The 8th International Hornbill Conference

22nd to 24th May 2023
Faculty of Forestry, Kasetsart University,
Bangkok, Thailand

Happy Hornbills, Healthy Forests

8th INTERNATIONAL HORNBILL CONFERENCE

<hybrid conference>

22nd to 24th May 2023

at

Faculty of Forestry, Kasetsart University,
Bangkok, Thailand

Hornbill Specialist Group

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Designed by Chattraphas Pongcharoen


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FACULTY OF FORESTRY
KASETSART UNIVERSITY

MESSAGE FROM

Asst. Prof. Dr. KOBSAK WANTHONGCHAI

DEAN OF THE FACULTY OF FORESTRY, KASETSART UNIVERSITY

On behalf of Kasetsart University. I wish to extend a very warm welcome to all of you to **the 8th International Hornbill Conference (IHC)**. In addition, I would like to express my sincere thanks to committee of the Hornbill Research Foundation in selecting Kasetsart University to co-host this hybrid international conference. This is the fourth of such events as the 1st, 2nd and 3rd conferences were held in Thailand in 1992, 1996 and 2001, respectively.

The 8th IHC is jointly organized by Kasetsart University, Thailand Hornbill Research Foundation, Department of National Parks, Wildlife and Plant Conservation and Ugyen Wangchuck Institute for Forest Research and Training (UWIFORT) and in collaboration with IUCN SSC Hornbill Specialist Group and Mahidol University. The 8th IHC with the theme of ***"Happy Hornbills-Healthy Forests"*** aims at creating a platform for the scientists and conservation practitioners in and outside Asia to present and share their research progresses, findings and innovative ideas, as well as to promote long-term ecological and social research and conservation partnership among multi-stakeholders in countries with all natural hornbill habitats under uncertain environment conditions.

Our institute was established over 80 years ago. To celebrate the 86th anniversary of the Faculty of Forestry, Kasetsart University, we are organizing this hybrid conference series for the 8th IHC. I would like to inform you that this Hybrid Conference is the second international conference under the 3rd FORTROP (Forestry of Tropical Forests). In addition, the conference objectives are highly relevant with the mission of the Faculty of Forestry, Kasetsart University, which we envision to provide '**Knowledge of the Land and Natural Resources, and to contribute to sustainable development in our country, as well as to conserve biodiversity**'.

It is my hope that this 8th IHC Conference will be a platform to share up-to-date scientific findings and best practices of applied hornbill conservation projects that are being implemented across Asia and Africa continents, as well as to discuss further research collaborations among the member networks and participating scientists and practitioners.

I would like to conclude by thanking members of the 8th IHC Organizing Committee and Scientific Committee, all participants joining this Hybrid Conference, in particular the co-chairs of the committees for making this conference possible.

20th May 2023

MESSAGE FROM

Prof. Dr. YONGYUT TRISURAT

CO-CHAIR OF THE 8TH INTERNATIONAL HORNBILL CONFERENCE

On behalf of the host institutions of the 8th International Hornbill Conference (IHC), it is our great honour to jointly host this Hybrid Conference on 22-24 May 2023 at the Faculty of Forestry, Kasetsart University (KUFF) in Thailand. Thailand has 13 out of 62 species of African and Asian hornbills, the family Bucerotidae. Hornbills play an important role in dispersing seeds in tropical forests and have been referred to as the **"farmers of the forest"**.

In addition, hornbills are useful indicators of forest conditions and man-made disturbances as they require large tracts of forest with large trees for nesting and many species of fruiting trees for food. The decline of hornbills has affected the dispersal and recruitment of fruit trees especially the large-seeded tree species in logged forests from the foothills of the Indian Eastern Himalayas, the monsoon evergreen forest in Khao Yai, Thailand and many of the lowland rainforests in Southeast Asia.

With knowledge of hornbills important role in ecosystem services, Prof. Dr. Pilai Poonswad began her study of hornbills in Khao Yai National Park in 1978 and founded the Thailand Hornbill Project (THP) in 1979. She also founded the Hornbill Research Foundation in 1993. In 1992, Dr. Pilai Poonswad from Thailand and Dr. Alan Kemp from South Africa convened the first workshop on the conservation of Asian hornbills in Bangkok and Khao Yai National Park. Since then, the IHCs have been organized almost every four years for the past 30 years.

This is the 8th IHC with the theme of ***"Happy Hornbills-Healthy Forests"*** jointly organized by that Kasetsart University and Hornbill Research Foundation and co-hosted by Department of National Parks, Wildlife and Plant Conservation and Ugyen Wangchuck Institute for Conservation and Environment Research. This Hybrid Conference will take place at Kasetsart University in Bangkok, Thailand from 22-24 May 2023. The 8th IHC will feature six sessional topics ranging from evolutionary biology and genetics, hornbill ecology to applied hornbill conservation to minimize impacts from human activities and climate change on hornbills.

I would like to convey my great appreciation to IUCN SSC Hornbill Specialist Group, Mahidol University for their collaboration. My acknowledgment is also to my co-chairs (Dr. Vijak Chimchome and Dr. George Gale), scientific and organizing committee members, and colleagues for their continuous efforts to make this conference possible. Last but not least, I would like to extend my sincere thanks to two philanthropists in Singapore, and Wildlife Conservation Society (Thailand-Program) in supporting students from Asia and Kasetsart University's students, respectively to present their research studies.

20th May 2023

After nearly two decades of studying hornbills in the wild of Thailand and South Africa and the significant degradation of many natural habitats, Dr. Pilai Poonswad from Thailand and Dr. Alan Kemp from South Africa convened the first workshop on the conservation of Asian hornbills in Bangkok and Khao Yai National Park in 1992. Since then, the International Hornbill Conferences (IHC) have been organized continuously and are drawing experts and representatives from around the world.

The 2nd and 3rd workshops were again held in Thailand in Bangkok in 1996 and in 2001, respectively. The 2nd workshop focused on ecology and conservation and the 3rd on ecology, reproduction and populations. After many years of covering just Asian hornbills, the 4th International Hornbill Conference was held in South Africa in 2005. With the help of National Parks Board, the 5th IHC was held in the Singapore Botanic Gardens in 2009 with the theme "Challenges for the Future". In 2010, the 6th IHC was organized by the Wild Bird Club of Philippines with the theme entitled "Hornbills and Caring Communities; Helping Forests to reflect the integral relationships between hornbills and ecological communities and the role they play in ensuring the sustainability of forests and in providing ecosystem services. Again, the 7th IHC with the theme of "Hornbills; Fly Free, Fly High" was held in Kuching in 2018.

Immediately after the 7th IHC, Ugyen Wangchuck Institute for Forest Research and Training, Bhutan proposed to host the 8th IHC in the year 2021 and focused on Range-wide Conservation Strategy and Action Planning for Helmeted Hornbill (*Rhinoplax vigil*). Unfortunately, the global COVID-19 pandemic was spread across the globe in mid-2020. The planned 8th IHC was rescheduled due to all governments imposed international travels, large gathering and onsite meetings. Although, many countries lift travel restriction measures and resume most activities as usual after early 2022, Bhutan government is still reluctant to be ready to host the 8th IHC.

The IHC Scientific Committee had a meeting in mid-2022 and designed to arrange the hybrid 8th IHC held in Thailand. The upcoming conference will be jointly organized by Kasetsart University, Thailand Hornbill Research, and Ugyen Wangchuck Institute for Forest Research and Training in collaboration with IUCN Hornbill Specialist Group, Mahidol University and Department of National Parks, Wildlife and Plant Conservation.

CONFERENCES BACKGROUND

The 8th IHC with the theme of "Happy Hornbills-Healthy Forests" is organized in conjunction with the is organized by Faculty of Forestry, Kasetsart University to celebrate the 80th Anniversary of Kasetsart University. The overall objective of this workshop is to

1) create a platform for the scientists and conservation practitioners in- and outside Asia to present their research progresses, findings and innovative ideas;

2) provide a forum for the exchange of views, dissemination of ideas and the development of possible future collaborations between the local and international scientists and practitioners;

and 3) promote long-term ecological and social research and conservation partnership among multi-stakeholders in all natural hornbill habitat countries under uncertainty environment conditions.

The 8th IHC includes six sessional topics as follows:

1) Hornbill evolutionary biology and genetics;

2) Hornbill ecology (feeding, roosting and nesting ecology & behaviour; population estimations and monitoring);

3) Functional role of hornbills (studies on seed dispersal, frugivory);

4) Threats to hornbills (studies evaluating threats to hornbills due to hunting, logging, forest loss, trade, etc.);

5) Impacts of Climate Change on hornbills;

and 6) Applied hornbill conservation – including community-based conservation, captive breeding, re-introduction, nest-boxes, etc.

TABLE of CONTENTS

Overall Programs

Monday, 22nd May 2023

Time	Room	Session
8:00 – 9:00	Sa-nga Suppasri 3rd Floor, 60 Years Building	**Conference Registration**
9:00 – 9:45	Sa-nga Suppasri 3rd Floor, 60 Years Building	**Opening Ceremony:** • **Welcoming Remarks** Dr. Rungnapar Pattanavibool Deputy Director-General of the Department of National Parks, Wildlife and Plant Conservation • **Opening Remarks** Assist. Prof. Dr. Kobsak Wanthongchai Dean of Faculty of Forestry, Kasetsart University (KUFF **Moderator:** Dr. Jongdee To-im
9: 45 – 10:30	Sa-nga Suppasri 3rd Floor, 60 Years Building	**Openning Keynote:** *Long-term ecological and social research and conservation in uncertain environmental conditions* Dr. Woraphat Arthayukti President of Thailand Hornbill Research Foundation
10:30 – 11:00		Coffee Break
11:00 – 12:00	Sa-nga Suppasri 3rd Floor, 60 Years Building	**Presentation Session:** *Impacts of Climate Change on hornbills (Part 1/2)* Chairman: Prof. Dr. Yongyut Trisurat Assistant: Ms. Benchawan Meeamnart
12:00 – 13:00		Lunch
13:00 – 15:20	Sa-nga Suppasri 3rd Floor, 60 Years Building	**Presentation Session:** *Threats and Impacts of Climate Change on Hornbills (Part 2/2)* Chairman: Assist. Prof. Dr. Vijak Chimchome Assistant: Ms. Nutthinee Sirichan
15:20 – 16:00		Coffee Break
16:00 – 18:00	Room 104 1st Floor, 60 Years Building	**Poster Presentation Session, Photo Presentation, and Exhibitions** Chairman: Dr. Chattraphas Pongcharoen Assistant: Mr.Thanapong Fueakong
18:00 – 20:00	KUFF Garden	**Welcome Reception** **Dinner Talk:** Emeritus Prof. Dr. Pilai Poonswad Advisor of Thailand Hornbill Research Foundation **Fire Dance and Kaw Liga Dance by KUFF Students** **Moderator:** Mrs. Bee Choo Strange

Overall Programs

Tuesday, 23rd May 2023

Time	Room	Session
8:00 – 9:00	Sa-nga Suppasri 3rd Floor, 60 Years Building	**Conference Registration/Hornbill's story (Clip VDO)**
9:00 – 9:45	Sa-nga Suppasri 3rd Floor, 60 Years Building	**Keynote Presentation 2:** *Research and Conservation of Hornbills in Africa* Dr. Lucy Kemp Co-chair of IUCN SSC Hornbill Specialist Group **Moderator:** Dr. Jongdee To-im
9:45 – 10:20	Coffee Break	
10:20 – 12:00	Sa-nga Suppasri 3rd Floor, 60 Years Building	**Presentation Session:** *Applied Hornbill Conservation (Part 1/4)* Chairman: Assoc. Prof. Dr. George Gale Assistant: Ms. Kanlayanee Juakwoen
	FORTROP 3rd Floor, 60 Years Building	**Presentation Session:** *Hornbill Ecology (Part 1/3)* Chairman: Asst. Dr. Rohit Naniwadekar Assistant: Ms. Benjamas Boonyuen
12:00 – 13:00	Lunch	
13:00 – 13:45	Sa-nga Suppasri 3rd Floor, 60 Years Building	**Keynote Presentation 3:** *The future for hornbills in the face of local and global change: insights from long-term ecological monitoring and conservation action in the Eastern Himalaya* Dr. Aparajita Datta Nature Conservation Foundation, India
13:45 – 14:20	Coffee Break	
14:20 – 16:20	Sa-nga Suppasri 3rd Floor, 60 Years Building	**Presentation Session:** *Applied Hornbill Conservation (Part 2/4)* Chairman: Assist. Prof. Dr. Warong Suksavate Assistant: Ms. Praewa Mahaphol
	FORTROP 3rd Floor, 60 Years Building	**Presentation Session:** *Hornbill Ecology (Part 2/3)* Chairman: Asst. Prof. Dr. Vijak Chimchome Assistant: Ms. Natthanicha Chookaew

Overall Programs

Wednesday, 24th May 2023

Time	Room	Session
8:00 – 9:00	Sa-nga Suppasri 3rd Floor, 60 Years Building	**Conference Registration/Hornbill's story (Clip VDO)**
9:00 – 9:45	Sa-nga Suppasri 3rd Floor, 60 Years Building	**Keynote Presentation 4:** *Conservation Message from Bhutan* His Excellency Dasho Paljor J. Dorji Ugyen Wangchuck Institute for Forest Research and Training, Bhutan **Moderator:** Dr. Jongdee To-im
9:45 – 10:20	Coffee Break	
10:20 – 12:00	Sa-nga Suppasri 3rd Floor, 60 Years Building	**Presentation Session:** *Applied Hornbill Conservation (Part 3/4)* Chairman: Dr. Caroline Dingle Assistant: Ms. Benchawan Meeamnart
	FORTROP 3rd Floor, 60 Years Building	**Presentation Session:** *Hornbill Ecology (Part 3/3)* Chairman: Dr. Lisa Nupen Assistant: Mr. Pronthep Boonprom
12:00 – 13:00	Lunch	
13:00 – 14:40	Sa-nga Suppasri 3rd Floor, 60 Years Building	**Presentation Session:** *Hornbill Evolutionary Biology and Genetics* Chairman: Dr. Chalita Kongrit Assistant: Ms. Chayanee Raknim
	FORTROP 3rd Floor, 60 Years Building	**Presentation Session:** *Applied Hornbill Conservation (Part 4/4)* Chairman: Dr. Sherub Assistant: Mr. Jedsada Noo-wong
14:40 – 15:10	Coffee Break	
15:10 – 15:30	Sa-nga Suppasri 3rd Floor, 60 Years Building	**SSC Report/Awards/Conference Summary** **Moderator:** Mrs. Bee Choo Strange, Dr. Jongdee To-im, and Dr. Nanida Sutummawong
15:30 – 16:00	FORTROP 3rd Floor, 60 Years Building	**Warp Up and Summary** **Moderator:** Mrs. Bee Choo Strange, Dr. Jongdee To-im, and Dr. Nanida Sutummawong

Overall Programs

Thursday, 25th May 2023

Time	Room	Session
8:00 – 9:00	Sa-nga Suppasri 3rd Floor, 60 Years Building	**Conference Registration/Hornbill's story (Clip VDO)**
9:00 – 12:00	FORTROP 3rd Floor, 60 Years Building	**Workshop II: Study Design (max 20 persons)** Dr. Rohit Naniwadekar Nature Conservation Foundation, India
12:00 – 13:00		Lunch
13:00 – 16:00	FORTROP 3rd Floor, 60 Years Building	**Workshop I: Wiring manuscript for journal publication (no limit)** Assoc. Prof. Dr. George Andrew Gale King Mongkut's University of Technology (KMUTT) at Bangkhuntian Campus)

(Optional Program)

Friday, 26th-30th May 2023

Field Excursion at Khao Yai National Park, Nakhon Ratchasima Province

(Optional Program)

Sessional Programs

Impacts of Climate Change on Hornbills (Part 1/2)

Room: Sa-nga Suppasri, 3rd Floor, 60 Years Building
Time: Monday, 22nd May 2023 / 11:00 – 12:00

Threats and Impacts of Climate Change on Hornbills (Part 2/2)

Room: Sa-nga Suppasri, 3rd Floor, 60 Years Building
Time: Monday, 22nd May 2023 /13:00 – 15:20

Sessional Programs

Threats and Impacts of Climate Change on Hornbills (Part 2/2) cont.

Room: Sa-nga Suppasri, 3rd Floor, 60 Years Building
Time: Monday, 22nd May 2023 /13:00 – 15:20

Time	Presentation	Page
14:20 – 14:40	**Niche specificity of the Malabar Pied Hornbill and Conservation of Endangered Low Elevation Riparian Forest Ecosystems in the Western Ghats** *Devika M. Anilkumar*	28
14:40 – 15:00	**Land-use change to agroforestry plantations affects three hornbill species in Northern Western Ghats** *Siddharth Biniwale*	29
15:00 – 15:20	**The Casque Crisis – the Past and Present situation** *Jessica Lee*	30

Applied Hornbill Conservation (Part 1/4)

Room: Sa-nga Suppasri, 3rd Floor, 60 Years Building
Time: Tuesday, 23rd May 2023 / 10:20 – 12:00

Time	Presentation	Page
10:20 – 10:40	**Successful Breeding of Wrinkled hornbills (*Rhabdotorrhinus corrugatus*) at the Phoenix Zoo** *Marisa Boyd*	32
10:40 – 11:00	**A comparison of traditional and passive acoustic monitoring techniques in a tropical semi-inundated forest patch for hornbill research in Sabah** *Ashraft Syazwan Ahmady Yusni*	33
11:00 – 11:20	**Important Hornbill Landscapes in Sarawak** *Shelby Wee Qi Wei*	34
11:20 – 11:40	**Securing a safe haven for the Helmeted Hornbill in Usun Apau National Park, Sarawak, Malaysia** *Reeve Mark Maya Sagan*	35
11:40 – 12:00	**The Development of a Helmeted Hornbill Education Kit for Enforcement and Courts (HEKEC) in Hong Kong SAR** *Chloe Hatten*	36

Sessional Programs

Applied Hornbill Conservation (Part 2/4)

Room: Sa-nga Suppasri, 3rd Floor, 60 Years Building
Time: Tuesday, 23rd May 2023 / 14:20 – 16:20

Applied Hornbill Conservation (Part 3/4)

Room: Sa-nga Suppasri, 3rd Floor, 60 Years Building
Time: Wednesday, 24th May 2023 / 10:20 – 12:00

Sessional Programs

Applied Hornbill Conservation (Part 3/4) cont.

Room: Sa-nga Suppasri, 3rd Floor, 60 Years Building
Time: Wednesday, 24th May 2023 / 10:20 – 12:00

Applied Hornbill Conservation (Part 4/4)

Room: Sa-nga Suppasri, 3rd Floor, 60 Years Building
Time: Wednesday, 24th May 2023 / 13:00 – 15:00

Sessional Programs

Applied Hornbill Conservation (Part 4/4) cont.

Room: Sa-nga Suppasri, 3rd Floor, 60 Years Building
Time: Wednesday, 24th May 2023 / 13:00 – 15:00

Hornbill Ecology (Part 1/3)

Room: FORTROP, 3rd Floor, 60 Years Building
Time: Tuesday, 23rd May 2023 / 10:20 – 12:00

Sessional Programs

Hornbill Ecology (Part 2/3)

Room: FORTROP, 3rd Floor, 60 Years Building
Time: Tuesday, 23rd May 2023 / 14:20 – 16:20

Hornbill Ecology (Part 3/3)

Room: FORTROP, 3rd Floor, 60 Years Building
Time: Wednesday, 24th May 2023 / 10:20 – 11:40

Sessional Programs

Hornbill Ecology (Part 3/3) cont.

Room: FORTROP, 3rd Floor, 60 Years Building
Time: Wednesday, 24th May 2023 / 10:20 – 11:40

Time	Presentation	Page
10:40 – 11:00	**Practical Management of Iron Storage Disease in Captive Hornbills** *Trent C. Van Zanten*	67
11:00 – 11:20	**Observation of Animals Feeding on Fruits of *F. subcordata* in Tawau Hills Park, Sabah, Malaysia** *Yulinda Wahyuni binti Eddyutowo*	68
11:20 – 11:40	**Empowering Communities to Save The Critically Endangered Sulu Hornbill, *Anthrococeros montani* from Extinction** *Dayang Ima Sahali*	69

Hornbill Evolutionary Biology and Genetics

Room: Sa-nga Suppasri, 3rd Floor, 60 Years Building
Time: Wednesday, 24th May 2023 / 13:00 – 14:40

Time	Presentation	Page
13:00 – 13:20	**Mitochondrial genetic diversity of captive Great Hornbills (*Buceros bicornis*) in Thailand** *Pimpisa Jansamut*	71
13:20 – 13:40	**Management of a Non-union Maxillary Beak Fracture Using Polyamide Prosthetics in a Great Hornbill (*Buceros bicornis*)** *Trent C. Van Zanten*	72
13:40 – 14:00	**Community-Based Hornbill Conservation in Southern Tanintharyi Region** *Myat Zaw Moe D'silva*	73
14:00 – 14:20	**Protocol Development for the Management of Casque Squamous Cell Carcinoma in Great Hornbills (*Buceros bicornis*)** *Trent C. Van Zanten*	74
14:20 – 14:40	**Patterns of Egg Production in Monteiro's Hornbill** *Mark T Stanback*	75

Sessional Programs

Poster Presentation

Room: Room 104, 1st Floor, 60 Years Building

Sessional Programs

Poster Presentation

Room: Room 104, 1st Floor, 60 Years Building

Keynote Presentation

Long-term ecological and social research and conservation in uncertain environmental conditions

Dr. Woraphat Arthayukti
President of Thailand Hornbill Research Foundation

Brief about resource person:

Woraphat is a former professor at Bangkok's Chulalongkorn University, and a former corporate executive in the Thai Business Unit of a US Company. After his retirement, he became a Buddhist monk in a forest monastery in North Eastern Thailand for one rain retreat, and became interested in the conservation of the flora and fauna of Thailand's remaining forests, where forest monks roam in their search for wisdom. Dr. Woraphat has been president of the Hornbill Research Foundation since 2015. He has written a number of books in the Thai language, and is currently the editor of a book being written on the work and lives of researchers who spend their time in various forests studying and looking after hornbills, in the midst of difficulties and sometimes danger working in the remaining pristine forests of Thailand.

Summary of the keynote presentation:

The presentation will focus on the work undertaken over the past 40 years by Thailand's Hornbill Research Team. The main points will focus on the initial challenges to undertake research in the forests without modern climbing equipment, the development of a method to extend natural Hornbills nest cavity lives and increase the propagation of hornbill chicks in forest areas, description of a socio-economic solution to prevent poaching of hornbill chicks, and Thailand's first forays into the release of hornbills in former habitats where they were poached to extinction several decades ago.

Keynote Presentation

Research and Conservation of Hornbills in Africa

Dr. Lucy Kemp
Project manager Mabula Ground Hornbill Project
Co-chair (Africa) of IUCN SSC Hornbill Specialist Group
Fascilitator IUCN SSC Conservation Planning Specilaist Group

Brief about resource person:

Her main interest is how to take sound scientific evidence and use that to formulate on-the-ground conservation action, that considers socio-economic realities, cultural sensitivities, and conservation biology. She has been privileged to work on conservation projects in both Namibia and South Africa including black rhino, wild dog, cheetah, high value plants species, community-based natural resource management and food security for communities living in national parks. My greatest need is to be in wild places and so I see it as my duty to do all I can to help keep wild places wild. As a conservation biologist she feels that the Southern Ground-hornbill, as a flagship species, is an excellent candidate for testing conservation tools, and connecting people throughout southern Africa through a common conservation interest, and growing love for this icon of our savannahs.

Summary of the keynote presentation:

I will share our lessons of what has, and hasn't, worked in the research and conservation of Southern Ground-hornbill over the past 25 years and where the IUCN SSC Hornbill Specialist Group would like to take the conservation of all African hornbill species. The Southern Ground-hornbill is a long-lived, cooperative breeder, with complex social structures making it a very difficult species to work with, in many respects similar to the African wild or painted dog. In the decades of testing new conservation tools as the research unfolded new possibilities, we have learnt how to hand-rear and reintroduce this species, monitor nests with minimal invasion, develop artificial nests well accepted and successfully fledging chicks, understand and use cultural value and use as a conservation asset, restoration using nests and education and build an inclusive citizen science network that is reaching areas where conventional atlassing is insufficient. The greatest threat this species currently faces is from spent-lead ammunition, presenting that same conservation threat that led to the almost complete decimation of the Californian Condor. By necessity our work requires a multi-disciplinary approach and collaborations with all sectors of society are critical if this species has a chance of survival. A custodianship model, using traditional leadership structures, is bearing fruit. These lessons are now paving the way for the first ecological research into the dramatically under-studied Northern or Abyssinian Ground-hornbill. With pilot projects underway in Ghana and Senegal we are laying the groundwork for a full-range collaborative study to gather sufficient biological data to undertake a conservation planning workshop for the species, which faces all the same threats as the Southern. I then present a summary of the research and funding needs for our other threatened hornbills to enable adequate conservation listing, that in turn, will allow for fund raising to enable the conservation.

Keynote Presentation

The future for hornbills in the face of local and global change: insights from long-term ecological monitoring and conservation action in the Eastern Himalaya

Dr. Aparajita Datta
Senior Scientist, Nature Conservation Foundation, India
Co-chair (Asia) IUCN SSC Hornbill Specialist Group

Brief about resource person:

Aparajita's interests are in plant–animal interactions in rainforests, tropical forest dynamics and tree phenology, understanding human impacts on wildlife, and engaging with people for conservation. She and her team have been primarily engaged in long-term research, monitoring and conservation of hornbills in the Eastern Himalaya for 20 years. Currently, conservation work is focussed on protecting hornbills and forest habitats through partnerships with communities and the government. When she not in the field, she enjoys watching and photographing birds and plants in urban-rural habitats and making eBird lists. She has written several books for children, co-authored ***Trees of Arunachal Pradesh: a field guide and co-edited a book At the Feet of Living Things: Twenty-Five Years of Wildlife Research and Conservation in India***. She is the Co-Chair of the IUCN SSC Hornbill Specialist Group.

Summary of the keynote presentation:

I will synthesize and present some of our long-term data to speak about the insights gained from 20 years of long-term ecological research and monitoring of hornbills in multiple sites in the Eastern Himalaya in terms of understanding the status of populations, their functional role, breeding and the role and impact of local threats as well as global factors such as climate change. Our long-term data on nest occupancy, timing of nesting, nesting duration and nesting success of three hornbill species shows some changes or 'anomalies' in breeding patterns in recent years. I will present some evidence to show that these anomalies may be linked to the El Niño phenomenon and climate change. Long-term monitoring of fruiting patterns also shows shifts in timing for some hornbill food plants. Monitoring of hornbill populations in some key sites suggests some stability and resilience, however there are increasing local threats due to habitat loss and degradation. Monitoring of roost sites has pointed to annual fluctuations linked to local threats such as infrastructure development and habitat degradation. Hornbills play a key role as seed dispersers functionally and their decline is likely to have consequences for regeneration of key food plants in the landscape. While key hornbill populations exist in a few Protected Area sites, their distribution and occurrence outside is affected by hunting and habitat loss. Our work over 20 years indicates that hunting remains a greater direct threat to hornbills and needs to be addressed at a wider scale than currently achieved. Given that hornbills range over large areas and these landscapes outside are greater in extent, it is important to consider these areas for conservation. Our engagement with communities for hornbill conservation outside PAs has focused on partnerships with forest officials, indigenous youth, activists, leaders, politicians, citizens, and donors. While this has succeeded to some degree in terms of greater awareness, interest, and love for hornbills and even funding support from citizens, on-ground changes to threats such as illegal logging have been a major ongoing challenge to address. Scaling the existing conservation model to other areas in the landscape will require greater investment in outreach, partnership-building, while changes in policy and governance of forest areas and strengthening local community institutions will be critical to protecting habitats and hornbill populations in future.

Keynote Presentation

Conservation Message from Bhutan

His Excellency Dasho Paljor J. Dorji
Ugyen Wangchuck Institute for Forest Research and Training, Bhutan

Brief about resource person:

Dasho Paljor Jigmie Dorji is currently serving as Special Advisor to National Environment Commission (NEC), Royal Government of Bhutan. Dasho had held many other diplomatic positions throughout his career. He is the recipient of Coronation Gold Medal, UNEP Global Laureate of work on Protection of black-necked cranes in Bhutan, Officer of the Order of the Golden Ark (The Netherlands) for Environment Conservation, Jigme Singye Wangchuck Conservation award for excellence in policy leadership and Balipara Land and Tract Foundation. Dasho is the founder of Royal Society for the Protection of Nature in Bhutan (RSPN), founder President of the Bhutan Ornithological Society and founder President of the Bhutan Ecological Society (BEST). Dasho has also published papers regarding the black-necked crane in Bhutan, distribution and conservation of tiger and elephants in Bhutan. "On the wings of prayer", is a twenty-minutes documentary film published out of his conservation passion and still is one of the nature enthusiasts in the country.

A NIGHT TALK

40 years of Experience of long-term Hornbill Research and Moving Forward

Emeritus Prof. Dr. Pilai Poonswad
Honourable Advisor to Thailand Hornbill Research Foundation

Brief about resource person:

De. Pilai has an M.Sc. in Microbiology from Mahidol University and a Ph.D. in Avian Ecology from Osaka City University, Japan. Her field of expertise is Avian Parasitology and Avian Biology and Ecology. She began her study of hornbills in Khao Yai National Park in 1978 and founded the Thailand Hornbill Project (THP) in 1979. She also founded the Hornbill Research Foundation in 1993. She is the representative of Thailand in the International Ornithologists' Union. She has retired from her work as Professor of Biology at Mahidol University. She has received numerous honors and awards for her scientific work and contribution to conservation including the 2006 Rolex Award for Enterprise from Rolex SA, Switzerland and the Dushi Mala Medal for Great Eminence in Science from His Majesty King Bhumibol in 2007, the highest national award.

Summary of the keynote presentation:

The talk is aimed to motivate researchers and conservationists to work on hornbill research and conservation. Collaboration and support are needed equally from the global community. With over 40 years of experience, she can address common problems and their solutions while providing all participants a venue for questions and answers.

Impacts of Climate Change on hornbills

Great Hornbill and the Tropical Rainforest Dynamics of the Western Ghats in the Era of Climate Change

Amitha Bachan K.H. *[1]

The Western Ghats Mountains, one of the global biodiversity hot spots encompassing south India and Sri Lanka has been the cradles of biodiversity supported with monsoonal tropical climate. The Great Hornbill (*Buceros bicornis*) represent the tropical primary rainforests of the region and recognised as the flagship of south Indian state Kerala which holds most diverse and rainfed regions in the Southern Western Ghats. Hornbill nest tree monitoring data of the community-based hornbill monitoring since 2005 in the Vazhachal region of Anamalai part of Western Ghats initiated by the Western Ghats Hornbill Foundation. These information and recent records across the Western Ghats used here and the Great hornbill nests are correlated with primary, then secondary rainforest habitats and the nesting density decreases with the degradation types. The nest is restricted strictly to the low to medium elevation forests (100-1500m). The study identified 18 important rainforest ecoregions of the southern Western Ghats as the Great Hornbill habitats of which the Anamalais are the strongholds. High nesting abundance in the Vazhachal Forest Division within the Anamalais indicate the importance of the low elevation and medium elevation rain forests for the Great Hornbills. The community based monitoring provided long-term data which is presented here as a reflection of rainforest dynamics since 2005, where each hornbill nest represent 240 ha primary rainforests in dense forest areas. The loss of nesting trees 2006-2017 indicate 5% (0.5%/year) and are corelated chiefly with the degraded forests with a history of various forest conversion practices and then on the damage to the nesting trees during the monsoon seasons, followed by forest fire and traditional hunting. The degradation due to decline in the quality of the forests is the pertaining threat and traditional hunting nearly nullified in community based conservation areas. The climatic data showed increase of exceptional rainfall years since 1972 and the 2018 and 2019 were the extreme in which there is loss of 12% nests and 22% nesting trees were severely damaged indicate climate change a serious concern bringing fluctuations in the nesting trees. The conservation planning requires area specific management plans supported with bioclimatic predictions, continuous monitoring, niche specific and ecosystem based ecorestoration of present and potential habitats.

Keywords: Climate change, Flood, Rainforest, Great Hornbill, Ecorestoration

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Perception of the current and future distribution of hornbills in Sri Lanka through ecological niche modeling

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There is now ample amount of evidence for the ecological impact of recent climatic change on species distribution. Weather is of major importance for the population dynamic of birds. Also, there is compelling evidence that birds have been affected by recent bioclimatic variations. High mobility and long-distance movement of hornbills, challenge to demarcate exact population and distribution records. To bridge these research gaps, we applied ecological niche modeling for two hornbill species in Sri Lanka, *Ocyceros gingalesis*, and *Anthracoceros coronatus* to map their geographic distribution. We updated the current and future predicted maps for two hornbill species in Sri Lanka using the observation records from GBIF and random grid sampling methods throughout the country since 2015. Ecological Niche Modeling tools (MaxEnt) and Arc GIS was used to generate the predicted distribution maps. Inverse distance mapping was used for the determination of the boundary shift of the hornbills compared with the temperature data collected throughout a similar time period. Gradual changing of distribution of the hornbill population to the hill country wet zone of Sri Lanka where the high elevation and lower temperature were clearly observed. The widespread nature of this shift in species distribution boundaries and its coincidence with a period of global warming suggests a connection with global climate change. We also encourage conservation authorities to employ ecological niche models to map potential species distributions and to forecast range shifts due to climate change.

Keywords: Climate change, Distribution, Sri Lanka grey hornbill, Malabar pied hornbill

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From captivity to release: The conservation of the endangered Visayan Hornbills in Negros Island, Philippines

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The endangered Visayan Hornbill, *Penelopides panini*, is *endemic* to several Visayan islands but now can only be found on two islands in the Western Visayan region, Negros, and Panay. The wild population decline, and island extinctions have been caused by hunting, wildlife trade, and continuous forest degradation. This has led to fragmented populations where they can only be found in protected areas in Negros.

In response to this continuous population decline, captive breeding of these endangered hornbills was intiated. Breeding started with two pairs of rescued hornbills in Bacolod City, now we have 17 pairs, with 6 existing proven pairs. Clutch size is usually 2-4 eggs and nesting lasts for 55-58 days. A total of 55 individual chicks successfully fledged between 1997 to 2022. The breeding success has been due to husbandry and management practices, particularly providing increased protein sources during the breeding season as well as hatching and fledgling periods. Alongside the diet, nest boxes may have been influential in breeding successes. As we achieved stable numbers in captivity due to this breeding success, we had the confidence confidence to start releasing captive-born individuals back into the wild.

In December 2020, we translocated a mixed-age group of 15 Visayan Hornbills to a soft-release flight aviary at our 300-ha release site, the Bayawan Nature Reserve in Negros Oriental. Prior to the release, preliminary site assessments for diet and habitat viability as well as community outreach and education were completed. During thepre-release period, the birds acclimated to the climate and environment, and were gradually provided local wild food and anti-predator training. Last June 2021, we released the first captive Visayan Hornbills. Post-release monitoring is done using GPS and radio tagging. Ongoing post-release support includes maintaining feeding areas and nest boxes placed in strategic areas. It has taken three decades to prepare for this species' release back into the wild, and continued development and learning in breeding and management, as well as post-release management and monitoring will help us define conservation efforts for these species in the long term.

Keywords: Hornbills, Reintroduction, Captive breeding, Endangered, Husbandry

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Hot Thunderbirds - implications of year-round warming for Southern Ground-Hornbills (*Bucorvus leadbeateri*)

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As global temperatures continue to rise, it is crucial to understand how animals respond to heat stress to assess their vulnerability. Birds living in hot climates face high thermal loads and must efficiently dissipate heat to maintain a safe body temperature. However, increased heat dissipation and heat avoidance behaviours come at a cost, resulting in missed foraging opportunities and reduced reproductive outputs. Southern Ground-Hornbills (*Bucorvus leadbeateri*) are large, ground-foraging birds found throughout southern Africa. Given their terrestrial foraging habits, they are particularly vulnerable to the adverse effects of rising temperatures, which are exacerbated by prolonged exposure to solar and ground radiation.

We investigated the behavioural responses of Southern Ground-Hornbills to high temperatures in the Greater Kruger region of South Africa by recording binary information on the presence or absence of heat dissipation behaviours, such as panting, wing drooping, and ptiloerection, as well as heat avoidance behaviour, such as seeking shade. We collected data over 3 years, with 6000 camera trap observations, 200 field observations, and 1000 citizen science photographs. Additionally, we measured the thermal load experienced by birds in different microsites using black bulbs to obtain operative environmental temperatures. Finally, we analysed long-term climate data from the study site to investigate temperature trends, thus providing a comprehensive understanding of the thermal conditions experienced by Southern Ground-Hornbills in the context of a changing climate.

We found that Southern Ground-Hornbills began heat dissipation behaviours at lower air temperatures in winter than summer, but heat avoidance behaviours were more apparent in summer. We also found that winters are warming faster than summers in the study site, highlighting an unexpected vulnerability for birds in this region. Given the limited food and shade resources available during winter, the rising temperatures in this season could have negative consequences for their ability to reach breeding condition after hot winters, ultimately affecting the condition and fitness of adults and subsequent chicks, which could in turn impact the species' persistence.

Keywords: Climate change, High temperatures, Behaviour

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Relationship of ripe fruit tree availability to nesting attempt and flocking size of large-sized hornbills and the effect of El Niño on hornbill life cycle in Khao Yai National Park, Thailand

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Nesting attempts of large-sized hornbill, the Great (GH) and Wreathed (WH) Hornbills, flock size of WH and fruit availability were monitored in Khao Yai National Park over a 15 – year period (2008 – 2022). The total number of ripe fruit trees in winter (November –February) varied greatly (45 – 167 trees) with an average of 85.9 trees per year (n = 15 years). There was an average of 37.3 nesting attempts of GH and WH annually (n = 15 years), ranging from 8 to 50 attempts. The total number of nesting attempts of GH and WH significantly correlated positively with the ripe fruit tree availability (r = 0.7, P = 0.003, n = 15). The average flock size of WH was 556.3 (n = 15 years), ranging from 167 to 1,050 individuals. The number of ripe fruit trees in summer (July-October) varied from 76 – 183 trees with the average of 139 trees over 15 years. There were no significant relationships between maximum flock size of WH and number of ripe fruit trees. We found that the drought associated with El Niño phenomenon limited nesting attempts of GH and WH, and the flock size of WH.

Keywords: Hornbill nesting attempts, Flock size, Fruit availability, El Niño

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Impact of Climate change on Helmeted Hornbill's remaining habitat

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The Helmeted Hornbill (*Rhinoplax vigil*) has been downgraded to critically endangered in 2015 due to its drastic population decline due to severe hunting pressure and habitat loss. While the extensive focus has been given to increasing poaching for the species' valuable casque, little focus has been given to the conservation status of its habitat, the evergreen forest of southern Thailand, Myanmar, Peninsular Malaysia, Sumatra, and Borneo. Sundaic forest has been declining over the past decades due to infrastructure and large-scale agricultural development. In the long-term (2100), this region has been predicted to change significantly due to predicted changes in climatic conditions. This study assessed the current extent of the helmeted hornbill's suitable habitat across its range and estimated the effects of short-term threats (infrastructure development, large-scale crop expansion, and logging) and long-term threats (the effect of climate change on the natural forest of the region). To improve the conservation of the species, the study identified potential areas for future management. Locations from the citizen science database and habitat variables from a geographic information system database were used to 1) define suitable habitats for the species based on the best-performing model using the lowest AIC. 2) Model the probability of occurrence of the helmeted hornbill using an infinite weight logistic model. 3) Classify key localities where there is a large extent of suitable habitat based on overlap with the high probability of occurrence map ($p > 0.5$). 4) Predicted short-term threats, defined as forest loss hotspots and long-term threats. 5) Define future suitable habitat availability and species distribution based on changing climatic variables by using three modeling scenarios (SSP126, SSP370, and SSP585) that reflect various socio-economic pathways and radiative forcing projections for the end of the century (years 2081–2100). The results showed that the evergreen forest was the most important habitat type explaining the species occurrence. The total area represented by large habitat patches (>100 km2) decreased by 16% over the past 20 years (2000–2020). The short-term threat varied between countries, with a high impact on forest patches located outside protected areas. In the short-term, a total of 12% of suitable habitat, showing a high probability of occurrence, is under high degradation threat. In the long-term, predicted climate changes are likely to reduce suitable habitat by 85% by 2100. Our results provide critical information for conservation planning, and the current and future predictions give straightforward evidence that governments and decision-makers should immediately take action to conserve the remaining natural evergreen forest currently inside the protected areas throughout the entire range of the helmeted hornbill.

Keywords: *Rhinoplax vigil*, Biodiversity hotspot, climate change, forest loss hotspot

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Hot-dry weather is associated with poorer reproductive outcomes regardless of group composition in the cooperatively breeding Southern Ground-Hornbill

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Anthropogenic climate change is driving increases in temperature and extreme weather events, and understanding how species respond to these conditions has become of major importance. Cooperative breeding is common in regions experiencing higher environmental variation and has been suggested to mitigate harsh climatic conditions, but results have been inconsistent and differ across taxa, perhaps because variation in life-history strategy influences breeders' and helpers' investment decisions and so the effect of helpers. In addition, long-lived, slow-developing species can contain group members of varying age and experience which might modulate group size effects.

We examined how different reproductive parameters are associated with climatic, social, and life-history factors in a large, slow-developing, and long-lived cooperative breeder, the southern ground-hornbill (*Bucorvus leadbeateri*). Groups in this species typically contain members that can be morphologically classified into distinct age classes (adult, sub-adult, and juvenile), allowing us to examine the effects of members of different ages on reproduction, and whether they modulate the effects of environmental conditions. We used 17 years of breeding data collected from 23 territorial groups within the Greater Kruger National Park, South Africa, to test for associations between climate and group composition and breeding probability, laying date, fledging success, and nestling growth.

We found that, regardless of group composition, higher winter and breeding season temperatures were associated with later laying dates and declines in nestling body mass, while low winter rainfall was associated with decreased breeding probability. There was no clear association between group composition and fledging probability. The number of adult helpers was associated with longer nestling tarsi, while the number of juvenile group members (and, to a lesser extent, sub-adults) was associated with higher breeding probability, earlier laying, and longer nestling tarsi. However, we suggest that the associations with number of juveniles and sub-adults more likely reflect group or territory quality than contributions by these younger individuals.

We conclude that hot and dry conditions are associated with poorer breeding performance in Southern Ground-Hornbills, and that this negative association is not meaningfully mitigated by the composition of cooperative groups. We expect that further research on other long-lived species will produce similar findings and contribute to broaden our understanding of this social system and its biogeography.

Keywords: Hornbill nesting attempts, Flock size, Fruit availability, El Niño

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Niche specificity of the Malabar Pied Hornbill and the conservation of Endangered low elevation riparian forest ecosystems in the Western Ghats

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Low elevation tropical moist forests have been the most degraded and diverted tropical moist forest biome. These areas represent important human habituated zones where the remnants of primary vegetation occur in severely fragmented patches where humans have traditional access. Large areas are converted either for large scale Agro-forestry plantations or for developmental purposes. The scattered and patchy distribution of the Malabar Pied Hornbill, *Anthracoceros coronatus* from the Satpuda Hills of Maharashtra in Central India to the low elevation areas of Northern to Southern Western Ghats were niche-modelled to understand the bioclimatic suitability and also to predict the potential habitats across the range. The study indicates the Malabar Pied Hornbills are distributed in eight ecoregions where most of the areas are associated with river valleys and riparian habitats of very low elevation. The Maxent-based niche-modelling provided predictions for potential areas of suitable habitat. Eleven of the 19 bioclimatic variables considered contributed to the bioclimate of Malabar Pied Hornbills, with the most significant being: "precipitation during the driest and wettest months" (positive), "Temperature seasonality", and "minimum temperature of coldest month" (negative). The model showed significant overlap with actual and potential distribution of the Endangered low elevation Tropical Riparian moist forest habitats and other riparian forest types. The Maxent-based niche-modelling and the contributing bioclimatic parameters of the World Clim database defines the Grinnellian niche of the Malabar Pied Hornbill. The correlation with riparian forest and similarity in the riparian forest composition and Malabar Pied Hornbill nesting habitats throws light on Eltonian niche factors where the linear riparian low elevation habitat less in extent are significant and vulnerable. Malabar Pied Hornbills can be considered flagship species of the low elevation riparian or valley forests habitats, which need conscious conservation and restoration efforts. This can be used for the conservation and restoration of Malabar Pied Hornbills and their threatened habitat.

Keywords: Niche modelling, Bioclimate, Maxent, Riparian

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Land-use change to agroforestry plantations affects three hornbill species in northern Western Ghats

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The conversion of primary forest to agroforestry plantations is one of the major drivers of tropical forest loss in south and south-east Asia. These lowland habitats are also critical habitats for multiple hornbill species. Therefore, it is imperative to determine the impacts of forest conversion on threatened hornbills. In the Western Ghats biodiversity hotspot of India, 35.3% of forests were converted to agroforestry plantations between 1920 to 2013. In the northern Western Ghats, forested habitats continue to be converted to agroforestry plantations of rubber, cashew and mango at an alarming rate. The Protected Areas in the region are restricted to higher elevations, with remnant patches of government-owned Reserved Forests and private forests in lower elevations. This study aimed to determine the impacts of forest conversion on three hornbill species, the Great Hornbill, *Buceros bicornis*, Malabar Pied Hornbill, *Anthracoceros coronatus* and Malabar Grey Hornbill, *Ocyceros griseus*. We used variable-width line transect survey across six categories of land-use types in approximately 15,000 km^2 landscape. All other land-uses except Protected Areas were in lower elevations. We used variable-width line transect surveys (n = 184 transects) covering 137.5 km (ca. 20 km in each land-use type) to estimate hornbill densities. We recorded a total of 126 detections (calls and visual observations) of four hornbill species, Great Hornbill: 15, Malabar Grey Hornbill: 74, Malabar Pied Hornbill: 35 and Indian Grey Hornbill: 2. We did not estimate the density of the Indian Grey Hornbill since we had only two detections. We used a multi-covariate distance sampling approach to estimate densities of different hornbill species across forested habitats and agroforestry plantations. Among the three species, the Malabar Grey Hornbill (2.6 flocks/km^2, 95% CI: 1.6 – 4.1) was commonest, followed by Malabar Pied Hornbill (1.23 flocks/km^2, 95% CI: 0.7 – 2.0) and Great Hornbill (0.5 flocks/km^2, 95% CI: 0.2 – 0.9). The overall mean (95% CI) density of hornbills (pooled across species) was higher in the low-elevation Reserved Forests [15.7 flocks/km^2 (95% CI: 10.2 - 24.4)] than in the Protected Areas [1.3 flocks/km^2 (95% CI: 0.5 -3.6)] which were in the high elevations, highlighting the value of low-elevation forests for hornbills. The mean densities of hornbills (pooled across species) were higher in Reserved Forests than Private Forests [3.5 flocks/km^2 (95% CI: 1.7 – 6.9)], Cashew Plantations [3.7 flocks/km^2 (95% CI: 1.6 – 8.2)], Rubber Plantations [2.2 flocks/km^2 (95% CI: 0.9 – 5.2)] and Mango Plantations [1.0 flocks/km^2 (95% CI: 0.3 – 2.8)], highlighting the negative impact of forest conversion on hornbills. This study highlights 1) the value of unprotected low-elevation forests for hornbills, 2) the inadequacy of the existing high-elevation Protected Areas for hornbills and 3) the negative impacts of forest conversion to agroforestry plantations on hornbills.

Keywords: Land-use change, Low-elevation forests, Conservation, Endemic, Hornbills, Western Ghats

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The Casque Crisis – the Past and Present situation

Jessica Lee [*1], and Anuj Jain [2]

The Helmeted Hornbill (HH) *Rhinoplax vigil* is one of the largest hornbill species in Southeast Asia. It's unique solid casque is in high demand across Asia as material for carved jewelery and ornaments. It has been listed on Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) since 1975. However, escalating demand, coupled with inadequate enforcement in several countries, has led to a recent surge in illegal trade. In late 2015 this surge, combined with ongoing habitat loss, the species' conservation status in the IUCN Red List of Threatened Species was up-listed from Near Threatened to Critically Endangered. The year 2016 saw two events occurring as a result – the adoptions of: 1) the IUCN motion WCC-2016 Res-009 Conservation of the Helmeted Hornbill at the IUCN World Congress; and 2) CITES CoP17 Resolution Conf. 17.11 Conservation of and Trade in Helmeted Hornbill at the CITES Conference of the Parties 17. Both resolutions urge for enhance conservation efforts around the species, management of trade and saw the development of a region-wide action plan in 2017 - 2018, as well as the formation of the Helmeted Hornbill Working Group (HHWG) under the auspices of the IUCN SSC Hornbill Specialist Group to implement actions stipulated in the plan. This presentation summarises the back-story of the HH in the trade and updates on actions carried out by the IUCN SSC HHWG to-date. We also aim to emphasize areas where HHWG is doing well and where we foresee collective actions could be ramped up.

Keywords: Helmeted Hornbill, Trade, Casque

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Applied Hornbill Conservation

Successful Breeding of Wrinkled Hornbills (*Rhabdotorrhinus corrugatus*) at the Phoenix Zoo

Marisa Boyd [*1]

Phoenix Zoo has a long history of breeding Rhinoceros Hornbills (*Buceros rhinoceros*) in captivity. We successfully produced 11 Rhinoceros Hornbill chicks over the years but have never been successful with Wrinkled Hornbills (*Rhabdotorrhinus corrugatus*). In 2017, due to their lack of breeding in the past few years, we decided to systematically modify our husbandry and management protocol based on environmental conditions found in their native range, with the aim to induce breeding. We modified nest box design, rain cycle and diet. We designed a new artificial nest with a smaller opening to reduce the amount of mudding needed to complete the entrance seal, added ventilation holes to increase air flow, and added a rear access door to facilitate nest checks. These nest changes were based on prior challenges we encountered while breeding Rhinoceros Hornbills. We modified our rain cycle by increasing both the volume and frequency of rain to correspond with the rainy season in their native range.

We increased the amount of invertebrate protein and ripe fruit in their diet to simulate increased resource availability. Once these modifications were complete, we scheduled physical exams with our veterinary team for our Wrinkled Hornbill pair. Post exam, we observed the pair displaying courtship behaviours and performing nest visits. We theorize that this "false traumatic event" helped initiate breeding in captive hornbills, as we historically observed the same sequence of behaviours with our Rhinoceros Hornbill pairs. Chester Zoo observed a similar outcome with their Rhinoceros Hornbill pair after a fire forced staff to evacuate the birds to safety. Following the modifications to the protocols, in 2021we successfully produced a Wrinkled Hornbill chick that survived to adulthood. In June 2022, our female entered the nest and laid two eggs before mudding was complete. Unfortunately, the bird had a medical complication with her reproductive tract that required surgical intervention and all reproductive behaviours ceased thereafter. As Rhinoceros Hornbills have been more successful at breeding in captivity, we have future plans to foster out Wrinkled Hornbill eggs to nesting Rhinoceros Hornbills, in order to increase the survival of additional chicks in a clutch that may otherwise be subjected to filial infanticide or siblicide. Due to space limitations, shipping out fertile eggs to other facilities is also another consideration. This management plan may help increase captive population growth and viability in species whose rates are limited by their reproductive biology.

Keywords: Captive breeding, Artificial nest, Fostering

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A comparison of traditional and passive acoustic monitoring techniques in a tropical semi-inundated forest patch for hornbill research in Sabah

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The aim of this study is to investigate the potential use of passive acoustic monitoring (PAM) as a new tool for hornbill research in Sabah, where its application has been limited. Our study compares the effectiveness of PAM with the widely-used point-count method and documents the long-term economic benefits of adopting PAM for data collection. To this end, we established 23 survey stations in Lot 6 of the Lower Kinabatangan Wildlife Sanctuary and conducted three surveys at each station using both methods simultaneously for 20 minutes between 06h30 and 09h00. Our results indicate that human observers mainly identified hornbills aurally as birds are difficult to observe in the field. The ARU detected hornbills that were also detected aurally by humans. We tested both human observer and ARU detection events for sensitivity and specificity. We found a 100% specificity for all hornbill species, while there was a sensitivity discrepancy between Oriental Pied Hornbills and Black Hornbills (60.7% and 91.6%, respectively). Based on our study and experience in the field, we provide specific protocols and suggestions for future hornbill research in Sabah using PAM. Our study is expected to contribute to the development of PAM-based methods for hornbill research and conservation in Sabah, and beyond.

Keywords: Hornbill, Bioacoustics, Passive acoustic monitoring, Sabah, Borneo

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Important Hornbill Landscapes in Sarawak

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The importance of identifying priority sites for hornbill conservation planning in Malaysia was highlighted at the 7th International Hornbill Conference. These sites were termed as Important Hornbill Landscapes (IHLs) and were determined through a set of four criteria which were applied to sites within Peninsula Malaysia. Outside the Peninsula, the Bornean states of Sarawak and Sabah are similar with critical habitats supporting a high diversity of hornbills and yet, IHLs have not been identified in these states. Thus, we embarked on a study to apply and adapt the four IHL criteria to sites in Sarawak, Malaysia to inform land use and conservation action planning.

The four IHL criteria include hornbill species richness at the site, site area, role of the site in conservation policy, and breeding evidence at the site. In order to conduct an IHL assessment in Sarawak based on the above, hornbill records from a diverse range of sources were compiled and key information on the species, location of sightings, and breeding records were analysed alongside forest data to identify IHLs in the state. Data was available for 119 sites of which eight were identified as IHLs. A further seven sites were identified as potential IHLs that may qualify in the coming years with the availability of more information. This prioritisation exercise not only shows the adaptability of the IHL criteria, but its results also bear a practical significance for conservation stakeholders in Sarawak. As development continues, this prioritisation exercise represents a relevant and important opportunity to secure IHLs for hornbills in Malaysia.

Keywords: Conservation prioritisation, Malaysia, Borneo

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Securing a safe haven for the Helmeted Hornbill in Usun Apau National Park, Sarawak, Malaysia

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Based on recommendations from the Helmeted Hornbill Conservation Strategy and Action Planning Workshop in 2017, rapid assessments were conducted by the Malaysian Nature Society Kuching Branch (MNSKB) from 2019 to 2021 in eight selected priority sites in Sarawak. The Usun Apau National Park (UANP) was identified as a priority site based on sightings of the Helmeted Hornbills and other hornbill species from the site, presence of good quality habitat and relatively low disturbance. In order to conserve and protect hornbills at this site, MNSKB and BirdLife embarked on a long-term project in 2021, in collaboration with Sarawak Forestry Corporation and other relevant stakeholders. Biodiversity knowledge of UANP is still in its infancy stage due to the site's rugged terrain and accessibility. Since 2021, MNSKB has engaged relevant stakeholders, conducted expeditions to UANP, detected the target species, and engaged indigenous communities through interviews and assessment of local livelihoods. The interviews have already provided invaluable knowledge of hornbills' presence, abundance trends, local use, hunting, cultural beliefs, and the threats to the hornbills. We continue to work in the landscape with a long-term view of providing sustainable alternative livelihoods to indigenous communities whilst protecting hornbills. In doing so, we have also reviewed the UANP Management Plan which aims to catalyze development at the site through eco-tourism. We are engaging stakeholders to ensure such development plans consider both indigenous people's lifestyle and hornbill ecology.

Keywords: Sarawak, Usun Apau National Park, Local communities, Helmeted Hornbill

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The Development of a Helmeted Hornbill Education Kit for Enforcement and Courts (HEKEC) in Hong Kong SAR

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One of Asia's largest hornbills, the helmeted hornbill (*Rhinoplax vigil*), is Critically Endangered largely due to the illegal wildlife trade as well as habitat loss. R. vigil is illegally hunted, traded, and sold for ornaments made from its solid casque. Despite legal protections, trade and seizures of *R. vigi*l products still occur across Asia, including Hong Kong SAR. As such, there is a need for increased awareness among the government and judiciary across range and consumer states to support investigative and legal efforts. Here we will describe and show a summary of the materials and workshops provided to the Hong Kong government. These were developed through an international collaboration to aid enforcement of *R. vigil* crimes in this major trade hub. Materials include a short documentary linking the bird in the wild (Malaysia) to the trade (Hong Kong), a presentation on the research conducted on wildlife forensics and trade investigation in Hong Kong, a Species Victim Impact Statement developed to provide information about *R. vigil* and the impacts of its trade for use in court cases, and educational material (poster, information labels for education centre) for government-led outreach for the Hong Kong public. We provided a short survey to workshop participants after the presentation to assess their knowledge of crimes against *R. vigil*. Our materials will be made available for those who wish to use them for their own enforcement education needs. Together the aim of these materials and research efforts is to support enforcement of illegal trade of *R. vigil* in Hong Kong and the wider region.

Keywords: Illegal Wildlife Trade, Helmeted Hornbill, Critically Endangered, Enforcement and Judiciary Education, Hong Kong

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From the sky to ground: Lessons learnt from Helmeted hornbill conservation in Kho Sok Klang Saeng forest complex, Thailand

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Helmeted hornbill is a Critically Endangered species, as a result of hunting, illegal trade, and habitat loss. In Thailand, this project has used multiple approaches to conserve this species. Bird Conservation Society of Thailand (BCST) has long-term collaborations with awildlife research center, national parks, and wildlife sanctuaries (the Khao Sok, the Khlong Saeng, the Khlong Phanom, the Khlong Yan, the Sri Phang Nga, the Khlong Nakha and the Kaeng Krung), and with local communities to protect this species in the Khao Sok Klang Saeng forest complex, which is the one of the most important habitats of this species. There are three main approaches. The first is to estimate populations and to identify key habitats in this forest complex by BCST and smart patrol teams of government agents. The results found that a population of Helmeted Hornbill were distributed around the area of Khao Sok, Klong Saeng and Sri Phang Nga,while the surveys are still underway in the rest of the protected areas in the forest complex. The second approach is to empower all stakeholders, especially government sectors and communities. BCST hosted workshops of systematic data collection and Thai hornbill species identification. The last approach is to identify the ecosystem service values of living Helmeted Hornbills and their habitats to generate incomes and benefits to local communities. The socio-economic data has been collected from the communities around the forest complex to understand the perception of community on this bird. The Helmeted Hornbill questionnaire data was collected in five villages to cover all key groups in the villages. In total, 80 questionnaires, of which 56.7% were males and 43.3% were females. The result showed that 56% of respondents knew Helmeted hornbill, and mostly in the age of 46-6. About 35% of respondents had seen/heard of the bird in the national park or around the Ratchaprapa dam, and most people, who have seen the bird, work in the field of tourism. Lastly, the result of the questionnaire found that the connection of the bird and habitat conservation and ecosystem services are nature-based tourism (bird watching), pollination services of Durian, rambutan, and mangosteen.

Keywords: Helmeted hornbill, Local community, Population, Ecosystem services

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The Bateks and Hornbills: Documenting Local and Traditional Ecological Knowledge from the Batek Indigenous Group from Kuala Koh, Malaysia for Hornbill Research and Conservation

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In recent years, local ecological knowledge (LEK) and traditional ecological knowledge (TEK) have been increasingly recognized for their potential benefit to wildlife conservation, research, and monitoring. However, it remains difficult for LEK and TEK to gain recognition among the wider scientific community due to challenges in differentiating reliable from non-reliable information. This is because LEK and TEK may be entangled in folklore, spiritual beliefs, and other cognitive biases. Xploregaia's Flying Gardeners Project currently employs three individuals from the indigenous Batek people group from Kuala Koh, Kelantan, Malaysia as field assistants. They were employed to assist in monitoring the hornbill population and nesting in the newly established Kenyir State Park, Terengganu, Malaysia. This presents a unique opportunity to evaluate to what extent the LEK and TEK collected from them could be incorporated in Asian hornbill conservation and to highlight the unique challenges faced in this endeavour. Despite how modernization is causing massive changes to the Batek way of life, Batek's insights into hornbill ecology may still be invaluable as a lot of them continue to reside near the rainforests where they experience these birds almost on a daily basis, and some of them continue to practice the teachings of their more nomadic hunter-gatherer elders. This paper presents and discusses some of the anecdotal and traditionally accumulated information that was collected from the Batek field assistants.

Keywords: Indigenous Communities, Local Ecological Knowledge, Traditional Ecological Knowledge, Conservation, Hornbills

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Habitat Protection and Management Conserves Hornbill Population In Mt. Banahaw, Philippines

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The Mt. Banahaw-San Cristobal Protected Landscape is one of the important Protected Areas supporting populations of endemic hornbills in the Philippines. The local government of the City of Tayabas initiated the community-based habitat restoration and protection in one village in 2012. The support for communal native tree nurseries and enforcement in partnership with the local communities successfully restored degraded forests habitats. Trainings for community-based hornbill monitoring were introduced from 2016-2018. The synchronized hornbill monitoring system for citizen scientist was conducted from 2018 to 2021. A total of 45 point count stations were established where each count station was surveyed for eight minutes resulting to 84 hornbill detections. Using Distance sampling analysis, Luzon Tarictic Hornbill Penelipides manillae density was estimated at 147.4 hornbills/km^2 (±80). Three Northen Rufous Hornbill, *Buceros hydrocorax* were also recorded for the first time in May 2022 for over 20 years of not encountering the bird.

The local government's habitat restoration initiatives with support from the local communities helped improved the habitat quality and rehabilitated degraded habitats. The good environmental governance as well as conservation challenges are also presented.

Keywords: Habitat Protection And Management Conserves hornbill Population In Mt. Banahaw, Philippines

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A comparative study between the microclimate conditions of artificial nest boxes and six natural nests of Oriental Pied Hornbill (*Anthracoceros albirostris*) in Kinabatangan, Malaysia

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There are eight species of hornbills found in Kinabatangan, Borneo. According to the IUCN Red List, one species is critically endangered (Helmeted Hornbill, *Rhinoplax vigil*), two as endangered (Wrinkled Hornbill, *Rhabdotorrhinus corrugatus* and White-crowned Hornbill, *Berenicornis comatus*, three as vulnerable (Rhinoceros Hornbill, *Buceros rhinoceros*, Black Hornbill, *Anthracoceros malayanus* and Wreathed Hornbill, *Rhyticeros undulatus*), one near threatened (Bushy-crested Hornbill, *Anorrhinus galeritus*), and one least concern (Oriental Pied Hornbill, *Anthracoceros albirostris*). Typically, Asian hornbills' nest in natural cavities of living trees and they are unable to excavate these cavities themselves. Conservation efforts in the region include the introduction of nest boxes into natural habitats. Microclimatic conditions inside the boxes are key for successful breeding. Here we present data on the microclimate conditions of six natural nest cavities used by the Oriental Pied Hornbills (*A. a. convexus*) and five artificial nest boxes designed to create nesting opportunities for the hornbills. Say something here about the nest box design. The mean temperature inside each of the six nest cavities varied, ranging from 25.8°C to 28.8°C whereas the mean humidity ranged from 88.2% to 99.8%. As for the nest boxes, boxes labelled as A3, A4 and A5 had very similar mean temperature readings i.e. 27.2°C, 27.5°C and 27.7°C respectively. A3 recorded the lowest mean temperature among the three nest boxes, followed by A4 and A5. In terms of humidity, A3 had the most humid internal condition (mean 89.3%) while A4 and A5 nest boxes had lower mean humidity levels (85.8% and 83.7% respectively). Interestingly, A3 was the preferred nest box as it was used by Rhinoceros Hornbills over three successful nesting cycles. A1 and A2 represent phase two of the nest box installations and they were of similar in design, i.e. a wooden rectangular box yet differing slightly in size. Though these two boxes experienced the smallest temperature and humidity fluctuations i.e. 1.8°C and 8.1% and 3.5°C and 6.1% respectively, they did not last long in the forest and were rotten within five years.

Keywords: Artificial nest boxes, Microclimate, Nest

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Captive Breeding for Oriental-pied Hornbills in Nagaland, India

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Nagaland falls in one of the most biodiverse regions of the world where two global biodiversity hotspots, the Indo-Burma Biodiversity Hotspot and the Eastern Himalaya Biodiversity Hotspot, meet. Five species of hornbills are found in the north-eastern state of Nagaland, India: Great Hornbill, *Buceros bicornis*, Rufous-necked Hornbill, *Aceros nipalensis*, Wreathed Hornbill, *Rhyticeros undulatus*, Oriental-pied Hornbill, *Anthracoceros albirostris*, and Brown Hornbill. Among frugivores in the highly biodiverse tropics, hornbills rank among the most important seed dispersers, especially for large-seeded trees. In addition, the ecologically important frugivores have an immense significance in the tradition and culture of the indigenous Naga tribes. Despite this, hornbill populations across the state have been pushed to local extinction in the face of habitat loss and hunting. To address these declines, efforts have been made to breed threatened hornbill species in Nagaland. The Nagaland Zoological Park currently houses three species of hornbills (Rufous-necked Hornbill, Brown Hornbill, and the Oriental-pied Hornbill). The captive breeding initiative for Oriental-pied Hornbills started in 2014. The first success for the species at the facility came in 2018 with one chick. In 2019, two more chicks hatched, although they were killed by an adult male the following year. This year (20XX), seven individuals comprising three males and four females are being housed in three different enclosures and regularly monitored to facilitate successful pairing for breeding. This effort aims to enhance our understanding of captive breeding of the Oriental-pied Hornbill with respect to key factors such as dietary requirements, enclosure enrichment, nest box design, numbers, and placement, and taking into account behavioural aspects and interaction with other individuals. Courtship feeding has been observed among the individuals in all the enclosures, while for some individuals, billing behaviour, previously reported by Vyas R, 2002, has also been observed. For the current breeding season, copulation has been observed in one of the pairs. Diet composition has been observed to have a positive impact on breeding success. Through this captive breeding programme, we aim to fill existing knowledge gaps on what facilitates success in breeding programmes for hornbills. Successful breeding programmes have the potential to address the concerning hornbill population declines in the wild and securing their future in the landscape.

Keywords: Conservation, Breeding, Keystone, Flagship, Hornbill

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Exploring Local Community Perceptions on Hornbill Conservation in West Kalimantan, Indonesia

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Effective wildlife conservation strategies must consider local community perceptions as a basis to develop an effective action. This study aimed to explore community attitudes toward hornbill conservation in West Kalimantan, Indonesia. Between November 2018 and August 2019, we conducted interviews with 513 respondents in ten villages in Kapuas Hulu Regency. Using Open Data Kit, we collected data on respondents' demographics, socio-economic status, human-forest interactions, cultural values, hornbill encounters, and knowledge of hornbill hunting. The majority of respondents were Dayak people who have a strong cultural relationship with the hornbills and rely on the forest for their livelihoods. Sixty percent of the respondents reported engaging in regular forest-related activities, including farming and the harvesting of forest resources for subsistence and commercial purposes. Our findings show that while most respondents had knowledge of hornbills, 47% of Dayak respondents were not aware of their cultural significance. We also discovered that hunting of hornbills has occurred in the area in the past five years, with Helmeted Hornbills being specifically targeted for their heads using handmade rifles as a weapon of choice by the poachers (89%). Additionally, 12% of respondents reported hunting hornbills for food. These results indicate a decline in the spiritual value of hornbills and suggest that hunting is related to socioeconomic changes, given that a significant proportion of respondents had no steady income. To address these issues, we propose alternative conservation interventions, such as hornbill ecotourism, to enhance and fortify the socio-economic well-being of local communities. These community-based programs can promote sustainable conservation practices and mitigate the unsustainable use of natural resources, such as hornbill poaching.

Keywords: Conservation perception, Helmeted Hornbill, Cultural values, Local community perceptions

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Hornbill conservation; the views of local communities in North Central Province, Sri Lanka

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Hornbills are critical to a forest ecosystem's health, but habitat loss, fragmentation, and hunting pose threats to their survival throughout the world. Due primarily to a lack of nest cavities, two hornbill species, including the near-threatened Malabar Pied Hornbill, *Anthracoceros coronatus* and the endemic Sri Lanka Grey Hornbill, *Ocyceros gingalensis*, are in danger. One of the main reasons for the declining hornbill population in Sri Lanka is a lack of public awareness of hornbill conservation. Yet, there is still little knowledge about how hornbills are seen by local communities and their ideas about them. To bridge the knowledge gap and dispel misconceptions about hornbill conservation efforts in North Central Province (NCP), we surveyed the local community to learn more about their awareness and attitudes towards hornbills. A validated questionnaire was distributed to the local community (n = 200) through a face-to-face survey in five administrative divisions of NCP in Sri Lanka. The local population employed SPSS software to analyze, correlate, and visualize these two hornbill species. Our results show that the local community has very little knowledge and experience with hornbills, while their attitude suggests a moderate level. Economic and social factors strongly predicted awareness and knowledge of hornbills. Knowledge was influenced by degree of schooling and number of dependents, demonstrating how current degree of knowledge of hornbill conservation is influenced by factors such as the neighborhood's characteristics, daily life and social interactions, services and facilities, education, and monthly income. This study described the hornbills, behaviors in the surrounding. In the present study, hornbill behavior in nearby towns was reported. Such socio-economic data is essential to bolster hornbill conservation in the area and these findings aid in bridging the gap between community participation in NCP and hornbill protection. Introduction of artificial nests and its monitoring through the community participation and conduct awareness programs for the school children on hornbills and its ecological importance will be an effective mechanism for conservation of hornbills in this area.

Keywords: Conservation, Habitat loss, Awareness, Community

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Becoming protectors of hornbills: the story of the Nyishi tribe

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The Pakke Tiger Reserve in the Eastern Himalayan region has four hornbill species – the Great, Oriental Pied, Wreathed and the Rufous-necked hornbill. A long-term study of hornbills in this landscape highlighted the need for protection of hornbills outside Protected Areas (PAs). The adjoining Reserved Forest (RF) has villages, with majority of the population belonging to the indigenous Nyishi tribe. Hunting of hornbills was common in the past. The traditional headgear is adorned with the Great hornbill's beak, which have now been replaced with fibreglass beaks. The Nyishi culture however prohibited hornbill hunting during the breeding season. While hornbills and their nesting trees are well-protected within the PA, there was habitat degradation in the adjoining forests because of increased dependency on resources and lack of employment opportunities.

The Hornbill Nest Adoption Programme (HNAP), a community-based conservation programme in the RF was started in 2012. The HNAP adopted a previously used model of bringing together citizens and institutions to support hornbill conservation. The funds are used to employ members from the community. The "nest protectors", are engaged in monitoring and protecting hornbill nests, roost sites and monitoring hornbill population. From 2012-2022, we have located and monitored 40 hornbill nest trees in the RF. The annual nest monitoring records nest occupancy, nest entry, exit dates and nesting duration. Successful fledging of 193 hornbill chicks of the Great, Oriental Pied and Wreathed hornbills have been recorded. The average nest occupancy rate in the RF is 67%, lower than the adjacent Pakke Tiger Reserve (80% from 2012-2019). The average nesting success in the RF is 86% and in Pakke TR is 90%. Despite a lower nest occupancy rate in the RF, the nesting success continues to be similar to the PA.

Among the three species, the mean nest occupancy and nesting success is highest for the Oriental Pied compared to the Wreathed and Great hornbill. Oriental Pied adapts better in secondary forests compared to the two larger-sized hornbills.

There are also several challenges the programme has faced. There is ambiguity in the ownership and governance of the RF which makes it challenging to address the ongoing forest loss. The role of the Nyishi nest protectors has been crucial not just in hornbill monitoring but also in engaging in dialogue with communities and authorities to help sustain this decade-long programme.

Keywords: Community-based conservation, Hornbill breeding, Great hornbill, Wreathed hornbill, Oriental Pied hornbill

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Lessons learned from recent hornbill field surveys and conservation work across Southeast Asia

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BirdLife International and its partners has been closely engaged in hornbill conservation projects across Indonesia, Malaysia, Myanmar and Thailand. This talk will cover the work initiated by the BirdLife partnership in key Helmeted Hornbill sites since 2018 in the above countries. This was done via a series of rapid assessments as well as targeted engagement at a subset of sites where local communities were engaged at multiple fronts. Lessons learned include how models of hornbill conservation need to adapt based on site context, protection status, type of communities and how tightly communities might associate with hornbills. Thinking about such models is particularly relevant for the conservation of taxa that are traded and in high demand as we need low-cost yet locally suited, scalable and long-term solutions that can help hornbills and people directly impacted by populations and trade.

Keywords: Helmeted Hornbill, Local communities, Livelihoods, Trade

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Understanding the impacts of a community-led integrated landscape initiative in Indonesia

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There is a growing understanding among conservation practitioners, academics, and resource managers that impactful management systems must be locally-led and account for a diverse range of legal, economic, social, political, and environmental factors. Calls have been made for integrated approaches that focus on local needs and opportunities among resource-users while balancing the needs of threatened species such as hornbills. We evaluated the outcomes of an integrated conservation initiative at the local level, implemented at treatment sites in protected areas in West Kalimantan, Indonesia. Our multi-faceted approach provided information about human well-being, environmental integrity (e.g. forest loss), and overall participation. We found that in the protected areas, forest loss was lower in treatment sites compared to control areas, and that hornbill encounter rates were relatively more stable in treatment sites . In intervention sites, we found that poaching, illegal logging, and encroachment encounter rates were negatively correlated with indicators of participation in the integrated landscape initiative (ILI) and with improvements in human well-being. Our results suggest that locally-led approaches can produce positive cross-sectoral outcomes for biodiversity and human wellbeing.

Keywords: Community-led conservation, Integrated landscape initiative, SMART patrols, Indonesia

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Some human dimensions and success factors of community-based hornbill conservation at Budo Mountain, Thailand

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The Hornbill community-based conservation at Budo Mountain (HBCB) was initiated in 1994. As a result of its successful implementation, the chick survival rate increased on Budo Mountain in Budo-Su-ngai Padi National Park, as well as an increased frequency of hornbills in the human vicinity, thereby protecting hornbills from local extinction. However, there needed to be an assessment of the perceptions of local people (LP) and hornbill adopters (HA) regarding the success of this project. This study examined factors determining HBCB success and human dimensions. We applied a mixed method by conducting semi-structured interviews with 78 HBCB participants to design a questionnaire. We then surveyed 124 HA and 564 LP, classified them into 142 (25.18%) HBCB participants and 422 non-HBC participants. We used the Welch's T-test to compare different social dimensions of HBCB between HA and LP. Factor analysis reduced large numbers of variables. We analyzed factors influencing HBCB's perceived success using ordinal regression. HA believed the most critical HBCB objective was to engage residents in hornbill conservation efforts. Different from LP ($p < 0.05$), which viewed hornbill conservation on Budo Mountain as a priority. HA held a more positive attitude toward hornbills, perceived more benefits and challenges regarding HBCB sustainability than LP ($p < 0.05$). However, HA perceived fewer conflicts and lower outcomes for HBCB ($p > 0.05$). HA and LP perceived a moderately high level of HBCB success, though insignificant ($p > 0.05$). Social determinants of HBCB's success statistically significantly relied on occupation, HBCB participation, income, knowledge about hornbills, a belief in HBCB preventing local extinction of hornbills, attitudes toward hornbills, benefits of HBCB, perceptions of conflicts, and outcomes of HBCB. This study provides social determinants for other conservation projects to be used in designing successful community-based conservation of hornbills, other wildlife, and other renewable natural resources.

Keywords: Budo-Su-ngai Padi National Park, Community-based conservation; hornbills; human dimensions; success

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Connecting Children to Hornbills and their forests

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Hornbills have had a cultural importance for the Nyishi community that reside near the Pakke Tiger Reserve which has four hornbill species. The long-term presence of conservation NGOs, and regular interactions of researchers with the indigenous community have resulted in greater awareness about wildlife conservation in the area. Many community members also work with the forest department, NGOs, while others are engaged in nature tourism. However, despite awareness and reduced hunting pressures locally, forest degradation and loss remain a major challenge in the area. For long-term forest conservation, it is critical to reach out to school-going children, who would be important future advocates for nature conservation. In this talk, we will discuss our long-term engagement with local children who are increasingly losing connection with their natural heritage. We do this through a Nature Education Program that began in 2017 for government and private schools through specially designed age-appropriate modules in collaboration with the Forest Department. We have engaged with 1500 students (10 to 15 years old) from eleven schools. We have two modules that are based on the Great hornbill and *Tetrameles nudiflora*, an important hornbill nesting tree to get students interested in hornbills and help them form a stronger bond with the forest and its other denizens. We obtain written and verbal student feedback at the end of the camps. For a question analysing their main learnings from the camps, broadly 45% mentioned educational knowledge on animals/nature, while 26% spoke of moral/ethical values (n=1099). Of those who mentioned knowledge, 6.4 % students specifically mentioned learning about hornbills. To a question on their most memorable moment, 40% students pointed to an emotional/experiential one, 33% to a recreational one, 13% to an observational moment and only 6% to informational (n = 541). Specifically, 5.5% students mentioned seeing/learning about hornbill, 7.7 % mentioned about Bhelu tree, whereas 16% mentioned hugging tree as their favourite moment. To a question on naming/drawing the three most memorable things, 48% of responses named/drew invertebrates as their most memorable, 16% named birds, 13% named plants and only 11.5 % named mammals (n= 777). Eighteen Class 8 students wanted to contribute their pocket money towards adopting a hornbill nest. An attendee of our first camp in 2017 is now working as an assistant for a research project. We will also talk about the activities and the resource material through which we build connections to nature.

Keywords: Hornbill conservation, Nature education, Community engagement, Children

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The study of nesting tree preference of hornbills and nesting cavity restoration in Bala forest, Narathiwat

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Bala forest is part of Halabala Wildlife Sanctuary, located at Sankalakhiri mountain range. The forest type is Malayan rainforest with a connection to the forest in Malaysia. This region has high biodiversity. Ten of thirteen hornbill species have been reported in this area. Halabala Wildlife Research Station surveyed hornbill nesting trees in Bala Forest during 2018-2021. There were 34 nest cavities. Only 13 nest cavities were used by four hornbill species, including 7 Rhinoceros Hornbills nests, 4 Wreathed Hornbill nests, 1 Bushy-crested Hornbill nest, and 1 Great Hornbill nest. Most of the nesting trees are *Shorea* spp., which have an average of 37 m in height. Twelve nesting cavities were repaired. These nest cavities were both unused natural cavities and old-occupied cavities. After the restoration, four nest cavities were used solely by Rhinoceros Hornbill. This study suggested that nest cavity restoration can increase the nest cavity number in the area and be valuable in hornbill conservation.

Keywords: Halabala, Nest, Preference, Restoration

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Conserving the Rufous-headed Hornbill in the northern parts of Central Panay Mountains Key Biodiversity Area in Panay Island, Philippines

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The Rufous-headed Hornbill (*Rhabdotorrhinus waldeni*), locally known as dulungan, is one of the rarest hornbills in the world. It is endemic to Western Visayas bioregion and listed as critically endangered. Unfortunately, in the past few decades, information about the species' population has never been updated. The northern part of Central Panay Mountains (CPM) Key Biodiversity Area is considered as an important site for the remaining populations of dulungan. A project entitled Species of Hope: Dulungan was implemented which aims to generate updated information on the hornbill's conditions in the northern parts of CPM and to develop conservation actions for the species and its habitat. In 2017, perceptions surveys were conducted to understand the people's understanding about the target species. In 2019, point transect surveys were conducted in the northern parts of CPM. A total of 111 observations were made along the 10 transects. During the perceptions surveys, majority of the interviewees knew the dulungan based on personal experience. There was a high level of awareness that the dulungan is threatened and of the pressures it faces. Over the project duration, about 60 volunteer Wildlife Enforcement Officers were trained. A locally managed Critical Habitat was established using the survey results and a management plan is being developed to further protect the species & its remaining habitat. This is partnered by awareness activities at community, municipal, and provincial level. Students and teachers were also trained to become biodiversity champions. Towards the end of the project implementation, the provincial government of Antique declared every August as the "Dulungan Month". Project activities, with the help from BirdLife, will expand to the southern parts of CPM to have a better view and understanding of the species' population and increase other conservation efforts in the island of Panay.

Keywords: Rufous-headed Hornbill, Community, Research, Awareness, Conservation

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Elucidating the seed dispersal potential of hornbills to maintain forest health in Sabah, Malaysia

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Asian hornbills are primarily frugivorous and play an important ecological role as seed dispersal. They only consume ripe fruits and are able to digest the fleshy parts of the fruits without harming the seeds, which will then be regurgitated or removed through their feces. Due to their large bodies, they are also able to consume and regurgitate larger seeds. They have long seed retention time, and their ability to travel over vast distances allows for seeds to be dispersed at a wider range. The relative importance of seed dispersal by hornbills for a particular plant species are poorly studied, especially for plant species with larger seed size. In this study, our team attempted to improve the current understanding of plants and animal interactions, particularly for *Cananga odorata* trees. *Cananga odorata*, or commonly known as Ylang-ylang has been acknowledged as an important food source for the hornbills (Kinnaird & O'Brien 2007), especially from studies in Indonesia. In Kaur (2020), this was also a commonly collected seed from underneath Rhinoceros hornbills and Oriental Pied hornbill nest. This study was broken down into three stages, namely the Ylang-ylang phenology observation, the observation of hornbill feeding behaviour at Ylang-ylang trees, and germination of Ylang-ylang seed. The team began observing the flowering and fruiting pattern of Ylang-ylang trees in August 2022. As of now, the team observed a distinct peak in the flowering season for those trees in August 2022, and the peak fruiting season was from September until November 2022. This coincides with the tail end of the breeding season of the hornbills as reported by Kaur (2020). Observations were then conducted in November 2022 when the fruits started to ripen. 63 hours of observation did not yield much information regarding the hornbills' dependence on the Ylang-ylang fruits. However, the team encountered other wildlife species feeding on the fruits, including the critically endangered Bornean orangutan (*Pongo pygmaeus*), the Green imperial pigeon (*Ducula aenea*), Prevost's squirrel (*Callosciurus prevostii*), and Grey-headed babbler (*Stachyris poliocephala*). Although the team did not observe hornbills feeding directly from the Ylang-ylang trees, feces collected from under the roost site of a flock of Bushy-crested hornbills were observed to contain Ylang-ylang seeds. From this study, we discovered that Ylang-ylang trees are widespread along the riverbanks in Kinabatangan. That poses a challenge as the hornbills have many trees to feed from and visiting the trees that are being observed might only be by chance.

Keywords: Hornbill, Seed dispersal, *Cananga odorata*, Lower Kinabatangan Wildlife Sanctuary

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Home Range and Habitat Selection by Breeding Rufous-necked Hornbill in Bhutan

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Bhutan harbors four species of hornbills including the vulnerable Rufous-necked Hornbill (RNH) within the eastern Himalayas (Grimmet et. al., 2019). The vulnerable RNH occupies varied altitudinal zones reaching as high as 2400 m above the sea level within the montane forests across the country (Anon, 2020). Hornbills in Bhutan are icons of socio-culture values owing to its colorful body structure and their non-destructive habit towards agriculture crops but controls insect and pests (Wangchuk and Sherub, 2017 – unpublished). RNH in Bhutan are threatened due to the habitat degradation and fragmentation from deforestation for timber and firewood, road construction, electric transmission lines, and land clearing for agriculture (Wangchuk and Sherub, 2017 – unpublished). Information on habitat selection and home range of RNH is still unknown in Bhutan that is critical for conservation and management.

The current study focused to answer the following questions or immediate objectives. 1) Why Bhutan is important for hornbill conservation in South Asian region? 2) Understand the habitat selection by breeding RNH? 3) Determine RNH movement and its space within its habitat range? UWIFoRT initiated bio-logging of hornbills using GPS fixes and online apps. The Minimum Convex Polygon (MCP) and Kernel Density Estimators (KDE) and Resource Selection Function 1(RSF) was adopted. Seven male RNHs caught and identified with each pet name. Tagged birds with GPS fixes tracked and movement assessed.

Based on cumulative home range over the years, 11 years old RNH-Penjor covered 5733 km^2 (MCP) and 2363 (KDE kref) while 8 years RNH-Sonam covered the least area of 16.83 km^2 (MCP) and 13.92 km^2 (KDE krf) only. Data compared with study of Chimchome and friends reported 78.157 km^2 in Thailand while Tifonia et.al. found 23.84 km^2 which could pertain to use of techniques and study site condition. Seasonal movements showed RNH-Penjor covered 5460 km^2 followed by 4653.43 km^2 (RNH-ICARUS) and 981 km^2 (RNH-Kinley) during the breeding season. During non-breeding season RNH-ICARUS covered the highest area of 10491 km^2 followed by RNH-Penjor covering 4071.43 km^2 and RNH-Kinley 788.81 km^2, respectively. Tifonia and friends reported 6.73 ± 1.5 km^2 during breeding and 16.26 ± 5.9 km^2 for non-breeding. Broadleaved forest amongst eight land use types preferred the most while orchards revealed lowest preference. Altitude (avg- 1475 m with SD of 365 m, 1141 m with SD- 1696 m average distance to settlement, and 139 m with SD- 110 m distance to water revealed staying close to water sources and away from the human inhabitations. Bhutanese RNH population reveals serving as a source population within India and Bhutan. Bigger home range required to sustain and manage larger tracts of broad-leaved forest areas in Bhutan and beyond. Small home range pertains to adequate resources and successful breeding while larger home range is scarce of resources, migration to lower areas during winter and nest competition. In future assessment of habitat use, monthly and annual scale with addition of geo-physical and climate data could provide reliable information. Targeting juvenile tagging, plantation of multipurpose tree species and trans-boundary conservation awareness felt important based on current experiences.

Keywords: Rufous-necked Hornbill, Home range, Habitat selection, Bhutan

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Conservation Modalities in Saving The Critically Endangered Hornbills in The Philippines

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The Philippines supports a diversity of endemic hornbills distributed in relatively small ranges. Unfortunately, given the extent of forest loss, rampant hunting the live trade of these birds, Philippines has more threatened hornbills than any other country in the world. In recognition of this situation, the 'Philippines Hornbills Conservation Programme (PHCP)', implemented a range of interrelated conservation activities. Three conservation modalities were applied: a) mainstreaming hornbill conservation in the government's agenda; b) protected area declaration through the local development councils and c) integrating hornbill conservation in site management policies. As a result, the critically endangered *Rhabdotorrhinus waldeni* and endangered *Penelopides panini* were included as priority species in the Negros Island Biodiversity Strategy and Action Plan 2018 – 2028. The adoption of the plan effectively increased the budget allocation for protection and management of hornbill habitats in the last five years. The two Visayan Hornbills were among the species used as supporting evidence in a resolution passed by the Reginal Development Council engaging the Department of Environment and Natural Resources in October 2018 to facilitate the protected area suitability assessment (PASA) of the 86,000+ ha of forestland in the Central Panay Mountain Range (CPMR). The PASA was passed last December 9, 2021, recommending CPMR as part of the national integrated protected areas system. Biological assessments are on-going, and a house bill is currently drafted. In addition, the *P. panini* was also the banner species for the establishment of Hinoba-an Wilderness Areas on Negros as Critical Habitat.

At least five protected areas and one ancestral domain integrated hornbill conservation in site management policies and regular bio-monitoring system. The *P. panini* and *R. waldeni* were used as indicator species in at least three protected areas while the *P. affinis*, the vulnerable *Buceros mindanensis* and *R. leucocephalus* in Agusan Marsh Wildlife Sanctuary and the *P. manillae* and the vulnerable *B. hydrocorax* in Mt. Banahaw de Tayabas, the *P. manillae* was also identified as priority species by the City of Tayabas in Quezon while the critically endangered *Anthracoceros montani* was named in the municipality of Panglima Sugala in Tawi-tawi. As a result, management of unprotected forest of Hinobaan and Panglima Sugala has improved, hornbill monitoring in five protected areas, one locally managed key biodiversity area and one ancestral domain were enhanced and ecological information of at least four poorly known threatened hornbills were generated. The science-driven hornbill conservation strategies enabled progress in saving threatened Philippine hornbills from extinction.

Keywords: Sulu, Endemic, Conservation, Protected areas

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Hornbill Ecology

Diet composition and food preference of Malabar Pied Hornbill *Anthracoceros coronatus* in Pench Tiger Reserve, Madhya Pradesh, India

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Hornbills are regarded as one of the key components of forest ecosystem resilience brought about by natural forest regeneration, being fruit eaters, seed dispersal agents, and predators for forest insect pests. They also provide important ecological services to biotic communities wherever they dwell. So, hornbills like the Malabar Pied Hornbill, *Anthracoceros coronatus*, play an important role in the sustainability of the broadleaved forest. Although the species is omnivorous, their diet varies between seasons and can be restricted by food availability and abundance in the forest.

The study was conducted from January 2021 to December 2022 in Pench Tiger Reserve (PTR), Madhya Pradesh state, in Central India. The forest type in PTR is tropical deciduous forest. To understand the diet composition and food preferences in the non-breeding season, the visual scanning method was used. For the breeding season, a camera trap was mounted near the nest cavity (collection data of 1150 hrs), besides collecting the midden (which includes regurgitated seeds and other dropped food items) from below the three active nest cavities. Observations about the fruiting phenology were taken.

It was found that fruits belonging to 22 plant species were consumed in the non-breeding season (August to February); and that in the breeding season (March to July) fruits belonging to 31 plant species were consumed. Overall, fruits belonging to 10 fig species and 26 non-fig plant species were taken in both seasons. Fruits belonging to the Moraceae family were the most preferred among all plant species in the hornbill diet. Nine plant species belong to the Moraceae, two plants species belong to Euphorbiacea, and Anacardiaceae, and the rest of the individuals belong to other families like the Annonaceae, Ebenaceae, Boraginaceae, etc. The diet also included animal matter, including insects, insect larvae, scorpions, mollusks, frogs, geckos, lizards, *Varanus*, birds, eggs, chicks, squirrels, and bats. These were supplied by male hornbills to nest inmates during breeding season.

The present study concluded that among the 10 fig species, *Ficus benghalensis* was the most preferred, followed by *Ficus religiosa*, and among non-fig plants, *Putranjiva roxnburgii* was most consumed by *A. coronatus*, possibly because of its fruiting during both the breeding and non-breeding seasons. On average, male paid 10 visits to the nest per day. In the post-hatching period, the frequency of the supply of animal's matter was found to increase with the maximum supply of insects and their larvae in the months of June and July.

Keywords: Malabar Pied Hornbill, *Anthracoceros coronatus*, diet composition, food preference, Pench Tiger Reserve, Central India

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Southern Ground-Hornbills boom to their own beat – vocal signatures and the role of chorus vocalisations in territorial defence

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In birds, vocalisations are often used to advertise and defend territories and are crucial in many solitary species in identifying different categories of intruders and mediating different responses towards neighbours and strangers. Yet, although many bird species live in cooperative groups and vocalise collectively, few studies have examined the functions of group vocalisations and how they support information about group identity. Cooperatively breeding southern ground-hornbills are large, terrestrial birds which live in groups of 2-11 individuals, each containing a single adult female. They are well-known for their dawn chorus vocalisations uttered from their large territories. However, how these vocalisations are structurally organised has never been analysed in detail, and little is known about their function in inter-group interactions. We studied chorus vocalisations to determine vocal 'signatures' potentially supporting group and individual recognition, and how they mediate territorial conflicts. Territorial chorus calls of 13 ground-hornbill groups were recorded at nesting sites within the Associated Private Nature Reserves, South Africa. Calls were labelled and automatically analysed using discriminant analyses and machine learning algorithms to assess sexual, individual and group differences.

Results showed that the fundamental frequency of calls was significantly different between sexes and that females produced sequences of calls constituting unique melodies which could be automatically assigned to the correct individual with a 94% success rate. Thus, each group can be identified by the female's signature. Then, territorial intrusions were simulated by playing back chorus vocalisations of neighbour and stranger groups to assess how intruder group identity, and how holding group size affected territorial responses. Results showed that group size was an important factor in predicting responses, but group identity only had marginal effects. This study represents the first step in understanding the function of chorus vocalisations in territorial defence in an iconic cooperatively breeding species.

Keywords: Territory defence, Vocalisations, Signatures, Playback experiment

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RIMBA Sarawak Hornbill Conservation Project in Lanjak Entimau Wildlife Sanctuary (LEWS)

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Sarawak Forestry Corporation has stepped forward to conserve hornbills through a collaborative project, the Sarawak Hornbill Conservation Project, with the Hornbill Research Foundation Thailand. This 5-year project aims to speed up hornbill conservation works in Sarawak. In this study, we aimed to determine the fruiting pattern of hornbill food trees, estimate the hornbill population, determine hornbill distribution, and access hornbill breeding behaviour and nest tree preferences in Lanjak Entimau Wildlife Sanctuary. We established twelve 1-ha permanent plant phenology plots in six different vegetation types: riparian, alluvial, mixed dipterocarp forest (MDF), hill MDF, and young and old secondary forests. We identified, tagged, and labelled all trees over 10 cm diameter at breast height (DBH) and monitored them every month. The diversity of food tree species was high; 62 species, 26 genera and 17 families. We did population estimates by conducting transect surveys along 20 permanent transect lines and analyzed point count data with the DISTANCE program. Using the Kernel Density function, we calculated the density of point features around each output raster cell weighted by the values in that number of hornbills from each point. We conducted hornbill nest surveys during the breeding season between late 2018 and early 2019. Three active nests belonging to two hornbill species were documented and monitored. We surveyed, modified, and monitored 49 tree cavities during the non-breeding season. Six out of eight hornbill species in Sarawak were recorded in our study area. Lipid-rich fruits from the family Myristicaceae, Burseraceae, and Myrtaceae were highly seasonal. In contrast, Ficus was a seasonal, bearing fruits all year round, thus providing enough food at times of low resource availability. The hornbills were also observed feeding their chicks with nestling birds, snakes, and other invertebrates. Three hornbill nests were found in *Shorea macrophylla* and *Shorea argentifolia*, with an average diameter at nest height (DNH) of 68.3 cm and an average height of 29.5 m. During this study, 49 trees with cavities were located, but only four were occupied at the time of the surveys. All cavities were repaired and modified accordingly to suit hornbill nesting needs, which included modification on the nest entrance, wall, floor, ceiling, and perch. In LEWS, the hornbill breeding season coincides with the mass fruiting of hornbill food trees, which occurs towards the end of 2018 until February 2019. A long-term study is needed to see the pattern of fruiting food plants with breeding and non-breeding seasons of the hornbill to understand, protect and conserve the species, particularly in Sarawak.

Keywords: Hornbill, Seed dispersal, *Cananga odorata*, Lower Kinabatangan Wildlife Sanctuary

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Breeding Ecology of the Luzon Hornbill (*Penelopides manillae manillae*) in Luzon Island, Philippines

Vince Angelo Gicaraya [*1] and Carmela P. Espanola [1]

The Luzon Hornbill (Tariktik; *Penelopides manillae manillae*) is one of the smallest hornbills in the Philippines and is endemic to the lowland forests of Greater Luzon. Due to the intensifying threats of deforestation, land-use change, and wildlife poaching, they have been listed as Vulnerable by the Philippine Red List in 2020. Unfortunately, ecological, and natural history studies on the species remain scarce. In this paper, we present the tree and cavity preferences, diet, some aspects of the breeding biology, and the first description of the breeding behavior of the Luzon Hornbills. Seven nests at the Subic Watershed Forest Reserve were examined for cavity, opening length and width, vertical and horizontal depth) and tree (i.e., tree status: live or dead) characteristics. Nests were accessed through single rope climbing techniques post-fledging. One active nest was also monitored for breeding behavior and diet from March to June 2022 for a total of 75 hours. Based on this study, Luzon Hornbills nested only on natural cavities of live large-diameter trees particularly on White Lauan (*Shorea contorta*: Dipterocarpaceae). Mean cavity opening dimensions (W x L) was 11.79 x 18.36 cm with mean vertical depth (floor to ceiling) of 92.57 cm and mean depth of 3.86 cm—suggesting a preference for shallow cavities with high ceilings and small entrances. We estimate that the female hornbill has remained within the cavity for a total of 90 days from the time of cavity sealing to emergence. Clutch size was two. Food was delivered by a single male hornbill 11-27x in a day: consisting mainly of fruits from at least 25 species of plants. Cooperative breeding, as was previously reported for the Penelopides hornbills, was not observed in this study. Information from this study may help guide conservation efforts to focus on: 1) planting of the preferred nesting and fruiting trees of the Luzon Hornbills to secure future potential nesting sites and food sources during the breeding season; and 2) creation of species-specific nest boxes for ex-situ conservation and/or to support hornbill breeding in the wild in areas where cavities may be in shortage. With only 4 of 11 Philippine hornbills virtually known biologically and ecologically, our findings add valuable insights on the natural history of hornbills in the country.

Keywords: Breeding ecology, Diet, Luzon Hornbill, Nest, Nesting behavior

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Population Density of Hornbills in Non-Breeding Season at the Core Area of Khao Yai National Park, Thailand

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Hornbills are classified as an important environmental condition indicator but the population of hornbills tend to decline. The study on population is essential to enhance measures to manage and monitor hornbill population. The objectives of this study were to estimate population density of 4 hornbill species, namely Oriental Pied Hornbill (*Anthracoceros albirostris*) Great Hornbill (*Buceros bicornis*) Wreathed Hornbill (*Rhyticeros undalatus*) and White-throated brown Hornbill (*Anorrhinus austeni*) in non-breeding season at the core area of Khao Yai National Park, Thailand. The study area covers 144 km^2 (12 km x 12 km). Field survey was conducted from June 2022 to December 2022 by using 10 transect lines, covering natural trails, roads and patrol routes. The length of transect is about 1.5 km. The distance sampling of DISTANCE 7.5 program was used to analyze hornbill density, based on sighting data.

The results indicated that the three-hornbill species could be estimated the population density. The density of the Oriental Pied, the Great and the Wreathed Hornbill were 10.48 (n = 47), 2.41 (n = 26) and 2.60 (n = 29) individuals/km^2, respectively. The White-throated brown Hornbill was not detected during the survey period. Population density of the Oriental Pied Hornbill in this study was gone up 1.83 times the number of the Round et. al. (2005) was study in the Mo-Singto, Khao Yai National Park in 2003-2005 but the density of this study less than the study at Khao Yai National Park in 2004-2008 that found 21 individuals/km^2. Population density of the Great Hornbill was less than the study of Round et. al. (2005) (4 individuals/km^2) and greater than the study at Bala Forest in Hala-bala Wildlife Sanctuary in 2001 - 2002 (0.12 individuals/km^2). Population density of the Wreathed Hornbill was gone up the Round et. al. (2005) study that found 2 individual/km^2. The white-throat brown Hornbill was classified global status in a near threatened species and a vulnerable species for national status. Trisurat et. al. (2013) recommend that the Thailand Red List authority changes the status of white-throat brown Hornbill to endangered species because they are at risk and small population. We should monitor the status of the white-throat brown hornbill population closely. The results can be used for long-term monitoring of hornbill population and evaluate the management effectiveness of Khao Yai National Park, which in a portion of the Dong Phayayen – Khao Yai Forest Complex Natural World Heritage Site.

Keywords: Hornbills, Population, Density estimation, Khao Yai National Park

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Nesting ecology and breeding success of Malabar Pied Hornbill *Anthracoceros coronatus* in Pench Tiger Reserve, Madhya Pradesh, India

Gajanan Wagh [*1], Nikhil Borode [1], Raju Kasambe [2], and Jayant Wadatkar [3]

Malabar Pied Hornbill, *Anthracoceros coronatus* is one of the nine species of hornbills found in the Indian subcontinent. It is listed as a Near Threatened species due to an alarming decrease in its population. *A. coronatus* prefers deciduous forest and thick canopies with distinct distributional ranges in India, i.e., the Western Ghats, the Eastern Ghats, and patchily in the Satpuda Range in Central India. Nesting ecology and breeding success are important aspects of Hornbill's research. Most of the research about the breeding biology of *A. coronatus* was carried out in the Western Ghats and Eastern Ghats parts of India. Not much research about breeding biology was carried out in the Central Indian landscape. The present study was conducted from January 2021 to December 2022. It focused on the nest site selection, nest tree preference, nest characterization, and breeding success of *A. coronatus* in Pench Tiger Reserve (PTR), Madhya Pradesh state of India. PTR covers an area of 1179.63 sq. km., including the core and buffer. *A. coronatus* nests were monitored for two consecutive breeding seasons, which last from (March to July) in the Satpuda ranges of Central India. A camera trap was used to monitor the pre-breeding and breeding activities of *A. coronatus* at the nest sites and set on a nearby branch.

A survey to locate nesting trees and potential cavities was carried out in 110 localities (bits) in the PTR, in breeding as well as non-breeding seasons. The nest cavities were confirmed in the breeding season by tracking the male hornbills. During the study, five active nests of *A. coronatus* and 13 potential nest cavities were found in PTR. Out of these active nest trees, *Madhuca indica* had four nests and *Terminalia arjuna* had one nest. The potential nest cavities (recorded blank cavities that showed similar characteristics to active nests) were in four species of trees, viz., *Madhuca indica*, *Terminalia arjuna*, *Terminalia tomentosa* and *Tectona grandis*. The average height of nesting trees was found to be 18.7 m, average height of the nest from ground level was found to be 12.28 m; the overall nest tree girth (GBH) was measured at >2.2 m; and the nest cavity entrance length and width showed 20.2 and 20.1 cm, respectively. Nests were located on secondary branches (60%), and the nest cavities mainly faced north-east. Four of these five nests were located inside the core area (National Park), and the fifth nest was in the buffer zone. The study revealed that the Madhuca indica trees were mostly preferred by *A. coronatus* for nesting in PTR, possibly due to their good population, longevity, and resilience to climatic conditions. Also, the onset and culmination of breeding varied for different nests, but the period of incarceration of the female inside the nest cavity was similar (88 ±4 days). The breeding success rates of four nests (100%) and (80%) in 2021 and 2022 respectively.

Keywords: Malabar Pied Hornbill, *Anthracoceros coronatus*, Nesting ecology, Breeding success, Pench Tiger Reserve, Madhya Pradesh, Central India

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The Rufous-necked Hornbill population in Latpanchar: realities and perception

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The Eastern Himalayan region is important for birders and Latpanchar, a village located close to the Mahananda Wildlife Sanctuary in northern West Bengal, India, has become a popular birding destination since 2012. The Rufous-necked hornbill (RNH) is the most iconic species here. Easy sightings of the RNH have escalated bird tourism prospects, improving the overall economy. To assess people's perception towards hornbills, we interviewed 42 respondents aged 26-71 years from four villages around Latpanchar in 2022. Most of the respondents believe that there is an increased affinity towards hornbills in the last 5-10 years and some have attributed this change to bird tourism. We further tried to understand perceptions of hornbill population trends over the last 20-25 years. Forty-three percent respondents believed that the hornbill population has decreased, 26.2% believed it has increased, 19% observed no change, while 11.9% had no view. People who said that the population has declined cited the reasons were due to reduced food and nest trees and increased disturbance. The people who believed that there was an increase, opined that good availability of food trees, increased breeding success, increased awareness and value for hornbills were reasons for the increase. We also conducted key-informant interviews with 18 elderly members to document the oral history of the landscape. Fifty percent spoke of large-scale deforestation around Latpanchar due to a socio-political agitation in 1986. From the late 1990s, there were local plantation efforts to revive the habitats. We also used line-transect surveys to estimate RNH population around Latpanchar from December 2021 to December 2022. In an effort of 188 km, we had 88 detections (calls and sightings) of the RNH. The mean encounter rate (ER) for group detections (perched and flight) was 0.31 per km (SE ±0.05). The mean ER (numbers per km) was 0.79 individuals per km (SE ±0.24). The density estimates of RNH in Latpanchar was 9 birds/ km^2 (CI 2-33) and the overall flock density was 4 flocks/km^2 (CI 1-12). Although there are no earlier baselines, the encounter rates and density of the RNH is relatively high and similar to some Protected Areas indicating that the species is doing well currently. While people have different perceptions of the status of hornbill population, there is a consensus that past events have altered the forests which have had implications for hornbills. However, our study suggests that the area supports a good population of Rufous-necked hornbills.

Keywords: Mahananda Wildlife Sanctuary, Population trends, Hornbill breeding, Eastern Himalaya, Local perceptions

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Estimating the Population of the Critically Endangered Helmeted Hornbill (*Rhinoplax vigil*) in Indonesia

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The helmeted hornbill (*Rhinoplax vigil*) is a Critically Endangered species that have been extensively hunted for its valuable casques. Although the scale of poaching was unknown until its resurfacing in Indonesia in 2012, conservation efforts at all levels have been initiated. However, the current population status of the species remains unknown. In this study, we aimed to estimate the population of the helmeted hornbill in Indonesia using an improved population extrapolation approach. We used historical and latest density estimations, incorporated probable distribution and habitat suitability produced by Maximum Entropy (Maxent), and tested for multicollinearity for all environmental variables and occurrence data to reduce spatial autocorrelation. We analyzed 55 and 27 occurrences of the species in Sumatra and Kalimantan, respectively, collected from various biodiversity surveys and opportunistic sightings since 1980. The Maxent analysis was restricted to known preferred habitats in primary and secondary forests based on 2016 data. Previous density studies in Sumatra and Kalimantan reported helmeted hornbill densities ranging from 0.1 to 1.9 birds/km^2 in Sumatra and 0.7 to 0.5 birds/km^2 in Kalimantan. Our most recent study in 2019 found densities of 0.3-0.5 birds/km^2. Of the total preferred habitat in 2020, 116,198 km^2 in Sumatra and 259,862 km^2 in Kalimantan, only 41.5% and 32.7%, respectively, were predicted to be suitable for helmeted hornbills. The suitable habitat loss from 2016 - 2020 was only < 1%. Before 2013, we estimated the helmeted hornbill population to be between 5,786 and 101,262 birds in Sumatra and 59,531-63,783 in Kalimantan. However, based on our 2019 density estimation, the population in Kalimantan likely dropped by 38.6%-70.7%. Despite the lack of the latest density information in Sumatra, it probably has a similar pattern to Kalimantan. Considering the specific resource requirement of the Helmeted hornbill and its slow breeding rate, any poaching rate will significantly impact their population. Our study results confirmed declines in helmeted hornbill populations in Indonesia.

Keywords: Helmeted hornbill, Distribution, Population, MaxEnt, Habitat suitability

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Spatial characteristics of the Black Hornbill (*Anthracoceros malayanus*) nest in disturbed forests of Kapuas Hulu Regency, West Kalimantan, Indonesia

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The Black Hornbill prefers lowland forest habitats and disturbed forests; however, the extent of its habitat preference in disturbed forests remains poorly understood. This study aims to investigate the habitat preference of the Black Hornbill in Kapuas Hulu Regency, West Kalimantan, Indonesia, by analyzing the characteristics of 15 active nests. Thirty one percent of the nests were found in lowland areas (<500 m asl), mainly in dry-mixed land farms and secondary dryland forests. The remaining nests were in the secondary swamp and shrub forests, and approximately 6% were in dryland agriculture. The majority of the nest trees were of the *Shorea* spp. (family Dipterocarpaceae) with an average diameter (DBH) greater than 40 cm and a height range of 2-15 m. Ten out of 15 nests were located on the perimeter of shifting cultivation fields, close to trails and settlements, with the nearest nest located 525 meters away. The spatial analyses also revealed the proximity of the nests to potential anthropogenic disturbance sources such as road and river networks, fields, fire hotspots, and deforested areas. The findings provide insights into the Black Hornbill's tolerance level and preference for habitat use, and highlight the importance of protecting its habitat, particularly in areas with shifting cultivation fields and human settlements. This study underscores the need for further research to identify effective conservation strategies for the Black Hornbill in disturbed forest habitats and highland areas.

Keywords: Black Hornbill, Conservation, Nest preferences, Spatial analysis

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Characteristics Of Hornbill Nests (Aves: Bucerotidae) In West Kalimantan, Indonesia

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Hornbills are the secondary cavity nester that rely on naturally formed hollow trees. However, the availability is very limited and declines due to damage. This study is to understand the characteristics of trees and nest cavities used by hornbills in Batu Lintang Village, Kapuas Hulu, West Kalimantan. We used photographic measurement to extract the nest entrance dimension and measure other characteristics such as: nest bearing, tree diameter, nest height, nest position on the tree and cavity shapes. We found 18 nest cavities used by Bushy-crested Hornbill, Wreathed Hornbill, Rhinoceros Hornbill and mostly by Black Hornbill (66.67%). Nest cavities were mostly in Dipterocarpaceae trees (83.33%) with an average diameter of 91.6 cm and an average height of 36 m, and a branch-free height of at least 8 m. Most nest holes are located on the main trunk and have a slit shape, with entrance dimensions ranging from 53.6-615.2 cm^2. The nest height of the hornbill ranged from 2.8-29.1 m, and the direction of the nest entrance varied from 62-346°, with Wreathed Hornbill nests relatively oriented to the east. Additionally, we found that the area of the nest hole increases with the weight of the hornbill. These findings provide valuable insights into the selection criteria of hornbills for nesting sites, which can help inform conservation efforts to protect these unique birds and their habitats.

Keywords: Hornbills of Borneo, Cavity nesting, Nesting ecology, Nest characteristics

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Habitat Requirements, Distribution and Conservation Status of Threatened Visayan Hornbills in The Philippines

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The Critically Endangered Walden's hornbill, *Rhabdotorrhinus waldeni* and the Endangered Visayan tarictic hornbill, *Penelopides panini* are known only to occur in a small group of islands in Western Visayas, Philippines. Both species have undergone a significant decrease in their area of occupancy and has experienced extirpation in islands and several forest areas within their original extent of occurrence. This study aimed to acquire the habitat requirements and update the distribution status of the Walden's hornbill and Visayan tarictic hornbill. We used point-transect method for the hornbill detection survey and 30m x 30m plots established in each point station for habitat survey. We also reviewed literature and reports for the updating of the distribution status. We used Logistic regression for hornbill presence-habitat analysis. Results showed that the Walden's hornbill prefer and are more likely to occur in areas with trees that have >90 cm diameter at breast height ($p>0.002$) while Visayan tarictic hornbills prefer and are more likely to occur in areas with trees with 30 - 60cm diameter at breast height ($p>0.001$). The *R. waldeni* was recorded and is now only know to occur in six localities in Negros and Panay islands while the *P. panini* exists in at least 17 localities in Negros, Panay, and Masbate islands. Density estimates of the *P. panini* showed three forest fragments on Negros are crucial to the conservation of the species. The Central Panay Mountains remain as the main population hub and the most important site for the Critically Endangered *R. waldeni* urging the need to declare the site as a Protected Area. Also, increased protection through policy and technical support of the isolated forest fragments managed by local communities and local government units is highly recommended.

Keywords: Conservation, Visayas, Hornbill, Critically Endangered, Philippines

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Ecological Observations on the Critically Endangered Sulu Hornbill, *Anthracoceros Montani*

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The conservation status of the Sulu Hornbill, *Anthracoceros montani*, a species endemic to the islands of Jolo and Tawi-Tawi in the Philippines, has long been obscured by lack of information from the field. Distance sampling method combined with observations on feeding trees and active nests were conducted from 2017 to 2020 within the forests of Panglima Sugala, Tawi-Tawi Island. Using June 2021 sentinel-2 satellite imagery and QGIS 3.0, we calculated suitable forest habitat for the Sulu Hornbill at c. 14,500 ha (14.5 km^2). The Sulu Hornbill population appears to be stable within the monitoring site. We report the presence of immature hornbills, diet, and nesting behaviour. The hornbill appears less adapted to disturbed and logged forests. Habitat loss remains a conservation challenge for the Sulu Hornbill.

Keywords: Tawi-Tawi, Critically Endangered, Suitable forest, Logged forests, Habitat loss

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Practical Management of Iron Storage Disease in Captive Hornbills

Trent Charles van Zanten [*1,2]

Hemochromatosis or iron storage disease (ISD) refers to the excessive accumulation of iron within the liver, resulting in damage to hepatocytes due to excessive dietary iron intake or variations in iron metabolism. The potentially fatal disease is well documented in hornbills, which are over-represented in the literature and considered predisposed to the disorder in a captive setting. Hemochromatosis is challenging to resolve and understanding the pathophysiology and natural history of affected birds is essential to developing an effective treatment plan. Diagnosis is reliant on hepatic biopsy using Prussian-blue staining, and the severity of the condition can be graded based on the number of affected hepatocytes per slide. Haematology, biochemistry, diagnostic imaging, and iron serum testing generally are inadequate to confirm the diagnosis but may assist in evaluating concurrent pathologies. Clinical management is dependent on the disease severity, and dietary review ensuring iron intake remains below 50mg/kg of dry matter fed in susceptible species may be sufficient in mild cases. Severe ISD additionally requires treatment with iron chelators or serial phlebotomy, and control of concurrent conditions. Treatment of chronic cases can be challenging. A surveillance program was initiated in 2020 after the loss of several birds with severe hemochromatosis through examining coelioscopic hepatic biopsies of the hornbills from Jurong Bird Park to evaluate case prevalence and severity in the collection. Twenty species were sampled, comprising a total of 85 birds. 27.1% of birds had no evidence of ISD, 54.1% had mild (Grade 1-2) ISD, and 18.8% had severe (Grade 3-4) ISD with notable species differences in disease occurrence. This presentation reviews the management practices utilized at Jurong Bird Park, the outcomes of treatment and expected prognosis in a range of species. Subsequent evaluation in this same group of birds demonstrated a marked reduction in the number of birds with high hepatic iron content on histopathological scoring and allowed exploration for the reasons as to why some birds appear non-responsive to treatment. The results of this investigation demonstrated how incorporation of coelioscopic screening for ISD in susceptible species can be safely incorporated into the annual health program for captive hornbills resulting in the improved health and husbandry of those birds under managed care.

Keywords: Avian disease, Pathophysiology, Captive birds, Wildlife health

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Observation of Animals Feeding on Fruits of *F. subcordata* in Tawau Hills Park, Sabah, Malaysia

Yulinda Wahyuni binti Eddyutowo [*1]

Figs are considered critically important food sources for wildlife. However, the species of wildlife that feed on the fig fruits are not well documented, especially in Tawau Hills Park, Sabah, Borneo, Malaysia. Tawau Hills Park is a primary rainforest with area of 27, 972 ha and was gazetted in 1979 to safeguard Tawau Town, and the Semporna Peninsula's, water catchment resources. Thus, this study is focusing on the Headquarter area of Tawau Hills Park which located 24 km Northwest of Tawau and observations were conducted to document the animal communities that visit fruiting fig trees frequently. Observations were done six hours per day: in the morning from 0700 to 1100 and continued in the evening from 1600 to 1800. Observations were done at the base of the crown or any open area of the canopy for about 42 hours on 7 days, using binoculars (Vortex 10 x 42) and photographing animals (Canon PowerShot SX70 HS and digital Single-lens Reflex (DSLR) cameras). We recorded a total of 15 species of mammals, including rare and endangered species such as binturong (*Arctictis binturong*), red leaf monkey (*Presbytis rubicunda*), pig-tailed macaque (*Macaca nemisterina*), North Bornean gibbon (*Hylobates funereus*) and Bornean orangutan (*Pongo pygmaeus morio*). In addition, five species of hornbills were also recorded, including Rhinoceros Hornbill (*Buceros rhinoceros*), Wreathed Hornbill (*Rhyticeros undulatus*), Helmeted Hornbill (*Buceros vigil*), Asian Black Hornbill (*Anthracoceros malayanus*) and Bushy-crested Hornbill (*Anorrhinus galeritus*). The animals were observed feeding on the fruits of *F. subcordata* especially during the peak of the fruiting season of this fig tree species which we recorded to be around July to December. Finally, we noted that fig trees are very important to be conserved because it became the center of attraction for all wildlife for food especially hornbills.

Keywords: Figs, Wildlife, Tawau Hills Park

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Empowering communities to save the critically endangered Sulu Hornbill *Anthrococeros montani* from extinction

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The Sulu Hornbill, *Anthracoceros montani* is the world's most critically endangered hornbill, with fewer than 20 pairs surviving on the island of Tawi-Tawi, southern Philippines. Since 2017, the Municipality of Panglima Sugala in collaboration with key stakeholders and the local communities implemented the Tawi-Tawi Advocates for Wildlife Support Initiatives (TAWSI) Project with focus on the Sulu Hornbill. Local community partners have grown from only ten in 2017 to 32 members in 2022. Community-based Forest protection, regular Sulu Hornbill population monitoring, habitat rehabilitation and conservation education and awareness activities have led to an increased understanding of the species' ecology, a significant reduction in the illegal harvesting of trees, and a significant increase in the abundance of Sulu Hornbills recorded in the area. Strong collaboration and partnerships with relevant stakeholders and the local communities were key in the protection and conservation of the Sulu Hornbill habitat on Panglima Sugala.

Keywords: Avian communities, Critically Endangered, Southern Philippines, TAWSI, Habitat rehabilitation

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Hornbill Evolutionary Biology and Genetics

Mitochondrial genetic diversity of captive Great Hornbills (*Buceros bicornis*) in Thailand

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The management of imperilled captive species presents a particular challenge to maintaining genetic diversity. Due to habitat loss and poaching, populations of the Great Hornbill (*Buceros bicornis*) have declined and listed as Vulnerable in the IUCN Red List of Threatened Species. A Great Hornbill reintroduction project in Thailand was initiated in 2017 to restore populations in areas where they were previously extirpated. Selection of an appropriate number of genetically diverse founders is critical to establish self-sustaining wild populations with sufficient genetic diversity. However, genetic data for potential founders were not available. In this study, we designed a set of mitochondrial DNA (mtDNA) primers to amplify the mitochondrial genome, characterize haplotypes based on the concatenated ND2 and COI gene sequences, and estimated population genetic diversity and structure of captive Great Hornbills (n = 97) from five zoos in Thailand. After analysing 3,082 base pairs of the concatenated ND2 and COI, we found 19 variable sites and a total of 21 haplotypes. Evolutionary history based on both concatenated and mitogenome indicated a close genetic relationship among the captive Great Hornbill and no evidence was found for spatial genetic partitioning among 21 haplotypes into northern and southern clades. There was one shared haplotype among all zoos and results revealed weak genetic structure (FST = 0.000 - 0.097, $p > 0.05$), as might be expected with frequent founder exchange among zoos. Our findings showed that all five zoo groups of these hornbills had a high haplotype diversity ($H = 0.813 \pm 0.021$) and nucleotide diversity ($\pi = 0.001 \pm 0.0004$). Our findings indicate that the population genetics of Great Hornbills deserves further investigation to properly incorporate genetic diversity into the captive breeding planning, with the additional caveat that comparisons with wild hornbill populations also be studied prior to any future reintroductions.

Keywords: Captive populations, COI, Great Hornbill, Mitochondrial DNA, Genetic diversity

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Management of a Non-union Maxillary Beak Fracture Using Polyamide Prosthetics in a Great Hornbill (*Buceros bicornis*)

Trent Charles van Zanten [*1,2]

Maxilla fractures are a relatively common occurrence in both captive and wild birds. These fractures can occur directly due to traumatic injury or result from weakening of the structural integrity of the maxilla after systemic disorders such as nutritional deficiencies, infectious etiologies, chronic hepatopathies, and congenital abnormalities in bone development. Management of such fractures requires evaluation of the bird's overall health, control of underlying pathology, and advanced imaging to determine the fracture's severity before deciding on a treatment plan. Due to the beak dexterity required by hornbills to perform their daily activities, surgical intervention is often necessary to restore the function of the rhinotheca. Bone morphogenetic protein (BMP-2) is often used as a therapeutic agent to promote bone regeneration and repair in cases where traditional methods are insufficient, however, it's use in avian fracture repair remains in its infancy. Where repair of the fracture site is not possible, prostheses have been increasingly used as an alternative salvage procedure to mimic the anatomical structures of the affected bone, thereby providing support and stability during the healing process. In such cases, prosthetic beak placement reduces healing time, improves beak utilization, and may replicate normal conspecific interactions.

A 15-year-old male Great hornbill (*Buceros bicornis*) sustained a transverse premaxillary fracture of the distal 10 cm of rhinotheca resulting from aggressive interactions with the bird's long-term breeding partner. Surgical repair using a type-II external skeletal fixator (ESF) was initiated with close apposition and alignment of the bone ends being achieved, however, after 30 days repeat radiography demonstrated a non-union of the distal and proximal fragments. Contrast-enhanced computed tomography (CT) showed the interrupted vascular supply of the distal fragment, and an attempt at repeated surgery was conducted while applying BMP-2 to enhance osteogenesis after debriding necrotic material to improve the vascular supply within the maxilla. A CT-rendered, 3D-printed polyamide prosthesis was placed over the distal beak to stabilise the fracture site, containing preformed holes for pin replacement of the ESF. After two months, radiographs showed persistent non-union of the fracture site, and the original prosthesis was replaced with a 22 g model containing a lattice framework to act as a permanent functional beak. The prosthetic has proven successful for over two years since initial presentation, with quarterly replacement of the fixator pins. Lessons from this case are discussed to encourage faster resolution and improved rates of maxillary fracture repair for these long-billed birds in the future.

Keywords: -

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Community-Based Hornbill Conservation in Southern Tanintharyi Region

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The rapid assessment of Helmeted Hornbill Rhinoplax vigil (IUCN critically endangered) was carried out in 2019 in Southern Tanintharyi Region to expand identification of Key Helmeted Hornbill sites. We consult local using semi-structured interviews on their knowledge of the distribution, abundance trends, local use, hunting and cultural beliefs of Helmeted Hornbill. This knowledge was used to identify sites rapid assessments to verify Helmeted Hornbill presence/absence can be made-both inside and outside of protected areas. The assessments were done at Ngawun Reserve Forest, Lenya Reserve Forest and Htaung phru Reserved Forest. The number of fig tree and tree species, the pressure on the Hornbill species and lowland forest were also noted. Helmeted Hornbills and 6 other hornbill species were recorded. The team found that logging, wildlife hunting especially for monkeys, forest fires by humans, encroachment by plantations and road construction are key pressures for conservation in that area. Since 2019, BANCA Myanmar has been collaborating with local villagers by formulating Hornbill Guardians. The Guardians were provided biodiversity conservation training and SMART patrol training to assist them with conservation activities. These Guardians have already embarked on monitoring surveys with BANCA. BANCA has consistently engaged with the Myanmar government Forest Department and Kawtoolei Forest Department on distribution and population surveys for Helmeted Hornbill, conservation awareness activities and hunting surveys. BANCA has also raised conservation awareness through putting signages in local languages and by conducting activities in 11 schools. conservation continues to face challenges due to the political situation and strict regulations sometimes prohibiting travel out of villages. New protests from October 2022 to till now, continue to disrupt our conservation activities.

Keywords: Helmeted Hornbill, Rapid assessment, Hornbillguardian, Pressure of conservation, South Tanintharyi

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Protocol Development for the Management of Casque Squamous Cell Carcinoma in Great Hornbills (*Buceros bicornis*)

Trent Charles van Zanten [*1,2]

Squamous cell carcinoma (SCC) is a neoplastic disorder of epithelial origin arising from squamous cells lining the various surfaces of the body. It is a malignant tumour that is typically locally invasive, causing extensive cellular destruction as it spreads and may result in metastases in later stages of progression. It is diagnosed via tissue biopsy and histopathological analysis. Curative treatment is possible in less advanced cases with surgical excision, cryosurgery, electrodessication, and occasionally radiation therapy. SCC of the casque is reported with regularity in Great Hornbills (*Buceros bicornis*), and medical treatment of this cancer is typically unrewarding. Two cases (a 22-year-old male and an 18-year-old female) presented to the Jurong Bird Park Veterinary Hospital within a three-year timeframe exhibiting grossly degenerative changes to the premaxilla and casque rhamphotheca, and radiographs revealed a focally increased radio-opacity of the otherwise pneumatised underlying maxillary bone in both instances. Computed Tomography (CT) and CT-guided biopsy of the casque lesion were performed under general anaesthesia, revealing a contrast enhancing, well defined mass in the male, and a non-contrast enhancing, progressive, bulging lesion of the rostroventral casque in the female. Neoplastic changes to the epithelial cells of the base layer of squamous cells were identified, and surgical excision with curative intent was elected as the treatment of choice. Surgical planning was possible using CT-based measurements to allow for sufficient margins around the neoplastic lesions to minimise the risk of recurrence, and a 3D printed prosthesis based on CT-rendered models that perfectly fitted the subject was implanted to replace its resected casque. Long term management with meloxicam was instituted for two years in the male bird due to evidence of its inhibitory effect on SCC development. Casque radiographs performed at six monthly intervals showed no evidence of recurrence, and at two (female) and five (male) years post-operatively both birds remain cancer free. From these outcomes, a protocol for managing SCC of the casque in Great hornbills can be recommended and applied to future cases. New technologies in medical imaging and 3D printing have made customisation of surgical tools and implants more accessible, revolutionising many surgical fields. Such implants have led to superior surgical outcomes and greatly improved patients' quality of life. Both subjects exhibited natural eating behaviour with no post-operative complications. Using these examples, the positive outcomes suggest a great potential in applying these technologies to treat other wildlife diseases.

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Patterns of Egg Production in Monteiro's Hornbill

Mark Stanback [*1]

Because the breeding of hornbills takes place inside sealed nests, our understanding of egg production is limited. Monteiro's Hornbill (*Tockus monteiri*) is a relatively large member of the African hornbill Genus *Tockus*. We examined egg production patterns in Monteiro's hornbills in a nestbox-breeding population in semi-arid acacia woodland near Windhoek, Namibia. We checked the nests of approximately 90 females nests every 2-3 days during the egg-laying period. We examined clutch size, inter-egg intervals (both among and within clutches), egg size (both among and within clutches), and pre-laying intervals. Overall, long pre-laying intervals are associated with smaller clutches and smaller mean egg size. Within clutches, eggs tend to get smaller over the course of laying, while inter-egg intervals tend to lengthen over the course of laying. Our results suggest that long pre-laying intervals and long inter-egg intervals represent a form of income breeding, while females exhibiting shorter pre-laying and inter-egg intervals are engaging in capital breeding.

Keywords: *Tockus monteiri*, Egg production, Nestbox, Reproduction, Parental investment

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Poster Presentation

Online Trade in Hornbills in Indonesia

Vincent Nijman [*1] and Anna Fourage [1]

Wildlife trade is increasingly moving from physical markets to online platforms. Indonesia is home to 13 species of hornbill; all are protected by law, and neither the birds nor their parts are allowed to be traded. In the past, several species were sold in bird markets in most larger cities throughout Indonesia, but this trade has now moved largely online. We aimed to gain insight into the online trade in hornbills or their parts, which species were offered for sale, and how this trade manifests itself. The most common live birds we encountered for sale were the Sulawesi Wrinkled hornbill, Rhinoceros hornbill, Wreathed hornbill and Blyth's hornbill; all these species are found within Indonesia. About half of the birds were adults; the other half were fledglings or juveniles. Around a fifth were offered as single birds, two-fifths as pairs, and the largest number of birds in one advert was seven. We found live hornbills for sale on Instagram and Facebook; both platforms explicitly forbid the advertising of live and protected animals. Hornbill feathers and ivory jewellery made from Helmeted hornbill casques were available on online sales platforms - here, advertisers clearly indicated if these were real or fake (e.g., painted turkey feathers). Most adverts spelt out what they were selling, but some resorted to minor linguistic alterations to evade easy detection. Asking prices, names and locations of traders were listed. We conclude that the widespread availability of hornbills and their parts indicated a lack of effective enforcement of existing legislation and show that the online trade is a direct impediment to the conservation of hornbills in Indonesia.

Keywords: Indonesia, Online wildlife markets, Wildlife trade

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Roosting patterns of two hornbill species in Buxa Tiger Reserve in the Indian Eastern Himalaya

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Communal roosting is an interesting phenomenon observed in many hornbill species. Out of the 9 hornbill species found in India, 5 are present in Buxa Tiger Reserve (BTR), in the foothills of the Indian Eastern Himalaya. This region also forms the westernmost distribution limit for the Wreathed and Rufous-necked Hornbills. We located seven roost sites of Great Hornbill (*Buceros bicornis*) and Wreathed Hornbill (*Rhyticeros undulatus*) from 2018-2022 at Buxa TR. We monitored these sites to determine population trends, seasonal and annual roosting patterns and variation in numbers over different years. Since 2018, regular monitoring was conducted at one GH and one WH roost site in the non-breeding season (September-February). In 2022, the monitoring was carried out throughout the year to determine if these roost sites are used even during the breeding season (March-August). The number of hornbills arriving at these sites, the first and last arrival times, and the sex/age of arriving birds were recorded where possible. The Great Hornbill roost is located in hill-forest habitat mostly on *Albizia procera* trees surrounded by *Shorea robusta* trees. The number ranged from 1-17 in the non-breeding season and from 1-2 in the breeding season (2022). One of the main roosts of Wreathed hornbills is along a riverbank in BTR. They roost on 2-3 *Bombax ceiba* trees which are surrounded by *Terminalia tomentosa* and *Lagerstroemia speciosa* plantations. The highest number seen on a single day was 224 in February (non-breeding season). In the breeding season (2022), occasionally 1-2 birds were seen at the roost site. The age/sex composition of Great Hornbill flocks was 26% males, 19% females, 11% juvenile, while 43% remained unidentified. The age/sex composition of Wreathed Hornbill flocks was 37% males, 31% females, 3% juveniles, while 30% remained unidentified. Hornbills arrived almost an hour earlier in winter than in summer. Great Hornbills usually arrived together within a short period very close to sunset or after sunset. Wreathed Hornbill flocks usually arrived over a longer period with most arriving 10-45 minutes before sunset. Our study highlights that Wreathed Hornbill roost in larger number than Great Hornbill and the two species use distinct habitats. Our roost count also gives us an idea about the population of Wreathed Hornbill at its extreme western distribution limit. Long term roost monitoring will also help identify threats and disturbances affecting the use of these sites and can help develop future conservation plans for hornbills at Buxa TR.

Keywords: *Buceros bicornis*, Great Hornbill, *Rhyticeros undulatus*, Roost site, Wreathed Hornbill

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Reintroduction of captive Oriental-pied Hornbill and Community-based Conservation in Koh Kut, Trat Province

Nuttanun Leenoi [*1,2], Montita Inja [1,2], Nukool Kongprom [1], Urarikha Kongprom [3], Jiraporn Teampanpong [3], Arnfinn Oines [4], Somying Thunhikorn [4], Siriwan Nakkuntod [5], Sitthichai Jinamoy [6], and Vijak Chimchome [1]

The Objective of the project was to reintroduce the Oriental-pied Hornbills (OPH) to Huang Num Keaw forest patch, Koh Kut Island (KKI), Trat Province, Thailand (Area: 111.9 km^2; Latitude:11°39′N 102°32′E Longitude:11.650°N 102.53 ′E) in collaboration with local communities between 2021- 2022. Zoos under the Zoological Park Organization of Thailand (ZPOT) provided three pairs of OPH which were translocated to an enclosure at KKI for soft release, wherein each pair were allotted 2 - 6 months to adapt to their surroundings before their eventual release to the wild. During this period, the birds were specifically trained (food & feeding behavior and flying practices). Their diet includes a daily intake of 150 - 200 grams of local market-sourced fruits, a bi-weekly at least 100 grams of wild fruits such as *Myristica* sp., *Ficus* spp. and pork meat per bird as well as supplements such as vitamin water, fish oil and calcium powder. After the OPH had been released, one male died from an accident while one pair made nesting attempts near an artificial nest box installed on the forest tree. All five OPH were observed to have been able to adapt to the environment. In addition to the food provided, they were able to consume local wild fruits such as *Ternstroemia wallichiana*, *Ficus* spp., *Caryota urens*, *Syzygium* sp. to include into their diet. The released birds were also able to hunt animals such as millipedes, earthworms, geckos, grasshoppers, butterflies, caterpillars, etc. for inclusion into their dietary intake. Most OPH shared the area of the released site but defended their territories near the artificial nest box. Only one female showed behavioral inclination for long dispersion for areas further than 6 km of release site. The released OPH showed high adaptability to survive and breed in their new natural environment. Additional OPH should be released in order to repopulate in the area where OPH was extinct from the ecosystem for more than 30 years.

Keywords: Oriental-pied Hornbills, Reintroduction, Soft release

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Food diversity and low competition of two hornbill species during breeding season in Mixed Deciduous Forest, Huai Kha Khaeng Wildlife Sanctuary

Amonpong Khlaipet [*1], Vijak Chimchome [2], and Pilai Poonswad [2]

The objectives of this study were to investigate food diversity and competition between Plain-pouched Hornbills (PPH) and Oriental Pied Hornbills (OPH) during the breeding season in the mixed deciduous forest of Huai Kha Khaeng Wildlife Sanctuary, Western Thailand. Nest trees previously used by both hornbill species were checked and repaired in December 2016, prior to the breeding season. From seven repaired nests, four were used in February 2017 (two nests of PPH and two nests of OPH). Observations of the active nests were conducted for 3-7 days interval. The incubation and nestling phases of PPH were 27 and 70.5 days, respectively, with 1 chick/nest (n=2), while OPH spent 15 and 68 days for these phases with 2 chicks/nest (n=2). Fruits that were the most preferred food for both PPH and OPH were *Ficus albipila*, *F. kurzii*, *F. racemosa*, *P. viridis*, and *F. retusa*. Cicadas and beetles were the most preferred animal food. The Shannon-Wiener Diversity Index (*H'*) of fruits and animals consumed by the two hornbill species were 2.27 and 1.45, respectively, while *H'* of OPH was 2.13 and 1.59. The Food Overlap Index of fruit and animal consumed by PPH and OPH was 0.259 and 0.223, respectively indicating low food competition between these two hornbill species.

Keywords: Plain-pouched Hornbill, Oriental Pied Hornbill, Food diversity, Food competition

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Green spaces in urban area serve as a suitable habitat for Indian Grey Hornbill, *Ocyceros birostris*, Amravati, Maharashtra, India

Pratik Chaudhari [*1], Gajanan Wagh [1], Nikhil Borode [1], and Raju Kasambe [2]

Indian Grey Hornbills (*Ocyceros birostris* [Scopoli, 1786]) are a common resident hornbill species of the Indian subcontinent. Although it has adapted to the urban landscape in India, the Indian Grey Hornbill is commonly seen in urban areas compared to other hornbill species found in the central Indian landscape. Few studies are available, about the distribution, feeding, and breeding ecology of Indian Grey Hornbills in urban landscapes. Hence, this attempt was made to know the presence of hornbills in urban areas. This study was carried out from 2016 to 2019 in wooded green patches in Amravati city. The study focused on nest site selection, nesting success, and its diet. Observations were taken in the morning (06:00–10:00 am) and evening (04:00–6:00 pm) hours.

During the study period, four nests of Indian Grey Hornbills were located in the Wadali Garden and its adjoining area in Amravati city. Three of the four nests were found in cavities of indigenous tree species, while the fourth nest was in an exotic tree species. One of the nests was found non-active in the last two breeding seasons due to urban impact and local disturbances. Food preferences were recorded during the breeding season (April to July), and it was found that Indian Grey Hornbills preferred the fruits of indigenous plants and insects and reptiles as animal matter in their diet. This Hornbill species preferred more indigenous plant species over exotic plant species for nesting. Hornbill sightings were observed throughout the year in the urban area of Amravati city, but they preferred only green patches and safe areas for nesting and roosting, such as government offices, public parks, university campuses, and education institutes, possibly because of the less disturbance and the presence of old trees.

The present study revealed that green patches served as suitable habitat, with more indigenous tree species like *Bombax ceiba*, *Albizia lebbeck*, *Millettia pinnata*, *Azadirachta indica*, and *Erythrina variegata* were being preferred for successful nesting, and trees of fig species like *Ficus benghalensis*, *Ficus religiosa*, *Ficus recemosa*, and *Ficus variegata*, as well as non-fig species like *Syzygium cumini*, *Manilkara hexandra*, and *Putranjiva roxburghii*, preferred for feeding. Hence, more indigenous plant species should be planted to conserve the Indian Grey Hornbill in urban habitats.

Keywords: Indian Grey Hornbill, *Ocyceros birostris*, Green patches, Urban landscape ecology, Amravati, Maharashtra, India

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Composition of the Great Hornbill Nesting Habitat in the Southern Western Ghats for Ecosystem-based Species and Habitat Management

Anitha K.T [*1] and Amitha Bachan K.H. [1]

The degradation of moist tropical habitats in its extent and quality has been the major reason for the decline of Great Hornbill populations in the Western Ghats. Studies indicated the removal of old-growth nesting trees, large-scale conversion of forest for non-forest purposes, degradation of primary forest and traditional hunting as the major reasons. The traditional hunting factor can be reduced with proper community involvement in conservation but the degradation of the forest habitat is a persistent threat. Great Hornbill nest locations were overlaid on a vegetation map, and were found to be in wet evergreen primary forest, wet evergreen secondary forest, secondary moist deciduous forest, forest plantation and forest converted agro-industrial plantations within the evergreen and wet evergreen bioclimate. We conducted stratified random sampling of 24 plots of 0.3ha size, around nesting trees across the identified various vegetation types of the Southern Western Ghats, India. The nest plot vegetation data were clustered based on species similarity (Bray-Curtis) and 11 different vegetation clusters were obtained. These include the composition of climax tree species found in the wet evergreen forest of the Western Ghats such as *Palaquium ellipticum – Cullenia exarillata* type with high species diversity, density and climax species dominance index. This also includes primary low-elevation forest compositions, such as *Vateria indica* and *Chukrasia tabularis* type. Others represent various degradation types of the rainforest formations inferred with less species diversity, density and climax species dominance index. The *Ochlandra travancorica* dominated composition indicates the highly degraded forest region with isolated old-growth nesting trees. The composition of nesting habitats in the secondary moist deciduous forest, forest plantation and agro-industrial plantation also comes within the low- and medium-elevation tropical rain forest biome. The detailed vegetation composition around the nests ranging from the heavily degraded to primary forest habitat can be used as scale for site-specific conservation plans and ecological restoration of degraded hornbill nesting habitats in the Western Ghats.

Keywords: Tropical forest, Conservation, Great Hornbill, Western Ghats, Nest site

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Different between less and more disturbed protected area on density and drastic reduction of critically endangered hornbill over time

Vatcharavee Sriparsertsil [*1], Bee Choo Strange [1], Vijak Chimchome [1,2],
Daphawan Khamcha [3], George A. Gale [3], and Rohit Naniwadekar [4]

Hornbill is important large seed disperser in tropical rain forest in South-East Asia. Large-bodied hornbill can carry many of seed across forest patch with long distance. But population of hornbill is facing threaten by illegal poaching and habitat degradation. We asked two questions, the first, do density of 4 large-bodied hornbill species including Great Hornbill (*Buceros bicornis*), Rhinoceros Hornbill (*B. rhinoceros*), Wreathed Hornbill (*Rhyticeros undulatus*) and critically endangered Helmeted Hornbill (*Rhinoplex vigil*) differ between less and more disturbed protected area? The second, do density of large hornbill change after 20 years in less-disturbed protected area? We survey hornbill density using line-transect in two protected area in Southern Thailand, Bala Forest (less-disturbed site) and Budo forest (more-disturbed site), in June 2021 to June 2022. We walked 162 km of effort transect in Bala Forest and 164 km of effort in Budo Forest and analysis with R using package 'distance'.

Result show three hornbill species are higher mean density in Bala Forest, less-disturbed area, than Budo Forest, more-disturbed area, except Great Hornbill. We expected, in more-disturbed site might less food resource and nest cavity than after habitat change. Lacking fruiting tree might drive hornbill to move outside protected area for searching food and be targeted by poaching. In Bala Forest, we compared density on this study with previous study in 2002. After 20 years, Helmeted Hornbill is drastically decrease more than 90% while other three species increase insignificantly. We expected illegal trade of Helmeted Hornbill might once of cause of decline. This study shows effect of human disturb in protected area on hornbill population and shows how ineffectively protection of small protected area on highly targeted species.

Keywords: Hornbill density, Helmeted Hornbill, Disturbed area

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Examining the Illicit Online Trading of Indonesian Hornbills

Yok Yok Hadiprakarsa [*1] and Aryf Rahman [1]

Despite all Indonesian hornbills are protected species, advancing internet access in Indonesia has significantly impacted the illegal trade on protected species, including hornbills. We have monitored the internet media from March 2017 to January 2023 in all social media and e-commerce platforms for trade posting on body parts such feathers and skulls or live hornbills. A total of 85 illegal trade postings were recorded with an estimated 195 hornbill individuals, with 80% on social media with Facebook being the most common platform (76%) and the only platform that sale live hornbills. The e-commerce platform most preferred to sale hornbill body parts, with 75% were skulls. Nine out of the 13 Indonesian hornbills were traded, with the Rhinoceros Hornbill being the most traded species (59%), mostly offering body parts for cultural ornament. We also recorded 11 trade postings on critical endangered of the Helmeted Hornbill casque. The Wreathed Hornbill and Oriental Pied Hornbill are most offered as a live bird, 38.2% and 32.7% respectively, mostly at young aged. Based on seller origin, most of the live hornbills came from Java (75.5%), while for body parts came from Kalimantan (55.6%). Our findings showed that the internet has been used effectively to illegally traded Indonesia hornbills, therefore we propose monitoring illegal activity in the hornbill trade and teaming up with law enforcement and platform providers to monitor and intervene in all postings related to the trade.

Keywords: Illegal trade, Internet, Social media, Hornbill

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Population genetics and genomics for conservation of hornbills in Peninsular Malaysia

Wilhelm Wei Han ENG [1], Frankie Thomas SITAM [2], Sadequr RAHMAN [1], and Qasim AYUB [*1]

Peninsular Malaysia hosts 10 of the 62 hornbill species found in the world. This avian family is found predominantly in Asia, Africa and Oceania and is characterized by unique species-specific casques. They are increasingly under threat of extinction by illegal hunting, trafficking, deforestation and habitat destruction. At present, 8 out of 10 hornbill species in Malaysia are listed as at least "Vulnerable" in The International Union for Conservation of Nature (IUCN) Red List Categories. Although the importance of conserving this avian family is widely acknowledged, there is a knowledge gap concerning our understanding of these birds, especially in its population genetic data and evolutionary history in Malaysia. Recent advances in molecular biology have identified several genetic markers that can be used to identify species and track the origin of wildlife specimens based on their genetic profile. However, this approach is only feasible if we have sufficient background molecular or genetic data to serve as a reference. Such data is currently unavailable for hornbills in Malaysia. The lack and urgency of such genetic data is also acknowledged by the IUCN Species Survival Commission (SSC) Hornbill Specialist Group that recently called for creating a genetic reference library for *Rhinoplax vigil*, the Critically Endangered Helmeted Hornbill. In this project, we propose to sequence complete mitogenomes and two candidate autosomal genes loci (AK1 intron 5 and RAG1) in at least 5 – 10 unrelated samples per species to help develop a database of genetic resources for all Malaysian hornbill species. As a start, our samples will include captive and wild birds representing all 10 species of hornbills across Peninsular Malaysia, with the hope to include Sabah and Sarawak hornbills in the future. This dataset will enable us to differentiate between species and subspecies of hornbills in Malaysia and characterize their intra- and interpopulation genetic diversity. The results will be indispensable for the design of conservation programs and highlight molecular markers that could further assist in forensic identification of the species and to facilitate law enforcement.

Keywords: Population genetics, Conservation genomics, Diversity, Forensics, Complete mitogenome

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Incorporating Hornbill Biology and Behaviour into Constructing Nest Box

Helson Hassan [*1], Ravinder Kaur [1,2], and Marc Ancrenaz [3]

Hornbills are secondary cavity-nesting birds. Logging over the past few decades in the Lower Kinabatangan Wildlife Sanctuary (LKWS) has caused the forest to be highly fragmented and has reduced the number of tree cavities available to hornbills. Therefore, efforts are underway in the LKWS to artificially increase the number of breeding sites to improve breeding success. In 2013, the first nest box in LKWS was built by HUTAN/KOCP, Chester Zoo and Beauval Zoo. Gaia joined in these efforts in 2015. The internal conditions of the natural cavity play an important role in ensuring successful breeding. The internal microclimate conditions of natural nests of the Oriental Pied hornbill (*Anthracoceros albirostris*) nests natural cavity were studied by Kaur (2020) and her team by placing data loggers in six. The internal temperature ranged from 25.8 - 28.8°C and the internal humidity ranged between 88.2 - 99.8%. This information was incorporated into the nest box designs during 2016 – 2023 and five different prototypes were tested. Various experimental materials were tested to build a nest box that would best imitate the conditions inside a natural cavity. In 2017, the team managed to design a nest box that only had approximately 10% difference between the internal temperature and humidity of the natural cavity and the artificial nest box. It was also lightweight and easier to manage.

The team also experimented with the entrance shape of the nest box. By conducting nest observations of Helmeted Hornbills, Rhinoceros Hornbills and Oriental Pied Hornbills, the team observed a difference in the cavity entrance preferred by hornbill species. Helmeted Hornbills preferred knobby-shape nest cavities with protruding entrances, whereas other hornbill species favoured narrow nest entrances and can nest in round-shaped cavities. Throughout the 10 years, Gaia and the Hutan team have installed a total of 37 nest boxes, 33 boxes along the Kinabatangan River, one in Sepilok, and 2 boxes in Terengganu. Three species have been recorded using the nest box, which are the Rhinoceros Hornbill, Bushy-crested Hornbill, and Oriental Pied Hornbill. Six Rhinoceros Hornbill chicks have successfully fledged from the nest boxes. These boxes have also been visited by Great Hornbills and Wrinkled Hornbills. Future plans for hornbill conservation in the region will be explored.

Keywords: Hornbill, Nest box, Cavity, Lower Kinabatangan Wildlife Sanctuary, Hole-nesting bird, Artificial nest

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The Helmeted Hornbill's hammer: complex anatomy and impact-resistant structural design of the casque

Chloe Hatten [*1], Mason Dean [1], Venkata Amarnadh Surapaneni [1] ,Ting Fai Kong [2], and Ruien Hu [2]

The Critically Endangered Helmeted Hornbill (*Rhinoplax vigil*) is the only species of hornbill with a solid casque, an anterior protrusion above the beak. As a result, these birds are poached across their range, their casques traded illegally, carved, and made into ornaments. Casques function in sexual selection, acoustic resonance, as a digging tool, and in a rare defensive behaviour called 'aerial jousting', where they collide casques mid-flight, in a display that can be heard for ≤100m. Previous X-ray imaging revealed dense bone trabeculation in a cavity between the casque and the braincase. However, it is unknown how this is structured to sustain such extreme impact. Here we present preliminary data from Stage 1 of this project, characterising the structural relationship between skull and casque internal anatomy using microCT, digital network analysis. We find that the trabeculae form a complex anisotropic network, most dense between the dorsal casque and anterior braincase and converging on particular skull regions (e.g., the craniofacial hinge and the gap between the nasal passages). In some specimens, we found bullets within the trabeculae, their entry trajectories surrounded by tissue masses, suggesting potential for tissue regeneration within this cavity. We will also present our plans and objectives for Stage 2 of this research, which include testing the material composition of the casque and the casque/skull mechanical properties for impact-resistance. Ultimately, the combination of casque and trabeculae represent a complex architectural composite, with implications for the species ecology and biology, and our project (preliminary findings and objectives) assesses how *R. vigil* is morphologically adapted for its unique aerial jousting behaviour.

Keywords: Helmeted Hornbill, Casque, Skull, Functional morphology, Behaviour

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Plain -pouched Hornbill migration

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The Plain-pouched Hornbill (*Rhyticeros subruficollis*; PPH) is currently one of Asia's globally threatened hornbills. This hornbill has a small distribution range limited to Myanmar, Thailand, and Peninsular Malaysia. They are known to breed in Huai Kha Kheang Wildlife Sanctuary (HKK) in western Thailand from January until May or July and are the only area of importance of the nest site capacity. Due to this, attempts to radio-track individuals in HKK have been used to help understand the ecology of the species; but these attempts failed as the individuals disappeared from the operating distance of the radio-tracking devices. These failed attempts have led us to believe that the migratory status of PPHs requires further evaluation. In 2013 – 2022, seven PPHs were tagged using PTTs and tracked through a satellite-based GPS system to investigate their movements and habitat use. The results showed that PPHs fly southwards after the breeding season from the only confirmed breeding site in HKK to Tenasserim Range Myanmar and Belum-Temengor Forest Complex (BTFC) in northern Peninsular Malaysia. In conclusion, we have confirmed that the PPH is a seasonal migratory bird. However, the findings provide crucial information to reinforce the transboundary conservation of natural forests between Thailand, Malaysia, and possibly Myanmar to safeguard the long-term survival of PPH.

Keywords: -

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The Study of possibility for Reintroduction of Great Hornbill (*Buceros bicornis*) in the North of Thailand

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Great Hornbill (*Buceros bicornis*) is one of thirteen species of Asian Hornbills in Thailand. However, they are almost near extinction in the Northern Thailand. They disappeared from the wild within the past 20 years. Khao Kheow Open Zoo under the Zoological Parks Organization of Thailand (ZPOT) has successfully bred Great Hornbills in captivity every year since 2011. This study aimed to conserve this species and possibility of reintroduction to promote biodiversity in the Northern Thailand. ZPOT had planned re-wilding of Great Hornbill since 2019. The study began with assessment of Mitochondrial and Microsatellite DNAs in 97 individuals in ZPOT to understand genetic diversity and captive management for conservation. Second, consideration of the habitat quality from six Wildlife Sanctuaries and National Parks in the Northern Thailand had been evaluated. Third, the study of rehabilitation as preparation before releasing them in a protected area conducted. From preliminary studies of DNA, the genotype of male and female of Great Hornbills can be grouped into four and thirteen respectively, with some individuals has potential to exhibit the genetic diversity in wild. From the assessment of releasing site for Great Hornbill had found that most suitable area in wildlife sanctuary and National Park with considering the food diversity, large trees, nest cavity, threat factors, and community involvement is ($P>0.05$). The primary studies of behavioral rehabilitation and reintroduction were released two pairs (2.2.0) of Great Hornbills to the two protected areas in the Northern Thailand between October 2022 and January 2023. From the monitoring after released, there was found that these birds could survive in the forests and had the breeding behaviors and using the artificial nest in the tree by entering and seals the cavity nest. The female locks herself in an artificial nest with the male taking food to feed the female. This long-term study plan provides for the release of more birds. Include the monitoring and preservation of other data over the next four years by the IUCN SSC and AZA guidelines for animal reintroduction.

Keywords: Genetic Diversity, Rehabilitation, Release, Monitoring, Behaviors

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Sulu hornbill habitat assessment in Tawi-Tawi province, Philippines

Abdel-aziz Ballon [*1] and Nikki Dyanne Realubit [1]

Tawi-Tawi is home to some of the most threatened and rare bird species in the Sulu archipelago Endemic Bird Area (EBA). One of these endemic bird species includes the least studied and Critically Endangered Sulu Hornbill (*Anthracoceros montani*) with an estimated population of 40-50 individuals left due to habitat loss for agriculture and residential purposes. For this study we performed a field assessment for the first quarter of 2023 in two main municipalities (Panglima Sugala and Sapa-Sapa) in the province of Tawi-Tawi. Opportunistic bird sampling was used to identify possible locations where the Sulu Hornbill thrives. For each area we established four (4) one-kilometer transects observation points with 250-m distance interval. Four encounters of the Sulu Hornbill were observed in the Panglima Sugala site (highest peak at 400 masl). This habitat was assessed to have a forest stand of trees with tree girth range of 4-5m. The presence of dipterocarps, fruiting trees, palms, bamboos, rattans, and lianas surrounding the forest with high canopy cover at about 200 masl. The other site in Sapa-Sapa we describe as an expansive grassland with palm trees on a lower elevation (0-250 masl) range, with lower tree girth, lower canopy cover and marked by dense fruiting trees, palms, lianas, herbs, and bushes. Habitat disturbances were also observed including extensive logging and mining.

Keywords: Tawi-Tawi, Panglima-sugala and Sapa-Sapa, Habitat assessment, Threats to habitat

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Save Hornbill
Photo Exhibition

เนื่องในโอกาสที่ประเทศไทยเป็นเจ้าภาพ
จัดการประชุมนกเงือกนานาชาติ ครั้งที่ 8
มูลนิธิศึกษาวิจัยนกเงือก จึงร่วมกับคณะวนศาสตร์
มหาวิทยาลัยเกษตรศาสตร์ จัดแสดงนิทรรศการภาพ “รักษ์นกเงือก” ขึ้น
ที่อาคารวนศาสตร์ 60 ปี คณะวนศาสตร์ มหาวิทยาลัยเกษตรศาสตร์
ในวันที่ 22-24 พฤษภาคม ศกนี้ พร้อมทั้งจำหน่ายภาพนิทรรศการ
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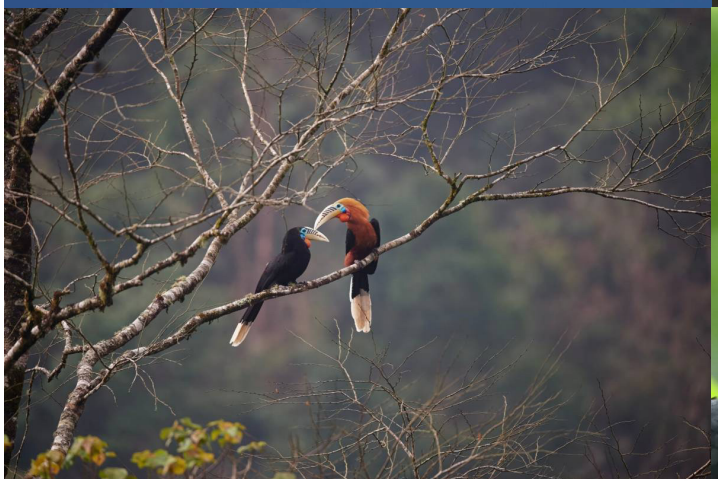

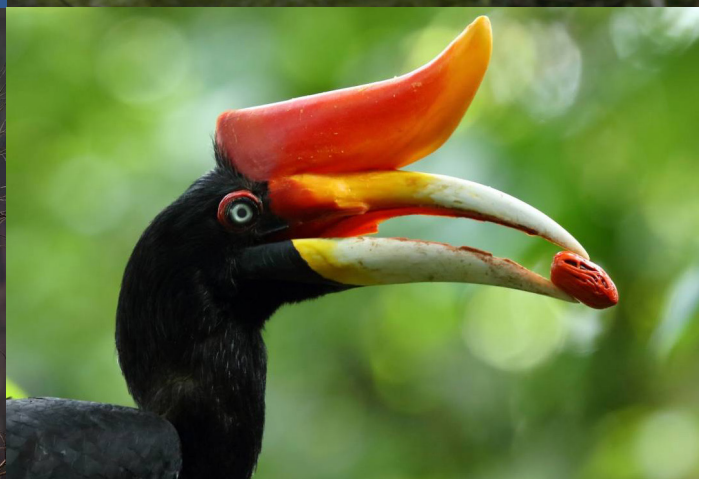

กลุ่มช่างภาพจิตอาสา

Canon

FB : NATURE EXPLORER THAILAND

1 Writing Scientific Paper for International Journal Publication

Focus ot this WORKSHOP:

The focus of this workshop is to assist young researchers/students in writing their first paper for international publication. The workshop will cover topics including the structure of a scientific paper, selecting an appropriate journal, the ethics of authorship, and how to handle responses from journal editors. Depending on demand, there may be opportunities for young authors to have drafts of their manuscripts reviewed by experienced authors and to provide them with suggestions about paper structure and form, although detailed comments about a particular topic may not be possible.

Brief about resource person:

Associate Professor George Andrew Gale work at the School of Bioresources and Technology, KMUTT, Thailand. He graduated with a Ph.D. (Ecology) from University of Connecticut, U.S.A. Research of iinterests are ecology and conservation biology. He is ccurrently advising several Master and Ph.D. students at KMUTT on various aspect of biological research.

Instructor	**Assoc. Prof. Dr. George Andrew Gale** (KMUTT)
Maximum of participants	No limit
Time/Location	**13:00 - 16: 00** at FORTROP Room, 3rd floor, 60 years building, Faculty of Forestry, Kasetsart University
Cost	20 USD
Grant	KUFF students will get the support from WCS

8th International Hornbill Conference
Half-day Students Workshops

Ecological Study Design 2

Focus ot this WORKSHOP:

In this workshop, we will teach participants how to design ecological studies. Ecological studies must be designed well to allow us to determine the impact of the ecological or anthropogenic predictors on the response variable with a certain level of confidence. This half-day course will discuss the fundamentals of designing an ecological or conservation science study. This will include aspects like replication and pseudo replication, independence, interspersion, some standard study designs and the use of basic statistics in interpreting patterns in data.

Brief about resource person:

Rohit is a Scientist at the Nature Conservation Foundation, India. He completed his Master's in Wildlife Sciences at the Wildlife Institute of India, Dehradun in 2005 and his PhD from the Nature Conservation Foundation and Manipal University in 2014. His work straddles research and conservation with major focus being on endangered hornbills. His research aims to understand the ecological role of hornbills and other frugivores in tropical forests and the impacts of hunting, habitat degradation and fragmentation on them. He is currently collaborating with artists with an aim to sensitize different stakeholders about endangered species and the need for their conservation.

Instructor	**Dr. Rohit Naniwadekar** Nature Conservation Foundation
Maximum of participants	20 persons
Time/Location	**09:00 - 12:00** at FORTROP Room, 3rd floor, 60 years building, Faculty of Forestry, Kasetsart University
Cost	20 USD
Grant	KUFF students will get the support from WCS

Khao Yai National Park

Khao Yai is recognized as the best national park in Thailand for regular visitors where it is relatively easy to see some impressive animals. It was established in 1962 as Thailand's first national park, and the third largest national park in Thailand, covering covers an area of 2,168 km². It is situated in Nakhon Ratchasima Province, Khao Yai extends into Prachinburi, Saraburi and Nakhon Nayok provinces. The main checkpoint of the park is 180 km from Bangkok.

The park covers moist (rain) evergreen forest, dry evergreen forest, mixed deciduous forest, dry dipeterocarp forest, and grasslands. Khao Rom with the height of 1,351 meters above mean sea level (asl) is the highest mountain within the park. The average altitude of the national park ranges from 400 to 1,000 meters asl. Khao Yai is part of the Dong Phayayen-Khao Yai Forest Complex inscribed on the UNESCO World Natural Heritage list in 2005. This world heritage covers 5 protected areas in which Khao Yai contributes about one-thirds of the total area (61,550 km^2). Khao Yai National Park has three main seasons. The rainy season is from May to October with high humidity and with the most rainfall in September. The rest of the year is quite dry. November to February are the winter months with cooler weather and average temperatures of 22 °C during the day and down to 9-10 °C during the night.

There are 3,000 species of plants, 440 species of birds and 66 species of mammals. Khao Yai provides habitats for 4 out the 14 hornbill species found in Thailand. Great hornbills, *Buceros bicornis* and Oriental-pied Hornbill, *Anthracoceros albirostris* can be seen flying over the visitor center area almost daily, while Wreathed Hornbill , *Rhyticeros undulatus* and Austen's Brown Hornbills, *Anorrhinus austeni* are rare. Interesting mammal species include Asian black bear, Indian elephant, gaur, gibbon, sambar deer, southern pig-tailed macaque, Indian muntjac, Ussuri, dhole and wild pigs. There have been are no tigers in Khao Yai for at least 20 years.

Activities

The main activities in the park are; hiking, wildlife watching, visiting waterfalls & viewpoints and camping. The visitor center area is a good spot to get some quick information and start a day trip. In addition, there are seven trails ranging from 800 m up to 8 km long. Most of the trails are northwest from the visitor center area which are all circular trails. There are a number of waterfalls in the park, most of them easily accessible by vehicles combined with a short walk. Haew Narok Waterfall in Khao Yai is one of the highest and most impressive waterfalls in the country.

Camping and accommodations

There are two main campsites in the park; Lam Ta Khong Campsite and Pha Kluai Mai Campsite. There are accommodations in two different spots inside the national park. The capacity of all campgrounds and bungalows can accommodate more than 5,000 visitors per night.

8th IHC ORGANIZING COMMITTEE

No.	Name	Affiliation	Country
1	Prof. Dr. Yongyut Trisurat (Co-chair)	Kasetsart University, Faculty of Forestry (KUFF)	Thailand
2	Asst. Prof. Dr. Vijak Chimchome (Co-chair)	Thailand Hornbill Research Foundation/ Kasetsart University	Thailand
3	Mrs. Bee Choo Strange	Thailand Hornbill Research Foundation	Singapore
4	Ms. Siriwan Nakkuntod	Thailand Hornbill Research Foundation	Thailand
5	Mr. Sittichai Jinamoy	Thailand Hornbill Research Foundation	Thailand
6	Mrs. Sopha Sa-nguanchat	Thailand Hornbill Research Foundation	Thailand
7	Dr. Chattraphas Pongc-haroen	KUFF	Thailand
8	Dr. Nantida Sutummawong	KUFF	Thailand
9	Miss Sirin Kansutharak	KUFF	Thailand
10	Mr. Paramed Yuak-im	KUFF	Thailand
11	Dr. Somying Thunhikorn	Department of National Parks, Wildlife and Plant Conservation	Thailand
12	Dr. Jongdee To-im	Mahidol University	Thailand
13	Ms. Jitrana Kengkanna	Mahidol University	Thailand
14	Dr. Kyle-Mark Middleton	Mabula Ground Hornbill Project	South Africa
15	Mr. Rinchen Wangchuk	Ugyen Wangchuck Institute for Forest Research and Training	Bhutan

8th IHC SCIENTIFIC COMMITTEE

No.	Name	Affiliation	Country
1	Assoc. Prof. Dr. Prateep Duengkae (Advisor)	Kasetsart University, Faculty of Forestry (KUFF)	Thailand
2	Prof. Dr. Yongyut Trisurat (Co-chair)	KUFF	Thailand
3	Dr. George Gale (Co-chair)	King Mongkut's University of Technology, Thonburi	Thailand
4	Asst. Prof. Dr. Vijak Chimchome	Thailand Hornbill Research Foundation/ Kasetsart University	Thailand
5	Assist. Prof. Dr. Warong Suksavate (Secretary)	KUFF	Thailand
6	Mrs. Bee Choo Strange	Hornbill Research Foundation	Singapore
7	Dr. Caroline Dingle	University of Hong Kong	Hong Kong
8	Dr. Chalita Kongrit	Mahidol University	Thailand
9	Dr. Jongdee To-im	Mahidol University	Thailand
10	Dr. Divya Mudappa	Nature Conservation Foundation	India
11	Dr. Lisa Nupen	Mabula Ground Hornbill Project	South Africa
12	Dr. Rohit Naniwadekar	Nature Conservation Foundation	India
13	Dr. Kaka Tshering	Ugyen Wangchuck Institute for Forest Research and Training	Bhutan
14	Dr. Sherub	Ugyen Wangchuck Institute for Forest Research and Training	Bhutan

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HORNBILL RESEARCH FOUNDATION
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