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Distribution of Large- and medium-sized Mammals in Sumatra Island, Indonesia

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INTRODUCTION

Habitat degradation is rapidly increasing in Sumatra, which seriously threatening tropical biodiversity and may cause some local extinction of many mammal species. In many tropic countries including Indonesia, even the first step information on the distribution of large- and medium-sized mammals is not provided yet. Such information is usually limited on some reserved areas and/or specific localities; for example, many references introduce basic information on the distribution of each species only by the landmass of large islands such as Sumatra, Kalimantan, Java and etcs (e.g., Colbet & Hill 1992, Noerdjito & Maryanto 2001, Payne & Francis 1998, Suyanto et al. 1998). The relationship with human activities and/or the detailed distribution pattern of the subject species in those islands are very obscure. The realistic information on the historical changes on those species' distribution is very poor. The information how wide and large populations are currently present on those islands are known insufficiently excluding some specific species. Undoubtedly, such information is essential for conservation of the species. The large- and medium-sized mammal species, further, are often key or umbrella species in the relevant ecosystem and their presence is extremely important for considering conservation of tropical biodiversity.

We surveyed current distributions of 26 large- and medium-sized mammal species in three provinces of Sumatra; that is, West Sumatra, Riau and Jambi Provinces. The West Sumatra Province has been developed from the earlier historical time, while in the other two provinces economical developments were being done very rapidly recently. Especially in the Riau Province habitat destructions accompanied with large scaled plantations are being done at anywhere during these one or two decades. Therefore, the now is a time that we should make notice about the changing nature of Sumatra and remain the historical records of living species in the area. The detailed information on those species could help us to establish better way for their conservation.

This study aims to delineate present distribution and population status of 26 large- and medium-sized mammal species living in Sumatra concerning with geographical and floral differences as well as habitat degradation and human-animal relationships. The subject 26 species includes 8 primates, 7 carnivore, elephants, 5 ungulates, tapir, porcupines, flying lemur, pangolin and otter. The present status of those mammal species would be described with factors affecting their distribution. The study will be extended to analyze the historical change of distribution and possible factors to influence on those, especially on elephants and tigers.

METHOD

Field survey was conducted in 2003, 2004 and 2005 in West Sumatra (36,218km^2, population=4.18million in 2000, excluding offshore islands), and in 2006 in Riau (94,562km^2, population=1.8million in 2005) and Jambi (53,436km^2, population=2.41million in 2000) provinces. Data on the distribution of large- and medium-sized mammal species were collected by direct interviewing to the local inhabitants approximately at every 5km distances in West Sumatra and at

every 10km distances in the other two provinces traveling along the main roads and its tributaries by a car. The number of locations where interview was made is 550 in total; 270 in West Sumatra, 160 in Riau and 120 in Jambi Provinces. Each location was confirmed using GPS information and recorded on the map.

Direct interview was made to the local inhabitants, preferably old men (18years of age or more), long-lived residents at the relevant location (more than 3years), and workers in the nearby forests (hunters, farmers, loggers). For avoiding misunderstandings by personal differences of their experiences, exaggeration, and malicious deception interview was repeated at two or more places at any locations. We prepared photographs and/or drawings of subject species to indicate and, if need, their sounds or videotapes were shown for them. The questionnaires include 1) presence or absence of each species, 2) last encounter (especially on tiger and elephant), 3) land use and its change, 4) relationships between human beings and subject species (damage on crops, threat on peoples, hunting pressure, animal trading, etc). In some appropriate locations, further, we carried out direct observation on those species and investigated the pet owners or ornaments from animals.

RESULT

The present distribution of 26mammal species (Tab. 1) was analyzed in the separate sheets by each province (the map of surveyed route is shown in Fig. 1). We got no information on Sumatran Rhinoceros and guess the species was extinct in the earlier day in the area.

The distribution pattern of each species was varied by their nature and surrounding conditions which might influence on their lives. Generally, the distribution of those mammal species was very likely to become smaller due to the habitat

Figure 1 The map of survey route
Each spot indicate the location where direct interview was carried out.

Table 1 The list of mammals species surveyed

No	Species	English Name	Local Name
1	*Nicticebus coucang*	Slow loris	Kukang
2	*Macaca fascicularis*	Long-tailed macaque	Monyet
3	*M. nemestrina*	Pig-tailed macaque	Beruk
4	*Presbytis melalophos*	Mitered leaf monkey	Simpai
5	*P. femoralis*	Banded Leaf Monkey	Nokah
6	*P. cristata*	Silvered langur	Cingkuak
7	*Hylobates agilis*	Agile gibbon	Ungko
8	*H. syndactylus*	Siamang	Siamang
9	*Sus scrofa*	Wild Pig	Babi
10	*Cervus unicolor*	Sambar deer	Rusa
11	*Muntiacus muntjac*	Common barking deer	Kijang
12	*Tragulus napu*	Mouse-deer	Kancil
13	*Capricornis sumatraensis*	Mountain goat	Kambing hutan
14	*Panthera tigris*	Sumatran Tiger	Harimau
15	*Felis bengalensis*	Asian golden cat	Kucing hutan
16	*Neofelis nebulosa*	Clouded leopard	Harimau dahan
17	*Helarctos malayanus*	Sun bears	Beruang madu
18	*Paradoxurus hermaphroditus*	Common palm civet	Musang
19	*Arctictis binturong*	Bearcat	Bintorong
20	*Mustela nudipes*	Malay weasel	Muntira
21	*Lutra lutra*	Otter	Berang-berang
22	*Cynocephalus variegatus*	Flying lemur	Kubung
23	*Manis javanica*	Pangolin	Tenggiling
24	*Hystrix brachyura*	Common porcupine	Landak
25	*Tapirus indicus*	Malayan tapir	Tapir
26	*Elephas maximus*	Elephants	Gajah

destructions. The data, however, indicates that many species still keep wide distributions in the area. It can be natural since we searched for information only on the presence of subject species in the relevant area where some scattered forests remained and even a very small population could be counted as "presence." Anyway, the distribution of some species (e.g. elephant, tiger, leopard, gibbon, siamang, deer, bear, tapir, flying lemur) were small and scattered, while some species (e.g. wild boar, crab-eating monkey, common palm civet, otter) still kept wide distributions well in the altered habitats by human beings. Land use trend and habitat disturbance may influence on each species in different ways. However, it was apparent that clearance of the forest cover for establishing the cultivated field and/or human settlement had the serious effects on most species' distributions and some local extinction might occur in such areas recently.

The relationships between land use types and species' distribution are shown in Table 2. Further, the relationship between vegetation types and species' distribution was shown in Table 3. It is interesting that most of land use and vegetation types still foster many species. However, we should examine carefully more in detail on those distributions since it is very possible those distributions indicate only the remnant population of the species in the area decreased rapidly within these few decades. Further, the distribution pattern does not suggest anything on the changes of their population densities. The populations of widely distributed species like wild boar, long-tailed macaque, palm civet and otter, however, can be expected sustainable when the present condition or present degree of habitat alteration will be kept. Besides, it is apparent that the most endangered species is elephant and then Sumatran tiger.

table 2 The relationships between species' distribution and land use (West Sumatra, Riau, Jambi)

No	Local Name	English name	Abandoned (n=10)	Deforest (n=39)	For & Trad (n=168)	Forest (n=32)	Plant & For (n=17)	Plant & Trad (n=42)	Plantation (n=60)	Swamp forest (n=12)	Traditional (n=170)	Total (N=550)
1	Pukang	Slow loris	2	22	138	27	11	21	16	3	95	335
2	Monyet	Long-tailed macaque	3	34	157	30	15	34	38	11	149	471
3	Beruk	Pig-tailed macaque	2	32	159	31	17	32	29	9	92	403
4	Simpai	Milered leaf monkey	3	20	125	27	4	21	24	1	94	319
5	Nokah	Banded Leaf Monkey		9	30	5	10	10	10	4	22	100
6	Cingkuak	Silvered langur	2	19	72	8	9	23	16	4	76	229
7	Ungko	Agile gibbon		24	106	23	14	23	17	6	53	266
8	Siamang	Siamang		15	128	31	5	8	8	2	27	224
9	Babi	Wild Pig	10	37	168	32	17	42	57	12	160	535
10	Rusa	Sambar deer	1	22	131	28	11	25	20	5	63	306
11	Kijang	Common barking deer	3	22	147	31	12	22	21	2	84	344
12	Kancil	Mouse-deer		25	110	28	12	21	18	5	68	287
13	Kambing	Mountain goat		1	49	20		1			8	79
14	Harimau	Sumatran Tiger		15	88	28	6	9	4	7	13	170
15	Har buluah	Asian golden cat	6	31	130	28	16	28	39	7	109	394
16	Har dahan	Clouded leopard		14	91	19	8	15	5	4	51	207
17	Beruang	Sun bears	3	26	135	29	13	23	13	6	72	320
18	Musang	Common palm civet	10	38	164	31	16	42	58	10	165	534
19	Binturong	Bearcat		14	94	25	5	10	4	1	63	216
20	Muntira	Malay weasel	4	26	121	22	11	21	21	1	93	320
21	Berang2	Otter	9	32	158	30	16	38	42	10	158	493
22	Kubuang	Flying lemur		12	98	21	12	15	11	3	57	229
23	Trenggiling	Pangolin	7	32	146	29	14	32	41	8	131	440
24	Landak	Common porcupine	8	30	154	29	15	32	34	6	123	431
25	Tapir	Malayan tapir	2	17	109	28	8	18	5	1	45	233
26	Gajah	Elephants		5	12	2	3	3	2			27

Land Status

Abandoned (unfertil, no cultivation after clearing, usually dominated by bushes)
Deforest (forest extracted from logs)
For & Trad (Forest form adjacent to traditional land use)
Forest (Forest reserve)
Plant & For (Plantation adjacent to forest form)
Plant & Trad (Plantation adjacent to traditional landuse)
Plantation (large scale of monocultur plant)
Swamp forest (temporary floated)
Traditional (traditional landuse)

Table 3 The relationship betwwen species' distribution and vegetation types

No	Vegetation	English name	1 (n=55)	2 (n=182)	3 (n=168)	4 (n=18)	1 & 2 (n=22)	2 & 3 (n=64)	3 & 4 (n=41)	Total (N=550)
1	Pukang	Slow loris	9	87	134	18	7	46	34	335
2	Monyet	Long-tailed macaque	26	154	160	18	16	60	37	471
3	Beruk	Pig-tailed macaque	15	113	158	17	6	53	41	403
4	Simpai	Mitered leaf monkey	12	84	105	14	8	58	38	319
5	Nokah	Banded Leaf Monkey	9	38	44	4		2	3	100
6	Cingkuak	Silvered langur	12	83	99	4		19	12	229
7	Ungko	Agile gibbon	7	62	124	15	2	31	25	266
8	Siamang	Siamang	2	28	85	18	6	46	39	224
9	Babi	Wild Pig	48	178	168	18	18	64	41	535
10	Rusa	Sambar deer	9	65	139	14	3	42	34	306
11	Kijang	Common barking deer	11	73	145	18	4	54	39	344
12	Kancil	Mouse-deer	6	74	130	17		32	28	287
13	Kambing	Mountain goat		4	27	11		11	26	79
14	Harimau	Sumatran Tiger	1	24	81	17	1	16	30	170
15	Har buluah	Asian golden cat	33	113	139	16	7	49	37	394
16	Har dahan	Clouded leopard	1	38	105	15		21	27	207
17	Beruang	Sun bears	6	81	133	18	4	42	36	320
18	Musang	Common palm civet	53	174	166	18	21	61	41	534
19	Binturong	Bearcat	3	44	86	16	2	36	29	216
20	Muntira	Malay weasel	16	88	122	16	5	44	29	320
21	Berang2	Otter	36	162	158	18	18	60	41	493
22	Kubuang	Flying lemur	3	59	111	12		18	26	229
23	Trenggiling	Pangolin	35	134	154	16	11	54	36	440
24	Landak	Common porcupine	22	131	156	17	7	59	39	431
25	Tapir	Malayan tapir	3	32	111	15	2	33	37	233
26	Gajah	Elephants	2	6	16	1		2		27

Vegetation type

1 Clearing, bush or monocultur vegetation
2 Bush with scattered trees
3 Secondary forest with gaps or forest form mixed with cultivated plant
4 Forest form with interconnected canopy

The brief description on each species' distribution is as follows;

(1) Elephant (*Elephas maximus*)

The present distribution of elephants was confirmed only in 27 locations within three provinces (5% of all locations surveyed). This species now can be seen in Riau and only adjacent small areas in West Sumatra, and disappeared from Jambi within these several years. After 1980, its distribution shrank away to only 31% (Table 4). The reason of very rapidly decreasing distribution could be that the main habitat of elephants is lowland plains and those areas have been altered recently for large-scaled plantations. The areas of Riau and Jambi Provinces were covered widely by the secondary forests until around 1980. The lowland forests were kept relatively untouched because the area could not be utilized for agriculture without irrigation with a use of heavy machinery. Now, we found many large-scaled plantations of oil palms and acacia trees in the lowlands. A lot of trucks transported the products without interruption in the area. Presumably, the most altered habitat within these one or two decades was the lowland plains where elephants live. The extant population of elephants is likely to travel around some scattered forest patches and, when they entered to the cultivated fields, they were being chased off or killed at anywhere. Undoubtedly, each group of elephants needs a wide range and so, their population can be decreased more unless the present condition could be improved.

Table 4 The successive changes of elephant distributions

Locations where elephant disappeared in Jambi (Survey Aug-Sept2006)							
The year of the possible last record of elephant							Currently exist
1940	1950	1960	1970	1980	1990	2000	2006
J117	J039	J023	J017	J019	J007	J026	
		J038	J018	J022	J046		
			J020	J088	J084		
			J021	J090	J085		
			J024	J100			
			J047				
			J051				
			J053				
			J055				
			J059				
			J082				
			J087				
			J089				
#1 1	1	2	13	5	4	1	0
#2 26	25	24	22	9	5	1	0

Location where elephant disappeard in Riau			
The year of disappearance			Currently exist
1980	1990	2000	2006
R001	R002	R015	R050
R005	R003	R016	R051
R021	R004	R070	R052
R026	R007	R072	R068
R029	R014	R088	R069
R030	R042	R089	R073
R039	R045	R094	R079
R041	R057	R095	R080
R047	R066	R096	R085
R048	R086	R098	R087
R053	R092	R099	R091
R062	R124	R107	R097
R127	R126	R114	R100
R128	R151	R123	R101
R129		R149	R103
R146		R155	R104
R147		R158	R105
			R106
			R116
			R117
			R153
			R156
#1 17	14	17	
#2 70	84	89	22

Note: Location number was indicated under the year of final records:
#1: The number of locations where elephant disappeared.
#2: The cummulative number of locations where elephant was present

(2) Tiger (*Panthera tigris sumatraensis*)

It looks like that the distribution of tiger is still wide when comparing with elephants since their presence was confirmed at 31% of all locations surveyed. However, their distribution was also being decreased recently (Table 5). About 50years ago tiger could be found in the most areas and their distribution decreased much around 1970s to 1980s. The present distribution of tiger is characterized by the widely scattered but not concentrated patches. It may indicate the nature of tigers that each individual have a wide range and move quickly. The big population of wild boars (tigers possibly depend on them for their foods) may assure their lives in the area. Peoples may kill tigers at anytime when tigers appeared near to the villages. The nocturnal activity and quick movement of tigers may conceal their presence and real situation of them. It is noteworthy that each individual tiger may need about a 20km^2 range and the habitat of them is now being largely altered. It is unknown how many individuals of tiger are there, but presumably it can not be so large. Their presence always attract remarkable attention of human beings and so, it is very possible that the wide distribution of tigers is somewhat exaggerated by such a conspicuousness of species.

(3) Primates

1) Siamang (*Hylobates syndactylus*)

The population of siamang was found mostly in the highland, especially along the Barisan Mountains although a few populations were known existing near coastline of West Sumatra. They exist usually in the steep slopes of the mountain not suitable for plantation. The species was located at 41% of the area surveyed.

2) Ungko; agile gibbon (*Hylobates agilis*)

The species distribute widely in the area (48% of the locations). Fur coloration varies from brown, dark brown to black but local difference was not recognized. In some locations they live sympatric with siamang. Ungko needs forests with interconnected canopy and this species as well as siamang did not occur without forests. They were often found in the forest patches where only a few individuals could survive and isolated far from the other. This species are more common in the lowland forests than siamang. Scattered population in small fragmented habitats might not be able to grow and anyhow disappear in the near future.

3) Beruk; pig tail macaque (*Macaca nemestrina*)

Population of pig-tailed macaques foraged close to human villages especially near traditional cultivate fields. Their night sleeping sites, however, are usually in the forest. They are very sensitive to the presence of human beings and soon escaped when they encountered. Local inhabitants often complained this macaque as a pest because they often raid many kinds of fruit and vegetables. Such problem occurred often at the crop fields close to the forests. Sometimes they were trapped or poisoned. Pet and animal trades were occasionally found. Forest clearance and large-scaled plantation undoubtedly influenced on their distribution and population density, but their distribution is still wide (73% of the locations).

4) Monyet; long tail macaque (*Macaca fascicularis*)

This species is very common in the area (reported at 86% of the locations surveyed). Population spreads widely from coastline to mountains. Riverbank, traditional land use and mixed forest with agricultural plants were favorable habitats of them. Logging and forest disturbance might not severely threaten their population. People recognize this species very easily because they live near to the human settlements. Crop raiding was reported in many places. This species seems to be able to adapt well to the man-made environments.

5) Cingkuak; silver leaf monkey (*Presbytis cristata*)

The species mostly distribute in the lowland forests along the riversides and does not occur in the highlands (42% of

Table 5 The successive changes of tiger distribution

West Sumatra

Number of locations where tiger disappeared in Sumbar							Currently exist		
1950	1960	1970	1980	1990	2000		2004		
49	34	7	3	4	31	1	74	151	227
52	50	11	6	13	67	2	75	153	229
55	60	14	35	17	182	5	76	154	231
90	61	15	38	24	235	12	77	159	232
115	85	20	38	25	238	16	81	160	233
127	86	23	44	26	260	18	82	161	234
138	89	28	48	27	261	19	83	162	245
214	94	30	62	46		21	87	163	246
	114	37	68	47		22	102	167	248
	121	42	84	65		29	104	172	249
	122	51	93	135		32	105	173	250
	125	53	95	169		33	106	174	253
	129	54	117	185		39	109	177	254
	130	88	140	200		40	110	178	255
	133	92	170	240		41	111	179	258
	207	96	176	259		43	112	180	267
	215	98	190			45	124	186	268
	228	119	198			56	141	188	269
	264	123	219			57	142	189	
		131	237			58	143	199	
		152	238			59	144	202	
		165	257			63	145	203	
		222				64	146	205	
		226				66	147	206	
		230				69	148	210	
		247				70	149	218	
		256				72	150	223	
#1 8	19	27	22	16	7				
#2 198	190	171	144	122	106	99			

Location where tiger disappeared in Riau

The year of disappearance					Currently exist
1960	1970	1980	1990	2000	2006
R011	R040	R005	R014	R023	R003
R057	R050	R015	R039	R035	R004
R076	R054	R025	R044	R036	R017
R110	R059	R042	R045	R051	R021
R111	R093	R053	R052	R074	R022
R129	R094	R055	R061	R087	R027
R130	R100	R062	R064	R117	R028
R132	R112	R070	R066	R120	R029
R137	R122	R071	R072	R139	R033
R148	R133	R073	R082		R046
R154	R135	R077	R085		R047
R155	R138	R088	R086		R048
	R142	R089	R114		R060
	R143	R090	R118		R068
	R152	R091	R119		R069
	R153	R092	R124		R078
	R157	R095	R126		R080
		R116	R149		R081
		R128	R159		R083
		R134			R084
		R136			R096
		R144			R097
		R147			R098
		R160			R099
					R101
					R103
					R104
					R105
					R106
					R108
					R109
					R110
					R113
					R121
					R123
					R131
					R145
					R146
					R150
					R151
					R156
					R158
#1 12	17	24	19	9	
#2 123	111	87	63	44	25

Number of locations where tiger disaapeared in Jambi (Suvey August-Sept 2006)

The year of possible last record of tiger							Currently exist
1940	1950	1960	1970	1980	1990	2000	2006
J096		J021	J010	J001	J026		J027
		J029	J012	J002	J055		J046
		J033	J013	J004	J110		J047
		J052	J030	J005			J053
		J079	J035	J006			J054
		J084	J038	J011			J058
		J087	J039	J014			J066
			J044	J018			J070
			J059	J023			J071
			J069	J034			J076
			J080	J049			J078
			J081	J061			J085
			J083	J068			J089
			J086	J072			J090
			J086	J075			J091
			J092	J082			J097
			J112	J107			J099
			J114	J109			J100
				J115			J102
							J103
							J104
							J105
							J106
							J113
							J117
							J118
							J119
							J120
#1 1	0	7	18	19	3	0	28
#2 76	75	75	68	50	31	28	28

Note: Location number was indicated under the year of final records:
#1: The number of locations where tiger disappeared.
#2: The cummulative number of locations where tiger was present

the locations). It is likely that they still occur in their original habitats even though their population became small. However, the detailed analysis was not yet done.

6) Simpai; (*Presbytis melalophos*)

This species includes several local variations and still widely distributed (58%), but does not occur in the area where nokah distribute (allopatric species). This species live in the natural forests but also well adapted in the mix forests with cultivated plants. Dense population of them was usually found in the traditional land use including rubber plantations.

7) Nokah; (*Presbytis femoralis*)

The species distribute in the area between Kampar and Indragiri Rivers and to the east of Barisan Mountains. Together with simpai, the species can be seen widely in their original range.

8) Kukang; slow loris (*Nycticebus coucang*)

Slow loris is a nocturnal primate species and distributed widely (61% of the locations). Forests and traditional land use are favorable habitats for slow loris.

(4) Ungulates

1) Babi; wild boar (*Sus scrofa*)

Wild boar was found in the most areas (97% of the locations). Forest destruction and human habituation per se might not threaten their population. It is possible that the population increased in the newly established habitats. Traditional hunting being done by human beings does not threat the boar population. More than 80% of peoples in this area don't consume pork because of religious restriction. Conflict between wild boar and farmers has reported from many areas.

2) Rusa; Sambar deer (*Cervus unicolor*)

Sambar deer was reported in about half of all locations (54%). They could adapt well to the newly established habitats such as palm oil plantations which usually provide grasses or herbs for their foods, and forest gaps may create grazing spots. Traditional hunting and trapping occurred at almost all area surveyed because deer meat is favorable for local peoples. The meat of deer was being sold on the market at some places. Antler and skin were also used as decorations and ornaments. Crop damage by deer also reported in some areas. Usually deer make damage on vegetable and seedling or sapling of rubber. Comparing with wild boars the distribution of sambar deer was rare around the villages and/or areas disturbed by human beings.

3) Kijang; Barking deer (*Muntiacus muntjac*)

Kijang was reported in 63% of all locations surveyed. The species live in the forests remaining in the area.

4) Kancil; Mouse deer (*Tragulus spp.*)

Mouse deer was found almost half of the locations surveyed (52%). They may include two different species; Greater Malay mouse deer (*T. napu*) and Lesser Malay mouse deer (*T. javanicus*). It was difficult to discriminate these two species in the field and no effort to allocate them was done. Together with kijangs, the distribution patterns were similar with that of sambar deer.

5) Kambing hutan; mountain goat (*Capricornis sumatraensis*)

This species distribute only in the mountainous areas of Barisan Mountains. The small number of location distributed (14%) is the reflection of such a species' nature but not indicates the decreasing habitats. The mountainous areas in the area seem to be maintained relatively untouched because of very steep land physiognomy, which may secure the survival of this species.

6) Tapir; Malayan tapir (*Tapirus indicus*)

Tapirs were reported at 42% of all locations surveyed. This species might have occurred in the wider areas through mountainous areas to lowlands in the former times, but it is possible that their distribution is being decreased especially in the area where habitat destructions were done seriously.

(5) Carnivores

1) Harimau dahan; clouded leopard (*Neofelis nebulosa*)

Clouded leopards were reported at 38% of all locations surveyed. It was unknown whether the information involved those on sympatric Marbled cats (*Pardofelis marmorata*) or not. The distribution pattern is resemble to that of tigers but somewhat larger. The reported locations were less than tiger in the forests (Table 2), but it might reflect the habits of this species to conceal themselves in the forest. On the other hand, tiger could cause boisterous uproars of local inhabitants at any time when they were detected.

2) Kucing hutan; leopard cat (*Felis bengalensis*)

This species were found in the most areas (72%). We found some specimens killed by traffic accidents even in the center of large oil palm plantations. There are some other wild cat species, but their coat color is very distinctive and easily detectable. We are, thus, convinced that Leopard cats have wide distribution and they might be able to survive in the newly established circumstances.

3) Beruang madu; Sun bear (*Helarctos malayanus*)

Sun bears were reported in 58% of all locations surveyed. The distribution of this species is wider than tigers or clouded leopards but smaller than leopard cats or palm civets. It is especially true in the habitats where forest cover was disturbed, which indicates the species also need forests for survive.

4) Musang; common palm civet (*Paradoxurus hermaphroditus*)

Common palm civets were found at any sites (97%). Several other species of civets distribute in the same areas. Their external coat color of the species is very distinctive, but it might be inevitable that information on some other species intermingle with in some areas. However, this species were often found in the homes of local inhabitants and have wide adaptability to the man-made environments.

5) Binturong; bearcat (*Artictis binturong*)

Bearcats were found at 39% of all locations surveyed. Bearcat might depend on the forest habitats when comparing with other Mustelidae species.

6) Muntira; Malay weasel (*Mustela nudipes*)

Malay weasels were reported at 58% of all locations surveyed. The body of this species is blight orange that can not be seen in the other sympatric martens, badgers and civets. So, the information on the species could be correct.

7) Berang-berang; otter (*Lutra sp.*)

Otters were reported widely (90% of the locations). They might include some other species (e.g., hairy-nosed otter, *Lutra sumatrana*), but they were not discriminated in the field. Anyway, otters live at any places along the river tributaries at present.

8) Kubung; flying lemur (*Cynocephalus variegatus*)

Flying lemurs were reported at 42% of the locations surveyed. The distribution of the species limited to the forest habitats and even in the forests they were not reported in some areas.

9) Tenggiling; Pangolin (*Manis javanica*)

Pangolins were found in all habitat types and at any places (80% of all locations surveyed). This species could survive well in the newly-established habitats.

10) Landak; Porcupine (*Hystrix spp.*)

Porcupines may involve two species; *H. sumatrana* and *H. brachyura*, but no discrimination was done in our survey. Porcupines were found at 78% of the locations surveyed and so, they may still have a wide distribution.

CONCLUTION

It was very conspicuous that distribution of many species has been decreased with enlargements of large-scaled plantation of oil-palm or acacia trees, especially which is being done in the Riau Province. This survey only concerned with the distribution of the species and no data on the population or density of those species is available. It was strongly suspected that, at present, only the small population of many species remained in the isolated and scattered forests within the large-scaled plantations although they were found still in the wide areas. We are convinced that the variety of mammal species in the transformed areas could be decreased by the time passed by.

In the West Sumatra Province, many species still distribute. It may be the result that the steep slopes of Barisan mountains run in the center of province and civilization in the area occurred from the ancient times and the room for large-scaled plantation was not so large. For instance, however, it is known that huge number of agile gibbons (8 groups/km^2) live in the reserve forest adjacent to the Andaras University, Padang (usually 3 group/ km^2). We should carefully study about what occurred in fauna of the area too.

The economical development in the Jambi Province was done a little bit earlier than Riau Province. It may reflect to the differences between these two provinces and, as elephant disappeared from Jambi, the results is suggestive for the future in the Riau Province.

Elephant is now especially in the dangerous state when considering their survival in the area. It depends on their ecological needs for wide lowland forest habitats. As far as the large-scaled plantation will be continued, elephant can vanish out in the area.

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要約

スマトラ島における現生中大型哺乳類の分布現状およびその歴史的変遷に関する調査研究

アムシル・バカル、リザルディ、サンティ・N・カミラ

スマトラ島中部西スマトラ州、リアウ州、ジャンビ州において、8種の霊長類、トラ、ゾウ、イノシシ、サンバージカ、ホエジカ、マメジカ、ベンガルヤマネコ、マレーグマ、ビントロン、ジャコウネコ、タピル、ヤマアラシ、センザンコウ、マレーイタチ、カワウソ、ヒヨケザル、カモシカ、ウンピョウの計26種中大型哺乳類について、現在の分布状況に関する聞き取り調査を行った。聞き取り内容は、1)各種の生息有無、2)最後の観察年(特にゾウとトラ)、3)土地の利用形態とその変化、4)人間との関係(獣害や狩猟圧等)であり、聞き取りの不正確さを防ぐため、土地に長く住んでいる年輩で、できるだけ近隣の森近くで働いている人を優先し、かつ各地点複数回の聞き取りを原則とした。また動物写真や録音した音声なども必要に応じて回答者に示した。聞き取り地点は西スマトラ州270地点、リアウ州160地点、ジャンビ州120地点である。西スマトラ州は、スマトラ島を縦断するバリサン山脈にそって古くから開けていた。一方、リアウ州はかって低湿地林が優先していたが、ここ20年ほどの間に大規模な開発が進められたところである。調査の結果、1)スマトラサイについては全く情報がなく、この地域にはすでに棲んでいないと思われること、2)トラとゾウの分布はこの30年ほどの間に急速に減少している。特にゾウは低地林にしか分布しないので、現在リアウ州・ジャンビ州で進められている低地林の改変、特にアブラヤシ・プランテーションやアカシアの植林が大きな脅威になっていること、3)テナガザル等の霊長類はパッチ状に残された森にまだ生息しているが、それぞれの個体数が小さく分断されていて、将来に暗い影を落としていること、4)それぞれの種が多様な分布パターンを示したが、現時点ではまだかなりの種がそれなりに広い分布域を持っていた。またイノシシやカニクイザルなどのように、あるいは人為的な環境に進出して分布を広げているのかもしれないと思われる種もあることがわかった。いずれにせよ現在は急速に環境改変が行われている時期であり、本調査結果は今後の各種個体群モニタリングのための基礎となるものである。各州政府や森林局自然保護局に対して、各種の今後の動向について注意を払うよう働きかけていきたい。

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