

ASSESSMENTS ON CURRENT STATUS OF ELEPHANT PRODUCTS TRADE IN SOME AREAS OF MYANMAR

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Abstract

Current status of Elephant product trade in some areas of Myanmar was studied from January 2017 to March 2018. The four main study areas were Yangon, Mandalay, Kyaiktiyo (Golden Rock) and Bhamo. The research was based on field studies and involved interviews with local dealers and on direct observation. The pieces of skin and teeth were recorded in the pagoda markets from Kyaiktiyo. The ivory products and product shops were recorded as highest in Bogyoke market from Yangon areas. Items were observed at the study sites included skins, teeth, and bones mainly for use in traditional medicine and various ivory products were on sale to foreigners, especially from China border country.

Keywords- ivory products

Introduction

Myanmar is the largest country in mainland Southeast Asia. Bordering five nations, Bangladesh, India, Thailand, Lao PDR and the People's Republic of China where it is strategically located as a land bridge between South and East Asia. The country is endowed with rich natural resources—arable land, forestry, minerals including gas and oil, and freshwater and marine resources (ADB, 2006). Although rich in wildlife, habitat loss, illegal and unregulated hunting for domestic and international trade, threaten the existence of many species in Myanmar (Rao *et al.*, 2005; Shepherd and Nijman 2007 a,b, 2008).

Myanmar is thought to have the largest remaining population of wild Asia elephants in Southeast Asia, and is second only to India in all of Asia (Kemf and Santiapillai, 2000). In the past elephants were smuggled into Thailand for use in the logging industry. Since Thailand's logging ban in

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1990, the illegal market targets and sells to the lucrative tourism industry (Shephard and Nijman, 2008).

The Asian elephant is listed as Endangered under the IUCN Red List classification system. The progressive decline of the original population across Asia is largely due to unrelenting human–elephant conflict, habitat loss and fragmentation, as well as ongoing illegal capture, killing and trade. Asian elephants are protected in Myanmar as a “Totally Protected Species” under the protection of Wildlife and Wild Plants and Conservation of Natural Areas Law. Violation of this law is an offence punishable with imprisonment for a term which may extend to seven years, or with a fine which may reach 50,000 MMK (\$1,490) (Aung, 1997).

Myanmar is the most significant country in South-east Asia for elephant conservation, with an estimated 2,000 elephants remaining in the wild, with a further 5,600 elephants registered in captivity. There are numerous threats to elephants in Myanmar, including loss of

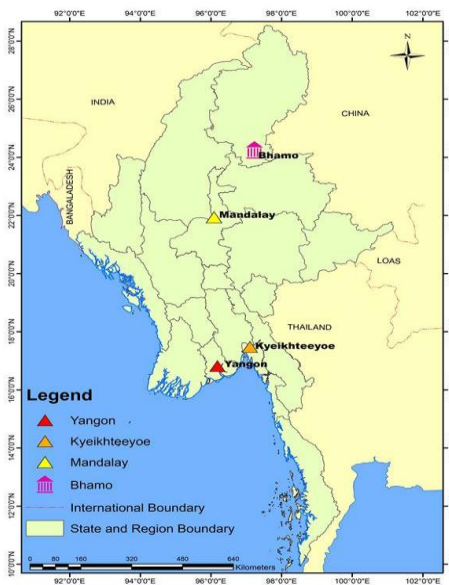


Figure1. Map of the study areas

Source by Geography Department, University of Yangon

habitat, and poaching for the wildlife trade. The Forest Department has recorded 98 elephants killing in the last six years; this is likely to be just a small proportion of the true number.

The present research is carried out with the following objectives: to collect data on: the number of trades identified, the quantity of stock, or the reported availability of additional stock.

Materials and Methods

The study was undertaken from January 2017 to March, 2018. The four main study areas; Yangon, Mandalay, Kyaihtiyo (Golden Rock) and Bhamo which is located in the Kachin State were conducted. The research was based mainly on field studies and involved interviews with dealers to assess the source of the material and on direct observation. Visits to the four study sites; once for Mandalay and Golden Rock each sites and three times for Yangon and Bhamo were undertaken during the survey period. Information relating to identification of the number of traders, the quantities of stocks were collected via interviews with traders and observations and counting of elephant parts and derivatives at the markets. All specimens and parts observed were recorded by taking photos. All elephant parts, such as ivory, skin, teeth, and any other parts were assessed at public and private markets.

Conservation status

The conservation status of recorded species was also identified in accordance with global and national status of threatened categories; The World Conservation Union (formerly the International Union for the Conservation of Nature and Natural Resources) (IUCN) (2017), Conservation on International Trade in Endangered species of Wild Flora and Fauna (CITES) (2017) and Myanmar Wildlife Protection Law (MWPL) (1994).

Results

In 2017, a total of 30 shops were recorded. In Yangon, 13 shops were recorded. In these, three retail outlets along the south entrance of Shwedagon pagoda and ten shops from Bogyoke market were observed. In Mandalay, 8 shops were recorded and seven retail outlets along the south entrance of Mahamuni pagoda and only one shop at downtown were observed. In Kyaiktiyo (Golden Rock pagoda), eight retail outlets shops were recorded along the entrance of pagoda market. In Bhamo, only one traditional medicine shop was observed. In 2018, the total of 28 elephant parts shops and 1017 items were found from all study areas.

A total of 16 ivory shops were observed from Shwedagon pagoda and Bogyoke market. In these, three retail outlets along the south entrance of Shwedagon pagoda and 13 shops from Bogyoke market were observed with 844 pieces of ivory and elephant products. In Bogyoke market, there are openly displayed the ivory products such as bead necklaces, pendants, bangles, pipe smokings, name seals, earrings and others. Moreover, mostly numbers of elephant bones products were found as bangles, bead necklaces. Along the southern entrance of Shwedagon pagoda, three shops were observed in ivory products such as the statue of gong with ivory carved, small forks and spoons, small hairpin the highest items of ivory products were found as 311 pendants and 109 bangles from Yangon area. In Yangon, 457 items of elephant products were observed in the last year and more markedly increase in this year. According the interview surveys with the shop owners in market, mostly the ivory products are sold to Chinese visitors.

Mandalay, the ancient city of Myanmar, a total of seven shops were recorded in the entrance of Mahamuni pagoda. Among these, three ivory product shops occurred and another three shops were non ivory parts as the religious beads necklaces, pendants of elephant's bone. A total of 127 elephant products items were observed that pendants were most numbers of items. Also an ivory shop was found in the city but we didn't get the photo record of ivory products item. Although there are decreased the ivory products

shops than the last year, one owner who showed many of creative ivory carved photos in his phone for sale but we didn't get photo record.

Kyaiktiyo (Golden rock) is very famous pagoda where many shops are found as traditional medicine. A total of four shops have found the ivory and elephant parts such as skins, molar teeth and tip of ivory. There were observed three molar teeth, 22 pieces of molar teeth, nine skin pieces and one tip of ivory during the survey period. The numbers of elephant parts were found for sale in traditional medicine shop. According to the interview with dealers, mostly of elephant's parts are used for traditional medicine. In this year, the items of elephant parts for sale were observed about half of the fewer than the last year.

Bhamo is a city of Kachin State in the northernmost part of Myanmar, lies within 65 km (40 ml) of the border with Yunnan Province, China. Only one traditional medicine shop was observed with six skin pieces and five pieces of molar teeth of elephant parts. During the surveys period, three kg of elephant's bone powder were found for sale. According to the interview with dealers, most of elephant parts were used for traditional medicine. The ivory and elephant part items were fewer than the last year.

According to compare of two years survey, although the elephant parts shops decreased markedly in Kyaiktiyo (Golden rock) pagoda market, increased in Yangon area. The elephant parts such as hoof, tail, raw pieces of tusk didn't found in all study sites in this year.

Table 1. Numbers of ivory products shop and non-ivory products shop from four study areas in 2017

No.	Study areas	Study sites	Numbers of shop	Total
1	Yangon	Shwedagon pagoda	3	13
		Bogyoke market	10	
2	Mandalay	Maharmuni pagoda	7	8
		Ivory shop	1	
3	Kyaiktiyo (Golden pagoda)	Pagoda market	8	8
4	Bhamo	TM shop	1	1
		Total	30	30

Table 2. The numbers of elephant products' shop in 2018

Sr.	Study areas	Study sites	Numbers of shop		Total	Remarks
			Ivory products shop	Non-ivory products shop		
1	Yangon	Shwedagon pagoda	3	-	3	
		Bogyoke market	6	7	13	
2	Mandalay	Maharmuni pagoda	3	3	6	did not get photo
		Ivory shop	1	-	1	
3	Kyaiktiyo (Golden pagoda)	Pagoda market	1	3	4	
4	Bhamo	TM shop	-	1	1	
		Total	14	14	28	

Table 3. Compare of the Ivory product's shop in four study areas (2017 and 2018)

Sr.	Study areas	2017		Total	2018		Total	Remarks
		IPS	NIPS		IPS	NIPS		
1	Yangon	13	-	13	9	7	16	
2	Mandalay	8	-	8	4	3	7	
3	Kyaiktiyo (Golden Rock)	-	8	8	1	3	4	
4	Bhamo	-	1	1	-	1	1	
	Total	21	9	30	14	14	28	

IPS -Ivory products shop

NIPS - Non ivory products shop

Table 4. Elephant parts showing the different items and products offered for sale in four study sites in 2017

Items used	Products	Study sites				Total	Remark
		Yangon	Mandalay	Kyaiktiyo	Bhamo		
Ivory parts	Bead necklace	22	4	26	-	26	
	Earrings	3	5	8	-	8	
	Hairpin	6	13	19	-	19	
	Religious icons carved	23	115	138	-	138	
	Bangle	32	8	40	-	40	
	Pendants	216	173	389	-	389	
	Ring	-	10	10	-	10	
	Ivory carving	12	12	24	-	24	
	Name seals	5	2	7	-	7	
	Brooch	6	2	8	-	8	
Raw tusks	Piece of tusk	46	18	93		93	
	Tip of tusk	-	-	6	-	6	
Non-ivory parts	Pendants	2	-	2	-	2	
	Bead necklace	58	8	66	-	66	
	Hair pin	24	63	87	-	87	
	Hair rings	2	18	20	-	20	

Items used	Products	Study sites				Total	Remark
		Yangon	Mandalay	Kyaiktiyo	Bhamo		
	Rings (bone)	-	-	-	-	-	
Ivory parts	Skin piece	-	-	38	5	43	
	Molar teeth	-	-	5	-	5	
	Piece of molar teeth	-	-	42	8	50	
	Tail	-	-	4	-	4	
	Piece of tail	-	-	6	-	6	
	Hoof	-	-	2	-	2	
	Piece of hoof	-	-	10	-	10	
	Total	457	451	142	13	1063	

Table 5. Elephant parts showing the different items and products offered for sale in four study sites in 2018

Items used	Products	Study sites				Total	Remark
		Yangon	Mandalay	Kyaiktiyo	Bhamo		
Ivory parts	Bead necklace	35	-	-	-	35	
	Earrings	8	10	-	-	18	
	Hairpin	35	-	-	-	35	
	Religious icons carved	8	22	-	-	30	
	Bangle	109	7	-	-	116	
	Pendants	311	28	-	-	339	
	Ring	24	2	-	-	26	
	Ivory carving		1	-	-	1	Not get photo
	Pipe smoking	11	2	-	-	13	
	Name seals	18	3	-	-	21	
	Animal's statue (elephant)	6	3	-	-	9	

Items used	Products	Study sites				Total	Remark
		Yangon	Mandalay	Kyaiktiyo	Bhamo		
	Stick of tusk	4	-	-	-	4	
	Gong and tusk statue	3	-	-	-	3	
	Small fork	15	-	-	-	15	
	Small spoon	8	-	-	-	8	
Raw tusks	Piece of tusk	-	-	-	-	-	
	Tip of tusk	-	-	1	-	1	
Non-ivory parts	Pendants (bone)	5	-	-	-	5	
	Bangle (bone)	132	-	-	-	132	
	Bead necklace (bone)	58	21	-	-	79	
	Hairpin (bone)	32	18	-	-	50	
	Tail hair rings	10	-	-	-	10	
	Rings (bone)	12	10	-	-	22	
	Skin piece	-	-	9	6	15	
	Molar teeth	-	-	3	-	3	
	Piece of molar teeth	-	-	22	5	27	
	Bone powder (kg)	-	-	-	-	-	3 kg
	Total	844	127	35	11	1017	

Table 6. Compare of the ivory products and non ivory products in four study areas (2017 and 2018)

Items used	Products	2017	2018	Remarks	
Ivory parts	Bead necklace	26	35		
	Earring	8	18		
	Hairpin	19	35		
	Religious icons carved	138	30		
	Bangle	40	116		
	Pendants	389	339		
	Ring	10	26		
	Ivory carving	24	1		
	Name seals	7	21		
	Brooch	8	-		
	Pipe smoking	-	13		
	Animal's statue (elephant)	-	9		
	Stick of tusk	-	4		
	Gong with ivory carved	-	3		
	Small falk	-	15		
	Small spoon	-	8		
	Raw tusks	Piece of tusk	93	-	
		Tip of tusk	6	1	
	Non-ivory parts	Pendants	2	5	
Bangle		-	132		
Bead necklace		66	79		
Hairpin		87	50		
Hair rings		20	10		
Rings (bone)		-	22		
Skin piece		43	15		
Molar teeth		5	3		
Piece of molar teeth		50	27		
Tail		4	-		
Piece of tail		6	-		
Hoof		2	-		
Piece of hoof		10	-		
Bone powder (kg)		-	-	3 kg	
	Total	1063	1017		

Table 7. Compare of elephant products in four study sites (2017 and 2018)

No.	Study sites	Products	
		2017	2018
1.	Yangon	457	844
2.	Mandalay	451	127
3.	Kyaiktiyo	142	35
4.	Bhamo	13	11
	Total	1063	1017

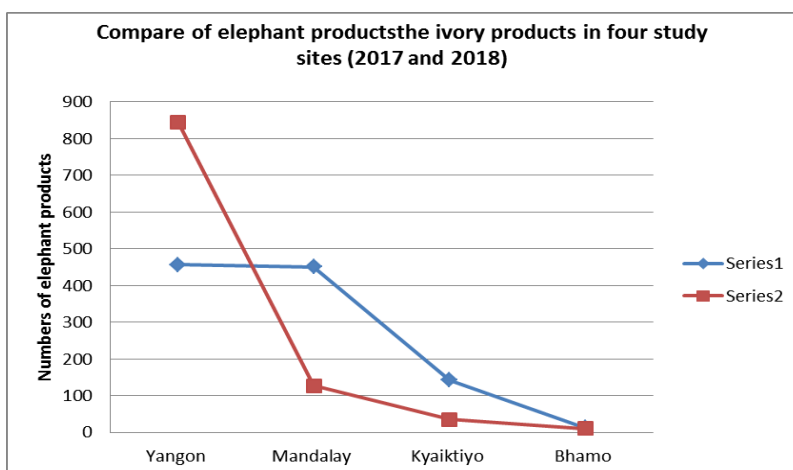


Figure 2. Compare of elephant products the ivory products in four study sites (2017 and 2018)

Discussion and Conclusion

Elephant ivories and parts were traded across the country such as Yangon, Mandalay, Kyaiktiyo and Bhamo areas. Many of the products are traded with neighbor countries mainly with China and marketed to foreign visitors rather for domestic use. Products were observed to be commonly used for traditional medicine, accessories, souvenirs and decoration such as gong with ivory, small forks and spoons, beads necklaces, earrings, bangles, many pendants.

According to the results from market surveys of four study sites, ivory products were observed to be found in Yangon and Mandalay, and elephant parts were observed to be found in Kyeiktiyo and Bhamo. Ivory products were most commonly found in Bogoke Market and Shwedagon Pagoda in Yangon. There has been an increase in numbers of products as well. According to interviews, many of the buyers are from China. There are a few buyers from Japan as well. It was observed that the main market for ivory products trade is Bogoyoke Market in Yangon. Owners of the shops stated that tips of the ivory can be purchased from elephant veterinarians, and raw materials come from Hle Ku Township. It can be assumed that products are purchased from elephant hunters from around Bago mountain ranges.

Numbers of products for sale at Shwedagon Pagoda has decreased compare to last year. Sculptors are usually from older generations and the new generation did not inherit the career. As a result, new generation is unable to sculpt ivory but sell products that are already in stock. They also said that it is uneasy to obtain elephant ivory. The decrease in numbers of products shows that the market at the Pagoda has weakened in comparison with last year.

Also, in Kyeikhtiyo, the number of shops and elephant products sales has decreased by half in contrast with last year. According to interviews with shop owners, ivory products sales are not in accordance with the laws, and there are severe penalties for selling them. However, it was observed that there are secret sales of ivory products. Effectiveness in law enforcement has increased compare to last year.

There has been a decline in number of elephant parts in Bhamo as well. Overall, it is observed that sales in all study sites except Bogoyoke market have declined.

All dealers stated that law enforcement is taken more seriously during this year. However, traders in Mandalay still have a black market for ivory and elephant products. Although retail shops are now less visible in general trade market except Bogoyoke Market, connections and hidden markets for ivory and elephant products still exist. It is observed that Mandalay and

Yangon are commercial towns of ivory and elephant products. Dealers intend to sell it to foreign buyers, both tourists and foreign middlemen, who would then in turn take it out of the country (Shephard, 2002).

According to the results, the highest numbers of ivory product were observed in Bogyoke market from Yangon area. In Mandalay, although the displayed of ivory product items for sale were decreased than the last year, the secret markets flow to China. Similarly, dealers stated that in Kyeiktiyo (Golden Rock) and Bhamo, elephant parts were carried to China. There is evidence to trade across the border with China (Li and Wang, 1999; Yi Ming *et al.*, 2000).

Rule of law and enforcement is necessary for commercial cities, border areas and gates. It is vital to increase border gate patrols for illegal ivory and elephant products trade, and restrict rules and regulations to control illegal trades in border areas. To prevent

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Displayed for sale of Ivory products and non ivory products in south entrance of Shwedagon Pagoda



Plate1. Displayed for sale of ivory and non ivory products in Pagoda market from Mandalay



(a) Molar teeth



(b) Molar teeth

(c) Molar teeth



(d) Pieces of molar teeth
ivory

(e) Pieces of molar teeth

(f)Tip of



(g) Elephant skins
Elephant skin

(h) Elephant skins

(i)

Plate 2. Showing for sale of elephant parts in traditional medicine shops from Kyeikyitio









Plate 3. Displayed for sale the ivory products in jewelry shops from Bogyoke market



(a) Ivory products
Necklace (bone)

(b) Ivory products

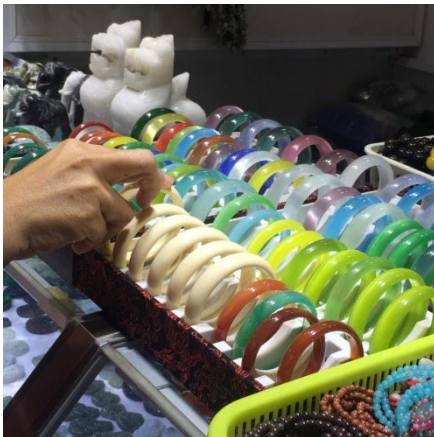
(c)



(d) Beads bangles (bone)



(e) Bangles (bone)



(f) Beads bangles (bone)

(g) Bangles (bone)

Plate 4. Displayed for sale of ivory products in jewelry shops (a), (b) and non ivory products in accessories shops (c), (d), (e), (f) and (g) from Bogyoke market



(a) Elephant skin

(b) Ring (ring)



(c) Tip of Ivory
teeth

(d) Piece of molar



(e) Bone powder

Plate 5. Displayed for sale of ivory products in Bhamo (a) Elephant skin, (b) Ring (c) Tip of ivory, (d) Piece of molar teeth, (e) Bone powder

MOTHER - INFANT RELATIONSHIPS AND INFANT BEHAVIOUR OF RHESUS MACAQUE (*MACACA MULATTA*) IN SHINMA TAUNG AREA, YESAGYO TOWNSHIP, MAGWAY REGION

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Abstract

Mother - infant relationships and infant behaviour of rhesus macaque (*Macaca mulatta*) from Shinma Taung area, Yesagyo Township, Magway Region was investigated during June, 2013 to February, 2014. The maternal care showed various motherly activities such as suckling, grooming, ventral and dorsal carrying. The behavioral data included the time spent on various infant activities. The activities patterns were observed on the focal sampling using five minutes scan at ten minutes intervals from 08:30hr to 16:30hr. A total of 288 scan samples in 1440mins of scan time were used. Based on nine months data, rhesus infant spent 20.21% of total time on grooming, followed by 16.88% on suckling, 15.14% on feeding, 14.03% on playing, 10.56% on moving (off mother), 10% on resting, 6.74% carrying infant ventrally and 6.46% carrying infant dorsally. Rhesus infant spent more time on grooming compared to the other activities. The strongest social bonds were linked between mother and infant.

Keywords: *Macaca mulatta*, mother-infant relationships, infant behaviour, Shinma Taung

Introduction

A characteristic feature of primate's life history is the prolonged period of postnatal development in which newborns depend on adults especially their mothers, for nutrition, transport and protection. Many researchers have focused on the development of infant nonhuman primates, attempting to identify factors that influence the ontogeny of social behavior, with strong emphasis on the mother – infant relationship (Nicolson, 1987).

Studies on infant development in Old World monkeys have concentrated on macaques, especially *Macaca mulatta* (Forster and Cords, 2002). Animals allocate resources, both time and energy, to offspring care at a cost to their own maintenance, survival or future reproduction (Altmann and Samuels, 1992).

Most studies on primate maternal styles have been conducted with Cercopithecine species in which variation in infant - directed behaviors usually fall along two dimensions: protection and rejection (Lathouwers and Elsacker, 2004).

Rhesus mother and infant relationship are the most intimate and long lasting of all the relationships (Rowell *et al.*, 1964). The infants of rhesus monkeys begin life completely dependent on their mother for survival, receiving all nourishment, physical warmth and other basic biological support. Rhesus mothers are usually very restrictive as they restrict the movements and social contacts of their infants from approaching or being approached by other monkeys (Sambyal *et al.*, 2009). The physical contact between mother and infant is influenced by the mother's feeding behavior (Johnson, 1986).

Rhesus monkey, infants develop distinctive social relationships with their mothers and with same-age peers during their initial weeks and months of life respectively. However, these relationships differ substantially, from one another in several fundamental ways. An infant attachment relationship with its mother is firmly established long before it begins any interactions with peers. The resulting attachment is specific to its mother whereas the infant typically develops multiple relationships with several different peers. The infant's frequency and duration of interactions with its mother are highest

during its first month of life and decline steadily thereafter, especially following the birth of younger siblings (Suomi, 2005).

Data on behavior of macaques from different places already existed Naw Phaw Phaw Say, 2005; Aye Mi San, 2007 and Nwe Nwe Win, 2013. Therefore there is sometime needed to carry out the same trend work in Shinma Taung area. The monkeys become so much accustomed to the human presence, making it easier to conduct study. Thus Shinma Taung was chosen as the area of study.

The objectives of the present study are:

- to study the relationship between rhesus mother and different ages of infant
- to compare the activity patterns of infant in rhesus macaque.

Materials and Methods

Study area

The study site is Shinma Taung area located at Yesagyo Township, Magway Region. The location of the area is situated between North latitudes ($21^{\circ} 35' N$ and $21^{\circ} 38' N$) and East longitudes ($95^{\circ} 03' E$ and $95^{\circ} 10' E$). According to the data from Dry Zone Greening Department, Pakokku District, the highest peak of Shinma Taung is 525.52 meters (1723 ft) and total area is 687.17 hectares (18995 acre) wide. It is covered with deciduous forest (Fig 1, Plate 1).

Study period

The study was conducted from June, 2013 to February, 2014.

Study group

From the study site, nine pairs of mother with offspring were selected as focal sampling monkeys. All individuals were recognized by features of their faces, tails and others body parts.

Activity pattern

The field's trip was conducted once a month (one day) during the study period. Data was collected using five minutes scan sampling with ten minutes intervals from 08:30 hr to 16:30hr. A total of 288 scan samples in 1440 mins of scan time were used. Behavioral data included time spent on various infant activities and activity between mother-infant relations was observed according to Foster and Cords (2002).

Behavioral categories

- | | |
|-------------------------|---|
| Suckling behavior | - Infant sucks nipple in mouth (whether clinging or not) |
| Grooming behavior | - Infant groomed by mother |
| Resting behavior | - Sitting off mother, sleeping, not engaged in social interaction, nor feeding. |
| Ventral carrying | - carrying position ventrally by mother |
| Dorsal carrying | - carrying position dorsally by mother |
| Moving (off the mother) | - Infant locomoting off mother |
| Playing | - social play with peers |
| Feeding | -searching for, manipulating and swallowing food items |

Figure 1. Map of Shinma Taung area (Source: Geology Department, Pakokku University)

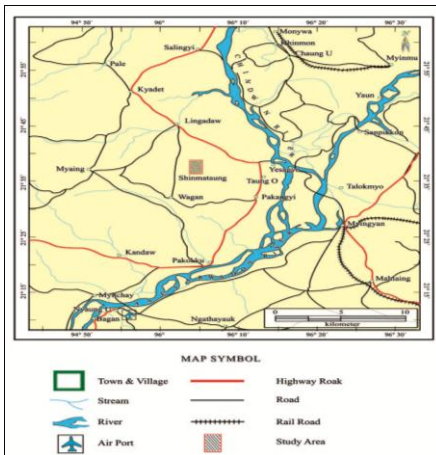
Results

Mother-infant relationship and infant behaviour

The newborn offspring was usually taken care of by females. Newborn infant spent a great deal of time nursing or sleeping on chest of its mother (Plate 1, and 2). Mother may restrict and control the activities of its infant by physically restraining it and by making contact with it frequently.

Time on mother (ventrally)

While the infant was on the mother, it regularly changed positions.



During one month old infant, the infant was almost always positioned ventrally to the carrying mother (Plate 3). But infant was not found ventrally to the carrying mother during the six months old (Table 1). The infant spent on the mother (ventrally) was 21.88% of time at the 1st month, 15.63% of time at the 2nd month, 13.75% of time at the 3rd month,

6.55% of time at the 4th month and 3.13% of time at the 5th month, respectively (Fig. 1, Table 2).

Time on mother (dorsally)

The infant began riding dorsally during the two months old infant (Plate 4). As the infant achieved locomotion independence, the percentage decreased to 9.38% during the 6th month and 6.25% by the 7th month. By the 8th month, the mother seldom carried the infant when traveling (3.13%) but never observed by the 9th month (Fig. 1 and Table 2).

Suckling

Mother helps with hands only pressing the infant to ventral side while carrying or suckling. Mother was generally very attentive to her infant but sometimes had difficult supporting infant in gaining nipple access, especially while moving or foraging. The infant spent on the nipple 39.38% of time at the 1st month, followed by the 2nd month with 37.50%, the 3rd month with 30%, the 4th month with 23.13%, the 5th month with 15% and the 6th month with 6.88% (Fig.2, Table 2). Although the mother rejected the infant for the first time in the five months old, the infant was being nursed still at the six months old (Plate 5).

Grooming

Infant received a great deal of grooming from its mother beginning on its first day of life (Plate 6). The highest time spent on grooming of infant rhesus was found 28.13% of time by the 1st month, the 2nd month with 25%, the 3rd month with 23.13%, the 4th and 5th months with 18.75%, the 6th and 7th months with 17.50%, the 8th month with 16.88% and the 9th month with 16.25% (Fig. 2, Table 2).

Time off mother (moving)

The time of an infant spent off the mother increased with age (Plate 7). The infant spent moving (off the mother) 3.13% of time at the 3rd month, 9.38% of time at

the 4th month, 10.63% of time at the 5th month, 15.63% of time at 6th month, 17.50% of time at 8th and 20% of time at the 9th month. (Fig. 2, Table 2).

Resting

The infant spent time sitting off mother, sleeping, not engaged in social interaction and nor feeding. The infant spent resting 10.63% of time at the 1st month, 9.38% of time at the 2nd month, 8.13% of time at the 3rd month, 9.38% of time at the 4th month, 10% of time at the 5th month, 11.25% of time at the 6th month, 10.63% of time at the 7th month, 10% of time at the 8th month and 10.63% of time at the 9th month (Fig.2, Table 2).

Playing

First social play occurred during the two months old of an infant. Early social play occurred with infant peers or small juveniles (Plate 8). When no playmates were available, solitary object play was observed and usually consisted of manipulation twigs and small sticks with hands and mouth. The infant spent 3.13% of time at the 2nd month, followed by the 3rd month with 9.38%, the 4th month with 12.50%, the 5th month with 15.63%, the 6th and 7th

months with 20.63%, the 8th month with 21.88% and 9th month with 22.50% (Fig.2, Table 2).

Feeding

Infant began to consume solid foods during the two months old, while riding dorsally the mother or moving about independently (Plate 9). It consumed solid foods 3.13% of time during the 2nd and 3rd months, 10% of time during the 4th month, 13.75% of time during the 5th month, 18.75% of time during the 6th month, 27.50 of time during the 7th month, 29.38% time during the 8th month and 30.63% time during the 9th month (Fig.2, Table 2).

Based on the data for nine months, it was found that rhesus infants spent 20.21% (32.33 ± 13.29 min) of their total time on grooming, followed by 16.88% (27 ± 7.45 min) on suckling, 15.14% (24.22 ± 25.93 min) on

Table 1.	
Time spent	
Mean ± SD	
	10.78 ±
	10.33 ±
	27.25 ± 9.3
	32.33 ±
	16.89 ±
	16 ± 1.50
	22.44 ±
	24.22 ±
Table 2	
Activity	
Feeding	
	0
	3.13
	3.13
	10.00
	13.75
	18.75
	27.50
	29.38
	30.63
	15.14

feeding, 14.03% (22.44± 6.69 min) on playing, 10.56% (16.89 ± 12.77 min) on moving, 10% (16 ±1.50 min) on resting, 6.74% (10.78 ± 13.42 min) carrying infant ventrally and 6.46% (10.33 ± 19.22 min) carrying infant dorsally (Figure. 3).

Activity pattern	Jun	July,	Aug,	Sep,	Oct,	Nov,	Dec,	Jan,	Feb, 14	Total
	e,	13 2 nd	13 3 rd	13 4 th	13 5 th	13 6 th	13 7 th	14 8 th	9 th	
Ventral carrying	35	25	22	10	5	0	0	0	0	97
Dorsal carrying	0	10	15	17	21	15	10	5	0	93
Suckling	63	60	48	37	24	11	0	0	0	243
Grooming	15	10	37	30	30	28	28	27	26	201
Moving (off the	0	0	5	15	17	25	28	30	32	152
Resting	17	15	13	15	16	18	17	16	17	144
Playing	0	5	15	20	25	33	33	35	36	202
Feeding	0	5	5	16	22	30	44	47	49	218
Month	Ventral	Dorsal	Suckli	Groom	Moving	Resting	Playing			
June, 13 (1 st)	21.88	0	39.38	28.13	0	10.63	0			
July, 13 (2 nd)	15.63	6.25	37.50	25.00	0	9.38	3.13			
Aug, 13 (3 rd)	13.75	9.38	30.00	23.13	3.13	8.13	0.38			
Sept, 13 (4 th)	6.25	10.63	22.13	18.75	0.38	0.38	17.50			
Oct, 13 (5 th)	3.13	13.13	15.00	18.75	10.63	10.00	15.63			
Nov, 13 (6 th)	0	9.38	6.88	17.50	15.63	11.25	20.63			
Dec, 13 (7 th)	0	6.25	0	17.50	17.50	10.63	20.63			
Jan, 14 (8 th)	0	3.13	0	16.88	18.75	10.00	21.88			
Feb, 14 (9 th)	0	0	0	16.25	20.00	10.63	22.50			
Percentage	6.74	6.46	16.88	20.21	10.56	10.00	14.03			

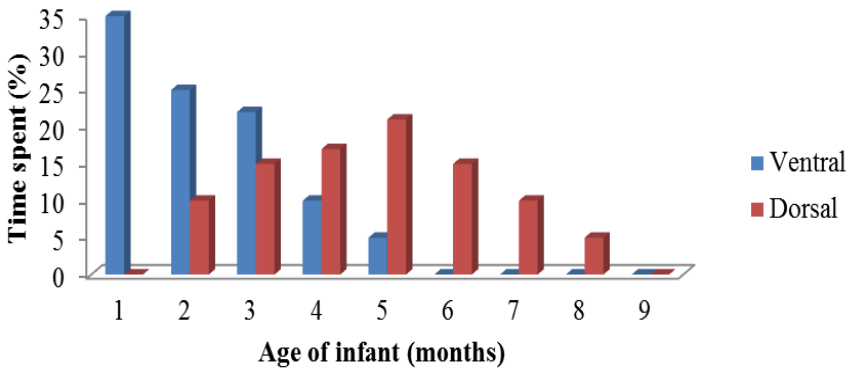


Figure1. Monthly time spent according to the position adopted by infant staying on the mother

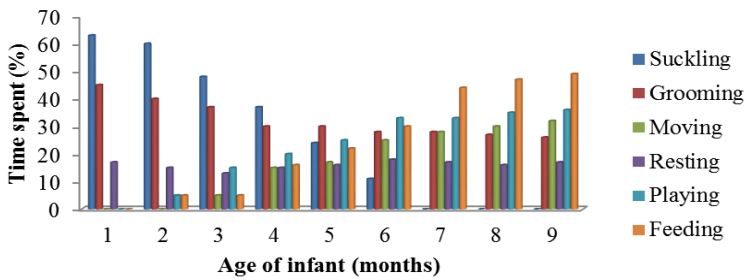


Figure2. Monthly time spent on infant according to mother-infant relationship

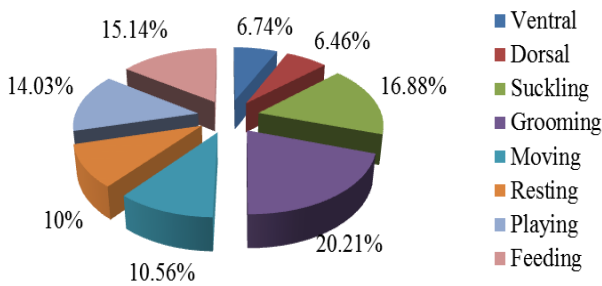


Figure3. Percentage of the activity patterns of infant *Macaca mulatta*



Plate1. Focal study groups of mother and infant



Plate 2. Embraced her infant with one arm



Plate3. Mother carrying her infant (Ventral side)



Plate 4. Mother carrying her infant (Dorsal side)



Plate 5. Suckling behaviour



Plate 6. Grooming behaviour



Plate7. Moving behaviour



Plate 8. Playing behaviour



Plate 9. Feeding behaviour

Discussion

Mother-infant relationship and infant behavior of rhesus macaque (*Macaca mulatta*) were conducted during the study period of June, 2013 to February 2014. In this study, transference of infants between their parents was rarely observed during the study months Dixson and Fleming (1981) reported that after the infant *Aotus lemurinus* had suckled, transfer from mother to father occurred. This is probably due to different habit of species.

In the present study, ventral carrying position occurred most frequently during the one month old infant rhesus but thereafter the infant was increasingly positioned on the dorsal surface of the mother. Moreover the infants spent 6.74% of their total time on mother (ventrally) and 6.46% on mother (dorsally). This finding is in agreement with the statement of Dixson and Fleming (1981) that the mother carries the single offspring during the 1st week in *Aotus Lemurinus*. It may be assumed that this shows a strong and affectionate social bond between mother and her infant.

In this study the infants spent 16.88% of their total time on suckling. The infant did not remain on the nipple of the mother often at about 6 months old. This finding is in agreement with the statement of Fooden *et al.* (2000), who found that at about four or five months of age, mothers begin to resist the attempts of their offspring to suck or nurse.

Immature rhesus monkeys resemble many other primate species in enduring grooming relationship with their mothers. In this study during the one month old, rhesus infants spent the most time on grooming (20.21%) compared to other months. This is similar to a study of Aye Mi San (2007) that young infants were groomed more often by their mothers than older infants. It is assumed that the frequency of mother to infant grooming depends on the age of infant. Moreover most immaturity groomed with their mothers more than with any other partner. This is similar to a study of Nwe Nwe Win (2013) that mothers continue to groom their offsprings while they are moving out from the group. It is assumed that the social bonds are the strongest ones between mothers and infants.

During the three or four month old infant, they began gradually to break contact with their mothers. Moreover mothers also gradually rejected the attempt of their infants to make contact and gain access to nipple. The infants spent time of 10.56% moving (off the mother). This finding is supported by Hinde and Spencer-Booth (1967), who reported that during the first few weeks of infant life, mothers are almost entirely responsible for maintaining contact and proximity of their infants. During the two or three

months old infant life, mothers frequently break contact with and walk away from their infants, while the infants follow their mothers and make contact with them. It may be assumed that mothers encourage their infants staying independently.

In this study, during the two months old infants spent time playing with twigs and leaves. As infants became more independent, they spent increasing amount of time in rough and tumble play with their peers. The infants spent time of 14.03% on playing. This is similar to a study of Nwe Nwe Win (2013), who reported that the juveniles and infants spent more of playing behavior of than the adults. This finding is similar to the report of Rotundo, *et al.* (2005), who found that during the second month most play consisted of the infant moving and jumping around other members of the group on playing with twigs and leaves. When the infants were three months old, they started chasing juveniles in the group. When the infants were older, play chases continued. It is assumed that it is associated with their physical and behavioral development and socialization.

In this study infant began to consume solid food at the two months old and it was weaned by seventh month. The infant spent 15.14% of this total time on feeding. This finding is supported by Rotundo, *et al.* (2005), who reported that in Argentina, infants began to manipulate twigs and food items during the two months old and that by four months old they eat fruits. It is assumed that infants explore the environment and start foraging independently.

It was concluded that rhesus infants spent the most time on grooming compared to other activities. The grooming between mother and her younger infant was frequently observed especially in the birth season. So the strongest social bonds are linked between mother and infant. Thus it is important for the group living primates. The finding of the present study is contributing to future researchers who study with reproductive biology and animal behaviors of macaques in Myanmar.

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