

Ants as prey of the Yezo brown bear *Ursus arctos yesoensis*, with considerations on its feeding habit

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Abstract

The ants and a wasp contained in scats and a stomach of the Yezo brown bear *Ursus arctos yesoensis* from Tomuraushi and Omabetsu, Tokachi were examined. Recorded as prey species were *Myrmica ruginodis kotokui*, *Lasius niger*, *L. umbratus* or *rabaudi*, *Formica truncorum*, *F. lemani*, *Camponotus obscuripes*, and *Vespula vulgaris*. The abundance, habitat, nest site, size, and digestibility of formicine ants in Tokachi were suggested as the reasons for food preference of the bear.

keywords bear, ant, food preference, habitat, nest.

Introduction

Bears are omnivorous; depending largely on vegetable food, they eat insects to some degree. Ants, belonging to one family, the Formicidae of Hymenoptera, occupy a conspicuous position as food of bears (e. g. Hatler, 1972 and Graber & White, 1983 for *Ursus americanus*; Mealey, 1980 for *Ursus arctos horribilis*; Hozaki *et al.*, 1983 for *Selenarctos thibetanus japonicus*). For the Yezo brown bear *Ursus arctos yesoensis*, ants are the commonest item in the animal food and frequently eaten by the bear throughout its active season, April to September (Kadosaki, 1983; Aoi, 1985).

Only a few authors identified the ant species names: Nishijima (1957) reported 3 species of ants found in a bear stomach, and Kadosaki (1983) and Inukai & Kadosaki

(1987) listed 6 and 8 species respectively as bear food.

The present paper deals with the ants, determining species names, found in scats and a stomach of Yezo brown bear and gives considerations on bear's feeding habits from the nesting and distributional ecology of ants.

Materials and Methods

The ants examined came from 30g fractions of 4 scats collected in July 1980 by Akira Takeda on Tonokari and Reisakubetsu of Tomuraushi (600 to 780m above sea level), Shintoku-cho, Tokachi Region, Hokkaido (Table 1). The scats he collected ranged from 22 to 1040g (average 337g). In addition, the ants found in a bear stomach were also examined. The bear was a male (estimated 3 years old) and captured on 18th May 1980 in an artificial *Larix leptolepis* forest at

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Omabetsu, Memuro-cho, Tokachi. Ants were examined under a stereoscopic microscope, and the number of heads with or without other parts of body and appendages was regarded as that of individuals.

Preparation of a list of the ants of Tokachi Region was based on my collection, almost all of which was made by myself during the last ten years. Habitat types of ants are classified into four: bare land (B), grassland and herby land (G), forest margin or scrub (M), and forest (F). Nest sites are seven types: ground surface (s), under piles of humus and debris (h), under stones (u), around roots of grasses and herbs (g), around roots of trees (t), in tree trunks (k), in decayed stumps or fallen logs (d). Relative abundance, main types of habitat and nest site of each ant species were judged from my experience, referring to Hayashida (1960, 1963)

and Yamauchi & Hayashida (1968, 1970). Total lengths of workers (soldiers included in *Pheidole*) of each species were measured from the mandibular apex to the gastral apex at natural postures reading nearest 0.5mm under a stereoscopic microscope. The specimens used were from my collection.

Results and Discussion

Table 1 shows the species and number of individuals of ants found in the scats and stomach. The number of species of ants per scat ranged 1 to 3. A total of 6 species were observed. Ants were the most frequent item in the animal matter (Takeda, unpubl.). Scat No. 22 contained 5 workers of a vespine wasp, *Vespula vulgaris*. The greatest number of individuals was recorded from *Lasius* (*Lasius*) *niger*, and the next from *Camponotus obscuripes*. However, scat No. 22 originally

Table 1. The ants found in scats and a stomach of *Ursus arctos yesoensis*. The number of individuals found in a part of original materials is given. Locality and date in which the sample was obtained are given below the sample number. F: female, W: worker, L: larva.

Species name	Scat No. 14	No. 20	No. 42	No. 22	Stomach	Total length (mm)
	Tonokari Jun 10	Reisakubetsu Jun 12	Reisakubetsu Jun 12	Tonokari Aug 11	Omabetsu May 18	
Formicidae						
Subfamily Myrmicinae						
<i>Myrmica ruginodis kotokui</i>		1W				4.5
Subfamily Formicinae						
<i>Lasius</i> (<i>Lasius</i>) <i>niger</i>		44W	30W		1W	3.0-4.0
<i>L.</i> (<i>Chthonolasius</i>) <i>umbratus</i> or <i>rabaudi</i> *					5W	5.5-6.0
<i>Formica</i> (<i>Formica</i>) <i>truncorum</i>			12W			6.0-7.0
<i>F.</i> (<i>Serviformica</i>) <i>lemanii</i>			5W			4.0-5.0
<i>Camponotus</i> (<i>Camponotus</i>) <i>obscuripes</i>						
	19W			1F, 14W, 2L		7.5-11.0
Vespidae						
Subfamily Vespinae						
<i>Vespula vulgaris</i>				5W		10.0-10.5
No. species	1	2	3	2	2	
No. individuals	19	45	47	22	6	

* Without the female or male caste, to determine either *L. umbratus* or *rabaudi* is impossible.

included more than 100 individuals of *C. obscuripes* and many chips together (Takeda, pers. comm.). Graber & White said, "*Camponotus* spp. were most commonly eaten" in the animal matter by *Ursus americanus* in Yosemite National Park. *C. obscuripes* in scat No. 14 consisted of 8 major, 8 media, and 3 minor workers. *C. obscuripes* in scat No. 22 also consisted of workers of various size and a wingless female. These suggest that the bears ate any individuals that appeared before them.

Almost all ants in scats were dismembered. This situation was prominent in *L. niger* specimens in scats No. 20. In *C. obscuripes* specimens of scat No. 14, one worker had the head to gastral segment I and another the head to propodeum, but the others were all destroyed in pieces. However, the *C. obscuripes* specimens of scat No. 22 had most of the parts of the body, though often losing appendages. Two workers each held a larva between their mandibles. The larvae lost their contents inside their integuments. The bear must have eaten also many larvae, and they seem to be digested almost completely. Nishijima (1957) reported that almost all contents of a male Yezo brown bear stomach were ants and their pupae.

Change of color was also observed in the ants and wasps. The integuments became lighter or decolorated. In *L. niger* the original color of brown to brownish black changed to brownish yellow, which may lead to misidentification as *L. flavus* without careful examination. In *C. obscuripes* the gaster became decolorated into white and transparent.

Table 2 shows the ant species of Tokachi Region with their relative abundance, habitats, nest sites, and total lengths. In my calculation at least a total of 57 species of ants live in Hokkaido, and at least 29 species are present in Tokachi Region. Kadosaki (1983)

gave 6 species of ants as prey, of which *Formica fusca* may be regarded as *F. japonica* (or possibly *F. lemani*). The present result and Nishijima (1957), Kadosaki (1983), and Inukai & Kadosaki (1987:135) together have come to list 11 species of 4 genera. All of the ants eaten by bears belong to the subfamily Formicinae, except *Myrmica ruginodis kotokui*, which belongs to the Myrmicinae. It is possible that the *Myrmica ruginodis kotokui* worker was eaten accidentally when the bear fed on the *Laius niger* colony, because *M. ruginodis kotokui* and *L. niger* are sometimes found to nest close to each other in a rotten log or a pile of debris.

Food preference may be considered from abundance, easiness to find and handle, size, and digestibility of prey. The six species reported here are all abundant in Tokachi (Table 2). Abundance seems to be reflected in the brown bear's food to some degree. However, *Myrmica* species are also abundant. There are probably some factors other than abundance.

Accumulative numbers of habitat types of the five species (excluding *Myrmica ruginodis kotokui*) calculated from Table 2 are M=5, F=4, G=2, B=1. Namely forest margins and forests have many prey ants.

Nests of ponerine, dolichoderine, and half of myrmicine species are difficult to find or dig. Nests in trunks of living trees and deep in the soil seem unavailable for bears. Nests of *Formica truncorum* may be easy to find, because they are built in mounds made of pine and larch leaves and dead grass stems etc on relatively open forests and wood margins. Scat No. 22 contained many chips with a female, workers, and larvae of *C. obscuripes*. The bear must have dug and destroyed the ant nest in a dead or living tree. Nishijima (1957) considered that the bear

Table 2. A list of the ants of Tokachi Region. The 2 species of *Formica* listed at the bottom have been not yet found from Tokachi. Marked with # and * are the prey species of *Ursus arctos yesoensis* reported here and by Nishijima (1957), Kadosaki (1983), and Iunkai & Kadosaki (1987) respectively. ++: very common, +: common, -: rare. B: bare land, G: glassland and herby land, M: forest margin and scrub, F: forest. s: ground surface, h: under piles of humus and debris, u: under stones, g: around roots of grasses and herbs, t: around roots of trees, k: in tree trunks, d: in decayed stumps or fallen logs.

Species name	Abundance	Habitat	Nest site	Total length (mm)
Subfamily Ponerinae				
<i>Ponera japonica</i>	-	G F	hu	2.5
Subfamily Myrmicinae				
<i>Myrmica lobicornis jessensis</i>	++	BG	s g	3.0-5.0
<i>M. kurokii</i>	+	GM	d	4.0-5.5
<i>M. rubra</i>	-	G	g	3.5-4.0
# <i>M. ruginodis kotokui</i>	++	GMF	h g d	3.5-5.5
<i>M. sp.</i> (Omobiro)	+	MF	hu	4.0-5.5
<i>M. sp.</i> (Tsubo)	-	GM	g	3.5-4.0
<i>Stenammas nipponense</i>	+	MF	h t	3.0
<i>Aphaenogaster smythiesi japonica</i>	-	BG	s	3.5-5.5
<i>Pheidole fervida</i>	+	BG	ug	1.5-3.5
<i>Leptothorax acervorum</i>	+	GM	u d	2.5-3.0
<i>L. congruus</i> var. <i>spiniosior</i>	-	BG	u	1.5-2.0
<i>L. sp.</i> (Munedaka)	+	MF	h	2.0-3.0
Subfamily Dolichoderinae				
<i>Dolichoderus sibiricus</i>	-	F	k	2.5-3.5
Subfamily Formicinae				
<i>Paratrechina flavipes</i>	+	BG	hug	1.5-2.0
<i>Lasius hayashi</i>	+	MF	tk	3.0-3.5
* # <i>L. niger</i>	++	BGMF	hugt d	3.0-4.0
* <i>L. flavus</i>	++	G	hug	2.5-3.0
* # <i>L. umbratus</i>	++	MF	g d	3.0-4.0
<i>L. rabaudi</i>	+	MF	g d	3.0-4.0
* <i>L. fuliginosus</i>	+	MF	t	3.5-4.5
<i>L. spathepus</i>	+	MF	t	3.5-4.5
* <i>Formica sanguinea</i>	+	BG	s	6.0-7.0
<i>F. fukaii</i>	+	GM	gt	4.0-6.0
# <i>F. truncorum</i>	++	MF	gt	5.0-6.0
# <i>F. lemani</i>	++	GM	ug	4.0-5.5
<i>F. transcaucasica</i>	+	GM	ug	4.0-5.0
* # <i>Camponotus obscuripes</i>	++	MF	t d	6.5-11.0
<i>C. herculeanus sachalinesis</i>	+	MF	t	6.0-11.5
* <i>F. truncorum</i> var. <i>yessensis</i>	++	MF	gt	4.0-6.0
* <i>F. japonica</i>	+	BG	s g	3.5-6.0

attacked the ant nests in dead trees. *Vespula vulgaris* is distributed in level land and montane zones, and nests in the soil and sheltered spaces such as tree holes (Matsuura & Yamane, 1984).

Accumulative numbers of nest site types of the five species calculated from Table 2 are $g=4$, $t=3$, $d=3$, $u=2$, and $h=1$. Most prey ants build their nests around roots of grasses and herbs, around roots of trees, and in decayed stumps or fallen logs. The distribution of ant nests on the bear habitats is sparse, and the nests in the litter or soil seem to be difficult to find for the bear. The ant nests in the rotten stumps and decayed logs and near the tree roots are perhaps easy to find and handle for the bear.

The total length of ants eaten ranged from 3.0 to 11.0mm in the worker, and a female was 15.0mm long (Table 1). The size of ants eaten was relatively large. Ponerine, dolichoderine, and about a half of myrmicine species are of smaller size (Table 2). *Ponera*, *Stenammas*, *Pheidole*, *Leptothorax*, and *Dolichoderus* are usually 3.0mm or less. *Lasius* is 3.0mm or more, and *Formica* and *Camponotus* are still larger. Ants of these three genera, all belonging to Formicinae, were frequently eaten.

Formicine ants have soft integuments, while almost all species of the other subfamilies have strongly sclerotized ones. The former may be easy to be digested. The gaster contents of formicine ants found in scats were almost empty and seemed to be digested. Since myrmicine ants and formicine ants are equally abundant in Hokkaido, bears seem to select formicine ants for food.

The number of ant species per scat was in most cases 2 or 3. This indicates that the bear positively searched for ant nests for food. Ants are therefore a significant food for the Yezo brown bear. Its preference for or selec-

tion of formicine ants for food may come from their 1) relative abundance, 2) habitats and nest sites easy to find and handle, 3) relatively larger size, and 4) having soft integuments.

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エゾヒグマ *Ursus arctos yesoensis* の
摂食習性と餌としての蟻類

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摘 要

北海道十勝地方のトムラウシと雄馬別で採集されたエゾヒグマの糞と胃に含まれた蟻類と蜂類を調べ、種まで同定した。餌種としてシワクシケアリ *Myrmica ruginodis kotokui*, トビイロケアリ *Lasius niger*, アメイロケアリ *L. umbratus* またはヒゲナガアメイロケアリ *L. rabaudi*, ケズネアカヤマアリ *Formica truncorum*, ヤマクロヤマアリ *F. lemani*, ムネアカオオアリ *Camponotus obscuripes* の6種の蟻類とキオビクロスズメバチ *Vespula vulgaris* を記録した。シワクシケアリは偶然口に入った可能性があり、ヤマアリ亜科の種類に偏っていた。その理由として、十勝地方のヤマアリ亜科の蟻類のコロニー数の多さ、生息場所と造巣場所の発見しやすさと取りやすさ、体の比較的大きいこと、消化しやすさを示唆した。