AN INTRODUCTION TO

The Biological Education and Research Forest of Andalas University

This is the first reference book describing the Biological Education and Research Forest (called as HPPB) of Andalas University written in English to reach a wider audience. Here, writers provide general information about history and management of the HPPB, biodiversity richness, services and facilities, local and worldwide collaborators, potential research subjects and activities. The writers present views and access to the facilities, and photographs of representative Sumatran's flora and fauna from various taxa exist in the HPPB.

This book aims to serve education, research and conservation in all related subjects to the field of biology. At the same time, this book implements valuable supports to the eco-friendly green campus program of Andalas University, edu-ecotourism designs and outdoor activities. The readers of this book, students, teaching staffs, researchers, conservationists and stakeholders will get informed and come with great interest to conduct research, exploration and outdoor activities in the HPPB.

ANDALAS UNIVERSITY Press

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The Biological Education and Research Forest of Andalas University

Dr. Rizaldi
Dr. Mairawita
Dr. Wilson Novarino
Dr. Nurainas
Dr. Jabang Nurdin
M. Idris, M.Si

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Penulis	:	Dr. Rizaldi Dr. Mairawita Dr. Wilson Novarino Dr. Nurainas Dr. Jabang Nurdin M. Idris, M.Si.
Reviewer	:	Prof. Dr. Syamsuardi
Editor Bahasa	:	Wulan Fauzanna, S.S., M.EIL
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Aerial view of The Biological Education and Research Forest (HPPB), Bukit Kamulau, Limau Manis, Padang, West Sumatra, Indonesia

Foreword

The praise and thanks to the presence of Allah. We have accomplished an introduction book to the Biological Education and Research Forest, Andalas University (Hutan Pendidikan dan Penelitian Biologi, thereafter called HPPB). The HPPB consists of natural forest and biodiversity garden managed by the Department of Biology, Faculty of Mathematics and Natural Science in cooperated with Technical Service Unit of Biodiversity (UPT. KEHATI) of Andalas University.

This book is the first reference covering general topics about HPPB including; history of HPPB and important function of forest station for education and research in the field of biology; the biodiversity richness of HPPB; the organization structure of HPPB within Andalas University; services and facilities provided by HPPB; collaboration of research study conducted in HPPB with local, national and international collaborators; and potential research studies. This book aims to introduce the resource and facilities organized by the forest station in order to support the needs of education, research, and conservation. We hope students, teaching staffs, researchers, and our collaborators could get informed and come with great interest to work using those facilities. For further information please contact the head of HPPB, Department of Biology, Andalas University and also find some references from published studies conducted in HPPB.

We acknowledge the rector of Andalas University, the dean of Mathematics and Natural Science Faculty, the head of Technical Service Unit of Biodiversity (UPT. KEHATI), and the head of International Office (UPT. Layanan Internasional) for their advices. We express special gratitude to the head of Biology Department, retired faculty members, students and alumni for continuous support toward revitalization of HPPB. At last, we acknowledge to all people who have contributed on providing materials for this introduction book. Here, in commemorate 30 years anniversary of HPPB, we hope this book brings benefit to all readers.

Dr. Rizaldi, M.Sc.
(Head of The Biological Education and Research Forest)


DEPARTEMEN PE
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Preface

In 1980, Andalas University begun a grand design for new campus at Limau Manis. As a dean of Science Faculty (FIPIA) at the moment, I was directly involved to carry out a preliminary survey to the appointed area including Bukit Kamulau at Limau Manis. I was fascinated with the beautiful heavy green vegetation of Bukit Kamulau which also belongs to the new campus territory. Following several discussions about the needs of representative forest station for biological studies, my colleagues (The late Prof. Drs. Anas Salsabila, M.Sc. and the late Drs. Rusjdi Tamin) and I proposed to the rector of Andalas University to allocate Bukit Kamulau as The Biological Education and Research Forest (HPPB).

The forest consists of secondary tropical rainforest ecosystem and aquatic ecosystem along the water streams with tremendous biodiversity. Furthermore, this location is easy to be accessed and monitored by students and users. So far, The Department of Biology has successfully maintained this facility for education, training, conservation, and promoting eco-friendly green-campus. Many students, graduates and researchers have been published their research conducted in HPPB. Field training, ecological monitoring, conservation practice and collaboration have also been implemented. All this efforts have been possible because of contribution and support from many stakeholders.

In the future, I hope HPPB could increase collaboration with not only Indonesian researchers, but also foreign researchers. I believe The Department of Biology in near future could extend its function for ecotourism. To the end, supporting facilities must be constructed including representative research station, information center, and research facilities (camping ground, observation tower, greenhouse, and modern research equipments).

Prof. Dr. Marlis Rahman, M.Sc.
(Initiator of The Biological Education and Research Forest)


UNIVERSITAS ANDALAS

Preface

Andalas University has been recognized as a member of first cluster universities in Indonesia based on various assessment criteria. In the era of intense competition among Indonesian universities to produce skilled and competitive graduates, Andalas University must be able to optimize all facilities and potential resources. The HPPB is one of the university resources that could be managed to achieve an optimal value of use. Therefore, the strategic management programs need to get support from all stakeholders.

This is the first book covering valuable information about the HPPB and exposing the potential flora and fauna through representative photographs. I give my appreciation to the authors and to the Department of Biology who have shown great efforts in managing and introducing the potential forests to a larger range. Given the long history of the HPPB and its potential resource, we encourage the ongoing revitalization efforts and develop supporting facilities. We hope this effort will expand the use of the forest from educational and research forest into edu-ecotourism which is in line with the business strategy plans (Renstra Bisnis) of Andalas University. This effort also supports the University's green-campus program that could raise the UI World Green Metric Ranking of Andalas University from the eighth position in 2014 among hundreds of national universities.

We hope this book benefits the readers and gives them big interest to conduct biological field research and other suitable activities within HPPB facilities. Field observation and experimental studies in the natural habitat combining with laboratory studies would bring much more fruitful results. We also expect more research collaborations with internal and external parties of Andalas University as well as our international partners. Finally, this book could attract more attention from readers to conserve our tremendous biological diversity for the next generation which is a part of our commitments for social responsibility. In the future, the HPPB would be a world standard facility supporting education, research, and training for students, scientists, and conservationists through practical activities, long-term research, and monitoring.

Prof. Dr. Tafdil Husni, S.E., M.B.A.
(Rector of Andalas University)

Introduction

The Biological Education and Research Forest (HPPB) is an educational and research facility owned by Andalas University. This facility managed under the Department of Biology in coordinated with Technical Service Unit of Biodiversity (UPT. Keanekaragaman Hayati). Throughout its history, HPPB has benefited in supporting education, research and community service (Tridarma Perguruan Tinggi), especially in training and educating students majoring in biology, producing conservation cadres, resulting research publications, serving local community and enhancing cooperation with various national and international institutions. At the beginning, the HPPB mainly served students and lecturers in biology for education and research. Along with the development of higher education, campus as an education industry should be able to create an eco-friendly management model through green campus programs. It is realized that the HPPB can provide greater support through a better revitalization and governance. The functions of HPPB further has been extended into eco-tourism site, health sports and hobbies while consistently supporting eco-friendly green campus programs. Thus, here we reformulate vision, missions and our objectives for an effective HPPB management.

The HPPB is located in the western edge of Bukit Barisan Mountain at Bukit Kamulau, Limau Manis, Padang, West Sumatra Province (0°54'S, 100°28'E). The northern side directly continues to the larger natural forest of Bukit Barisan, Air Sekayan River and village of Batu Busuk, while the southern side to the Experimental Grass Farm (maintained by Faculty of Animal Husbandry) and main campus area. The eastern site also borders with natural forest of Bukit Barisan, Experimental Research Field for Agriculture (maintained by Faculty of Agriculture) and Air Nareh River, while the western edge borders with Medicinal Plant Garden (maintained by Faculty of Pharmacy) and closely attached to main campus area of Andalas University. This situation allow easy access by 10 to 15 min walking to the forest main station. The forest can be reached by driving approximately 25 min driving from Padang downtown and 1 hour from Minangkabau International Airport- the nearest international airport from Padang. Such easy access brings benefits to researchers and all visitors.

In1980s the HPPB consisted mainly secondary natural forest and partly disturbed abandoned lands. The secondary natural forest has been continuously managed for education and research. Later on, within 2000s the disturbed land was appointed to be biodiversity garden. This garden enriched the HPPB by planting selected rare species collected across Sumatra Island. So far, there are more than 100 species were grown in the garden which each individual is accessible through catalog database.

The total area of HPPB is 150 ha extension ranging from 275 to 450 m above sea-level and topography varies between hilly and flatty areas. The forest is categorized as a secondary Laura-Fagaceous lowland evergreen rain forest with A-type climate, characterized by very wet and high annual rainfalls which ranges from 3,724 to 5,546 mm/years (1980-2002). The daily temperatures of HPPB ranges from 21 to 29oC with relative humidity ranges from 68 to 90%. Soil type mainly red clays soil (ultisol) which relatively high fertility. Such condition support the most forest vegetation those in turn provide resources for diversity of micro and macro fauna. This forest area has proven to have a high biodiversity richness.

The Biological Education and Research Forest
(Hutan Pendidikan dan Penelitian Biologi)

N
W E
S

Legend

- Natural Forest
- Medicinal Plant Garden
- Biodiversity Garden
- Durian plantation
- Pathway

0 0,1 0,2 0,4 0,6 Kilometers

Coordinate System: WGS 1984 UTM Zone 47S
Projection: Transverse Mercator
Datum: WGS 1984
Author: Gonzalo Páez Pérez
Date Saved: 06/06/2018


BIOLOGI

Vision, Missions, and Objectives

Vision:

To be an excellent forest station for education, research and conservation on Sumatran tropical biodiversity by 2035

Missions:

- To facilitate education on field biology for various education levels in Andalas University and external parties
- To facilitate research on tropical biodiversity of Sumatran Rainforest
- To extend collaboration with various stakeholders in promoting education, research, and tropical biodiversity conservation
- To support Andalas University in promoting eco-friendly green-campus

Objectives:

- To fulfill demand on field biology education in term of natural facility and to enhance nature responsibilities
- To fulfill demand on research facility for Sumatran tropical rainforest
- To share mutual benefits among stakeholders in promoting education, research, and tropical biodiversity conservation
- To foster university in developing eco-friendly green-campus through edu-ecotourism

The initiator of HPPB, from left to right;
Drs. Rusjdi Tamin,
Prof. Dr. Marlis Rahman, M.Sc.,
and Prof. Drs. Anas Salsabila, M.Sc.

History

The preparation and construction of Andalas University (UNAND) campus begin in 1980's at Limau Manis, Padang. Faculty of Science (FIPIA) was appointed to design and select suitable forest area within Andalas University territory for biological studies. Bukit Kamulau was selected because of having high biodiversity and unique landscape after flora and fauna inventories conducted by Dr. Marlis Rahman, Anas Salsabila, M.Sc and Drs. Rusjdi Tamin. Later, they become initiators for the establishment of forest research station in Bukit Kamulau called as HPPB

The establishment of The Biological Education and Research Forest (HPPB) officially declared on December 10th, 1989. The official declaration of HPPB was made by Prof. Dr. Jurnalis Kamil M.Sc. (University Rector) and attended by Prof. Dr. Ir. Fachri Ahmad (University Vice Rector I), Drs. Rasul Hamidi (University Vice Rector II), Prof. Dr. Hendra Esmara (Head of University Research Board), and Prof. Dr. Thamrin Nurdin (Head of Plan and Development Region Bureau, BAPPEDA, West Sumatra). Prof. Dr. Marlis Rahman was appointed as the first head of HPPB. Since that time, The HPPB has been used by many students and researchers, and published several scientific papers in national and international levels.

In 2009, the main forest station building and other facilities were ruined due to severe earthquake occurred in West Sumatra. Since then, research activities in the HPPB was decreased. From 2016, to achieve our vision we begin revitalization project supported by Andalas University under supervision from Prof. Dr. Ir. Asdi Agustar, M. Sc as a vice rector II.

Glossy ixora *(Ixora lobbii)*

Biodiversity

HPPB supports a high diversity of plants and animals including several endemic species of Sumatra. Many species have been identified but some of them remain unidentified. A recent study undertaken in the area estimated a richness of 530 tree species with predominant families of Euphorbiaceae, Moraceae, Fagaceae, and Lauraceae. Studies on the plant diversity have also been undertaken in HPPB lead by staff of Andalas University Herbarium (ANDA). There are 25 species of epiphyte ferns, 34 species of wild orchids, 21 species of gingers (Zengiberaceae) have been identified. In general, more than half of the plant species are considered as fruit production species which in turn provide foods for frugivorous animals.

There are some important exotic flora existing in the natural forest of the HPPB:

- Dipterocarps (*Dipterocarpus* spp., *Hopea beccariana*, and *Shorea* spp.)
- Oaks (*Castanopsis costata*, *Quercus oidocarpa*, and *Lithocarpus meijeri*)
- Glossy Ixora (*Ixora lobbii*)
- Scorpion orchid (*Arachnis* sp.)
- *Rhizantes deceptor* (Rafflesiaceae)
- The flash-shaped pitcher-plant (*Nepenthes ampullaria*),
- The common swap pitcher plant (*N. mirabilis*)
- The slender pitcher plant (*N. gracilis*)
- The Sumatran Bulbophyllum (*Bulbophyllum lobbii*)
- The Sumatran Vanda (*Vanda sumatrana*).

While for the animals, there are 5 species of termites, 30 species of ants, 21 species of spiders, 23 species of dragonflies, 51 species of butterflies (Rhopalocera), 18 species of amphibian, 8 species of snakes, 160 species birds, at least 60 species of mammals. Several species of primates live or seasonally range in the HPPB, including a very attractive singing black-handed gibbons or agile gibbons known as Ungko (*Hylobates agilis*) and the black lesser ape of Sumatra with large vocal sac known as Siamang (*Symphalangus syndactylus*). Both species have great calls and sympatric habitats but their overlap range is quite small in the HPPB. Agile gibbons found in the south while siamang mostly in north of the HPPB with higher elevation. The black-crested Sumatran langur with mostly orange coat color known as Simpai (*Presbytis melalophos*) are quite common in the área. They are relatively easy to hear and see during foraging times. Silvered langurs (*Trachypithecus cristatus*) or lutung also reported to live at the northwest river border at Sekayan River but its population is small. Long-tailed macaque (*Macaca fascicularis*) and Pig-tailed macaque (*M. nemestrina*) also occurred. Group size of long-tailed macaques is quite smaller comparing to the pig-tailed, but the pig-tailed just ranges temporarilly within HPPB territory. Pig-tailed macaques sometimes

observed feeding together with other primate species and hornbill in a fruiting tree. Sunda slow loris or *kukang* (*Nycticebus coucang*) has also been found exist in HPPB but there was no scientific study conducted to this nocturnal primate.

Studies using camera traps has proven many large mammals existed in the HPPB. Here, we include some existing species with their current conservation status following the IUCN Red List of Threatened Species (IUCN, 2018).

- Malayan sun bear (*Helarctos malayanus*): Vulnerable
- Malayan Tapir (*Tapirus indicus*): Endangered
- Malayan porcupine (*Hystrix brachyura*): Least Concern
- Sambar deer (*Rusa unicolor*): Vulnerable
- Barking deer or Red Muntjac (*Muntiacus muntjak*): Least Concern
- Lesser mouse-deer (*Tragulus javanicus*): Data Deficient
- Leopard cat (*Prionailurus bengalensis*): Least Concern
- Sumatran tiger (*Panthera tigris sumatrae*): Critically Endangered
- Golden cat or Bornean Bay Cat (*Catopuma badia*): Endangered
- Clouded leopard (*Neofelis nebulosa*): Vulnerable
- Wild boar (*Sus scofra*): Least Concern. Wild boars are common wild mammals in the HPPB although direct encounters are rare. A study on wallowing behavior of the wild boar has shown how wildboar selects and uses the wallowing sites. It has been known that many animal species visited and utilized the boar wallows for various purposes.

Some other arboreal mammals are also encountered in the HPPB, which they could be indicators of good quality natural forest.

- Black giant squirrel or Malayan giant squirrel (*Ratufa bicolor*): Near Threatened
- Red giant flying squirrel (*Petaurista petaurista*): Least Concern
- Sunda flying lemur (*Galeopterus variegatus*): Least Concern

Watching birds is quite challenging in all different vegetation types and canopy levels of HPPB. We can find and observed native and migratory birds as well. Here some attractive bird species found in the HPPB,

- Rhinoceros hornbill (*Buceros rhinoceros*): Near threatened
- Wreathed hornbill (*Rhyticeros undulatus*): Least Concern
- White-crowned hornbill (*Berenicornis comatus*): Near threatened
- Tiger shrike (*Lanius tigrinus*): Least Concern
- Oriental dollarbird (*Eurystomus orientalis*): Least Concern
- Asian brown flycatcher (*Muscicapa dauurica*): Least Concern
- Javan broadbill (*Eurylaimus javanicus*): Near Threatened
- White-bellied sea-eagle (*Haliaeetus leucogaster*): Least Concern
- Pink-necked green-pigeon (*Treron vernans*): Least Concern

Pig-tailed macaque *(Macaca nemestrina)*

Exotic butterfly species of HPPB

- Glassy tigers (*Ideopsis* sp.)
- Common bluebottle (*Graphium sarpedon*)
- Lime swallowtail (*Papilio demoleus*)
- Jungle jade (*Papilio karna*)
- Rajah Brooke's birdwing (*Trogonoptera brookiana*): Least Concern.

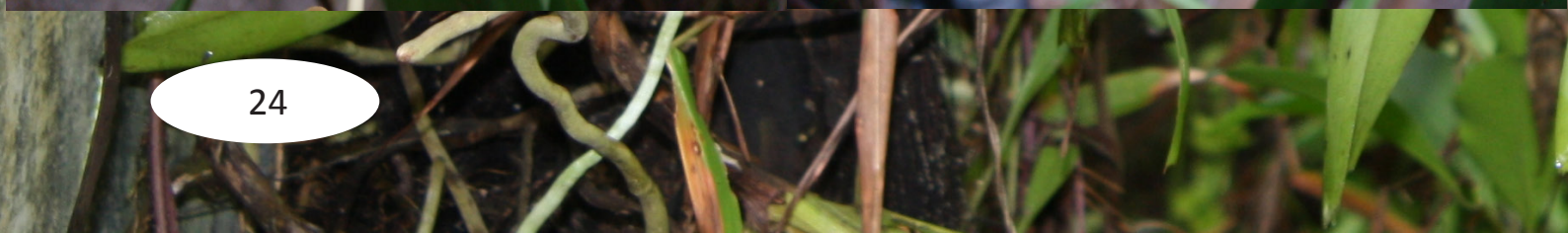
The common swap pitcher-plant *(Nepenthes mirabilis)*
(inset: a pitcher of *N. mirabilis* (top) and *N. gracilis*, The slender pitcher plant (bottom)

The flask-shaped pitcher-plant *(Nepenthes ampullaria)*
(inset : showing two types of pitchers in *N. ampullaria*)

The Ginger *(Amomum apiculatum)*

The Sumatran bulbophyllum *(Bulbophyllum lobbii)*
(inset: flower of *B. lobbii* (top) and *B. auratum* (bottom)

Scorpion orchid *(Arachnis* sp.*)*



The Sumatran Vanda *(Vanda sumatrana)*
(inset: flowers of *V. sumatrana*)

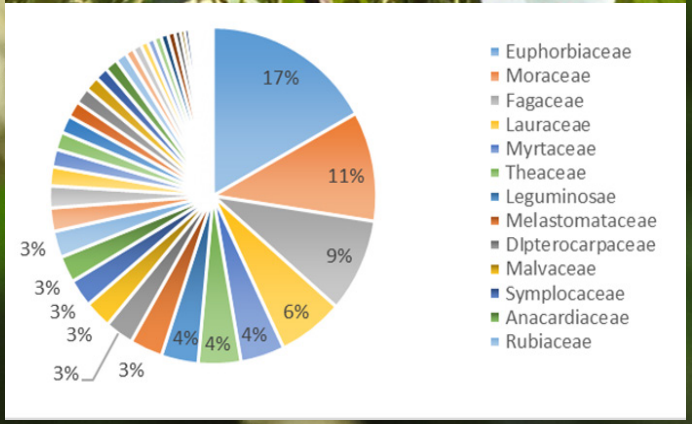
Rafflesiaceae, holoparasite *(Rihizanthes deceptor)*

(photograph by W. Meijer, inset: *Tetrastigma leucostaphylum*, Rafflesiaceae host plant on vegetative stage

Balanophoraceae, holoparasite (*Balanophora* sp.)

Moraceae *: Artocarpus* sp.

(inset: *Endospermum diadenum*, food source of Agile gibbon (top) and graph of the most abundant tree's family recorded in HPPB (bottom), data was recorded by Perez, *et, al* 2018)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Euphorbiaceae
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Fagaceae
Lauraceae
Myrtaceae
Theaceae
Leguminosae
Melastomataceae
Dipterocarpaceae
Malvaceae
Symplocaceae
Anacardiaceae
Rubiaceae

Pig-tailed macaque *(Macaca nemestrina)*

Long-tailed macacque *(Macaca fascicularis)*

Agile gibbon (*Hylobates agilis)*

Siamang (*Symphalangus syndactylus)*

**The agile gibbons, singing gibbons (*Hylobates agilis*)
(inset: the agile gibbon in action**

Malayan Sun Bear *(Helarctos malayanus)*
(inset: captured by camera trap

Asian Tapir *(Tapirus indicus)*
(Inset: trap installment for studying Asian Tapir)

Malayan porcupine *(Hystrix brachyura)*

Sambar deer *(Rusa unicolor)*

Red muntjac *(Muntiacus muntjak)*

Lesser mouse-deer *(Tragulus javanicus)*

Leopard cat *(Prionailurus bengalensis)*

HCO ScoutGuard 08.24.2015 01:43:11

Sumatran tiger *(Panthera tigris sumatrae)*


Bay cat (Catopuma badia)
HCO ScoutGuard
06.12.2016 07:23:53


Clouded leopard (Neofelis nebulosa)

Tiger shrike *(Lanius tigrinus)*

Oriental dollarbird
(Eurystomus orientalis)

Asian brown flycatcher
(Muscicapa dauurica)

Javan broadbill
(Eurylaimus javanicus)

White-bellied sea-eagle
(Haliaeetus leucogaster)

Pink-necked green-pigeon
(Treron vernans)

White-crowned Hornbill
(Berenicornis comatus)

Exotic butterfly species of HPPB

Common bluebottle
(Graphium sarpedon)

Lime swallowtail
(Papilio demoleus)

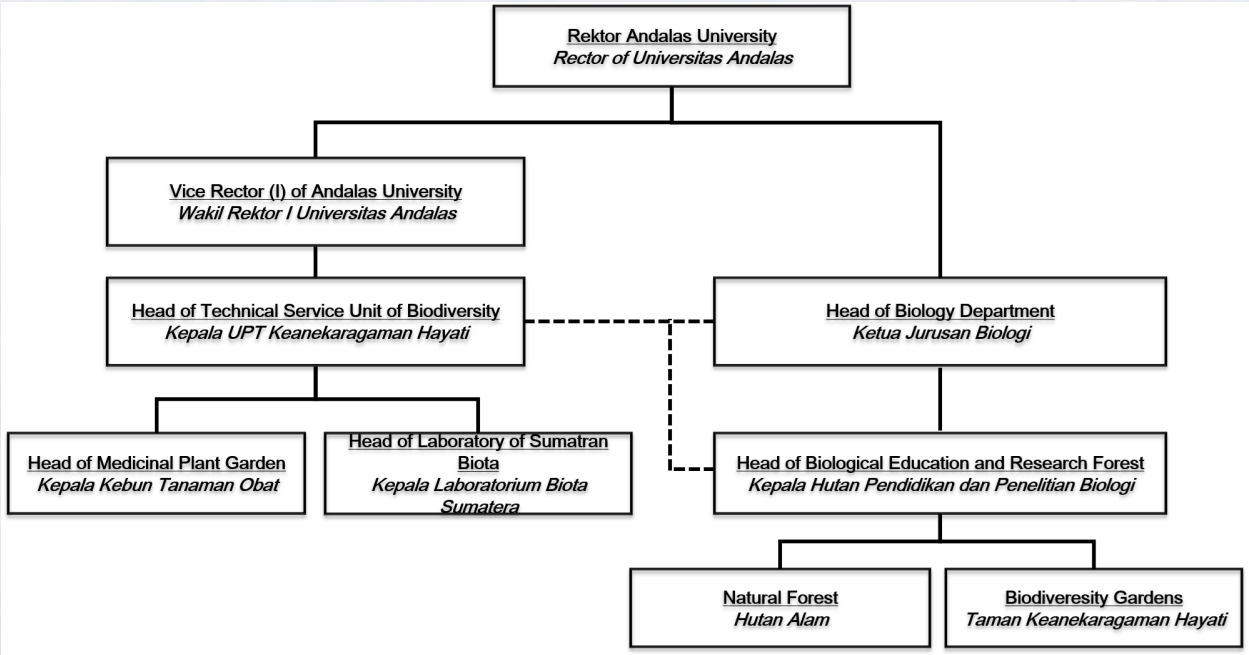
Jungle jade
(Papilio karna)

Rajah Brooke's birdwing
(Trogonoptera brookiana)

Glassy tigers *(Ideopsis* sp.*)*

Organization Structure

The position of HPPB within Andalas University shown below:



The HPPB is a facility owned by Andalas university and managed by Department of Biology as shown in the chart above. It also coordinates with Technical Service Unit of Biodiversity (UPT. KEHATI). HPPB consists of natural forest (Hutan Alam) and biodiversity garden (Taman Keanekaragaman Hayati).

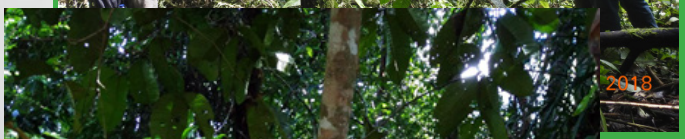

Biodiversity Garden

Facilities

The HPPB has several facilities to support education, research and outdoor activities including:

1. Natural forest and biodiversity gardens (150 ha)
2. Research station
3. Walking paths and directions
4. Forest hut
5. Permanent forest vegetation plots
6. Gazebo
7. Camping grounds
8. Jogging tracks
9. Information center and library
10. Parking area

Education and research activities in HPPB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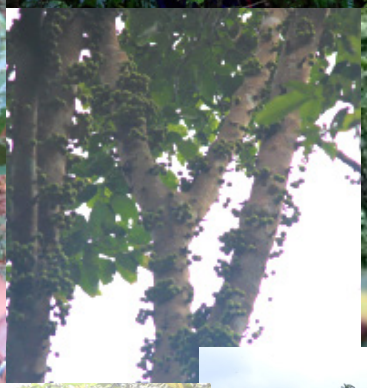


14.04.2018

Natural Forest of The HPBB

Services

HPPB provides several services for students, academic staffs, researchers from Andalas University and external parties. Those services focus primarily related to education, research, training, and outdoor activities including;

- Plant and animal identifications
- Wildlife observations
- Tracking animals and plants
- Birds watching
- Camping and day camp
- Join research and training
- Monitoring tropical biodiversity
- Hiking, jogging and out-bond
- Community development program
- Edu-ecotourism

Gazebo, constructed in 2017
(Inset from top: research station, build in 2010; jogging tracks, and former research station build in 1995, ruined in 2009 after earthquake)

Expert visit: Prof. Dr. Tsuji Yamato, Primate specialist from Primate Research Institute, Kyoto University

Expert visit: Dr. Andie Ang, Conservationist from Jane Goodal Insitute, Singapore

25 . 04 . 2018

Collaboration

HPPB has been collaborated with national and international institution for various activities. Those institution include:

1. Natural Resources Conservation Bureau (BKSDA), West Sumatra
2. Forest and Environmental Department, West Sumatra
3. Indonesian Institutes of Sciences (LIPI)
4. Indonesian Army Forces
5. Local University: Batusangkar Islamic National University, Tanah Datar; Padang Pharmaceutical College, Padang
6. National University: Raden Fatah Islamic National University, Palembang; Bogor Agricultural University; Bandung Institute of Technology
7. International University; Kyoto University, Osaka City University, Kagoshima University, Sun Yat-Sen University, Ibaraki University, Kanazawa University, Edinburgh Napier University, Jane Goodall Institute.
8. NHK broadcast, Japan
9. The Royal Botanic Gardens, Edinburgh
10. Non-Government Organization; WWF, WCS, ZSL, FFI, WARSI

Dr. Rizaldi and team (Primate behavior and ecology research)

A visit by Directorate General of Energy and Natural Resources Conservation Bureau

Anniversary of the HPPB in 2016 attended by faculty members, retired faculty members and alumni

Expert visit: Prof. Dr. Yatna Supriyatna, M.Sc. (in the center), replanting Andalas (*Morus macroura*) - floral mascot of West Sumatra

Gibbon researcher appreciated by the head of Biology Department.

[From left to right; Dr. Henny Herwina (Ants specialist), M. Nazri Janra, M.Si., M.A. (Birds specialist), Gonzalo Paez Perez (Gibbon researcher), Dr. Mairawita (Insect taxonomist, head of Biology Department), Dr. Rizaldi (Primate specialist), M. Idris, M.Si. (Plant physiologist)]

Border check and patrol lead by Rector of Andalas University in 2016

Potential Research

There are several studies being conducted in HPPB and potential research collaborations including:

1. Inventory of Sumatran tropical forest biodiversity
2. Ecology and behavior of species from various taxa
3. Population dynamic and monitoring
4. Forest dynamic and monitoring
5. Impact of global warming to the plant phenology
6. Fresh water ecology and bioindicator
7. Carbon stocks
8. Medicinal plants (herbs) and exploration for edible plant resources
9. Genetic diversity and genetic resources for domestication and breeding
10. Exploration of endophytic microbes and fungi

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An un-identified flowering species

Photograph Contributors

1. Prof. Dr. Dahelmi
2. Dr. Rizaldi
3. Dr. Wilson Novarino
4. Dr. Nurainas
5. Dr. Mairawita
6. Dr. Henny Herwina
7. M. Nazri Janra, M.Si., M.A.
8. M. Idris, M.Si.
9. Ilham Kurnia, M.Si.
10. Inda Dwi Solina, M.Si.
11. Rizki Paramitha Mukti, M.Si.
12. Junaidi, S.Si.
13. Irvan Prasetyo, S.Si.
14. Sepriyoga Virdana, S.Si.
15. Tengku Lidra, S.Si.
16. Fika Efendi, S.Si.
17. Dr. Andie Ang
18. Mr. Dickson Ng
19. Mr. Gonzalo Paez Perez
20. Try Surya Harapan
21. W. Meijer

Additional Information

Department of Biology,
Faculty of Mathematics and Natural Science, Andalas University
Kampus UNAND Limau Manis Padang
West Sumatra 25163, Indonesia
Email : biologi@fmipa.unand.ac.id
Website: http://biologi.fmipa.unand.ac.id/

Personal contact (Department of Biology members)
Dr. Rizaldi; rizaldi_au@yahoo.com
Dr. Wilson Novarino; wilson_n_id@yahoo.com
Dr. Nurainas; nas_herb@yahoo.com

Follow HPPB at: Facebook : HPPB_bio_ua
Tweeter : hppb_bio_ua