

Grazing Habitat of the Rusa Deer (*Cervus timorensis*) in the Upland Kebar, Manokwari

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ABSTRACT

The general objective of the study was to provide current information on grassland communities as deer habitat and its future development plan for a sustainable forage management in upland Kebar, Papua. Quantitative estimation of forage production was carried out by measuring a biomass harvest in fresh weight bases, while occasional observations on ranging deer were done within habitat range with the aid of 7x50 binoculars verified by actual visitation of grazed area. The study indicated Kebar, as the only grazing area of deer varies in low layer vegetation composition that comprised of eleven grass species and five legume species. *Imperata cylindrica*, *Paspalum conjugatum*, *Themeda arguens*, *Melinis minutiflora* and *Cyperus rotundus* were identified as food plant of deer in Kebar. Among these species *T. arguens*, *M. minutiflora*, *C. rotundus* and *I. cylindrica* were the most preferred species consumed by deer. The biomass harvest (species productivity) was 30.36 kg/ha fresh weight, while deer food productivity in the grassland was slightly lower (26.70 kg/ha) than total productivity of the grassland. The major drainage area is Kasi River, but two other rivers across this valley (Api River, Apriri River) are also supply water to the swampy area.

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INTRODUCTION

Grasslands are mostly found in arid and semi-arid zones where rainfall is sparse and unpredictable, or in humid zones where topography is steep or temperatures are low. Their existence is also determined by cultural factors, distance to markets or the presence of low fertility or stony soils, salinity or seasonal flooding (Harris, 2000)

Grassland Conservation Group (2004) indicates that the grassland biome covers about one quarter of the Earth's land surface. Unique from most other biomes, grasslands are relatively simple in structure but rich in number of species. However, most areas of the prairie have experienced serious declines in biodiversity.

In Indonesia, large areas of grassland are found in Sumatra, Kalimantan, Sulawesi, Nusa Tenggara, and Irian Jaya (Ivory and Siregar, 1984). The pasture consists of many grasses and legumes, with the commonest genera being *Imperata*, *Paspalum*, *Chloris*, *Eleusine*, *Themeda*, *Tetrapogon*, *Polytrias*, and *Desmodium*. During dry season, the land is

almost bare because of overgrazing and uncontrolled burning. In fact, grassland areas were identified as one of several factors that significantly contributed to attract the presence of deer as an important animal protein source and income generating in the rural areas in Papua (Pattiselanno, 2003).

With the development of the Papua Province, more remote areas are being opened and most forestlands are competing with other intensified land use purposes (logging concessionaires, mining, agriculture development, new infrastructure improvement and transmigration), these also influence the grasslands including in the upland Kebar in Manokwari, Papua. In other side, climatic conditions also pressure on grazing land in some areas. As a consequence, the sustainability of use of much grassland is being questioned. Facts show grassland was utilized as places for deer hunting by local communities in the remote areas in Papua (Pattiselanno, 2004).

In order to prepare suitable information on sustainable management of grassland community, assessment is required to document current condition of grassland in the upland Kebar, Manokwari, Papua. The general objective of the study was to provide current information on grassland communities as deer habitat and its future development plan for a sustainable forage management in upland Kebar,

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Papua. Specifically, the study aimed to analyze the potency of grassland area as deer grazing habitat in upland Kebar, West Papua.

MATERIALS AND METHODS

Time and place

The study was conducted in the upland areas of Kebar district, during the dry season from August to October 2003. Upland Kebar is known to be a natural grassland area in Manokwari where a large concentration of deer species could be found. The settlement area is situated about 500-1000 m above sea level. At 1000-2000 m above sea level are forested areas.

The central part of Kebar district, where the center of local government office, school, health center, and settlement areas are located, occupies about 510 hectares. The topography varies from plain to mountainous areas, which are predominantly *Imperata cylindrica* areas.

Botanical composition analysis

Quantitative estimation of forage production was carried out by measuring a biomass harvest in fresh weight bases assisted by 100x100 cm² as the sampling frame and laid every 2m interval along the transect line within the plots. The presence of all vascular species in each sampling frame was recorded and collected by clipping to the ground about 6-7 cm in height, and separated to plant species then weighed.

In the present observation, 565 times quadrat (sampling frame) was investigated in the 375 ha of the study site. Abundance of a species was calculated as the percentage of the quadrats in which the species is present or to be determined as a proportion (percentage frequency) of each plot (Kirby et al., 1997; Hopkins et al., 1999; Coventry et al., 2000).

Occasional observations on ranging deer were done within habitat range with the aid of 7x50 binoculars. Grazed-over and browsed-over plants were verified by actual visitation of grazed area. This permits the identification of practically everything that was eaten, including items that might not have been noticed from distant observations of the vegetation. Identification of vegetation species eaten by deer was done in the grassland because it is the only grazing area in upland Kebar. Herbarium specimens were collected. Descriptions were accomplished in the field for further investigation in the Manokwariense Herbarium, Biodiversity Research Center, The State University of Papua (UNIPA) in Manokwari.

Deer was reported to seek refuge for shelter during the day especially in the dry season. The cover plants utilized for shelter by the deer were monitored, and identified as well. This was done through the presence of hoof marks of deer and other species (wild pig) that might be present in the study site.

Deer habitat characterization

Field work was commenced with a comprehensive reconnaissance of the 510 hectares pasture area with the aid of 7x50 binoculars and a district situation map. Likewise, identification of habitat range and water source distribution was conducted by taking into consideration the distribution of trails and hoof marks, browsed-over and grazed-over plants or feeding areas, bedding, hiding or resting places, mating and playing areas, fecal droppings and deer physical presence. Distribution of all existing water sources (rivers, creeks, springs and lakes) within the identified deer habitat range were documented.

Interviews were conducted among the hunters and local people around the study sites to validate field findings with their experiences. All observations and notes from the interviews were recorded. Data on major environmental variables (temperature, humidity and rainfall) were gathered from the meteorology station closest to the study site. Soil characteristics were obtained from previous researches conducted at the same sites.

RESULTS AND DISCUSSIONS

Description of the study site

Upland Kebar (Kebar Valley) is a long east-trending pleistocene/holocene intermontane basin, which is enclosed by fault-bounded mountains up to 2000 m high, and 2,703 km² wide. Geographically, it is located at 500-600 m above sea level (132° 35'-134°45'E and 0°15'-3°25'S) or about 150km southwest from Manokwari City. The valley floor is leveled or gently tilted (up to three degrees) and is interrupted by narrow east-trending ridges.

Along its margins are several small alluvial cones, and terrace remnants of high level lake or alluvial deposits rest along the north side of the valley. At the eastern end of the valley, the quaternary basin sediments are cut by the Kasi River and exposed in terraces up to 30 m high. Approximately, Kebar valley covers a total area of 21,841 ha, while the natural pasture comprises 5,391 ha.

Generally, the topography of deer habitat in Kebar is the area with degree of elevation between 0 to 3% and 3% to less than 30%. In the study site, the movement of deer was mostly found close to the flat territory encompassing the grassland and forest site. However, it is common to find deer across the grassland and looking for shelter in the hilly forest block. The hilly grassland territory can be described as the pathway of water from top to the flat areas through the gullies.

Encompassing "The Vogelkop Mountain Rainforest Ecoregion," Kebar valley has a wet, tropical climate and is subject to seasonal influence of northwest monsoon from November to March and the southeast trade winds from June to September. Limited meteorological observations indicate a

relatively dry season along the north coast when winds are blowing from the southeast.

Rainfall is higher probably up to 3,500 mm per year. Temperatures are uniformly high in the lowlands, which range from about 23°C to 30°C, decreasing with elevation to a mean daily temperature of about 16°C and 2000 m. Relative humidity is also uniformly high, ranging from 80 to 100 percent. Morning cloud or ground fog may hamper aircraft operations in intermontane valleys like Kebar during dry season.

The physical characteristic of soil in Kebar is described as sandy in texture with little coherence structure in Central Kebar. Meanwhile, sandy clay loam in coherent plastic bolus structure is found in Eastern Kebar (Imbiri et al., 1998). Soil pH is about 4.6 (more acidic) to 5.6 (acidic).

Characteristics of deer habitat

Botanical composition

Primary forest includes large trees such as *Intsia bijuga*, with canopy dominated by epiphyte. Almost all the ground was covered by shrubs, ferns and mosses.

Secondary forest is mostly dominated by small diameter trees like matoa (*Pometia pinnata*), binuang (*Octomeles sumatrana*), damar (*Araucaria*, sp.) planted during the Dutch colonization era. Other trees found are: kayu merah (*Homalium foetidum*), pulai (*Alstonia* spp.), sukun (*Artocarpus communis*), rattan (*Calamus* spp and *Korthalsia* sp.), pandan (*Pandanus* sp.), bamboo (*Bambusa* sp), kayu raja (*Endospermum moluccanum*), pala hutan (*Myristica*, spp), sirih hutan (*Piper aduncum*), sagu (*Metroxylon* sp.), enau (*Arenga pinnata*), lansat (*Lansium domesticum*), kedondong hutan (*Spondias dulcis*), genemo (*Gnetum gnemon*), and linggua (*Pterocarpus indicus*). Certain epiphytes and ferns are also well distributed in the area.

Swampy area includes forest, dominated by Sago (*Metroxylon sago*) and other aquatic plants. This area is also important as habitat for fresh water fishes, which are utilized by the local people as animal protein sources for the family.

Natural pasture known as grazing areas, in particular location dominated by *Imperata cylindrica*, and it was easily burned during the dry season. Several studies conducted in this area identified some potential forages that grow and distribute fairly within the valley such as: *Melinis minutiflora*, *Cynodon dactylon*, *Cyperus rotundus*, *Themeda arguens*, *Pennisetum purpureum*, *Phragmites karka*, *Tridax procumbens*, *Panicum maximum*, *Indigofera hirsuta*, *Leersia hexandra*, *Cenchrus ciliaris*, *Setaria geniculata*, *Paspalum conjugatum*, *Digitaria ciliaris*, and *Paspalum orbiculare*. There are leguminous plants found in the pasture such as *Crotalaria juncea*, *Centrosema plumeria*, *Leucaena leucocephala*, and *Desmodium* sp.

Result of analysis revealed that most of the species were the low layer vegetation found in five sampling plots in 375 ha grassland areas. Eleven grass species and five legume species were identified during the observation in the grassland areas in Kebar (Table 1).

Table 1. Low layer vegetation species found in the upland Kebar grassland.

Species	Occurrence				
	A	B	C	D	E
Grass					
<i>Imperata cylindrica</i> *	+	+	+	+	+
<i>Paspalum conjugatum</i> *	+	+	+	+	+
<i>Eragrostis brownii</i>	-	-	+	+	+
<i>Themeda arguens</i> *	+	+	+	+	+
<i>Melinis minutiflora</i> *	+	+	+	+	+
<i>Setaria geniculata</i>	+	+	-	+	+
<i>Cenchrus ciliaris</i>	+	+	-	+	+
<i>Leersia hexandra</i>	+	+	+	-	+
<i>Cyperus rotundus</i> *	+	+	-	+	-
<i>Indigofera trifoliata</i>	-	+	+	+	+
<i>Tridax procumbens</i>	+	-	-	-	-
Legumes					
<i>Biophytum petersianum</i>	+	+	+	+	+
<i>Crotalaria juncea</i>	+	+	+	-	+
<i>Centrosema plumeri</i>	+	+	-	+	+
<i>Desmodium</i> sp	+	+	-	-	+
<i>Mimosa pudica</i>	+	+	+	+	+

Note: (*) Observed species consumed by the deer; + Present in the area; - Absent in the area.

Potential forage for deer

Identification of low layer vegetation species eaten by deer was undertaken to identify potential source of food. In this study, identification was carried out in the grassland dominated by *I. cylindrica* since it is the only grazing area for deer in Kebar. During the observation, evidences by tracing trails and hoof marks, browsed-over and graze-over plants or feeding areas were established.

Among the eleven species of low layer vegetation found in the grassland of Kebar, five were found to be eaten by deer. These include *I. cylindrica*, *P. conjugatum*, *T. arguens*, *M. minutiflora*, and *C. rotundus*. It was observed that *T. arguens*, *M. minutiflora*, *C. rotundus* and *I. cylindrica* were the most preferred feeds of deer. Some previous species recognized in Kebar such as *I. cylindrica*, *Pennisetum purpureum*, *M. minutiflora* and *Pennisetum purpureophoides* were also preferred by deer kept in backyard model in Manokwari (Pattiselanno et al., 2008).

Wirdateti et al. (2005) noted approximately 40 species, and mostly from *Euphorbiaceae*, *Leguminosae*, *Fabaceae*, *Poaceae* and *Convolvulaceae* were consumed by *Cervus timorensis* in captivity area in PT Kuala Tembaga, in Bitung, North Sulawesi. Similarly, Garsetiasih (2005) cited that certain forages have been eaten by deer in captivity for example: *Setaria* sp., *Brachiaria decumbens*, *Andropogon*

contortus, *Eragrostis bahiensis*, *Scleria lithosperma* and *Andropogon fastigiatus*. Therefore, *P. purpureophoides* was fed to the deer in the captive breeding at Taman Safari, Cisarua, Bogor (Wirdateti et al., 1997). Different species consumed by deer in different habitat showed that food was not limited factor to breed deer under captivity condition (Semiadi, 1986; Subekti, 1995).

Kencana (2000) explained that *T. arguens*, *C. rotundus* and *I. cylindrica* are the food plants of deer in the Rumberpon Island. In Wasur, Merauke, potential forages identified as food plants for deer were *Setaria* sp., *Panicum maximum*, *P. purpureum*, *Setaria sphacelata*, *Brachiaria decumbens* and *Melinis minutiflora* (Environment Study Center of Papua University, 2000). Sutrisno (1993) indicated that among the eleven species eaten by Javan Deer in Menipo Island, the most preferred were *Microlaena stipoides*, *Danthonia pilosa*, *I. cylindrica*, and *Paspalum scrobiculatum*. In Kebar, the bedding site is dominated by *I. cylindrica* approximately 75-100 cm tall. While the bedding site in Wasur, Merauke is dominated by *Acacia* species (Pattiselanno, 2002). In Rumberpon Island, the main species are *Gleichenia linearis* and *Dacrydium* sp. (Murwanto et al., 2000).

Biomass harvest

Results of clipping of grassland vegetation showed that the total biomass harvest averaged 30.36 kg/ha fresh weight, with the highest account is by *I. cylindrica* (16.92 kg/ha) followed by *P. conjugatum* (6.73 kg/ha) fresh weight. Biomass harvest in this study is also considered as species productivity expressed in kg/ha fresh weight.

Four species considered to be the most dominant in the study site were *I. cylindrica* (55.74%), *P. conjugatum* (22.18%), *E. brownii* (9.37%), and *T. arguens* (8.94%). Others were found in fairly low percentages. As cited by Imbiri et al. (1998) five dominant species in the natural pasture in Kebar were *I. cylindrica*, *P. conjugatum*, *M. minutiflora*, *C. rotundus*, and *T. procumbens*.

Water sources availability

The major drainage area is the Kasi River. However, there are two other rivers across this valley (Api River, Apriri River) that also supply water to the swampy area. During the rainy season, deer were mostly concentrated in the forest belt (as shelter) during daytime (from 0800 to about 1600 h), to utilize the water flowing from the stream inside the area. However, since the study was conducted in a dry season, flocks expanded their movement closer to water source (swampy areas, and rivers) to find water. Pellet, trail, and hoof marks were some evidences during the sighting in the grassland and swampy sites.

CONCLUSIONS

Kebar, as the only grazing area of deer varies in low layer vegetation composition that comprised of eleven grass species and five legume species. *Imperata cylindrica*, *Paspalum conjugatum*, *Themeda arguens*, *Melinis minutiflora* and *Cyperus rotundus* were identified as food plant of deer in Kebar. Among these species *T. arguens*, *M. minutiflora*, *C. rotundus* and *I. cylindrica* were the most preferred species consumed by deer. The biomass harvest (species productivity) was 30.36kg/ha fresh weight, while deer food productivity in the grassland was slightly lower (26.70kg/ha) than total productivity of the grassland. The major drainage area is Kasi River, but two other rivers across this valley (Api River, Apriri River) are also supply water to the swampy area.

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