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Article

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Traditional knowledge and use of wild mushrooms in Simbhanjyang, Makwanpur district, Central Nepal

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Abstract

Mushrooms are an important source of food among different ethnic communities in Nepal and are widely collected during rainy season. This paper includes documentation of wild mushrooms in the vicinities of Simbhanjyang, Makwanpur district, central Nepal. Semi-structured open ended questionnaire and Rapid Rural Appraisal were followed to get information about edibility of wild mushrooms from local harvesters. Forty-three species of mushrooms were documented. The collected species are saprophytic, parasitic, and mycorrhizal. Ethnic communities identify edible and other useful mushroom species based on traditional knowledge transferred from their ancestors orally which was in practice and tested through generations. Edible *Boletus edulis*, *Russula virescens* and medicinal *Ganoderma tsugae* are some potential non-timber forest products from the study area.

Key words – Agaricomycetes – edible mushroom – ethnomycology – macrofungi – mushroom diversity

Introduction

Wild edible mushrooms are important high valued Non-Timber Forest Products (NTFPs) collected as food resource by Nepalese ethnic groups since time immemorial (Devkota 2008) and it represents an important income source for livelihoods in rural areas (Adhikari 2000, Christensen & Larsen 2005, Devkota 2006, 2008). In different areas of Nepal and India, mushrooms are commonly regarded as “poor man’s meat” (Harsh et al. 1993, Christensen et al. 2008a) whereas in the Nepalese high mountains they are considered as an important and prestigious part of the culture (Christensen et al. 2008a). Wild edible mushrooms are widely collected from lower plains to the highlands (Devkota 2017) across different parts of Nepal during rainy season (June to September) for their food value. Mushrooms are an important major source of protein that substitutes the meat in developing countries (Pandey & Bhudathoki 2007, Giri & Rana 2008).

The studies on Nepalese fungi began in the 19th century with the works of Lloyd (1808) and Berkeley (1838), with the taxonomic studies on *Ganoderma* and *Polystictus* species, respectively. Further, the collection and survey on mycoflora of East Nepal was done by Hooker (1848-1854) and published by Berkeley (1854 a, b, c). Other major studies on diversity of wild mushrooms of Nepal were carried out by Pandey (1976), Waraitch & Thind (1977), Bhandary (1980), Hijortsam & Ryvarden (1984), Adhikari (1990, 2000), Balfour-Browne (1995), Adhikari & Manandhar (1996), Rana & Giri (2006), Adhikari & Devkota (2007), Giri & Rana (2007), Aryal et al. (2012), Jha & Tripathi (2012) and Baral et al (2015).

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The last fungal diversity update was made by Adhikari (2018) who estimated around 2,467 fungal species in Nepal. From this number 1,271 are macrofungal species belonging to Ascomycota and Basidiomycota (Adhikari 2014). Christensen et al. (2008a) recorded 228 as edible and Adhikari (2014) recorded 100 species as poisonous and 89 as medicinal. Misidentification of wild mushrooms during harvesting season is the main cause for mushroom poisoning. The similar morphological features that some species displays creates confusion among local collectors (as genus *Amanita* and *Russula* similar in appearance, poisonous *Inocybe rimosa* similar in appearance with edible *Russula* sp); which is also a cause along with the lack of traditional techniques to identify edible mushroom to increase in the mushroom poisoning casualties during harvesting season.

One of the first ethnomycological studies in Nepal was conducted by Joshi & Joshi (1999) in the Kathmandu and Pokhara Valley who recorded the uses of some mushrooms by the Tamang and Newar communities documenting as edibles, some species of *Amanita*, *Boletus*, *Cantharellus*, *Hydnum*, *Pleurotus*, *Polyporus* and *Russula*, and some species of *Lycoperdon* as medicinal. Adhikari et al. (2005) documented the edibility of some species of *Laccaria*, *Lactarius*, *Laetiporus*, *Ramaria* and *Russula*, the medical uses of species *Coriolus*, *Daldinia*, *Lycoperdon*, and *Schizophyllum* and the uses in the ignition of cigarettes with sporocarps of species of *Coriolus*, *Ganoderma* and *Trametes* by Newars, Tamangs and Chhetris from Lumle, Kaski district and different areas of Kathmandu district; Giri et al. (2005) recorded the edibility of some species of *Boletus*, *Naematoloma*, *Russula* and *Tylophus* by the Sherpa community in the Khumbu region in eastern Nepal; Devkota (2006) reported medicinal uses for *Ophiocordyceps sinensis* by Amchis and local community of Dolpa, west Nepal; Pandey et al. (2006) reported species of *Grifola*, *Laccaria*, *Lactarius*, *Laetiporus*, *Ramaria* and *Russula* as edibles, the medical use of some species of *Grifola*, *Laetiporus*, *Pleurotus*, *Pycnoporus*, *Ramaria* and *Trametes* and the ornamental uses of species of *Ganoderma* and *Schizophyllum* by Tamangs of Nepal.

The latest ethnomycological studies were carried by Christensen et al. (2008b) who documented some species of *Boletus*, *Cantharellus*, *Gomphus*, *Helvella*, *Hydnum*, *Lactarius*, *Laetiporus*, *Lentinus*, *Morchella*, *Pleurotus*, *Polyporus*, *Ramaria*, *Russula* and *Suillus* used as food by the indigenous local peoples and different ethnic communities within Annapurna Conservation Area, Nepal; Giri & Rana (2008) reported some species of *Amanita*, *Boletus*, *Chroogomphus*, *Ghompus*, *Hydnum*, *Hygrophorus*, *Leccinum*, *Paxillus* and *Ramaria* as edible mushrooms, the medicinal uses of species of *Lycoperdon* and species of *Ganoderma* in decorative purpose by Sherpa community of East Nepal and Aryal & Bhudathoki (2013) reported species of *Amanita*, *Armellaria*, *Flammulina*, *Lentinus*, *Macrolepiota*, *Russula*, *Schizophyllum* and *Scleroderma*, the use of some species of *Ganoderma*, *Termitocyes* and *Volvarella* in decorative purposes and species of *Pycnoporus* and *Scleroderma* as medicinal mushrooms from Rupandehi district, Nepal.

This study aims to explore the uses of mushrooms, its diversity and associated traditional knowledge among different ethnic groups inhabiting in Simbhanjyang, central Nepal.

Materials & Methods

Study Area

The study site is in Simbhanjyang and its adjoining areas of Thaha Rural Municipality (RM) ward 3 and 4 and Bhimphedi RM ward 9. Simbhanjyang situated in Bhimphedi RM, Makwanpur district, is located in southern Nepal as in Fig. 1, 26 km away from Kathmandu city between the coordinates 27.5933°N and 85.0818°E with an elevation of 2488 m a.s.l. The vegetation is a temperate cloud forest (Miehe et al. 2015) represented by *Quercus-Rhododendron* forest (*Quercus lanata*, *Q. lamellosa*, *Rhododendron arboreum*) and pine mixed forest (*Pinus wallichiana*, *Alnus nepalensis*) with high canopy cover and litter cover. These two factors are good for mycorrhizal, saprophytic or parasitic fungus (Baral et al. 2015). The annual precipitation of about 1154.7 mm falls mostly from May to September. Temperatures vary from -1.8°C to 11.9°C during the winter season, rising 18°C to 20.3°C during the summer season (Source: www.climate-data.org/).

Simbhanjyang, Makwanpur district is inhabited by different ethnic groups as Tamang, Brahmin, Chhetri, Newar and others as Dalits. All of them are totally depended on either agriculture or livestock rearing. Some Newars and Dalits are involved in tourism and other business sectors at small scale.

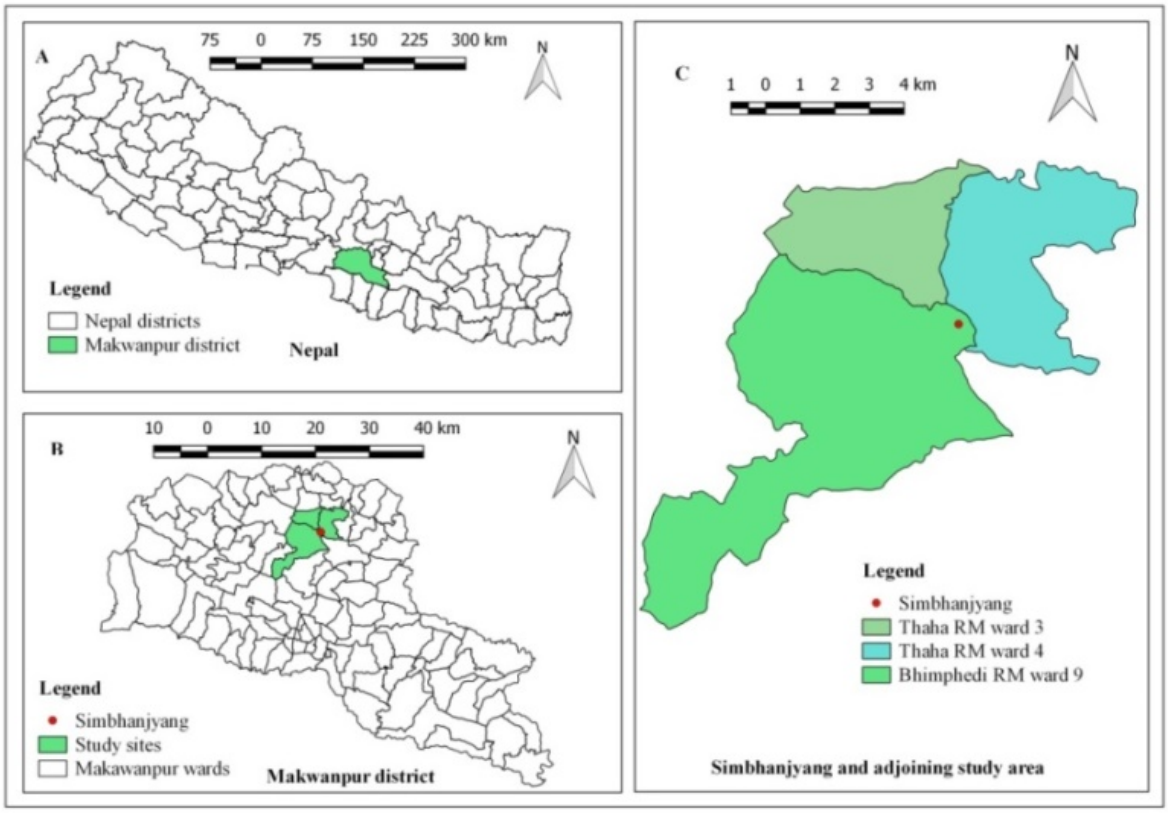

Fig. 1 – Map of study area

Sampling and morphological study

The specimens were collected in rainy season from 2017 to 2019. The mushrooms were photographed in their natural habitat and the colour, shape, elevation, ecology, and habitats of each specimen were recorded. Delicate specimens were preserved in a liquid preservative as per Hawksworth et al. (1995) (25:5:70 ml of Rectified alcohol + formalin + distilled water), hard and woody specimens were air dried. The samples were identified using previous descriptions in taxonomical works as Singer (1952), Imazeki et al. (1988), Dickinson & Lucas (1979), Arora (1996), and Adhikari (2000, 2014). All the names and authors follow Index Fungorum (www.indexfungorum.org). The specimens were deposited in pathology laboratory at Central Department of Botany, Tribhuvan University, Kathmandu, Nepal.

Ethnomycological study

Prior consent of information (PIC) and required field permission were taken orally from the elder leader of ethnic community and forest users group. Five random individual interviews, a participatory discussions and a forest walk were done in each ethnic groups (Tamang, Chhetri and Newar) about the purpose of collecting mushrooms, cooking methods of raw mushrooms and how to identify edible and poisonous mushrooms. Rapid Rural Appraisal (RRA) and semi-structured open ended questionnaires (Martin 1995) were used. Respondents represented three ethnic groups (Tamang, Chhetri and Newar) and most ages between 20 and 50 years. Species recognition by local respondents was based on fresh samples and author's photograph. All the ethics of traditional ethnic communities and ethnomycology were followed.

Results

Diversity of wild mushrooms

Forty-three species of mushroom were documented representing 22 families and 30 genera (Annex 2). *Amanita fulva*, *Boletus edulis*, *Calocybe chrysenteron*, *Helvella atra*, *Leccinum rugosiceps*, *Lycoperdon perlatum*, *Russula cyanoxantha*, *Russula nigricans*, and *Russula rosea* were some common (Fig. 2) species meanwhile *Ganoderma tsugae* and *Ramaria aurea* were rare in distribution. Among forty-three species of mushroom, based on habitat fifteen species were saprophytes, eleven were mycorrhizal and two were parasitic as well as four species were either saprophytic or parasitic and eleven species were either saprophytic or mycorrhizal.

Fig. 2 – Some representative mushrooms from the study area: A) *Amanita fulva* Fr.,, B) *Amanita longistriata* S. Imai, C) *Rugosomyces chrysenteron* (Bull.) Bon., D) *Amanita pantheriana* (DC.) Krombh., E) *Ganoderma tsugae* Murrill, F) *Hygrocybe russocoriacea* (Berk. & T. K. Mill.) P. D. Orton & Watling,, G) *Leccinum rugosiceps* (Peck) Singer, H) *Boletus edulis* Bull., I) *Lycoperdon perlatum* Pers., J) *Ramaria aurea* (Schaeff.) Quél., K) *Russula nigricans* Fr. and L) *Russula virescens* (Schaeff.) Fr.

Edible, medicinal and poisonous wild mushrooms

The results of the questionnaires and the bibliographic research showed that twenty-five species are edible, four are medicinal and four are poisonous wild mushroom. *Amanita fulva*, *Boletus edulis*, *Hydnum repandum*, *Laetiporus sulphureus*, *Marasmius oreades*, *Russula nigricans* and *Russula virescens* were recorded as edible among ethnic peoples of Simbhanjyang. *Amanita longistriata*, *Amanita pantherina*, *Helvella atra* and *Inocybe rimosa* are poisonous mushrooms. *Fomes fomentarius* and *Trametes gibbosa* are non-poisonous mushroom but inedible due to its woody texture.

Indigenous knowledge on using wild mushrooms

A total of 15 random interviews were done following the questionnaire model (Annex 1) to people from the 3 different ethnic groups within the study area. Only 9 individual collects mushroom from the wild for their own use and remaining 6 collects for selling in the local markets. The purpose of mushroom harvesting was mostly as food which they eat as curry and soup. Women and men collect mushrooms along with firewood, cattle beddings gathering, tree shoots looping and herding activities. Ethnic people were totally dependent on traditional knowledge to identify edible and poisonous mushrooms. Ethnic communities of Simbhanjyang did not collect bright coloured mushrooms. Mushroom pickers and ethnic people were well aware about the presence of poisonous mushrooms. Mostly Tamang and Newar ethnic group collect mushrooms than Chhetri whose knowledges were not so different from each other. Differences were found on the preferred edible species and mushroom picking practices. *Amanita fulva*, *Helvella elastica*, *Lycoperdon perlatum* and *L. pyriforme* young buds were consumed by Tamangs only whereas *Hydnum repandum* and *Marasmius oreades* were collected by Tamangs and Newars. *Boletus edulis, Laetiporus sulphurous, Russula nigricans* and *Russula virescens* were preferred by all three ethnic communities. Collection of mushrooms were either done in Awushii (no moon day) or Poornima (full moon day) based on their traditional beliefs among Tamangs and chhetris. There was no any document about the traditional knowledge and practices as this type of knowledge were transferred orally.

Chhetri and Newar communites boil it in water either with salt or ash from firewood before consuming most of the edible mushrooms to avoid possible poisoning risks. But Tamang people wash the raw mushrooms in clean water and avoid pre-boiling the raw mushroom before cooking as it decreases the natural taste of mushroom. According to some respondents from Tamang and Chhetri communites, the transfer of spores dust from poisonous mushroom to edible mushrooms naturally, the presence of poisonous small mushroom within the colony of edible mushroom and misidentification of edible mushrooms might be the cause for mushroom poisoning. So, they suggest proper identification and cleaning of collected raw mushroom before cooking is essential. Though people were dependent on their own knowledge to identify mushrooms, but this type of knowledge is not applicable for every mushroom species.

Discussion

Diversity of wild mushrooms

Forests of Simbhanjyang are rich in diversity of mushrooms as other forests within Nepal. We found twenty-five species as edible among forty-three species documented in Simbhanjyang, Makwanpur district whereas Christensen et al. (2008a) reported 228 edible mushrooms species and Adhikari (2012) reported 140 species within Nepal. *Boletus edulis* and *Laetiporus sulphureus* were commonly collected species in Symbhanjyang as in 14 districts within Nepal (Christensen et al. 2008a). *Helvella elastica* is not highly preferred but edible as in throughout the Himalaya (Lakhanpal 2000, Christensen et al. 2008b). *Boletus edulis*, *Hydnum repandum*, *Lactarius porninsis*, *Laetiporus sulphureus*, *Leccinum rugosiceps*, *Marasmius oreades*, *Russula nigricans*, *Russula virescens* and *Suillellus queletii* were commonly used in Simbhanjyang are species that are commonly used all over the world (Imazeki et al. 1988, Kuo 2007, Christensen et al. 2008a).

Uses of the common mushrooms and ethnomycological knowledge

Ethnic communities depending on forest for their livelihoods and community forest users group are the wild mushroom collectors and consumers. We recorded *Amanita fulva*, *Boletus edulis*, *Hydnum repandum*, *Laetiporus sulphureus*, *Lycoperdon perlatum*, *L. pyriforme*, *Russula nigricans* and *Russula virescens* as edible species as reported by Pandey et al. (2006) and Christensen et al. (2008a). We did not record any uses for *Fomes fomentarius* which was recorded for making masks by the peoples in western and eastern region of Nepal by Adhikari (2014). Immature fruiting bodies of *Lycoperdon perlatum*, *L. pyriforme* and *Ramaria aurea* are popular

edible mushrooms only by Tamangs. This latter species is used by Tamangs as in other parts of the country (Joshi & Joshi 1999) but has been reported as poisonous in Japanese literature (Imazeki et al. 1988, Adhikari 2014). Young buds of *Ganoderma tsugae* were edible. Ethnic peoples of Simbhanjyang were unaware about medicinal uses of *Ganoderma tsugae* but they found it to be a medicinal mushroom as it was collected few years ago by traders. *Laetiporus sulphureus* is consumed by all three ethnic groups as previously by Adhikari et al. (2005) but ethnic peoples of Simbhanjyang did not recognize as medicinal mushrooms as reported by Pandey et al. (2006). Ethnic inhabitants did not consume *Exobasidium butleri* which was reported edible by Adhikari et al. (2005) and Adhikari (2014) who also recorded that some people squeezed the fruiting bodies to consume the watery content. *Laetiporus sulphureus*, *Lycoperdon perlatum* and *L. pyriforme* are edible species and were recorded with medicinal properties by Joshi & Joshi (1999), Adhikari et al. (2005) and Giri & Joshi (2008). Species of *Ramaria* were used as food and medicine in other parts of Nepal (Adhikari et al. 2005) but it has no such uses among ethnic communities of Simbhanjyang.

Ethnic people in Simbhanjyang did not consume *Lactarius porninsis*, *Leccinum rugosiceps* and *Pluteus salicinus* even though these mushrooms are considered edible in different parts of the world (Wang 2000, Kuo 2007, Konuk et al. 2006). *Amanita longistriata* and *Amanita pantherina* are considered as deadly poisonous species. *Amanita fulva* is edible after cooking properly as it belongs to poisonous genus *Amanita.* Mushroom harvesting and their use have become a part of rural culture without knowing their dietary importance (Giri & Rana 2008), anticancer, antioxidative and hypercholesterolic properties (Wong & Cheung 2001). Ethnic communities of Simbhanjyang follow their ancestral beliefs and use *Allium sativum* (Lasun), *Xanthoxylum armatum* (Aankhe Timur) and *Paris polyphylla* (Satuwa) to minimize possible mushroom poisoning as reported in different earlier findings (Adhikari et al. 2005, Devkota 2008). Until now they have not any fast and strong rule to differentiate the edible and poisonous mushroom.

Conclusion

Identification of mushroom in Simbhanjyang, Makwanpur district, central Nepal is based upon their ancestral knowledge and their own experiences. Local people and indigenous communities are unaware about the presence of other edible and highly medicinal species such as *Ramaria aurea* and *Ganoderma tsugae*. Proper study, documentation, identification, sustainable harvesting awareness and cultivation of common wild species of mushrooms can support the local economy as well as conservation of wild varieties. So, proper survey based in important species of fungi and their market is important. Involvement of both the ethnic communities and mycologist with their own level of knowledge can play pivotal role for the utilization and conservation of this valuable mushrooms as resources.

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Annex 1

Questionnaires for documenting ethnomycological information

Date…… Locality……..
Name of Respondents…….
Age…….. Sex: a) Male b) Female
Occupations…….. Cast/ Ethnicity……
Education ……..

1. Do you collect the mushroom?
2. For what purpose you collect the mushroom?
3. In which season of the year collection is done?
4. Are there any rules to follow while collecting mushrooms?
5. Where do you collect the mushrooms from?
6. Which forest is good for mushroom collection?
7. Is every mushrooms are edible?
8. Which mushrooms are highly preferred for collection?
9. Which mushroom is this as shown in the photograph or sample specimen?
10. Which one is edible, poisonous and inedible?
11. Which wood is better for mushrooms to thrive well in the wild?
12. Are there any mushroom having cultural belief and importance?
13. Do you collect the mushroom to sell in the market?
14. Who collects the mushroom?
15. Is there any medicinal use of these mushrooms and for what purpose do you use it?
16. When do you collect the mushroom?
17. How do you differentiate between edible and poisonous mushroom?
18. From whom did you get this type of knowledge about mushroom?
19. How to you collect and prepare mushrooms before eating?
20. Have you ever hear about mushroom poisoning?
21. How do you treat mushroom poisoning?
22. Is there any other use of the mushrooms?
23. Which colour mushrooms are edible?
24. Is it easy to find mushroom nowadays?
25. What is the status of mushroom in the forest?

Further questions can be raised based on the answers of the participants, their interest and knowledge level.

Annex 2 Mushrooms reported from Simbhanjyang in wild.

S.N.	Collection Number	Name	Family	Common Name	Ecology and Habitat substratum	Edibility	Distribution in World
1	BKS–5	*Aleuria aurantia* (Pers.) Fuckel, 1870	Pyronemataceae	Orange peel fungus (English)	Saprobic, on moist soil	Edible	North and South America, Europe, Japan, China, India and Nepal
2	BKS–2	*Amanita fulva* Fr., 1815	Amanitaceae	Twany grisette, orange-brown ringless amanita (English), Gadha khairo chayu (Nepali) and Tahar shyamo (Tamang)	Mycorrhizal, growing on moist soil, in shady places, in Oak forest	Edible with proper care	North America, Europe, Japan and Nepal
3	BKS–9	*Amanita longistriata* S. Imai, 1938	Amanitaceae	Imai's Slender Caesar (English), Khairo bhoot chyau (Nepali)	Mycorrhizal, growing on soil, in shady place under canopy of mixed forest	Poisonous	Europe, Japan, China and Nepal
4	BKS–31	*Amanita pantherina* (DC.) Krombh., 1846	Amanitaceae	Panther cap and false blusher (English), Bhut chyau (Nepali) and Manga shymao (Tamang)	Mycorrhizal, on moist soil in shady place, Oak and Pine forest	Poisonous	North and South America, Europe, South Africa, Japan, North Asia and Nepal
5	BKS–5	*Boletus edulis* Bull., 1782	Boletaceae	Dark cap, Tanned cep, Penny bun, cep, porcino or porcini (English) and Pho shyamo (Tamang)	Mycorrhizal, growing on soil, under the canopy of mixed forest	Edible	Cosmopolitan
6	BKS–37	*Coltricia cinnamomea* (Jacq.) Murrill, 1904	Hymenochaetaceae	Coltricie, Shiny cinnamon polypore (English)	Saprobic or mycorrhizal, on soil in moist oak forest	Unknown	Worldwide
7	BKS–4	*Coprinellus disseminates* (Pers.) J. E. Lange, 1938	Psathyrellaceae	Fairy ink cap, Little helmet, Fairy bonnet, Trooping crumble cap (English); Bagale seto-kalo chyau (Nepali).	Saprobic, on soil	Unknown	Worldwide
8	BKS–32	*Crepidotus mollis* (Schaeff.) Staude, 1857	Inocybaceae	Peeling oysterling, Jelly crap, Flebby crepidotus and soft slipper (English).	Saprobic, on the dead trunk of oak tree	Unknown	North America, Europe, Japan, China and Nepal
9	BKS–43	*Exobasidium butleri* Syd. & P. Syd., 1912	Exobasidiaceae	Pani pokey chyau (Nepali)	Parasitic on *Rhododendron* leaves	Edible	India, Nepal

Annex 2 Continued.

S.N.	Collection Number	Name	Family	Common Name	Ecology and Habitat substratum	Edibility	Distribution in World
10	BKS–8	*Fomes fomentarius* (L.) Fr., 1849	Polyporaceae	Hoof fungus, Timber bracket (English); Ghodatape chyau (Nepali).	Parasitic and saprobic, on the trunk of oak tree	Inedible	Worldwide
11	BKS–3	*Ganoderma tsugae* Murrill, 1902	Ganodermataceae	Hemlock varnish shelf (English)	Saprobic and parasitic, on *Pinus roxburghii* trunk and decaying woods	Edible at young stage	Europe, North-eastern North America, Japan and Nepal
12	BKS–34	*Gomphidius maculatus* (Scop.) Fr., 1838	Gomphidiaceae		Saprobic or mycorrhizal, on moist soil, in oak forest	Edible	North America, Europe, Nepal
13	BKS–39	*Helvella atra* J. König, 1770	Helvellaceae	Dark elfin saddle (English)	Saprobic or mycorrhizal, on the mossy rocks, in canopy of mixed forest	Poisonous	North America, Europe, Japan, China, India and Nepal
14	BKS–36	*Helvella elastica* Bull., 1785	Helvellaceae	Flexible *Helvella*, elastic saddlem, brown elfin saddle, elastic brain fungus (English)	Saprobic or mycorrhizal, on moist soil among bryophytes under canopy of oak forest	Edible	North America, Europe, Japan, China, India and Nepal
15	BKS–10	*Helvella* sp	Helvellaceae		Saprobic or mycorrhizal, on moist soil among mosses	Unknown	Europe, Asia, Nepal
16	BKS–20	*Humaria hemisphaerica* (F. H. Wigg.) Fuckel, 1870	Pyronemataceae	Hairy fairy cup, Brown-haired fairy cup or Glazed cup (English)	Saprobic and mycorrhizal, on soil	Unknown	Europe, North America, Japan, India and Nepal.
17	BKS–33	*Hydnum repandum* L., 1753	Hydnaceae	Sweet tooth, wood hedgehog or hedgehog mushroom (English), Chwali Ura shyamo (Tamang)	Mycorrhizal, in Oak forest, on soil	Edible	Europe, North America, South Australia, Japan and Nepal
18	BKS–13	*Hygrocybe conica* (Schaeff.) P. Kumm., 1871	Hygrophoraceae	Witch's hat, conical wax cap or conical slimy cap (English), Chuche rato kalo chyau (Nepali)	Mycorrhizal or saprobic, on soil in moist oak forest	Unknown	Europe, North and South America, Australia New Zealand, Japan, China, India and Nepal

Annex 2 Continued.

S.N.	Collection Number	Name	Family	Common Name	Ecology and Habitat substratum	Edibility	Distribution in World
19	BKS–14	*Hygrocybe miniata* (Fr.) P. Kumm., 1871	Hygrophoraceae	Vermilion waxcap, Fading scarlet wax cap (English) and Wala shyamo (Tamang).	Saprobic, on soil in moist oak forest	Edible	Europe, North America, Japan, China, India and Nepal
20	BKS–12	*Hygrocybe punicea* (Fr.) P. Kumm., 1871	Hygrophoraceae	Crimson or Scarlet Waxy Cap (English)	Saprobic, on soil in moist oak forest	Edible	Europe, North America, Japan, China, India and Nepal
21	BKS–42	*Hygrocybe russocoriacea* (Berk. & T. K. Mill.) P. D. Orton & Watling, 1969	Hygrophoraceae	Cedarwood Waxcap (English)	Saprobic, on soil in oak forest	Unknown	Europe and Nepal
22	BKS–26	*Inocybe rimosa* (Bull.) P. Kumm., 1871	Inocybaceae	Silken haired (English)	Mycorrhizal, on moist soil under canopy of oaks	Poisonous	Europe and Nepal
23	BKS–27	*Inonotus hispidus* (Bull.) P. Karst., 1879	Hymenochaetaceae	Shaggy bracket (English)	Parasitic, on oak tree stump	Unknown	North America, Europe, Japan, India and Nepal.
24	BKS–38	*Lactarius porninsis* Rolland, 1890	Russulaceae	Larch milkcap (English)	Mycorrhizal, on moist forest under the canopy of mixed forest	Edible	Europe, Japan, China and Nepal.
25	BKS–41	*Laetiporus sulphureus* (Bull.) Murrill, 1920	Fomitopsidaceae	Chicken of the wood, Sulfur shelf (English), Rato khashru chyau, Bhalu chyau, Rato chayu (Nepali) and Phenji thanga shyamo (Tamang)	Saprobic and parasitic, on oak tree trunk	Edible	Worldwide
26	BKS–15	*Leccinum rugosiceps* (Peck) Singer, 1945	Boletaceae	Wrinkled *Leccinum* (English)	Mycorrhizal, on soil in moist dark Oak forest	Edible	Europe, North and South America, Japan and Nepal
27	BKS–30	*Lepista nuda* (Bull.) Cooke, 1871	Tricholomataceae	Wood blewit (English).	Saprobic, on moist soil	Unknown	North America, Europe, Australia and Nepal
28	BKS–16	*Lycoperdon perlatum* Pers., 1796	Agaricaceae	Warted puffball, gem-studded puffball or	Saprobic, growing among mosses on moist soil	Edible when young	North America, Europe, Tasmania, Africa, Australia,

Annex 2 Continued.

S.N.	Collection Number	Name	Family	Common Name	Ecology and Habitat substratum	Edibility	Distribution in World
				the devil's snuff-box (English), Patkey and Phusphusey Chyau (Nepali)	under canopy of oak trees		Japan, China, India, and Nepal
29	BKS–21	*Lycoperdon pyriforme* Schaeff., 1774	Agaricaceae	Pear-shaped puffball or stump puffball (Englilsh), Patkey and Phusphusey Chyau (Nepali)	Saprobic, on moist soil among mosses	Edible when young	Europe, Sino- Japan, Central and South East Asia, North America, Australia, Africa, Tasmania, New Zealand, Japan, Australia, China, India and Nepal
30	BKS–18	*Marasmius oreades* (Bolton) Fr., 1836	Marasmiaceae	Fairy ring champignon, Fairy ring mushroom, Scotch bonnet (English), Boody chyau (Nepali)	Saprobic, on soil	Edible	North temperate region including Nepal
31	BKS–24	*Mycena galericulata* (Scop.) Gray, 1821	Mycenaceae	Bonnet *Mycena*, common bonnet, the toque *Mycen*a, or the rosy-gill fairy helmet (English)	Saprobic, growing on moist soil and decaying wooden logs	Edible	North America, Europe, Japan, China, India and Nepal
32	BKS–25	*Phylloporus bellus* (Massee) Corner, 1971	Boletaceae		Mycorrhizal, on soil in moist oak forest	Unknown	Europe, Singapore, Japan, Malaysia, India, Bhutan and Nepal
33	BKS–28	*Pluteus salicinus* (Pers.) P. Kumm., 1871	Pluteaceae	Knackers Crumpet (English)	Saprobic, on soil under the canopy of mixed oak forest	Edible	Europe, India and Nepal
34	BKS–19	*Ramaria aurea* (Schaeff.) Quél., 1888	Gomphaceae	Golden Coral, Yellow Coral, Coral mushroom (English), Thakre chyau (Nepali)	Saprobic or mycorrhizal, on soil with high litter in Oak forest	Edible	Europe, North America, Japan, India and Nepal
35	BKS–7	*Rugosomyces chrysenteron* (Bull.) Bon, 1991	Lyophyllaceae	Yellow domecap (English)	Mycorrhizal, on moist soil, under canopy of Oak forest	Edible	Europe, North America and Northern Asia including Nepal

Annex 2 Continued.

S.N.	Collection Number	Name	Family	Common Name	Ecology and Habitat substratum	Edibility	Distribution in World
36	BKS–35	*Russula amoena* Quél., 1881	Russulaceae	*Russula* agreeable (English)	Saprophytic, on soil in moist shady place, in mixed forest	Unknown	North America, Europe, Japan, China and Nepal
37	BKS–11	*Russula cyanoxantha* (Schaeff.) Fr., 1863	Russulaceae	Variable *Russula*, Charcoal burner or Forked gill *Russula* (English)	Saprobic or mycorrhizal, on soil in moist shady place, in mixed forest	Edible	Growing on soil in moist shady place, in mixed forest
38	BKS–40	*Russula fragilis* Fr., 1838	Russulaceae	Fragile brittle gill, Fragile *Russula* (English)	Saprobic, on moist soil in oak forest	Inedible	North America, Europe, Japan, China, India and Nepal
39	BKS–21	*Russula nigricans* Fr., 1838	Russulaceae	Blackening brittle gill or blackening *Russula* (English), Haandi chyau(Nepali)	Mycorrhizal or saprophytic, on moist shady place	Edible	Europe, North America, Japan and Nepal
40	BKS–17	*Russula rosea* Pers., 1796	Russulaceae	Beautiful *Russula*, Rosy *Russula*, Rosy brittle gill (English), Raktey shyamo (Nepali)	Saprobic, on soil in shady place	Edible	Europe, North America, Japan, China and Nepal
41	BKS–23	*Russula virescens* (Schaeff.) Fr., 1836	Russulaceae	Green-cracking *Russula*, quilted green *Russula*, or green brittle gill (English), Maili shyamo (Tamang)	Mycorrhizal or saprobic, on soil in moist shady place in Oak forest	Edible	Europe, North America, Japan, China and Nepal
42	BKS–6	*Suillellus queletii* (Schulzer) Vizzini, Simonini & Gelardi, 2014	Boletaceae	Deceiving bolete (English)	Mycorrhizal, growing on moist soil under the canopy of mixed forest	Edible	Europe, North America, North Asia and Nepal
43	BKS–29	*Trametes gibbosa* (Pers.) Fr., 1838	Polyporaceae	Lumpy bracket, Gibbous polypore (English).	Saprobic and parasitic, on the trunk of oak tree	Unknown	North America, Europe, Japan, China, India and Nepal