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## Fungi, trees, people, nematodes, beetles, and weather: ecologies of vulnerability and ecologies of negotiation in matsutake commodity exchange

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**Abstract.** The author draws attention to the ways in which commodity chains take shape in the intersections between different natural–cultural ecologies. It is suggested that a focus on the diverse ways that people involved in commodity chains relate to these ecologies reveals not only the links but also the disarticulations through which commodity relations take shape. To develop this perspective, the author focuses on the trade in ‘matsutake,’ a variety of related species of wild mushrooms that are consumed primarily as a gourmet luxury item in Japan. Matsutake have never been successfully cultivated, and during the 1970s and 80s, as a growing market for luxuries in Japan coincided with a decline in domestic production, Japan began importing increasing amounts of them. The author first considers scientific discussions about the contingencies and uncertainties that relationships involving fungi, trees, people, nematodes, beetles, and weather create in different matsutake regions. Discussion then turns to the some of the different ways that matsutake pickers in rural Nagano and matsutake traders in Tokyo make sense of these uncertainties by characterizing matsutake ecologies as, respectively, ecologies of vulnerability and ecologies of negotiation. By attending to the conflicting ways that people make sense of human–nonhuman relations in matsutake exchange, the author demonstrates that commodity chains do not occur through smoothly articulated chains, networks, or circuits: rather, they involve processes in which variously situated ecologies collide across relations of geographical and cultural difference.

In this paper I draw attention to the ways in which commodity chains take shape in the intersections between different natural–cultural ecologies. I suggest that paying attention to the diverse ways that people involved in commodity chains relate to these ecologies helps us see not only the links but also the disarticulations through which commodity relations take shape. To illustrate my approach, I focus on one particular commodity: *matsutake*. The term ‘matsutake’ refers to a variety of related species of wild mushrooms that are consumed primarily as a gourmet luxury item in Japan. The most widely consumed of these are *Tricholoma matsutake*, *Tricholoma magnivelare*, and *Tricholoma caligatum* (Tsing and Satsuka, 2008; Yang et al, 2008). These mushrooms are the most expensive in the world. Sometimes single caps retail for hundreds of dollars. Matsutake have never been successfully cultivated, and during the 1970s and 1980s, as a growing market for luxury items in Japan coincided with a decline in domestic matsutake production, Japan began importing increasing amounts of them. Since 1981 Japan has imported more matsutake than it has produced (Saito and Mitsumata, 2008). The imported mushrooms come from China, Korea, and the Pacific Northwest, as well as from Mexico and Turkey (Saito and Mitsumata, 2008).

A standard commodity-chain analysis of matsutake might consider the paths these mushrooms take to get to Japanese consumers from their forest environments in various parts of the world (eg see Yang et al, 2008). Such a model would focus on the different people linked through this process, considering their positioning within the chain and relative to each other (see also Bair and Werner, 2011). In contrast, here I develop an understanding of matsutake commodity relations that foregrounds how they are facilitated by different sets of interactions among people, weather, nematodes,

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beetles, fungi, and trees, and I highlight how and why people involved in matsutake exchange understand these interactions in very different ways. I suggest not only that nonhumans introduce uncertainties into human plans for matsutake exchange, enabling the inclusion of some people and places while excluding others; I also demonstrate that various people involved in matsutake commodity chains make sense of these uncertainties in different ways, based on their geographical and political economic positioning and their different engagements with various matsutake ecologies. My aim is to illustrate that commodity chains involve more than links between people and places. Rather, I suggest, they are processes in which variously situated ecologies collide across relations of cultural and geographical difference.

I build my analysis on the insights of two bodies of literature that have explored the place of nature and nonhumans in the political economies of food, agriculture, and natural resources. The first of these scholarly literatures focuses on relationships between ‘nature’ and ‘capitalism’, to demonstrate how nature can introduce contingencies and uncertainties into political economic relationships. This literature has explored how nature both enables and obstructs capitalist processes (Goodman and Redclift, 1991; Goodman et al, 1987; Henderson, 1998; Mann and Dickinson, 1978; Prudham, 2005). It has considered how capitalism aims to circumvent, or even capitalize on, ‘the problems of nature’ (Goodman et al, 1987; Henderson, 1998). And it has explored how nature resists commodification (Bakker, 2003; Bakker and Bridge, 2006) and ‘tempers’ (Fine, 1994) or ‘ecoregulates’ capitalism (Prudham, 2005).

These studies usefully demonstrate that capitalist practices and biophysical processes—seasonalities, resource finitude, and biochemistry—inform each other. I share with this work a concern with the ways in which nonhumans create uncertainties and contingencies in political economic relations. However, because these studies aim to define general relationships between capitalism and nature, they often overlook the cultural specificity of capitalist practices (see also Cook and Harrison, 2007; Fischer and Benson, 2006; Freidberg, 2004; Guthman, 2004; Mansfield, 2003a; 2003b; Tsing, 2005), and the multiple meanings and valences which ‘nature’ can take on for people in different contexts (Choy, in press). Moreover, these studies tend to focus on the role of nature in a given political economic formation [eg ‘food provisioning systems’ (Fine, 1994) or ‘family farms’ (Mann and Dickinson, 1978)] or a single region or locality [eg the Pacific Northwest (Prudham, 2005) or England (Bakker, 2003)]. As a result, they do not consider the ways that, in a globalized world, political economic relations emerge at intersections of multiple, geographically and culturally specific formations of capitalism and nature.

A second, related body of literature has drawn on actor-network theory (ANT) (eg Callon, 1986; Latour, 1993; 2005) to complicate ‘follow-the-thing’ approaches to commodity-chain research which rely on modernist binaries of nature/culture, human/nonhuman, and structure/agency (Goodman, 1999; Lockie and Kitto, 2000; Whatmore, 2002). ANT-inspired studies break down these binaries to demonstrate that agrofood networks involve ‘shared corporealities’ (Goodman, 1999) and create ‘hybrid geographies’ (Whatmore, 2002). They approach commodity chains as hybrid, natural–cultural assemblages (Mansfield, 2003a; Whatmore 2002; Whatmore and Thorne, 1997), and they stress the importance of attending to the roles which translation strategies, intermediaries, and modes of ordering play in facilitating such networks (Lockie and Kitto, 2000). In these studies, ‘nature’s agency’ is not a resistant force or set of enabling possibilities but a relational effect that is distributed within networks which include human and nonhuman ‘actants’ (Latour, 2005) and which are at once natural and social.

Analyses based on ANT broaden our understanding of who and what is involved in the making of commodity networks. I share their commitment to understanding commodity relations as involving hybrid, natural–cultural worlds. However, these studies tend to restrict their analyses to single networks, focusing on how the agency of actants emerges because of their relational roles within these networks, or how these roles constitute and transform the network under analysis. These studies do not consider how participants in commodity networks are involved in other kinds of social relationships, nor do they consider the ways in which their participation is shaped by broader cultural histories and relations of power (Ingold, 2008; Tsing, 2010). These analyses, thus, also do not capture the multiple, situated, sets of natural–cultural relationships through which commodity chains take shape.

Here I turn my focus to the ways in which matsutake commodity chains both bring together and divide differently situated human–nonhuman worlds. I consider how cultural, historical, and geographical factors shape nonhuman participation in these worlds, and I explore some of the ways in which different people involved in matsutake exchange make sense of this participation. My goal is to evoke some of the ways in which the differences and similarities among natural–cultural ecologies push together and pull apart the links of these chains, helping create both the connections and the disarticulations through which they take shape. By illuminating these dynamics, I intend to contribute not only to studies of nature and commodity chains but also to recent efforts to understand capitalist processes as disjunctive, culturally embedded practices (Freidberg, 2004; Gibson-Graham, 1996; Mansfield, 2003a; 2003b; 2003c; Rofel, 2007; Tadiar, 2004; Wright, 2001; 2006) which emerge through ‘disarticulations’ (Bair and Werner, 2011) and ‘friction’ (Tsing, 2005). As presented here, commodity chains are not established or bounded patterns of exchange but sites of encounter which involve the coming into productive engagement of distinctive, socially and geographically situated, natural–cultural worlds.

My analysis proceeds in two parts. First, I draw on scientific narratives to take a forest-centered approach to understanding how human–nonhuman relationships shape the availability and value of matsutake in different parts of Japan and the world. I suggest that these narratives help us see how nonhumans introduce contingencies and uncertainties into matsutake yields, and create differences among matsutake regions. Then, in the second part of this paper, I explore ethnographically how the uncertainty introduced by nonhumans figures for two sets of people involved in matsutake exchange: (1) matsutake pickers and others in Central Kiso, a mountainous region of rural Nagano on the peripheries of matsutake trade, and (2) two Tokyo-based matsutake traders—an intermediate wholesaler at Tokyo’s Tsukiji market, and the scion and executive of a large trading firm.<sup>(1)</sup> I show that, because of their different geographical and political economic positioning, the Central Kiso pickers and Tokyo-based traders make sense of the uncertainty introduced by nonhumans in different ways: whereas for Central Kiso residents it is a sign of their region’s vulnerability in the face of what they call ‘global’ trends, for the traders it is a challenge, the successful navigation of which demonstrates their business prowess.

The ideas in this paper developed in conversations with members of the Matsutake Worlds Research Group, a collaborative ethnographic project exploring the politics and poetics of matsutake collection, commodification, consumption, and science across the Pacific Rim. The paper is based on interviews and participant observation I conducted with mushroom pickers and other Japanese residents in rural Nagano in 2005, 2006, and 2007, on earlier ethnographic research I carried out in rural Nagano

<sup>(1)</sup> I use the term ‘Central Kiso’ to refer to a cluster of mountain towns and villages in the central portion of Kiso County that share histories, geographies, and cultural and political economic ties.

between September 1998 and August 2000, and on interviews which Anna Tsing and I conducted with Japanese scientists, intermediate wholesalers, auction house employees, trading company executives, produce market owners and employees, and restaurant owners in and around the Tokyo area in 2005 and 2006. Unless otherwise specified, I spoke in Japanese with all interviewees discussed below, and translations of their statements are my own.

### **Satoyama and pine wilt ecologies: scientific stories of human – forest relationships and matsutake availability**

I begin with some science-based stories about relationships among matsutake, people, trees, nematodes, beetles, and weather. I draw on the work of scientists, with the recognition that science involves culturally and politically inflected forms of knowledge that are constantly being appended and transformed. Many scientific studies of matsutake in Japan have been undertaken in the interest of increasing yields (Saito and Mitsumata, 2008; and see Tsing and Satsuka, 2008), and some of these studies have been conducted by government administrators in rural areas on the urging of local groups who hope that matsutake production will offer viable economic prospects in depopulated and economically depressed rural mountain regions across Japan (see, for example, Narimatsu, 2007; Omori, 1989; 1997). Other scientists are inspired by environmental concerns and commitments to matsutake traditions, history, and culture, and some scientists are also driven by a desire for the profits that may be reaped by successfully cultivating the expensive mushrooms. Despite matsutake scientists' varying motivations and research strategies, however, they tend to focus on the activities of nonhumans in matsutake forests. Their work thus focuses our attention on these activities, helping us take a forest-centered approach to understanding some of the ways in which nonhumans shape matsutake exchange.

In what follows, I first offer some general information about matsutake, including some of the ways scientists have identified and classified the mushrooms. I then turn to some recent scientific discussions about the impact of pine wilt disease in forests where matsutake are found. Pine wilt disease has been linked to the decreasing availability of matsutake in many regions of Japan, and its spread has encouraged matsutake consumers and traders to look to other parts of the world to acquire the mushrooms. Most scientific discussions of pine wilt disease attempt to understand its dynamics in the interest of creating generalizable knowledge about it and, in many cases, control it. Here I read against the grain of these discussions to draw attention to what they tell us about some of the contingencies and uncertainties that human-nonhuman relationships create for matsutake yields and the different kinds of matsutake ecologies they produce in different parts of Japan and the world.

Matsutake only grow in certain kinds of forests, and, even then, a number of environmental and social relationships affect their growth (Amaranthus et al, 2000; Arora, 2008). Matsutake are the fruiting bodies of ectomycorrhizal fungi—fungi that live symbiotically with the roots of certain species of trees. The main host of matsutake fungi in Japan is the red pine (*Pinus densiflora*); however, in Japan and other parts of the world they have also been found in relationships with other kinds of pines as well as with some oaks, firs, spruce, cedar, chinkapin, and other trees (Wang et al, 1997). Between or around host trees, *T. matsutake* and related species form fungal colonies in the soil, which in Japanese are called *shiro* (literally, white, castle, place). The hyphae of the fungus form a sheath around the roots of a tree and then grow inward, penetrating them. The fungus takes carbon and other essential organic substances from the tree. In return, it helps the tree absorb water, salts, and metabolites. Matsutake fungi

cannot grow and produce fruiting bodies (mushrooms) without these tree–fungus relationships (Wang et al, 1997).

Historically, matsutake production in Japan was encouraged by *satoyama* relations. ‘Satoyama’ is a Japanese term which combines characters for ‘village’ and ‘mountain/forests’. It refers to mixed community forests, or to the management of forests by local communities in rural Japan. Some scientists have drawn attention to how shifts in *satoyama* relationships have affected matsutake yields (Saito and Mitsumata, 2008). For instance, they tell us that, in the past, villagers went into the forests to gather firewood and construction materials (Saito and Mitsumata, 2008). In the process, they removed trees, shrubs, and fallen leaves. This cutting of trees and thinning of the soil encouraged the growth of the matsutake’s host, red pine—a pioneer species that grows well in nutrient-poor soil and needs a lot of light to flourish. The thinning of the soil itself may also have encouraged matsutake growth. However, as wood and other biomass fuels have been replaced by oil and gas, this practice has stopped, and *satoyama* ecologies have been on the decline (Saito and Mitsumata, 2008). Shifts in forest use have favored the growth of broadleaf trees, which grow faster and shade out the pine (Saito and Mitsumata, 2008). Moreover, as rural forest use has changed and cheaper woods have increasingly been imported, some forests in Japan which historically produced large amounts of matsutake have been converted to homes and golf courses (Saito and Mitsumata, 2008). These shifts in relations involving people and forests in rural Japan have affected matsutake availability in many parts of the country.

Scientists concerned with declines in matsutake production have also been interested in how and why pine forests in Japan have been destroyed by pine wilt disease over the past hundred years. The disease has seriously affected matsutake availability in many parts of Japan by destroying the fungus’s primary arboreal host. The disease is also encouraged by interactions among trees, beetles, nematodes, weather, and people. The decline of *satoyama* relationships in rural areas—a process that has not only reduced the overall number of pine trees but has also weakened the remaining ones and made them more susceptible to disease—is one important cause of the spread of pine wilt disease; but, as I will explain, histories of trade and militarized nationalism in Japan, as well as global warming trends, have also played primary roles.

Pine wilt disease is caused by the pine wood nematode (*Bursaphelenchus xylophilus*) (Mamiya, 1988; Togashi, 2008). The nematode is a microscopic (1 mm in length) worm-like animal that feeds both on the blue-stain fungi that live in the wood of dead and dying pine trees and on the living plant cells that surround the water-conducting passages of the pines (Futai, 2008; Gleason et al, 2000). Scientists have found that some pine trees are resistant to the nematode (Takeuchi, 2008). In pines that are susceptible, however, the nematodes travel to the resin canals of the tree, molt to adults, and then begin feeding on the cells lining these canals. During warm summer periods, they spread throughout the tree and rapidly multiply, destroying the tree’s resin canals. The tree’s water-transportation system becomes clogged and resin flow slows and then stops. The needles on the tree turn grayish, then tannish, and eventually brown as the tree dies (Gleason et al, 2000).

Because the nematode is not native to Japan, scientists have also been interested in the ways in which geopolitical and industrial events have enabled the spread of pine wilt disease both into and within the country. The nematode first appeared in Nagasaki, a port town on the island of Kyushu, in 1905, when trade ships carrying infected pine items brought it from North America (Futai, 2008). The 1905 outbreak of pine wilt disease in the area was controlled by the eradication of dead trees, which kept the nematodes from spreading to other healthy trees. However, the nematode disease broke out again in 1925 in Sasebo, a port city 50 km north of Nagasaki which had

served as an important base for the Japanese imperial navy since the Sino-Japanese and Russo-Japanese wars. Because the affected trees were on important military land, efforts were not made to control the nematode disease, and it spread into the surrounding areas during the 1930s (Mamiya, 1988). By the late 1930 pine wilt disease was identified in other areas in Kyushu—in most cases in forests adjacent to pulp factories (Mamiya, 1988). On Honshu, pine wilt disease was first found in Hyogo prefecture in 1921 and spread during the 1930s and early 1940s (Futai, 2008). Control efforts kept losses down to 500 000 m<sup>3</sup> per year during the 1950s and 1960s, but in the 1970s losses began to increase (Mamiya, 1988). During the 1970s the demand for pine timber in Japan declined, as the use of cheaper imported woods from Southeast Asia became more widespread. As a result, efforts to control the disease were neglected. Trees killed by pine wilt were left in forests and became a source of new infection and increased vector production as pine wilt nematodes and pine sawyer beetles (*Monochamus alternatus*) (discussed below) multiplied within them. In 1979, 2.4 million m<sup>3</sup> were recorded as lost in Japan (Mamiya, 1988). Another outbreak occurred in 1973, when pine wood infested with vector beetles and nematodes was transported to the Ryukyu Islands to be used for construction; soon thereafter, many Ryukyu pines died from pine wilt (Futai, 2008).

Scientists thus suggest that human activity not only brought the pine wood nematode to Japan, but also played an important role in transporting the nematode within the country. However, relations between people, trees, and nematodes cannot alone explain the spread of pine wilt disease in Japan. Scientists also suggest that its spread was shaped by relations among pine wilt nematodes, pine sawyer beetles, trees, fungi, and weather. Pine wood nematodes cannot easily travel between trees. They hitch rides within the trachea of adult pine sawyer beetles. These beetles, which feed on the twigs of healthy pine trees, do little damage on their own to the trees but, by providing transport for the pinewood nematode and creating points of entry for the nematode to enter a healthy tree (Gleason et al, 2000), they can have a devastating impact. Pine sawyer beetles are strong fliers that can travel between 50 and 260 m on their own (Gleason et al, 2000); with the help of a cooperative wind, they can go several kilometers (Futai, 2008). When a new adult pine sawyer beetle finally leaves a pine tree to breed, it can carry up to tens of thousands of nematodes with it (Gleason et al, 2000).

The pine sawyer beetle was a rare insect in Japan until the introduction of the pine wood nematode. But just as the beetle has helped to spread the nematode, the nematode has encouraged the spread of the beetle. This is because the beetle larvae, unlike the adult, must feed on dying or newly killed pine. [Live pines release oleoresin as a defense, and pines that have been dead for several months or more will be completely exploited or occupied by other insects (Nakamura-Matori, 2008).] After the introduction of the pine wood nematode, which kills its host tree, the food resources of the larvae of the pine sawyer beetle increased greatly. The two thus established a mutual relationship and their populations have increased greatly within Japan, spreading pine wilt across the country (Nakamura-Matori, 2008). Moreover, in addition to attracting egg-laying pine sawyer beetles (whose eggs eventually develop and carry pine wood nematodes to other trees), the dying trees also attract bark beetles which carry blue-stain fungi to the trees. These fungi quickly colonize the wood of the dying tree and provide an added food source for the pine wood nematodes to thrive and multiply even faster (Gleason et al, 2000).

Scientists also suggest that warming trends have further encouraged the spread of pine wilt disease by accelerating the development of pine sawyer beetles and pine wood nematodes. The adult pine sawyer beetle emerges later in the year in cooler climates than it does in warmer regions, and the span of emergence is only one month (late June

through late July), whereas in warmer regions they emerge for two months (early May through early July) (Mamiya, 1988). In some cooler regions the beetles adopt a biannual, rather than annual, life cycle, and thus they do not reproduce as prolifically or as frequently (Mamiya, 1988). Cooler temperatures are also not favorable for the beetle's oviposition and embryonic development (Nakamura-Matori, 2008). Moreover, years of high temperatures and low precipitation weaken the trees' water-transportation system, making them more vulnerable to beetles and nematodes (Nakamura-Matori, 2008).

These scientific studies suggest some of the relationships through which spread of pine wilt disease has devastated pine forests in Japan and dramatically affected matsutake yields, which have declined precipitously over the past seventy years (Amaranthus et al, 2000; Saito and Mitsumata, 2008).<sup>(2)</sup> However, scientists have also found that, because of geographically variable conditions within Japan, it has not affected all regions of Japan in the same way. For instance, it did not affect trees in colder regions of Japan, such as Iwate and Nagano, until the late 1970s and early 1980s, and it has still not spread to Aomori and Hokkaido (Futai, 2008; Mamiya, 1988). Even within Nagano, some areas have been harder hit than others. For instance, Central Kiso residents told me that the disease had affected trees in the southern portion of Kiso County but was not yet as widespread in the cooler, more mountainous, areas. Moreover, some regions, such as Iwate, have had some success in preventing its spread (Kamata, 2008).

Scientists have also found that pine wilt disease did not spread to China and Korea until the 1980s, and because both countries have larger areas of pine forests, they may not be as seriously affected as quickly (Shin, 2008; Zhao, 2008). In the Pacific Northwest, another area of matsutake production, pine wilt disease has mostly affected nonnative tree species in ornamental conifer plantings or plantations (FAO, 2009). Periods of high summer temperatures in the area are short, and most North American conifers are resistant to the disease (Sutherland, 2008). Thus pine wilt disease is not viewed as a significant threat to matsutake there.

Finally, some scientific studies have also suggested that weather patterns, which shift from year to year and have been affected by global warming patterns, affect not just the spread of pine wilt disease, as mentioned above, but also the growth of the mushrooms themselves—and therefore matsutake prices. Despite numerous studies, scientists do not fully understand what prompts matsutake fungi to produce fruiting bodies, but the fungi seem to begin to produce mushrooms only after the soil temperature drops below a certain threshold, and only if the decline in temperature occurs gradually (Yamada, 2007). The number of fruiting bodies any given matsutake fungus produces also seems to be related to the amount of rainfall before and during the time of this temperature decline (Omori, 1997; Yamada, 2007). Although scientists are not sure exactly how these mechanisms work, it does seem clear that global warming trends and shifts in precipitation patterns, which have been shaped by human practice, are affecting patterns of matsutake yields.

In sum, scientific studies of matsutake ecologies draw attention to a range of human–nonhuman relationships which affect the availability of matsutake within Japan and, correspondingly, the regions from which mushrooms are sourced and the prices they garner from year to year. The prices of matsutake are determined according

<sup>(2)</sup> In 1941, 12 000 tonnes of matsutake were harvested in Japan. During the 1970s, however, only 1000 tonnes were gathered, and by 2006 this number had declined to 39 (Saito and Mitsumata, 2008). In Tanba, the region of Japan most famous for matsutake, the annual harvest in 2002 was 0.5% of what it was in 1963, having decreased from 161 730 kg to 817 kg (Tanba-ken Minkyoku, 2004).

to their origin, availability, and the quality and size of individual mushrooms (whether or not their caps have opened, their freshness, and whether they have been infested by fungus flies) (see Yang et al, 2008, page 275). Within Japan, there are hierarchies of matsutake regions. The most valuable and delicious matsutake are generally agreed to be Miyako matsutake from Kyoto, followed by those from Tanba—both regions with long associations of tradition, high culture, and ties to the Imperial family. Yet, in recent years, because of pine wilt disease and weather patterns in these regions, fewer mushrooms have been available from them than in the past, and other regions have come to play more important roles in matsutake trade. For example, in June 2006, matsutake wholesalers and retailers I met in Tokyo suggested that, because of weather and disease, most early domestic matsutake (*hayamatsu*) the previous year had come from Iwate, a region which in the past had not been well known for its matsutake but which was becoming increasingly prominent. In 1987 Iwate accounted for 5.8% of the total amount of matsutake produced in Japan; in 2005, it produced 16.9% of the total yield in Japan (Nōrin Suisanshō, 2005; Omori, 1989).

Moreover, despite—or perhaps in part because of—their wider availability, foreign matsutake have generally been regarded as less desirable and delicious than domestically harvested ones. North American ones differ in appearance, and—some argue—fragrance and flavor. Even those from Korea or China—which are the same as or similar to varieties which grow in Japan—are believed to lose some of their fragrance and flavor in the time it takes to be transported overseas. (Whereas it takes days to get them to Japan from Korea or China, matsutake can be transported within Japan in a matter of hours.) The appeal of domestic matsutake is also consistent with nationalist discourses which stress the uniqueness and superiority of the Japanese archipelago and Japanese culture. These preferences notwithstanding, the scarcity of matsutake in Japan has encouraged the importation of foreign mushrooms, enabling imported mushrooms to occupy a larger market share and garner higher prices. As mentioned above, since 1981 more matsutake have been imported to Japan each year than are produced domestically (Saito and Mitsumata, 2008).

Thus, reading across scientific discussions of matsutake forests brings attention to the ways in which matsutake ecologies involve contingent sets of human–nonhuman interactions which impact matsutake production and valuation. These works often aim to create generalizable knowledge about such interactions. However, reading against the grain of these studies helps us see the various ways in which different ecologies (ie satoyama ecologies and pine wilt disease ecologies) develop in differently located forests and, thereby, affect the commodity value matsutake assume from year to year and the shape of matsutake commodity chains, enabling some places to be linked through these chains and prompting others to be disarticulated from them. They also help us see how the spread of pine wilt disease has made some regions of Japan more important for matsutake trade, while others have come to play smaller roles or been cut out. They help us understand how pine wilt disease has made the Japanese market more reliant on imports from China, Korea, and elsewhere and how it has made these imported mushrooms more valuable. Finally, these studies suggest that weather conditions also are a factor in these processes. If some regions of Japan and the world have weather conditions that are consistently more favorable to matsutake growth, matsutake commodity chains must shift accordingly. These relationships make the paths of matsutake commodity chains somewhat unpredictable as the patterns of production, and the valuation of the mushrooms, shift from year to year and even within a season.

Yet scientific stories about the contingencies and uncertainties of nonhuman involvement in matsutake ecologies are only one way of understanding the ways in which nonhumans figure in matsutake trade. Indeed, most scientists have been, as yet,



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indirectly, if only marginally, involved in matsutake commodity exchange by working to increase yields. In the remainder of this paper, I turn to some human players directly involved in matsutake exchange—matsutake pickers in rural Nagano and Tokyo-based matsutake traders—and I explore some of the different ways in which nonhuman actors figure in these pickers' and traders' lives. By drawing attention to some of the different reasons these pickers and traders view matsutake forests as, respectively, ecologies of vulnerability and ecologies of negotiation, I highlight how they are unequally positioned within matsutake exchange, and thus draw attention to some other forms of social and ecological difference through which commodity chains take shape.

### **Commodity ecologies: stories of human pickers and sellers**

Matsutake travel as commodities along various routes to Japanese consumers. In some cases they are exchanged as gifts by Japanese villagers who pick them on mountains owned for generations by their households, or they are sold by these villagers to local retailers and produce markets which market the mushrooms to urban tourists and visitors. In other cases in rural Japan, local pickers bid for the rights to pick mushrooms on local mountains (both publicly and privately owned) through a system of community-based management (*iriai*) (Saito and Mitsumata, 2008). Some of these matsutake collectors sell their mushrooms directly to retailers in urban areas. Others are represented by local agricultural cooperatives or distributors who also sell the mushrooms to licensed auction houses at regional wholesale markets. These wholesalers then resell the mushrooms, usually on consignment, to intermediate wholesalers who then resell them once again to retailers such as restaurants and supermarkets.

Matsutake that come to Japan from China, Korea, and the Pacific Northwest come through trading companies. In the United States the mushrooms are gathered by collectors (which can include people from a range of different backgrounds, including Southeast Asian and Latino migrants, and white men, some of who are Vietnam veterans, among others), who sell to buyers who set up clusters of stations along mountain highways and in small towns (Hansis, 1998; McLain, 2002; Tsing, 2009). Matsutake that come from China begin with rural villagers (many in Yunnan, which produces almost 80% of the Chinese yield, are Tibetan or members of other ethnic minorities) who harvest matsutake in the mountains within the borders of their villages (Arora, 2008; Hathaway, 2009; Yeh, 2000). They take these mushrooms to the local market, where middlemen (often locally based independent ones, but also representatives of larger trading companies) buy the mushrooms and then resell them to bigger buyers who in turn resell them to trading companies whose agents are often Han Chinese (Arora, 2008; Yang et al, 2008; Yeh, 2000). These mushrooms may change hands as many as six or seven times in this process (Yeh, 2000). In both China and the Pacific Northwest the matsutake are then air freighted (they are sea freighted in some cases involving North Korea) to Japan. At wholesale produce markets in Japan, such as at Tsukiji, produce distributors and auction houses sell the imported mushrooms on commission by auction (*seri*) or through a daily advance-order system (*sakidori*) to intermediate wholesalers who then resell the mushrooms to restaurants, produce markets, and supermarkets.

The diversity of people involved in these processes—variously positioned pickers in different parts of the globe (Japanese villagers, Southeast Asian and Latino migrants, white Vietnam veterans, and Tibetan minorities in China, among others), as well as small-scale Japanese wholesalers and retailers and large-scale white-collar Japanese and Chinese trading-company employees—suggests that matsutake commodity chains take shape at the intersections of a wide range of differently situated

human–nonhuman worlds. I contrast two of these below: the vulnerable ecologies of matsutake pickers in rural Nagano and the ecologies of negotiation of Tokyo-based matsutake traders.

**Ecologies of vulnerability in central Kiso: feeling left behind in a ‘globalized world’**

“The bugs that eat the pine trees can’t survive in places that drop below five degrees Celsius”, Morikawa-san explained as we searched for matsutake on a mountain that had been in his family for generations. “In Kiso, it drops below ten. They can’t survive in a cold place like Kiso.” In the face of many Central Kiso residents’ concerns about the forests, including the effects of climate change on the region, Morikawa-san was trying to be hopeful.

I had contacted Morikawa-san on the recommendation of some friends in the area. He was the Vice Mayor of a small town in the Kiso region of Nagano, Japan, and he was widely recognized as a local ‘matsutake expert’ (*matsutake no meijin*).

During our conversation, he, like a number of others in Central Kiso with whom I spoke, expressed concern about recent social and environmental changes and their implications both for local matsutake yields and for the region more generally. Like many rural mountain communities in Japan, Central Kiso was struggling with depopulation on account of long histories of urban migration and a shortage of employment in the face of Japan’s industrialization and corresponding urbanization. The Kiso region had once had a profitable timber economy. A branch of the national forestry office had been based in the region, and a good part of the area’s economy had been built around the work of pruning and managing the trees so that they produced the highest quality timber. However, beginning in the 1960s, imported woods from Southeast Asia, Siberia, and North America started supplanting domestic timber in Japan, eventually devastating the Kiso timber economy. Local woods, such as *hinoki* (Japanese cypress), are expensive, especially when one factors in maintenance costs, to say nothing of the expense of reforestation. Changing weather patterns, which many Central Kiso residents connected to ‘global trends,’ were also worrisome and uncontrollable. Rainfall had become increasingly unpredictable—including strong typhoons that had caused serious landslides (in part because of deforestation). Moreover, efforts to revive the local economy by building ski resorts were now endangered by what appeared to be a pattern of decreasing annual snowfall.

Those I interviewed in Central Kiso do not depend on matsutake for their livelihoods. The region is not particularly famous in Japan for matsutake. Although some matsutake can be found there, the harvest is not really large enough to make it a reliable form of income for local residents. For many matsutake pickers in the region, like Morikawa-san, gathering wild mushrooms is a hobby. Others collected small quantities of mushrooms that they sold to local produce markets, which resold them to urban tourists, hotels that catered to them, and owners of vacation homes in the area.

Yet, despite the relatively limited mushroom trade in the region, people who picked, exchanged, and sold matsutake in Central Kiso could discuss in detail the weather conditions necessary for matsutake to grow in the surrounding mountains, and the problems with pine wilt disease and fungus flies that could threaten them. For instance, Morikawa-san went on at length about recent weather patterns when I asked why there were so few matsutake this year:

“You need rain in May and September. If there isn’t enough rain, the mushrooms won’t grow. This May there was hardly any rain. And in September too, it didn’t fall the 100 millimeters we get in the average year. It only rained one or two days this September. The mushrooms, they start to grow around the beginning of April.

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That's why you also need rain in April and May ... or the mushrooms won't grow well ... Last year (2004) there were lots of typhoons. They all came to Japan. And not just typhoons, there was lots of rain too in May, and even in June ... But this year none came through here ... We had lots of strong high pressure air in the skies. Even if the typhoons came this way, it drove them all away. They slid right by. They all went to Taiwan and China."

Morikawa-san and other Central Kiso residents also cited 'global warming' (*chikyū ondanka*) as a factor affecting local matsutake harvests. They spoke about how rain and other weather patterns had become unpredictable in recent years, explaining that "Matsutake need rain, but because of global warming, the rain patterns have changed." Watanabeya-san, who ran a small produce market in town and sold local and imported matsutake to tourists, told me that global warming was affecting the quality of mushrooms in the region, leading to fewer and poorer quality matsutake:

"It used to be cooler in the summers and we had matsutake from June through October. Now that it's warmer, if they come, they rot."

These Central Kiso residents' concerns and explanations about the fate of matsutake production were not limited to changing weather patterns. One longtime matsutake picker, Kawanishi-san, also stressed the ways in which local residents' relationships with the forests had changed, leading to decreased matsutake harvests: "It's quite different than it was in the past", she claimed, explaining that before gas usage was widespread, people went into the forests to get firewood for cooking and heating their homes. "Before, the forests were always neat and clean [*kirei*] and the matsutake grew. Now people use gas so ... you can't find many matsutake anymore." She and another longtime resident lamented that local forests were no longer being maintained. Gesturing to the effects of urban migration and the corresponding graying of the local population, they explained that those who knew how to care for forests were elderly and thus could no longer manage such work.

When these Central Kiso residents discussed the uncontrollable ways in which weather and bugs affected matsutake harvests in the region, they often borrowed from the language of science, framing their discussions in terms of 'global warming' and 'pine wilt disease'. These residents' engagement with the cosmopolitan and universalistic language of science was part of their efforts to participate in a world that they viewed as, in the words of one middle-aged woman living in the region, "getting more global". However, they also reframed these scientific ideas, connecting them to regional histories and concerns about recent political economic and environmental changes (see also Faier, 2009). That is, just as discussions of the effects of weather and bugs on matsutake availability offered an opportunity for these Central Kiso residents to participate in a cosmopolitan scientific world, these discourses also provided a means for them to express feelings of vulnerability in the face of recent translocal sets of relationships that were shaping their lives in unpredictable—and not always beneficial—ways. Timber imports had destroyed the region's economy. Weather patterns were shifting and mountainsides were no longer being maintained; this meant a growing likelihood of floods and landslides as more frequent and powerful typhoons ravished denuded mountainsides. Global warming trends also increased the possibility of pine wood nematodes and other tree pests becoming a problem in the region. Already, many older residents commented with dismay that snowfall patterns had changed and decreased overall.

The lives and livelihoods of most Central Kiso residents were tied to the region, and their attitudes suggest both the longings and the fears they felt on this account—particularly those linked to feeling left behind, in what they viewed as an increasingly globalized world. Many residents spoke of desires for aspects of city life. When I asked

these residents why they remained in the region, especially when the economy was so bad, they told me humbly that they, like most people in the region, had nowhere else to go; they would not have job or housing prospects elsewhere. Some of them also spoke of their love for the landscape and their roots in the region. But such attachments were also sources of insecurity. Many Central Kiso residents associated the well-being of their community with the well-being of the forests. Their comments about the ways in which recent social and weather patterns were detrimental to matsutake production in the area reflected feelings of lack of control over the fate of the region in the face of what they viewed as larger scale political economic and climate trends. These trends in turn reflected the ways in which not only matsutake harvests but also everyday life in Central Kiso were impacted by uncertain forces that originated outside the region—and that were beyond residents' control. Many expressed concern that there was little left for a place like Central Kiso today. The matsutake ecologies they described were vulnerable ecologies that reflected their feelings of insecurity and lack of control within the contemporary world.

#### **Ecologies of negotiation: dealing in matsutake at Tokyo's Tsukiji market and beyond**

The perspectives of Central Kiso residents contrast strikingly with those of the Tokyo-based traders with whom I spoke. Below I discuss two of these—those of an intermediate wholesaler at Tsukiji market and of a Japanese trading-company scion and executive. The wholesaler ran a small, locally based business, while the trading company was a large corporation with branches in Tokyo and Kobe. However, I suggest that despite the different scales and positions of their businesses within matsutake commodity chains, the perspectives of both the wholesaler and the trading-company executive illustrate how financial security, geographical location (and, specifically, distance from matsutake production areas), and the luxury and flexibility of having access to multiple matsutake sources enabled them to participate in matsutake ecologies in ways very different from those available to Central Kiso residents.

##### *An intermediate wholesaler*

Nakajima-san joked that he was the 'Matsutake Jedi' when Anna and I met him at Tsukiji wholesale market in Tokyo while we were conducting fieldwork in late June 2005. Nakajima-san sold gourmet food products to expensive restaurants in the city. He dealt not only in domestic and imported matsutake but also in seasonal decorative flowers, leaves, and other fancy items. He was proud of the successful business he had developed over the past twenty-three years. He boasted that for more than a decade he had been a top matsutake seller at Tsukiji and that he sold to many of the most elite shops in the city. He showed us photographs of his expensive Harley Davidson motorcycle as evidence of his success.

As we spoke with Nakajima-san, his employees were weighing modest quantities of mushrooms on a small scale and then placing them atop ferns in a motley assortment of small open boxes that sat on well-worn Styrofoam crates. Nakajima-san explained that these mushrooms were *hayamatsu*—early matsutake—which grew in small amounts; matsutake season did not peak in Japan until September and early October. It was then that his matsutake business would really take off.

Nakajima-san bought the matsutake he sold from the Tsukiji auction houses each day and, occasionally, from domestic pickers with whom he had longstanding relationships. The matsutake for sale in Nakajima-san's display were separated by country of origin, which was clearly marked on signs beside their boxes. South Korean matsutake were in small cardboard shipping boxes with air holes poked through the sides. They were packed eight or nine medium-sized mushrooms to a box. A single white piece of paper rested in the center of the boxes: ¥14 000 (about US\$130.00). The mushrooms

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from China were clustered in groups of six with a sign that read “China ¥ 18 000” (about US \$167.00).

The domestic matsutake were lounging in groups of three or four in opened, green boxes that read “Iwate Agricultural Co-op”. Sturdy brown hats on gently bowed, white-and-brown-streaked stems, these mushrooms were the most expensive. The prices of each box were written in bold black marker on slips of paper tucked into their edges; they ranged from ¥6800 (about US \$63.00) for caps that were fully open and had ragged edges to ¥23 000 (about US \$213.00) for those that were still intact. The highest prices were assigned to a prized few sets of matsutake from Kyoto in small, pale wood crates. One of these crates, which contained four particularly nice looking caps, was wholesaling for ¥30 000 (about US \$278.00).

Nakajima-san’s primary concern with matsutake was price. He purchased the mushrooms from primary wholesalers at the market through daily auctions and advance order. The prices of the mushrooms—which, as mentioned above, were determined by size, grade, and place of origin—fluctuated from day to day. Nakajima-san explained the erratic fluctuation of matsutake prices as the result of the invisible hand of the market. “It’s a matter of supply and demand”, he said. For him this meant that prices of imported matsutake get set “somehow, naturally” because, he explained, matsutake were not cultivated but grew wild. “You know, things like rice involve cultivation. It involves farmers; it’s labor intensive. [Matsutake] grow all over the mountainside. You walk onto a mountain, and all you have to do is take them. Besides, in China, labor is cheap”, he explained, referring to the imported mushrooms he sold. “So [for Chinese pickers the mushrooms are] virtually free ... The Chinese traders are really the ones making a profit.” Nakajima-san did not mention the human relationships with forests that historically enabled (or jeopardized) rich matsutake harvests. He stressed instead the effortlessness with which the mushrooms could be obtained because they are not deliberately planted. He showed us photographs of himself picking matsutake on a friend’s mountain in Hiroshima during a year of plentiful harvest. “These are all free [for the taking]”, he explained. “In an hour you can gather about 3 kilograms worth. I ate these myself. They were about ¥150 000 worth. In an hour, you get ¥150 000 for free!”

Like the residents of Central Kiso, Nakajima-san was aware of the ways in which weather conditions affected matsutake availability. He explained how the situation the previous year had been so bad that regions famous for producing matsutake (Kyoto and Hiroshima) had been forced to import them:

“For example, last year in Japan, in Osaka and Kyoto there wasn’t any rain. The drought was so bad they didn’t have water to boil udon noodles. The dam was empty. And the producers of matsutake in Kyoto, Hiroshima, Yamaguchi, Okayama, Shimane, Ehime, since it didn’t rain last October, there weren’t any matsutake.”

Yet, for Nakajima-san concerns about weather came back to pricing: a limited availability of mushrooms could actually make them more profitable for him to sell. He explained that most of the mushrooms sold in Kyoto and Hiroshima the previous year came from Korea and Iwate. “Ordinarily, Iwate matsutake are not very expensive”, he explained. However, that year Iwate mushrooms were selling for higher-than-usual prices.

To be sure, nonhumans introduced some uncertainty into Nakajima-san’s business. This uncertainty made dealing in matsutake something of, as he put it, “a gamble”. Yet, unlike Central Kiso residents, who felt themselves at the mercy of an undependable and not always generous ‘global nature’, for Nakajima-san, the uncertainty that weather and bugs introduced to matsutake availability was an uncertainty that was

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his to master and manage by buying mushrooms from different places and skillfully calibrating how much to pay for them and sell them for.

Nakajima-san's business as an intermediate wholesaler depended on his ability to cultivate social relationships and maintain a reputation (Bestor, 2004). He spoke from a position of financial security, having developed networks of regular customers over the more than twenty years he had been in business. Because he purchased the products he sold from centralized auction houses, if weather patterns and the spread of pine wilt disease were problems in one area, he could buy matsutake from another region of Japan, or just sell more imported mushrooms. Of course, some years, production conditions might be unfavorable in many, or even all, source countries and negatively affect his overall sales. However, because Nakajima-san dealt in a variety of products, not just matsutake, even if environmental factors affected the number of mushrooms available, where he sourced them, and at what price he bought them, poor matsutake harvests would not break his business. As a businessman in Tokyo, he was at a safe distance (both geographically and financially) from the environmental and political economic issues that concerned Central Kiso residents.

Instead, Nakajima-san prided himself on his ability to negotiate the uncertainties of the matsutake market—a skill he attributed to his experience and intuition. He boasted that knowing how much to pay for the mushrooms was a matter of “instinct”, suggesting that his innate business sense had enabled his success. If Nakajima-san recognized that weather and bugs were unpredictable agents that heightened the risk inherent in his job, at times making it more challenging, he also viewed his ability to navigate the uncertainty of the market as a sign of his business acumen.

#### *A trading company scion*

Matsuda-san, an executive at a large Japanese trading corporation, expressed a perspective similar to that of Nakajima-san. Matsuda-san's father had started the trading company several decades back, building it up as a leading produce importer with one of the largest market shares of matsutake in Japan. Matsuda-san had completed an undergraduate degree in the United States and was managing the imported-goods division of his family's business. In October of 2005 Anna and I interviewed him in English, which he spoke with fluency and ease—in part, he suggested, because of his regular and extensive travel.

Like Nakajima-san, Matsuda-san was sensitive to the ways in which matsutake availability depended on weather. He too could speak in detail about the weather and environmental conditions necessary for matsutake to grow:

“Matsutake production requires very subtle weather conditions, combinations such as precipitation prior to the season plus really enough precipitation *right* at the beginning of the season. Then the temperature comes down to a certain level (and) enhances the growth of the fungus.”

Matsuda-san also recognized that unpredictable weather conditions affected his business. The current year was a case in point; it was one of the worst in a while. First, he explained, a series of heat waves in South Korea had killed the fungus. Early production in China was also bad that year. There was a drought, so production was quite small. But then unexpectedly, and not necessarily for the better of his business, the situation in China had suddenly turned around and production had increased, flooding the market with mushrooms. Matsuda-san explained that the market had not been prepared for this influx and had crashed, depressing the prices of the mushrooms. To make matters worse, on top of the boom in Chinese production, North Korean production was the largest it had been in years. His company could do little in the face of such trends. He explained:

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“In one week—this is my own calculation but—two hundred seventy, eighty, tons of matsutake came from North Korea, the same as last season’s *total volume* [from there]. We couldn’t do anything about it.”

Matsuda-san also told us that unexpected production patterns like these were the norm for matsutake, and had made his business unpredictable:

“We want, really, [a] consistent supply, nicely spread throughout the season. But unfortunately, we don’t have control over it.”

He explained how he had learned to manage this uncertainty in his dealings with customers, who often asked about prospects of matsutake availability for the season:

“Though we answer questions from the market people about how the season will be, etc, we can only guess and give them a forecast based on the conditions, [the] factors, that we can identify at the time.”

Yet, as a head of a profitable trading company, Matsuda-san could afford to take the unpredictability of matsutake production in his stride. Indeed, the challenge of dealing with such an unpredictable product may have been part of its appeal. When we asked Matsuda-san why his father decided to begin importing the mushrooms more than two decades ago, he joked that his father “loves gambling,” using the same metaphor that Nakajima-san had to describe matsutake business. (Matsuda-san also explained that, when considered in terms of weight, matsutake is one of their most profitable products—worth more than its weight in gold and grossing them US \$20 000 000 – 30 000 000 per season).

Matsuda-san, like Nakajima-san, spoke from a position of financial security and geographic distance from production areas, that afforded him flexibility in his dealings. He explained:

“You know, in any line of business in the world, if you are a leading company, you never lose. Even I don’t understand how it works exactly. But under any circumstance, we can manage the season and end up with some profit.”

He then added casually:

“Of course, in this kind of year, we are making [a] much smaller profit than [in a] normal year. You know, [there is an] oversupply. What can you do?”

The temporary decline in their matsutake profits did not seem to be a source of serious concern for him, however; larger profits from the sales of other products, or a different configuration of conditions the following year, could compensate for this loss. Matsuda-san explained that his company’s strategy for coping with uncontrollable weather conditions was to have multiple matsutake sources in different locations. He stated:

“So it’s kinda nice for us not to have all our eggs in one basket, so to speak. Like in late September when the South Korean supply regularly starts, it’s good to have [a] North Korean supply as well.”

By sourcing mushrooms from many different countries, Matsuda-san protected his business, and was to some degree insulated from pine wilt disease and the vagaries of weather. He also told us that, although he traveled the world exploring prospects for matsutake trade, he avoided visiting gathering sites in other countries during gathering seasons. Pickers and buyers overseas were “rough”, he explained, describing a Wild West boom-and-bust scene and adding that each year people are killed over matsutake trade. He told us that he could not relate to this world, and he avoided it during harvesting season, preferring to manage his business from the safety of his Tokyo office.

## Conclusion

In this paper, I have presented scientific narratives about matsutake forests alongside the commentaries of matsutake pickers and traders to draw attention to two aspects of matsutake commodity relations. First, I have suggested that matsutake

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commodity chains take shape at the intersections of diverse sets of human–nonhuman interactions. I have shown that because nonhuman involvement in commodity chains enables, in contingent and geographically specific patterns, some people and places to be included in matsutake exchange while reducing and even precluding the involvement of others, it shapes matsutake production and valuation in variable ways and introduces uncertainties into matsutake trade.

Second, I have maintained that people involved in matsutake commodity exchange make sense of these uncertainties in diverse ways based on their geographical and political economic positioning. I offered two examples. First, I explained that matsutake pickers and sellers in Central Kiso described matsutake ecologies in their region as vulnerable in ways that paralleled the lack of control they felt about their future in what they viewed as an increasingly globalized world. These rural residents felt a sense of fate shared with that of vulnerable local forests, and they reworked scientific frameworks to make sense of the translocal natural–cultural web in which they felt caught. In contrast, Tokyo traders spoke of matsutake forests as ecologies of negotiation that were theirs to capitalize upon as they ‘gambled’ their way to business success from the security of their Tokyo shops and offices. They were less concerned about the scientific specifics of matsutake production and more with how they could maximize their profits, regardless of the quantity of matsutake yielded in any given place or year.

By drawing attention to the different ways in which these pickers and traders understood how nonhumans shape matsutake availability, I have suggested that matsutake commodity chains involve different forms of engagements with human–nonhuman ecologies. These different relationships do not neatly interlock or come into resonance through matsutake commodity chains. Rather, they rest uncomfortably alongside each other, and even conflict. Moreover, the different ways in which pickers and traders make sense of the roles nonhumans play in matsutake ecologies are tied to different forms of participation in these ecologies. Central Kiso residents, who identify with matsutake forests and view their own well-being as tied to them, express desires to maintain matsutake forests. Tokyo traders, who feel distant from matsutake ecologies, even while relying on them for part of their livelihood, treat matsutake forests as resources to exploit strategically for personal profit.

The examples of Central Kiso pickers and Tokyo traders are just two of the kinds of relationships that different groups involved in matsutake trade have with matsutake ecologies in Japan and around the world. My Matsutake Worlds Research Group collaborators are exploring others of these relationships, including those involving pickers and traders in Yunnan Province (China), Kyoto (Japan), and Oregon (United States). This paper, then, is just one part of a broader set of explorations of interactions among fungi, trees, people, nematodes, beetles, and weather in matsutake forests across the globe.

By drawing attention to the heterogeneity and geocultural specificity of these interactions as they relate to matsutake exchange, I have suggested that commodity relations emerge in the intersections and gaps among diverse and differently positioned human–nonhuman worlds. I have also shown that they are shaped by people’s different attitudes towards, and corresponding participation in, these worlds. When we pay attention to these dynamics, we can see that commodity exchange does not occur through smoothly articulated chains, networks, or circuits. Rather, it is the product of contingent and uneasy relationships among differently situated natural–cultural ecologies, and the discrepant ways people are positioned within and relate to them.



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