

The Important Hornbill Landscape 2.0 in Peninsular Malaysia : Revised

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Abstract : Important Hornbill Landscapes (IHL) act as a long term investment to ensure a future with surviving and viable hornbill population(s) in Peninsular Malaysia. In 2017, the IHLs were first introduced to reflect the conservation and policy developments for this majestic bird species in Peninsular Malaysia. As a result, 17 IHLs (3.1 million ha) were identified (up from the previous 14 / ca. 2.5 million ha) within the eight States in Peninsular Malaysia, coined as ‘Hornbill States’. The threats plaguing hornbills and their forest habitats underscore similar issues to forest loss and degradation from good quality, intact, old-growth forests. Hornbill poaching is currently kept at hindsight, attributing to the intensive and extensive patrolling undertaken in safeguarding the forest landscapes, with stricter enforcement, and better intelligence combating wildlife trade although with few isolated cases compared previously. More worrisome is the resurgence of national interest in rare earth element (REE) mining, as this new emerging industry is seen as ‘new wealth’ which may impact biodiversity (including hornbill populations) in what remains today of the Malaysian forest landscapes.

Keywords: Conservation, hornbill, Important Hornbill Landscape, Permanent Reserved Forest

INTRODUCTION

The “Important Hornbill Landscape” (IHL) concept was first proposed by the Malaysian Nature Society (MNS) at the 7th International Hornbill Conference held in Kuching, Sarawak in May 2017. Later, the article presented from the conference was published in a Special Issue of the Sarawak Museum Journal for 2018. This concept drew attention to the need of conserving remaining key forest sites and habitats of the 10 hornbill species identified in its known distribution ranges, and in light of the declining populations observed in Southeast Asia. Of the 10 hornbill species found in Malaysia, eight are globally threatened (BirdLife International 2023).

The identification and selection of IHLs were determined by exemplifying four criteria (see Annex 1). This exercise drew extensive information gathered from published and unpublished/grey literature, and with web-based materials to construct a preliminary database about hornbill distributions and its ecological findings in Peninsular Malaysia. As a result, 14 IHLs were identified for Peninsular Malaysia (Yeap and Perumal 2018). The IHL has since been adopted by expanding a similar concept for Sabah and Sarawak (Teepol *et al.* 2021; Wong *et al.* in prep.). However, given that East Malaysia only supports eight hornbill species and with different forest-related policies, the IHL criteria were applied for the Borneo landscape.

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REMAINING FOREST IN PENINSULAR MALAYSIA FOR HORNBILLS

Permanent Reserved Forests (*Hutan Simpan Kekal*)¹, or colloquially referred as Forest Reserves, is important for the continued survival of hornbills in Peninsular Malaysia and to preserve viable populations. At the end of 2015, Forested Land (*Tanah Berhutan*) stood at 5.8 million ha or 44% of the total land area of Peninsular Malaysia (FDPM 2016). Forest Reserves constitute about 85% of the Forested Land, of which Pahang, Perak, Kelantan, Terengganu, Johor, Kedah, Selangor, and Negeri Sembilan, hold at least 150,000 ha/State, respectively. These States remain key ‘Hornbill States’ with a total of 4.9 million ha of Forest Reserves. However, it is important to note that Forest Plantations (*Ladang Hutan*) are included within Forest Reserves and hence this forms a part of the Forest Reserve statistics.

MNS has compiled the 2017 and 2021 forestry statistics and made a comparison to determine any loss or gain in Forest Reserve sizes in key ‘Hornbill States’. This indicated 2017 as the baseline inception year of the IHL. During this process, it was evident that the official forestry figures reported publicly by Federal or State Forestry Department Annual Reports were found to differ at times. Annex 2 explains the sources of data obtained, and how it was processed and interpreted. Nevertheless, the figures provided in Table 1 should be treated with caution and require confirmation from the Forestry Department Peninsular Malaysia or its respective State forestry agencies for accuracy.

Table 1. Comparison of Forest Reserve sizes (excluding Forest Plantations) between 2017 and 2021.

(a) As at 2017 (ha)

State	Inland Forest (1)*	Peat Swamp Forest (2)	Mangrove Forest (3)	Forest Plantation (4)	TOTAL (1-4)	(1)+(2)+(3)*
Kedah	296,909.00	0.00	6,201.00	3,936.00	307,046.00	303,110.00
Perak	942,175.25	0.00	41,983.15	5,361.00	989,519.40	984,158.40
Selangor	148,240.00	82,890.00	18,998.00	11,381.00	261,509.00	250,128.00
Negeri Sembilan	154,267.93	0.00	101.07	1,281.00	155,650.00	154,369.00
Kelantan	444,142.00	0.00	0.00	169,133.00	613,275.00	444,142.00
Terengganu	514,135.93	25,931.10	1,036.55	3,833.00	544,936.58	541,103.58
Pahang	1,311,780.33	140,829.97	2,415.96	104,904.75	1,559,931.01	1,455,026.26
Johor	269,903.41	3,796.04	18,198.21	40,851.58	332,749.24	291,897.66
	4,081,553.85	253,447.11	88,933.94	340,681.33	4,764,616.23	4,423,934.90

Note: *Excludes Forest Plantation

(b) As at 2021 (ha)

State	Inland Forest (1)*	Peat Swamp Forest (2)	Mangrove Forest (3)	Forest Plantation (4)	TOTAL (1-4)	(1)+(2)+(3)*
Kedah	296,021.00	0.00	6,201.00	4,824.00	307,046.00	302,222.00
Perak	939,591.64	0.00	41,185.37	6,037.00	986,814.01	980,777.01
Selangor	148,591.00	83,156.00	18,998.00	11,381.00	262,126.00	250,745.00
Negeri Sembilan	153,768.22	0.00	101.07	1,274.00	155,143.29	153,869.29
Kelantan	587,363.00	0.00	0.00	42,518.00	629,881.00	587,363.00
Terengganu	513,341.15	25,931.10	1,036.55	3,833.00	544,141.80	544,141.80
Pahang	1,468,691.26	97,731.93	1,823.47	28,776.00	1,597,022.66	1,568,246.66
Johor	312,298.21	3,796.04	18,198.21	26,382.00	360,674.46	334,292.46
	4,419,665.48	210,615.07	87,543.67	125,025.00	4,842,849.22	4,721,657.22

Note: *Excludes Forest Plantation

¹Terms used in the Annual Reports of the Forestry Department Peninsular Malaysia.

(c) Differences in Forest Reserve sizes (excluding Forest Plantations) between 2017 and 2021 in eight States

State	2015 (ha)**	2017 (ha)*	2021 (ha)*	Difference (ha) (2015 / 2021)
Kedah	332,393	303,110.00	302,222.00	-30,171
Perak	942,970	984,158.40	980,777.01	-37,807
Selangor	238,748	250,128.00	250,745.00	+11,997
N. Sembilan	152,650	154,369.00	153,869.29	+1,219
Kelantan	468,595	444,142.00	587,363.00	+118,768
Terengganu	541,050	541,103.58	544,141.80	+3,092
Pahang	1,469,925	1,455,026.26	1,568,246.66	+98,322
Johor	354,529	291,897.66	334,292.46	-20,237
TOTAL	4,500,670	4,423,934.90	4,721,657.22	

Note: *Excludes Forest Plantation / #FDPM (2016)

The Forestry Department Peninsular Malaysia categorises Forest Reserves into three forest types, i.e. Inland (*Hutan Darat*), Peat Swamp (*Hutan Paya Gambut*), and Mangrove Forests (*Hutan Paya Laut*). In the context of hornbill conservation, Inland and Peat Swamp Forests are primary habitats supporting diverse hornbill species. Mangrove Forests are generally less ideal for hornbills although the Oriental Pied Hornbills *Anthracoceros albirostris* utilise this habitat. Ecologically, they are known to be adaptable, with documentation of foraging for food and investigating nesting opportunities, even within urban settings with sufficient greenery (Teo 2022; Plowden *n.d.*; Poonswad *et al.* 2013).

In 2015, about 4.5 million ha of Forest Reserves remained in Peninsular Malaysia (FDPM 2016). This figure declined slightly to about 4.4 million ha in 2017 and increased to 4.7 million ha in 2021 (Table 1c). Of the eight States, three experienced some decline between 2017 and 2021. Within these figures, Inland Forests constitute 92% and 94% of the total size of the Forest Reserves in 2017 and 2021, respectively. There was a substantial loss of ca. 43,000 ha in the Peat Swamp Forests during this period, particularly in Pahang (Table 1a and 1b).

Even though the acreage of Forest Reserves remains above the 4 million ha today, it is difficult to ascertain the quality of forests, as Forest Reserves can be categorised as protection and/or production (i.e. timber extraction) forests. Almost all hornbill species thrive in intact and old-growth forests, hence it would be crucial to determine how much of these forest habitats of Hornbills remained viable within the Forest Reserves. Hornbills can survive in logged-over forests with varying stages of regeneration, its diversity in abundance is greatly dependent on the availability of food and nesting resources (Datta 1998; Johns 1987). The shrinking of Peat Swamp Forests in Pahang is concerning, as past surveys have identified this forest type to be a primary habitat and stronghold for the globally threatened Wrinkled Hornbill *Rhabdotorrhinus corrugatus* (Lim 2008; Peat Swamp Forest Project 2008).

RECENT POLICIES AND SPATIAL PLANNING DEVELOPMENTS IN PENINSULAR MALAYSIA IMPACTING HORNBILL CONSERVATION

Over the past five years (2018–2022), several new and revised spatial policies have been developed that are able to bear direct and indirect impacts towards hornbill conservation in Peninsular Malaysia. These policy developments are generally positive with the exception of a renewed interest in rare earth elements (REE) and mineral mining.

(1) Malaysian Forestry Policy 2020

The policy and the Peninsular Malaysian Forestry Policy (PMFP) 2020² were approved and adopted during the 78th National Land Council Meeting in January 2021. The latter also replaces the National Forestry Policy 1978 (Revised 1992). The implementation of PMFP is guided by nine core pillars with strong emphasis towards forest biodiversity conservation, sustainability of forest resources, Orang Asli engagement, and social well-being among others. These pillars are directly supportive of hornbill conservation.

(2) National Physical Plan (NPP) 4 (2020-2040)

The NPP is currently in its fourth iteration. Strategy 6 of the NPP4 calls for the “Preservation and Conservation of ecological assets” in its perceived development target to “return our forest coverage back to 50% by 2040 in Peninsular Malaysia. As of 2023, the forest coverage is estimated to be between 47–48%. The NPP is reviewed every five years in tandem with the formulation of Malaysia Plan. Retaining quality (intact) forest cover will undoubtedly preserve the key hornbill habitats and sites for their long-term survival.

(3) Central Forest Spine Master Plan for Ecological Linkages (PIRECFS) (2022-2040)

The Central Forest Spine was first launched in 2010 with the intention to maintain and/or reconnect forests anchored by four main complexes in Peninsular Malaysia. A total of 37 ‘ecological linkages’ were identified and categorised into Primary (PL) and Secondary Linkages (SL). The Master Plan was recently revised to reflect current on-the-ground conditions after reviewing the existing ecological linkages. The PIRECFS was given a nod during the 40th Meeting of the National Physical Planning Council in July 2022, thus replacing the previous plan. Thirty-nine ecological linkages were identified within the eight States (PLANMalaysia 2021). Many of the ecological linkages are linked to IHLs.

(4) Drafting of Royal Belum State Park Special Area Plan (SAP)

The preparation of the SAP is intended to provide management direction, policies, and actions for Royal Belum State Park in light of its status as a National Heritage Site under the National Heritage Act 2005 (Act 645). It also meets the criteria to be potentially listed as a UNESCO World Heritage Site (PLANMalaysia 2023). Many of the proposed management actions in the SAP relate to hornbill conservation in this protected area. The recognition of hornbills are featured as a keystone species and one of the Outstanding Universal Values (OUV) in this Royal Belum State Park UNESCO nomination.

(5) National Mineral Industry Transformation Framework 2021-2030

The surging global demand for renewable energy led to the heightened focus on REE and its availability within Malaysian soil. The Department of Mineral and Geoscience has identified 29 areas with mining potential in 10 States (FMT Reporters 2023). The framework was launched in 2021 with the intention to “*develop and streamline the sustainable management of the mineral industry to achieve economic growth....especially for strategic minerals*”. Therefore the exploration and potential mining within Forest Reserves, protected areas, and even environmentally-sensitive areas would undoubtedly jeopardise the integrity of these habitats. IHLs identified within eight of the 10 States could also be affected.

²Although ‘unified’, the Malaysian Forestry Policy 2020 is divided by three regions i.e. Peninsular Malaysia, Sarawak and Sabah catering to policy and legislation differences.

(6) Newly established authorities for protected areas and State protected area

Since the creation of State protected areas and their administrative agencies (i.e. Perak State Parks Corporation, Johor National Parks Corporation) in the 1990s and early 2000, other States have followed suit. The Forestry Department Peninsular Malaysia has also created more State Parks such as the Kenaboi State Park (Negeri Sembilan), Stong State Park (Kelantan) and Ayer Hitam Utara State Park (Johor).

In Pahang, the newly set-up Pahang State Parks Corporation is now responsible for four protected areas i.e. Tasik Chini, Rompin, Cameron Highlands, and Lubuk Yu. A newly established protected area in Pahang, i.e. Al-Sultan Abdullah Royal Tiger Reserve consists of Gunung Aais and parts of Tekai-Tembeling Forest Reserves (GTFAdmin 2023). In Terengganu, the Terengganu State Parks Management Council now manages the Kenyir and Setiu Wetlands State Parks, Pulau Tenggol and Pulau Nyireh. In the state of Perak, MNS is working with the Perak State Forestry Department to conserve the Sungai Halong area in Temenggor Forest Reserve within the Belum-Temenggor Forest Complex. Sungai Halong was the focal MNS scientific expedition area in 1993/1994 (Davison *et al.* 1995). Some of the newly gazetted protected areas/forests form a part of the IHLs.

IMPORTANT HORNBILL LANDSCAPES 2.0 – REVISED AND UPDATED

The availability of information especially towards hornbill distribution and the indicators of breeding are key considerations for revising and updating the Important Hornbill Landscapes (IHL) in Peninsular Malaysia. Biodiversity surveys in Forest Reserves organised by the Forestry Department Peninsular Malaysia provide information on hornbill presence (or absence) and distribution. At the same time, the expanding birdwatching community and bird photographers have highlighted the presence of various hornbills in different locations across the country via images and videos.

Based on new information and evidence, 17 IHLs have been identified for Peninsular Malaysia, up from 14 previously (Table 2). These revised IHLs cover about 3.1 million ha, or 24% of Peninsular Malaysia's land. The IHLs now covers about 54% of the 5.73 million ha of Forested Area (as of 2021) in Peninsular Malaysia.

Distribution of IHLs

Eight States continue to form the backbone of hornbill conservation in Peninsular Malaysia. Pahang dominates with five IHLs within its boundaries and shares two IHLs with adjacent States (IHL7 and IHL14). Terengganu and Perak have two IHLs each, while Kedah, Selangor, Negeri Sembilan, Johor, and Kelantan have one IHL each. Kedah and Perak also share one IHL. All the IHLs fulfil at least two Criteria. The majority of the IHLs (i.e. eight IHLs) fulfil three Criteria. Four IHLs fulfilled all the Criteria.

Sizes of the IHLs

The total size of 17 IHLs amounts to approximately 3.12 million ha. The largest IHL is Taman Negara National Park (IHL14 / 437,300 ha) and the smallest is the South-east Pahang Peat Swamp Forest (IHL11 / 87,045 ha). The average size for an IHL is about 184,000 ha (n=17). Administratively, the Bintang Range Forest Complex (IHL02) is made up of 12 Forest Reserves in both Kedah and Perak State. The Greater Berembun-Angsi Forest Complex (IHL06) is similar but it is located entirely within a single State. The Selangor State Park (IHL05 / 108,740 ha) has the most administrative forest blocks in an IHL – 18 Forest Reserves in total.

IHLs and the Central Forest Spine (PIRECFS)

Over 70% (12) of IHLs are linked to either a Primary (PL) or Secondary Linkage (SL) (Table 3). Only five IHLs are not included - Korbu-Piah Forest Complex (IHL04), Greater Endau-Rompin Forest Complex (IHL07), Fraser's Hill Forest Complex (IHL09), Tekai Tembeling-Gunung Aais Forest Complex (IHL12) and Taman Negara National Park (IHL14). Most of the IHLs are currently recognized as Important Bird and Biodiversity Areas (IBA) globally. Six are provisional IBAs (i.e. being evaluated).

Exceptions to the IHL 2.0

The revised 17 IHLs represent the best sites to retain long-term viable hornbill populations in Peninsular Malaysia. However, there are also a few sites that could not fulfil the IHL selection criteria, nevertheless it supports important populations. The Perlis State Park is only about 5,000 ha in size but supports a considerable six hornbill species (Gregory-Smith 1995). More importantly, it is contiguous with Thale Ban National Park (Thailand / 19,600 ha) creating a transboundary forest complex of about 25,000 ha. No hornbill nests have been reported in Perlis State Park to date. This protected area is still an important site for hornbills for the northern region of Peninsular Malaysia despite falling short of the Criteria.

The Langkawi archipelago is also an important site for hornbills, primarily the Great Hornbills *Buceros bicornis*. It is one of the two islands in Peninsular Malaysia that supports hornbill populations. The Great Hornbill is the dominant hornbill species of the archipelago where large groups have been recorded roaming (Hasdi Hassan and Siti Hawa Yatim 2003; Yeap *et al.* 2006) and nesting in Forest Reserves. They have also been observed to traverse island to island in the archipelago, likely in search of food.

Pulau Pangkor supports two hornbill species i.e. the Great and Oriental Pied (Rahmah Ilias and Hamdon Tak 2009-2010). Although the Forest Reserves on the island are small (<1,000 ha each) individually, there is a patchwork of Forest Reserves on the mainland (e.g. Teluk Muroh, Teluk Kopiah, Tanjung Hantu, Segari Melintang). The island and mainland are separated by a narrow channel of about 3-5 km distance. Three Great Hornbills were documented feeding on figs (*Ficus* sp.) in the Teluk Muroh Forest Reserve in January 2014 (Nur Atiqah and Ahmad Tarmizi 2014). After this encounter, they were not seen again in the following months. This observation pointed to a strong possibility that they are utilising a network of Forest Reserves on the island and mainland. Small, but fragmented Forest Reserves can still retain some value to hornbills provided that their food and nesting resources are present and the travel distance between sites is not too far apart.

Table 2. The Important Hornbill Landscapes (IHL) 2.0 in Peninsular Malaysia.

IHL CODE	STATE	FOREST COMPLEX	SITE COMPOSITION (FR=Forest Reserve / WR= Wildlife Reserve)	IHL SIZE (approx. ha)	NUMBER OF ADMINISTRATIVE FOREST BLOCK(S)
IHL01	Kedah	Greater Ulu Muda Forest Complex	Ulu Muda (Tengah) FR, Ulu Muda (Selatan) FR, Ulu Muda Tambahan FR, Pedu FR, Chebar Besar FR, Padang Terap FR, Bukit Keramat FR, Bukit Saiong FR	162,600	8
IHL02	Kedah / Perak	Bintang Range Forest Complex	Gunung Inas FR (Kedah) / Bintang Hijau FR (Hulu Perak), Bintang Hijau FR (Kuala Kangsar), Bintang Hijau (Larut Matang), Bubu FR (Kuala Kangsar), Bubu FR (Larut Matang), Bukit Larut FR (Kuala Kangsar), Bukit Larut FR (Larut Matang), Kenderong FR, Belukar Semang FR, Padang Chong FR, Sungai Kuak FR	221,000	12
IHL03	Perak	Belum-Temenggor Forest Complex	Royal Belum State Park, Temenggor FR, Gerik FR, Amanjaya FR, Banding FR	339,100	5
IHL04	Perak	Korbu-Piah Forest Complex	Korbu FR, Piah FR	164,100	2
IHL05	Selangor	Selangor State Park	Ampang FR, Ampang Pecah FR, Bukit Kutu FR, Batang Kali FR, Gading FR, Hulu Langat FR, Hulu Selangor FR, Kanching FR, Semangko FR, Serendah FR, Sungai Lalang FR, Templer FR, Ulu Gombak FR, Ulu Gombak Tambahan (Klang Gates) FR, Ulu Gombak Tambahan I (Kuartz Ridge) FR, Semangko Tambahan FR, Sungai Lalang (Tambahan) FR, Ulu Gombak Tambahan III FR	108,740	18
IHL06	Negeri Sembilan	Greater Berembun-Angsi Forest Complex	Kenaboi FR, Gapau FR, Lenggeng FR, Setul FR, Triang FR, Serting FR, Berembun FR, Pelangai FR, Angsi FR, Senaling Inas FR, Johol FR, Gunung Tampin FR	133,700	12

IHL07	Johor/Pahang	Greater Endau-Rompin Forest Complex	Pahang: Taman Negeri Rompin, Lesong FR, Endau FR, Sungai Pukin FR / Johor: Endau-Rompin National Park, Labis FR, Labis Tambahan FR, Sungai Segamat FR	224,050	8
IHL08	Johor	Greater Ulu Sedili Forest Complex	Panti FR, Lenggur FR, Ulu Sedili FR, Ulu Sedili Tambahan FR, Kluang FR	117,670	5
IHL09	Pahang	Fraser's Hill Forest Complex	Batu Talam FR, Sungai Sia FR, Rotan Tunggal FR, Rotan Tunggal (Tambahan) FR, Sempam FR, Teranum FR	82,895	6
IHL10	Pahang	Greater Krau Forest Complex	Tengku Hassanah WR*, Gunung Benom FR, Lakum FR (Temerloh), Lakum Tambahan FR (Bentong), Krau FR, Krau Tambahan FR, Jerantut Tambahan FR	124,000	7
IHL11	Pahang	South-east Pahang Peat Swamp Forest	Pekan FR, Pekan Tambahan FR, Nenasi FR, Nenasi Tambahan FR, Kedondong FR, Resak, Resak Tambahan FR	87,045	7
IHL12	Pahang	Tekai Tembeling-Gunung Aais Forest Complex	Tekai Tembeling FR, Tekai Tembeling (Tambahan) FR, Gunung Aais FR, Gunung Aais (Tambahan) FR	230,730	4
IHL13	Pahang	Ulu Jelai Forest Complex	Ulu Jelai FR, Ulu Jelai (Tambahan) FR, Sungai Yu FR, Persit FR	218,320	4
IHL14	Pahang / Kelantan / Terengganu	Taman Negara National Park	Taman Negara Pahang, Taman Negara Terengganu, Taman Negara Kelantan	437,300	3
IHL15	Terengganu	Dungun Forest Complex	Sungai Nipah FR, Jengai FR, Pasir Raja Selatan FR, Besul FR, Besul Tambahan FR, Jerangau FR, Pasir Raja Barat FR	149,410	7
IHL16	Terengganu	Tembat-Hulu Terengganu Forest Complex	Hulu Terengganu Tambahan FR, Hulu Terengganu FR, Tembat FR**	164,580	3
IHL17	Kelantan	Greater Stong Forest Complex	Gunung Basor FR, Balah FR, Gunung Stong Utara FR, Stong State Park, Gunung Stong Selatan FR	157,750	5
TOTAL SIZE				3,122,990	116

Notes: *Formerly known as Krau Wildlife Reserve.
**30,000 ha of this Forest Reserve was gazette as the Kenyir State Park.

Table 3. Important Hornbill Landscapes 2.0 and their score against the selection criteria.

IHL CODE	STATE	FOREST COMPLEX	IBA (2007 / In prep.)	PIRECFS (2022)	IHL C1	IHL C2	IHL C3	IHL C4
IHL01	Kedah	Greater Ulu Muda Forest Complex	Yes	K-SL1	X	X	X	X
IHL02	Kedah/Perak	Bintang Range Forest Complex	Yes	K-PL1	X		X	X
IHL03	Perak	Belum-Temenggor Forest Complex	Yes	A-PL1	X	X	X	X
IHL04	Perak	Korbu-Piah Forest Complex	Provisional		X		X	X
IHL05	Selangor	Selangor State Park	Yes	B-SL2	X	X	X	X
IHL06	Negeri Sembilan	Greater Berembun-Angsi Forest Complex	Provisional	N-SL3	X		X	X
IHL07	Johor/Pahang	Greater Endau-Rompin Forest Complex	Yes		X		X	X
IHL08	Johor	Greater Ulu Sedili Forest Complex	Yes	J-PL2	X	X	X	X
IHL09	Pahang	Fraser's Hill Forest Complex	Yes		X	X	X	X
IHL10	Pahang	Greater Krau Forest Complex	Yes	C-SL1	X	X	X	X
IHL11	Pahang	South-east Pahang Peat Swamp Forest	Yes	C-PL5	X		X	X
IHL12	Pahang	Tekai Tembeling-Gunung Aais Forest Complex	Provisional		X		X	X
IHL13	Pahang	Ulu Jelai Forest Complex	No	C-PL1	X		X	X
IHL14	Pahang / Kelantan / Terengganu	Taman Negara National Park	Yes		X	X	X	X
IHL15	Terengganu	Dungun Forest Complex	Provisional	T-SL1	X		X	X
IHL16	Terengganu	Tembat-Hulu Terengganu Forest Complex	Provisional	T-PL1	X	X	X	X
IHL17	Kelantan	Greater Stong Forest Complex	Provisional	D-SL1	X		X	X

Abbreviation: IBA (Important Bird and Biodiversity Area) / PIRECFS (Central Forest Spine Master Plan for Ecological Linkages)
 Note: Provisional IBAs are currently sites that have been identified as candidate IBAs for evaluation and adoption in the review of Malaysian IBAs currently conducted by MNS.

A FUTURE FOR HORNBILLS IN PENINSULAR MALAYSIA

Hornbills are one of our rainforest's most iconic birds and all 10 species in the country can be found within Peninsular Malaysia. Every large protected areas gazetted under the Federal or State legislation i.e. Royal Belum State Park, Taman Negara National Park, Endau-Rompin National Park are considered as a part of the IHL network. The remaining Forest Reserves, especially Inland and Peat Swamp Forests within it, are an inseparable feature in strengthening the future of hornbills survival in Peninsular Malaysia. However, the integrity, quality, and interconnectivity of these forests and IHLs at large will determine the viability of the hornbill populations (Datta 1998; Häkkinä *et al.* 2018; Sitompul *et al.* 2004). The presence of hornbills within a forest landscape is not an indicator that they are breeding in the forest unless suitable trees hollowed for nests are present or juvenile(s) sighted. Breeding birds are indicative of the habitat quality in which they are found (Powell and Powell 1986). Confirmation of breeding hornbills is still inadequately identified in most of the eight key 'Hornbill States'. More on-the-ground conservation actions are necessary to address the knowledge gaps and more assistance required in managing the IHLs at the landscape- or *in-situ* level.

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Annex 1. The Selection Criteria of the Important Hornbill Landscapes (IHL).

DEFINITION: An Important Hornbill Landscape (IHL) is “an area of at least 50,000 ha and above which exists as a single block or collectively as a forest complex that supports at least six breeding hornbill species within it.”

CRITERION 1. The area supports at least six (6) hornbill species within its landscape.

CRITERION 2. The hornbills in the area are known to breed either by direct (e.g. nest tree) and/or indirect evidence(s) (e.g. sighting of resident juveniles with and/or without parent birds).

CRITERION 3. The area should be as large as possible (at least 50,000 ha) either as a single block or made up of a cluster of blocks (forest complex).

CRITERION 4. The area identified supports and assists in the implementation of national conservation policies, especially the Central Forest Spine Master Plan.

Annex 2. Sources of forestry data and how it was interpreted in Table 1.

Data on forestry in Peninsular Malaysia were obtained from several online sources available to the public. Annual Reports produced by the Forestry Department Peninsular Malaysia (in Kuala Lumpur headquarters) or respective State Forestry Departments were the primary reference. We prioritised using the latter for better accuracy of State-related forestry data. However, not all State Forestry Departments upload their Annual Reports on their websites. Additionally, forestry figures in State and Federal Annual Reports at times do not tally or were dissimilar for a particular year of reporting. Where information was lacking, we referenced the SIRIM QAS’ public summaries on State forest management units (<https://www.sirim-qas.com.my/our-services/sustainability/forest-management-chain-of-custody>).

For Permanent Reserved Forest figures in Annual Reports, Forest Plantations are included within. Monoculture Forest Plantations³ generally have low bird diversity and seldom support hornbill species, if any (Mitra and Sheldon 1993; Abdul Kadir *et al.* 2018). If or when hornbills are present, it is likely that they are using this landscape as part of their foraging grounds especially when the Forest Plantations are adjacent to forests proper. No hornbills have been found or reported nesting in Forest Plantations to date. Hence, we deducted Forest Plantation figures from the Permanent Reserved Forest’s Inland Forest figures.

³The Forestry Department Peninsular Malaysia lists down eight tree species for Forest Plantations - *Acacia mangium*, *Azadirachta excelsa*, *Hevea brasiliensis*, *Khaya ivorensis*, *Neolamarckia cadamba*, *Octomeles sumatrana*, *Paraserianthes falcataria* and *Tectina grandis*. <https://www.forestry.gov.my/my/spesies-ladang>

STATE	REFERENCES
Kedah	<p>SIRIM QAS Kedah Forest Management Unit 2nd Surveillance (3rd Cycle)</p> <p>SIRIM QAS Kedah Forest Management Unit Recertification Assessment (3rd Cycle)</p>
Perak	<p>Perak State Forestry Department 2018 Annual Report</p> <p>Perak State Forestry Department 2021 Annual Report</p> <p>Forestry Department Peninsular Malaysia 2021 Annual Report</p>
Selangor	<p>SIRIM QAS Selangor Forest Management Unit 1st Surveillance (3rd Cycle)</p> <p>SIRIM QAS Selangor Forest Management Unit 3rd Surveillance (4th Cycle)</p>
Negeri Sembilan	<p>Negeri Sembilan State Forestry Department 2017 Annual Report</p> <p>Forestry Department Peninsular Malaysia 2018 Annual Report</p> <p>Negeri Sembilan Forestry Department 2021 Annual Report</p> <p>Forestry Department Peninsular Malaysia 2021 Annual Report</p>
Kelantan	<p>Forestry Department Peninsular Malaysia 2017 Annual Report</p> <p>Forestry Department Peninsular Malaysia 2021 Annual Report</p>
Terengganu	<p>SIRIM QAS Terengganu Forest Management Unit 1st Surveillance</p> <p>SIRIM QAS Terengganu Forest Management Unit 3rd Surveillance (4th Cycle)</p>
Pahang	<p>Pahang State Forestry Department 2017 Annual Report</p> <p>Pahang State Forestry Department 2022 Annual Report</p>
Johor	<p>Johor State Forestry Department 2017 Annual Report</p> <p>Johor State Forestry Department 2020 Annual Report</p> <p>Forestry Department Peninsular Malaysia 2021 Annual Report</p>