen (*Papilio iswara araspes*) which was reported to be rare on Borneo, was encountered. *Tanaecia orphne* and *Arhopala dajagaka* are notable in being Bornean endemics.

The Cycad Blue (*Luthrodes pandava pandava*) (Lycaenidae) was the most encountered species in the Bako National Park. Their ubiquity is due to the *Cycas* plants (host plants) of this species were planted abundantly at the Park Headquarters and low flight around the said plants. Scarce Saturn (*Zeuxidia doubledayi horsfieldii*) is the most abundant species sampled in the baited traps deployed in all habitats.

The butterfly fauna of Bako National Park, despite the rather short observation period, is shown to be rich and the Park is also a reservoir of threatened and protected species (see Checklist).



Fig. 3. Occasionally, butterflies are seen with their wings wide open during resting as in this *Papilio demolition demolion*. Photo: Cynthia Lobato.



Fig. 4. Two individuals of *Eurema* sp. around flowers. Photo: Cynthia Lobato.

BUTTERFLIES

Checklist

Butterflies recorded from Bako National Park, Sarawak.
Current: 1 September 2022. Abbreviation: * = Endemic to Borneo.

Family	Scientific Name	Common Name	IUCN Red List
Papilionidae	<i>Arisbe agamemnon agamemnon</i>	Tailed Jay	-
	<i>Arisbe antiphates itamputi</i>	Five-bar Swordtail	-
	<i>Losaria neptunus doris</i>	Common Neptune	Least Concern
	<i>Graphium empedovana empedovana</i>	Malayan Yellow Bottle	Least Concern
	<i>Graphium eurypylus mecisteus</i>	Great Jay	-
	<i>Pachliopta antiphus antiphus</i>	-	Least Concern
	<i>Papilio demolion demolion</i>	Banded Swallowtail	-
	<i>Papilio iswara araspes</i>	Great Helen	-
	<i>Troides amphrysus flavicollis</i>	Golden Birdwing	Least Concern
	<i>Troides helena mosychlus</i>	Common Birdwing	Least Concern
Pieridae	<i>Catopsilia pyranthe pyranthe</i>	Mottled Emigrant	-
	<i>Eurema andersonii borneensis</i>	Anderson's Grass Yellow	Least Concern
	<i>Eurema blanda blanda</i>	Three-spot Grass Yellow	-
	<i>Eurema lacteola lacteola</i>	Scarce Grass Yellow	-
	<i>Eurema nicevillei nicevillei</i>	Banded Grass Yellow	-
	<i>Eurema sari sodalis</i>	Chocolate Grass Yellow	-
	<i>Gandaca harina elis</i>	Tree Yellow	-
	<i>Leptosia nina malayana</i>	Psyche	-
Nymphalidae	<i>Amathusia phidippus phidippus</i>	Palm King	-
	<i>Athyma clerica clerica</i>	Strange Sergeant	-
	<i>Athyma kanwa kanwa</i>	Dot-dast Sergeant	-
	<i>Athyma nefte subrata</i>	Colour Sergeant	-

BUTTERFLIES

Family	Scientific Name	Common Name	IUCN Red List
	<i>Charaxes durnfordi everetti</i>	Chestnut Rajah	-
	<i>Chersonesia peraka peraka</i>	Little Maplet	-
	<i>Cirrochroa emalea emalea</i>	Malay Yeoman	-
	<i>Cirrochroa malaya calypso</i>	Malayan Yeoman	-
	<i>Cirrochroa tyche thilina</i>	Common Yeoman	-
	<i>Coelites epiminthia epiminthia</i>	-	-
	<i>Cupha erymanthis erymanthis</i>	Rustic	-
	<i>Danaus melanippus thoe</i>	Black Veined Tiger	-
	<i>Elymnias hypermnestra nigrescens</i>	Common Palmfly	-
	<i>Elymnias nesaea hypereides</i>	Tiger Palmfly	-
	<i>Elymnias penanga kongka</i>	Pointed Palmfly	-
	<i>Euthalia godarti vacillaria</i>	-	-
	<i>Euthalia monina bipunctata</i>	Malay Baron	-
	<i>Faunis stomphax stomphax</i>	Banded Faun	-
	<i>Hypolimnas bolina philippensis</i>	Great Egg-Fly	-
	<i>Ideopsis juvena kinitis</i>	Grey Glassy Tiger	-
	<i>Ideopsis vulgaris interposita</i>	Blue Glassy Tiger	Least Concern
	<i>Junonia atlites atlites</i>	Grey Pansy	-
	<i>Junonia hedonia ida</i>	Brown Pansy	-
	<i>Junonia orithya metion</i>	Blue Pansy	Least Concern
	<i>Lasippa monata monata</i>	Fuliginous Sailer	-
	<i>Lasippa tiga empat</i>	Malayan Lascar	-
	<i>Lebadea martha paduca</i>	Knight	-
	<i>Lexias dirtea chalcenoides</i>	Black Tipped Archduke	-
	<i>Lexias pardalis dirteana</i>	Common Archduke	-
	<i>Mycalesis anapita fucentia</i>	Common Bush Brown	-
	<i>Mycalesis fusca adustata</i>	Malayan Bush Brown	-
	<i>Mycalesis janardana baluna</i>	-	-
	<i>Mycalesis mineus macromalayana</i>	Dark-band Bush Brown	-
	<i>Neptis omeroda omeroda</i>	Dingy Sailor	-

BUTTERFLIES

Family	Scientific Name	Common Name	IUCN Red List
	<i>Pantoporia dindinga</i>	Greyline Lascar	-
	<i>Pantoporia paraka paraka</i>	Perak Lascar	-
	<i>Pantoporia sandaka sandaka</i>	Extra Lascar	-
	<i>Parantica agleoides borneensis</i>	Black Tiger	-
	<i>Parthenos sylvia borneensis</i>	Clipper	-
	<i>Tanaecia aruna aparasa</i>	Small Viscount	-
	<i>Tanaecia clathrata coeruleascens</i>	-	-
	<i>Tanaecia munda munda</i>	-	-
	<i>Tanaecia pelea djataca</i>	Malay Viscount	Least Concern
	<i>Tanaecia orphne*</i>	-	-
	<i>Thaumantis klugius lucipor</i>	Dark Blue Jungle Glory	-
	<i>Thaumantis noureddin chatra</i>	Dark Jungle Glory	Least Concern
	<i>Zeuxidia amethystus wallacei</i>	Common Saturn	-
	<i>Zeuxidia doubledayi horsfieldii</i>	Scarce Saturn	-
	<i>Ypthima pandocus pandocus</i>	Common Three Ringed	-
Lycaenidae	<i>Anthene emolus goberus</i>	Ciliate Blue	-
	<i>Arhopala ace ace</i>	Tytler's Dull Oakblue	-
	<i>Arhopala achelous achelous</i>	-	-
	<i>Arhopala alaconia alaconia</i>	-	-
	<i>Arhopala atosia atosia</i>	Tailed Disc Oakblue	-
	<i>Arhopala baluensis</i>	-	-
	<i>Arhopala dajagaka*</i>	-	-
	<i>Arhopala delta</i>	Delta Dull Oakblue	-
	<i>Arhopala democritus olinda</i>	White-dot Oakblue	-
	<i>Arhopala epimuta epimuta</i>	-	-
	<i>Arhopala hypomuta deva</i>	-	-
	<i>Arhopala lurida</i>	Lesser Disc Oakblue	-
	<i>Arhopala major major</i>	Major Yellow Oakblue	-
	<i>Arhopala moolaiana yajuna</i>	Pale Yellow Oakblue	-

BUTTERFLIES

Family	Scientific Name	Common Name	IUCN Red List
	<i>Arhopala pseudocentaurus nakula</i>	Dull Oakblue	-
	<i>Arhopala semperi semperi</i>	-	-
	<i>Arhopala similis</i>	-	Least Concern
	<i>Arhopala vihara vihara</i>	Large Spotted Oakblue	-
	<i>Cheritra freja pallida</i>	Common Imperial	Least Concern
	<i>Dacalana lowii</i>		-
	<i>Drupadia ravindra surindra</i>	Common Posy	-
	<i>Drupadia theda umara</i>	Dark Posy	-
	<i>Hypochrysops coelisparus kerri</i>	-	-
	<i>Jacoona anasuja jusana</i>	-	-
	<i>Jamides aratus adana</i>	-	-
	<i>Jamides philatus armatheus</i>	Burmese Caerulean	-
	<i>Jamides zebra zebra</i>	-	-
	<i>Luthrodes pandava pandava</i>	Cycad Blue	-
	<i>Miletus biggsii biggsii</i>	Bigg's Brownie	-
	<i>Miletus drucei metrovius</i>	-	-
	<i>Nacaduba pactolus odon</i>	Large Four-line Blue	-
	<i>Nacaduba pavana singapura</i>	Small Four-line Blue	-
	<i>Neocheritra amrita theodora</i>	Grand Imperial	-
	<i>Prosotas dubiosa subardates</i>	Small Purple Lineblue	-
	<i>Spindasis lohita sehama</i>	Long-banded Silverline	-
	<i>Zizina otis otis</i>	Lesser Grass Blue	Least Concern
Hesperiidae	<i>Ampittia dioscorides camertus</i>	Common Bush Hopper	-
	<i>Hasora taminatus malayana</i>	White Banded Awl	-
	<i>Hidari irava</i>	Coconut Skipper	-
	<i>Potanthus omaha maesina</i>	Lesser Dart	-
	<i>Tagiades parra parra</i>	-	-
	<i>Taractrocera ziclea stella</i>	-	-

BAKO NATIONAL PARK

This work takes the readers through a journey through several unique ecosystems within Bako National Park, highlighting many inhabitants on the way, from humble insects, such as mosquitoes and dragonflies, to the charismatic species, including the Proboscis Monkey and a rich assemblage of shorebirds that draw tourists by the thousands to the Park.

Bako is rich in biodiversity and accessible throughout the year via a short boat ride to the Park headquarters. From this vantage point, an eager tourist will be able to easily access the various habitats represented, including mixed dipterocarp forests, mangrove forests, cliff forest, beach forests, Kerangas, as well as mudflats, each with its unique biodiversity. The Park is also home to several endemic species, as well as species of conservation importance, upon which substantial ecotourism activities are based.

Bako National Park's rich ecosystems are presented through images and text accounts in this volume, which is based on field research, that reiterates their value for naturalists, tourists, as well as researchers. This book aims to enlighten stakeholders and present information on species biology and distribution to nature enthusiasts.

The chapter on geology and geomorphology sets the scene for the book. The wildlife aspects cover species from an array of taxa that includes plants and invertebrates, to fishes, herpetofauna, birds and mammals, rounded up with the ecotourism potential of the Park.

Research in Bako National Park was possible thanks to the generosity of various government agencies through research grants to Universiti Malaysia Sarawak. The project is aimed at assessing the area's biotic diversity, examine anthropogenic elements, and finally, to develop an applicable environmental model for ecotourism.



The Editors



Jayasilan Mohd-Azlan (left) earned his doctoral degree from Charles Darwin University for his work on mangrove avifauna of Australia. He is currently the Director of the Institute of Biodiversity and Environmental Conservation, Universiti Malaysia Sarawak.

Mohamad Kadim Suaidi (middle) is the Vice Chancellor of Universiti Malaysia Sarawak since 2013, and hails from Kampung Bako. He is passionate about community engagement and sustainable development in relation to biodiversity conservation. The university's visibility and recognition at the global stage is one of his main achievements.

Indraneil Das (right) received his doctoral degree from the University of Oxford, and was a Fulbright Fellow at the Museum of Comparative Zoology, Harvard University. Currently, he is Professor at the Institute of Biodiversity and Environmental Conservation, Universiti Malaysia Sarawak.