

A SURVEY OF THE MAMMALIAN FAUNA OF THE GUNUNG RARA FOREST RESERVE, TAWAU, SABAH

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ABSTRACT. *Gunung Rara Forest Reserve is a commercial Forest Reserve under concession of Yayasan Sabah in Tawau, Sabah. A four months mammal survey, was carried out in a forest area actively logged by the Reduced Impact Logging techniques within the Forest Reserve. Forty-eight species of mammals were recorded to be present. The Reserve seemed to support a mammal fauna typical of interior hill ranges of Sabah but, generally, species richness and abundance were low.*

INTRODUCTION

Gunung Rara Forest Reserve (GRFR) is a large Commercial Forest Reserve under the concession of Yayasan Sabah. Extending from Maliau Basin to Sungai Imbak, GRFR is located in south central Sabah, within the district of Tawau (Figure 1). No systematic studies of mammals have ever been conducted at the area, though casual monitoring of wildlife species is carried out by the Sabah Wildlife Department (SWD) from time to time.

The objective of the present survey was to produce a checklist of mammal species occupying an area within GRFR that was actively logged by the Reduced Impact Logging techniques. RIL techniques are a set of logging guidelines which emphasise minimal damages to residual trees and the environment.

Survey area

The survey was carried out for four months continuously from December 1996 to March 1997. The area surveyed was a 35 ha forest located in the north-east corner of the overall 980 ha area being logged using RIL. Topographically, the survey site varies from about 180m to 300m in altitude, had a steep to moderately undulating terrain and was being logged at a density of approximately 10trees/ha. Damage was, however, uneven being concentrated along the main access roads which tend to follow ridge tops. Logging operations commenced on August 1996 and are expected to finish in 1998.

MATERIALS AND METHODS

Both direct and indirect methods of mammal survey were employed in the survey. Direct methods were used to identify species such as squirrels and rats. Indirect methods were used to identify species such as cats, civets, and mongooses. Traps were used to capture birds, reptiles and amphibians.

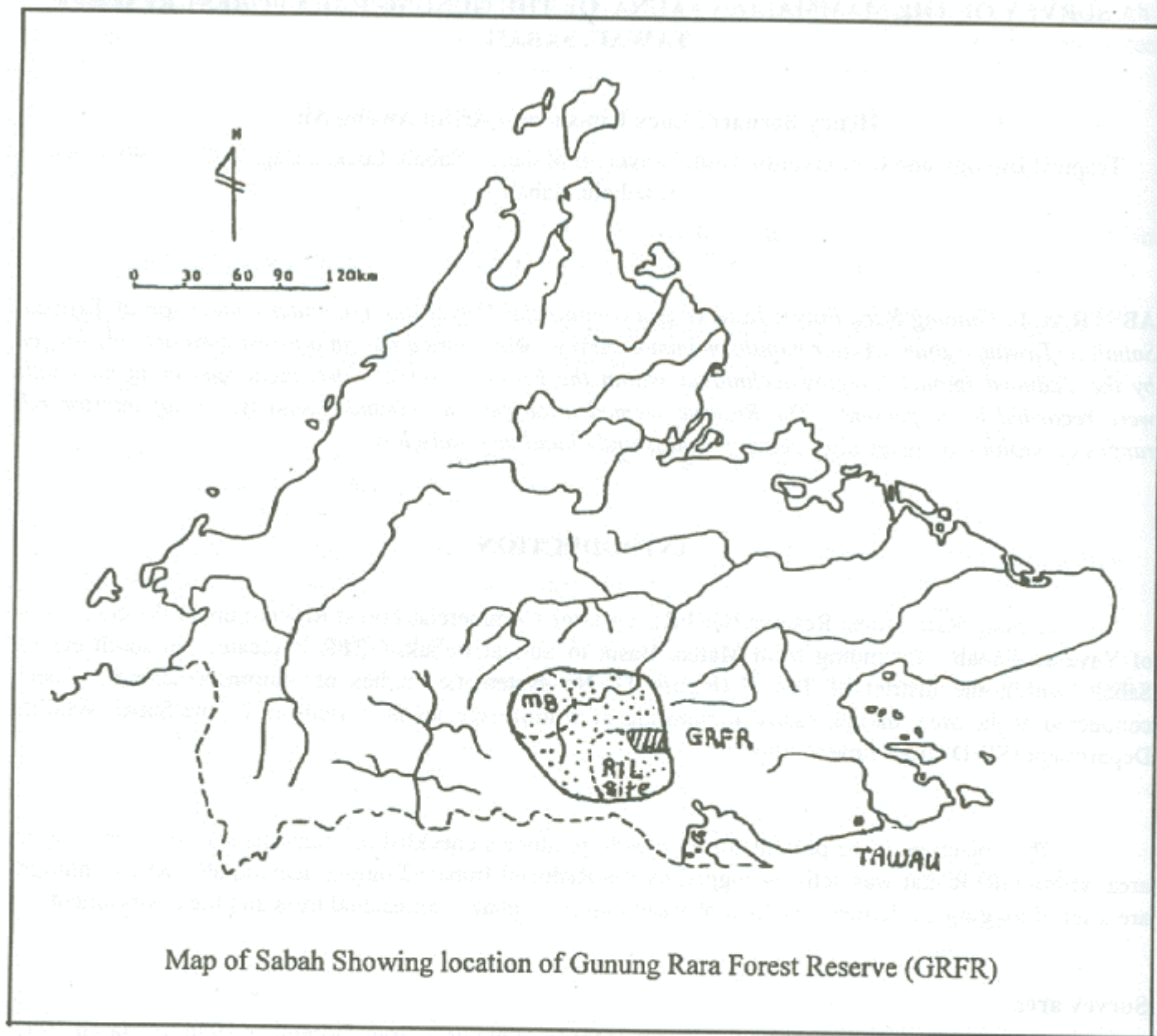


Figure 1. Map showing the location of Gunung Rara Forest Reserve (GRFR), RIL site (shaded area indicating survey site) and Maliau Basin (MB).

MATERIAL AND METHODS

Both direct and indirect observations of mammals were employed in the survey. Cage traps and snap traps were used to sample small mammal species such as squirrels and rats. Cut ripe bananas and red guavas were used as baits. Mist nets were used to sample bats. Aside from trapping and mist-netting,

searchers for large mammal species and other wild animals were made by walking along game trails and existing man-made trails. Searches were also carried out in the forest by following a compass bearing such that a looping trail of approximately 3 km was walked. In addition to observations made by the authors, reports of animal sightings were gathered from the field staff of Rakyat Berjaya Sdn. Bhd. (RBJ). However this was confined to animals that were directly seen and positively identified from the start of the logging operations until the commencement of this survey. Indirect observations were recorded only by the authors and included tracks, sound/calls, faeces, nests and claw marks. Identifications and classifications of all animals captured or sighted and their signs were based on Payne *et al.* (1985).

RESULTS AND DISCUSSION

Although initially intended to be carried out prior to the commencement of logging operations, this survey was conducted a few months after logging operations started. Skid trails, feeder roads and main roads were therefore already in existence. The areas where no logging activities had begun contained many man-made trails, and "parang" cuts on the vegetation were found almost everywhere. In logged areas, trees were selectively felled by using chain-saw and logs were transported to the landing area using heavy tractors. Pre-determined routes were made for the tractors and were mainly restricted along ridge-tops to minimise soil erosion and compaction. In order to minimise damage to residual trees, directional felling was undertaken. Nevertheless, even with these practised there was a quite high loss rate of residual trees through incidental damage and blading of skid trails were also noted.

Overall, forty-eight species of mammal, typical of interior hill ranges of Sabah, were recorded in this survey (Appendix 1). Of these, 38 species (or 79%) were observed by the authors whilst, 10 species (or 21%) were recorded exclusively from sightings made by RBJ's field staff. Wildlife Observations made by SWD were not included. The following are general descriptions on all groups of mammals noted present.

Moonrat (family Erinaceidae)

The moonrat (*Echinosorex gymnurus*) was sighted by RBJ's field staff during climber cutting and stock mapping exercise in late 1995. The animal was described as similar to the commensal rat but much bigger in size and having thick white to yellowish fur with very strong and distinctive odour. A savi's pigmy shrew (*Suncus etruscus*) was caught in the pit-fall trap meant for insects. The species is very small with Head-Body length of 50mm only.

Treeshrews (family Tupaiidae)

Overall, only 28 individuals (not including recaptured individuals, Table 1) of treeshrews were caught after more than 800 trap-nights, giving the trapping success of less than 3.5%. The large treeshrew (*Tupaia tana*) was the most frequently captured species followed by the mountain treeshrew (*Tupaia montana*) and common treeshrew (*Tupaia glis*). All three species were caught in cage traps. Cut ripe banana seemed to be the more preferred bait but requires daily replenishment.

A pentail treeshrew (*Ptilocercus lowii*) was observed under a fallen log near the river at 0800hrs. The species may have taken shelter under the log following heavy rain during the previous night. It is a

nocturnal species and usually arboreal. It was easily identified for its long tail except the tip which was feather-like (Payne *et al.*, 1985).

Bats

Very few bats were caught in this survey (Table 2). The most frequently captured species was the spotted-winged fruit bat (*Balionycteris maculata*) and the short-nosed fruit bat (*Cynopterus brachyotis*). Both species are generally common in lowland Dipterocarp forest habitat elsewhere and 20-50 individual can be easily captured within 40 netting-hours. Although 248 netting-hours were carried out in this survey, less than 9 individuals of each species were captured.

The flying foxes (*Pteropus vampyrus*) was never observed by the authors but, were said to be numerous by RBJ's field staff. The species is known to roost in large colonies on open branches of trees and to fly long distances in large numbers at dawn or dusk in search of food (mainly nectar and fruits).

The least horseshoe bat (*Rhinolophus pusillus*) was captured only once but is thought to be only the second record for Sabah. The first record was made from Maliau Basin, north west of the survey site (Payne *et al.*, 1989).

Primates

Two nocturnal and four diurnal primates were recorded in this survey. The western tarsier (*Tarsius bancanus*) was caught in the mist net at 2100hrs whilst, the slow loris (*Nycticebus coucang*) was seen on tree branches (at 10m height from the ground) at approximately the same time, about 350m away.

The calls of the bornean gibbon (*Hylobates muelleri*) was consistently heard during early morning between 0600-0900hrs, virtually throughout the survey period. At least two groups of the species may be inhabiting the survey site. One group was situated near the base camp and the other approximately 1 km (straight line distance) away from the site. The group in proximity of the base camp was comprised of two adults and an infant. All individuals were observed on the crown of an emergent tree at approximately 40 meters height above the ground.

Two groups of long-tailed macaque (*Macaca fascicularis*) were encountered. Each group comprised of at least ten individuals of various ages. In addition, a solitary adult male of the species was observed foraging on the ground near a deserted logging road. It was observed tearing the bark of a dead tree presumably in search of insects. The event occurred at 1425hrs just after a mild rain.

It is interesting to note that RBJ's field staff had never observed the long-tailed macaques despite having entered the survey sites before any logging was started. However, the red leaf monkey (*Presbytis rubicunda*) was said to be fairly frequently encountered. The presence of the grey leaf monkey (*Presbytis hosei*) was detected from its call.

The presence of orang-utans (*Pongo pygmaeus*) can be detected readily by looking for signs of their nests. Neither the survey team members nor RBJ's field staff saw any signs of the species. However, records from the Sabah Wildlife Department (SWD) stated the presence of orang-utan in GRFR (C.Jomitin, *pers. comm.*). Similarly, SWD's records also stated the presence of the pig-tailed macaque (*Macaca nemestrina*). The species was not sighted in this survey. Pig-tailed macaques are wide-ranging and were

probably migrating elsewhere during the survey. No estimates of primate population was made. Nevertheless, it can be said that based on the very low encounter rate of group of primate, the primate population, at least within the survey sites, were generally very low.

Table 1. Treeshrews caught in Gunung Rara Forest Reserve

Species	Mean body Weight (g) (n = # weighted)	No. of individuals caught (not including recaptures)
Large treeshrew (<i>Tupaia tana</i>)	193 (n = 5)	20
Mountain treeshrew (<i>T. montana</i>)	weight not taken *	6
Common treeshrew (<i>T. glis</i>)	127 (n = 1)	2

* all individuals were wet

Table 2. Bats mist-netted in Gunung Rara Forest Reserve

Species	Mean body weight (g) (n = # weighted)	No. of individuals netted (not including recaptures)
Spotted-winged fruit bat (<i>Balionycteris maculata</i>)	3.0 (n=4)	8
Short-nosed fruit bat (<i>Cynopterus brachyotis</i>)	25.7 (n=3)	6
Diadem roundleaf bat (<i>Hipposideros diadema</i>)	95.0 (n=1)	2
Fawn roundleaf bat (<i>H. cervinus</i>)	1.0 (n=1)	1
Long tongued nectar bat (<i>Macroglossus minimus</i>)	1.0 (n=1)	1
Least horse shoe bat (<i>Rhinolophus pusillus</i>)	6.0 (n=1)	1
Trefoil horse shoe bat (<i>R. trifolius</i>)	11 (n=1)	1

Squirrels (family Sciuridae)

Results for squirrels sampling is given in Table 3. Both ground squirrels and tree squirrels were trapped in cage traps, except the giant and pygmy squirrels. The giant squirrel (*Ratufa affinis*) was seen only once, at approximately 1500hrs while walking along a newly constructed feeder road on a ridge top. It made a loud crash sound while leaping from one branch of a tree to another at about 30m height above ground. Although the animal has been known to frequent the middle storey below 5m (Lim, 1992), giant squirrels are mostly active in tall trees and only descend to the ground to cross gaps in the tree canopy (Payne *et al.*, 1985).

Table 3. Squirrels caught in Gunung Rara Forest Reserve

Species	Mean body weight (g) (n = # weighted)	No. of individuals caught (not including recaptures)
Low's squirrel (<i>Sundacius lowi</i>)	70 (n=2)	6
Horse-tailed squirrel (<i>S. hippurus</i>)	276 (n=1)	2
Prevost's squirrel (<i>Callosciurus pervostii</i>)	278 (n=1)	2

The pygmy squirrels (*Exilisciurus exilis*) was frequently observed on a small tree, with large liana attached to it, near the base camp site. It descends to the ground using the liana as its path each morning to feed on food remnants (0700-0800hrs). It appeared to follow exactly the same route every morning. Several cage traps baited with cut ripe bananas, and sometime with bread, were laid on the ground where the species was normally seen but, the squirrel was never captured. Only two different individuals of the species was seen throughout the survey periods. RBJ's field staff saw the horse-tailed squirrel (*Sundasciurus hippurus*). While, the only flying squirrel reported in this survey was the horse's pigmy flying squirrel (*Petaurillus hosei*). The species was also observed by RBJ's field staff.

Three other species of squirrels were actually caught in cage traps baited with cut ripe bananas that were set on the ground. They were the prevost's squirrel (*Callosciurus prevostii*), low's squirrel (*Sundasciurus lowi*) and bornean mountain ground squirrel (*Dremomys evertti*). The former two species were caught and identified by HB. The bornean mountain ground squirrel was identified by LK. Perhaps, this is the first report on sightings of the species in areas below 980m a.s.l. (see, Payne *et al.*, 1985).

Rats (family Muridae)

Forest rats were easily caught in cage traps. In total seven species of rats were captured including a house rat (*Rattus rattus*) caught at the base camp site (Table 4). The brown spiny rat (*Maxomys rajah*) was the most frequently captured species accounting for about 72% from the total number caught.

Individuals of the brown spiny rat were caught in widely-spaced localities. The whitehead's rat (*Maxomys whiteheadi*) and the small spiny rat (*Maxomys baeodon*) were both represented by seven and four individuals respectively caught in widely-spaced localities. Given the trapping efforts of 800 trap-nights, the trapping success of rats in this survey was 9 %.

Table 4. Rats caught in Gunung Rara Forest Reserve

Species	mean body weight (g) (n = # weighted)	no. of individuals caught (not including recaptures)
Brown spiny rat (<i>Maxomys rajah</i>)	5.2 (n=17)	51
Whitehead's rat (<i>M. whiteheadi</i>)	1.2 (n=5)	7
Small spiny rat (<i>M. baeodon</i>)	eight not taken *	4
Red spiny rat (<i>M. surifer</i>)	weight not taken *	2
Dark-tailed tree rat (<i>Niviventer cremoriventer</i>)	43.0 (n=1)	3
House rat (<i>Rattus rattus</i>)	67.0 (n=1)	1
Muller's rat (<i>Sundamys muelleri</i>)	181.0 (n=2)	3

* all individuals were wet

It was observed that the number of rats caught was influenced by weather conditions. Significantly less individuals were caught during rainy days as compared to drier days ($\chi^2=9.68$; d.f.=1; $P<0.01$). The number of individuals caught also seemed to be correlated with fruiting phenology. There was an apparent scarcity of fruiting trees during the early part of the survey which resulted in fewer numbers of rat caught. During the latter part however, more individuals were captured. Discarded fruits (species not known) with bite marks on them were abundant in the forest during those periods. Numerous number of discarded fruits were also noted floating in the river.

Carnivores

The presence of the sun bear (*Helarctos malayanus*) can be detected from its claw marks on trees. Nevertheless neither the animal nor its signs were sighted. Only two carnivores were actually seen during

the survey; the malay civet (*Viverra zibellina*) and the oriental small-clawed otter (*Aonyx cinerea*). The former species was observed in the afternoon (1200hrs) climbing a fallen tree at approximately 2 meters height above the ground. The tree was located about 30 meters from a logging road. The latter species was encountered at 0800hrs near the river bank where the cage traps were set. The animal appeared to be trying to tear one of the cage traps open possibly to take the bait (banana). Sightings of other carnivores were recorded from RBJ's field staff. The leopard cat (*Felis bengalensis*), the short-tailed mongoose (*Herpestes brachyurus*) and the banded palm civet (*Hemigalus derbyanus*) were noted to be present. Fresh faeces of civet were encountered once. It is believed that even more carnivores could have been found if spotlight surveys were conducted in the night when most carnivores are active.

SWD had recorded the presence of the clouded leopard (*Neofelis nebulosa*), the flat-headed cat (*Felis planiceps*) and the marbled cat (*Felis marmorata*) in GRFR but, no confirmation could be made in this survey. However, it is possible that these carnivores may exist in the Reserve.

Other large herbivores

Unusually, wild pigs (*Sus barbatus*) were not present as evidenced by the absence of fresh tracks, active mud wallows or nests of the animal. Records of sightings of the species were obtained only from RBJ's field staff. Similarly, the signs of large ungulates were also scarce.

Few fresh tracks of mouse-deer species were encountered and they were mostly confined along the feeder road. Two fresh tracks of mouse-deer species were found by the river side. Based on RBJ's field staff observations, both the lesser mouse-deer (*Tragulus javanicus*) and greater mouse-deer species (*Tragulus napu*) occurred in the survey sites. Both muntjac species that are found in Borneo; the bornean red muntjac (*Muntiacus muntjac*) and the bornean yellow muntjac (*Muntiacus atherodes*) were also present in the area.

There was evidence of the presence of the asian elephant (*Elephas maximus*). Old tracks (possibly less than four months) of a lone elephant were found on the RBJ's camp site. The track diameter measured 29cm. In addition, a pile of elephant dung, dry but intact, was also encountered in an old logging road approximately 1km distance from the camp site. Based on the diameter of the foot imprints near the dung and the proximity of the signs from the camp site, it can be inferred that both signs could have been made by the same individual.

Tracks or signs of sumatran rhinoceros (*Dicerorhinus sumatrensis*) activity were not seen within the area surveyed. No sightings of the species was made by RBJ's field staff. Although footprints and dung of the sumatran rhinoceros were found within the Maliau Basin, it is unlikely that this large herbivore existed in the survey sites of GRFR. Similarly, no tracks or signs of banteng (*Bos javanicus*) were observed and it may be assumed that the species do not occur in the area.

The apparent scarcity of large mammals within the survey site shows that these animals have moved away from the logging sites and activities. The southern fringe of GRFR was still unlogged when the survey was completed. This area may be providing suitable refuge. Even though consisting of steep terrain at high elevations, large mammals have been found to utilise such habitats when there is no other better alternative area available (Burhanuddin *et al.*, 1995).

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REFERENCES

- Burhanuddin Mohd. Nor, Hassan Kassim, Samsuddin Suri, Shahrudin Othman and Mohd. Tajuddin Abdullah 1995. A survey on the distribution of large mammals in Endau Rompin State Park, Johor. *The Journal of Wildlife and Parks*, 14.
- Lim, B.L. 1993. Behaviour and food habits of the giant tree squirrels (*Ratufa bicolor* and *R. affinis*) in Peninsula Malaysia. *The Journal of Wildlife and Parks*, 12.
- Payne, J., F.M. Charles and K. Phillips 1985. *A field guide to the mammals of Borneo*. The Sabah Society and World Wildlife Fund Malaysia.
- Payne, J., A. Johns and J. Gasis 1989. Mammals, In: *Maliau Basin Expedition*. C.M. Marsh (Ed.) Unpublished report.

Appendix 1. Checklist of mammal species recorded in GRFR

- | | |
|--------------------------------------|---------------------------------|
| moon rat (R) | spotted winged fruit bat (O) |
| slow loris (O) | short-nosed fruit bat (O) |
| westren tarsier (O) | trefoil horse shoe bat (O) |
| bornean gibbon (O) | diadem roundleaf bat (O) |
| grey leaf monkey (O) | least horse shoe bat (O) |
| red leaf monkey(R) | long tongued nectar bat (O) |
| long-tailed macaque (O) | fawn roundleaf bat (O) |
| giant squirrel (R/O) | large flying fox (R) |
| prevost's squirrel (O) | malay civet (R/O) |
| horse-tailed squirrel (R) | oriental small-clawed otter (O) |
| low's squirrel (O) | anded palm civet (R) |
| bornean mountain ground squirrel (O) | short-tailed mongoose (R) |
| plain pigmy squirrel (R/O) | eopard cat (R) |
| horse's pigmy flying squirrel(R) | asian elephant (R/O) |
| dark-tailed tree rat (O) | lesser mouse-deer (R/O) |
| house rat (O) | greater mouse-deer (R/O) |
| muller's rat (O) | red muntjac (R/O) |
| brown spiny rat (O) | bornean yellow muntjac (R) |
| red spiny rat (O) | sambar deer (R/O) |
| small spiny rat (O) | bearded pig (R/O) |
| whitehead's rat (O) | pangolin (R) |
| common porcupine (R) | |
| savi's pigmy shrew (O) | |
| pentail treeshrew (O) | |
| large treeshrew (O) | |
| mountain treeshrew (O) | |
| common treeshrew (O) | |

- (O) indicates direct (trapped or free roaming) or indirect sightings by at least one of the authors
(R) indicates direct sightings by RBJ's field staff
(R/O) indicates direct or indirect sightings by at least one of the authors and also RBJ's field staff