

Anthropogenic Influences on The Sosoecology of Long-Tailed Macaques (*Macaca fascicularis*) in Lombok Island, Indonesia

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ABSTRAK

Beberapa Pengaruh Antropogenik pada Sosioekologi pada Monyet ekor Panjang (*Macaca fascicularis*) di Pulau Lombok, Indonesia. Survey distribusi monyet ekor panjang dilakukan di P. Lombok selama 2001-2009 dan dari 37 kelompok, satu kelompok jantan muda dan 3 individu soliter yang terdata dari 27 lokasi sekitar 63% monyet dijumpai pada areal karena terpengaruh oleh aktivitas kehidupan manusia, seperti hutan sekunder, kebun buah-buahan, hutan persembahan dan tempat rekreasi. Besarnya kelompok monyet cenderung menjadi lebih besar di area semi buatan dibandingkan dengan kelompok yang hidup liar (Liar= 7.08, buatan =19.04, $X^2 = 5.4763$, $df = 1$, $P = 0.01928$). Faktor-faktor ketergantungan pada manusia yang menyediakan sejumlah pakan ternyata mempengaruhi tingkah lakunya sedangkan penebangan hutan dan pengubahan alih fungsi menjadi kawasan lain selain hutan akan memicu monyet terkesan menjadi hama tanaman.

Kata Kunci: Monyet kra, *Macaca fascicularis*, Pulau Lombok, Anthropogenik

INTRODUCTION

Long-tailed macaques, *Macaca fascicularis*, have dispersed to wide geographical range, from southernmost Bangladesh to continent of southeast Asia (Myanmar, San & Hamada 2009 ; Thailand, Aggimarangsee 1992, Malaivijitnond & Hamada 2008, Fooden 1995, Malaya Peninsula and Singapore, Furuya 1965), and spread in Indonesia Archipelago from Sumatera to Timor extended to Philipines archipelago except Sulawesi (Fooden 1980, Kawamoto 1984). They occupied wide range of habitat from the coastal to mountainous area, in in mangrove swamp, inland freshwater swamp

forest, lowland forest, secondary forest and montain forest (Furuya 1965, Hock & Sasekumar 1979, Yeager 1996, Hadi 2005). Long-tailed macaques frequently found in the riverbank or riverine forest (Kurland 1973, Abberg & Thierry 2002) and human-disturbed habitat (temples, Aggimarangsee 1992; recreation areas, Fuentes *et al.* 2007 and Djuwantoko *et al.* 2008; orchard, Hadi 2007)

Lombok Island was exactly situated in eastern of Wallace's line. This island was inhabited by long-tailed macaques and lutungs. Those two species would have been introduced by human (Kawamoto 1984, Supriatna *et al.* 1986, Fooden 1995). Since Kawamoto (1984) Supriatna *et al.*

(1986) and Nijman (2000). In this decade, development in many sectors has change many aspect of environmental, for example on long-tailed macaque species. This paper describes the anthropogenic influence on the socioecology of long-tailed macaques in the island of Lombok.

MATERIALS AND METHODS

The research was conducted in Lombok Island, Indonesia, which is situated in the eastern of Bali, separated by Lombok Strait. Geographical position of the island is 08°13'-08°58' S and 105°50'-106°43' (Fooden 1995).

The island encompasses 4,738.70 km² (DPR RI 2009) and lies exactly in the eastern of Wallace's line which separated Asian and Australian faunas type. Lombok Island has temperature range from 20.6-32.1°C. The annual rainfall is 1000-2000 mm/year with mean rainy days are 87 days/year with exception 32 days/year for southern part of Lombok (Dislutkan NTB 2006). According to As-Syakur (2008), the climate type of in Lombok is dominated

by E and F-type in Schmidt-Ferguson climate categories. It indicates that the Island is dry. Topographically, Lombok Island has mountainous area in the northern and southern part of the island. The central part was flat and has intensively used for human activities. This area were estimated 56 km length from west to east, and 25 km from south to north (van der Kraan 2009). The northern mountainous area is covered by 125.000 hectares (Ha) forest area called Rinjani Forest Group (BPPHP IX 2010) with Mount Rinjani is the highest peak (3726m asl). Otherwise, the southern mountainous areas are covered by shrub and grass with Gunung Mareje as the highest peak (783 m asl) (van der Kraan 2009).

This research was initialed and conducted in March 2001, located at two places where the monkey groups has reported by Kawamoto *et al.* (1982) and Fooden (1995). These were Gunung Pongsong and Pusuk Forest. During period of 2002-2004 the survey was extended to eastern part of Lombok. These survey were aimed at getting the blood samples for genetic and medicinal analysis of long-

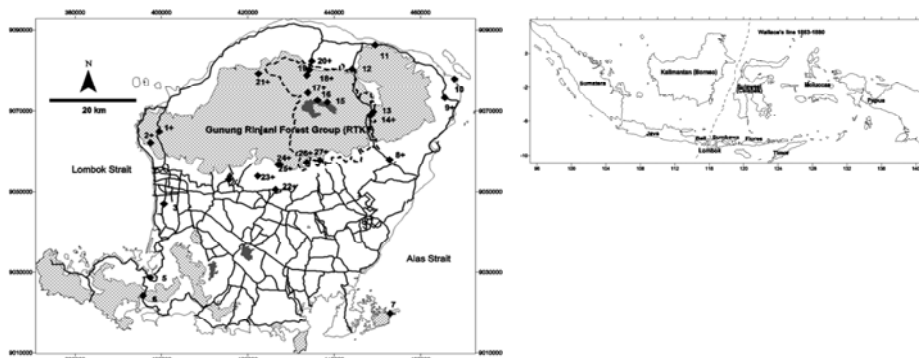


Figure 1. Localities of long-tailed macaques groups in the Island of Lombok based on survey data during year of 2001-2009.

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tailed macaque population. Since 2005, survey on the of long-tailed macaque distribution was extended throughout Lombok Island for ecological and behavioral analysis.

We applied reconnaissance sampling method (Newig *et al.* 2002) by walking throughout the area in the location those suspected were inhabited by long-tailed macaques and lutung. The suspected habitat were river banks, disturbed and secondary forest, temples, natural-recreation park, conservation forest and human settlements (Kurland 1973, Hock & Sasekumar 1979, Cocket & Wilson 1980, Fitinghoff & Lindburg 1980, Wheatley 1989, Aggimarangsee 1992, Low *et al.* 1994, Hamada *et al.* 2005, Hadi 2007, Malaivijitnond 2008). The ad libitum method (Altman 1974) also applied during the observation. The number of individuals were noted several times during observation (Hamada *et al.* 2005). The type of habitat where the groups of long-tailed macaques and or lutung were found were also recorded e.g primary forest, secondary forest, mangrove, orchard, rice field, river bank, human settlements, recreation park and temples. Localities coordinates of long-tailed macaques were recorded using GPS (Garmin Co.) in UTM coordinates format. Status of long-tailed macaques and lutungs were arbitrarily divided into provisioned and non-provisioned according to estimation of frequencies of contact with human who provided food for monkeys. The groups of monkeys were also categorized into crop-raiding and non-crop raiding. Anthropogenic activities impact were arbitrarily categories into ecotourism activities, land clearing/shifting, and hunting. Frequencies of

each categories was tabulated based on the group status of long-tailed macaques.

The data of long-tailed macaques were tabulated and analysis with Pearson's chi-squared test using R statistical software (R Development Team 2009) to test the status and distribution and degree of impact of human activities to groups of long-tailed macaques. The degree of impact were categories into high if the frequencies is more than 50%, moderate 25-50%, and low when less than 25%.

RESULTS

On the survey of long-tailed macaques during 2001-2009, we visited 32 locations suspected inhabited by long-tailed macaques. Of the 32 locations, 27 locations/points (84.38%) were inhabited by long-tailed macaques (Table 1). The localities of groups are plotted into map of Lombok Island (Figure1).

The number of individuals of long-tailed macaques were observed maximum 709 individuals in 44 groups. Seventeen locations out of 27 locations (62.69%) were recorded as the sharing areas of long-tailed macaque and lutung. The provisioned and non-provisioned groups of long-tailed macaques were different significantly in number of groups amongst area ($X^2=4.22$, $df=2$, $p=0.1210$). The proportion of provisioned groups was 45% and non provisioned groups was 55%., respectively. The mean groups size is different between provision and non-provisioned groups ($X^2=7.8131$, $df=1$, $p=0.005187$). During the observation period, three main aspects of anthropogenic influences on group of long-tailed macaques in Lombok Island have been identified. The

impact of each aspect was also described and calculated as shown in the Table 2.

Ecotourism practice and land clearing/shifting have been the main aspect of anthropogenic influences to group of long-tailed macaques, which highly affect the population of two groups of macaques. Hunting on the long-tailed macaques was not common practice to local people in Lombok.

DISCUSSION

Long-tailed macaques in Lombok island showed various number of individuals in group and also habitat type in various altitude. Of the all various type of habitats, however, long-tailed macaques tend to choose secondary forest and human dis-

turbed area (recreation park, temple, orchard and rice field) in the lowland, and this was supported by Suaryana *et al* (2000) in Bali and Subekti *et al.* (2000) and Yanuar *et al.* (2009) in Sumatera. Disproportionate on the distribution of long-tailed macaque on Lombok Island were observed between southern and northern part of Lombok. In the southern part of Lombok, number of groups and individuals observed were lower than those in northern part of Lombok. Low number of groups and size of long-tailed macaques groups in southern part of Lombok was correlated with the existence of forest and vegetation. For example, Kuta, an area which was observed by Kawamoto *et al.* (1982), nowday has disappeared. Most of the forest only covered by shrub and grass form savanna and

Table 1. Localities Long tail macaques 2001-2009 at Rinjani Mountain

Point	Habitat	Group	Group Size	Total indiv	Status
Kerandangan	Secondary forest/recreation park	1	5	5	Non provisioned non crop raiding
Pusuk	Secondary forest/recreation park	5-8	9-40	119-202	Provisioned, non-crop raiding
Santung	Orchard riverbank	1		9	Non provisioned, crop raiding
Sendang Gila	Riverbank	1	6	6	Non-provisioned non crop raiding
Jebag gawah	Orchard	1	6	6	Non-provisioned non crop raiding
Bunut ngengkang	Primary forest	2	5-7	12	Non-provisioned non crop raiding
Pos 3 Senaru	Prymary forest	1-2	4-9	21-29	Provisioned non cropraidding
Segara anak	Savana	1-2	9-26	9-26	Provisioned non cropraidding
Plawangan sembalun	Savana	1	8-13	8-13	Provisioned non cropraidding

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Table 2. Anthropogenic influence on long-tailed macaques

Anthropogenic activities	Impact to macaques	Frequencies	Degree of impact	Statistical test
Ecotourism practise	Dependencies of macaques to human food, increasing number of individuals (group size), increasing of aggressiveness of macaque to human, human-macaques disease transmission. Reducing width and number of habitat, crop raiding behavior	10	High	X-squared = 8.6154, df = 2, p-value = 0.01346
Land clearing/shifting		14	High	
Hunting	Reducing number of individuals in groups	2	Low	

suffering from water in riverbank. It caused by long drought condition which probably drove by forest logging activities during last decades. In the northern part of Lombok, most of the groups were found in lowland and sub-mountainous area especially around Gunung Rinjani Forest. It was reasonable since Gunung Rinjani was the only forest covered a third of the island. These area also comprised of various type of habitats and some human activities spots which provide food resource for the monkeys. Although long-tailed macaques is high adaptable animals, which allow them to live in various condition, however, forest and forested area were needed as source of food and refugee area. The continuous of habitat disturbance (logged and shifting) habitat to human economical activities will be a main contribution on decreasing the population of these monkeys since no indication of serious hunting on these species. The forest clearing /shifting to agricultural field also drive behavioral changing of long-tailed macaques. In many areas where the forest shifting to agricultural field and orchard occurred, long-tailed macaques reported visiting the areas to raid the crop (Wangon Central Java, Hadi *et al.* 2007; Central

Sumatera, Hill & Marchall 2009). The crop raiding behavior of animal will increasing human-animal conflict wich drive animal hunting or eradication. Group size and total number individuals of provision long-tailed macaques was larger in human provisioned groups rather than those non-provisioned ones. It was congruence with many provision groups of long-tailed macaques in many areas (Fooden 1995). High nutrition of was became the main factor of increasing number of individuals of animal, especially long-tailed macaques. Human-provisioning also drive the dependence of macaques to human food. Djuwantoko *et al.* (2008) and Fuentes & Gamerl (2005) reported those provisioned groups of long-tailed macaques became more aggressive to human than the wild ones. On the other hand, provisioning activities by human to monkeys will accelerate transmission of diseases which harmful both to human and monkeys. The previous study show those of long-tailed macaques in the area of Gunung Pongsong were infected by 8 species of gastrointestinal parasites (Tresnani *et al.* 2007). In the areas where human-macaques interact intensively, long-tailed macaques was suggested to transmit virus to human.

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