REPORT

Reindeer and Fly Agaric (*Amanita muscaria*)

Between Ethnic Beliefs and Ethological Observations

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Abstract: A commonplace in the literature on traditional Siberian uses of *Amanita muscaria* is the belief that reindeer become intoxicated by eating this mushroom, a belief enriched by misunderstandings in the Western culture literature. Ethnographers have reported contradictory data concerning the attraction of reindeer for any mushrooms or specifically for fly agaric, and the attraction of reindeer for any human urine or specifically for that of humans who have ingested the fly agaric. Siberian reindeer herders consider the meat of reindeer intoxicated by fly agaric to be intoxicating for humans, and they use the attraction of reindeer for fly agaric for the purpose of its capture or domestication. The preferential or accidental relationship of reindeer with fly agaric has been neither confirmed nor denied, due to the lack of specific studies on the subject.

Keywords: ethnomycology, ethnozoology, ethology, intoxicants, Siberia

The use of the hallucinogenic mushroom *Amanita muscaria* among Siberian human populations is well known; it is an ancient practice—as archaeological documentation seems to attest (Samorini 2020)—which has been recorded in ethnographic literature since the eighteenth century (Wasson 1968), and which has been preserved to this day (Samorini 2022b).

A theme that frequently accompanies the human use of fly agaric concerns the attraction that reindeer (*Rangifer tarandus* L.) are said to feel towards this mushroom. This belief has been reported several times by

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reindeer herding populations, and has been enriched with imaginative details due to misunderstandings and uncontrolled reports passed down in Western culture. In order to define the boundaries between local beliefs and the scientific findings of ethology, the data extant in the literature regarding the relationship of reindeer with fly agaric are presented below.

The data reported by ethnographers, and which concern the beliefs of indigenous Siberian populations, can be divided into the following themes: the attraction of reindeer for mushrooms and specifically for fly agaric; the use by humans of the attraction of reindeer for fly agaric for the purpose of its capture or domestication; the meat of reindeer intoxicated by fly agaric being considered intoxicating for humans; and the attraction of reindeer for human urine and specifically for that of humans who have ingested fly agaric.

The consumption of mushrooms of any kind is a widespread behavior among reindeer, being part of their diet in the periods in which they grow on the ground. In summer and autumn, in addition to mushrooms, reindeer feed on fresh grass, birch, willow, and poplar leaves, and spend the long winter months feeding almost exclusively on lichens, the only food they can find available in this period (Brandišauskas 2017: 195).

The strong attraction of these cervids to mushrooms is both proverbial and at the same time pragmatically problematic for Siberian breeders. With the arrival of the mushroom season, the reindeer become excited and disperse, creating a major problem that breeders have to deal with every year, as described by ethnographer Yurii Simchenko:

> According to the Chukchi, but also to the Sami, Nenets, Enets, Selkups, Khanty, Komyats, Mansi, Tungus, Nganasan, Evenks, Evens, Koryaks, reindeer "go crazy" over mushrooms. As soon as they smell them, they lower their muzzles to ground level and scatter across the tundra. They lose the most important thing on which all reindeer husbandry is based, the herd instinct. This is what keeps the animals in large communities and allows the herders to manage the herd. Protection is based on crowding the animals, driven by centrifugal force. The herders have to run after the reindeers that isolate themselves and push them back into the herd. It has been observed that reindeer quickly gain weight by eating mushrooms. This is why the herders send them through places where mushrooms grow, but it is a risky action. Stray reindeer can easily fall victim to wolves. (Simchenko 1993: 22–23)

According to Simchenko, mushrooms of any kind excite reindeer, and Estonian ethnographer Ülo Siimets, who conducted fieldwork among the Chukchi in 1971, was of the same opinion:

> August arrived. The appearance of the first mushrooms excited the reindeer herd. They craned their necks and looked upwind into the distance. As soon as animals were released, leading reindeer made a dash for mushrooms. Others followed them quickly. The herd split as soldiers in a war. In a moment more than 4,200 animals were scattered all over the tundra. Every animal tried to find a mushroom. Having found one, it ran sniffing for the next one. Having got yet another one, it picked it up with the mouth and rushed for the next one. The majority of mushrooms were boletuses. (Siimets 2006: 140)

Siimets goes on to report a conversation he had with one of the reindeer herders named Ejgeli. The ethnographer asked Ejgeli why they did not gather mushrooms as food, meaning edible mushrooms. Ejgeli replied: "Can't you see what these mushrooms do to reindeer? Animals go stark mad even if they smell mushrooms. Do you want to go crazy like them? Go on, crawl on all fours and eat them until your belly is swollen. Then you will see what happens. We pick and honor only fly agaric" (ibid: 140–1). From this it is clear that the herder believes that reindeer "go crazy" with all kinds of mushrooms they encounter, that it is the searching for mushrooms that makes them restless, and not specifically the searching for and ingesting fly agaric.

Before the massive and permanent arrival of Russians and Cossacks in Eastern Siberia in the twentieth century, both the Chukchi and the neighboring peoples appear not to have had a history of collecting mushrooms for food purposes. The Chukchi considered mushrooms "reindeer food" or, more eloquently, "reindeer drugs" (Yamin-Pasternak 2007). Simchenko (1993: 22) observed that among the Chukchi only fly agaric has a name (*wa''pak*), while the other mushrooms do not, all of them falling into the generic class of "mushrooms" (*poŋpoŋ*).

Japanese ethnographer Takashi Irimoto, who conducted ethnographic studies among the Koryaks in the early 2000s, reported that in the group that he studied, herders tried to move the herd to areas of lichen—which is the winter food for these cervids—in early autumn, so that the reindeer would not eat the fly agaric. If the reindeer did eat it, they would start to circle and it was difficult for the herder to control their movements. In late winter, the reindeer became quieter, since there were no more mushrooms or flies to make them nervous (Irimoto 2004: 67). According to Irimoto, it is the fly agaric and not just

any mushroom that induces the state of excitement in the reindeer that makes the herd so nervous and difficult to control at that time.

Erich Kasten (2021: 259) also recently acknowledged the reality of the problem of reindeer eating fly agaric and *therefore* straying from the herd and having to be chased by herders, while noting the dietary usefulness of the "other mushrooms" that are eaten by the reindeer.

Amongst this contradictory information regarding the preferences of reindeer for different types of mushrooms, it must be taken into account that Siberian populations, either when they have to capture a reindeer or when they want to reward it during the phase of its domestication, use the fly agaric and not any other mushroom. The first reference to this practice was reported by the German naturalist Karl Heinrich Merck, who participated in the Russian Billings-Sarycev expedition of 1785–1795. This expedition, promoted by Tsarina Catherine II, was kept secret and had the aim of opening the way for the Russian Empire to the Aleutian Islands and the coast of Alaska. The manuscripts of the participants of this expedition, which were kept in Russian and German archives, were collected and published only in 1978. I specify this historical note because a series of ethnographic observations of the use of fly agaric were carried out in the context of this expedition, a fact that could not have been observed by R. G. Wasson during his collection of Siberian ethnomycological data a decade earlier (Wasson 1968; Samorini 2022a: 78). Merck had noted that "reindeer are very fond of fly agaric and are seduced by it" (Merck 1978: 113).

Khanty hunters from the Yugan River used to lure reindeer with fly agaric: next to the trap, they built a small snowman on which they placed two or three dried fly agarics, positioning them so that their smell would attract the animal into the trap (Saar 1990). Chukchi herders also used fly agaric as a means of domesticating pack reindeer. Using the "carrot and stick" technique, they put fly agarics greased with seal fat into the reindeer's mouth as a treat. This custom is still in vogue today. A herder named Tymnenentyn was seen giving this treat to a reindeer for several days in a row (Khakhovskaia 2019: 101). The use of fly agaric to attract reindeer was confirmed by ethologist Semion Pomishin, who emphasized that the specific attraction to this mushroom, and not to just any mushroom, is the factor that leads wild reindeer to interact with humans (Pomishin 1990: 23).

In ethnographic literature, it has been reported that Siberian populations believe that the meat of a reindeer that has eaten fly agaric remains impregnated with the active ingredients of the mushroom,

with the consequent possibility for the person who eats it to become a victim of the fungal intoxication. In this regard, Georg Steller reported that when a Koryak encountered a reindeer intoxicated by fly agaric, he would tie it up and keep it alive while waiting for the animal to recover from the effects of the mushroom, and only then would he kill it to eat it (Steller 1774: 93). The same news was reported by the German botanist Hofrath Langsdorf for the populations of the Kamchatka Peninsula, and the reason for waiting to kill the reindeer was that otherwise those who ate its meat would become intoxicated (Langsdorf 1809). Even George Adolph Erman—the German physicist who in the years 1828–1830 toured the world for his geomagnetic studies and who stopped in Siberia—reported that the meat of a reindeer that had eaten the agarics was infused with the mushroom, and that it intoxicated whoever killed and ate it while the reindeer was still under the effect of the mushroom (Erman 1848: 304–6). It seems that one did not always avoid becoming intoxicated by reindeer meat, at least according to Karl Ditmar's statement that, among the Kamchadals, "the meat of reindeer that has accidentally eaten the mushroom is said to possess the intoxicating effect in a very pleasant form" (Ditmar 1856: 31). Note that Ditmar speaks of an accident on the part of the reindeer eating fly agaric.

That the meat of a reindeer that has eaten fly agaric can be intoxicating for humans is plausible, falling within the phenomenon of the so-called secondary sources of drugs, that is, living beings that absorb the psychoactive principles of other beings—plants or animals—and that in turn become potentially psychoactive. I cite as an example the snails of the genus *Scutalus* that in a certain period of the year in the Peruvian Andes climb onto the hallucinogenic cacti of San Pedro (*Trichocereus* spp.) to feed on its pulp. The meat of the snails remains impregnated with mescaline, the active principle of the cactus, and the people who eat it become intoxicated, either accidentally as happens today, or intentionally, as probably happened among the ancient Moche who had deified this mollusk (Bourget 1990). In the England of 1865, a curious case of an accidental secondary source of drugs occurred, in the family of a doctor. The wife and mother-in-law had eaten a hare that the doctor had hunted and found themselves in hospital suffering from hallucinations. The investigations revealed that, shortly before being killed by the hunter, the hare had eaten leaves of the deadly nightshade (*Atropa belladonna* L.), and its flesh had become impregnated with the hallucinogenic tropane alkaloids (Ruspini 1865).

In addition to being "crazy" about mushrooms, reindeer are known to be strongly attracted to human urine. One of the first descriptions of this behavior was reported among the Koryaks by Waldemar Jochelson:

> When the reindeer feed exclusively on lichens, they acquire a special longing for the urine of human beings. This longing attracts them to human habitations. … Quite frequently the reindeer come running to camp from a far-off pasture to taste of snow saturated with urine, a delicacy for them. The reindeer have a keen sense of hearing and of smell, but their sight is rather poor. A man stopping to urinate in the open attracts reindeer from afar, which, following the sense of smell, will run to the urine, hardly discerning the man, and paying no attention to him. (Jochelson 1905–1908: 483)

In the same period, Waldemar Bogoras reported that the Chukchi used a pouch filled with urine to attract the reindeer, and "when thoroughly tame, reindeer will come and drink urine from the hands of their masters" (Bogoras 1904–1909: 85–6). It is still a widespread behavior today among various Siberian populations that the members of a family urinate in a block of snow, which is then broken up and fed to the reindeer (Baskin 2021: 66).

The Siberian custom of drinking the urine of an individual who has ingested fly agaric, with the aim of achieving a state of intoxication, is well known. This bizarre custom was first reported in 1730 by the Swedish officer Filip von Strahlenberg, who spent twelve years in Siberia as a prisoner of war and who lived among the Koryaks (Strahlenberg 1730: 389).

It should be noted that, based on ethnographic data, the relationship between urine and fly agaric concerns only human urine and not that of reindeer. The information that Siberian populations and the Saami of Scandinavia would drink the urine of reindeer that have eaten fly agaric with the aim of becoming intoxicated themselves, which is sometimes found in the literature, even in the academic sphere (Whelan 1994; Michelot and Melendez-Howell 2003; Huffman 2022), is not supported by any ethnographic data.

Another common assertion without attested ethnographic data concerns the preference of reindeer for human urine containing the active ingredients of fly agaric; this was due to a misunderstanding by Gordon Wasson. The Russian naval officer Andreevich Sarychev, who took part in several geographical expeditions in the late eighteenth and early nineteenth centuries, reported two reindeer found dead by the Chukchi group he was observing, who believed that the cause was that

they had been given too much human urine to drink (Sarychev 1815, III: 44). Wasson (1968: 243) suspected that the Chukchis meant that the urine in question was saturated with the active ingredients of the fly agaric, misinterpreting the sentence reported by Sarychev: "The fluid [urine] has the same effect on the reindeer as the intoxicating drink has on people who have fallen victim to the habit of drinking. The reindeer become just as drunk and just as thirsty." In this passage, Sarychev meant that when faced with human urine ("normal" human urine) reindeers behave as alcoholics do when they smell alcohol; in other words, reindeer "go crazy" at the smell of human urine. It should be noted, moreover, that Sarychev did not make the slightest mention of fly agaric throughout his book. This passage of his therefore had nothing to do with fly agaric, but after Wasson's misunderstanding it was used as evidence of the reindeer's preference for human urine "drugged" with fly agaric (Siegel 1973, 1989: 66; Rudgley 1998: 19–20). Other authors (Salzman et al. 1996) have reiterated this belief, referring to the ethnographic studies of Jochelson (1905–1908), who however makes no mention of it.

In this connection it is interesting to note what was reported at the end of the seventeenth century by the German K. Merck (as already cited): "In winter the reindeer are so eager for urine that they have to be restrained from consuming large quantities of it when the women place the pots of urine outside the iaranga early in the morning. I have seen two reindeer excessively drunk with urine in such a state of intoxication that one of them seemed dead and the second was bloated and could not stand" (Merck 1978: 113). From this it would be deduced that simple human urine, when drunk in excess, seems to produce a state of apparent intoxication in the reindeer.

The attraction of reindeer to human urine has long been explained by ethologists, as urine is a rich source of salts, in which the winter diet of reindeer is severely lacking. Merck also reported that "in summer reindeer are not given urine to drink because they have no desire for it" (Merck 1978: 113); in fact they do not need it because salts are present in the summer flora they feed on. To make up for the reindeer's lack of salt in the long winter period, salt is nowadays brought from the village to be administered directly to the reindeer (Irimoto 2004: 39, 67). The reindeer rush to the men's hands full of salt. Siberian Orochen breeders use another administration technique, rubbing salt on the trunks of corral trees. The reindeer lick these trunks avidly (Brandišauskas 2017: 197–8).

Searching for data on the interaction of the cervids with *Amanita muscaria* in other regions of the world, a reference in the literature is

found regarding the consumption of this mushroom by reindeer (caribou) in Canada, with consequent intoxicating effects. This information comes from a text by Ronald Siegel in which it is reported that adult females have been observed feeding on fly agarics. Within one or two hours, these caribou abandon the colony and run, swinging their hindquarters awkwardly and twisting their heads. This behavior would have a certain cost for the herd, since in doing so the mothers leave their young unattended, which often fall victim to wolves (Siegel 1989: 67). Again, it is unclear whether caribou specifically seek out fly agaric for its intoxicating effects. It is worth noting, however, that a list of mushrooms eaten by caribou compiled by ethologists studying caribou behavior does not include the genus *Amanita* (Launchbaugh and Urness 1992). In contrast, caribou in Denali National Park, Alaska, have been observed to avoid *Amanita* mushrooms, even though they are abundant in the grazing area, preferring to feed on *Boletus*, *Lactarius*, and *Russula* (Boertje 1984).

Fly agaric consumption has been observed among mule deer (*Odocoileus hemionus* Raf.) in the Kaibab National Forest, Arizona (Hungerford 1970), but no evidence of an intoxicating effect has been reported.

The attraction of various animal species towards sources that are intoxicating to them is a fact that is being accepted in the field of ethology (Siegel 1989), although the problem of defining what is meant by "intentional use of psychoactive drugs" in the animal world has not yet been completely resolved (Samorini 2013; Pagán 2021). The fact remains that some statements by indigenous peoples regarding the animal attraction of intoxicating sources have been confirmed by ethological observation. This is the case of gorillas (*Gorilla gorilla* Savage & Wyman) in equatorial Africa, whose use of the hallucinogenic plant *iboga* (*Tabernanthe iboga* Baill., Apocynaceae) is part of the mythologies of local populations (Samorini 2024). These primates have actually been observed by professional ethologists uprooting *iboga* to eat the root bark and obtain a clear intoxicating effect, so powerful as to exclude the mere nutritional purpose (Cousins and Huffman 2002; Huffman 2022).

In the light of ethological data, the supposed intentional search for fly agaric by Siberian reindeer for the specific purpose of intoxication might appear plausible. The Russian ethnographer Vladislav Kulemzin collected from a Khanty informant the belief that bears also eat fly agaric, to increase their performance during the mating season (Saar 1991: 163). Regarding bears, in his biography dated 1910, the Saami reindeer herder Johan Turi described the practice of capturing them

by luring them with liquor, which these quadrupeds are fond of to the point of getting drunk. Turi stated that reindeer were also captured by offering them liquor (Turi 2011: 43, 71–2).

Ultimately, the problem that emerges from the ethnographic and ethological data presented here concerns whether reindeer become intoxicated by fly agaric accidentally, that is, as a consequence of avidly devouring whatever mushrooms they encounter, or whether they have acquired a specific preference for fly agaric, and if so, whether this eventual preference is motivated by the intoxicating effects and not by other reasons, such as organoleptic preferences; in the latter case the intoxication would again be considered accidental and not sought. In the current state of ethological studies, this preference has been neither confirmed nor denied, for the simple reason that it has not been studied. The Russian ethologist Baskin seems to have understood the problem by complaining, in a recent book on the history of reindeer domestication, that no specific studies have yet been carried out on the effects of fly agaric on reindeer (Baskin 2021: 17). The only facts that can be considered certain are: reindeer are greedy for mushrooms, and when a reindeer eats fly agaric it becomes intoxicated by it.

A limitation of the present study is that almost all the ethnographic descriptions reviewed in this article come from a single region in northeastern Eurasia—Chukotka and Kamchatka—and it is difficult to clarify if this geographic overrepresentation is due to limits of the ethnographic data available from the author, or to a specific regional concentration of the particular beliefs about reindeer and fly agaric.

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