A STATE WIDE SURVEY TO DETERMINE THE TRUE DENSITYOF THE SUMATRAN RHINOCEROS
- a project outline submitted to the Sabah Wildlife Department.

[1992]

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ABSTRACT

A state-wide survey to determine the distribution and density of the Sumatran rhinoceros (*Dicerorhinus sumatrensis*), is proposed. While emphasis is on the Sumatran rhinoceros, data will also be gathered for two other large herbivores in Sabah: the Asian elephant (*Elephas maximus*) and Banteng (*Bos javanicus*). The project aims to provide data on the true status of the large herbivores. The results of this project will assist in the proposal of new protected areas, and provide a baseline for long-term monitoring of these species in Sabah.

INTRODUCTION

There is a general agreement among conservationists worldwide of the need to conserve large herbivores. Large herbivores need large areas to fulfil their ecological and biological needs. It is realised that by ensuring the long-term survival of these species and their habitats, would also ensure the long-term survival of other wildlife species inhabiting those habitats. Yet, there has been little work done on trying to obtain their numbers in the wild and finding out what their habitat requirements are. True densities, not guesstimates, are a prerequisite to a species conservation management plan. This need is recognised by the Sabah Wildlife Department as a high priority in their effort to ensure the long-term survival of wild fauna in the state.

It is difficult to conserve Sabah's large herbivores particularly the highly endangered Sumatran rhinoceros because of their low population densities, large ranges, unique habitat needs, crop destruction tendencies, and their value to poachers. Large herbivores are highly vulnerable, more than carnivores, mainly due to their size and activity. Also, these animals or parts of them, fetch a high market price. One of the main problems in the conservation of these large herbivores is conserving the geographical extent as well as the quality of wildlife habitat of these ranges. Their conservation, however, is crucial because large herbivores directly or indirectly affect forest structure, regeneration, and consequently other animal species. Furthermore, these large herbivores are rapidly becoming confined to a few dwindling patches in eastern Sabah (Mohd. Khan, 1989; Santiapillai & Jackson, 1990).

Protection and management of the Sumatran rhinoceros, the Asian elephant and banteng in the wild cannot be addressed until

there is better data on the presence, distribution and densities of these large herbivores in the remaining forest blocks of Sabah. A knowledge of the densities and ranges of these large herbivores in Sabah is to be used as a basis for understanding habitat requirements, an essential step towards a long-term conservation of the species. A species conservation management plan for each of the three species is then to be used to bring about conservation actions that are effective.

BACKGROUND INFORMATION

The true densities of these large herbivores for the entire State, however, are still unknown. Faunal surveys (Davies & Payne, 1982; Ambu, 1990) and surveys carried out for the Sumatran rhinoceros (Ahmad Darus, 1987; Payne, 1990a & b; Abd. Hamid Ahmad, 1991; Jomitin, 1991; Rabinowitz, 1992), and for the Asian elephant (Dawson, 1992), have provided much information on signs and distribution of these large herbivores. Species density estimates, however, are available for only a few areas within the state. Thus, in reality, we are still uncertain of the true status of these species. Before formulating management policies for these species, it is of utmost urgency to determine the true densities and distribution of these extinction-prone species. The density of an animal population is also a useful parameter for comparison with other areas within the state, and in other parts of Borneo where they are found.

In Sabah, the Sumatran rhinoceros, the Asian elephant and banteng are totally protected species under the Fauna Conservation Ordinance, 1963 and its amendments. At present, Tabin Wildlife Reserve and the Danum Valley Conservation Area are the only two protected areas that are known to contain populations of the Sumatran rhinoceros that might be viable in the long term (Payne, 1990a). Banteng populations are afforded some protection in Tabin Wildlife Reserve and Kulamba Wildlife Reserve (WWF Malaysia, 1986; Ambu, 1990). For the Asian elephant, the only protected area with a sizable population is Tabin Wildlife Reserve (WWF Malaysia, 1986; Dawson, 1992). It would, however, be a grave error to assume that these species will be safe in these reserves. Information regarding their true densities and distribution is needed to be able to bring about an effective management plan. More surveys are needed to identify the whereabouts of other populations, and in turn identify new areas to be proposed as totally protected areas.

PROJECT DESCRIPTION

Primary Objectives

i. To survey intensively and extensively the presence, density, and distribution of the Sumatran rhinoceros, the Asian elephant and banteng in Sabah.

ii. To provide a species conservation management plan for each of the three large herbivores of Sabah.

iii. To identify areas having viable populations of any of the species for the purpose of proposing new protected areas, and revise existing management plans for areas that are already protected.

iv. To provide baseline information whereby monitoring of Sabah's large herbivores can be conducted by the Sabah Wildlife Department, including a monitoring system for the seasonal abundance and distribution of these large herbivores in key areas.

Secondary Objectives

i. To gather general information on wildlife in areas surveyed.

ii. To gather basic ecological and behavioural information on Sabah's three large herbivores.

Training

i. Once the study has been set up and well underway, regular workshops will be held for the Sabah Wildlife Department's staff, at both the junior and senior levels. Workshops can be held on the average once in three months. Besides learning techniques of survey, findings of survey will also be reported and discussed. These workshops will discuss the proposal of new protected areas, and review existing management plans for areas that are already protected. Also, once key areas have been identified, a monitoring system will be planned during these workshops.

ii. Field training will be provided, if requested, to the staff of Sabah Wildlife Department. Schedule for training will be worked out with the department's senior officials. It is recommended that two rangers at a time be attached to the project every two months.

iii. Field training will also be extended to students of local universities, and field staff of the Sabah Parks, Sabah Foundation and WWF (Malaysia). Requests for training, however, would be subjected to the Sabah Wildlife Department's approval

vast area of several contiguous forest reserves, and the Tabin Wildlife Reserve. Surveys will then be extended to other areas in the southeastern, northeastern and southwestern regions, and in the interior (Davies & Payne, 1982; Marsh, 1988; Payne, 1990a, b & c; Rabinowitz, 1992).

Census techniques employed to determine densities will be different for the Sumatran rhinoceros than that for the Asian elephant and banteng. Both techniques will, however, use indirect signs to determine population densities. Use of indirect evidence is favoured and found to be more practical when assessing densities of elusive animals in dense tropical rainforest habitats. Counting indirect evidence gives indices of population abundance useful to management (Wiles, 1980; Sale *et al.* 1990; Rodgers, 1991; Srikosamatara, in press).

Surveying for the Sumatran rhinoceros will involve the thorough patrolling of existing animal trails in forested areas for indirect evidence such as dung, spoor, wallows and feeding signs. Using the animal trails is most likely the best way to cover a sufficiently large area (Borner, 1979; Ammann, 1985; van Strien, 1986; Rabinowitz, 1992). Trails used will be mapped. Tracks encountered will be measured and plaster casts of the tracks will be made. A reference collection of the plaster casts will be maintained. Attempts will also be made to identify and age individual rhinos from the track measurements, particularly of the front toe (van Strien, 1986; Rabinowitz, 1992). The direction of the tracks will be recorded and mapped. Attempts will be made to follow the tracks so as to gain insight into the behaviour and ecology of the Sumatran rhinoceros (Borner, 1979; Ammann, 1985; van Strien, 1986; Ahmad, 1987; Abd. Hamid, 1991).

The density of Sumatran rhinoceros will be calculated from the number of individuals that can be identified from tracks found during a survey. This can be regarded as a count of the minimum number of animals that are present in the area during the time of survey. To estimate the minimum number of rhinos present in the area surveyed, differences in size of the prints and minimum distances between individuals with identical prints will be used (Ammann, 1985; van Strien, 1986).

Surveys for the Asian elephant and banteng will employ the line transect sampling method (Burnham *et al.* 1980). Line transects will run along a predetermined compass bearing oriented perpendicular to skidder roads, major animal trails, rivers and streams, and will cover different forest habitats. Dung piles observed during the survey will be identified, aged and perpendicular distance to the transect will be measured. Tracks observed will be measured, identified and compiled into a database.

Densities of the Asian elephant and banteng will be determined from the dung density estimation, while taking dung defecation rate and dung decomposition rate into consideration (Rodgers, 1991; Dawson, 1992). Calculation of dung density will

be done by Fourier Series Analysis using perpendicular distances (Burnham et al. 1980; Brockelman & Ali, 1987; Buckland *et al.*, 1993). For the Asian elephant, dung density once known, is correlated to the elephant density using dung correction factors for the daily rate of deposition and decay. Thus, the equation:

$$E = \frac{DxR}{d}$$

where E = elephant density; D = dung density; R = rate of decay; d = rate of defecation (Dawson, 1992). Similarly, banteng density will be calculated using the above equation.

Dung decomposition rate will be determined when a number of samples with known dates of deposition are monitored on a weekly basis, from day 1 until they completely disappear. Each sample will be numbered and marked with a wooden stake for easy location and identification in subsequent weeks. It is also ranked into one of the five decay "stages", which is characterised by the physical appearance of a dung pile, rather than age (Dawson, 1990). The dung decay stages of banteng will be categorised differently (Wiles, 1980; Srikosamatara, in press). At subsequent inspections the samples will be re-categorised if they have changed, and monitoring will be continued until they have reach the final decay stage when they are deemed to have disappeared. To study the rate of dung decomposition, dung piles will be chosen from a variety of habitats throughout the data collection period to cover all seasons.

During these surveys, general information on the presence, relative abundance and distribution of other wildlife will also be gathered. Information will be gathered through interviews and by direct observation, and through indirect evidences such as vocalisations, dung, spoor, scrapes and feeding signs. A checklist will be prepared for every area surveyed. Ecological and behavioural aspects of the species, particularly the Sumatran rhinoceros, will also be gathered by studying signs made by the species (Borner, 1979; Ammann, 1985; van Strien, 1986; Ahmad, 1987; Abd. Hamid, 1991).

Soil, water and plant samples will be collected from salt licks, wallows and watering holes; and will be analysed for mineral contents and the presence of other trace elements. Samples taken from food plants (identified by feeding traces characteristic to each species) will be identified and analysed for crude protein, mineral contents and for other trace elements. This will be useful in understanding feeding ecology and the distribution of large herbivores in relation to mineral requirements, particularly for the Sumatran rhinoceros (Borner, 1979; van Strien, 1986).

Throughout the data collection period, remote photography will be done by setting up camera traps near wallows, mineral licks and major animal trails. Attempts will be made to identify and age/sex individual animals from the photographs taken. If attempts are successful, then this can form the basis

of "mark-recapture" technique for these species by using remote photography. The least a photograph could tell is the health of the animals, estimated from their general physical appearance. (A.R. Rabinowitz & U. Karranth, pers. comm.).

OUTPUTS

i. A report on the density and distribution of Sabah's three large herbivores.

ii. A species conservation management plan for each of the three large herbivores.

iii. A baseline information for long-term monitoring program for the abundance and distribution of each of the three large herbivores.

iv. A proposal to protect area/areas having viable populations of the large herbivores.

v. Scientific and popular publications in local and international journals.

POST-PROJECT FOLLOW-UP

1. The results obtained by the study will provide baseline data on population size and distribution. Using this information, annual and seasonal censuses should be carried out by the Wildlife Department to monitor population trends.

2. The results will serve as a foundation stone for future in-depth ecological studies on any one of the three species of large herbivores in Sabah.

3. The results can be used in studies investigating the influence of logging, oil palm and cocoa plantations on the ecology of large wide-ranging mammals.

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and principal investigator's work schedule.

Local Collaboration

i. Since this project will fulfil one of the Sabah Wildlife Department's priorities for large herbivore density estimation and species conservation management plan, collaboration in the form of logistical support was indicated (M. Andau, pers. comm.).

ii. A request will be made to the department to allow a wildlife ranger to be attached to the project throughout the study. The ranger concerned, is a Mr. Richard Jaikim. The principal investigator has had the pleasure of training Mr. Richard Jaikim during a conservation research project on proboscis monkeys in the Lower Kinabatangan.

ii. This study will possibly involve collaboration with a phytochemist from the National University of Malaysia (Sabah Campus) who will analyse plant samples for crude proteins and mineral contents.

v. This study will also involve collaboration with the Department of Soils and Hydrology to help analyse soil and water samples for trace elements and mineral contents.

METHODS

Captive animals will be observed for physical characteristics, which may aid in distinguishing different individuals (Hoogerwerf, 1970; Lekagul & McNeely, 1977; Medway, 1978). For example, individual elephants can be identified by cuts, holes and degree of folding in their ears; and in males, by the size and shape of their tusks. (Douglas-Hamilton & Douglas-Hamilton, 1975, in Sukumar, 1989). A list of distinguishing characters will be made for each of the three species. This list will serve as a reference for identifying photographs of different individuals in the wild (from remote photography). Photographs of all age/sex classes of captive large herbivores will be taken. They will be used as an aid to age and sex wild large herbivores.

Intensive and extensive state-wide ground surveys and interviews will be conducted to determine the presence, abundance and distribution of Sabah's three large herbivores. Interviews will be conducted in villages, and plantations and logging camps situated in and around forested areas. Pressures on forests and wildlife in different areas will also be recorded.

Surveys will initially concentrate in high priority areas, areas that are most likely to contain viable populations of large herbivores. Such areas include the Ulu Segama-Kuamut area, a

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