Short communication

Social system of the lesser mouse-deer (Tragulus javanicus)

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The lesser mouse-deer (Tragulus javanicus), the smallest ungulate species in the world (Ronald 1991), is a common native to the tropical forests of Southeast Asia. As the mouse-deer is a primitive ruminant, investigating their social system is necessary for understanding the evolution of social systems in ungulates. Except for a few field reports on group size (Ratnam 1982; Miura and Idris 1999) and on the fighting and marking behaviours of males based on fragmental observations (Davison 1980), there are almost no reports on their social behavior in their natural habitat. To study social system of the lesser mouse-deer in natural habitat, we analyzed 1) the group size, 2) the core-area overlap, and 3) interaction among neighboring individuals.

Materials and methods

We conducted field studies at the Kabili-Sepilok Forest Reserve (5°51’N, 117°56’E), Sabah, Malaysia (Fig. 1). The study area was about 7 ha in size, located in a mixed dipterocarp forest in lowlands. The study period was over two years between May 1998 and March 2001. We captured 15 lesser mouse-deer including 9 males (8 adults), 6 females (5 adults), and conducted a radio-tracking study fitting radio transmitters (144 MHz, 11 g, Holohil Systems Ltd., Ontario, Canada) to 11 individuals (7 adult males and 4 adult females). Locations of mouse-deer were determined by measuring direction of the radio signal from >2 points. Locations of the animals were plotted on a 1 : 1,000 map. We tracked animals at distances <100 m as beyond that we could not receive clear transmitter signals. Therefore, location error was comparatively small. For example, for one individual located 13 times in a full day of radio-tracking on 22 and 23 November 2000, the mean distance between animal and observer was estimated to be 30.3 ± 6.1 m (n = 30) and mean area of error polygons was 29.9 ± 19.9 m² (n = 10). Indeed, dropped transmitters were located within about 10 m from the estimated location. Precise methods of the field mapping and animal trapping conducted in this study were reported in our previous paper (Matsubayashi et al. 2003). The size of the home range and the core area were determined with minimum convex polygons (MCP) (Mohr 1947) and adaptive kernel techniques (Software: The Home Ranger version 1.5). For analyses of the core-area overlap, we analysed the data of 6 individuals (3 males: M06, M10, and M12; 3 females: F01, F13, and F14). Daytime core-areas, which included 50% of the locations recorded during the day, were calculated for individuals with >70 locations (Table 1). We used the data of daytime core-area analysis because the active behaviors of males were observed between 8:00 h and 10:00 h (Davison 1980), and our previous study also found the lesser mouse-deer to be diurnal rather than nocturnal (Matsubayashi et al. 2003; Matsubayashi and Sukor 2005). In order to investigate their courtship behaviour, we tracked a whole-day behaviour through 24 hour radio-tracking (every 2 hours, 13 trials in total). To compare the average distance between the pair, the distance during courtship (13 locations in a day) and non-courtship (79 locations over 36 days) were calculated. The size of the home range and core area were statistically examined with t-tests. All tests were 2-tailed and the alpha level was set as 5%. Data are presented as mean ± standard deviation.

Results and Discussion

During the study period, 70 individuals were observed over a total of 66 times, 93.9% (n = 62) were solitary individuals, 6.1% (n = 4) were in a group with 2 individuals, and none was in a group with more than 3 individu-
The mean group size (including solitary individuals) was 1.06. This result shows that the lesser mouse-deer is highly solitary.

Table 1 shows the size of MCP home-range and core area of the lesser mouse-deer in Kabili-Sepilok Forest Reserve. Mean size of MCP home-range tended to be larger in males than in females ($P = 0.051$), while mean size of core area was not significantly different between males and females ($P = 0.74$). Fig. 2 shows that the core areas of neighbors were completely separate among same-sex individuals but overlapped widely among opposite-sex individuals. For instance, the core areas between neighbor females (F13 and F14) were completely separate, though the MCP home-range overlaps were 26.5% and 18.4% respectively (Fig. 2a). The core areas of neighbor males (M06 and M10) were also completely separate, though their MCP home ranges overlapped widely, 28.9% and 43.5%, respectively (Fig. 2b). In contrast, core areas of pair individuals were highly overlapped (M11 and F13: 64.9% and 76.3%, respectively) with widely overlapping home ranges. The results suggest social system of the lesser mouse-deer is monogamy. In addition, an obser-
vation of a consort pair, M06 and F01, also supports their monogamous social system. Fig. 3 shows the movement of an adult male (M06) and an adult female (F01) during the period when they were together (10:00 h 9 October–10:00 h 10 October 1999). The serial number shows the time at each location. Open square indicates resting sites in the nighttime. Open circle indicates the place where they approached within 20 m. Arrows indicate the route of their movements.

Fig. 3. The movement of an adult male (M06: ▲) and an adult female (F01: ●) during the period when they were together (10:00 h 9 October–10:00 h 10 October 1999). The serial number shows the time at each location. Open square indicates resting sites in the nighttime. Open circle indicates the place where they approached within 20 m. Arrows indicate the route of their movements.

ment together was 9.9 ± 5.0 m (n = 12), while that of non-movement together was 64.4 ± 44.8 m (n = 79).

However, male of lesser mouse-deer also can be polygamous. Because 1) the core area of paired female (F01) overlapped not only with the core area of the paired male (M06) but also with another neighboring male (M10) (Fig. 2b). This result suggests that males admit the invasion of females into their core areas and paired males do not control the movement of the paired female into the home range of other males. 2) We also confirmed that neighboring males (M10 and M11) invaded the home range of a missing male (M06) that had moved out of its home range after mating, and approached its paired female (F01). 3) Territory of males is more temporary than that of females. The tracking term of males (less than 1–8 months, mean = 4.3 months, n = 3) was much shorter than that of females (8–13 months, mean = 10 months, n = 3, Table 1).

Though the home range of this species has been believed to be permanent (Klaus 1990), data of other males and
females were eliminated because of problems with their transmitters. These results suggest that the social system of the lesser mouse-deer is facultative monogamy/polygyny (Clutton-Brock 1989). This social system is also found among small ungulates dwelling in the forests and ecotone habitats of Africa such as duiker and dikdik (Jarman 1974; Barrette 1987). These species are more primitive and have simpler social systems compared to more developed larger ungulates dwelling in forests, ecotone, or open habitats. This result suggests that the social system of ungulates might relate to their phylogeny as well as feeding style and group size (Jarman 1974). Further field studies on other small ungulates dwelling forests especially tragulids and small cervids will be necessary to understand the evolution of the social system of the ungulates.

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References


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