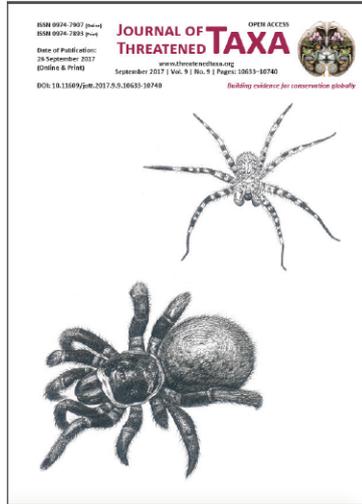


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AN ETHNOMYCOLOGICAL SURVEY OF JAUN SAR, CHAKRATA, DEHRADUN, INDIA

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Abstract: The indigenous people in Chakrata have an immense knowledge of edible and poisonous mushrooms. In the present study the use of mushroom in culinary practices was surveyed among three communities, viz., the natives: Brahmins, Kshatriyas and Scheduled Caste; and Nepali immigrants. The Brahmins & Kshatriyas showed a narrow range of consumption of mushrooms while the Nepalis showed the widest range of consumption. Medicinal and religious uses were reported by the scheduled caste. A total of 63 mushrooms were recorded from the study area. The knowledge of edible as well as medicinal uses of fungi is at risk in this region as the younger generation is not willing to learn this traditional knowledge. In the present study most of the youths were excluded at the end as they did not give much information.

Keywords: Edible mushrooms, medicinal mushrooms, *Morchella*, traditional knowledge.

Chakrata is chiefly divided into two regions namely Jaunsar and Bawar. Jaunsar and Bawar have common, cultural and traditional beliefs. The native tribe of the region is called 'Jaunsari'. The Jaunsari believe to be the descendants of the Pandavas of Mahabharat. The natives are divided into three categories: Brahmin, Kshatriya, and others (mostly Scheduled Caste). The area is also populated by a good number of Nepalis who came here initially as labourers and then became permanent residents. The others are 'Van Gujjars' who are nomadic

and live in the area only from March to September and move back to Saharanpur, Kalsi or other nearby places in the winter. Van Gujjars are usually divided into 'deras' or camp of 15–20 persons in each. There were 26 deras in the year 2014 mainly in the Jaunsar region (Source: Forest Department Kalsi, Chakrata) and the number usually increases each year. The population of Chakrata Forest Division is about 1,40,607 (2011 census) of which the scheduled caste is about 20%.

Jaunsar has not been studied before in reference to ethno-mycology. The native Jaunsari have an intimate knowledge of edible and poisonous mushrooms (called chewn); besides this they use some mushrooms/wood inhabiting fungi for medicinal purpose or for some religious rituals. There is a specific name for mushrooms (etymology) which is mainly based on the resemblance to some object (Table 1). Popular mushrooms can have two or more names because of different communities. In Jaunsar, mushroom eating is a common practice among the Brahmins & Kshatriyas but they are very selective. Their range is very narrow and largely depends on most commonly occurring edible mushrooms. A broader range of selection of mushrooms is eaten by Nepalis and the Scheduled Castes.

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METHODS

The survey was conducted along the Kalsi-Chakrata-Tiuni road in Chakrata Tehsil of Dehradun District in which places/villages were selected randomly. The places/villages that were surveyed are Kalsi, Sahiya, Korua, Chakrata Cantonment, Deovan, Gwasa, Oli, Jadi, Lohari, Lokhandi, Mangtar, Koti and Tuna. The above mentioned communities were interviewed. A total of 33 respondents at the end [Scheduled Caste: 7; Brahmin & Kshatriya: 19 (here Brahmin & Kshatriya has been treated as one community due to similar mushroom consumption habits); Nepali: 7] within the age group of 15–70 years (Table 2) were interviewed by applying artefact and inventory interviewing methods and semi-structured questionnaire (Harsh et al. 1993; Lampman 2004; Adhikari et al. 2005; Ayodele 2011). Key informants were selected purposefully and systematically based on recommendations of knowledgeable elders and local authorities. Photographs of locally collected mushrooms and mushrooms widely eaten were shown. Small kids of up to 10 years were able to recognize very commonly edible mushrooms as they accompany their mothers during collections. In our study we interviewed as many women as possible because of their knowledge of edible and poisonous mushrooms (Garibay-Orijel et al. 2012); however, only a few women could be interviewed as they were not available because of their household chores (Interviewers were able to talk to women only after taking the men of the family into confidence. Due to apprehensions and conservative behaviour, interviewers avoided direct interview with women). In comparison to them men were easily accessible but most of them did not have sufficient knowledge, especially young adults. Men collect mushroom in the forest while women collect from surrounding areas. Women are the main mushroom collectors. Community data is provided in Table 2.

RESULTS AND DISCUSSION

The fungi were collected between in 2013–2014 June to September and March (this period is marked by the fruiting of *Morchella*). Sixty-three species of 40 genera are listed in Table 1 of which 58 species are edible and five have medicinal or other properties. Only 48 species could be determined to species level. The listed mushrooms are only a fraction of the total edible mushrooms. Most of the species could not be determined because of immaturity, lack of critical field notes and lack of taxonomic expertise. Most common edible mushrooms were *Cantharellus*, *Helvella*, *Lactarius*, *Sparassis* and *Suillus*. In lower altitudes *Termitomyces*

sp. and *Termitomyces microcarpus* (Berk. & Broome) R. Heim are consumed most besides this *Agaricus* spp. ('kurer') and *Astraeus hygrometricus* (Pers.) Morgan were also much favoured. *Sparassis crispa* (Wulfen) Fr. and *Laetiporus sulphureus* (Bull.) Murrill were mentioned as most edible. The popularity of *S. crispa* (Wulfen) Fr. and *L. sulphureus* (Bull.) Murrill indicate its perceived economic and traditional significance to households. *S. crispa* (Wulfen) Fr., however, is readily available as compared to *L. sulphureus* (Bull.) Murrill. *Armillaria mellea* (Vahl) P. Kumm. and *A. tabescens* (Scop.) Emel which holds the edible status are not consumed in this region. Although natives altogether denied it as edible and most of the Nepalis too denied it one person said it was edible. *Spongipellis malicola* (Lloyd) Ginns is not edible but chewed by some Nepalis. *Morchella*, though a highly prized mushroom, is not consumed usually rather it is collected and stored for selling. Nepalis consumed all 58 mushrooms mentioned as edible followed by the Scheduled Caste (44 species) and the Brahmin & Kshatriya community consumed the least (35 species). The Nepalis came here approximately 100 years ago and it appears that Kshatriya of Nepali community taught Brahmin and Kshatriya of the Jaunsar to use mushrooms as food. Even some sects of Van Gujjars have also started eating mushrooms after working with Nepalis and the Scheduled Caste of the area but their number is very low. Nepalis, however, were not able to say about the medicinal uses of mushroom. The Brahmin & Kshatriya community only knew about a few edible mushrooms. On the other hand the Scheduled Caste shared information about the medicinal and religious uses of mushroom. The natives usually do not share the information with an outsider as they believe that the effect of that particular mushroom will vanish if they reveal it to anybody. Sometimes information is not even shared with daughters of the family as they have to settle down in another's house after their marriage. It took quite a long time to win their confidence. Some mushrooms were unanimously found edible while some mushrooms' edibility was unsure even within the same community. Persons living in lower altitudes were aware of common edible mushrooms at higher altitudes while inhabitants of higher altitudes were not very much familiar with mushrooms of lower regions except for those who had relatives on either side.

Morchella collected from villages by natives is bought by middle men (mostly from the state of Himachal Pradesh) at the price of Rs. 12,000–16,000 (178–238 USD) per kg (dried). *Morchella* is collected systematically during growing seasons. Members of the family come

Table 1. Edible status of mushrooms recorded in Chakrata region

| | Species name | Eaten by | | | Local name | Uses | | | |
|-----|---|----------|----|--------|--|------|----|---------------------------------------|---|
| | | Native | | Nepali | | C | P | M | O |
| | | B&K | SC | | | | | | |
| 1. | <i>Agaricus augustus</i> Fr. | X | X | √ | Chhtari chewn= Umbrella mushroom | * | 3 | -- | -- |
| 2. | <i>Agaricus</i> sp. 1 | √ | √ | √ | Chhtari | * | 2 | -- | -- |
| 3. | <i>Agaricus</i> sp. 2 | √ | √ | √ | Chhtari | * | 3 | -- | -- |
| 4. | <i>Agaricus placomyces</i> Peck. | X | x | √ | Kurer | * | 3 | -- | -- |
| 5. | <i>Albatrellus confluens</i> (Alb. & Schwein.) Kotl. & Pouzar | X | √ | √ | -- | * | 2 | -- | -- |
| 6. | <i>Amanita hemibapha</i> (Berk. & Broome) Sacc. | √ | √ | √ | -- | * | 2 | -- | * only poisonous <i>Amanita</i> are filled in 'beedi' |
| 7. | <i>Armillaria mellea</i> (Vahl) P. Kumm. | x | x | √ | -- | * | 3 | -- | -- |
| 8. | <i>Armillaria tabescens</i> (Scop.) Emel | x | x | √ | -- | * | 2 | -- | -- |
| 9. | <i>Astraeus hygrometricus</i> (Pers.) Morgan | √ | √ | √ | Put- puta/Roogda =some-thing that burst | * | 2 | spore mass used as burn remedy | -- |
| 10. | <i>Auricularia auricula-judae</i> (Bull.) Quél. | √ | √ | √ | Kanode/Kanchatta= Ear mushroom | * | 2 | used for ear puss | -- |
| 11. | <i>Auricularia polytricha</i> (Mont.) Sacc. | √ | √ | √ | Kanode | * | 2 | -- | -- |
| 12. | <i>Boletus edulis</i> Bull. | √ | √ | √ | -- | * | 1 | -- | -- |
| 13. | <i>Boletus</i> sp. | x | x | √ | -- | * | 2 | -- | -- |
| 14. | <i>Cantharellus cibarius</i> Fr. | √ | √ | √ | Peeli chewn= Yellow mushroom | * | 1 | -- | -- |
| 15. | <i>Cantharellus cinnabarinus</i> (Schwein.) Schwein. | √ | √ | √ | Narangi chewn/ Orange | * | 1 | -- | -- |
| 16. | <i>Clavulinopsis fusiformis</i> (Sowerby) Corner | √ | √ | √ | Kesari/Narangi chewn= Orange | * | 1 | -- | -- |
| 17. | <i>Coprinus comatus</i> (O.F. Müll.) Pers. | √ | √ | √ | Muli chewn = Radish mushroom | * | 1 | -- | -- |
| 18. | <i>Coprinus micaceus</i> (Bull.) Fr. | x | x | √ | -- | * | 3 | -- | -- |
| 19. | <i>Clitocybe gibba</i> (Pers.) P. Kumm. | x | √ | √ | -- | * | 3 | -- | -- |
| 20. | <i>Craterellus</i> sp. | √ | √ | √ | -- | * | 2 | -- | -- |
| 21. | <i>Fomes fomentarius</i> (L.) Fr. | x | x | x | -- | -- | -- | -- | as tinder, in religious rituals and exorcism |
| 22. | <i>Ganoderma lucidum</i> (Curtis) P. Karst. | x | x | x | -- | -- | -- | used for enhancing the milk secretion | in religious rituals and exorcism |
| 23. | <i>Geastrum triplex</i> | x | x | x | -- | -- | -- | spore mass used as burn remedy | -- |
| 24. | <i>Helvella crispa</i> (Scop.) Fr. | √ | √ | √ | Kanuda chewn/Jhuria= Ear like/Wrinkled | * | 1 | -- | -- |
| 25. | <i>Helvella elastica</i> Bull. | √ | √ | √ | Kanuda | * | 1 | -- | -- |
| 26. | <i>Helvella lacunosa</i> Fr. | √ | √ | √ | Kanuda | * | 1 | -- | -- |
| 27. | <i>Hericium coralloides</i> (Scop.) Pers. | √ | √ | √ | Khargosh chewn = Rabbit fir mushroom | * | 1 | -- | -- |
| 28. | <i>Hericium erinaceus</i> (Bull.) Pers. | √ | √ | √ | Khargosh chewn | * | 1 | -- | -- |
| 29. | <i>Hydnum repandum</i> L. | √ | √ | √ | Danti chewn= Teeth mushroom | * | 1 | -- | -- |
| 30. | <i>Hygrophorus</i> sp. | x | x | √ | -- | * | 2 | -- | -- |
| 31. | <i>Lactarius rufus</i> (Scop.) Fr. | √ | √ | √ | Dudhiya chewn= Milk mushroom | * | 1 | -- | -- |
| 32. | <i>Lactarius</i> sp. | √ | √ | √ | Dudhiya chewn | * | 1 | -- | -- |

| | Species name | Eaten by | | | Local name | Uses | | | |
|-----|---|----------|----|--------|--|------|----|--------------------------------|--|
| | | Native | | Nepali | | C | P | M | O |
| | | B&K | SC | | | | | | |
| 33. | <i>Lactarius deliciosus</i> (L.) Gray | √ | √ | √ | Khooni chewn/Raguri chewn = Bloody mushroom as it secretes red latex | * | 1 | -- | -- |
| 34. | <i>Lactarius paradoxus</i> Beardslee & Burl. | √ | √ | √ | Khooni chewn/Raguri chewn | * | 1 | -- | -- |
| 35. | <i>Laetiporus sulphureus</i> (Bull.) Murrill | √ | √ | √ | -- | * | 1 | -- | -- |
| 36. | <i>Lepiota procera</i> (Scop.) Gray | √ | √ | √ | Digura chewn | * | 1 | -- | -- |
| 37. | <i>Lepiota cristata</i> (Bolton) P. Kumm. | x | √ | √ | -- | * | 3 | -- | -- |
| 38. | <i>Lycoperdon perlatum</i> Pers. | √ | √ | √ | Phut phuta | * | 2 | spore mass used as burn remedy | -- |
| 39. | <i>Lycoperdon pyriforme</i> Schaeff. | x | √ | √ | Phut phuta | * | 2 | spore mass used as burn remedy | -- |
| 40. | <i>Morchella</i> spp. (Morels) | √ | √ | √ | Juma/ Guchchi | * | 1 | -- | -- |
| 41. | <i>Oedomanciella</i> sp. | x | x | √ | -- | * | 3 | -- | -- |
| 42. | <i>Phallus</i> sp. | x | x | √ | -- | * | 3 | as aphrodisiac | -- |
| 43. | <i>Pleurotus ostreatus</i> (Jacq.) P. Kumm. | x | √ | √ | Dhingri | * | 2 | -- | -- |
| 44. | <i>Pluteus cervinus</i> (Schaeff.) P. Kumm. | x | √ | √ | -- | * | 2 | -- | -- |
| 45. | <i>Ramaria stricta</i> (Pers.) Quél. | √ | √ | √ | Jhuria chewn = Bush mushroom | * | 1 | -- | -- |
| 46. | <i>Russula brevipes</i> Peck | x | √ | √ | Baghali chewn | * | 2 | -- | -- |
| 47. | <i>Russula</i> sp. | x | √ | √ | -- | * | 2 | -- | -- |
| 48. | <i>Scleroderma verrucosum</i> (Bull.) Pers. | x | x | √ | -- | * | 2 | -- | -- |
| 49. | <i>Strobilomyces strobilaceus</i> (Scop.) Berk. | x | x | √ | -- | * | 3 | -- | -- |
| 50. | <i>Suillus americanus</i> (Peck) Snell | √ | √ | √ | Chipli chatri = Slippery mushroom | * | 1 | -- | -- |
| 51. | <i>Suillus sibiricus</i> (Singer) Singer | √ | √ | √ | Chipli chatri | * | 1 | -- | -- |
| 52. | <i>Suillus</i> sp. 1 | √ | √ | √ | Chipli chatri | * | 1 | -- | -- |
| 53. | <i>Suillus</i> sp. 2 | √ | √ | √ | Chipli chatri | * | 1 | -- | -- |
| 54. | <i>Sparassis crispa</i> (Wulfen) Fr. | √ | √ | √ | Gobi chewn= Cauliflower mushroom | * | 1 | -- | -- |
| 55. | <i>Spongipellis malicola</i> (Lloyd) Ginns | X | x | √ | -- | * | 3 | -- | -- |
| 56. | <i>Spongipellis unicolor</i> (Fr.) Murrill | X | x | x | -- | -- | -- | -- | as tinder, in religious rituals and exorcism |
| 57. | <i>Stereum</i> spp. | X | x | x | -- | -- | -- | as burn remedy | -- |
| 58. | <i>Termitomyces microcapus</i> (Berk. & Broome) R. Heim | √ | √ | √ | Jhari chewn= appears like small flowers that are scattered on the ground | * | 2 | -- | -- |
| 59. | <i>Termitomyces</i> sp. | √ | √ | √ | -- | * | 1 | -- | -- |
| 60. | <i>Tremella fuciformis</i> Berk. | X | √ | √ | -- | | 3 | -- | -- |
| 61. | <i>Tremella mesenterica</i> Retz. | X | x | √ | -- | | 3 | -- | -- |
| 62. | Truffle | √ | √ | √ | Jhanda | * | 2 | as mouth freshener | -- |
| 63. | <i>Volvariella flaviceps</i> (Murrill) Shaffer | X | x | √ | -- | * | 2 | -- | -- |

B&K = Brahmins & Kshatriyas, SC = Scheduled caste, C = Culinary, M = Medicinal, O = others (religious/tinder), P = Palatability (1 = Delicious, 2 = Good, 3 = Just edible)

Table 2. Social demographic profile of surveyed area

| Village | Latitude | Longitude | Altitude (m) | Men | | | Women | | |
|---------------------|---------------|---------------|--------------|-----------|-----------|----------|----------|----------|----------|
| | | | | SC | B&K | Nepali | SC | B&K | Nepali |
| Kalsi | 30.51811389 N | 77.84555556 E | 514 | 1 | 1 | 0 | 0 | 0 | 0 |
| Sahiya | 30.61412222 N | 77.87527778 E | 1075 | 1 | 1 | 0 | 0 | 0 | 0 |
| Korua | 30.66076111 N | 77.85250000 E | 1563 | 0 | 2 | 0 | 0 | 0 | 0 |
| Chakrata cantonment | 30.68881111 N | 77.87305556 E | 2109 | 0 | 1 | 0 | 0 | 0 | 0 |
| Gwasa | 30.72464167 N | 77.87722222 E | 1875 | 0 | 1 | 0 | 0 | 0 | 0 |
| Oli | 30.72565278 N | 77.88888889 E | 1954 | 1 | 0 | 0 | 1 | 0 | 0 |
| Jadi | 30.74700278 N | 77.84833333 E | 2278 | 0 | 1 | 1 | 0 | 0 | 0 |
| Deovan | 30.76022778 N | 77.87222222 E | 2628 | 1 | 0 | 2 | 0 | 0 | 0 |
| Mohana | 30.73245556 N | 77.87444444 E | 2093 | 0 | 1 | 0 | 0 | 0 | 0 |
| Lohari | 30.75622500 N | 77.82166667 E | 2593 | 1 | 0 | 0 | 0 | 0 | 0 |
| Lokhandi | 30.75758333 N | 77.80833333 E | 2538 | 0 | 1 | 1 | 0 | 0 | 1 |
| Mangtar | 30.77952778 N | 77.83833333 E | 2041 | 0 | 5 | 0 | 0 | 2 | 0 |
| Koti | 30.78895833 N | 77.83388889 E | 1975 | 1 | 2 | 1 | 0 | 0 | 1 |
| Tuna | 30.78272222 N | 77.84027778 E | 1891 | 0 | 1 | 0 | 0 | 0 | 0 |
| Total | | | | 6 | 17 | 5 | 1 | 2 | 2 |
| Sum | | | | 28 | | | 5 | | |
| Sum total | | | | 33 | | | | | |

SC = scheduled caste; B&K = Brahmins & Kshatriyas



Image 1. a - *Laetiporus sulphureus*; b - *Termitomyces* sp.; c - Freshly collected morels; d - *Sparassis crispa*; e - *Boletus edulis*; f - *Russula brevipes*; g - *Hericium erinaceus*; h - *Pleurotus ostreatus*. © Manoj Kumar

back on leave from jobs so that they can contribute to the collection due to its higher economic return. A family collects 3–4 kg of fresh *Morchella* in a day. There is no official record of *Morchella* export. There is no market for morels or other edible mushrooms in Chakrata. The nearest city is Dehradun which is 90km and it takes 3–3.5

hours to reach there by local transport.

A mushroom locally known as 'Maida' is approximately 30cm in height and has cap expansion of approximately 20cm with a stipe of 4–5 cm diameter, is said to be blue in colour, and secretes milk when fresh. It was reported that this mushroom was used to

enhance milk secretion in young mothers. The author (MK) did not get a chance to see the mushroom in the wild or in dried condition. The above description is quite close to *Lactarius indigo* (Schwein.) Fr. but the size was too big from the usual. *Ganoderma lucidum* (Curtis) P. Karst. is also used for enhancing milk secretion in mothers. The mushroom is dried and powdered. The powder is consumed orally with hot water. *Spongipellis unicolor* (Fr.) Murrill (= *Polyporus obtusus* Berk.), *Fomes fomentarius* (L.) Fr., *G. lucidum* (Curtis) P. Karst. are used in religious rituals and used for exorcism. The fruit body is kept along with 'Devta', the God as it is considered sanctified. The sporocarps are burnt and the smoke is spread to every nook and corner of the house and on infants to protect them from evil spirits, but seldom sold in the market.

The Nepalis also consume stinkhorn (*Phallus* spp.) to enhance sexual prowess like the Chinese do (Roberts & Evans 2011), but natives avoid it as it causes an allergy in the form of a swelling of lips and cheeks. Truffles locally known as 'Jhanda' is used as a mouth freshener. Truffles are collected by both men and women who dig them out from cracks or humps in soil.

Auricularia auricula-judae (Bull.) Qué. locally known as "kanode" or "kanchatta" is used to remedy Ear Pus ('paka kan'). The mushroom is dried and ground and mixed in some liquid. The local 'Vaidya' (or healer) did not disclose the complete formula. *Stereum* spp. (*Stereum gausapatum* (Fr.) Fr., *S. hirsutum* (Willd.) Pers., *S. lobatum* (Kunze ex Fr.) Fr., *S. rugosum* Pers., *S. sanguinolentum* (Albertini & Schwein.:Fr.) paste is reportedly used for healing wounds. Puff balls (especially *A. hygrometricus* (Pers.) Morgan, *Lycoperdon pyriforme* Schaeff., *L. perlatum* Pers., *Geastrum* spp.) are used as remedy for burns. They appear to be quite effective when applied with stored rain water.

"Khatai" (*Rumex hastatus* D. Don) locally known as 'Almorapatti' or Almora leaves (also called Kilmora in Kumaun, Churki or Khatti buti in Hindi) is sour in taste and used to prevent toxicity of mushrooms by keeping leaves in hot or boiling water with mushrooms. Mushrooms are usually washed or boiled with a pinch of salt, then cooked with an adequate amount of onion and garlic to avoid toxicity. Amanitas which are quite infamous for their lethal effects are used by drug abusers for extreme relaxation and hallucination. Dried poisonous Amanita (mostly *A. muscaria* (L.) Lam.) are filled in 'beedi' (Indian cigarette) and 'chillam' (pipe) and then smoked.

Locals are well acquainted with the time and place to find the mushroom. Early morning dew, thunder and lightning are considered essential for mushrooms to

grow. The Brahmin & Kshatriya community in the area is somewhat liberal as compared to similar community of Kumaun region of Uttarakhand State where they do not consume mushrooms at all. The commonly given reason is that mushrooms have a texture and a taste of flesh which the Brahmins do not consume (Ferchak & Croucher 1996; Adhikari et al. 2005; Bertelsen 2013; Semwal et al. 2014). During their study in Kumaun region, Bisht & Harsh (1987) had already pointed out that the consumption was done by the Scheduled Caste and Nepalis only. Flesh is commonly consumed in all sects of the Kumaun region. So, similarity with flesh has nothing to do with it, but most of the time eating habits are dependent on climatic conditions and beliefs of a particular area/community.

The Brahmin & Kshatriya community in Jaunsar rely only on commonly occurring edible mushrooms (e.g., *Sparassis*, *Lactarius*, *Cantharellus*, *Suillus*, *Morchella*, *Helvella*, etc.). As discussed earlier, there is a possibility that they might have acquired this knowledge from the Nepalis. Like Kumaun and Garhwal, here also most of the mushrooms are consumed by Scheduled Caste and Nepalis. Nepalis consume the most; they have immense knowledge of edible mushroom and cooking techniques. Wild mushroom eating is related to social and economic condition and the lower income groups resort to eating most mushrooms available in the wild.

Effect of human activity in the area

The forests in the area are unmanaged. As informed by the natives, in the past few years a decline in the fruiting of mushrooms has been observed, especially that of *Morchella*. The reason could be over exploitation and habitat destruction. Opinions differ even among conservationists, on whether collecting fungi for food is a threat to the fungi (Rotheroe 1998). Some argue that because the toadstool is equivalent to a fungus fruit, picking it does no more harm than does picking blackberries (Bratton 2003). Increased human population (census 2001 and 2011) ensures increased human activity. People go in groups to collect mushrooms and return with a heavy collection. This reduces the chances of propagation. The pressure is mainly on *Cantharellus*, *Sparassis*, *Lactarius*, *Suillus* and *Morchella* which are the most liked mushrooms. *Morchella* is a bounty mushroom which is usually exported to cities if collected in good quantities. A family can earn nearly Rs. 1,00,000 (1,500 USD) to 3,00,000 (4,450 USD) in a season by selling the dried *Morchella* at the price of Rs. 12,000 (178 USD) to 16,000 (238 USD) per kg. Increasing numbers of Van Gujjar deras is a major concern. As they roam with a



Image 2. a - *Lactarius paradoxus*;
 b - *Amanita* sp.; c - *Suillus cibricus*;
 d - *Termitomyces microcarpus*;
 e - *Cantharellus cibarius*; f - *Ramaria stricta*;
 g - *Phallus induciatus*; h - *Agaricus* sp.
 © Manoj Kumar

large number of cattle (the number can reach up to 50 or more for some deras) they lop and cut a large number of *Quercus* spp. for fodder and shade. Natives too lop a large number of *Quercus* spp. (*Quercus floribunda*, *Q. leucotrichofora*, *Q. semicarpifolia*) for fuel, fodder and shade. Though felling is prohibited by law an increasing population has its own needs too. This increases the pressure on forests. Villagers have found loop holes in the law as there is no ban on felling of a dead tree. So they deliberately girdle it and when the tree is dead in 3–4 years they seek permission to cut it down. Litter too is not left to lie in the forest as fallen branches are collected for fuel and logs are immediately converted into commercial timber. Grazing is also permissible by law (Forest Rights Act 2006). Every year permission is granted by the forest department to cut a tree down to give a family of each village as 'Mafi' or pardoning from cutting a tree under Forest Recognition Act or Forest Right Act (2006). By this practice many trees are cut down in large numbers. There is no doubt that the habitat destruction has resulted in a decrease in the collection of mushrooms.

Mushroom poisoning

Deaths due to mushroom consumption are quite rare as locals are well acquainted with edible and poisonous mushrooms but chances of making a mistake cannot be denied. In 2014, five persons from Sahiya Village were reported to be dead because of mushroom poisoning. Reports of death by mushroom consumption cannot be confirmed as they do not involve scientific study. Most of them appear to be rumours. It is not clear whether deaths are due to mushrooms or local country made liquor or both as deaths due to country made liquor are quite common in India. Some of the mushrooms can be toxic when consumed with alcohol. Mushroom contains some alkaloids which when taken with alcohol can produce lethal effects (Arora 1986; Michelot 1992; Benjamin 1995; Aneja 2007). This includes 'inky cap mushrooms' *Coprinopsis atramentaria* (Bull.) Redhead, Vilgalys & Moncalvo and *Coprinus comatus* (O.F.Müll.) Pers. (Arora 1986; Powel 2013), *Lepiota aspera* (Pers.) Quel. (Haberl et al. 2011), *Clitocybe* (Ammirati et al. 1985), *Boletes* (Zeitlmayr 1976; Kiwitt & Laatsch 1994), Morels (Groves 1964; Ammirati et al. 1985),



Image 3. a - Nepali woman sewing morels; b - Beads of morels drying over the *chulha* (stove); c - Man with his collection of *Termitomyces*; d - Man with his collection of mushrooms; e - Girl placing mushrooms in open for drying; f - Famous '*Mahasu devta*' temple at Hanol.
© Manoj Kumar

Pholiota squarrosa (Oeder) Kumm. (Shaffer 1965), Oyster mushrooms (anonymous), *L. sulphureus* (Bull.) Murrill (anonymous). We tried to make people aware of avoiding alcohol when consuming mushroom. Individuals can, however, have different tolerance and resistance towards mushrooms. Most interesting was eating an *Amanita* sp. though we could not identify it to the species level. The same *Amanita* has also been reported from Garhwal Himalaya as *Amanita hemibapha* (Berk. & Broome) Sacc. (Semwal et al. 2014). Nepalis have developed some kind of resistance towards toxic mushrooms as they use a wide range of mushrooms. They have developed a preparation method. Scheduled Castes too have developed a method of preparation. The majority of mushrooms are boiled in water before consumption as it may contain insects and larvae. They use *Rumex hastatus* which is locally known as 'Almorapatti' or Almora leaves as 'khatai' or souring agent to prevent toxicity of mushrooms. Mushroom avoided by the natives are well cherished by Nepalis.

There is not yet a clear cut identification method of edible and poisonous mushrooms. Individuals can have different opinions. But no opinion is 100% applicable or reliable. This sort of information is actually transferred from generation to generation. Most agree that mushroom with white fruit body having firm fibrous stipe texture is edible. Sometimes the colour description by individuals vary, same colour can be described by other individuals differently. Some say mushrooms with bitter taste are edible and while sweet are poisonous or vice versa. Another belief of the local people is that if a mushroom is eaten by monkeys (Langur and Rhesus), deer, squirrel, rat or some other rodent, only then it is considered edible. Most of the *Russula* spp. are identified by this method. Description of a poisonous species referred to by local people matches mostly with that of *Amanita*.

Current scenario

Chakrata is in a primary stage of urbanization (Davis

1965 has given different stages of urbanization and Chakrata fits into the primary stage). Urbanization is flourishing in this region. Local people find themselves at ever shifting borders where traditional culture and modernity meet. The new generation is quite unwilling to learn traditional knowledge. The youth are hopeful of getting jobs in nearby cities. Today, Dehradun is growing in part because of expanded education centres, civil services, industrialization or other job opportunities, in fact urbanization is sweeping the entire district of Dehradun and it is increasingly attracting young Jaunsari for better chances of education and livelihood. Thus, traditional knowledge is vanishing in villages.

CONCLUSION

Chakrata has a vast diversity of macro-fungi and traditional knowledge. This needs to be tapped before it goes extinct. Unwillingness of youth to learn their traditional knowledge is a step towards extinction. The question arises, "Can education, social and financial upliftment go hand-in-hand with traditional knowledge? If we educate deprived communities certainly their economic upliftment will occur but at the same time they are cut off from their roots. Only financial gains as in the case of collecting *Morchella* and *Cordyceps* attract them to connect to their traditional roots, if that is not so the knowledge is lost. To promote this, awareness programmes should be conducted through donor funded projects. Besides this, programmes on mushroom cultivation training can also be conducted. It is an extension work which involves technology transfer, human resource development, promotion and awareness (under the Entrepreneurship Development Programme, EDP) but this is advisable only in town areas where people are alienated from mushroom. In the hills this can result in infatuation towards only limited mushrooms and loss of knowledge for other commonly edible mushrooms.

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Articles

The ecology of Harwood's Francolin *Pternistis harwoodi* (Aves: Galliformes: Phasianidae) at Merhabete District, central highlands of Ethiopia: implications for conservation
-- Abadi Mehari Abrha & Habtu Kiros Nigus, Pp. 10633–10641

Effects of the invasive Tilapia on the Common Spiny Loach (Cypriniformes: Cobitidae: *Lepidocephalichthys thermalis*) - implications for conservation
-- Sandip D. Tapkir, Sanjay S. Kharat, Pradeep Kumkar & Sachin M. Gosavi, Pp. 10642–10648

Communications

Distribution and habitat use of the endangered Dhole *Cuon alpinus* (Pallas, 1811) (Mammalia: Canidae) in Jigme Dorji National Park, western Bhutan
-- Chhimi Namgyal & Phuntsho Thinley, Pp. 10649–10655

Winter food habits of the Golden Jackal *Canis aureus* (Mammalia: Carnivora: Canidae) in Patna Bird Sanctuary, Uttar Pradesh, India
-- Khursid A. Khan, Jamal A. Khan & Narendra Mohan, Pp. 10656–10661

On the poorly-known White-spotted Skink *Lygosoma albopunctatum* (Gray, 1846) (Reptilia: Scincidae) with further topotypical records and notes on the type locality
-- S.R. Ganesh, Pp. 10662–10668

A study on the density, population structure and regeneration of Red Sanders *Pterocarpus santalinus* (Fabales: Fabaceae) in a protected natural habitat - Sri Lankamalleswara Wildlife Sanctuary, Andhra Pradesh, India
-- Chenchu Ankalaiah, Thondaladinne Mastan & Mullangi Sridhar Reddy, Pp. 10669–10674

Short Communications

First record and genetic affiliation of the Balkan Snow Vole *Dinaromys bogdanovi* (Rodentia: Cricetidae) in Albania
-- Ivan Stolarik & Daniel Jablonski, Pp. 10675–10678

Avifaunal diversity in the scrub forest of Sri Lankamalleswara Wildlife Sanctuary, Andhra Pradesh, India
-- Sumant Mali, Chelmala Srinivasulu & Asad R. Rahmani, Pp. 10679–10691

A second record of the Eastern Spadefoot Toad (Amphibia: Anura: Megophryidae: *Leptobrachium bompu* Sondhi & Ohler, 2011) with a note on its morphological variations and natural history
-- Bhaskar Saikia, Bikramjit Sinha & Ilona J. Kharkongor, Pp. 10692–10696

Spiders of Gujarat: a preliminary checklist
-- Archana Yadav, Reshma Solanki, Manju Siliwal & Dolly Kumar, Pp. 10697–10716

An ethnomycological survey of Jaunsar, Chakrata, Dehradun, India
-- Manoj Kumar, N.S.K. Harsh, Rajendra Prasad & Vijay Vardhan Pandey, Pp. 10717–10725

Notes

First record of Rufous-tailed Scrub Robin *Cercotrichas galactotes* (Aves: Passeriformes: Muscicapidae) from Jammu & Kashmir, India
-- Neeraj Sharma, Pp. 10726–10728

Sightings of the Great White Pelican *Pelecanus onocrotalus* (Linn. 1758) (Aves: Pelicaniformes: Pelicanidae) in Pallikarai Marshlands, Tamil Nadu, India
-- Kannan Thirunaranan, Samidurai Jayakumar, Sankaranathan Sivaraman & Santhanakrishnan Babu, Pp. 10729–10732

A note on three interesting Heteroptera from Kolhapur, Maharashtra, India
-- S.M. Gaikwad, Y.J. Koli & G.P. Bhawane, Pp. 10733–10737

Response & Reply

Response to article on Adventitious rooting of mature *Cycas micronesica*
-- S. Suresh Ramanan, P. 10738

Best protocols for cycad propagation require more research
-- Thomas Edward Marler & Gil Naputi Cruz, Pp. 10738–10740