note

Wild mushroom food custom associated with Japanese red pine forest in a small town in southwestern Japan

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Abstract

A wild mushroom food custom was investigated in the small town of Heguri, Nara Prefecture, southwestern Japan. Deciduous trees mixed with evergreen broad-leaved trees dominate the slopes as a secondary forest, while bamboo stands and a Japanese red pine forest grow closely around the villages that make up the town. Here, more than 200 mushroom species grow in the stands and forests, of which only 9 are traditionally gathered and consumed. These nine species are limited to ectomycorrhiza-forming basidiomycetes associated with Japanese red pine as symbiotic partners. Other types of mushrooms found in the broad-leaved forest are not harvested, even though some are known as commercially cultivated fungi or are popularly used elsewhere, especially in northeastern Japan. This study revealed tight relationships among people, the red pine forest, and ectomycorrhizal fungi, forming a wild mushroom food custom typical to southwestern Japan.

Introduction

People in northeastern Japan gather a variety of wild mushrooms and usually salt them for winter stock[1], whereas people in southwestern Japan use fewer types and either do not preserve their harvests or sometimes dry a few varieties but rarely salt them[2-4]. The present author[5] found that the residents of some areas in the Chugoku mountains, which are dominated by deciduous forests, exhibited a wild mushroom food custom with similar to that of northeastern Japanese. In southwestern Japan, however, few reports have focused on wild mushroom use, especially in the context of local vegetation, fungal flora, and the life of the people[2,3,6]. Ogawa[2] focused on changes in the production of matsutake, *Tricholoma matsutake* (S. Ito & Imai) Singer, in relation to intensive distribution and management of Japanese red pine forest, *Pinus densiflora* Sieb. et Zucc., in southwestern Japan.

In the present report, traditionally consumed wild mushrooms were investigated in the small town of Heguri, Nara Prefecture, southwestern Japan. This town is historically documented as one of the oldest centers of commercial matsutake production and gathering[7]. This study aimed to outline the structure of wild mushroom food customs in southwestern Japan from the viewpoint of the relationships among people, vegetation, and fungal flora.

Study site and survey

The study site, Heguri Town, is in northern Nara Prefecture in southwestern Japan (Fig. 1). Heguri is situated in a basin surrounding the Yata Hills and Shigi-Ikoma Mountains, which form the border of Osaka and Nara prefectures. Heguri has a mean annual temperature of 14.4℃ and a mean annual precipitation of 1354 mm. Warm-temperate evergreen broad-leaved trees such as *Castanopsis cuspidata* (Thunb.) Schottky, *Quercus glauca*

Thunb., and *Camellia japonica* L. dominate as the primary forest[8] or potential natural vegetation[9]. This primary forest, however, is now restricted to old Shinto shrines and areas surrounding Buddhist temples, in which tree-cutting has been severely restricted. Outside of the primary forest, deciduous trees such as *Quercus serrata* Murray, *Q. acutissima* Carrth., and *Q. variabilis* Bl. dominate the slopes as secondary forest[8]. Stands of bamboo, mainly *Phyllostachys bambusoides* Sieb. et Zucc., surround villages, and Japanese red pine forests grow along the upper slopes above the bamboo stands and along mountain ridges (Fig. 1).

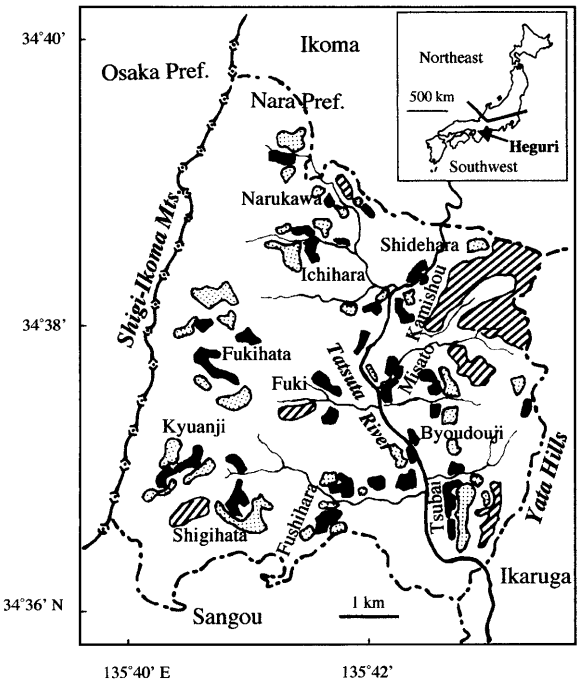

Fig. 1. Map of villages and vegetation of Heguri Town, located in Nara Prefecture in the southwestern region of Japan. The inset on the upper left of the figure represents the Japanese Archipelago, with a bold line dividing northeastern and southwestern Japan. Villages established in the past few decades are omitted from the map.
■, villages; ⁘, bamboo stands; ▨, Japanese red pine forests.

As mentioned above, fungal biodiversity seems to increase as vegetation becomes more varied. As an initial part of the study, the wild mushrooms growing in the study site were identified in 1999-2001 by reference to colored illustrations[10-12]. So far, more than 200 basidiomycetous mushroom species belonging to 39 families have been listed and documented[13]. Simultaneously, I interviewed residents about their use of mushrooms, especially in regard to local names, knowledge of the standard Japanese common names, how to distinguish edible from inedible species, and the method of preparing and cooking of the mushrooms. Seventeen residents were interviewed, consisting of nine men ranging in age from 42 to 82 years and eight women ranging from 57 to 86 years.

Results and Discussion

Wild mushrooms traditionally used

The wild mushrooms traditionally used for food in Heguri are listed in Table 1. People consumed only nine species, but these species were morphologically variable and belonged to six different families. There was a local name for each of the nine, but no general term for them. In contrast, concerning the types not used, there were a few general terms, such as "*doku-mattake*" for poisonous or useless mushrooms and "*beni-take*" for red mushrooms. "*Doku-mattake*" is used also in adjacent prefectures, such as Kyoto and Osaka[2] as well as Wakayama[14]. The purpose of mushrooming was primarily to gather 'matsutake', *T. matsutake*, for both trade and home consumption. During matsutake-gathering season, the gathering of other mushrooms was infrequent. People ate *T. matsutake* grilled and seasoned with salt or soy sauce, as material for *sukiyaki*, or steamed and mixed with rice. *T. robustum* (Alb. & Schw.: Fr.) Richen (sensu Imaz.) is similar shape to *T. matsutake* but is smaller and has no fragrance. This species usually appears somewhat later than

Table 1. Wild mushrooms traditionally used as food in Heguri.

Family and species	Local name	Japanese common name	Keys for identification
TRICHOLOMATACEAE			
Tricholoma auratum (Fr.) Gillet	Kii-shimeji	Shimokoshi	Yellow to olive cap.
T. matsutake (S. Ito & Imai) Singer[a)]	Mattake	Matsutake	Large, brownish fibers and scales over cap with white gills, stalk with ring, with strong unique fragrance.
T. robustum (Alb. & Schw.: Fr.) Ricken (sensu Imaz.)	Obahan	Matsutake-modoki	Similar in shape to *T. matsutake* but smaller; without fragrance.
CORTINARIACEAE			
Rozites caperata (Pers.: Fr.) Karst.	Zubotake	Shougenji	Large, grayish-brown; often found in fern bush, *Dicranopteris linearis* (Burm. f.) Undrew; grows in the margin of Japanese red pine forest floor.
BOLETACEAE			
Suillus bovinus (L.: Fr.) O. Kuntze[a)]	Iguchi	Amitake	Yellow-orange cap surface, sticky when wet; yellow pores.
S. luteus (L.: Fr.) S. F. Gray	Nonobiki	Numeri-iguchi	Slimy, reddish-brown cap with yellow pores; stalk with sheath-like ring.
RUSSULACEAE			
Lactarius hatsudake Tanaka	Hattake	Hatsutake	White latex; quickly bruising red to dark olive.
THELEPHORACEAE			
Boletopsis leucomelas (Pers.) Fayod[a, b)]	Kurokawa	Kurokawa	Large, gray to blackish cap with white pores.
RAMARIACEAE			
Ramaria botrytis (Pers.) Ricken[b)]	Nezuminote	Houkitake	Large, pinkish, cauliflower like, with many branches.

a): Sometimes dried under sunlight for daily stock.
b): Fruitbody not observed in natural habitat in this study site during the observation period of 1999 to 2002.

T. matsutake at the same sites and is locally called 'Obahan', slang for "old ladies". Like *T. matsutake*, *Boletopsis leucomelas* (Pers.) Richen was also eaten grilled and seasoned. This mushroom has a slightly bitter taste but is esteemed by Japanese. Lincoff and Nehring[15] described Japanese immigrants to North America who also favored gathering this mushroom, which the immigrants called '*Kurotake*'. The other mushrooms mentioned are usually cooked in various soups. *T. matsutake*, *B. Leucomelas*, and *Suillus bovinus* (L.: Fr.) O. Kuntze were sometimes dried under sunlight and eaten daily, but were never salted for preservation. These fungi are basically common with those used elsewhere in southwestern Japan, where the pine forest dominates as actual vegetation[9]. This custom of eating dried and unsalted mushrooms was in contrast to that in northeast Japan where people regularly gather many kinds of wild mushrooms and salt them for winter use[4, 16-18]. These include *Pleurotus ostreatus* (Jacq.: Fr.) Kummer, *Armillariella mellea* (Vahl.: Fr.) Karst., *Flammulina velutipes* (Curt.: Fr.) Singer, *Naematoloma sublateritium* (Fr.) Karst., *Pholiota nameko* (T. Ito) S. Ito & Imai in Imai, and *Grifola frondosa* (Dicks.: Fr.) S. F. Gray, in addition to the types listed in Table 1.

T. matsutake is the most esteemed and economically valuable mushroom in Japan because of its unique fragrance. According to a record of the year 1876, residents of the village of Kamisho, part of Heguri, gathered 12 kg matsutake, traded half of them and consumed half at home[9]. However, evidence suggests that this mushroom was not popular until the Kamakura era (late 12th century)

when the pine forests around villages had spread to form a secondary forest after the felling of the primary forest for fuel[2,3,7,20]. One historical document, 'Toji hyakugou monjyo,' dated September 27, 1259, stated that "ninety fruitbodies of matsutake had been sent to Toji Temple from Hirano-Denshou (Shidehara village in Heguri Town at present)". This description is one of the oldest valid historical records regarding the use of *T. matsutake* in Japan[7], and is notable as one of the oldest documents to show the date, amount, and place of production of fungal resources.

Food custom associated with Japanese red pine forest

Why do people in southwestern Japan use so few types of wild mushroom? It should be noted that the mushrooms listed in Table 1 are restricted to basidiomycetous fungi forming ectomycorrhizas, and that all have Japanese red pine as symbiotic partners. The local standards in Heguri for judging the edibility of mushrooms are as follows: 1) the mushroom must be found on the floor of a Japanese red pine forest; 2) the mushroom must have conspicuous morphological differences clearly distinguish it from other fungi, as briefly described in Table 1; 3) the mushroom must have been previously eaten by a family member or familiar and reliable residents, attesting to the mushroom's safety. By the first standard, the people of the town eliminated several species, such as an Enoki mushroom, *F. velutipes*, and an oyster mushroom, *P. ostreatus*, that were popular commercially cultivated fungi, as well as *A. mellea* and *N. Sublateritium*, which are commonly used in northeastern Japan. Although these fungi naturally grow on decomposing broad-leaved tree logs and stumps in this area[13], local residents do not gather them and seem unaware of their presence. People gather only those mushrooms that satisfy all three standards above. Consequently, the number of mushroom species actually used seems to be strictly limited.

For residents of Heguri, gathering pine needles and fallen twigs (called '*Kokuma*') from the forest floor, which were important materials for making fire, was once the most important work during autumn to early spring, until the use of propane gas spread across southwestern Japan[2,21]. This work seemed to familiarize people with the mushrooms growing in the pine forest. In fact, people living on the slopes of the Yata Hills, which are covered with major pine forests, possessed much more information about and expressed more interest in wild mushrooms than people on the slopes of the Shigi-Ikoma Mountains. These results revealed a tight relationship among people, the Japanese red pine forest, and some restricted ectomycorrhizal fungi associated with the pine tree, as represented in Fig. 2. This relationship formed a wild mushroom food custom typical to southwestern Japan. A similar relationship among people, the pine forest, and matsutake has been pointed out by Ogawa[2]. It should be noted that the abandonment or felling of pine forests would not only decrease the matsutake production but also destroy this tight relationship, including an

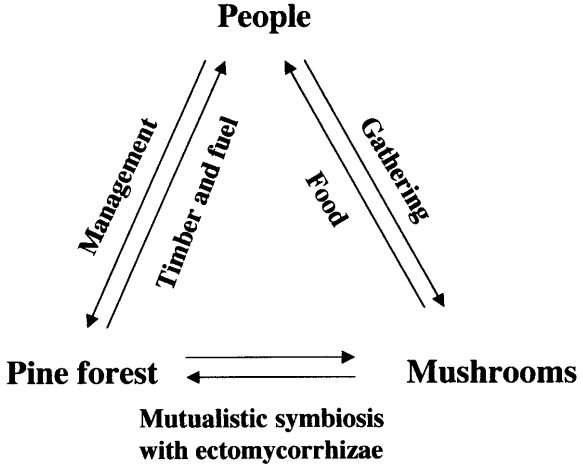

Fig. 2. Relationships among people, Japanese red pine forests, and consumed mushrooms, representing a traditional food custom involving wild mushrooms in Heguri.

entire set of wild mushroom food customs.

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和文摘要

西南日本の小さな町におけるアカマツ林に依存した野生きのこ食習慣

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西南日本に位置する小さな町，奈良県平群町，において野生きのこ食習慣を調べた．常緑広葉樹が混生する落葉広葉樹林が二次林として優占し，集落の周囲には竹林とアカマツ林が形成されている．ここでは，200種以上のきのこ類が発生するが，伝統的に9種のきのこしか採集・消費されてこなかった．これら9種のきのこはアカマツと共生する菌根菌に限られた．広葉樹林に発生する他のきのこ類は，たとえ商業的な栽培菌として知られた菌，あるいは特に東北日本で一般的に利用される菌であっても収穫されない．本研究は住民，アカマツ林，および菌根菌の緊密な関係を明らかにし，この関係は西南日本に典型的な野生きのこ食習慣を表現した．

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