Chaga and Other Fungal Resources

Assessment of Sustainable Commercial Harvesting
in Khabarovsk and Primorsky Krais, Russia.

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Forestry Applications of Mycology
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Document Overview

This report was prepared for Winrock International and the FOREST Project, Khabarovsk Office in support of their Component 3: Non-Timber Forest Product and Secondary Wood Processing Program (Appendix A. Terms of Reference). Although promoting the harvest of Non-Timber Forest Products (NTFPs) in Khabarovsk and Primorsky Krais for local economic development is a critical goal of this program, doing so in a manner that is sustainable also is a key objective. Recently, the issue of sustainable harvesting was questioned by a local newspaper article (Appendix B.) with reference to the FOREST Project facilitating increased harvest of a traditional medicinal fungus called chaga which grows on birch trees. This report was commissioned in order to address the specific criticisms raised in the newspaper article and, more importantly, to insure that all the FOREST Project promotion of local economic development based on NTFP harvesting of fungal resources (chaga and other edible wild forest mushrooms) met sustainability criteria.

The report was developed during one week of library research, two weeks of travel to Khabarovsk and Vladivostock Russia to meet key individuals, and one week of preparation. The time frame constrained the report in several important ways, including:

- The literature review is not exhaustive, but does include some of the best extant references.

- Interviews in Russia included some of the companies, foresters, scientists, and administrators who deal with the issue of chaga harvesting, but by no means was

the survey inclusive. Critically, there was no opportunity to interview harvesters or conservationists regarding their opinions.

- The report has not been peer-reviewed or professionally edited.

Sources of information on chaga harvesting are scarce, especially in the English literature, and few sources of data exist on chaga abundance or harvest levels, so this report represents one of the first summaries of these topics in the English language. References are cited where particular facts or important points are noted. Information derived from the literature, special reports, and interviews overlap considerably, so citations for general knowledge are not provided. Details about sources of information are listed at the end of the report, immediately preceding the Appendices.

The author assumes all responsibility for inaccuracies or errors in the manuscript and welcomes all comments, criticisms, and feedback as the report is intended for eventual peer-reviewed publication.

Some information in this report may be contractually proprietary, so the author and Winrock International (Appendix C. Contact Information) should be contacted for permission before citing data or conclusions.

Executive Summary

Chaga is a medicinal fungus harvested from birch trees by inhabitants of the boreal forests in the Northern Hemisphere since time immemorial. It is a sterile conk-like growth that is produced by the canker wood-rot fungus *Inonotus obliquus* as it interacts with the birch tree's physiological defense mechanisms. It was traditionally used as a tea for stomach ailments and as a skin-cleansing solution. Currently, its pharmaceutical properties are being investigated for immunological-enhancing and anti-cancer properties; consequently world markets are expanding. Russians have a long tradition of using chaga, and are now beginning to export it internationally. The increased demand for chaga products raised concerns about harvest sustainability on the part of the Forestry Resources and Technologies (FOREST) Project, which is located in Khabarovsk and Krasnoyarsk, Russia, and sponsored by Winrock International with support from US AID/Russia. This report was commissioned in response to those concerns and was developed through a literature search, reports submitted by Russian experts, and by visiting with FOREST Project staff in Khabarovsk and with business, research and administrative representatives in Khabarovsk and Vladivostok.

Commercial chaga harvesting has a long history in Russia although, until the last several years, it was predominantly marketed within the country. Methods and regulations for commercial harvesting are well-developed in the country and regionally in spite of the political, administrative, and economic turmoil of the last several decades. Less well developed are methods for ascertaining the size or extent of the resource, or to what degree increased commercial harvesting for export markets might be sustainable. Essential information was gathered to calculate preliminary estimates of resource abundance and how much might be economically accessible. Due to the range of values for each variable, calculations were conducted in an Excel spreadsheet that provided pessimistic, median, and optimistic estimates of biological resource abundance, accessible annual resource availability, and potential over or under harvesting for Khabarovsk and Primorsky Krais, for the Russian Federation, and globally.

Results showed that even using pessimistic values, the biological resource is exceedingly abundant and at no risk of over-harvesting, even with dramatically

increased harvest levels. Nevertheless, it is possible that chaga might be harvested in areas near rural communities or roads at such a rate that buyers would obtain it more inexpensively elsewhere in Russia or the world. Thus the economic sustainability of the resource near rural communities in Khabarovsk and Primorsky Krais could be of eventual concern because road networks are relatively underdeveloped.

This analysis is followed by recommendations to enhance local access to the resource and to locally and regionally retain more profits from the processing and sale of chaga products. These recommendations describe ways that the FOREST project, the NTFP business community, scientists, foresters, and local administrators could cooperate to enhance economic development while ensuring sustainable chaga supplies. The recommendations include using the calculation spreadsheet as a tool for discussions of sustainable harvesting, means of improving resource monitoring, changes to permit and harvest regulations, co-management of chaga and forest resources, inoculation trials, isolating and propagating superior strains of the fungus, testing concentrations of pharmacological ingredients in extracts from various parts of the fungus, means to retain more profits locally, marketing suggestions, educational activities, and English publications that should be translated into Russian. The report ends with a section on how sustainability issues apply to other commercially harvested edible forest mushrooms.

Supplemental materials provided with this report include the Excel Spreadsheet for calculating chaga resources, a PowerPoint presentation summarizing the investigation, electronic reference documents, examples of mushroom harvesting regulations in the US, Canada, and Scotland, nearly a hundred digital images, a list of pertinent publications, contact information for the individuals visited, a list of meetings, important reference books left with the FOREST Project office in Khabarovsk, samples of American mushroom products including an extract of chaga from mycelial culture, and web sites that were referenced.

Introduction

Chaga is a mass of fungal tissue that protrudes from the bark of birch (*Betula*) trees when the wood-decay canker-fungus *Inonotus obliquus* infects them (and a few other hardwood species). It occurs throughout the boreal forests of the Northern Hemisphere wherever birch species grow and has been harvested for medicinal use by aboriginal peoples since before historical times. As with a variety of other wood-rot fungi, it has been scientifically demonstrated to possess a variety of beneficial pharmaceutical properties that provide the rationale for an increasing commercial harvest to supply local, regional, national, and international markets for herbal health products and remedies. The longest, best documented, and most extensive use of chaga has been in Russia, but as recently as two years ago, demand from Asian markets, especially Japan and South Korea, has increased dramatically. Chaga is also sold in Europe, but the North American market for products from chaga is largely undeveloped.

As interest in the harvest and international marketing of chaga grows, the issue of how to sustain economic opportunities based on its harvest will become more salient for rural communities close to the resource and nascent businesses in boreal regions. This issue is particularly relevant in Russia where much of the chaga resource is located, rural employment opportunities are limited, and the overall economy is struggling to adapt to the advent of market economics.

This report starts by discussing the chaga, the fungus that produces it, and how the product is traditionally used, harvested, and processed.. It continues by exploring the issue of sustainable harvesting and Russian regulations pertaining to its harvest and sale, and then concludes with recommendations to the FOREST Project and Russian stakeholders concerning further steps that can be taken to insure the sustainable commercial harvest of chaga and other wild mushrooms.

About Chaga

Names and terminology

The current accepted scientific name for the fungus that produces chaga is

Inonotus obliquus (Pers.) Pilát, *Atlas des Champignons de l'Europe* 3: 572 (1942). Its position in fungal classification is: Polyporaceae, Polyporales, Agaricomycetidae, Basidiomycetes, Basidiomycota, Fungi (Index Fungorum web site, accessioned April 30, 2004. http://www.indexfungorum.org/Names/namesrecord.asp?RecordID=315905). Prior synonyms include *Polyporus obliquus* Fr., *Syst. mycol.* (Lundae) 1: 378 (1821) and *Poria obliquua* (Ach. ex Pers.) P. Karst., *Revue de Mycologie*, Mémoires Hors Série 3: 19 (1881), among others cited by Reid (1976).

Common names for the harvested part of the fungus are as varied as the cultures that have harvested it, including: chaga, tschaga, charga, tschagapilz, clinker fungus, clinker polypore, birch clinker, cinder conk, black birch touchwood, birch mushroom, crooked Schiller-porling, kabanoanatake, kofukisaruno-koshikake, and others. To my western ear, Russian pronunciation of “chaga” might be phonetically transcribed as “chaeGee”.

Even the fungal growth or protuberance that is called “chaga” lacks a unique scientific name. Commonly it is called a “sterile conk” insofar as it somewhat resembles a conk (the woody shelf-like fruit-bodies of many wood decay fungi), but chaga is not a sporocarp (spore-bearing structure) and has none of the associated features of a fertile fruit-body. It consists predominantly of tightly packed mycelia (webs of one-cell wide “hypahe”) with decayed bits of birch tissue incorporated. Although *Inonotus obliquus* is considered a canker-fungus, a “canker” usually refers to the swollen or diseased tissue of the host plant, not the infective fungus. A more appropriate term (Stamets and Yao 2002) is “sclerotium” as this term usually refers to tight masses of fungal hyphae (Kirk *et al*. 2001). Sclerotia (plural) are typically thought to be nutrient storage structures, whereas chaga likely forms as a reaction of the fungus to attempts by the birch tree to seal off the infection. Nevertheless, “sclerotium” is, in my opinion, the most appropriate term and will be used in this report.

Biology and ecology

The biology and ecology of *Inonotus obliquus* is well documented (Blanchette 1982, Gilbertson and Ryvarden 1986, Ivanovich 1980, Kuz'michev *et al*. 2001, Manion 1991, Reid 1976, Shigo 1969, Sinclair *et al*. 1987, Sokolova, 2004, Tainter and Baker 1996,

True *et al*. 1955, and Zabel 1976), therefore this section briefly summarizes characters of the fungus that pertain to the issue of harvesting chaga in a sustainable manner.

Inonotus obliquus is an aggressive, primary (does not require previous infections by other fungi or micorobes), wood-rot fungus that predominantly infects trees in the genus *Betula* (birches). Although it is known to infect a few other hardwood species, chaga is not harvested from these other trees. Infection occurs when wind-born spores colonize cracks in the bark resulting from limb loss, winter freezing, or other canker diseases such as *Nectria*. Spores are produced on a resupinate (flat, thin-layered) sporocarp that develops on the bole of the tree, under the bark, three to four years after the tree dies. Nearby fungal structures push the bark off the tree as the sporocarp develops, thus exposing the spores to wind-dispersal. The mycelial structures that push the bark off the tree resemble the mycelial structure of the chaga sclerotium. Sporocarps develop during spring to autumn during warm weather and infection likely occurs at the same time (as the spores are disseminated), especially in humid weather. The resupinate sporocarps last at most a few weeks because they are aggressively consumed by insects, a fact that raises speculation about the potential role of insects in spore dispersal.

Although not all wood-rotting fungi that infect live trees are considered pathogens in the sense that they attack live cambial tissue, *Inonotus obliquus* does do so, and therefore can be considered a true tree pathogen. Each spring and summer, during active tree growth, the birch tries to seal off the fungal infection, but each year the fungus spreads from the infection site in a dense mycelial wedge that re-damages the surrounding cambial tissue and sustains the infection. Eventually either the tree is girdled and dies, or the interior rot weakens the bole of the tree and it topples. The period from initial infection to tree death varies with the number of infection sites and tree resistance, but is typically two decades.

The chaga sclerotium begins growing within a year or two near the site of infection and is large enough to harvest within three to five years. As the infection spreads up and down the bole of the tree, or from multiple sites of initial infection, several chaga sclerotia may develop on the same tree, but usually only on the bole of the tree, not the limbs. After harvesting, chaga can regrow to harvestable size again in three to 10 years, and can be repeatedly harvested until the tree dies.

Infection rates in natural birch stands vary widely, but typically range from 1-20% of the trees showing signs of infection (Kuz'michev *et al*. 2001). Little or no data exist in Russia on rates of infection on different birch species, in different forest types, or in various environments, because the fungus was not typically included among data collected in forest inventories (Protasov and Danilin, Far East Forest Inventory Enterprise, 2004).

Chaga occurs throughout the range of *Betula* species in the circumboreal forest of the Northern Hemisphere. It occurs in pure birch stands and also on birch in mixed forests with other conifer and hardwood species. Typically, well-developed chaga sclerotia are found on trees over 40 years of age, but the infection likely starts earlier. Suppressed or weakened trees might have less resistance to the spread of the fungus after infection.

No methods are known to control the spread of the fungus or infection rates, and little work has been done to investigate control of the fungus because birch trees are often considered less valuable that other conifers or hardwoods. Even if infected birch are girdled, the bark stripped, or the trees felled and bucked, the sporocarps still develop and spread their spores (Zabel 1976).

Use

Chaga has likely been used by humans for as long as they have inhabited boreal forests. Not only does chaga have useful medicinal properties, but, as with other conks, the porous, well-aerated, “punky” structure of the sclerotium is ideal for catching sparks or storing and transporting burning coals for easy fire starting (Spillis 2004, Storm 2004).

The tradition of chaga use is especially strong in Russia. As one of the few examples documented in the English literature, Saar (1991) reports on the use of chaga in folk medicine by the Khanty people along the Ob river in western Siberia. They used chaga tea for stomach ailments, as “soap-water” for cleansing skin and sores, and as smoke for bronchial ailiments.

Current pharmacological research on biologically active constituents of chaga is rapidly progressing and the literature is replete with specific scientific articles. Hobbs (1986) and

Stamets and Yao (2002) provide cogent summaries in English. The promising results of these studies are fueling the increasing demand for chaga and might eventually lead to even greater demand if large pharmaceutical companies come to view chaga as a resource for extraction of particular compounds.

Harvesting and processing

Harvesters, processors, buyers, and government regulators in Russia have developed a variety of guidelines for harvesting methods and quality control (Health care Ministry of USSR and Ministry of Medical Industry 1985, Stepanova *et al*. 1999, and buyer interviews). These include:

- Only harvesting chaga from live trees (this likely insures freshness as the potency of chaga decreases over a period of a year in storage).
- Small cankers should be left to grow larger.
- Trees should not cut down to collect cankers high on the stem .
- Chaga is chopped from stem with an axe and birch bark and wood is subsequently removed.
- Chaga should be promptly dried to less than 14% moisture content using driers operating at temperatures less than 50 to 60 degrees Celsius. Cutting the chaga into chunks approximately 5 cm on a side shortens drying time.
- The best quality chaga is obtained by organized teams that can quickly transport the product to good drying and storage facilities.
- Chaga should be stored in cool dry conditions for less than a year to insure freshness.
- Vacuum packing it in plastic bags improves shelf-life.
- Chaga for tea should be ground immediately before packaging the tea-bags in air-tight envelopes.
- Opinions vary about which part of the sclerotium has the highest concentrations of various active ingredients.
- Chaga concentrates are easily produced by water extraction, but alcohol or carbonic acid extraction might dissolve other useful compounds.

Sustainability

Sustainability formula

In its basic form, the issue of sustainable harvesting is very simple. Namely, the resource should not be harvested more quickly than it is renewed. In the form of an equation, it might read: *Harvest Amount ≤ Resource Renewal*

Sustainable harvesting of NTFPs becomes complicated when it is considered in context. This context includes the following factors, among others.

- Biological
- Ecological
- Environmental
- Economic
- Social
- Cultural
- Traditional
- Historical
- Political
- Regulatory
- Legal
- Land tenure and harvest rights
- Aboriginal rights
- Poaching
- Enforcement
- Harvest methods
- Multiple resource co-management
- Cultivation
- Markets (local, national, international)
- Rural economic development
- Small versus large companies

- Commodity export versus value-added product retailing
- Equitable profit

These factors apply to the harvest of any natural resource, but become more complicated with the harvest of NTFPs because (as opposed to the industrial harvest or extraction of resources such as timber or minerals) numerous individuals do most of the harvesting (rather than a few large companies), the commercial harvest is usually overlaid on a long cultural tradition of sustenance harvesting, and the products are harvested from a vast array of biological species, each with their own biology, ecology, growth rates, and reproductive mechanisms.

All of the afore-mentioned factors should be addressed to derive a truly comprehensive approach to managing for the sustainable harvest of any one product, but such an effort is beyond the scope of this report. Many factors overlap among products or within regions, so a systematic analysis of sustainability for a given set of products or region is feasible. The analysis presented in this report covers some of the more salient issues regarding sustainable harvest of chaga and other edible wild mushrooms, but additional analyses are warranted for products such as medicinal herbs, berries, and wildlife products.

Biological versus economic sustainability

Essential to any analysis of sustainable harvesting of NTFPs is calculations regarding the extent of the resource, the rate of renewal, and the level of harvesting. But before such calculations are made, it is important to understand that the accessibility of the resource greatly affects the cost at which it can be harvested. If the primary goal is to encourage sustainable economic development based on a renewable resource, a distinction must be made between these definitions of sustainability.

Biological Sustainability– *The range, abundance, and reproductive capability of the species from which the product is acquired is not unacceptably diminished or endangered by human harvesting.*

Economic Sustainability – *The level of harvesting can be sustained indefinitely without*

diminishing the availability, quality, or cost of the raw product.

Sustainability calculations

Using these definitions, an Excel Spreadsheet entitled "ChagaResourceCalcs.xls" was developed to provide preliminary resource estimates for chaga. The spreadsheet provides data, formulae, and estimates for three regions: Khaborovsk and Primorsky Krais, the Russia Federation as a whole, and globally. For each region, separate individual spreadsheets calculate the following factors: The Biological Chaga Resource, the Annual Harvest Potential, the Accessible Annual Harvest Potential, and the Current Level of Under/Over-harvest of the accessible resource. For each factor in each region the calculations use optimistic, average, and pessimistic values to bracket the range of likely values. References and assumptions are documented in the spreadsheet and summaries are provided in this report in Tables 1-4 below.

Importantly, this spreadsheet and the imbedded calculations are provided as a tool for enhancing communication among interested parties regarding the range of possible values and the important variables that affect sustainability calculations. To that end, a fourth column was incorporated that provides the user with the opportunity to fill in the values they consider most probable and to use the same formulae to calculate their own estimates of the chaga resource.

The variables that can be customized to the user's sources of information include:

- The hectares of pure birch stands
- The number of birch trees per hectare
- The fraction of birch trees infected
- An average weight of chaga sclerotia that can be harvested per tree
- A multiplicative factor for the number of birch trees in mixed stands
- Years until equivalent re-harvest on same tree
- An adjustment factor for economic accessibility (nearness to settlements or roads)
- The current legal harvest level

- A multiplicative factor for personal use and poaching
- A multiplicative factor for the Russian resource
- A multiplicative factor for the global resource

Calculation assumptions

As with any such analysis, assumptions can greatly affect the output. Two important assumptions not mentioned on the spreadsheet should be noted.

First, the calculations assume that, over time, the spatial extent and average age of birch stands within the area of accessible harvesting will remain constant. This might not be true given human impacts such as logging or fire, or even climate change. Human disturbances of forests in Khabarovsk and Primorsky Krais to date have increased the extent of primary successional species such as birch in the absence of effective artificial conifer regeneration (Newell 2004), but the extent to which this trend continues will depend on future forest management and world timber markets. Global warming might shift birch forests northward over human generations, but the more immediate impact, if any, is difficult to judge.

Secondly, how economically-profitable it is for local harvesters to acquire chaga within a given radius of their community or the local road system is directly driven by the prices buyers are willing to pay. Those prices in turn are influenced in a world market by competition from other sources (with differing accessibility and wage expectations), as well as global demand. Khabarovsk Krai harvesters in particular, but also Primorsky Krai harvesters have less access to chaga resources than harvesters in Russia west of the Ural mountains because the local road systems are less extensive. By the same logic, they have a resource accessibility advantage over many communities in Siberia where roads are even less abundant.

Several buyers I spoke with noted that it was already cheaper to buy chaga for export from western Russia than locally, and these comments should be noted relative to the pessimistic estimates of Over/Under-Harvesting values for Accessible Annual Harvest Potential in Khabarovsk and Primorsky Krais in Table 4., where the calculations indicate

that over-harvesting (in an rural economic-development sense) might already be occurring.

Two foreseeable factors should be noted that could affect the demand side of these sustainability calculations. First, market demand for chaga tea and extracts is just beginning to develop in Asia and Europe. These markets might expand substantially. Similarly, markets in the United States are currently very small but could increase as well. Whereas Asian companies (currently Japan and South Korea) prefer to buy bulk chaga as a commodity, a better potential likely exists to market finished (value-added) products in European and US markets. Secondly, if large pharmaceutical companies determine that certain chemical compounds with market value are most readily derived from chaga, then the demand for the resource could expand dramatically, as was the case with taxane derivatives from yew trees (Goodman and Walsh 2001) for the production of the anti-cancer drug Taxol©. Either scenario could shift the price for chaga on the world market and thus increase the zone around local communities and roads where economically viable harvesting could occur.

Regardless of the assumptions inherent in these calculations and the factors that remain unknown, it is obvious form the calculations in Tables 1-4 that the biological chaga resource is immense, and unlikely to be over-harvested to the detriment of the species *Inonotus obliquus* any time in the near future. That said, it is the responsibility of all the stakeholders (harvesters, processors, buyers, retail companies, resource managers, administrators, legislators, the conservation community, and the general public) to participate in an open dialogue about how to best configure harvest of the chaga resource to benefit local communities and their economy without impairing the available resource or the environment. To that end, a list of recommendations is proffered in the next section.

Table 1. Biological chaga resource

(Metric Tons)

Area	Pessimistic Estimate	Median Estimate	Optimistic Estimate
Khabarovsk and Primorsky Krais	36,420	1,780,200	16,704,000
Russia	268,415	13,120,074	123,108,480
Global	375,782	23,616,133	270,838,656

Table 2. Annual harvest potential

(Metric Tons)

Area	Pessimistic Estimate	Median Estimate	Optimistic Estimate
Khabarovsk and Primorsky Krais	3,642	296,700	5,568,000
Russia	26,842	2,186,679	41,036,160
Global	37,578	3,936,022	90,279,552

Table 3. Accessible annual harvest potential

(Metric Tons)

Area	Pessimistic Estimate	Median Estimate	Optimistic Estimate
Khabarovsk and Primorsky Krais	73	14,835	556,800
Russia	537	109,334	4,103,616
Global	752	196,801	9,027,955

Table 4. Current under/over-harvest

(Metric Tons)

Area	Pessimistic Estimate	Median Estimate	Optimistic Estimate
Khabarovsk and Primorsky Krais	171.61%	1.52%	0.07%
Russia	No data on harvest levels	No data on harvest levels	No data on harvest levels
Gobal	No data on harvest levels	No data on harvest levels	No data on harvest levels

Recommendations

Spreadsheet use

Because chaga harvesting involves many stakeholders with varied interests and perspectives, the spreadsheet with its imbedded formulas and assumptions, represents a common framework to begin discussion of the various issues surrounding sustainable biological and economic harvesting of chaga. It also represents an analytical approach to discussing the sustainable harvest of any NTFP, including other edible mushrooms, although the assumptions and formulae would need to be altered accordingly.

As a common framework for discussion, I suggest that the spreadsheet be translated into Russian and distributed among the local members of the Russian Far East Non-Timber Forest Products Processors Association, representative government officials, and other interested parties. Ideally, a workshop would be sponsored where the calculations and assumptions are explained, explored, and discussed. Then each party can conduct their own calculations for future reference and discussion. This exercise will also highlight critical unknown, or poorly estimated, values that, if better estimated, would greatly improve the usefulness of the results.

As conditions change in the future, so the variables can be altered to update the sustainability prognosis.

Monitoring

During the course of my interviews, it became clear that reliable (statistically-derived) data regarding the actual abundance of chaga was scarce or non-existent, hence the indirect estimates of chaga abundance in the spreadsheet calculations became necessary. As a result, the range of values derived from consistently pessimistic values in the spreadsheet calculations compared to consistently optimistic values is immense. This range could be substantially reduced and the median value more precisely estimated if some relatively inexpensive inventory and monitoring of the chaga resource was implemented.

Means by which this goal might be accomplished include:

- Require harvesters and buyers to report quantities acquired annually
- Require harvesters and buyers to report where their chaga was acquired
- Add *Inonotus obliquus* infection rates to forest stand inventories and commission some preliminary inventories of such infection in representative forest types and birch species where chaga is currently harvested
- Conduct cooperative studies involving harvesters, forest managers, and scientists to better estimate:
    - Kilograms of chaga harvested from each tree
    - Regrowth rates until an equivalent amount of chaga can be re-harvested from the same tree
    - How many times chaga can be harvested from each infected tree before it dies
    - The areas surrounding each community or road where it is economically viable to harvest chaga

In all countries where resource managers are struggling to monitor the harvest of diverse NTFP resources with limited agency budgets, the trend is to develop monitoring programs that involve both harvesters and managers in cooperative efforts to use the resource wisely. Although various examples exist, only recently have social, environmental, and natural resource scientists started to investigate the factors that contribute to successful collaboration. Two such documents (Lynch 2004, Lynch *et al*. 2004) are included in the electronic resources submitted with this report and the author might be involved in a subsequent effort if a grant proposal to the National Commission on Science for Sustainable Forestry is approved this Spring 2004.

Permits and regulations

In the course of my discussions with individuals familiar with NTFP harvest regulations in Russia and in particular the Russian Far East, several favorable factors became evident relative to such regulations in other countries with which I am familiar. In particular:

- Russia has a longer history of, and experience with, regulating the harvest of NTFPs than most countries
- The permitting process is more thorough and detailed
- Harvest methods are often specified in greater detail

In contrast with other countries, the following shortcomings were evident:

- Estimates of harvestable quantities from specific areas are provided by the harvesters or purchasers, not independently by resource managers, who simply ascertained if the buyer estimates are appropriate.
- There exists no means of verification as to whether the actual harvest of an NTFP product was comparable to the proposed harvest
- There exists no objective or consensual monitoring of actual resource conditions
- There is little voluntary cooperation among stakeholders
- Compliance with regulations is officially enforced only with penalties, not also with incentives
- Following regulations and obtaining permits is time-consuming and expensive to the extent that such procedures likely encourage unauthorized harvesting

My recommendations include:

- Reduce the time, expense, and effort needed to acquire harvest permits and export permissions.
- Experiment with leasing exclusive rights to harvest discrete areas in exchange for cooperative monitoring
- Emphasize incentives to facilitate cooperation among stakeholders such as harvesters, companies, foresters, scientists, and regulators
- Conduct cooperative research and monitoring to build trust among stakeholders and mutual ownership of the process of resource management

These recommendations likely will be challenging to implement in the current political and economic context of Russian society, but the collaborative nature of the FOREST Project and the local Far East Non-Timber Forest Products Processors Association provide the institutional framework for initiating such cooperative ventures.

Co-management of chaga and forests

Many conifer forests in Khabarovsk and Primorsky Krais regenerate to less valuable birch species following logging or wildfires because environmental conditions often favor fast-growing birch over slow-growing conifer seedlings, even if the site is planted with conifers. Foresters would like to restore more of the valuable conifer stands. In habitats and soils that are appropriate for shade-tolerant (Vrishch *et al*. 2001) conifer species such as Ajan spruce (*Picea ajanensis*) and Korean pine (*Pinus koraiensis*), an opportunity exists to co-manage for chaga and conifer regeneration.

These conifers will grow in the understory of mature birch stands, so such stands could be planted to conifers and all the birch trees inoculated with *Inonotus obliquus*. Over the course of the following 20 years or so, the conifers will grow better in the protection of the birch overstory, while the larger birch trees slowly die of from the fungal infection and produce chaga crops. Some conifer damage will likely result as the dying birch fall over, but this could be minimized by felling the birch at a later date. If such a silvicultural scheme were implemented near a rural community or road, the stand would offer an abundant and easily-accessed source of chaga. If the birch are inoculated with superior strains of chaga (see below), then the economic advantages would be correspondingly greater.

Inoculation trials

Insofar as economic sustainability of chaga and the benefits that accrue to local or rural communities are a function of how far individuals have to travel to obtain chaga, having concentrated sources of the material in easily accessed areas would improve the price competitiveness of local supplies. If future demand for chaga increases dramatically, these sources would be particularly beneficial to rural communities.

To this end I recommend that small scale trials be conducted wherein birch stands near communities or roads are manipulated to increase chaga supplies. I suggest two methods be tried.

A simple method would consist of wounding birch trees by stripping portions of their bark or chopping into the stem at a height on the bole that harvesters could easily reach. Experimenters could implementing such treatments at several periods during the growing season to find the best timing to correspond with airborne spore loads.

A more elaborate method, but one which has even greater potential for producing chaga with the greatest concentrations of active ingredients, would consist of inoculating trees with selected strains of the fungus grown clonally in pure culture. This would involve some initial effort to select the superior fungal strains (see next section), and then growing those strains on short, round, wooden dowls that can be pounded into holes drilled in the birch (similar to common methods for inoculating logs for shitake production).

Given the uncertain future demand for chaga and its current abundance, I do not think either set of trials should yet be undertaken on a large scale. However, both experimental methods will take years to yield results, and starting trials now might well-position cooperators for producing competitive future supplies if demand does increase.

Strain isolation

Clonal strains (individuals) of various medicinal wood-decay fungi vary widely in their concentration of active pharmacological components (Personal communication, Paul Stamets, Fungi Perfecti, April 30, 2004). If this is also true of *Inonotus obliquus*, it provides an important opportunity to improve the quality of marketed chaga.

I recommend that strain selection trials be conducted to determine how much *Inonotus obliquus* clones vary in their concentration of active components. Such trials should test different isolates within and among geographically-dispersed populations of the species to determine the most useful sources of variation. If the variation in active compounds is great, superior strains should be further propagated for the pure culture inoculation trials suggested in the previous section.

Strains of *Inonotus obliquus* might also be selected for abundant production of

harvestable chaga, although such selection would take longer to conduct because investigators would have to wait for the sclerotia to develop on inoculated trees. This process might be shortened by selecting strains that grow quickly in pure culture, but pure culture growth might not correspond to infectivity or chaga production, and foresters might not appreciate aggressive strains being propagated in native birch stands. My suggestion is that strain selection should be based predominantly on the concentration of pharmaceutical compounds.

Scerotial versus mycelial extracts

Little consensus exists as to what part of the chaga sclerotium has the highest concentration of active ingredients. Indeed, different parts of the sclerotium may concentrate different compounds. Similarly, virtually nothing is known about the relative concentration of active compounds in chaga sclerotia compared to extracts from pure culture *Inonotus obliquus* mycelium grown on rye grain, such as the extracts sold by Fungi Perfecti on its web site (http://www.fungi.com/mycomeds/extracts.html).

Many medicinal fungi are grown in pure culture more cost-effectively than they are collected in the wild. This might, or might not, hold true for chaga which, unlike the sporocarps of other medicinal wood-rot fungi, develops as an interaction between the fungus and the physiological defense mechanisms of the host birch tree. One active ingredient in chaga, betulin, likely is only incorporated into the chaga sclerotium on live birch trees.

I recommend comparative testing of compound concentrations in various parts of the sclerotium, as well as extracts from mycelium. The proprietor of Fungi Perfecti, Paul Stamets, as well as Dr Tatyana Stepanova of Khabarovskaya Pharmaticia, Demitri Grankin of Dinkoma Intellect, and Edward Seleznev of Limonnik have all expressed interest in such comparative trials. I suggest that these, and possibly other interested individuals or companies should cooperate to conduct comparative trials in laboratories in both the United States and Russia. Shared samples, standard analyses, and mutually agreed-upon handling protocols should be employed. The FOREST Project could offer invaluable assistance in such a venture by helping to obtain funds, providing a neutral

forum for coordinating protocols, and by providing translation services. Such trials would be the first of their kind, and should be published after the cooperating companies have had an opportunity to incorporate the findings into their business practices.

Retaining profits within communities and regions

Retaining more profits in local communities and regions from the commerce in chaga and other NTFPs is one of the goals of the FOREST Project and also represents a means for obtaining greater income from reduced harvest of the resource. To this end I suggest the recommendations of Schlosser and Blatner (1995) and McCaleb (2001) regarding value-added products and market development be reviewed and given further consideration. Additionally I recommend that:

- Harvesters who attend training on sustainable harvest and quality-control methods should receive preferential access to harvest leases in convenient areas.
- Seminars on chaga processing and small loans be provided to individuals in distant rural communities who are willing to collect, dry, and store chaga in a manner that ensures a quality product.
- Favorable loans should be provided to businesses that participate in sustainable harvesting activities and are willing to provide data on chaga harvest quantities.
- Means should be developed to provide marketable “chain-of custody” certification for businesses complying with sustainable harvest regulations and guidelines, and that periodically test their products for purity.

Marketing

The business proprietors with whom I spoke all mentioned that buyers in Japan and South Korea preferred to purchase chaga in bulk and process it into final products in their own countries. While this might be true in Asia, I believe that markets in Europe and the US represent a better opportunity to market retail chaga products as “Produced in Russia”. I recommend that the FOREST Project support local businesses in efforts to pursue this marketing approach. When I suggested this to the business people I spoke

with, they all said that such an approach would be much easier if they could “partner” with US companies to sell their products. I am unable to help with finding such companies because my own background is more focused on mycological and forestry issues, but one of the more important obstacles I anticipate for such partnering would be language translation services. Arranging a continuous, on-demand, translation service for both Russian and American or European businesses would greatly facilitate such opportunities.

On the basis of my personal familiarity with the promotion and sales of NTFPs in American markets, I recommend the following characteristics of Russian products be emphasized in product advertising.

- That it is a “natural” product
- That the product has a long history of traditional use in Russia and that product labels provide a concise and interesting story about this history
- The product is harvested from environments free of pollution
- The product is independently certified to be harvested in a sustainable manner
- The product was harvested with an emphasis on quality control during processing
- The product was harvested and produced in a manner that benefits local communities and provides employment to rural harvesters
- The product labels have vibrant, humorous images that reflect Russian culture

Education

The FOREST Project also has an opportunity to enhance the sustainable economic marketing of chaga and other mushroom products in the Russian Far East through educational activities. Possible examples include:

- Sponsor attendance by members of the Far East Non-Timber Forest Products Processors Association at conferences as well as trade shows. The Third International Conference on Medicinal Mushrooms in Port Townsend, Washington, scheduled for October 12-17, 2005 is one such opportunity.

(http://www.fungi.com/immc/index.html) The sponsor of this conference, Fungi Perfecti, is also the company that I recommend be included in the comparative trails of chaga and mycelial extracts.

- The FOREST Project should continue to support translation of selected important scientific English literature on chaga, medicinal, and edible mushrooms, and distribute the translated articles to cooperators
- Contracting with Olga Krankina at Oregon State University to provide an official, updated electronic version of her bibliographic report on Russian NTFP literature (see the Publications section).
- Where possible, community outreach or extension activities could be conducted to explain the benefits of sustainable NTFP enterprises to rural Russian communities

Publications to translate

The following publications (or relevant sections thereof) are the best materials I encountered in the English literature for use by the FOREST Project and the NTFP Association members interested in chaga and mushroom sustainability. All these articles or their relevant sections are provided in the electronic references-supplemental materials folder accompanying this report. These materials were carefully selected for brevity, conciseness, and usefulness, so I suggest they be carefully translated to convey exact nuances.

Blanchette, R. A. 1982. "Progressive stages of discoloration and decay associated with the canker-rot fungus, *Inonotus obliquus*, in birch." Phytopathology 72(10): 1272-1277.

Christopher Hobbs, L. A. 1986. Medicinal Mushrooms: An Exploration of Tradition, Healing, and Culture. Summertown, TN, Botanica Press.

Pilz, D. and R. Molina 2002. "Commercial harvests of edible mushrooms from the forests of the Pacific Northwest United States: issues, management, and monitoring for sustainability." Forest Ecology and Management 155(1-3): 3-16.

Sinclair, W. A., H. H. Lyon, *et al*. 1987. Diseases of trees and shrubs. Ithica, NY, Comstock Pub. Associate.

Stamets, P. and C. D. W. Yao 2002. MycoMedicinals: An Informational Treatise on Mushrooms. Olympia, WA, MycoMedia Productions.

Zabel, R. A. 1976. "Basidiocarp development in *Inonotus obliquus* and its inhibition by stem treatments." Forest Science 22(4): 431-437.

Sustainable Harvest of Other Commercially Valuable Forest Fungi

The terms of reference for the contract to prepare this report also stipulated that sustainable harvest be addressed for the additional five most common commercially-harvested mushrooms in the Russian Far East. I have chosen not to spend a great deal of time on this topic because most of these mushrooms are relatively resistant to "over-harvesting" and because I have already published extensively on this topic. The Pilz and Molina (2002) article (above) that I suggest be translated, is a concise summary of the topic, addresses harvest regulations in other countries, and includes a pertinent bibliography of western literature. Kerns *et al*. (2003) in the Publications section below also provides a comprehensive summary of managing forests for sustainable co-production of both wood-decay and ectomycorrhizal ("fungi that colonize the outer layer of root-tips") mushrooms, as well as other NTFPs.

Briefly, ectomycorrhizal mushrooms are forest floor mushrooms that live symbiotically with tree roots. The fungi act as the fine root system of the tree by colonizing the feeder root tips and sending microscopic hyphae (one-cell wide fungal threads) out into the soil. The fungus translocates water and mineral nutrients to the tree, and the tree in return provides the fungus with carbohydrates that it has produced through photosynthesis. Many of the most highly-prized, edible, forest-floor mushrooms are the fruit-bodies of these ectomycorrhizal fungi. Like apples on an apple tree, harvesting the mushrooms does not impair the growth of the fungus, and no current evidence contradicts the assumption that enough spores are released from old or non-harvested mushrooms to

maintain viable populations of the fungi. The salient point for sustainable harvest of such mushrooms is that they depend on healthy mature trees, of the correct tree species, for their continued persistence and abundant fruiting. Thus logging operations present the greatest potential threat to their continued harvest. Sustainable logging operations are compatible with such mushroom production across landscape scales if forests are regenerated to their original species composition, logging is conducted at a rate that allows some of the forest to be mature, and soil compaction is avoided to the extent possible (such as conducting logging operations in the winter on top of snow packs). Several of the most commonly harvested mushrooms in the Russian Far East are such ectomycorrhizal fungi. These include the “white mushroom”, *Boletus edulis*, and several *Lactarius* species.

Some harvested edible forest mushrooms are saprobes, that is they decay woody debris or forest floor litter layers. Such mushrooms and conks are also the fruit-bodies of fungi, so picking them (per se) does not harm the body of the fungus which is imbedded in the substrate that it is decomposing. Maintaining viable populations of these fungi also involves maintaining healthy forests by leaving some snags and logs during logging operations and not disturbing the soil.

Finally, I will note an economic opportunity for mushroom harvesting that might be unexploited in the Russian Far East. Morel mushrooms (various species of the genus *Morchella*) often fruit in great abundance the first spring season following forest disturbances like wildfire or logging. It is highly probably that vast crops of these mushrooms have gone unharvested following the extensive wildfires that have plagued the forests of Khabarovsk and Primorsky Krais in the last several years. Morels are quite valuable on the world market, and are easily preserved by drying in the sun at the harvest site. Dried morels reconstitute readily when soaked in water, and indeed their flavor can be concentrated and enhanced by drying. Thus they are ideally suited to local harvest and preservation for later transport to retail markets. Harvesting morels is an economic opportunity that should be investigated in areas that have experienced tree-mortality fires the previous year.

Few publications currently exist on the commercial harvest and marketing of morels, but I am currently working on two such publications and will gladly provide them if reminded in a year or two.

Acknowledgements

I extend my thanks to Patrick Perner, Project Director for the Khabarovsk Office of the FOREST Project for selecting me to work on this project. Dr. Evgeniy Kuzmichev provided useful focus and guidance to my efforts. The translation services of Vera Kharberger and Elena Begunkova were invaluable during my visit to Khabarovsk and Vladivostok, and during the meetings with key individuals. My appreciation to Erin Hughes and Penny Wilson of Winrock International for making all the travel and contractual arrangements in a timely and professional manner. My salutations to the entire staff of the FOREST project for the beneficial work they are pursuing and their kindness during my visit. Lastly, my genuine thanks to the individuals who agreed to meet with me and share their perspectives on how to harvest chaga in a sustainable manner. I wish them all the best in their pursuits.

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Meetings, discussions, and interviews

Date	Person	Place	Purpose
April 12, 2004	Evgeniy P. Kuzmichev, Elena Begunkova, and Igor Snitsky	FOREST Offices, Khabarovsk	Review goals & salient topics.
April 12, 2004	Oleg Vonti (joined above meeting half way through)	FOREST Offices, Khabarovsk	Review goals & salient topics.
April 13, 2004	Nikolay A. Protasov and Andrey Danilin	Far East Forest Inventory Enterprise, Khabarovsk	Distribuiton and abundance of birch in Khabarovsky and Primorsky Krais
April 14, 2004	Eduard Seleznev Vasiliy I. Tolstikh Vera Poselenova, Zoya Vyvodtseva, and Anatoly Boyarinov	FOREST Offices, Khabarovsk Khabarovsky Krai Administrative Office, Khabarovsk Forest Museum, Khabarovsk Forest Genetic Breeding Unit, Khabarovsk	Introduction. Visit next Tuesday Discuss Krai NTFP regulations Natural history of *Inontotus obliquus* and birch in Khabarovsky and Primorsky Krais
April 15, 2004	Patrick Perner Valentin A. Chjolyshev Vladimir Maznev	FOREST Offices, Khabarovsk Far East Forestry Research Institute, Khabarovsk Natural Laboratory Company facilities, Khabarovsk	Discuss context of work Birch distribution and silviculture Discuss harvesting, buying, and selling of chaga

April16, 2004	Oleg Vonti	FOREST Offices, Khabarovsk	Discuss NTFP & chaga industry and regulations
	Tatyana Stepanova	Office at Khabarovskaya Pharmatcia, Khabarovsk	Discuss sustainable harvesting research, NTFP inventories, and pharmaceutical testing
April 20, 2004	Tamara Parfenova	Far Eastern Branch, Russian Academy of Sciences, Vladivostok	Discuss development of new nutraceutical products from chaga
	Evgenia Bulakh	Far Eastern Branch, Russian Academy of Sciences, Vladivostok	Discuss chaga from mycological perspective
	Demitri Grankin	Dinkloma Company Offices, Vladivostok	Discuss chaga marketing and testing
	Eduard Seleznev	Limonnik Company Offices, Vladivostok	Discuss chaga quantities, harvesting, markets, and marketing. Lab and field tours

Web sites

Organizations

Winrock International home page
http://www.winrock.org/

FOREST Project home page
http://www.forestproject.ru/web2/mainr.htm

Russian Far East Non-Timber Forest Products Processors Association
http://www.ntfp.ru/DefaultEn.htm

Institute for Sustainable Communities, Russian Far East Projects page
http://www.iscvt.org/psrussia.html

About Khabarovsk, Primorsky, and Krasnoyarsk Krais

Khabarovsk Krai
http://www.adm.khv.ru/invest2.nsf

Primorsky Krai
http://www.traveleastrussia.com/primorski.html

Krasnoyarsk Krai
http://www.bisnis.doc.gov/bisnis/country/9808kras.htm

Russian Far East Companies producing chaga products

Natural Laboratory Co., Ltd.
http://www.aralia.ru/EnglisPages/english_enters.htm

Limonnik
http://www.limonnik.ru/home_eng.htm

Dinkoma Intellect
http://www.dinkoma.ru/

Fungi Perfecti, Olympia Washington Information on chaga

Fungi Perfecti home page
http://www.fungi.com/index2.html

Mycelial chaga extract order page
http://www.fungi.com/mycomeds/extracts.html

Medicinal mushroom therapeutic chart and references
http://www.fungi.com/mycomeds/info.html

Information about *Inonotus obliquus* and chaga

Index Fungorum citation for *Inonotus obliquus* (Currently accepted scientific name, citation, and prior synonyms for *Inonotus obliquus*)
http://www.indexfungorum.org/Names/namesrecord.asp?RecordID=315905

Systematic Botany and Mycology Laboratory
Agricultural Research Service, U.S. Department of Agriculture
Fungal Databases (Currently accepted scientific name, citation, and prior synonyms for *Inonotus obliquus*)
http://nt.ars-grin.gov/fungaldatabases/DatabaseFrame2.cfm

Natural Resources, Canada
Common tree diseases of British Columbia
Sterile Conk Trunk Rot of Birch
http://www.pfc.forestry.ca/diseases/CTD/Group/Canker/canker6_e.html

Root Woman (Pamphlet on chaga available)
http://www3.sk.sympatico.ca/david079/

Third International Medicinal Mushroom Conference

http://www.fungi.com/immc/index.html

Appendix A. Terms of reference

FOREST PROJECT
Terms of Reference
International Position

Assessment of Sustainable Harvesting of NTFP
Component 3: Non-Timber Forest Product and Secondary Wood Processing
Length of Assignment:, Approximately 28 days
Location: Khabarovsk, Primorski, Krasnoyarsk.

I. Introduction to FOREST Project

In July of 2000, Winrock International launched a new five-year activity funded by USAID/Russia, the Forestry Resources and Technologies (FOREST) Project. The major goals are to reduce the threat of global climate change and preserve biodiversity through promoting sustainable forestry management and preserving Russian forests as a globally important carbon sink and critical habitat for rare and endangered species.

The FOREST project will work through 4 primary program components targeted at forest fire prevention, pest monitoring, non-timber forest products and secondary wood processing and biomass energy.

Winrock International is a nonprofit organization that works in 40 countries around the world to increase economic opportunity while protecting the environment. Winrock's five program areas – forestry and natural resource management, clean energy, enterprise development, leadership, and agriculture – link local communities with new ideas and technology to foster economically and environmentally sustainable development. Winrock's partners on FOREST include Chemonics, and the Heron Group.

This scope of work focuses on working towards the goals of the third component -- Non-Timber Forest Products and Secondary Wood Processing. Under this component Winrock International will work with non-timber forest products (NTFP) and secondary wood associations to strengthen their capacity to better serve association members.

The **overall goal** of this component is to: Increase value of forest products per ha harvested by in targeted areas through post harvest processing.

To reach this overall component goal, nine sub-indicators will be achieved based on strengthening the associations and their members.

Associations:

1. NTFP and Secondary Wood Processing Associations economically self sufficient and sustainable (defined as able to cover annual operating costs from membership and service fees and grants)
2. Increased membership supporting association through payment of annual dues or other service fees
3. Increased services provided to members

Member Clients:

4. Increased income/profit per unit harvested

5. Adoption of new or more efficient technology
6. New loans or investment secured (dollar value)
7. Improved quality (measured by ability to meet export quality standards)
8. Increased Export Sales
9. Adoption by NTFP processors of mechanisms (quotas, permits, or fee systems) that preclude the use of resource depleting harvesting practices

During the project design, it was decided that it was crucial for the forest processors to become more active to reduce the export of raw products. Parts of Russia have been hit with poverty and loss of jobs with the transition towards a free market economy. Companies lack business skills, equipment and market linkages.

FOREST has focused on helping companies process, make market linkages and improve business skills. However, we now are in a position to advise the companies and government on sustained harvesting practices.

II. Assessment of Sustainable Harvesting of NTFP
A. Objectives

The objective of this assignment is to work with local Russian Consultants to conduct a study on the ecology of the Chaga and other economically valuable fungi including mushrooms found in Siberia and the Russian Far East. This report should provide basic harvesting techniques, maximum frequency and populations required for the resource to renew itself on an annual basis. This report will guide forest harvesters and the government's legislation on collection of Chaga and other fungi.

Tasks

1) Review NTFP reports to assess the current key economically valuable fungi
2) Assess other plans and criteria used in other countries for the sustainable collection of fungi
3) Meet with local scientists and companies to learn conventional practices and wisdom
4) Determine which if any fungi are over harvested, threatened or endangered.
5) Write a report on the findings.

Deliverables:

- A trip Report (see attached outline),
- Report on the Assessment of Sustainable Harvesting of NTFPs which will include;
    - Criteria and practices of sustainability plans around the world
    - Criteria and practices of sustainability for the top five fungi products (including Chaga)
    - Cultivation recommendations (if applicable)
    - Recommendations for local legislation on policy regarding sustainable harvesting (including no harvesting for endangered species)

B. Timeline:

5 days – at home review literature including FOREST reports
Two weeks in the field – visit Khabarovsk, Primorski Krais
5 days to complete the report at home.
3 days of travel

Appendix B. Translated news article

Novak, O. 2004. “Incredible circulation of parasites in nature”. Pacific Star. Khabarovsk, Russia: 1, 7.

A Portrait of the Phenomenon

The Far Eastern scientists and ecologists are giving an alarm: the chaga boom in South Eastern Asia is threatening the Far Eastern forests with destruction.

Chaga, a parasite tree-fungus that grows on birch-trees, can come under threat of disappearance. Being unexpectedly entered into the list of "export goods", chaga is being sold to second-hand dealers by local people in huge quantities. You can judge about the scale of unorganized "harvesting" by the fact that within a couple of years export prices for chaga dropped by several fold. How much chaga has left in the Far Eastern forests, for how many years it will last and whether its resources can be restored - nobody knows today.

Far from all view mass destruction of chaga as a calamity though. Not long ago one American organization of ecological profile working in Khabarovsk reported to their Washington leadership about one more achievement. If we are going to believe the report, thanks to the American aid the Far Eastern chaga harvesters have received an export contract for three billion dollars.

- How much chaga are they to harvest, if the current price at the foreign market is about $15/kilo? - the ecologists are asking.

They are asking not only journalists. The Chairman of the Regional Khabarovsk Public Wild Life Fund Alexander Kulikov (who was delegated by public organizations to monitor implementation of the American FOREST Project in our krai) asked the Director of this project, Mr. Patrick Perner, same question. And received a comprehensive answer.

Your understanding of market economy is poor, - said Patrick Perner to the Khabarovsk ecologist.

Mr. Perner, we should think, has a good understanding of the market economy. He is a manager of the project named "FOREST", or in Russian translation - "Les", though. Of course, the forest activities in our country are closely connected with the economy. But the American project has more than once declared about the ecological focus of their work. The American specialists came here to teach us "efficient management of timber and non-timber forest resources to ensure their SUSTAINABILITY" - forgive me please, I am quoting a press-release of their own. However, things are not so simple in actual life…

Mr. Solzhenitsyn under Oriental Sauce

- Unique chaga properties were known in Europe and in Russia long ago. It is known, for example, that the king of Kiev Vladimir Momomakh had a lip cancer, and he was treated with chaga. This is mentioned in chronicles, - told me the Head of Non-Timber Forest Products Sector of the Far Eastern Institute of Forestry Research, Candidate of Science, Andrei Zakharenkov.

And very interesting is the fact that the traditional Chinese and Japanese medicine, which is rich in methods and recipes - does not know chaga. And the reason why is very simple. Chaga, this mysterious parasite fungus, grows only on birch-trees. And birch-trees in "commercial volumes" grow neither in China nor in Japan. May be a bit in the northernmost part of these countries. But in the ancient times when traditional medicine was born life was in full swing in the south.

However, history is a strange thing. You never know what forces are dormant in it and what will wake them up. The Decembrists, for example, were woken up by Herzen. And the "chaga boom" in Japan was woken up by… Alexander Solzhenitsyn.

The Japanese read and love Solzhenitsyn. But after his book "Cancer Corpus" was translated in the Country of the rising sun the island experienced a real tsunami. Having read in the book by the Russian classic that chaga can be used in folk medicine to treat cancer, the Japanese folks got strongly interested in the parasite fungus. So, the mass demand appeared spontaneously. We have to know the Japanese: their attitude to their health is very serious, and it is not in vain - the average life time in Japan is one of the longest in the world.

However, one more typically Japanese feature is that their industry values the consumer and responses to any mass demand adequately. So within two or three years, while the thin chaga stream was coming to Japan via private channels, the Japanese pharmaceutical companies studied its properties and organized mass production of medicinal remedies from the "birch-tree parasite". And then they brought them to the Pacific Rim market. So the purchase volumes of chaga in Europe and in Russia grew to actually "commercial".

- Such tea as this is very popular in Japan today, - Andrei Zakharenkov reached for small yellow box on the shelf.

…Most of all I was impressed by the fact that in the little paper tea bags there was only milled chaga. And nothing else. No special treatment that our Russian pharmaceutical industry could not master. Also I was impressed by the price. $80 per 60 grams of finely crushed chaga. It's a gold vein.

Alas, not for us. All the profit belongs to the foreign companies that are in fact only crushing and packing our chaga. The role left for us in this profitable business is again the role of a raw material supplier.

We are to blame ourselves, of course. As soon as there is a smell of conjuncture (favorable market situation), the masses are rushing to sell whatever they can grab, not thinking much about what it is: forest products, fish or non-ferrous metal… Now it is chaga. It's funny: people were bringing this tree-fungus to the second-hand dealers with such enthusiasm that within four years the price for this raw material on the world market decreased by several fold: from $70/kilo to $15/kilo. The harvesters themselves, it goes without saying, get the crumbles: about RUR60/kilo.

Only lazy do not offer chaga for sale now. The Internet is full of offers. Some want to sell several kilos. Some (and these are second-hand dealers, of course) are looking in the Web for a buyer of 10 - 15 tons.

However, this is not because there is lots of chaga in nature. Its resources, figuratively speaking, can be compared to hard coal resources. "There is much because it has been accumulating for long," - this is how they explain it at the Far Eastern Forest Research Institute.

What actual chaga reserves in the Far East and in Russia as a whole are - nobody knows. It's unbelievable, but chaga was virtually not studied in our country, neither in the Soviet nor in post-Soviet times. Chaga for us is a puzzle even today. Why does it appear on some damaged birch-trees and does not appear on others? How many years does it require to restore? Will we be able to harvest some of it in ten years?

Alas! The science gives no answer to all these questions.

A Missionary's Logic

For an experiment I entered the nearest pharmacy and bought some chaga syrup. Forty rubles. Our producers can and do make syrups and balsams from forest products extracts. However, domestic market is not the international market. The profit is different.

It would be great to enter the international market. With a finished product. But who will let us there? And though the Far Eastern producers are exporting something, these are little things at large. A question for dispute: will Japan (or China or any other country) buy chaga tea from a Russian enterprise, when commercial companies are standing in a waiting line begging to buy several tons of raw material 20 times cheaper?

We are speaking, of course, not only about chaga. As soon as the season begins, there appear in the Far Eastern forests second-hand dealers from somewhere, say, from Moscow. For small, but "living" money the people will bring them red bilberries, cranberries, nuts, ferns, ginseng, eleutherococus and mushrooms by buckets, back sacks and sacks. It is impossible to stop the human flow in the forest: you can harvest forest gifts "for your own needs" without any formalities or licenses.

The second-hand dealer is, of course, not so free. If he doesn't want to be caught by the hand by controlling bodies he will surely buy a license for the right to harvest wild forest plants (if we speak about the "medicinal-technical" raw material, because you do not need a license for any other types of raw materials). However, he will do it, most probably, as a blind:

It often happens with us that the documents show that 15 tons (!) of chaga were harvested from 100 ha of forestland. Though on such area it is just impossible to harvest such amount of chaga. The situation is similar with other wild plants, - the specialists say.

It's a wild thing, of course. Both great detriment to the forest and negligible taxes to the budget.

… However, you will be probably very surprise, if I say that it is more that three years already that American specialists are guarding our forests from these disgraceful things. That only for the implementation of one American project ("FOREST", "Forest Resources and Technologies") the U.S. Agency of International Development allocated

20 billion dollars. And not for no particular reason, but on a competitive basis. Several American non-governmental organizations were competing for the right to teach us effective forest management for the U.S. government money (in framework of the above mentioned FOREST Project). It was Winrock International that won.

Our newspaper told you about the FOREST Project three years ago (See "FOREST" - A Preventive (Prophylaxis) for Russian Papuans", "Pacific Star" of 04.27.2001). The heading was "inspired" by the words of ex-director of the Far Eastern Forest Research Institute, professor Dmitry Efremov:

- Since the time Winrock started implementation of the FOREST Project in the Russian Far East I feel being a Papua. This team came to teach us the ABC truths and does not want to understand what the forestry complex of Siberia and Far East actually needs.

From the very begging the Project Work Plan presented by Winrock was put to rout by Khabarovsk scientists. Including that part which was supposed to teach us how to manage "non-timber forest products" (to say it in a more simple way, just wild plants) effectively. The scientists were at once put on the alert by the plans to tie up these "products" to "export quality standards", and in their conclusions they were asking: What? Is it settled to tie up Khabarovski Krai to external markets only?

However, - what a rare occasion! - the article published in the "Pacific Star" played a certain positive role. American leaders (who, by the way, have to report to the U.S. Congress that the government money are spent effectively) made some staff transpositions in the project. Russian forestry specialists were invited to work for it. And, we should also note, project leaders tried to establish a constructive dialogue with the krai government (whereas at first they were slamming the doors: we are not going to stand any control over ourselves).

O.K. It turned out it was possible to stand. It is not control in the full meaning of this word, though. Krai government does not "control" American projects, but "monitors" them - in framework of specially created "Consultative Council". This Council includes also representatives of the Ministry of Nature and other public nature protection organizations.

The only problem is that Consultative Council meetings are held by FOREST sometimes in Sochi and sometimes in Moscow, while the busy officials most often do not have time for traveling. This is what happened with the latest "Council" meeting in Moscow, where FOREST representatives reported to their management about their latest achievements, which only the "public monitor", Chairman of the Regional Khabarovski Wild Life Fund Alexander Kulikov was able to attend.

And he returned from the capital quite discouraged. If FOREST representatives include "assistance" in making a $3,000,000 chaga export contract (bare raw material!) into the list of their achievements, where is the "effective" and "sustainable" forest management then? Chaga will soon disappear from the Far East. And three million dollars means about 200 tons.
Where is the logic?

And why did the Aboriginals Eat Mr. Cook?

… I earnestly tried to get in contact with Lydia Volkova. It is she who is responsible for "non-timber" Component in the Project. Alas! Saying that she does remember my last article, Lydia Valentinovna categorically refused to talk with me. In vain did I try to contact Project Senior Administrator Nina Danilyuk. Every time, when I called and told my surname, I learned that Nina Ivanovna is at a meeting.

However, not in vain do the scientists say that a negative answer is also an answer. And we can understand the FOREST representatives: they prefer to communicate with the journalists in the format of "glossy" press-conferences (we have been there and we know). And desire to avoid speaking in essence is quite explainable here. The 20 billion dollars won for the Project require victorious achievements. Otherwise they will be given no more money. Therefore "victorious reports" appear.

It is much more complicated with actual victories. But we have to be just: the American representatives could change the actual situation in our forests only if they had a magic stick. Because such situation does not exist by itself, it is a part of the entire economical situation.

Why do Russians rob their own forests like locusts? Is this because they are bad and disobedient? No, people need something to eat and feed their children. How can they earn money in remote villages, where production was ruined long ago? Only by using the forest and robbing the forest larders, including illegal harvesting. In the Soviet times there were "zagotkontory" (receiving offices), which took the gifts of the forest from the people. Then everything fell into pieces. Why not to go to the second-hand dealers? Or do the people have to die of hunger with a song about their motherland on their lips?

And what can the poor "white collars" do in this situation, the "collars" who think it their great mission to implant cultural "western" attitude to the larders of nature to the wild people? It's a great luck that within the three years the FOREST Project WAS able to do two or three good things. For example, it was FOREST who sponsored development of the draft "Non-Timber Forest Products Harvesting Rules" by Russian scientists, that will be soon considered by the krai Legislative Duma. They also gave out several grants. A little thing on the background of the FOREST "self-provision" - salaries, luxury offices, "Consultative Council meetings" in Sochi, etc. Still it is something. Even less comes our scientists' way from other sources.

Or let's say, we have a Far Eastern Non-Timber Forest Products Association that includes about thirty companies, big and small, involved in wild forest plants processing. FOREST sponsored several trips to international trade shows to some of the members of this association. Is it bad? It is at such shows, as known, that contacts are established and contracts are made…

The only thing is that to win the international market with one's products it is not enough to go to the show. Product promotion is a long and serious process, whereas to make a contract for supply of cheap raw material is easy.

I suspect that it was from there that the three billion contract appeared. Otherwise what does FOREST assistance has to do with this?

It's a queer thing, of course. However, I should not demonize the FOREST role here.

Hardly can we expect something serious from such projects at all. It is clear that nobody is going to solve our problems instead of us. We have to do it by ourselves.

The more so, as there is a beginning already. The first step was made by the recent opening of a Harvesting, Processing and Sales Center for traditional native trades practiced in the North of Khabarovsk Krai. And the fact that this step was made under the patronage of Khabarovski Krai government fills us with optimism.

Because forest larders are not a little private store. Therefore we are to approach them on the government level. The broken chain "harvester - accepter - producer" shall be restored. The internal market and unified price policies must be developed. The coming-and-going second-hand dealers must be left out of business. And then we will be able to investigate the international market.

We must be in time, while there is something to take in the forest yet.

Olga Novak

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Appendix D. List of deliverables

Electronic Files (Three copies on CD's)

- Final report
- PowerPoint Program, "PilzChagaApril04.ppt"
- Folder of Images used in PowerPoint Program, "Small images for Powerpoint"
- Folder of 14 cited references available in electronic format, "ElectronicReferences"
- Excel file for calculating chaga resource sustainability, "ChagaResourceCalcs.xls"
- A folder (with 4 sub-folders and 34 total files) that are examples of mushroom regulations in the US, Canada, and Scotland, "MiscMushRegsUSCanada"
- A folder "ChagaImages" with all the 92 images acquired in this project, each image provided in large format for printing, and small format for email and PowerPoint presentations. Cover photo for the report. Excel files with notes explaining the images and their source.

Printed materials and other items

- Printed copy of the final report
- Expense report and receipts
- Daily activities report
- Trip report
- Invoice for services
- Check for reimbursement of travel advance

The following items were sent or brought to Khabarovsk and left at the Forest Project Office for use by the staff.

- A file with all my personally published papers and booklets on sustainable harvesting of wild edible mushrooms and managing forests for fungi.
- Draft copies of a Report and Annotated Bibliography on Mushrooms and other NTFP literature in Russia since 1975 by Olga Krankina.

- Examples of mushroom harvesting pamphlets from the US and Canada
- A bottle of chaga extract (from mycelium) purchased from Fungi Perfecti, Olympia, WA
- Three packets of dried mushrooms with marketing labels as examples of products sold by small entrepreneurs in Oregon
- The following books (Hobbs to be mailed in May)

Arora, D. 1986. Mushrooms Demystified: A Comprehensive Guide to the Fleshy Fungi. Berkeley, CA, Ten Speed Press.

Arora, D. 1991. All That The Rain Promises and More...: A Hip Pocket Guide to Western Mushrooms. Berkeley, CA, Ten Speed Press.

Christopher Hobbs, L. A. 1986. Medicinal Mushrooms: An Exploration of Tradition, Healing, and Culture. Summertown, TN, Botanica Press.

Jones, E., R. Mclain and J. Weigand. 2002. Biological inventory and monitoring. Non Timber Forest Products in the United States. Lawrence, KS, University Press of Kansas.

Stamets, P. 2000. Growing Gourmet and Medicinal Mushrooms. Berkeley, CA, Ten Speed Press.

Stamets, P. and C. D. W. Yao 2002. MycoMedicinals: An Informational Treatise on Mushrooms. Olympia, WA, MycoMedia Productions.