

Cultural Ecology of Zenmai Gathering in the Northeastern Japan

著者	IKEYA Kazunobu
雑誌名	The science reports of the Tohoku University. 7th series, Geography
巻	53
号	1/2
ページ	1-28
発行年	2004-03
URL	http://hdl.handle.net/10097/45262

Cultural Ecology of *Zenmai* Gathering in the Northeastern Japan

Kazunobu IKEYA*

Abstract This study describes and analyzes the correlation of *zenmai* ecology and gathering activities in Miomote in northeastern Japan. The *zenmai* ecology is closely affected by snow coverage. Measurement of the *zenmai* length indicates that the “sakari” period lasts only 2-5 days. That period is signaled by leaf stalk length exceeding 25 cm and leaf opening. It is important for the local people to know the appropriate time of *zenmai* gathering. Furthermore, the distribution of *zenmai* colonies is affected by sunlight: colonies form at slopes with poor sunlight. *Zenmai* gathering activities based in mountain huts are composed of three elements: approach to gathering site, gathering, and transportation. Average gathering time per day is 4 hours 50 minutes; the volume gathered per gathering episode is 40-60 kg. Certain correlations—“hiraori”, “sawaori”, and “kuboori”—were found between snow disappearance time and geographical conditions of gathering. Examining the relation between changes in snow coverage and gathering activities in years with early melting, the author found out *zenmai* grows together all at once. For this reason, the gathering period is short and volume gathered per day is large. In contrast, in years with late melting, accumulated snow suppresses *zenmai* growth, engendering big differences in the snow melting time for each area. For this reason, gatherers adopt a strategy of limiting the volume gathered per day and increasing gathering duration.

Key words: *zenmai* gathering, cultural ecology, snow, gathering place, gathering village

1. Introduction

Cultural ecology is a well known approach in cultural geography and ecological anthropology (Netting, 1977; Townsend, 2000; Moran, 2000). It clarifies the relationship between the natural environment and subsistence activities like hunting, gathering, fishing, herding, farming, and others. Among previous studies, there are many monographs: for example the Ainu ecosystem in Japan (Watanabe, 1973) and the San

* Associate Professor of National Museum of Ethnology, Senri Expo Park 10-1, Suita, Osaka 565-8511, Japan
Science Reports of Tohoku University, 7th Series (Geography)
Vol. 53, Nos. 1/2, March, 2004, 1-28

ecosystem in Southern Africa (Lee, 1979 ; Tanaka, 1980). However, very few case studies exist regarding the gathering among the contemporary Japanese people (Tanno, 1978 ; Iida 1998).

On the other hand, though the fieldwork of this paper was held in 1980's, it seems to be meaningful in geographical studies to record the gathering activities in detail, and analyze them scientifically because they deeply depend on mountain environment in Japan, and have disappeared for the past 20-30 years.

This study shows the ecology of the use of resources in a lifestyle using the natural environment : the use of resources in a "gathering colony" in the Northeastern Japan (Tohoku district). The author addresses changing resource usage and resource management in a commonage from the viewpoint of cultural ecology through the analysis of *zenmai* (*Osmunda japonica*) gathering activities in a Japanese village community.

The author has already revealed the process through which the existence of a "gathering colony" was discovered where *zenmai* production was the mainstay of a village economy in the Tohoku district, and the process through which *zenmai* production was commercialized (Ikeya, 1989a). Unlike other edible wild plants, the *zenmai* was not only the village residents' preservable food, but also a product with a long history since the Edo period. However, "gathering villages" were formed in heavy snowfall regions along the Japan Sea from the second half of the Meiji to Taisho periods (Ikeya, 1989a). These are villages distributed at the foot of Moriyoshi, Waga, Kurikoma, Chokai, Asahi, Iide, and Echigo Mountains (Ikeya, 1988, 1989a). Moreover, this *zenmai* production brought about a change as great as an economic revolution for village residents. That is, it not only assured a stable cash income over the short term, but also yielded the custom of borrowing commodities for winter in advance and paying for them with *zenmai* in spring.

The study area¹⁾, Miomote in Asahi-mura, is located at the foot of the Asahi Range in Niigata Prefecture (Fig. 1). Most of this area is covered with national forest land of about 30,000 ha. It is an adequate area allowing *zenmai* growth in terms of its forestation, landforms, and heavy snowfall. The Murakami District Forest Office of the Maebashi Regional Forest Office manages the forest. Local residents are permitted to use the national forest to gather wild plants.

The settlement is located in the vicinity of a confluence of the Miomote River and the Suezawa River. About 40 households existed in the area ; the population was approximately 150 in 1981. The settlement housed 50 males and 72 females ; 31 people stayed outside the settlement. Most of the residents were middle-aged and older people from 40 to 60 years old. No residents were aged 0-5 or 15-30 years old (Fig. 2). Main jobs of the villagers were *zenmai* production in spring, road construction in summer and autumn, and work away from home in winter.

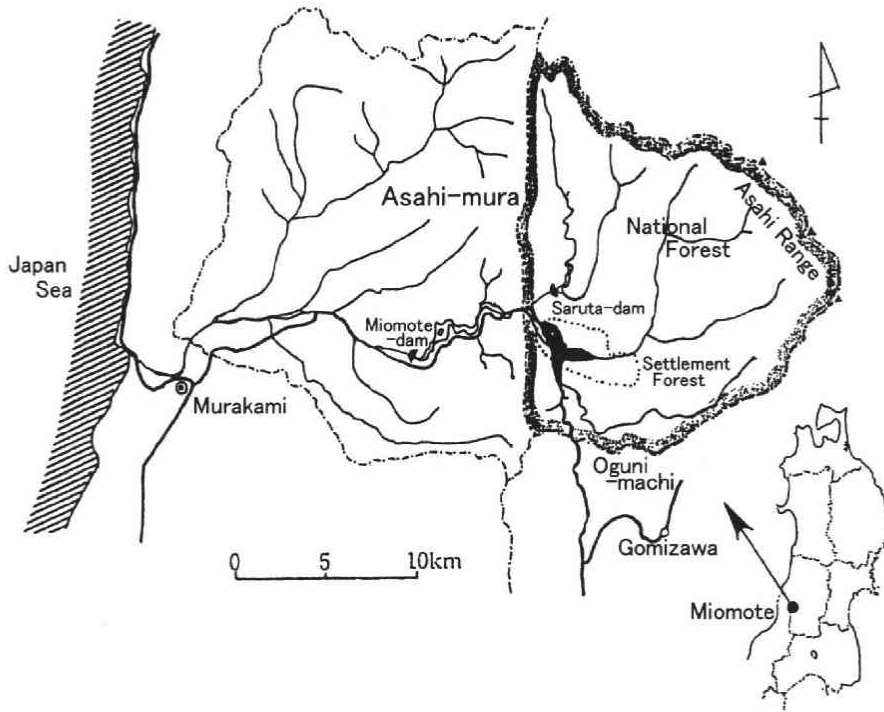


Fig. 1 The study area

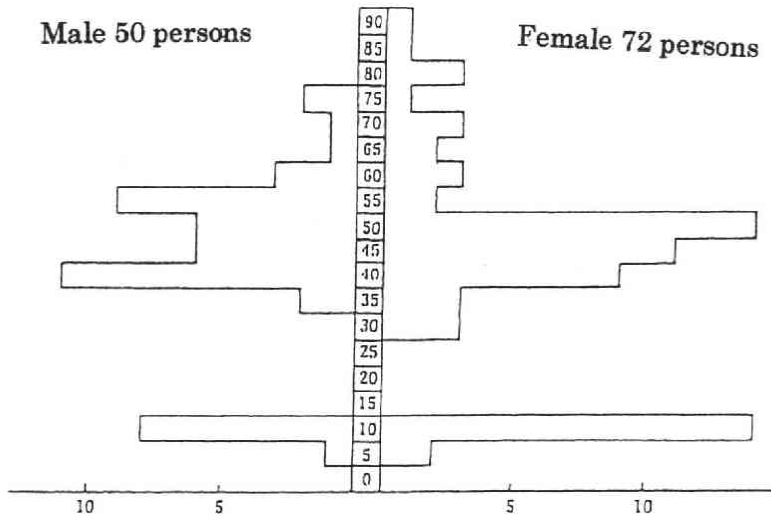


Fig. 2 Age composition in Miomote
 Males : 50 persons Females : 72 persons

2. Ecology of *zenmai* (*Osmunda japonica*)

Understanding human activities as well as the ecology of *zenmai* is crucial to analyze the correlation between the ecology and *zenmai*-gathering activities. This chapter reviews the ecology of *zenmai* required in an attempt to analyze *zenmai*-gathering activities outlined in the next chapter.

Zenmai (*Osmunda japonica*) and *yamadori zenmai* (*Osmundastrum cinnamomeum*) grow wildly in Miomote; both are edible. However, only the former is gathered and consumed by local residents. This section shall therefore discuss only *zenmai*.

Zenmai is a perennial growing gregariously throughout the Japanese countryside. It has a short rootstalk, blocky structure, and tussock leaves. Its leaves are of two types: several sterile fronds called "onna *zenmai*" and one fertile frond called "otoko *zenmai*". A major part of the leaf stalk of the fertile frond is hard and inedible, so only the leaf stalk of the sterile frond is gathered for consumption. Therefore, only the "onna *zenmai*" are gathered selectively. Moreover, these "onna *zenmai*" must be gathered within a certain period from budding, otherwise they overgrow and harden, thereby becoming unfit for consumption. Therefore, those gathering *zenmai* must be familiar with the right time and place to gather *zenmai*. The right time to gather *zenmai* is reviewed through analyzing *zenmai* growth conditions. Places for gathering *zenmai* are determined through analyzing *zenmai* colony distribution.

2.1. Growth conditions of *zenmai*

Small streams in early spring are buried in accumulated snow and snow sliding down from the both stream-bank slopes. This snow starts melting from upper slopes down to lower side slopes. Just after the snow has melted, the shrubs growing on the upper side slope have not yet foliated. Therefore, the fallen leaves of the previous year color the area red. Subsequently, plants including *zenmai* and shrubs begin growing rapidly, painting the area yellowish green as the days progress.

From 5 to 17 May, 1983, the author measured the length of *zenmai* leaf stalks growing in a 2×3 m block of area at Hataguro-*zawa* (Fig. 3), a river branching from the Doromata River, a tributary stream of the Miomote River. This block of area is a slope tilting 54.8° toward the northeast. At the time of the study, the slope was yellowish green at the top and red below. Measurement was carried out using a measure between 17:00 and 18:00. Table 1 summarizes those results.

Stumps A-W grow in this block of area. Each stump has two to five leaves. J4 is a fertile frond, and the rest are sterile fronds. On the first day of the survey (5 May), *zenmai* stumps A-K growing at the upper side of the slope in the surveyed area had leaves longer than 7 cm, clearly indicating that budding had occurred 5 days previous. Budding of M to O inside occurred on 7 May, whereas that of P to W at the

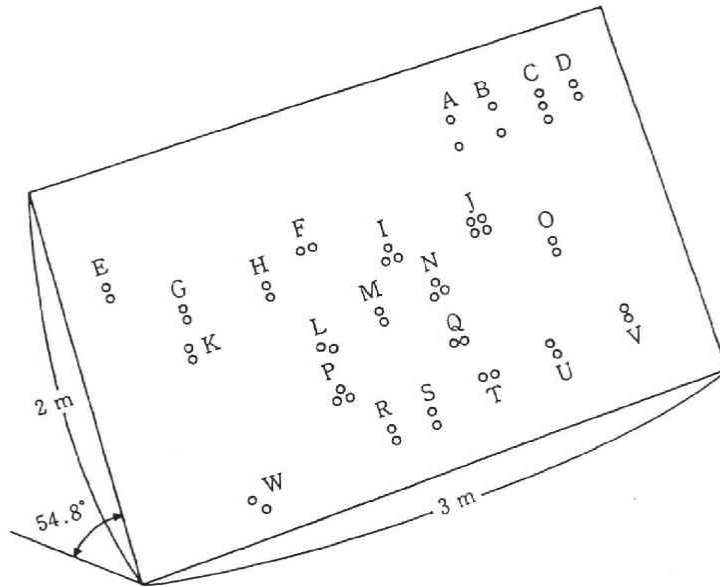


Fig. 3 Research section at the steep slope of the northeastern direction
Zenmai are shown respectively by letters A-V.

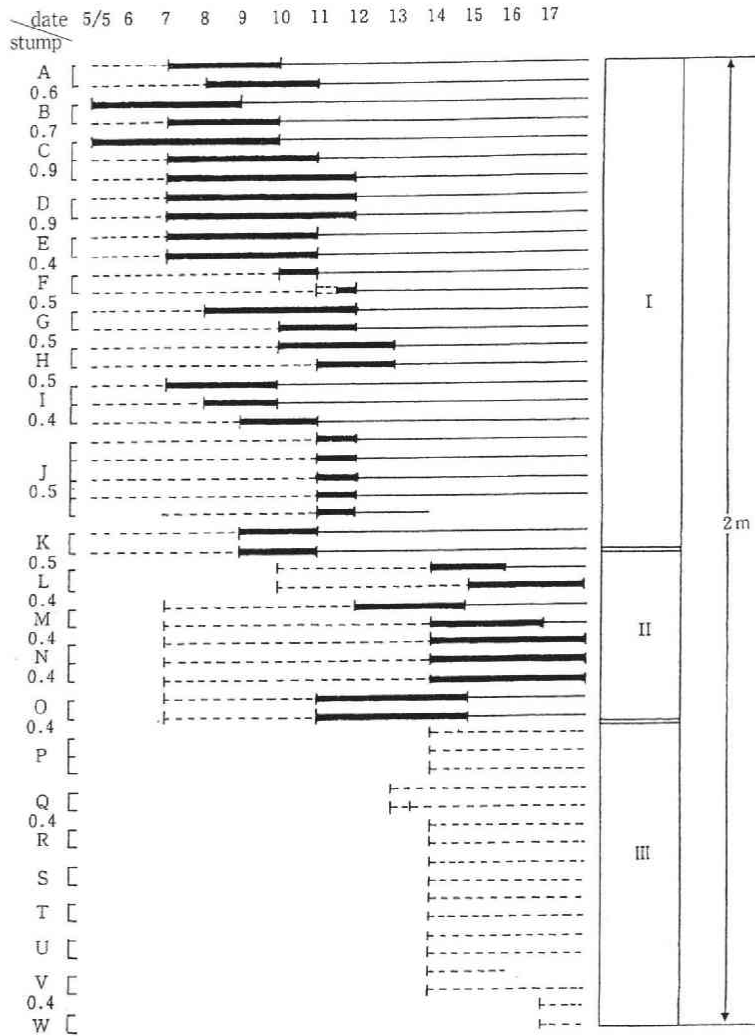
Table 1 *Zenmai* length

stump \ date	5/5	6	7	8	9	10	11	12	13	14	15	16	17
	(cm)												
A ₁	10	20	25	29	36	45	55	58	65	69	73	76	
A ₂	21	35	41	46	53	56	64	74	77	81	84	86	
B ₁	31	47	54	60	63	71	81	90	90	98	104	106	
B ₂	19	35	43	48	55	62	73	83	84	91	97	101	
C ₁	29	47	53	55	58	67	77	83	92	94	100	102	
C ₂	20	36	42	46	53	54	71	77	83	87	92	94	
C ₃	14	27	34	38	46	51	63	72	75	80	83	89	
D ₁	14	28	36	40	47	54	65	77	80	86	87	91	
D ₂	14	27	33	38	46	53	64	74	77	81	84	89	
E ₁	16	25	30	36	44	52	60	65	73	76	78	79	
E ₂	20	33	39	43	48	55	63	68	75	76	80	82	
F ₁	7	13	15	21	27	33	39	46	51	54	59	61	
F ₂	6	9	11	14	18	23	30	34	39	44	44	47	
G ₁	11	22	26	31	39	46	52	60	63	70	73	73	
G ₂	7	15	20	21	28	35	42	46	52	56	59	62	

stump \ date	5/5	6	7	8	9	10	11	12	13	14	15	16	17
	(cm)												
H ₁	9		13	16	22	28	36	45	52	58	63	65	70
H ₂	6		8	12	17	23	32	39	45	52	59	61	65
I ₁	12		25	27	34	38	46	54	62	64	69	73	74
I ₂	12		24	27	31	37	46	52	55	60	64	67	67
I ₃	8		18	22	27	30	42	49	53	58	62	66	66
J ₁	7		9	10	14	18	25	34	40	48	53	58	60
J ₂	7		9	12	17	22	26	32	38	47	47	54	54
J ₃	9		10	14	18	23	27	36	40	46	46	49	52
J ₄	11		13	17	21	24	27	32	32	38	41	43	43
J ₅			16	17	18	23	31	42	47				
K ₁	7		18	21	25	32	42	55	60	65	70	71	72
K ₂	9		20	23	29	38	42	55	60	65	72	72	74
L ₁						6	8	12	18	24	30	35	41
L ₂						5	7	11	13	18	22	24	27
M ₁			2	2	?	5	8	13	19	24	29	33	36
M ₂			2	2	?	10	17	25	30	37	43	46	48
N ₁			4	4	?	5	9	13	20	24	32	38	42
N ₂			4	4	?	7	9	16	22	28	34	41	43
N ₃			4	4	?	7	12	17	24	29	36	43	47
O ₁			9	9	?	23	28	34	41	50	53	60	62
O ₂			12	13	?	25	32	39	47	55	59	63	65
P ₁										3	5	6	7
P ₂										5	6	7	8
P ₃										5	7	8	9
Q ₁									4	5	7	9	10
Q ₂									5	5	9	11	12
R ₁										3	3	4	4
R ₂										3	3	4	6
S ₁										3	4	4	5
S ₂										3	4	4	5
T ₁										4	5	6	8
T ₂										4	5	7	8
U ₁										3	4	4	6
U ₂										3	4	4	6
V ₁										3	6		
V ₂										4	7	9	10
W ₁													3
W ₂												4	

date * shows the date leaves open

bottom occurred on 13 or 14 May. The reason for *zenmai* to start budding from the top of the slope then gradually downward is thought to be because snow starts to melt from the slope top, and consequently ground temperature increases.



before "sakari", "sakari", after "sakari"

Fig. 4 The "sakari" period of *zenmai* in the research section
 The "sakari" period is shown as the period between the time they reach 25 cm length and the time the *zenmai*'s leaves open. unit : cm

After budding, young leaves covered by brown fluff grow day by day. Leaf stalks that have just budded are ca. 5–7 cm long. Four to six days later, they become longer than 25 cm (H2, J1, J2, K1, L1 in Table 1). The fluff is shed when they grow further and their leaves open. Local people gather *zenmai* during this time. “Sakari” is the name given to the time before the leaf stalks exceed about 25 cm and the leaves open.

Figure 4 shows the “sakari” periods of *zenmai* for A1 to W2. Narrow *zenmai* with leaf stalks measuring 0.4–0.5 cm in diameter (F1•2, H1•2, I1•2•3, J1•2•3•4•5, K1•2, L1•2) have a “sakari” period of only 2–3 days. On the other hand, thick *zenmai* with diameters of 0.7–0.9 cm (B1•2, C1•2•3, D1•2) do not open their leaves even after their leaf stalks exceed 50 cm. Therefore, they have a “sakari” period of 4–5 days. Therefore, the “sakari” period differs according to the leaf-stalk thickness.

Zenmai can be as tall as 1 m when the “sakari” period ends and leaves open completely. They spend summer and autumn in this state and wither in winter. However, being a perennial, the stumps remain in the ground, sprouting again the following spring. Considering the one year span of *zenmai*, its “sakari” period, during which humans can consume it, is merely 2–5 days, demonstrating the value of knowledge regarding the appropriate time for gathering *zenmai*.

2.2. Distribution of *zenmai* colonies

Zenmai can be seen growing by the path inside Miomote or on the sides of trails. Most do not form colonies, but instead grow in stumps of two or three at the most. Progressing further into mountainous areas, however, *zenmai* shows a different distribution pattern, forming very large and dense colonies of 100 m². It is difficult to measure the size of the colony area because they grow on very steep slopes. This study estimated the *zenmai* colony distribution in gathering areas based on a follow-up survey of the activities of M20.

There are 55 colonies in the area where M20 gathers *zenmai* (Fig. 5). Slopes with *zenmai* colonies are called “zenmaippira”. Colonies are found in greater numbers at small streams of tributaries of the Doromata River such as Hataguro-zawa, Taruzawa, and Yougake-zawa rather than along the Doromata River itself. Moreover, like 1, 2 of Hataguro-zawa and *x*, *y*, *z* of Yougake-zawa, *zenmai* grows profusely at the branch flowing north of the small stream, from the bottom to the top of the slopes on both banks. This fact suggests that *zenmai* colonies distribute mainly on slopes facing northeast, north, and northwest, and that no colonies exist on south-facing slopes²⁾. In other words, *zenmai* colonies form on slopes with poor sunlight because of the deleterious effects of sunlight.

Local residents say that “when walking upstream, for streams converging from the right, *zenmai* grows on the right; for streams converging from the left, *zenmai* grows on the left”. This knowledge of the locals appears relevant when compared

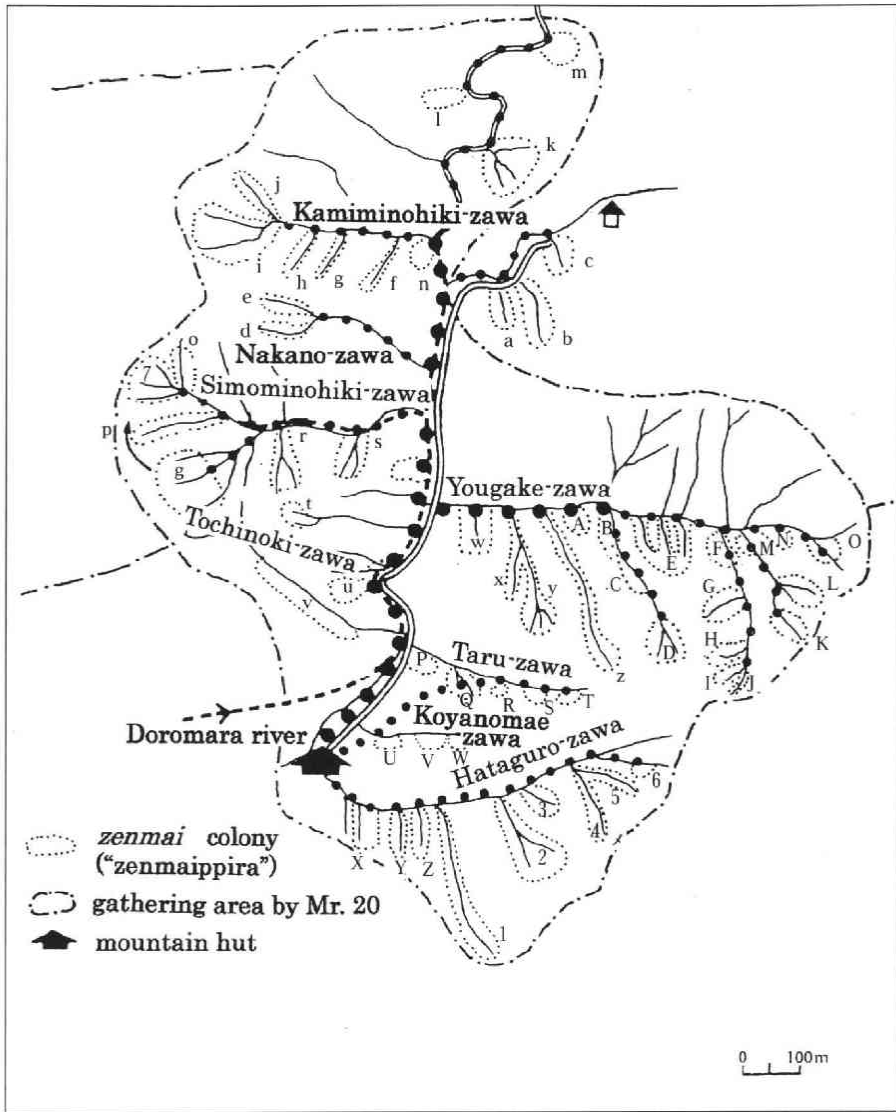


Fig. 5 Distribution of the *zenmai* in Miomote
zenmai colony ("zenmaippira")
 gathering area by M20 Doromara River Kamiminohiki-zawa Nakano-zawa

with Figure 5.

Such distribution extends over mountainous areas with altitudes of ca. 200-1,100 m.

3. *Zenmai* gathering activity

3.1. Forecasting the gathering time

In 1983, the snow depth in mid-January exceeded 1 m, decreasing to 50 cm at the end of the month. In February, it reached a height of 2 m and started to melt after 20 March. Around this time, mountain snow also hardens and beeches start to bud. About one month during this time is the bear hunting season. In 1983, the bear hunting season started around 10 April and ended on 28 April.

According to an informal interviews, local residents found that snow began melting earlier than the previous year from the crunchy state of the snow when they walked the mountains to hunt bear. Those that did not hunt had also predicted early melting from the slight snow coverage from the preceding winter (December, January). For instance, M32 (hereafter indicating the male head of a household) said on 28 April before the start of *zenmai* gathering that "because of the lack of heavy snow in January, snow melting should be early this year, and *zenmai* gathering should probably end around 20 May". M20 said on 27 April that "there is no snow this year, and *zenmai* will bud early. We will probably have about 10 days to gather *zenmai*. Snow in March is soft and disappears fast". In this way, the locals forecast the time and period to gather *zenmai* each year from the state of snow coverage in the mountains where they go bear hunting and around *zenmai* colonies.

Exactly as they predicted, *zenmai* gathering in 1983 started around 1 May and ended on 20 May. Compared to the *zenmai*-gathering period in 1982, which lasted from 4 to 31 May, it started early and lasted for a shorter period. Just as in previous years, elementary and secondary schools observed a 10-days work vacation from 8 May. The people of the region, including elderly persons and children, took to gathering *zenmai*.

3.2. Gathering place

Miomote has a 1,000-ha village forest around settlement and an approximately 30,000-ha national forest which surrounds it. The local residents sign common forest agreements with the Murakami District Forest Office, subcontracting work related to preventing fires and monitoring illegal harvesting. In return, they are able to freely gather forest products in the national forests. They can also gather forest products freely in the village forest according to local district rules. Around 1970, each Miomote household started to gather *zenmai* at certain places every year (Fig. 6). In areas further than the conventional gathering sites of this region, use of resources of neighboring Gomizawa in Oguni-*machi* in Yamagata Prefecture and residents of Chinawa in the same village was allowed.

However, this practice with neighboring regions was discontinued in 1980's. The

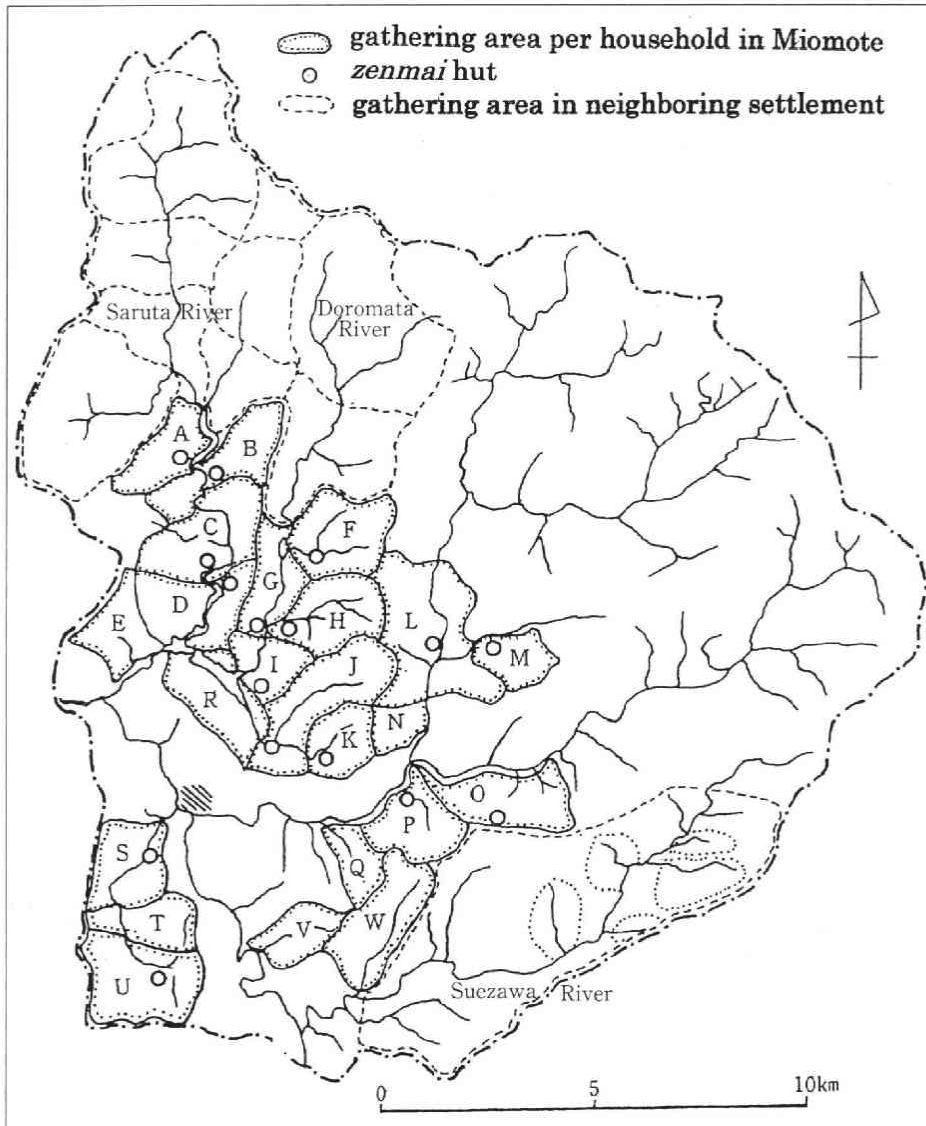


Fig. 6 The *zenmai* gathering area in Miomote and neighboring settlement in about 1970
Source: Author's interviews

people of Miomote use the mountains of Miomote exclusively. Furthermore, the gathering sites in Miomote are gradually expanding along the forest roads of the Suezawa River and the Saruta River.

Gathering sites in the whole region extend to the Suezawa River, the Saruta River,

and Doromata River in addition to the main river Miomote. In particular, at the Saruta River basin, where the unpavement road called "Asahi Super Rindou" penetrates deep into the forests, gathering sites expand up to the border of Yamagata Prefecture. The altitude of the gathering sites is lowest at about 200 m around the colonies; it reaches 1,100 m at Iwaimata-*zawa* tributary stream of Miomote River. This three-dimensional space, with an altitude difference of 900 m, is the gathering site of the whole region.

Snow melting in gathering sites is earlier along the Suezawa River than along the Saruta River. Whereas the latter is a mountain with many comparatively moderate slopes, the latter is a rocky mountain with numerous steep slopes. The "sakari" period of *zenmai* also differs according to the change in the snow-melting period; it is about 20 days. Gatherers use normal passenger cars and motorcycles to go to the part of gathering site along the Suezawa River and the Saruta River. Snow melting differs according to the stream size. It is especially fast along the river or at streams that are relatively wide because river or the stream water promotes snow melting during this time. On the other hand, narrow streams are buried by snow to a height of several meters. Thereby, snow melting is slow. On the other hand, deep snow coverage enables passage deep inside steep stream. Coupled with the delayed melting, two to three gatherings are possible at one slope side.

3.3. Mountain climbing

At huts where gatherers stay during the gathering period, resources required for staying 20 days to one month in a small mountain hut are brought in prior to gathering (mountain climbing). The following reviews the "mountain climbing" action based on the accounts of M12 on 8 May.

At 7:50 a.m., the couple leaves the colony on a motorcycle toward the Saruta Dam. The husband carries approximately 35 kg of goods and the wife approximately 25 kg. The goods consist of rice, miso, soy, noodles, seaweed, dried radish, eggs, bear meat, garlic, soy sauce, salt, can food, salt, canned goods, whale meat, dried seaweed, candles, newspaper, etc. At 8:20 a.m., they transfer to a small boat that runs along the waters of the Saruta Dam. At 9:00 a.m., they reach the entrance of the Doromata River. Because the river becomes very shallow further inside, the boat is unable to enter it. To ensure that the boat is not washed away in the event of a flood, the boat is placed slightly upland. They leave at 9:20 a.m.. No roads exist here. Choosing shallow places of about 50 cm, they gradually climb the 10-m-wide Doromata River ("Ookawa").

At 9:50 a.m., they reach the entrance of the Togu-*zawa* and climb a ridge with a small trail called "Akamezaka" (Fig. 7). The name of this slope, meaning red eyes, comes from the fact that because the slope is so steep, one's eyes become red while

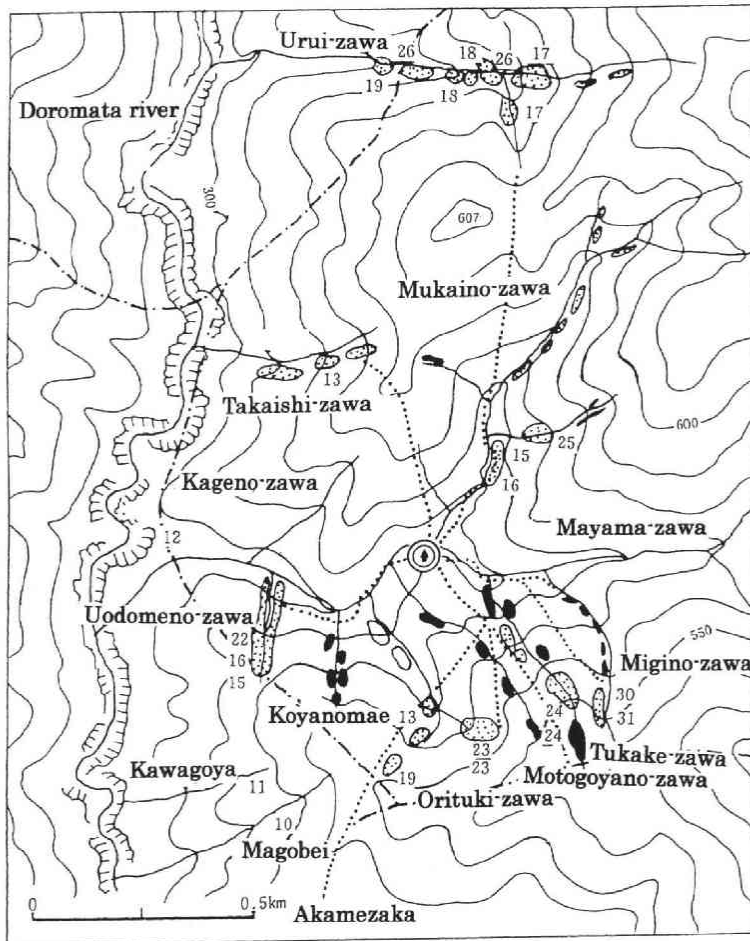


Fig. 7 *Zenmai* gathering activity and gathering date by M12

- : *zenmai* colonies that people can not gather
- ◐ : *zenmai* colonies gathered in 1982
- : *zenmai* colonies not gathered in 1982
- ⊙ : mountain hut
- ⋯ : gathering path

The figure shows gathering date in May, 1982

Source : Author's interview and *zenmai* diary

climbing. They climb the slope and reach the gathering site. The oak tree near the hut is engraved with the date of climbing as 10 May 1978, and 21 May 1981. At 12:10, they reach the hut. The route from the gathering site to the hut takes about 4 hours.

Mountain huts are usually built on flat ground of about 15 m² on the left bank of

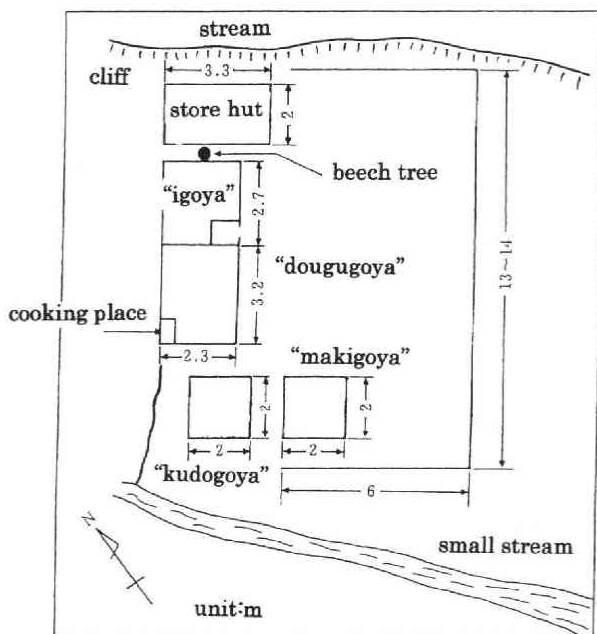


Fig. 8 Mountain hut arrangement

Mayama-zawa in the branch of the Doromata River, where there is sunlight (Fig. 8). They lean against beech trees of about 1-m diameter. These permanent huts are called "igoya" and are made by assembling oak and beech trees into a triangular shape and weaving *Sawagurumi* (*Pterocarya rhoifolia*) bark and galvanized iron sheet. During off-seasons, they are used to store pots, kettles, futons, straw mats, etc.

The wife dries the futons, arranges the straw mat, and uses a spade to dig up plants used for thatching and weeds growing on the grounds in front of the hut to prepare space for drying *zenmai*. The husband seeks out a full moon maple (*Acer japonicum*) called "hananoki"³⁾ of several centimeters' thickness behind the hut; then he builds a tool hut next to the "igoya". First he bends two "hananoki" from both sides and ties them with a rope to form a bow shape. *Marubamansaku* (*Hamamelis japonica* var. *obtusata* Matsum) called "mansaku", *Mizume* (*Betula grossa*), and oak vines can be used to tie the "hananoki". The bow-shaped frame is covered with a plastic sheet, completing the tool hut. Water is drawn from a nearby small stream using a plastic hose to build a cooking area at the side of the hut.

In the same way, "kudogoya" and "makigoya" are built in the layout shown in Figure 8. The "igoya" is used as a space for eating and sleeping; it also has a firepit. The "dougugoya" is used to store tools like straw mats and nanking bags, etc. Metal barrels⁴⁾ are placed in the "kudogoya" to boil *zenmai*. In the east is the "makigoya

(firewood hut)", which stores firewood used for the fire pit and "kudogoya". In the north end of the "igoya" is the hut for storing *zenmai* during processing. Mountain huts are built in areas that meet the following three conditions. The first one, which is the most important, is that there be a large *zenmai* colony nearby. For example, looking at Figure. 7, the hut of this household is seen to be located at the center of the gathering site next to the colony considering transportation to the colony after gathering. The second is that there be some drying place with good sunlight for drying *zenmai*. The third is that water, required for living in the mountain hut, be available nearby. These conditions roughly coincide with the locational requirements of Gomizawa's snow hut reported by Tanno (1978 : 201). However not more than two huts were found built next to each other in Miomote.

On 9 May, the next day, the gathering paths from the hut to the gathering site were cleared. Then a bridge was built halfway through. Gathering paths extend radially from the center of the mountain hut. If mudslides occur as a result of snow, winds, or water, several places will become difficult to walk in. Such areas are cleared using spades. Three bridges are also erected on Mayama-zawa of several meters in width using round trunks that are about 10 m long.

3.4. One day in *zenmai* gathering

On the day of gathering, the wife of the investigated household starts a fire in the firepit early in the morning at 5 a.m. ; she begins to prepare breakfast. The husband wakes at 6 a.m. and has breakfast. The menu includes homemade *natto* (fermented beans), soybean, "shidokina", udo (*Aralia cordata*), cut dried radish and a char, and bean paste soup containing "shinomi" (mountain vegetables and mushrooms used in bean paste soup)⁵⁾ such as Oobakiboushi (*Hosta sieboldiaba Engl.*) called "urui", udo (*Aralia cordata*), "wakai" (unknown) which the wife picks near the hut. Lunch and dinner are basically the same menu as the breakfast.

After breakfast, this household eats "nosanomochi" roasted at the firepit to ward off accidents in the mountains. This is the rice cake offered at shrines on the first day of the new year, brought home and dried. However women are prohibited to eat it. Men eat it before they leave for bear hunting.

The *zenmai* gatherers put on their work clothes, wear straw rain-capes made of grass sacking, and carry bags called "tengo" over their shoulders. The carrying bags come in two types : one is worn around the hips, called "koshi-tengo" (length 30 cm × width 50 cm); one is worn around the shoulders called "ootengo" (length 30-40 cm × width 60-70 cm). This outfit allows gatherers to gather and carry *zenmai* with both hands free all the time. To avoid slipping at steep slopes of the mountains, they also wear spiked rubber-soled tabi. Spikes tied to straw sandals with cross-shaped iron claws were used until ten years ago.

Around 6:30 a.m., the husband tells the wife the name of the stream planned for *zenmai* gathering; he then leaves the dwelling. It should be noted that there are streams which have names of places such as *Urui-zawa* and *Takaishi-zawa*, and names of small streams used only in households such as *Uodomeno-zawa*, *Koyanomae-zawa*, *Orituki-zawa*, *Motogoyano-sawa*, *Tsukake-zawa*, *Migino-sawa*, *Mukaino-zawa*, and *Kageno-sawa*. In households 12 and 20, *Hataguro-zawa* and *Taru-zawa* are examples of the former and *Yougakeichi* to *Yougakego* examples of the latter.

The husband heads to the “Zenmaippira” via the gathering trails, taking about 5–20 min. *Zenmai* of various thickness and length grow in the targeted slope called “hira”. Only “onna *zenmai*” that have grown more than 25 cm and whose leaves have not opened are picked. The gatherers break off 25–30 cm from the top of the “sakari” *zenmai* with their hands. The bottom part of long *zenmai* are not taken because they “motogatatsu” (the leaf stalk near the root is hard). With short *zenmai*, the root is said to rot easily if bent from the area near the rootstalk, causing *zenmai* depletion. In addition, gathering *zenmai* at the same location every year is also said to cause *zenmai* depletion. Gatherers intentionally leave one to two “onna *zenmai*” for every stump.

“Zenmaippira” can also be found under bushes of plains and below large beech trees. As described in the above section, most are distributed along steep slopes. To gather fat *zenmai* growing along the edge of cliffs, gatherers must cling onto shrubs and grass roots growing nearby to support themselves adequately. The shrubs and grass that the author has so far identified are Japanese astilbe (*Astilbe thunbergii* var. *congesta*) called “toriashi”, kuromoji (*Lindera umbellata*), yashabushi (*Alnus firma*) called “minebari”, full moon maple (*Acer pycnanthum*) called “hananoki”, beech, utsugi (*Deutzia crenata*), marubamansaku (*Hamamelis japonica* var. *obtusata* Matsum) called “mansaku”, akaso (*Boehmeria sylvestris*) called “akawata”, etc. The author has also clung onto “iwasuge” and “yamatsubaki”. However, gatherers need to pay careful attention to what they are clinging onto because these shrubs and roots sometimes wither and break when held (Photo1). Household number M12 says, “I steady myself without depending on brushwood, and just in case the brushwood breaks, I think beforehand which brushwood to cling onto next”.

The walking method differs according to the size and shape of the “hira”. The *zenmai* gatherers are familiar with the overall size of the “hira” and walk carefully to cover every inch. For example, in areas where long thin fissures run, as in “hido”, gatherers must walk up and down the slopes. On the other hand, in the cases of “hira” that are several meters wide and tall, as with “kacchi” (the upper part of the stream), the gatherers walk in a zigzag pattern from bottom to top for a width of 5–7 m before the *zenmai* comes into view. Moving from bottom to up provides a better view of the *zenmai* and facilitates gathering. The gatherers repeat this movement and carefully



Photo 1 *Zenmai* (*Osmunda japonica*) gathering activities

pick the *zenmai* in the “hira”. However some areas in the “hira” may be too “sakar-isugi”; for such areas, gatherers may move irregularly.

Looking in detail at the way in which the gatherers walk, they appear to hump over at steep slopes, hold onto shrubs and grass roots with their left hand, and pick one *zenmai* at the time with their right hand. After picking the *zenmai* of one stump, they look around, then move on to promptly the next stump. They rhythmically repeat rest and movement at steep slopes. When they are unable to hold all the *zenmai* in their right hand, they put the *zenmai* in the carrying bag⁶⁾. M12 says that hands become full with eight good *zenmai*. When their carrying bag becomes full with 8 kg of *zenmai*, they remove the *zenmai* and place it inside the slopes along the gathering pathway to the hut, or place the *zenmai* on ridges or snow avalanche.

Next, the transportation and processing methods of *zenmai* are described taking the gathering activities of M20 on 7 May, 1983 as example. M20’s hut is located south of M12. At M20’s hut, his two children also stay there to help with *zenmai* gathering.

On this day, M20 goes to Yougake-*zawa*. There, snow covers the area from the mouth of streams to the top of stream called “kacchi”. As shown in Figure 9, M20 places *zenmai* at A, B, C, and D on the snow bed. After completing gathering at five “zenmaippira”, he moves to transporting them back. Spreading the carrying bag on his shoulders, he starts to gather *zenmai* in the order of D, C, B, A from upstream to downstream. He then binds the *zenmai* as “hitoshi”⁷⁾, places small beech twigs to prevent damage to the *zenmai*; then he ties this with “o” (string attached to the carrying bag). He then ties this with a lash rope, and carries it on his shoulders.

The *zenmai* path is more or less the same road to and back. However, back home, the gatherers must burden themselves 40–50 kg of *zenmai* on their shoulders (Photo 2). In this situation, they also need to detour around several waterfalls and walk in a stream. For example, the Hataguro-*zawa* inside the gathering site of M20 has four waterfalls. The second waterfall from the bottom has a height of 20 m, and

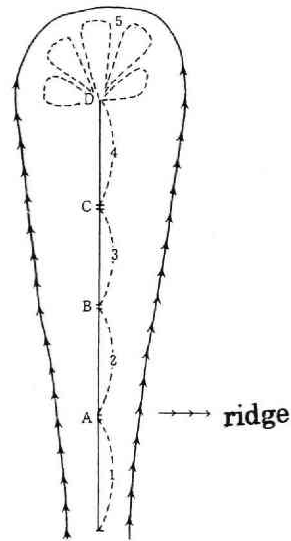


Fig. 9 An example of *zenmai* carrying in the stream
 A, B, C, and D show the places where *zenmai* remain
 1, 2, 3, 4, and 5 show the *zenmai* colonies ("zenmaippira")



Photo 2 *Zenmai* processing in front of the mountain hut

must be passed through. Because of the heavy load on their shoulders, they may slip and fall into the basin of a waterfall. For this reason, such places are extremely dangerous. The author, who accompanied M20, was warned here that "you are holding rotten grass". His wife does not go above the waterfall. In addition, because

snow melts from the center and produces only a thin covering, these areas are avoided.

Depending on the day, gatherers return to the hut at around 11 a.m.. They eat lunch at their huts and then go out again to gather *zenmai* if they were unable to cover all the *zenmai* in the area they worked in. Typically, however, they move on to work at a separate stream.

At 4 p.m., afternoon gathering ends and “watatori” starts. They sit down, hold one bunch of *zenmai* in one hand, and remove the *zenmai* fluff. They then separate *zenmai* into three groups: “tobi” above 1 cm in diameter, “hoso” below 0.5 cm, and the middle “huto”. At M20’s household, his two children, aged 9 and 15 years, help with the work. The sorted *zenmai* are placed in “ami” for every 20 kg, and boiled in the drums. If not boiled on the day they are gathered, *zenmai* become hard and inedible.

Zenmai take about 8-10 minutes to boil, after which their leaves turn white⁸⁾. The boiled *zenmai* are then placed unevenly over the “su” woven from bamboo grass and brushwood picked neat for the mountain hut. A plastic sheet is placed on top to protect from rain. The family then take their dinner, bathe in the drum cans, and go to bed at 8 to 9 p.m., ending one day of *zenmai* gathering work.

On the other hand, the wife gathers at the stream near the hut after breakfast, returns to the hut at about 10 p.m., and starts to dry the *zenmai* (“tenboshi”). First, she spreads straw mats or plastic sheet on the ground in front of the hut where there is adequate sunlight, spreads the boiled *zenmai*, which were placed on the “su” the prior evening. Next, she sits on the straw mat or plastic sheet, gathers the *zenmai*, and presses them with both palms until they exude water. This is done gently to prevent breakage of the *zenmai*. Both hands start to become wet with water from the *zenmai*, the leaf stalk starts to wrinkle, and the leaves at the tip drop off. After being left to stand for two hours, the *zenmai* is pressed two more times: thereby, it is pressed three times in one day. Greater force is used from the second time. If busy, *zenmai* may be pressed only twice a day. Upon completing this task, raw *zenmai* becomes black; one third of the leaf stalk (measured from the tip) dries up.

On the second day, an absorbent straw mat is used instead of the plastic sheet. *Zenmai*, shaped into 35-45 cm diameter balls, are squeezed gently and pressed against the straw mat while applying force from the wrist (Photo 3). Thereby, one ball is squeezed continuously for about 10-20 sounds. After squeezing, the *zenmai* ball is turned over to its backside and dried. Thin *zenmai* dries to the “moto” (root of stalk area) within that day and is finished.

On the third day, the *zenmai* are gently squeezed so that they do not break. Because overdrying will also induce breakage, the *zenmai* are stored in the tool hut carefully while observing the drying state.

If blessed with good weather, *zenmai* dry in 2-3 days. If it rains, they cannot be dried in the sun and raw *zenmai* pile up in so-called “tsudomu”. Although they do not

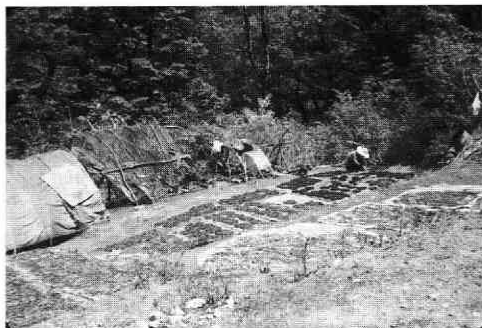


Photo 3 *Zenmai* carrying

need to be dried in the sun on the second day, raw *zenmai* will rot if left aside longer than this. Therefore, if rain continues to a third day, the *zenmai* are smoked so that they do not burn. This drying method is called “aoboshi”. M20 carried out this method on 17 May, 1983. They placed a 60-cm diameter net over a furnace burning wood near the hut; then they placed the *zenmai* over this to smoke. Eyes hurt from the smoke, so goggles have been used in the past.

Regardless of which method - drying in the sun or “aoboshi” — the finished dry *zenmai* becomes 1/10 the weight of raw *zenmai*. This dried *zenmai* is packed in grass sacks and kept in the tool hut.

On rainy days, *zenmai* gathering, transportation, and processing are not undertaken except for “aoboshi”. The family would often sleep in the hut. M12’s wife said, “Resting in the mountains is relaxing. Down in the village, you hear people going to the fields or going to find bracken, and you can not stand being alone in the house. If you do not go to the mountains, people around you would say you dislike the mountains; so I go to the mountains even if not for the purpose of finding something”. Though life in the mountain hut can be physically strenuous, the mountains apparently allow people to relax away from the eyes of others in the village.

In this manner, about 100 kg of dried *zenmai* is produced, ending the 25-day sojourn in the mountain hut. The last task is transporting the dried *zenmai* to the village. Everyone goes down the mountains after completing processing of all the *zenmai*.

M12’s family transported the dried *zenmai* to the place where the boat was docked twice, on 26 and 29 May, 1982. Then, on 4 June, he and his wife dismantled the hut except for the “igoya”, stored necessary tools for use again next year in the “igoya”, and went down the mountains with the remaining dried *zenmai*.

3.5. Time and space structure of *zenmai* gathering

As mentioned earlier, *zenmai* gathering based in the mountain hut comprises three activities: approach to the gathering site, gathering, and transportation. To clarify the time allocation of these activities, the time of each of these activities was measured for about 20 days from the start to end of gathering at household number 20. Table 2 shows the results. The time taken from the mountain hut to the gathering site was within 20 min in all. It is omitted in Table 2. However, it should be noted that the length of this time is linked to the transportation time. For this household, they approached the gathering site by boat and on foot.

Depending on the number of gathering sessions, the gathering time per day is 7 hours at the longest and about 30 minutes at the shortest, averaging 4 hours 50 minutes. The amount of *zenmai* gathered in the first gathering was not more than 40–60 kg (“hitoshoi”). That quantity was restricted by the transportation ability of the gatherer. In the case of M20, it was up to 65 kg; in the case of M12, he was able to carry only up to 50 kg.

The amount gathered in one hour differed according to the amount of *zenmai* that was gathered in the “zenmaippira”. For a “sakari” “zenmaippira”, the amount was

Table 2 Gathering activity by Mr. 20 on May, 1983

	dategathering place	gathering amounts (kg)	gathering time	carrying time	all activities time	classification of activities
May.1	(a, b, c)	40	?	?	?	A
2	(f, g, h, P)	50	?	?	?	A
3	(d, e, k)	55	4. ^h 10 ^m	0. ^h 40 ^m	7. ^h 45 ^m	A
4	(l, m)	55	3. ^h 05 ^m	0. ^h 48 ^m	6. ^h 52 ^m	A
5	(2, 3, 4, 5, 6) (Z, Y, X)	44, 37	2. ^h 54 ^m , 2. ^h 35 ^m	0. ^h 36 ^m	8. ^h 09 ^m	A
6	(F, G, H)	65	4. ^h 34 ^m	1. ^h 05 ^m	8. ^h 08 ^m	A
7	(x, y)	38	2. ^h 31 ^m	0. ^h 46 ^m	3. ^h 52 ^m	A
8	(l) (Q, R, S, T)	60, 50	3. ^h 37 ^m , 3. ^h 24 ^m	0. ^h 56 ^m , 0. ^h 45 ^m	5. ^h 08 ^m , 4. ^h 00 ^m	B
9	(a, c, n) (b)	50, 45	2. ^h 45 ^m , 2. ^h 42 ^m	0. ^h 35 ^m , 0. ^h 30 ^m	4. ^h 33 ^m , 3. ^h 52 ^m	B
10	(f, g, h, i) (s, r)	60, 45	3. ^h 28 ^m , 2. ^h 40 ^m	1. ^h 08 ^m , 0. ^h 48 ^m	5. ^h 06 ^m , 3. ^h 59 ^m	B
11	(k, l, m) (p, 7, o)	55, 45	2. ^h 51 ^m , 2. ^h 46 ^m	0. ^h 38 ^m , 0. ^h 37 ^m	3. ^h 58 ^m , 3. ^h 58 ^m	B
12	(m) (B, C, D)	50, 43	3. ^h 16 ^m , 3. ^h 10 ^m	0. ^h 48 ^m , 1. ^h 05 ^m	5. ^h 02 ^m , 4. ^h 45 ^m	B
13	(N, O) (d, e)	45, 45	2. ^h 33 ^m , 2. ^h 45 ^m	1. ^h 00 ^m , 0. ^h 45 ^m	4. ^h 54 ^m , 4. ^h 15 ^m	B
14	(K, L, M, E) (X, Y, Z)	40, 30	3. ^h 26 ^m , 2. ^h 20 ^m	0. ^h 42 ^m , 0. ^h 15 ^m	4. ^h 39 ^m , 2. ^h 50 ^m	C
15	(F, G, H, I, J) (2, 3)	42, 28	3. ^h 50 ^m , 1. ^h 50 ^m	1. ^h 10 ^m , 0. ^h 30 ^m	5. ^h 47 ^m , 2. ^h 33 ^m	C
16						
17						
18	(f, g, h, i, j) (1, 2, 3, 4, 5, 6)	40, 30	4. ^h 10 ^m , 2. ^h 10 ^m	0. ^h 50 ^m , 0. ^h 25 ^m	5. ^h 30 ^m , 3. ^h 00 ^m	C
19	(k, l, m) (s, r, q, 7, o)	?	?	?	?	C

A: “hiraori” B: “sawaori” C: “kuboori”

greatest on 9 and 11 May, for example. About 50 kg of *zenmai* was gathered in about 2 hours 50 minutes. On 15 and 18 May, gathering sites had been distributed. About 40 kg of *zenmai* was gathered in about 4 hours. That rate implies that it is important to predict "sakari" to enhance the *zenmai* gathering ability. On the other hand, if the "zenmaippira" is not "sakari", inadequate *zenmai* are generally picked from other gathering sites.

The time taken to transport raw *zenmai* to the mountain hut is basically within one hour. As mentioned previously, it is dangerous to transport a 50-kg load in a steep stream; such activity requires considerable effort. Therefore, decreasing the transportation time is one important strategy.

The total time of activities, including approach to gathering site, gathering, and transportation to mountain hut is 8 hours average per day, sometimes lasting to 10 hours. It is necessary to complete removal of fluff to boiling on the same day; thereby, 10 hours per day is a reasonable limit.

On the other hand, within the approximately 20-days gathering period, the time for snow to disappear varies by location within the gathering site. In areas of snow slides or under ridges, snow galls quicker, and snow melts early at slopes under strong sunlight. Snow melts the slowest in valleys and depressions where snow accumulation is quite deep, including that from avalanches.

In this way, in addition to the difference in the snow melting time within one "hira" and the altitudinal difference of 350 m, the time snow disappears differs by location within the gathering site. As discussed in section of *zenmai* ecology, *zenmai* growth differs locally according to this difference in the time of snow disappearance. This point is introduced taking the gathering activities of M12 as an example. Within his gathering site, *zenmai* "sakari" is early at the "hira" along the Doromata River, where the altitude is low (200 m) and snow melts quickly. Estimating from the gathering sites and days of M12, "sakari" places can be seen to be shifting to the high places one by one. Therefore, a certain correlation exists between the time of snow disappearance and geographical conditions. Taking this relation as the spatial typology of *zenmai* gathering activities, we can discern the following three patterns of gathering.

Type A is extensive gathering in "shibatsuki" and "waseppira". This pattern is equivalent to "hiraori". "Shibatsuki" is the area directly under ridges; snow melts quickly there. "Waseppira" are steep slopes with snow slides, or slopes with strong sunlight. Snow melts fast there as well. In the case of M12, activities were of this type from 1 to 7 May, during which he covered several "zenmaippira" extensively to gather "hitoshi" *zenmai*.

Type B is gathering of sakari "zenmaippira" in a narrow area. This pattern is equivalent to "sawaori". M12's activities were of this type from 8 to 13 May. It was sufficient for him to cover two or three colonies to gather "hitoshi" *zenmai*. For

instance, in the gathering site of Yougake-zawa (N,O) on May 13, he was able to gather "hitoshi" *zenmai* in about 2 hours and 30 minutes.

Type C is extensive gathering in a depression where snow melts slowly, as in the edges of snow accumulations such as those resulting from avalanches. This pattern is equivalent to "kuboori". M 12's activities were of this type from 14 to 19 May. To gather "hitoshi" *zenmai*, he needs to cover scattered "zenmaippira" extensively.

Zenmai gatherers broaden or reduce their areas of activities according to the snow melting time and local difference in the "sakari" time of *zenmai*.

4. Snow accumulation, *zenmai* ecology, and gathering activity characteristics

Previous chapters have discussed and analyzed the relation between snow accumulation and *zenmai* gathering activities overall. However, results of direct observation seem to leave room for clarification. There is a need to elucidate the way in which *zenmai* gatherers should cope with the annually changing snow depth.

It is evident that the snow melting state at Saruta-Dam differs vastly every year. To review long term variation, Figure 10 shows the days when accumulated snow of that year completely disappeared as the day snow disappeared for the 21 years from 1961 to 1981. This figure shows that snow disappeared in March in 1972 and 1979, but

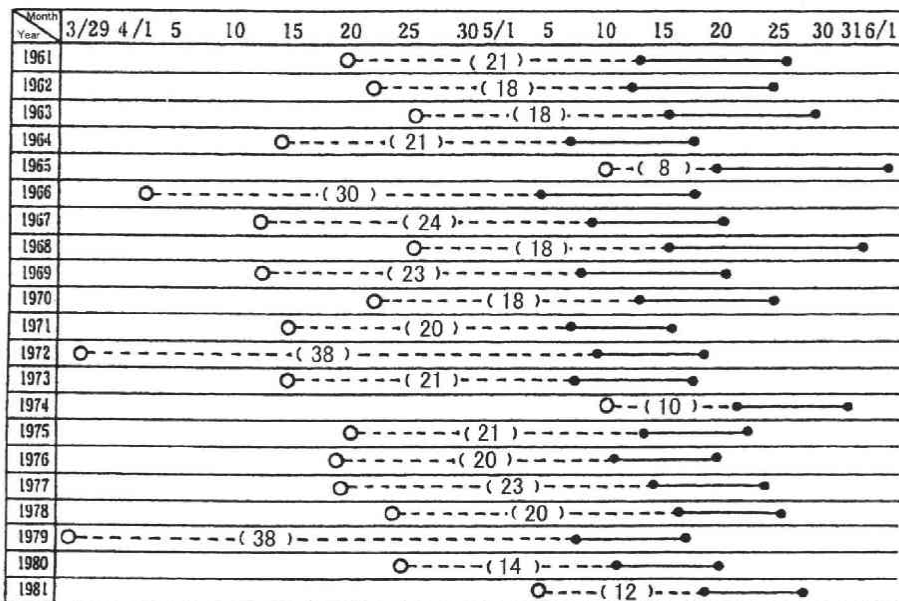


Fig. 10 The dates of snow's disappearance and gathering times
 ○ date of snow's disappearance ●-● gathering time

did not disappear even by May in 1965, 1974, and 1981. How should gatherers deal with such unpredictable natural phenomena? The following discusses this issue from the three aspects: *zenmai* gathering time, period, and gathering volume.

First, the gathering time is reproduced based on the "Zenmai Gathering Holidays at Miomote primary and secondary schools" documents. At Miomote primary and secondary school, a questionnaire survey was sent to each household with a student to inquire the gathering time of each home; thereby, the duration of school holidays was determined. For example, in 1982, the 11 requested school holidays start on 10 May, one on 13 May, and two on the 15 May. Consequently, the *zenmai*-gathering holiday was set for 9 to 18 May. Determining the school holiday duration in this way roughly indicates the duration of gathering for the whole village. Figure 10 shows the starting day of holidays as the starting day of gathering. This figure shows that the time from the day snow disappeared to the day gathering started has been an average of 20 days. In years where snow disappeared late, such as 1965, 1974, and 1981, this was shorter: 8, 10, and 12 days. In contrast, in years where snow disappeared early, as in 1972 and 1979, it was longer at 38 days. Differences in this duration indicate that the starting day of gathering is prescribed by factors other than the speed of snow disappearance. In years with slow snow disappearance, the relation to rice planting, which must be carried out regardless of the snow-melting state is important. Gathering must be started soon after snow disappears. In years where snow disappearance is fast, ecological conditions such as the rise in ground temperature are important limiting

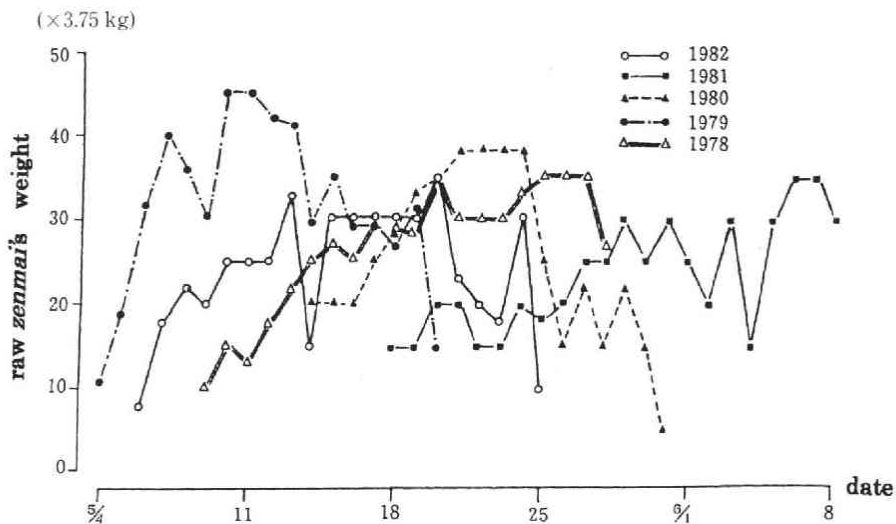


Fig. 11 Daily changes of *zenmai* gathering amounts
raw *zenmai* weight date

factors which promotes *zenmai* budding. Gatherers tend to slow down the start of gathering.

Next, annual changes in the gathering period and daily change in the gathered volume are tracked based on individual records (Fig.11). In 1979, when snow disappeared early, gathering activities lasted 17 days. In 1981, when snow disappearance was slow, activities continued for 22 days. The gathered volume per day was about 130 to 150 kg (35-40 "kan") of raw *zenmai* in years with early snow melting (1979) and little, about 90-110 kg (25-30 "kan"), in years with slow snow melting (1981).

Figure 12 shows changes in the volume of dry *zenmai* gathered every year by M4 from 1967 to 1982. Volume dropped in 1974, showing a slight downward trend after 1967. However, the overall volume is stable.

These analysis results indicate that differences in the snow melting time strongly affect *zenmai*-gathering activities. In years with early snowmelt, the gathering period is short and the gathered volume per day is high. *Zenmai* suddenly grows altogether at a certain time because snow melts early. Gatherers therefore adopt a strategy of focusing efforts on a short period while maximizing the gathered volume per day. In years where melting is slow, the great snow cover area suppresses *zenmai* growth. Moreover, differences in the snow melting times at each area increase. Therefore, gatherers adopt a strategy of decreasing gathered volume per day and increasing the gathering period according to the snow disappearance state and *zenmai*

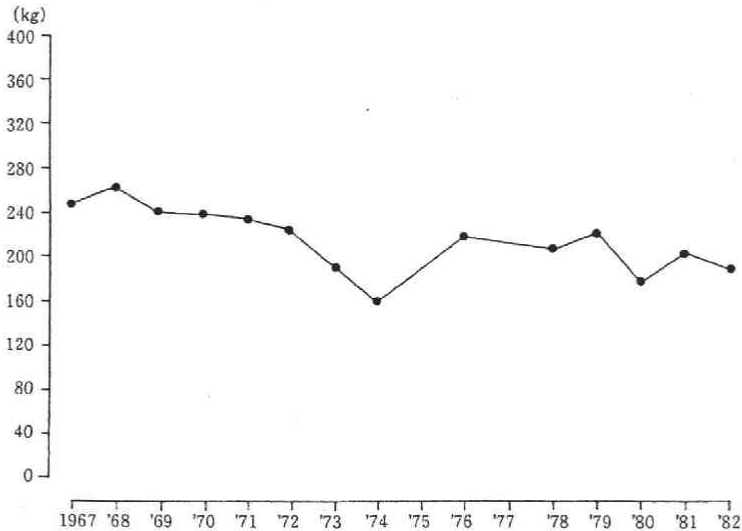


Fig.12 The yearly changes of dry *zenmai* by M4
source : diary of *zenmai*

growth conditions.

How do the locals themselves assess different strategies according to the snow melting time? Examining the gathering efforts made per day, compared to years where melting is early and maximization of gathered volume is required, locals appear to prefer years with slow melting because they are able to gather *zenmai* over a long period of time without excessive effort. However, they actually prefer years of fast melting because it does not coincide with the rice planting work that follows soon after the gathering period.

5. Conclusion

This study described and analyzed the correlation of *zenmai* ecology and gathering activities in Miomote in the northeastern Japan. The *zenmai* ecology is affected by snow coverage. Measurement of the *zenmai* length indicates that the sakari period lasts only 2-5 days. In that period, the leaf stalk length is under 25 cm and leaves have begun to open. Therefore, it is important for the locals to know the appropriate time for *zenmai* gathering. Furthermore, the *zenmai* colony distribution is affected by sunlight. Colonies are found to form at slopes with poor sunlight.

Zenmai gathering activities based in mountain huts comprise three activities: approach to gathering site, gathering, and transportation. The average gathering time per day is 4 hours 50 minutes; the volume gathered per session is 40-60 kg. Certain correlations—“hiraori”, “sawaori”, and “kuboori” - were found between snow disappearance and geographical conditions.

Examining the relation between changes in snow coverage and gathering activities, *zenmai* grows together all at once in years with early melting. For this reason, the gathering period is short and the volume gathered per day is high. In contrast, in years with late melting, the accumulated snow suppresses *zenmai* growth, resulting in vast differences in the snow melting time of each area. For this reason, gatherers adopt a strategy of limiting the volume gathered per day and, to compensate, increasing the gathering duration.

The cultural and ecological relationship between the natural property and the residents in a “gathering colony” in Miomote, Niigata, and activities of *zenmai* gathering, which is the economical basis, are analyzed. Consequently, they revealed that *zenmai*-gathering activities use snow coverage positively and conform to the environment splendidly. The *zenmai* ecology is influenced more or less by snow coverage. Measuring *zenmai* length indicates the “fertilization season” period because the length of a petiole is about 25 cm; it is 2-5 days until leaves open. Nevertheless, it has turned out that residents have full knowledge of the period suitable for gathering.

The following relationships hold between snow coverage and gathering activities: when a thaw comes early, the *zenmai* grows all at once in a certain period. For that reason, the gathering period is short and the amount gathered per day increases. On the other hand, when a thaw occurs late, snow coverage suppresses *zenmai* growth. Thereby, the thaw period gap becomes large in all locations and the amount gathered per day is less, whereas the gathering period is longer.

Moreover, in Miomote, before the Taisho Era, during which *zenmai* was commercialized, families did not have a particular gathering field (Ikeya, 1989a). Instead, they carried out common-use. However, when *zenmai* commercialization began at the beginning of the Taisho Era, gathering with a hut as a base began. Many villagers came to assume a particular area as their own gathering field. The questions of the historical process of the gathering territoriality remain for future study.

Notes

- 1) Primary and secondary schools abolished these in March 1985 by all people migrations under the influence of government relocation policy.
- 2) My interviews suggest that *zenmai* on south-facing slopes do not form colonies.
- 3) It is said that painted maples (*Acer mono*) are not used to build mountain huts.
- 4) Gatherers sit on a board inside the drum can, which serves as a bathroom.
- 5) When gathering is finished, *uwabamisou* (*Elatostema umbellatum* var. *majus*) called "aomizu" and "akamizu", Japanese butterbur (*Petasites japonicus*), bracken (*Pteridium aquilinum* var. *latiusculum*), etc. are used as "shinomi" in miso soup.
- 6) The gatherers sometimes throw *zenmai* on the snowbed without putting them into the carrying bag when they are gathered from a steep slope.
- 7) "Hitoshoi" equals about 40-50 kg weight of raw *zenmai* or about 3.75-kg weight of dry *zenmai*.
- 8) When people boil raw *zenmai*, people say it is finished when the *zenmai* becomes a red color.

References (*in Japanese, **in Japanese with English abstract)

- Iida, T. (1998): Competition and communal regulation in the Kombu Kelp harvest. *Human Ecology*, 26(3), 405-423.
- Ikeya, K. (1987): Rice crops and shifting cultivation in Miomote, Murakamihan in the Edo era. *Science Reports of the Tohoku University, 7th Series*, 37(1), 41-51.
- Ikeya, K. (1988): Spatial structure of *Zenmai* gathering: a case study of the mountain village in the heavy snow zone. *Science Reports of the Tohoku University, 7th Series*, 38(2), 104-118.
- Ikeya, K. (1989a): Formation of a *Zenmai* producing region in the remote mountain villages of the Tohoku region: An example of commodity production in the remote mountain villages from the late Meiji era**. *Jinbun Chiri*, 41, 71-85.
- Ikeya, K. (1989b): *Zenmai* gathering activity in the remote mountain villages in snowy zones and gathering territory*. *Kikan Jinrui-gaku* 20, 63-120.

- Ikeya, K.** (2003): Social Monograph of Wild Plant's Gatherers: Resource Use and Territoriality*. Sendai: Tohoku University Press.
- Lee, R.B.** (1979): The !Kung San: Men, Women, and Work in a Foraging Society. Cambridge: Cambridge University Press.
- Moran, E.** (2000): Human Adaptability: An Introduction to Ecological Anthropology. Boulder: Westview Press.
- Netting, R.** (1977): Cultural Ecology. Long Grove: Waveland Press.
- Tanaka, J.** (1980): The San, Hunter-Gatherers of the Kalahari. Tokyo: University of Tokyo Press.
- Townsend, P.K.** (2000): Environmental Anthropology: from Pigs to Politics. Long Grove: Waveland Press.
- Tanno, T.** (1978): Wild plant gathering in the mountain villages in snowy zones*. *Kikan Jinruigaku* 9(3), 194-239.
- Watanabe, H.** (1973): The Ainu Ecosystem. Tokyo: University of Tokyo Press.