

Road kills of medium- and small-sized mammals, reptiles and amphibians in eastern Hokkaido

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北海道東部における中・小型哺乳類,
爬虫類および両生類の交通事故

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(受理 : 2004年 4月30日)

摘 要

北海道東部において、中・小型哺乳類、爬虫類および両生類の交通事故が調査された。中・小型哺乳類455個体、爬虫類17個体、両生類1051個体の交通事故死体が、1996年4月～1998年3月の2年間で拾得された。哺乳類では、オオアシトガリネズミの事故が最も多く152個体、次いでエゾリス94個体、キタキツネ85個体であった。爬虫類の交通事故は少なく、4種類17個体のみであった。両生類では、ほとんどがエゾアカガエル (1044個体) であった。

キーワード : 交通事故, 哺乳類, 爬虫類, 両生類, 日本

Introduction

Roads are infrastructure indispensable to modern life, but they also have a tremendously negative impact on the environment. Often, roads become negative structure, especially to wildlife, fragmenting habitats and movement routes and causing road kills and injuries.

Traffic accidents, and in particular car accidents, are one of the most prevalent direct human-caused forms of wildlife mortality (Banks 1979). In fact, according to a survey investigating causes of death for wild birds in eastern Hokkaido, collisions with cars are the leading causes of death along with window collisions, and rare species such as Blakiston's Fish Owl (*Ketupa blakistoni*) and Goshawks (*Accipiter gentilis*) are also killed in such collisions (Yanagawa 1993, Yanagawa & Shibuya 1996). Meanwhile, traffic accidents involving wildlife may also occasionally lead to serious accidents resulting human death or injuries. In that respect, several studies have been conducted on accidents

involving large animals like Sika-deer (*Cervus nippon*) (Tamada & Matsuda 1994, Noro & Yanagawa 2002).

Studies on road kills of wildlife and measures against them are urgently needed both from the standpoint of wildlife and human life protection, yet no satisfactory studies have thus far been conducted. Since road kills of medium- and small-sized mammals, reptiles and amphibians are less likely to result in human injuries, some studies conducted on the mortality of such animals merely report on accidents involving one or more cases for each species (Kawabe et al. 1999, Kawabe & Nakaoka 2000, Akisawa & Yanagawa 2000, Kawabe & Tanaka 2003), and few of them provide a general understanding of the accidents and possible preventive measures. This report therefore describes the current condition of traffic accidents involving medium- and small-sized mammals, reptiles and amphibians in eastern Hokkaido, northern Japan.

Results and Discussion

At first, data were collected by regularly inspecting predetermined routes, which did not provide a sufficient amount of data. For this reason, dead animals were thereafter collected with the help of information provided by many peoples: teachers, graduate and undergraduate students at Obihiro University of Agriculture and Veterinary Medicine; Wild Bird Society of Japan, Tokachi; The Red Squirrel Club; members of environmental NGOs

such as the Nature Conservation Society of Tokachi; workers from the Tokachi Subprefectural Office; municipal government workers from Obihiro and other cities. Therefore, data collection efforts were not consistent throughout the period of the study, and relative comparisons such as the ratio of mortalities to total travel distance are not available. But for now, this is believed to be the best data ever gathered regarding traffic accidents involving wildlife.

Table 1 shows the number of medium- and small-

Table1. Number of road kills of medium- and small-sized mammals, reptiles and amphibians recorded in eastern Hokkaido, from April 1996 to March 1998.

Scientific name	Month												Total
	J	F	M	A	M	J	J	A	S	O	N	D	
MAMMAL													
INSECTIVORA													
Sorex gracillimus	-	-	-	-	-	-	-	-	1	3	-	-	4
S. caecutiens	-	-	-	1	-	-	3	2	5	2	-	-	13
S. unguiculatus	-	-	-	1	2	7	10	44	66	22	-	-	152
Unidetified shrew	-	-	-	-	-	-	-	-	7	1	-	-	8
CHIROPTERA													
Myotis frater	-	-	-	-	-	-	-	-	1	-	-	-	1
Plecotus auritus	-	-	-	-	-	-	-	1	-	-	-	-	1
Murina ussuriensis	-	-	-	-	1	-	1	-	-	-	-	-	2
Unidetified bat	-	-	-	-	-	-	-	2	-	-	-	-	2
LAGOMORPHA													
Lepus timidus	-	-	-	-	1	3	-	-	-	-	-	-	4
RODENTIA													
Sciurus vulgaris	4	6	8	4	3	7	12	11	17	12	6	4	94
Tamias sibiricus	-	-	-	-	1	-	2	10	4	2	-	-	19
Pteromys volans	-	1	-	-	-	-	-	-	-	-	-	-	1
Clethrionomys rufocanus	-	-	1	-	-	2	1	2	4	1	1	-	12
Apodemus argenteus	-	-	-	-	-	-	-	-	1	-	-	-	1
A. peninsulae	-	-	-	-	-	-	-	2	-	-	-	-	2
A. speciosus	-	-	-	-	-	-	1	1	1	-	-	-	3
Rattus norvegicus	-	-	-	-	2	2	1	3	5	4	4	1	22
R. rattus	-	-	-	-	-	-	-	2	2	-	-	-	4
Mus musculus	-	-	-	-	-	-	-	-	2	-	-	-	2
Unidetified mouse	1	-	-	-	-	-	-	-	-	-	-	-	1
CARNIVORA													
Vulpes vulpes	-	3	5	7	9	8	17	12	9	8	4	3	85
Nyctereutes procyonoides	-	-	1	2	1	1	1	1	1	2	-	-	10
Martes zibellina	-	2	-	1	-	-	2	-	-	-	-	1	6
Mustela itatsi	-	-	-	1	-	-	-	-	-	1	-	-	2
M. nivalis	1	-	-	-	-	-	-	-	-	-	-	-	1
M. vison	-	-	-	-	-	1	-	1	1	-	-	-	3
Mammal total 23 spp.	6	12	15	17	20	31	51	94	127	58	15	9	455
REPTILE													
Takydromus tachydromoides	-	-	-	-	-	-	-	1	-	-	-	-	1
Elaphe climacophora	-	-	-	-	1	2	-	3	3	-	-	-	9
E. quadrivirgata	-	-	-	-	-	1	-	1	-	-	-	-	2
E. conspicillata	-	-	-	-	-	-	2	-	2	-	-	-	4
Unidetified snake	-	-	-	-	-	-	-	1	-	-	-	-	1
Reptile total 4 spp.	0	0	0	0	1	3	2	6	5	0	0	0	17
AMPHIBIAN													
Hynobius retardatus	-	-	-	-	-	-	-	1	4	-	-	-	5
Rana pirica	-	-	-	858	18	7	3	19	94	45	-	-	1044
Hyla japonica	-	-	-	-	-	-	1	-	1	-	-	-	2
Amphibian total 3 spp.	0	0	0	858	18	7	4	20	99	45	0	0	1051
Total	6	12	15	875	39	41	57	120	231	103	15	9	1523

sized mammals, reptiles and amphibians found dead on roads in eastern Hokkaido, mainly in the Tokachi area, over a period of two years between April 1996 and March 1998. Large mammals such as Brown Bears (*Ursus arctos*) and Sika-deer and pets such as dogs (*Canis familiaris*) and cats (*Felis catus*) were excluded from this survey. Those found of with no visible external injuries or bruises and therefore considered to have died from other causes were also excluded from these data.

Collected mortalities revealed 23 species of medium- and small-sized mammals killed in traffic. It was also discovered that, with the exception of bats whose habitat distribution and number of species are unknown, most species were killed in road accidents. Only four species with relatively limited habitat distribution (high-altitude, high-latitude) were not recorded as road kills in this survey: Pikas (*Ochotona hyperborea*), two rare species of voles (*Clethrionomys rutilus* and *C. rex*) and Ermines (*Mustela ermineae*). However, other survey has reported on a Pika killed in traffic accident in the southern Tokachi area (Kawabe & Nakaoka 2000).

One hundred fifty-two dead Big-clawed Shrews (*Sorex unguiculatus*) were recorded, the highest number collected among medium- and small-sized mammals. Most of them were found in the fall between August and October. Considering the fact that many Big-clawed Shrews die of natural causes in the fall, this number may include bodies run over after they were already dead. Therefore, it is highly probable that the estimated number of Big-clawed Shrews is higher than the actual number of road kills.

The second highest after Big-clawed Shrews were Red Squirrels (*Sciurus vulgaris*), with 94 road kills. Red squirrels are fundamentally arboreal. However, as they often walk on the ground to feed, store and move, they are frequently involved in road kills. For example, in Minnesota in the USA (Sargeant & Forbes 1973), the top three species which died in traffic accidents all belonging to the squirrel family. Among them, the Thirteen-lined Ground Squirrel (*Spermophilus tridecemlineatus*) is a terrestrial squirrel but the remaining two species (Gray Squirrel, *Sciurus carolinensis* and

Fox Squirrel, *S. niger*) belonging to the arboreal squirrel family. In eastern Finland (Korhonen & Nurminen 1987), the Red Squirrel, which is a subspecies of the same species as the Red Squirrel of Hokkaido, were the most likely animals to be involved in traffic accidents after the Hedgehog (*Erinaceus europaeus*) and the Arctic Hare (*Lepus timidus*).

Traffic accidents involving Red Squirrels were less frequent in winter and spring and more frequent in summer and fall. Increases in the number of accidents seem to involve more than one factor, including squirrel factors (e.g. change in the number of individuals crossing roads due to changes in population size and activity level) and human factor (e.g. changes in traffic volumes and in automobile speeds). The reasons the accidents were less frequent in winter and spring may be due to the human factor in that automobile speeds are slower due to snowy or ice-bound roads, and the squirrel factor in that the activity ranges of squirrels are limited in these seasons due to increased consumption of stored food. On the other hand, the reasons that traffic accidents are more frequent in summer and fall are probably due to the fact that traffic volumes and automobile speeds increase in these seasons; the fact that squirrel movements increase due to increases in their population size as a result of addition of new-born individuals and due to the subsequent dispersion of these individuals; and the fact that squirrels travel more to collect food for storage and for other activities (Yanagawa 1998).

Accidents involving Red Foxes (*Vulpes vulpes*) came in third. It is believed that the high number of Red Fox death not only reflect its large population, but also its feeding behavior; that is, their dependence on people for food by approaching roadway to obtain food from sightseers (Tsukada 1995). Many dead foxes were found in July and August, many of which were thought to be young foxes born in the same year judging by the size of their bodies (adult: 9, young: 13, age unknown: 7).

Mortalities of these top three species were significantly high in comparison with other mammals, accounting for 72.7% of the total number of medium- and small-sized mammal casualties. Other species found in relatively large numbers (ten or

more mortalities) among medium- and small-sized mammals were as follows: Brown Rats (*Rattus norvegicus*), 22 mortalities; Siberian Chipmunks (*Tamias sibiricus*), 19; Laxmann's Shrews (*Sorex caecutiens*), 13; Bedford's Red-backed Voles (*Clethrionomys rufocanus*), 12; and Raccoon Dogs (*Nyctereutes procyonoides*), 10.

Regarding reptiles and amphibians, among these species inhabiting the Tokachi area, only three species were not confirmed as road kills: Red-eared Turtles (*Chrysemys scripta*), Japanese Mamushis (*Agkistrodon blomhoffii*) and Japanese Skinks (*Eumeces latiscutatus*). It is thought that the three species only have one habitat in the Tokachi area (Sato 1992), so it can be easily imagined that they live in a very small area with minor populations. Overall, road kills of reptiles were low, with only 17 mortalities, all of which were found between May to September.

For amphibians, a great majority of the mortalities were Ezo Brown Frogs (*Rana pirica*) with 1,044 cases, accounting for 99.3% of all amphibians mortalities. Few other species were found in the course of this survey. Accidents involving Brown Frogs were apparently affected by seasonal factors, with the peak being in the spring and fall. Spring, in particular, claimed the largest number of mortalities, probably because of migration for breeding during this season (Akisawa & Yanagawa 2000). The peak in fall is probably due to migration for hibernation.

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with English summary]

ABSTRACT

Road kills of medium- and small-sized mammals, reptiles and amphibians were surveyed in eastern Hokkaido, northern Japan. Four hundreds and fifty-five carcasses of medium- and small-sized mammals, 17 carcasses of reptiles and 1051 carcasses of amphibians were collected from April 1996 to March 1998. In mammals, the species with the highest number of casualties due to traffic accidents was the Big-clawed Shrew with a total of 152 killed, followed by Red Squirrel (94) and Red Fox (85). Road kills of reptiles were low, with only 17 mortalities of four species. In amphibians, a great majority of the mortalities were Ezo Brown Frogs with 1,044 casualties.

Key words : Road kill, Mammal, Reptile, Amphibian, Japan