POPULATION, ECOLOGY AND CONSERVATION OF BORNEAN ELEPHANTS IN SABAH, MALAYSIA

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INSTITUTE FOR TROPICAL BIOLOGY AND CONSERVATION
UNIVERSITI MALAYSIA SABAH
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THESIS SUBMITTED IN FULFILLMENT FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

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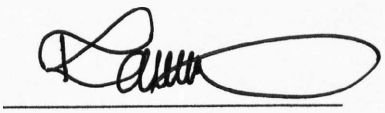

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CERTIFICATION

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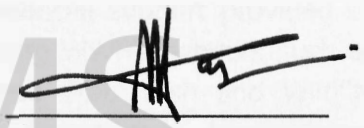

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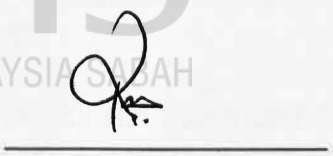

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Raymond Alfred @ Jenry

ABSTRACT

Today, the loss of habitat has been one of the major causes of the decline in the Asian elephant population in Asia. In order to develop a conservation strategy for the Bornean elephant, it is important to know the ecology, habitat need and status of the elephant population size in the forest in Sabah. This study is the first ever effort to study the overall population and ecology of Bornean Elephants in Sabah. Five adult female elephants were immobilized and their neck collars were fitted with tracking devices. The sizes of their home range and movement patterns were determined using location data gathered from a satellite tracking system and were analyzed by using the Minimum Convex Polygon and Harmonic Mean methods. The home range size for a period of one year in a non-fragmented forest was estimated to be 150 km^2 to 200 km^2 and in a fragmented forest was 256 km^2. The ranging behavior for the elephants was influenced by the size of the natural forest habitat and the availability of permanent water sources. 140 food plants species taken by elephants were recorded through direct observation. Five main food plants for Bornean elephants includes (i) Palmae, (ii) Moraceae, (iii) Euphorbiaceae, (iv) Leguminoceae, and (v) Graminaeae. Out of 140 plants and trees species consumed by the elephant, at least 35% is affected by silviculture activities while 14.3% of the trees are categorized as a commercial tree. Therefore, at least 49.3 % from 140 plants and trees species could be affected by the forestry activities such as harvesting and silviculture activities. it is suggested that the Borneon elephants in the rainforests are classified as both, browsers and grazers. The diversity of food plants is lower in primary forest and poor forest (treeless habitat), and is higher in forest less degraded and moderate forest. Although Sabah still has a continuous forest landscape in the central part of the state, not all of the area is suitable elephant habitat. This study provides a systematic approach for identification of key habitat for large mammals in a large area. The survey indicates that approximately 2,040 (95% CI: 1,184-3,652) elephants remain in the five main ranges in Sabah, with the largest population being in the unprotected central forests. Elephant density was highest in ranges where habitat has been removed and elephants are concentrated in remaining forest areas. These ecological and population data provide new baseline data to support the implementation of Bornean elephant conservation programme in Sabah.

ABSTRAK

PENDUDUK, EKOLOGI DAN PEMULIHARAAN GAJAH BORNEO DI SABAH, MALAYSIA

Hari ini, kehilangan hutan habitat adalah salah satu faktor yang menyebabkan populasi gajah di Asia berkurang. Untuk menyediakan plan strategi pemuliharaan dan pengurusan habitat untuk Gajah Borneo, adalah menjadi satu keperluan yang penting untuk mengetahui status ekologi, keperluan habitat dan populasi Gajah di Sabah. Penyelidikan ini ada usaha penyelidikan yang pertama untuk mengkaji populasi menyeluruh dan ekologi gajah-gajah Borneo di Sabah. Lima gajah betina telah ditangkap dan dilengkapi dengan alat kolar satelit. Saiz pengunaan habitat dan juga corak pergerakan gajah telah diselidik dengan menggunakan data-data lokasi yang diperolehi daripada sistem penjejakan data satelit. Data-data ini diproses dan dianalisa dengan menggunakan perisian sistem informasi geografi dengan menggunakan kaedah "Minimum Convex Polygon" dan juga "Harmonic Mean". Pengunaan habitat oleh gajah di kawasan hutan luas telah dikenalpasti iaitu dengan keluasan 150 km^2 ke 200 km^2 dan dalam kawasan habitat yang kecil dan terhad, saiz penggunaan habitat oleh gajah adalah 256 km^2. Sejumlah 140 spesis jenis pokok atau vegetasi makanan yang telah dikenalpasti, dan lima jenis makan gajah yang utama, terdiri daripada (i) Palmae, (ii) Moraceae, (iii) Euphorbiaceae, (iv) Leguminoceae, and (v) Graminaeae. Dalam 140 jenis spesis pokok dan vegetasi, 35 peratus daripada jumlah spesis pokok, terlibat dalam proses activiti silvikultur perhutanan dan 14.3% daripada jumlah species pokok, mempunyai nilai-nilai kormersial. Gajah borneo juga telah dikenalpasti sebagai "browsers" dan "grazers". Kepelbagaian spesis makanan gajah di hutan yang tidak diganggu dan juga kawasan hutan tidak berpokok adalah kurang berbanding dengan kawasan hutan yang dibalak secara mampan. Walaupun Sabah masih mempunyai hutan yang luas tetapi kawasan hutan yang sesuai untuk gajah adalah terhad dan tertumpu kepada tanah-tanah hutan yang rendah, di mana sumber air yang banyak dan senang didapati. Jumlah populasi gajah yang dikenalpasti melalui kerja-kerja penyelidikan yang sistematik ini, adalah 2,040 (95% CI: 1,184-3,652). Jumlah populasi gajah ini adalah berdasarkan kerja-kerja penyelidikan di lima kawasan habitat gajah di Sabah. Data-data ekologi dan populasi gajah yang diperolehi daripada penyelidikan ini sangat penting sebagai data baseline dan panduan dalam menjalankan program konservasi gajah di Sabah pada masa akan datang

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ABBREVATIONS

3D	Three Dimensional
AHP	Analytical Hierarchy Process
AIC	Akaike's Information Criterion
AREAS	Asian Rhinoceros and Elephant Action Strategy
CI	Confident Interval
CITES	Convention of International Trade in Endangered Species
CR	Consistency Ratio
CV	Consistency Vector
DF	Dipterocarp Forest
DNA	Deoxyribonucleic Acid
DVCA	Danum Valley Conservation Area
EMRs	Elephant Managed Ranges
ESW	Effective Strip Width
FR	Forest Reserves
FMUs	Forest Management Units
FSC	Forest Stewardship Council
FSF	Freshwater Swamp Forest
g	Gram
GIS	Geographical Information Systems
GPS	Global Positioning Systems
Ha	Hectare
HCVF	High Conservation Value Forest
HF	Heath Forest
HIS	Habitat Index Suitability
HM	Harmonic Mean
ITP	Industrial Tree Plantation
IUCN	International Union for Conservation of Nature
Km	Kilometre
Km^2	Kilometre Square
LDF	Lower Dipterocarp Forest