

An Aerial Survey of Large Mammals in Chichibu Mountains, Central Japan

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Introduction

The Chichibu Mountains are located at the westernmost of Kanto Area, central Honshu, Japan. Natural temperate forests cover this steep terrain area. This area is one of the core natural temperate forest areas in the central Japan Pacific side where the land is well developed for agriculture and forestry.

Conflicts between human being and wildlife have been more apparent recent years in Japan (KAJI 2001, TAKATSUKI 2002). It is important to estimate the population and distribution of animals to manage the wildlife population, and for this objective aerial surveys have been applied (Hokkaido Environment Research Center 1997, TAKATSUKI 2002). Aerial surveys by helicopter are advantageous for the census to estimate the population and distribution of large mammals of low density in areas of steep topography like Chichibu. In this area, a National Road (Route 140) was constructed in the last two decades, and the traffic restored since 1998. It was expected that construction and traffic of the road would affect the ecology of these large mammals. A long term radio tracking of the Asiatic black bear (*Ursus thibetanus*) and aerial surveys by helicopter were conducted in 1991–2000 (ISHIDA 2001) and in 1987–1989 (ISHIDA *et al.* 1993), respectively. There were also several counting ground surveys on sika deer (*Cervus nippon*) and Japanese serow (*Capricornis crispus*) (Gunma Pref. *et al.* 1994, 2002, WMO 1997). Since studies on population changes require a long term, we conducted an aerial survey by helicopter mainly to estimate the population and distribution of sika deer and Japanese serow in the winter of 2001.

Study Area

The study area is located in the western part of Ohtaki-village, westernmost Saitama Prefecture. It is near the border to neighboring four prefectures, Tokyo, Yamanashi, Nagano, and Gunma. The topography of this area is quite steep. The elevation of the study area ranges from about 600 m to 2,000 m. Sika deer and Japanese serows mostly stay in the cool temperate deciduous forest and the mixed forest up to about 1,600 m.

About 160 species of trees are recorded in the University Forest in Chichibu, the University of Tokyo, and the vegetation diversity is high according to a large elevation range and the complex terrain with much rain (Tokyo University Forest 2002).

In oldgrowth forests, the dominant tree species on the slopes are beech (*Fagus crenata*) and Japanese beech (*F. japonica*). Those on the ridges are hemlock (*Tsuga sieboldii*) and fir (*Abies firma*). Senwood (*Fraxinus spaethiana*) is dominant in the valley of the rocky slopes. Most of the area is covered by secondary deciduous forests of oak (*Quercus crispula*), beech, Japanese beech, chestnut (*Castanea crenata*), maples (*Acer* spp.), cherries (*Purnus* spp.), and other species. Nuts and acorns of beeches, oaks, and chestnut trees are important foods for the wildlife (HASHIMOTO 1995, MIGUCHI 1995) and they have great annual fluctuations or

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“masting” (KAJI *et al.* 2002, KELLY 1994). In this area, the mastings of the main four species (*F. crenata*, *F. japonica*, *Q. crispula* and *C. crenata*) are not always synchronized, and the food supply for wildlife in autumn seems less fluctuated than other areas in Honshu.

Methods

A helicopter (Aerospacial AS350B) flew from a valley to a ridge. It flew along the contour on the early morning of December 11 and 12, when it was windy. Four persons, a pilot and a navigator on the front seat, and two observers on the rear seat tried to find the animals. The rear doors of both sides of the helicopter were fully opened for better observation, especially beneath the helicopter. It flew at the height of 50 to 100 m above the forest canopy. This flight protocol was followed to the intensive method, with which we expected to gain the better results than the other aerial surveys (YONEDA *et al.* 1996).

The flight schedule is shown in Table 1. The survey area covered the Tokyo University forest compartments Nos. 11, 16–20 in the Takikawa Valley, and forest compartments Nos. 21, 22, 24–31 and a small section of a private forest (63.3 ha) in the Irikawa Valley (Fig. 1). We covered the whole area by eleven flights. This area is almost the same or larger than those covered by the former surveys from 1987 to 1989 (ISHIDA *et al.* 1993). Flight dates were December 11, 12, and 19, 2001.

The main target animals were sika deer and Japanese serows, and other larger mammals.

Results

Twenty-five sika deer, 6 Japanese serows, one Asiatic black bear (*Ursus thibetanus*), 7 Japanese macaques (*Macaca fuscata*), and 2 copper pheasants (*Phasianus soemmerringii*) were recorded (Table 1, Fig. 1). Flocks of jay (*Garrulus glandarius*) and siskin (*Carduelis spinus*) were recorded twice, respectively.

Most of the sika deer were observed near the ridges, where the terrain is less steep, and the undergrowth is covered with short *Sasa borealis*. The distribution seemed to be aggregated (Fig. 1). Three of the 25 deer were identified as adult males, and the sex of the

Table 1. Flight schedule and the findings of large mammals by helicopter survey at Chichibu Mountains in December 2001.

Flight No.	Forest compartment No.	Area (ha)	Date (month/day)	Flight time (min.)			Animal Species·Finding No.			
				Start	Goal	Duration	Deer	Serow	Bear	Monkey
1	28	145.1	12/11	09:02	10:08	66				1
2	29, 30, 31	346.89	12/11	10:18	11:28	70	1	1		
3	21, PL*	242.45	12/11	12:40	13:35	55	2		1	
4	16	74.88	12/11	13:45	14:08	23				
5	25, 26	415.56	12/12	08:25	09:25	60	9			
6	16, 11	230.78	12/12	09:35	10:32	57	3	2		
7	24	161.83	12/12	10:42	11:22	40	8			
8	27	244.52	12/12	11:37	12:27	50				
9	19, 20	226.47	12/12	12:38	13:28	50				
10	17, 18, 20	330.91	12/19	09:35	11:00	85	2	3		6
11	17, whole	29.94	12/19	11:05	11:25	20				
Total		2,448.88				576	25	6	1	7

*, Private land neighboring to the University Forest.

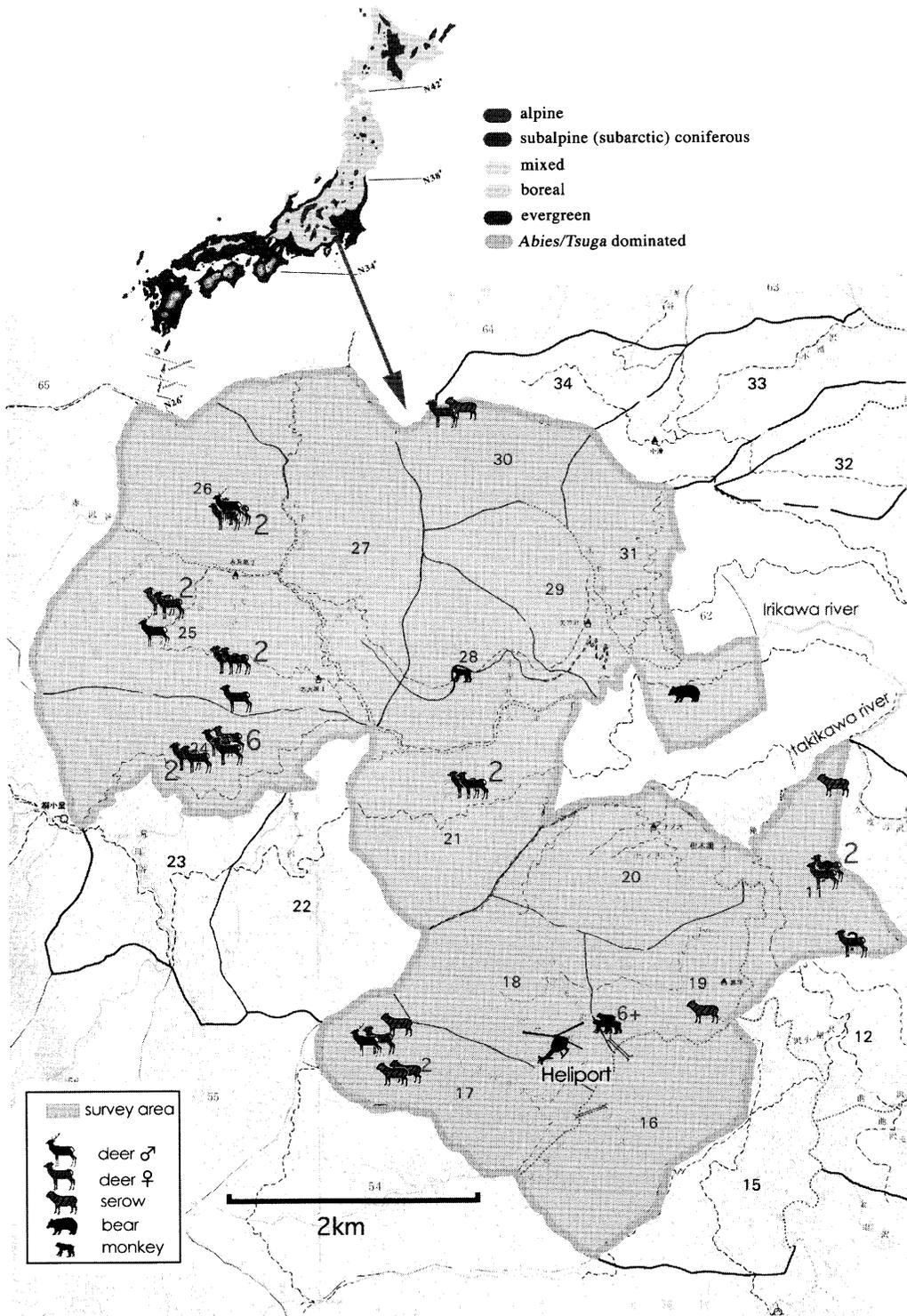


Fig. 1. Survey area (grey) and animals found by the helicopter survey in December 2001. Small numbers indicate forest compartment numbers.

Table 2. Summary of the density of Sika deer in Chichibu.

Date of survey [year/mon./day]	Density* [/km ²]	Survey area [km ²]	Method	Reference
2001/12/11-12, 19	0- 4.94	24.49	helicopter	this study
2000/10/14-2001/10/20	0-10.6	4.22	driving	Gunma <i>et al.</i> 2002
1997/3/17-21	0- 8.0	4.28	driving	WMO 1997
1996/3/20-21	0.15-1.62	24.48	helicopter	WMO 1997
1992/11/13-1993/10/27	0- 6.5	5.15	driving	Gunma <i>et al.</i> 1994
1989/12/5-7	0- 2.4	23.95	helicopter	ISHIDA <i>et al.</i> 1993
1988/12/7-9	0- 7.9	23.95	helicopter	ISHIDA <i>et al.</i> 1993
1987/12/21-23	0- 6.1	22.00	helicopter	ISHIDA <i>et al.</i> 1993
1986-1987	0- 1.9	—	driving	Gunma <i>et al.</i> 1988**

*, range (minimum and maximum results in each flight or location); **, from WMO (1997).

Table 3. Summary of the density of Japanese serow in Chichibu.

Date of survey [year/mon./day]	Density* [/km ²]	Survey area [km ²]	Method	Reference
2001/12/11-12, 19	0-0.91	24.49	helicopter	this study
2000/10/14-2001/10/20	0-3.4	4.22	driving	Gunma <i>et al.</i> 2002
1992/11/13-1993/10/27	0-6.5	51.53	driving	Gunma <i>et al.</i> 1994
1989/12/5-7	0-3.82	23.95	helicopter	ISHIDA <i>et al.</i> 1993
1988/12/7-9	0-5.05	23.95	helicopter	ISHIDA <i>et al.</i> 1993
1987/12/21-23	0-3.82	22.00	helicopter	ISHIDA <i>et al.</i> 1993

*, range (minimum and maximum results).

three were not identified. A single animal, two females in herds, one female and one male, one male and two females, and six females were observed (Fig. 1). A herd of six females separated into two after we found them.

The average density of sika deer was about one animal per one square kilometer. This was higher than the previous results of 0.33/km² (1987) and 0.88/km² (1988), but the difference was not apparent since we do not have continuous data. It was similar to the results of the ground survey conducted at the same area by Saitama Prefecture in 2000 and 2001 (Table 2).

Japanese serows stood on the tops of rocks at steep slopes, and they were observed in aggregated distribution (Fig. 1). They were observed as single, or in a group of two or three animals. The average density was 0.25/km², which was lower than the results of our previous surveys (0.68/km² to 1.50/km²), or those of Saitama Prefecture (1.1/km² in 1992 and 1993) (Table 3). However, this difference was not apparent. Three of the six were observed in a group in a flight on December 19, when weather condition was very good with no wind and we could fly lower (<50 m) and slower (about 40 km/hr.).

The flights were conducted in the morning and till early afternoon, while the atmosphere condition was good enough to fly low safely, and the light condition was good to sight the animals on the steep mountainous slopes (Table 1).

Discussion

In this study, we covered about 24.5 km² by 11 flights of 9.5 hours. It took only 9 persons including four well-experienced members. Since ground surveys covering this area

would require about 120 persons, or it would cost several times more expensive. Since it cannot perform to count some steepest parts in the same area, the aerial survey is more effective and advantageous than the ground survey.

The Japanese serow density was lower than those of the previous aerial and the other ground surveys (Table 3). However, we cannot find any reason of the density decrease during the last decade, because the animal is legally protected, and there was no climate or vegetation change.

Damages on agricultural products by sika deer and other mammal have been recently increasing in this area (Ohtaki Village, unpublished data). Though local people say that the populations have increased, it was proved that the sika deer density in winter was not high and the increase in the last decade was not significant in the Otaki Village (this study, Gunma Pref. *et al.* 1994, 2002). The result suggests that the damages have been increasing not by the population increase, but by the change of the behaviour of the wildlife near human residential areas.

Since estimating population changes is essential for the effective wildlife management, periodic helicopter surveys are recommended. It should be continued long here by the established wildlife management system and support of the local government of Saitama Prefecture, like Hokkaido and Iwate (Hokkaido 1997, TAKATSUKI 2002).

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Summary

Aerial surveys of large mammals by helicopter were conducted on 11, 12, and 19 December, 2001 in University Forest in Chichibu, Saitama Prefecture, central Japan. The survey area was 24.5 km², and total flight time was 9 hours and 36 minutes. It was covered by eleven flights. Four crew in a helicopter watched and counted the animals during each flight. Twenty-five sika deer, six Japanese serows and one Asiatic black bear were observed. Comparing the results of previous aerial surveys conducted here in 1987, 1988 and 1989, there was no apparent difference in the density of each species. The density of the sika deer was almost the same as that estimated by ground surveys conducted by Saitama Prefecture in 2000 and 2001. The density of the Japanese serow was lower, but we could find no reason.

Key words: helicopter survey, Chichibu mountain, sika deer, Japanese serow

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奥秩父山地における大型動物のヘリコプター調査

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要 旨

1. 2001年12月11, 12, 19日の3日間、埼玉県大滝村にある東京大学秩父演習林内の、国道140号線の開通した滝川流域および、その北側の入川流域の約24.5平方キロの区域を、ヘリコプターで9時間36分、11回に分けて飛行し、大型動物の生息数を調べた。パイロットの判断により安全性が確保できる範囲なるべく低空(樹冠上約50 m)をゆっくり(時速30~50キロ)と、谷から尾根に向かって繰り返し飛行する方法をとった。しかし、風が強かった場合には、等高線沿いにやや高速で飛行した。調査員4名ずつで、目視できた大型動物を計数した。
2. 全部で、シカ25頭、カモシカ6頭、クマ1頭などを記録した。
3. 観察されたシカの平均生息密度は、同地域ではほぼ同面積を同様の方法で調べた1987~1989年の3年間のヘリコプター調査の結果に比べて、わずかに高かったものの、明確な差はなかった。また、2000~2001年に埼玉県によって同地域の一部で行われた地上調査の結果と、ほぼ一致した。
4. 観察されたカモシカの平均生息密度は、前回のヘリコプター調査の結果に比べて少なかった。また、2000~2001年に埼玉県によって行われた地上調査の結果よりも低かった。しかし、いずれも明確な差や生じる理由はみつからなかった。
5. 広域の急峻な山岳地帯におけるシカとカモシカなどの生息密度と分布を確認する目的に、ヘリコプターを使った計数調査は効率がよく有効であり、秩父山地の野生動物個体群の資源管理と農林業被害対策として埼玉県などの自治体が定期的に継続して行うことが望ましい。

An Aerial Survey of Large Mammals in Chichibu Mountains, Central Japan

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We conducted a helicopter survey of large mammals in Chichibu mountains, central Japan, in December 2001. We did not find any difference in the densities of sika deer and Japanese serow estimated in this survey from those in the ground surveys of Saitama Prefecture in 2000–2001 and those in our similar helicopter surveys in 1987–1989.