

Checklist of wood-inhabiting fungi from Hyrcanian forests, northern Iran – a biodiversity hotspot

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Abstract

It is well-known that over-harvesting of timber threatens saproxylic fungal diversity. However, quantifying species loss is difficult due to the lack of spatial explicit baseline studies and related continuous temporal investigations. The first step to achieve basic information are systematic inventories in a given area. The Hyrcanian forest is among the most important forest biodiversity hotspots in Iran, which has been added to the UNESCO World Heritage List in 2019. Therefore, we collected 193 samples of wood-inhabiting fungi based on systematic surveys considering all seasons in Hyrcanian old-growth forests during five years (2016-2021). Species collected belonged to the fungal phylum *Basidiomycota* (169 species, 99 genera, 48 family and 1 *incertae sedis* family, 11 orders and 3 classes) and *Ascomycota* (24 species, 17 genera, 12 family, 6 orders and 4 classes). One collected species fall within the kingdom Protozoa, *Lycogala epidendrum*. 58 species and 16 genera were new for the Iranian fungi; 11 and seven species were new for Gilan and Mazandaran province respectively; 20 species and one genus were new for Golestan province and one genus was a new record for the Hyrcanian forests fungi. Our inventory highlights the need for documenting saproxylic fungi and to quantify the diversity in hotspot regions. This inventory might serve as a baseline for further studies to track diversity change due to forest management and climate change and to provide concepts to prevent fungal diversity from future loss.

Introduction

In forest ecosystems, deadwood is an important habitat for a wide range of species that are directly or indirectly dependent on deadwood and/or dying trees (Boddy et al. 2008, Stokland et al. 2012). Saproxylic fungi are among the most diverse organisms on deadwood (Stokland et al. 2012) and are the main wood decomposers in forest ecosystems (Dighton 2016). They are therefore crucial for carbon and nutrient cycling in forest ecosystems (Lonsdale et al.

2008, Carlsson et al. 2014). White rot fungi are particularly important due to the capability to produce a wide range of ligninolytic enzymes. These fungi are the only organisms on earth, able to degrade lignin in a rather efficient way (Paul 2007). Further, white rot fungi are valuable resources for the production of biological and natural compounds (Yeongseon et al. 2016) with a wide application potential in biotechnology including biopulping, wastewater treatment and bioremediation of polycyclic aromatic hydrocarbons, trinitrotoluene (TNT) 2,4,6- and chlorinated hydrocarbon (Hakala et al. 2004, Gao et al. 2010).

Temperate broadleaf forests are one of the most extremely exploited and endangered biomes throughout the world (Hannah et al. 1995). Removal or lack of dead wood and old trees due to intensified forest management has led to a significant reduction in amount and diversity of deadwood in most forest ecosystems of the world (Lindenmayer et al. 2012), which finally have reduced the abundance and diversity of wood-inhabiting fungi (Abrego & Salcedo 2013, Heilmann-Clausen et al. 2015). The diversity of saproxylic communities depends particularly on the amount and heterogeneity of dead wood (Dvořák et al. 2017, Parisi et al. 2018). In unmanaged forests, species richness of saproxylic fungi is higher than in managed forests (Paillet et al. 2010). Natural forests have the highest biodiversity and species richness of wood-inhabiting fungi (Purhonen et al. 2021). The global threatening of saproxylic fungi becomes also clear when focusing on the IUCN Red List. In 2022, 550 fungal species (431 and 119 species belonging to the phylum *Basidiomycota* and *Ascomycota*, respectively) are assigned the IUCN Red List and among those are 464 species related to forest ecosystems. According to this list, factors threatening the global biodiversity of fungi are manifold. However, the biological resources use is the most important threatening factor to forest-inhabiting fungi, which has endangered 190 species, 172 of which are due to logging & wood harvesting.

Agaricomycotina comprises one-third of all known fungi (Hibbett 2006) and 68% of basidiomycetes (Kirk et al. 2001), including mushrooms, jelly fungi, polypores and basidiomycetous yeasts. Ectomycorrhizae as well as wood and litter decomposer are the most important members of this subphylum,

but also pathogenic fungi of trees and humans, exist within this lineage (Hibbett 2006). The two main groups of saproxylic basidiomycetes are corticioids and polypores, which are traditionally known as aphylophoroid fungi (Swift 1982, Ghobad-Nejhad 2011). Polypores and corticioid fungi are phylogenetically convergent groups that are morphologically distinguished by the type of their basidiomata (Ghobad-Nejhad et al. 2009). Crust-like basidiomata, usually called corticioid fungi are known by effused basidiomata and a smooth, merulioid, gradinoid or hydroid hymenophore (Larsson 2007). Polypores are a group of basidiomycetes with bracket or conk-like fruiting bodies and poroid hymenophore that produce more durable basidiocarps than other fungi (Gilbertson & Ryvarden 1986).

The Hyrcanian forests form a green belt on the northern slopes of the Alborz Mountains in northern Iran, which borders the southern shores of the Caspian Sea covering 1.84 million hectares (it includes 15% of Iran's forests areas). The Hyrcanian forest in Iran and Azerbaijan is one of the last extensive remnants of the earliest temperate forests in the world and for this reason is a UNESCO World Heritage (Muller et al. 2016, UNESCO). Hyrcanian old-growth forests are important basic sources of genetic variation, biodiversity, industrial woody products, and various environmental services (Poorzady & Bakhtiari 2009). The Hyrcanian forests include 79% of the boletes and agarics species in Iran (Ghobad-Nejhad et al. 2020). Khabiri (1958) and Scharif & Ershad (1966) were the first to report wood-inhabiting fungi from Iran. In the first specialized study on wood-inhabiting fungi in Iran conducted by Soleimani (1976) 76 species were reported. Poroid basidiomycetes were previously reported from Gilan province (Saber 1987, Hallenberg 1981, Ghobad-Nejhad & Hallenberg 2012, Amoopour et al. 2016). Golestan province seem to have the highest polypore species diversity in Iran and after that Mazandaran and Gilan province, respectively (Amoopour et al. 2016). 19 saproxylic fungi were reported as new for Iran (Ghobad-Nejhad et al. 2020), in which Golestan province was the most species-rich province. A total of 40 saproxylic fungi were reported from Caspian natural beech (*Fagus orientalis* Lipsky) forests, Mazandaran province (Sefidi et al. 2015). 46 agaric species were reported from Mazandaran (Asef 2016). As a result

of a study of polyporoid basidiomycetes in Gilan province, 5 species (*Antrodiella fragrans*, *Ceriporia aurantiocarnescens*, *Oligoporus tephroleucus*, *Polyporus udus*, and *Tyromyces kmetii*) have been reported for the first time for the Iranian mycobiota and seven species has been reported new for Gilan province mycobiota (Amoopour et al. 2016). In total 29 boletes and 556 agarics species has been recorded from Iran, representing 147 genera and 34 families in which 19 species have been newly reported from Iran (Ghobad-Nejhad et al. 2020). *Russula*, *Cortinari*, and *Inocybe* were the largest genera.

Despite recent efforts to increase the knowledge about saproxylic fungi in the Hyrcanian forest, it is expected that the majority of diversity is still unexplored. In this study, we aimed to fill, at least partly, this knowledge gap and collected saproxylic fungi for determination and to provide an updated species list from this important region.

Materials and methods

Study area

The Hyrcanian forests covers around 55,000 km² of the northern slopes of the Alborz Mountains and its maximum altitude is 2800 meters above sea level. This region is dominated by temperate deciduous forests (Eslami 2011, Sagheb Talebi et al. 2014, Tohidifar et al. 2016) (Fig. 1). The Hyrcanian forests is humid with an annual temperature average of 16 °C and an annual precipitation sum average of 975 mm (Eslami & Hasani 2011). Totally 3234 species belonging to 856 genera and 148 families of conifers and flowering plants have been reported from Hyrcanian forests in Iran and Azerbaijan (Akhani et al. 2010). About one-third of the Hyrcanian forest is covered by oriental beech (*Fagus orientalis*) followed by *Quercus castaneifolia*, *Alnus subcordata*, *Carpinus betulus*, *Acer cappadocicum*, *Acer velutinum*, *Ulmus glabra*, *Prunus avium*, *Taxus baccata*, and *Tilia* spp. as prominent contributors to the forest ecosystems (Marvie Mohadjer 2005, Sagheb-Talebi et al. 2014). The Hyrcanian forests are distributed over five prov-

inces of Iran from east to west including Northern Khorasan, Golestan, Mazandaran, Gilan and Ardebil (Fig. 2). This study is established to evaluate the three northern provinces; Gilan, Golestan and Mazandaran.

Fungal species sampling

Sampling was conducted (2016-2021) from wood-inhabiting fungi fruit bodies in different months in all seasons over a period of five years in Hyrcanian old-growth forests (Gilan, Golestan and Mazandaran provinces). The dominant tree species in the study areas was beech (*Fagus orientalis*). Specimens were collected from each deadwood such as lying dead wood, snag/stump and branches with ≥ 10 cm length. We also tried to cover all wood decay stages within sampling. After being transferred to the laboratory, the samples were air dried at room temperature and then stored in polyethylene bags in a 4 °C incubator. All specimens are deposited at the Museum of Mycology, Research Institute of Forests and Rangelands, Tehran, Iran.

Morphological identification

Morphological identification of 193 collected specimens was performed by macro and micro characteristics using the determination keys provided by Núñez & Ryvarden (1995, 2001), Dai (2010) and Ryvarden & Melo (2014). Microscopy routines for all collected specimens were examined in 5 % potassium hydroxide (KOH), Cotton Blue in lactic acid (CB) and Melzer's reagent (IKI) by using of light and/or phase contrast microscopy (Largent et al. 1977). Nomenclature followed the databases (<https://www.mycobank.org>).

Molecular identification

Total DNA extraction was performed from the representative specimens as described by Izumitsu et al. (2012) and also using innuPREP Plant DNA Kit (Analytik Jena GmbH, Jena, Germany) following the manufacturer's protocol. DNA concentrations were quantified using a NanoDrop UV-Vis spectrophotometer (Peqlab Biotechnologie GmbH, Erlangen, Germany). The fungal ITS rDNA barcode region was

Table 1. Accession numbers achieved from Genebank database.

Isolate	Species	ITS Genbank Accession NO.
1	<i>Fomitopsis pinicola</i>	OR504251
2	<i>Phlebia tremellosa</i>	OR504252
3	<i>Plicaturopsis crispa</i>	OR504253
4	<i>Galerina marginata</i>	OR504254
5	<i>Trametes gibbosa</i>	OR504255
6	<i>Irpex lacteus</i>	OR504256
7	<i>Byssomerulius corium</i>	OR504257
8	<i>Trametes versicolor</i>	OR504258
9	<i>Coprinellus micaceus</i>	OR504259
10	<i>Chondrostereum purpureum</i>	OR504260
11	<i>Steccherinum bourdotii</i>	OR504261
12	<i>Lenzites betulinus</i>	OR504262
13	<i>Steccherinum ochraceum</i>	OR504263
14	<i>Polyporus tuberaster</i>	OR504264
15	<i>Femsjonia peziziformis</i>	OR504265
16	<i>Stereum ostrea</i>	OR504266
17	<i>Bjerkandera adusta</i>	OR504267
18	<i>Daedaleopsis confragosa</i>	OR504268
19	<i>Trichaptum bifforme</i>	OR504269
20	<i>Ganoderma lucidum</i>	OR504270
21	<i>Ramaria stricta</i>	OR504271
22	<i>Psathyrella candolleana</i>	OR504272
23	<i>Hypholoma sublateritium</i>	OR504273
24	<i>Schizophyllum commune</i>	OR504274
25	<i>Xylaria polymorpha</i>	OR504275
26	<i>Stereum hirsutum</i>	OR504276
27	<i>Loweomyces fractipes</i>	OR504277
28	<i>Helicogloea compressa</i>	OR504278

amplified using ITS1/ITS4 and ITS1F/ITS4 primer pairs (Gardes & Bruns 1993, White et al. 1990). The reactions were performed using the following PCR Protocol:

Initial denaturation step at 95 °C for 3 min, followed by 35 cycles of denaturation at 95 °C for 30 s, annealing at 52 °C for 30 s, and extension at 68 °C for 1 min. A final extension was performed at 68 °C for 3 min. In a total volume of 25 µl reaction mix containing 1 µl DNA template (7–15 ng), 12.5 µl Go Taq Green Master mix (Promega, Mannheim, Germany) and 1 µl of a solution containing 10 pmol of each of the primers. The PCR products were analyzed using a 1% agarose gel. The successfully amplified PCR products were purified using ReliaPrep™ DNA Clean-Up and Concentration System (Promega, Mannheim, Germany). Purified PCR products were sent to Microsynth SeqLab GmbH (Göttingen, Germany) for sequencing.

The newly obtained sequences were deposited in the GenBank database under the accession numbers (Table 1). The obtained ITS rDNA sequences were compared with those of other related species available in GenBank database using the BLAST homology search program. The relevant sequences having the high coverage were retrieved. ITS datasets were aligned using the Q-INS-i algorithm of MAFFT version 7 (<http://mafft.cbrc.jp/alignment/server/>) (Kato and Standley 2013) and the resultant alignments were edited using online version of Gblocks 0.91b (http://phylogeny.lirmm.fr/phylo.cgi/one_task.cgi?task_type=gblocks) with all three options for a less stringent selection.

Results

A total number of 193 saproxylic fungal species and one saproxylic *Protozoa* species were recorded from the Hyrcanian forests during the study. Of these 88 % were Basidiomycetes species (169 species, 99 genera, 48 family and 1 *incertae sedis* family, 11 orders and 3 classes) (Table 2), while 12% were Ascomycetes (24 species, 17 genera, 12 family, 6 orders and 4 classes) (Table 3). One collected species fall within the kingdom *Protozoa*, *Lycogala epidendrum*. 58 species and

16 genera are reported as new for Iranian funga; 11 and seven species are recorded as new for Gilan and Mazandaran province respectively; 20 species and one genus are new for Golestan province and one genus is new record for Hyrcanian forests funga. The families *Polyporaceae*, *Pluteaceae* and *Mycenaceae* contained most of the recorded species; with a proportion of 9%, 8% and 6% respectively; *Pluteus* and *Mycena* were the most species rich genus (13 and 11 species, respectively). *Trametes versicolor*, *Trametes hirsuta*, *Stereum subtomentosum*, *Stereum hirsutum*, *Eutypa spinosa* and *Schizophyllum commune* had the highest species frequency in Hyrcanian forests.

The checklist provided here includes 193 species accepted names. Species are listed in their families in alphabetical order. Newly recorded species and genera from Gilan, Golestan and Mazandaran provinces and also for whole Hyrcanian forests are indicated by *, species and genera newly reported from Iran are indicated by ** and ***, respectively.

Phylum: Ascomycota

Boliniaceae

****Camarops petersii* (Berk. & M.A. Curtis)
Nannf

COMMON NAME: The Dog's Nose Fungus

SYNONYM: *Numulariola petersii* (Berk. & M.A. Curtis) P.M.D. Martin

NOTES: The widespread genus contains 19 species (Kirk 2008). *C. petersii* is saprobic; solitary or grouped on decaying (typically decorticated) hardwood logs (oak, elm); summer and fall; widespread in eastern North America and also reported from Japan (Doi & Nunomura 1980) and northwestern Himalayas (Dargan 1976, Dargan & Thind 1984).

COLLECTION SITE: Golestan

Bulgariaceae

**Bulgaria inquinans* (Pers.: Fr.) Fr.

COMMON NAME: black bulgar, Black Jelly Drops

SYNONYM: *Peziza inquinans* Pers. 1794

Table 2. Families of recorded basidiomycetes saproxylic fungi based on the number of species per family.

Basidiomycota					
No.	Family	No. of Species	No.	Family	No. of Species
1	<i>Agaricaceae</i>	1	27	<i>Meruliaceae</i>	8
2	<i>Amylocorticiaceae</i>	1	28	<i>Mycenaceae</i>	12
3	<i>Aporpiaceae</i>	1	29	<i>Omphalotaceae</i>	3
4	<i>Auriculariaceae</i>	4	30	<i>Oxyporaceae</i>	1
5	<i>Auriscalpiaceae</i>	2	31	<i>Peniophoraceae</i>	1
6	<i>Bolbitiaceae</i>	3	32	<i>Phanerochaetaceae</i>	1
7	<i>Corticaceae</i>	1	33	<i>Phleogenaceae</i>	2
8	<i>Crepidotaceae</i>	7	34	<i>Physalacriaceae</i>	6
9	<i>Cyphellaceae</i>	1	35	<i>Pleurotaceae</i>	4
10	<i>Cystostereaceae</i>	1	36	<i>Pluteaceae</i>	15
11	<i>Dacrymycetaceae</i>	2	37	<i>Polyporaceae</i>	17
12	<i>Entolomataceae</i>	3	38	<i>Porotheleaceae</i>	2
13	<i>Fomitopsidaceae</i>	1	39	<i>Psathyrellaceae</i>	10
14	<i>Ganodermataceae</i>	4	40	<i>Rickenellaceae</i>	1
15	<i>Gomphaceae</i>	1	41	<i>Schizophyllaceae</i>	1
16	<i>Hericiaceae</i>	1	42	<i>Schizoporaceae</i>	2
17	<i>Hygrophoraceae</i>	1	43	<i>Steccherinaceae</i>	3
18	<i>Hygrophoropsidaceae</i>	1	44	<i>Stereaceae</i>	6
19	<i>Hymenochaetaceae</i>	4	45	<i>Strophariaceae</i>	6
20	<i>Incrustoporiaceae</i>	3	46	<i>Tremellaceae</i>	1
21	<i>Irpicaceae</i>	6	47	<i>Tricholomataceae</i>	3
22	<i>Ischnodermataceae</i>	1	48	<i>Tubariaceae</i>	2
23	<i>Lycoperdaceae</i>	2	49	<i>incertae sedis</i>	1
24	<i>Marasmiaceae</i>	5			
25	<i>Meripilaceae</i>	3			
				Total species No.	169

NOTE: Saprobic on decaying oak; late summer to fall; grows usually mainland Europe and in the British Isles, widely distributed in North America.

COLLECTION SITE: Golestan

DISTRIBUTION IN IRAN: Mazandaran (Borhani et al. 2014, Saber & Zangeneh 2004)

New genus record for
Golestan province funga

Catinellaceae

*****Catinella olivacea*** (Batsch) Boud

SYNONYM: *Peziza olivacea* Batsch

NOTE: fruiting body within cavities in rotting logs, apothecia are usually found only on the underside of moist, well-decayed hardwood covered by moss or soil (Spooner & Legon 1999, Greif et al. 2007).

COLLECTION SITE: Golestan

Diatrypaceae

*****Eutypa spinosa*** (Pers.) Tul. & C.Tul.

COMMON NAME: Spiral Tarcrust

SYNONYM: *Sphaeria spinosa* Pers.

NOTE: The widespread genus is estimated to contain 32 species. Anamorphic forms include the genera *Libertella* and *Cytosporina* (Kirk et al. 2008).

COLLECTION SITE: Golestan, Mazandaran

Graphostromataceae

****Biscogniauxia nummularia*** (Bull.) Kuntze
1891

SYNONYM: *Hypoxyton nummularium* Bull.

NOTE: The genus *Biscogniauxia*, has a worldwide distribution with over 50 taxa recognized (Nugent et al. 2005). *B. nummularia* is a common pathogen specific for Beech trees, and has been recorded throughout Europe and Russia; a saprotroph and a pathogen causing strip cankers following water stress and living in plant tissues without development of symptoms and (Luchi et al. 2015).

COLLECTION SITE: Gilan, Mazandaran

DISTRIBUTION IN IRAN: Mazandaran (Juybariet al. 2016)

New species record for
Golestan province funga

Helotiaceae

Bisporella citrina (Batsch) Korf & S.E.Carp.
1974 – Fig. 10. D

COMMON NAME: yellow fairy cups or lemon discs

SYNONYM: *Peziza citrina* Batsch 1789

NOTE: Saprobic on decaying logs and stumps of hardwoods and conifers; summer and fall (over winter in warmer areas); widely distributed in North America, most parts of Britain and Ireland. They have also been found growing on the fruit bodies of the polypore fungus *Daedaleopsis confragosa* (Muel-ler 2011).

COLLECTION SITE: Gilan

DISTRIBUTION IN IRAN: Gilan, Golestan, Mazandaran (Ershad 1995, Arefipour et al. 2002, Zokaei 2004)

Hypoxyloaceae

Annulohypoxyton stygium (Lév.) Y.M. Ju, J.D.
Rogers & H.M. Hsieh

SYNONYM: *Sphaeria stygia* Lév.

NOTE: The genus contains 60 species (Kirk et al. 2008), living as endophytes, saprobic or as pathogens; widespread distribution.

COLLECTION SITE: Mazandaran

DISTRIBUTION IN IRAN: Mazandaran (Juybari et al. 2019)

Daldinia concentrica (Bolton) Cesati & de
Notaris – Fig. 3. A & B

COMMON NAME: King Alfred's cake, cramp balls
and coal fungus

SYNONYM: *Sphaeria concentrica* Bolton

NOTE: Saprobic on decaying hardwood logs or standing trees especially *Fraxinus* sp. (Stadler et al.

Table 3. Families of recorded Ascomycetes saproxylic fungi based on the number of species per family.

Ascomycota					
No.	Family	No. of species	No.	Family	No. of species
1	<i>Boliniaceae</i>	1	7	<i>Hypoxylaceae</i>	8
2	<i>Bulgariaceae</i>	1	8	<i>Nectriaceae</i>	1
3	<i>Catinellaceae</i>	1	9	<i>Pezizaceae</i>	2
4	<i>Diatrypaceae</i>	1	10	<i>Pyronemataceae</i>	1
5	<i>Graphostromataceae</i>	1	11	<i>Rutstroemiaceae</i>	1
6	<i>Helotiaceae</i>	1	12	<i>Xylariaceae</i>	5
			Total species No.		24

2014); growing alone or gregariously; widely distributed in North America, but especially common east of the Rocky Mountains, Britain, Australia and in many other temperate countries.

COLLECTION SITE: Gilan

DISTRIBUTION IN IRAN: N-NW Iran (Walting & Sweeney 1974, Daneshpazhuh 1980, Arefipour et al. 2002, Asef & Tavanaei 2004, Badalyan & Borhani 2019)

****Hypoxylon fragiforme* (Pers.: Fr.) Kickx**

COMMON NAME: Beech woodwart, Red cushion hypoxylon

SYNONYM: *Sphaeria fragiformis* Pers.

NOTE: Saprobic; in clusters typically on the bark of dead beech (*Fagus*) trees; summer, fall, overwinters; worldwide distribution.

COLLECTION SITE: Golestan, Mazandaran

DISTRIBUTION IN IRAN: Gilan (Daneshpazhuh 1980, Raei et al. 2012),

New species record for
Golestan and Mazandaran funga

***Hypoxylon fuscum* (Pers.) Fr.**

COMMON NAME: Hazel Woodward

SYNONYM: *Sphaeria fusca* Pers.

NOTE: The type genus *Hypoxylon* is the largest genus in the family *Hypoxylaceae* with presently ca. 180 species. *H. fuscum* is widely distributed in North temperate areas with records from the tropics, which might, however, be other species (Ju & Rogers 1996).

COLLECTION SITE: Golestan

DISTRIBUTION IN IRAN: Golestan (Daneshpazhuh 1980, Arefipour et al. 2018)

***Hypoxylon howeanum* Peck**

SYNONYM: *Hypoxylon coccineum* sensu Plowright 1875

COLLECTION SITE: Mazandaran

DISTRIBUTION IN IRAN: Mazandaran, Gilan (Walting & Gregory 1977, Raei et al. 2012)

***Hypoxylon rubiginosum* (Pers.: Fr.) Fr.**

COMMON NAME: Rusty woodwart

SYNONYM: *Sphaeria rubiginosa* Pers.

NOTE: Saprobic; typically on decorticated wood (without bark); a mild pathogen on most hosts associated with decay of timber; widespread in northern temperate areas, Europe and North America.

COLLECTION SITE: Golestan, Mazandaran

DISTRIBUTION IN IRAN: Caspian forests (Daneshpazhuh 1995a, Raei et al. 2012, Pourmoghaddam et al. 2020).



Figure 1. Impressions from typical Hyrcanian forests ecosystems during all sampling seasons.

*****Hypoxylon subticinense*** Y.M. Ju & J.D. Rogers 1996

NOTE: It occurs on dead wood from deciduous trees.

COLLECTION SITE: Golestan

****Jackrogersella cohaerens*** (Pers.) L. Wendt Kuhnert & M. Stadler

SYNONYM: *Sphaeria cohaerens* Pers.

COLLECTION SITE: Golestan, Mazandaran

DISTRIBUTION IN IRAN: Mazandaran (Danesh-pazhuh 1980)

New species record for Golestan province funga

Nectriaceae

******Neonectria coccinea*** (Pers.) Rossman & Samuels

COMMON NAME: beech bark fungus, beech bark canker

SYNONYM: *Nectria coccinea* (Pers.) Fr., *Sphaeria coccinea* Pers.

NOTE: Opportunistic pathogen; exists as endophytes in beech tree and sporulate when the host becomes weakened; causing beech bark disease (BBD); worldwide distribution (Hirooka et al. 2013).

COLLECTION SITE: Golestan, Mazandaran

Pezizaceae

****Peziza repanda*** Pers. 1808

COMMON NAME: Palomino cup or recurved cup

SYNONYM: *Plicaria repanda* (Wahlenb.) Rehm

NOTE: saprobic; usually on the wood of hardwoods and Soil rich in decayed wood; commonly found in colder weather but sometimes appearing in summer; widely distributed in North America.

COLLECTION SITE: Gilan

DISTRIBUTION IN IRAN: Mazandaran (Watling & Sweeney 1974)

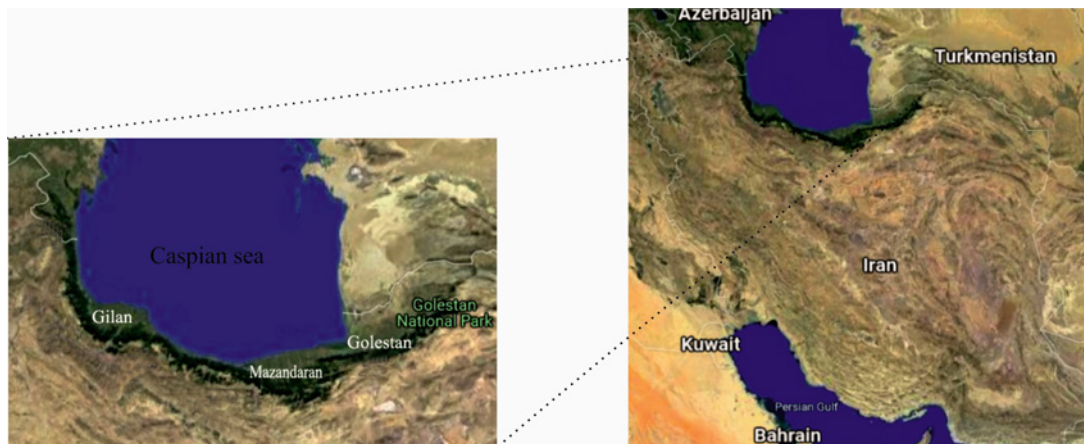


Figure 2. A total map of Iran with the position of the study area in three provinces Gilan, Golestan and Mazandaran in Hyrcanian region.

New species record for
Gilan province funga

*****Peziza varia*** (Hedw.) Alb. & Schwein. - Fig. 6. F

COMMON NAME: Layered Cup

SYNONYM: *Octospora varia* Hedw.

NOTE: Saprobic on rotting hardwoods; occasionally on wood chips or ground with decaying wood, worldwide distribution.

COLLECTION SITE: Golestan, Mazandaran

Pyronemataceae

Scutellinia scutellata (L.) Lambotte

COMMON NAME: Common Eyelash, eyelash cup, the Molly eye-winker, the scarlet elf cap, the eyelash fungus or the eyelash pixie cup

SYNONYM: *Peziza scutellata* L.

NOTE: Saprobic on wet and well-decayed wood or on damp soil; spring through fall; widely distributed.

COLLECTION SITE: Golestan

DISTRIBUTION IN IRAN: West Azerbaijan, Golestan, Mazandaran (Arefipour et al. 2002, Asef & Tavaneai 2004)

Rutstroemiaceae

******Rutstroemia* sp.** P. Karst. 1871

COLLECTION SITE: Gilan

Xylariaceae

Kretzschmaria deusta (Hoffm.) P.M.D. Martin

COMMON NAME: Brittle cinder

SYNONYM: *Sphaeria deusta* Hoffm.

NOTE: Saprobic; on the living or dead wood of hardwoods; causing white rot; often found at the bases of trees; spring through fall; common and widely distributed in Northern Hemisphere.

COLLECTION SITE: Golestan, Mazandaran

DISTRIBUTION IN IRAN: Caspian forests, Mazandaran (Daneshpazhuh 1995a, Saber 2002a)

*****Nemania diffusa*** (Sowerby) Gray

SYNONYM: *Hypoxylon vestitum* Petch, *Sphaeria diffusa* Sowerby

NOTE: Plant pathogen; causes large economic losses to the forestry industry (Tang et al. 2020)

COLLECTION SITE: Golestan



Figure 3. A-B. *Daldinia concentrica*. C-D. *Mycena haematopus*. E. *Panellus stipticus*. F. *Mycena renati*. G. *Trametes gibbosa*.

Note: Fig. 3 is related to fungi with intermediate frequency (abundance) range, Fig. 4-5 are related to common fungi and Fig. 6-10 are related to rare fungi in the study area.

Xylaria hypoxylon (L.: Fr.) Grev.

COMMON NAME: the candle snuff fungus, candlestick fungus, carbon antlers and the stag's horn fungus.

SYNONYM: *Clavaria hypoxylon* L.

NOTE: Saprobiic on the deadwood of hardwoods and also cause a root rot in hawthorn and gooseberry plants (Horst 2001); spring to fall; worldwide distribution.

COLLECTION SITE: Golestan, Mazandaran

DISTRIBUTION IN IRAN: Golestan, Mazandaran (Daneshpazhuh 1980, Arefipour et al. 2004)

****Xylaria longipes*** Nitschke 1867

COMMON NAME: Dead moll's fingers

SYNONYM: *Xylosphaera longipes* (Nitschke) Dennis 1958

NOTE: A saprotroph, growing directly from dead wood from hardwoods, including both fallen branches and stumps; causing a soft rot; recorded from Europe, Asia and North America.

COLLECTION SITE: Golestan

DISTRIBUTION IN IRAN: Mazandaran (Zare & Morid 2006, Zare & Asef 2008, Hashemi et al. 2013)

New species record for
Golestan province funga

Xylaria polymorpha (Pers.) Grev. 1824

COMMON NAME: dead man's fingers

SYNONYM: *Sphaeria polymorpha*

NOTE: Saprobiic on decaying hardwood stumps and logs, causing soft rot of the wood; usually near the base of rotting or injured tree stumps and decaying wood; appearing in spring; widely distributed in Rocky Mountains in North America

COLLECTION SITE: Gilan, Golestan, Mazandaran

DISTRIBUTION IN IRAN: Gilan, Golestan, Mazandaran (Soleimani 1976, Daneshpazhuh 1980, Arefipour et al. 2002, Sefid & Etemad 2015, Badalyan et al. 2019)

Phylum: *Basidiomycota*

Agaricaceae

Echinoderma asperum (Pers.) Bon. 1991

COMMON NAME: Freckled dapperling

SYNONYM: *Lepiota aspera* (Pers.) Quel (1886)

NOTE: Appears during autumn in deciduous woodlands; recorded widely in northern temperate zones, Europe, North Africa, North America, Japan, Australia and New Zealand

COLLECTION SITE: Golestan

DISTRIBUTION IN IRAN: Golestan (Saber & Zangeneh 2002, Arefipour et al. 2018)

Amylocorticiaceae

******Plicaturopsis crispa*** (Pers.) D.A.Reid - Fig. 8. F

COMMON NAME: Crimped gill

SYNONYM: *Cantharellus crispus* Pers.

NOTE: Saprobiic; growing on deadwoods of deciduous trees; year-round.

COLLECTION SITE: Gilan

Aporpiaceae

Elmerina caryae (Schwein.) D.A. Reid - Fig. 7. C

SYNONYM: *Polyporus caryae* Schwein.

COLLECTION SITE: Golestan

DISTRIBUTION IN IRAN: reported as *Protomerulius caryae* (Schwein.) Ryvarden from Golestan (Ghobad-Nejhad et al. 2009)

Auriculariaceae

NOTE: The genus *Auricularia* contains 21 species (He et al. 2019); species are saprobiic and grow upon deadwoods or parasite on living wood; usually causing a white rot; worldwide distribution in temperate, tropical and sub-tropical zones like Europe, Asia, Australia, Africa and North America.

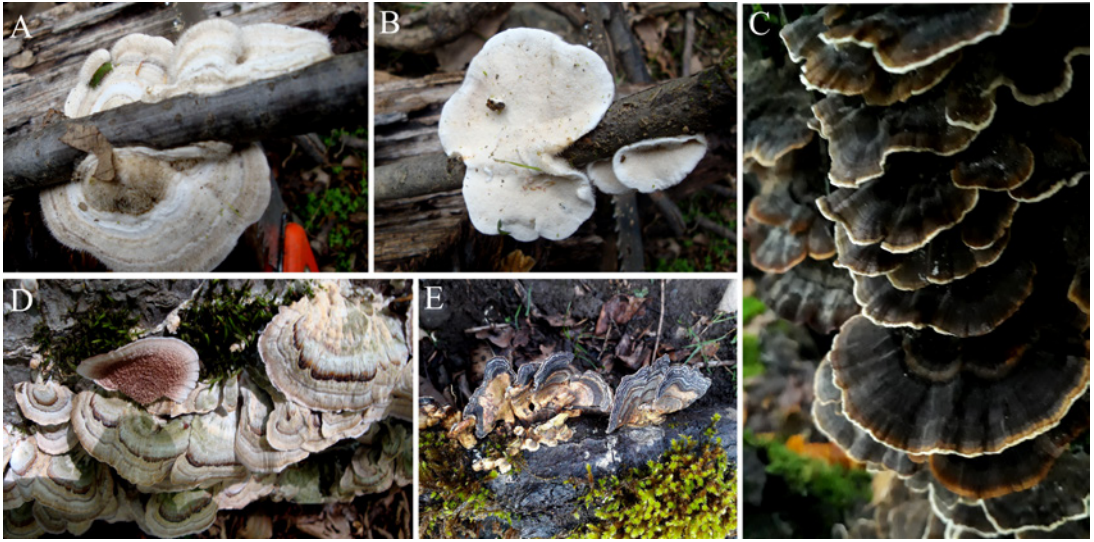


Figure 4. A-B. *Trametes hirsuta*. C and E. *Trametes versicolor*. D. *Trichaptum bifforme*.

Auricularia auricula-judae (Bull.) J.Schrot

COMMON NAME: Jew's ear or (black) wood ear (alternatively, black fungus, jelly ear)

SYNONYM: *Tremella auricula-judae* Bull.

COLLECTION SITE: Gilan

DISTRIBUTION IN IRAN: Gilan, Golestan, Kohgiluyeh and Boyer-Ahmad, Mazandaran (Arefipour et al. 2002, Soleimani 1976, Hallenberg 1981, Ghoabad-Nejhad & Hallenberg 2012, Sefidi & Etemad 2015)

Auricularia mesenterica (Dicks.) Pers.

COMMON NAME: Tripe Fungus, the Grey Brain Fungus

SYNONYM: *Helvella mesenterica* Dicks.

COLLECTION SITE: Gilan, Mazandaran

DISTRIBUTION IN IRAN: East Azerbaijan, Gilan, Golestan, Mazandaran (Hallenberg 1979, 1981, Ershad 1995, Saber 2000a, Arefipour et al. 2002, Ghoabad-Nejhad & Hallenberg 2012)

NOTE: The genus *Exidia* has a worldwide distribution and include 20 saprotrophic species (Kirk et al. 2008); species are Saprobic; wood-rotting fungi; typically growing on dead attached branches of broadleaf trees; widespread throughout the northern hemisphere.

****Exidia glandulosa*** (Bull.) Fr. 1822

COMMON NAME: Black witches' butter, Black jelly roll, Warty jelly fungus

SYNONYM: *Tremella glandulosa* Bull.

COLLECTION SITE: Gilan

DISTRIBUTION IN IRAN: Golestan, Mazandaran, East Azerbaijan (Soleimani 1976, Hallenberg 1979, 1981, Arefipour et al. 2002, Fazlali et al. 2008, Ghoabad-Nejhad & Hallenberg 2012)

New species record for Gilan province funga

*****Exidia nigricans*** (With.) P. Roberts- Fig. 7. B

COMMON NAME: Warlock's Butter

SYNONYM: *Tremella nigricans* With.

NOTE: Saprobic; wood-rotting fungi; typically growing on dead attached branches of broadleaf trees; widespread throughout the northern hemisphere.

COLLECTION SITE: Mazandaran

Auriscalpiaceae

Artomyces pyxidatus (Pers.) Jülich (1982)

COMMON NAME: Crown coral or crown-tipped coral fungus

SYNONYM: *Clavaria pyxidata* Pers. 1794

NOTE: Saprobic; growing on the dead wood of hardwoods, recorded in spring, summer, and fall; widely distributed in eastern North America, the Rocky Mountains, and Mexico

COLLECTION SITE: Golestan

DISTRIBUTION IN IRAN: Gilan, Golestan, Mazandaran (Ghobad-Nejhad & Hallenberg 2012, Badalyan et al. 2019, Arefipour et al. 2018)

Lentinellus ursinus (Fr.) Kühner, 1926 - Fig. 7. D

COMMON NAME: Bear Lentinus

SYNONYM: *Agaricus ursinus* Fr. 1821

NOTE: The genus *Lentinellus* include 24 species (Petersen & Hughes 2004). *L. ursinus* is a Saprobic, growing in shelf-like clusters on hardwoods; summer and fall; widely distributed in North America.

COLLECTION SITE: Golestan, Mazandaran

DISTRIBUTION IN IRAN: Golestan, Mazandaran (Saber 1997, Sefidi & Etemad 2015, Arefipour et al. 2018)

Bolbitiaceae

Bolbitius reticulatus (Pers.: Fr.) Rick.

COMMON NAME: Netted Fieldcap

SYNONYM: *Agaricus reticulatus* Pers.

NOTE: The genus contains 70 species (He et al. 2019), which are saprobic; wood-decaying fungi; living on deadwoods of hardwoods; summer and fall; widely distributed.

COLLECTION SITE: Golestan, Mazandaran

DISTRIBUTION IN IRAN: Golestan, Mazandaran (Saber 1993a)

****Conocybe subpubescens** P.D. Orton 1960

COMMON NAME: Downy Conecap

SYNONYM: *Conocybe pubescens* (Gillet) Kühner sensu Kühner 1935.

NOTE: growing in woods, and in damp places.

Watling and Bigelow (1983) reported on dung-soil mixtures, on soil, dead grass leaves and accumulations of leaves of deciduous trees and shrubs in moist areas; reported from Europe and Asia.

COLLECTION SITE: Mazandaran

****Conocybe brunnea** J.E. Lange & Kühner ex Watling

SYNONYM: *Pholiotina brunnea* (J.E. Lange & Kühner ex Watling) Singer

NOTE: The genus *Conocybe* contains 221 species (He et al. 2019), *C. brunnea* is a saprotrophic fungus with worldwide distribution.

COLLECTION SITE: Mazandaran

Corticaceae

Dendrothele acerina (Pers.) P.A. Lemke

SYNONYM: *Corticium acerinum* Pers.

NOTE: The genus *Dendrothele* grow on the bark of living trees; *D. acerina* is a saprotrophic lignocellulose degrader (Gao & Chamuris 1993); 75 species are listed as members of this genus in the Index Fungorum (<http://www.indexfungorum.org/names/Names.asp>, May. 2021), which are widely distributed in temperate to tropical regions.

COLLECTION SITE: Golestan

DISTRIBUTION IN IRAN: Golestan, N-NW Iran (Hallenberg 1981, Ghobad-Nejhad et al. 2009, Ghobad-Nejhad & Hallenberg, 2012, Arefipour et al. 2018)

Crepidotaceae

NOTE: The genus *Crepidotus* sp. contains 200 species (He et al. 2019); Saprobic; growing on dead hardwood stumps and logs; summer to fall; widely distributed in North America and Europe.

Crepidotus applanatus (Pers.) P.Kumm.

SYNONYM: *Agaricus applanatus* Pers.

COLLECTION SITE: Golestan, Mazandaran

DISTRIBUTION IN IRAN: Gilan, Golestan, Mazandaran (Saber 1990, Asef & Etemad 2016)

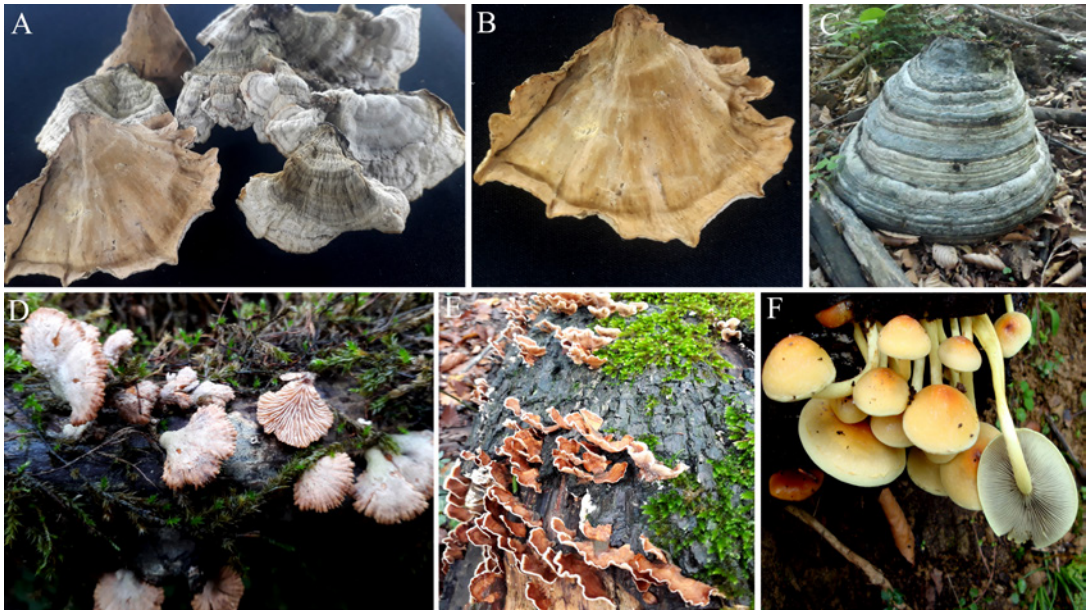


Figure 5. A-B. *Stereum subtomentosum*. C. *Fomes fomentarius*. D. *Schizophyllum commune*. E. *Stereum hirsutum*. F. *Hypholoma fasciculare*.

***Crepidotus crocophyllus* Berk. – Fig. 7. E**

COMMON NAME: Saffron Oysterling

SYNONYM: *Agaricus crocophyllus* Berk.

COLLECTION SITE: Golestan

DISTRIBUTION IN IRAN: Golestan, Mazandaran
(Saber 1997, Asef & Etemad 2016)

*****Crepidotus ehrendorferi* Hauskn. & Krisai**

COLLECTION SITE: Golestan

*****Crepidotus malachus* Sacc**

SYNONYM: *Agaricus malachus* Berk. & M.A.Curtis

COLLECTION SITE: Mazandaran

***Crepidotus mollis* (Schaeff.) Staude**

COMMON NAME: peeling oysterling, soft slipper,
and jelly crep

SYNONYM: *Agaricus mollis* Schaeff.

COLLECTION SITE: Gilan, Golestan

DISTRIBUTION IN IRAN: Gilan, Golestan,
Mazandaran (Saber 1990, Arefipour et al. 2002)

Description of genus *Simocybe* sp.: The genus *Simocybe* contains 26 saprobic species (He et al. 2019); growing on dead woods; widely distributed throughout the world.

****Simocybe centunculus* (Fr.: Fr.) P.Karst.**

COMMON NAME: Dingy twiglet, American Simocybe, Coesyn Blodiog

SYNONYM: *Agaricus centunculus* Fr. 1821

COLLECTION SITE: Golestan, Mazandaran

DISTRIBUTION IN IRAN: East Azerbaijan (Ghobad-Nejhad et al. 2020)

New genus record for
Hyrcanian forests funga

*****Simocybe sumptuosa* (P.D. Orton) Singer**

COMMON NAME: velvet twiglet

SYNONYM: *Naucoria sumptuosa* P.D. Orton

COLLECTION SITE: Mazandaran



Figure 6. A. *Rhizomarasmius pyrrocephalus*. B. *Stereum ostrea*. C. *Ramaria stricta*. D. *Lycoperdon perlatum*. E. *Naematelia aurantia*. F. *Peziza varia*.

Cyphellaceae

Chondrostereum purpureum (Pers.) Pouzar 1959

COMMON NAME: Silver leaf

SYNONYM: *Stereum purpureum* Pers.

NOTE: A facultative saprobic on old stumps and dead-woods with pathogenicity on most species of family *Rosaceae* and also on deciduous trees; its widespread depend on its host's distribution-common in orchards and tree plantations in temperate climates.

COLLECTION SITE: Gilan, Golestan

DISTRIBUTION IN IRAN: Gilan, Golestan, Mazandaran, Tehran, NW-Iran (Soleimani 1976, Hallenberg 1978, 1981, Ghobad-Nejhad 2009, Ghobad-Nejhad & Hallenberg 2012)

Cystostereaceae

Crustomyces subabruptus (Bourdot & Galzin) Jülich

SYNONYM: *Odontia subabrupta* Bourdot & Galzin

NOTE: Saprobic; wood-decay fungus; grows on both deciduous and coniferous wood, occurring in dry

and warm localities; widespread in Europe.

COLLECTION SITE: Golestan, Mazandaran

DISTRIBUTION IN IRAN: Gilan, Golestan, Mazandaran (Ghobad-Nejhad & Hallenberg 2012)

Dacrymycetaceae

Calocera viscosa (Pers.) Fr. 1827

COMMON NAME: Yellow staghorn

SYNONYM: *Clavaria viscosa* Pers.

NOTE: Saprobic, grows on decaying conifer wood, typically stumps and roots; August through November; fruit body common throughout the year, but most seen in autumn. It is widespread and common.

COLLECTION SITE: Gilan

DISTRIBUTION IN IRAN: Northern Iran (Ghobad-Nejhad & Hallenberg 2012, Sefidi & Etemad 2015)

******Ditiola peziziformis*** (Lév.) D.A.Reid

SYNONYM: *Exidia peziziformis*

NOTE: Saprobic; growing on the wood of hardwoods; found year-round; widely distributed in Europe and North America.

COLLECTION SITE: Gilan

Entolomataceae

***Clitopilus hobsonii* (Berk.) P.D. Orton

COMMON NAME: Miller's Oysterling

SYNONYM: *Agaricus hobsonii* Berk.

NOTE: Saprobic; growing on various plant substrates, including deadwood, bark and grasses, summer to fall; found throughout Europe; North America, Central America, and South America.

COLLECTION SITE: Golestan, Mazandaran

***Entoloma tjallingiorum* Noordel.

COMMON NAME: Hairy Pinkgill

NOTE: The genus contains 1800 species (He et al. 2019); Saprobic; growing on the well-rotted, mossy deadwood of oaks; fall; worldwide.

COLLECTION SITE: Golestan

****Rhodophana nitellina* (Fr.) Papetti

SYNONYM: *Agaricus nitellinus* Fr., *Rhodocybe nitellina* (Fr.) Singer

NOTE: The genus contains 7 species (He et al. 2019); *R. nitellina* is saprotrophic; grows on humus and soil under conifers in montane regions in the spring to winter; worldwide distribution.

COLLECTION SITE: Mazandaran

Fomitopsidaceae

Fomitopsis pinicola (Sw.) P.Karst. 1881

COMMON NAME: Red-belted conk

SYNONYM: *Boletus pinicola* Sw. 1810

NOTE: Saprobic on the dead wood of conifers and sometimes hardwoods, large stem wounds, broken tops; sometimes parasitic on living trees; causing a brown rot; fruiting body perennial; widely distributed in North America.

COLLECTION SITE: Gilan, Golestan

DISTRIBUTION IN IRAN: NW Iran, Gilan, Golestan, Mazandaran (Saber 1972, Hallenberg 1979, 1981, Sefidi & Etemad 2015, Ghobad-Nejhad 2009, Ghobad-Nejhad & Hallenberg 2012, Amoopour 2016)

Ganodermataceae

NOTE: members of genus *Ganoderma* sp. are polyporoid fungi that includes about 180 species (He et al. 2019); parasitic and saprobic on the wood of hardwoods or conifers; causing a white rot; mostly used in traditional Asian medicines; distributed over a widely eco-geographical range and have been reported on more than 150 host species.

Ganoderma adpersum (Schulzer) Donk

COMMON NAME: Shelf fungus

SYNONYM: *Ganoderma europaeum* Steyaert, *Polyporus adpersus* Schulzer

COLLECTION SITE: Golestan, Mazandaran

DISTRIBUTION IN IRAN: NW-Iran, Gilan, Golestan, Mazandaran, Tehran (Saber 1972, 1974, Soleimani 1976, Ghobad-Nejhad 2009, Ghobad-Nejhad & Hallenberg 2012, Sefidi & Etemad 2015, Badalyan et al. 2019)

Ganoderma applanatum (Pers.) Pat. –

Fig. 9. C & D

COMMON NAME: Artist's bracket, Artist's conk, Bear bread

SYNONYM: *Boletus applanatus*

COLLECTION SITE: Gilan, Golestan, Mazandaran

DISTRIBUTION IN IRAN: Gilan, Golestan, Khuzestan, Mazandaran, NW Iran, Khuzestan (Hallenberg 1981, Saber 1972, Walting & Sweeney 1974, Soleimani 1976, Saber & Minassian 2000, Arefipour et al. 2002, Fazlali et al. 2006, Ghobad-Nejhad et al. 2009, Ghobad-Nejhad & Hallenberg 2012, Amoopour et al. 2016, Bari et al. 2021).

Ganoderma australe (Fr.) Pat.

COMMON NAME: Southern Bracket

SYNONYM: *Polyporus australis* Fr.

COLLECTION SITE: Golestan

DISTRIBUTION IN IRAN: NW-Iran, Gilan, Golestan, Mazandaran, Tehran (Saber 1972, Soleimani 1976, Hallenberg 1979, 1981, Saber & Minassian 2000, Saber & Esmaeili Taheri 2004, Ghobad-Nejhad 2009, Ghobad-Nejhad & Hallenberg 2012, Amoopour et al. 2016).

Ganoderma lucidum sensu lato Karst 1881 – Fig. 8. E

COMMON NAME: Reishi mushroom

SYNONYM: *Boletus lucidus* (Curtis), *Polyporus lucidus* (Murrill)

COLLECTION SITE: Gilan, Golestan

DISTRIBUTION IN IRAN: Gilan, Golestan, Mazandaran, NW of Iran (Soleimani 1976, Hallenberg 1979, 1981, Saber 1987, Ghobad-Nejhad 2009, Ghobad-Nejhad & Hallenberg 2012, Amoopour 2016, Bari et al. 2021).

Gomphaceae

****Ramaria stricta*** (Pers.) Quél. 1888 – Fig. 6. C

COMMON NAME: Strict-branch coral, Upright Coral
SYNONYM: *Clavaria stricta* Pers. (1795), *Lachnocladium odoratum* G.F.Atk. (1908)

NOTE: Saprobic, growing on dead and buried wood, stumps, trunks, and branches of both leafy and conifers and hardwoods; appearing early summer through fall; widely distributed in North America, Rocky Mountains, Europe and Pacific Coast.

COLLECTION SITE: Gilan, Golestan, Mazandaran

DISTRIBUTION IN IRAN: Mazandaran (Ghobad-Nejhad & Hallenberg 2012, Sefidi & Etemad 2015)

New species record for Gilan and Golestan province funga

Hericiaceae

* ***Hericium coralloides*** (Scop.) Pers. 1794

COMMON NAME: Coral tooth fungus

SYNONYM: *Hydnum coralloides* Scop. 1772

NOTE: Saprobic; growing on dead deciduous wood and fallen hardwood branches and stumps; appearing August through October; reported from North America, Belarus and New Zealand.

COLLECTION SITE: Golestan

DISTRIBUTION IN IRAN: Caspian forests (Soleimani 1976), Gilan, Mazandaran (Ghobad-Nejhad & Hallenberg 2012).

New species record for Golestan province funga

Hygrophoraceae

*****Arrhenia epichysium*** (Pers.) Redhead, Lutzoni, Moncalvo & Vilgalys

SYNONYM: *Agaricus epichysium* Pers. 1794

NOTE: Saprobic on the dead wood of hardwoods and conifers; spring through fall; sometimes mutual with moss; widely spread in North America, Asia and Europe.

COLLECTION SITE: Golestan, Mazandaran

Hygrophoropsidaceae

***Hygrophoropsis* sp.**

NOTE: The genus contains 16 saprobic species (He et al. 2019); causing a brown rot; widespread genus; found in both Northern and Southern Hemispheres.

COLLECTION SITE: Mazandaran

DISTRIBUTION IN IRAN: The genus has been reported from Gilan, Mazandaran (Khabiri 1968)

Hymenochaetaceae

Fuscoporia ferruginosa (Schrad.) Murrill

COMMON NAME: Rusty porecrust

SYNONYM: *Phellinus ferruginosus* (Schrad. ex Fr.) Pat.

NOTE: The genus contains 62 species; *F. ferruginosa* is plant pathogen; wood-rotting fungus, causing a white rot.

COLLECTION SITE: Mazandaran

DISTRIBUTION IN IRAN: East Azerbaijan, Gilan, Golestan, Mazandaran (Ghobad-Nejhad & Hallenberg 2012)

Hymenochaete cinnamomea (Pers.) Bres. 1897

SYNONYM: *Thelephora cinnamomea* Pers.

NOTE: The genus has a widespread distribution, especially in tropical regions (Kirk et al. 2008).

COLLECTION SITE: Golestan

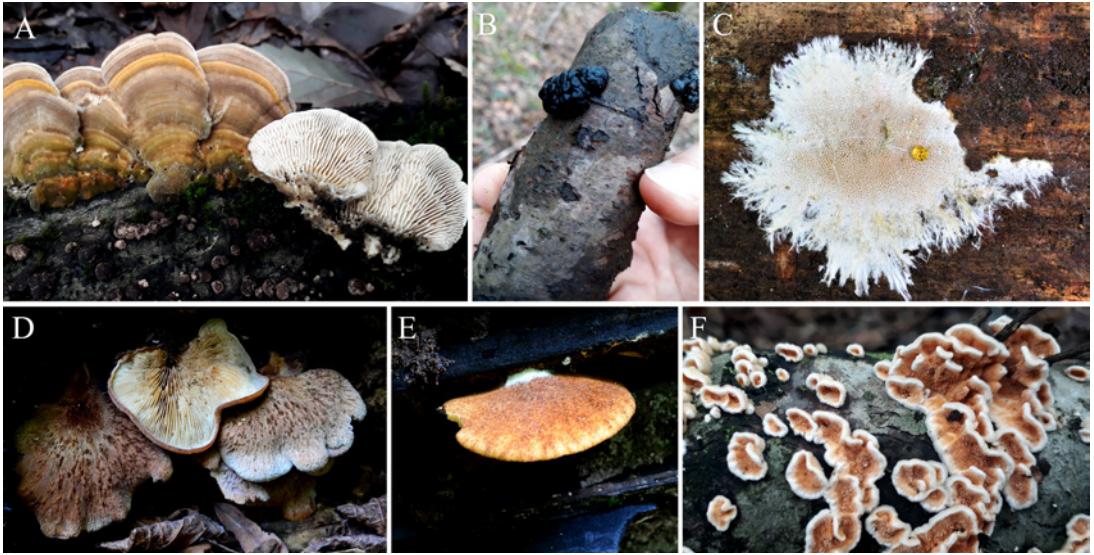


Figure 7. **A.** *Lenzites betulinus*. **B.** *Exidia nigricans*. **C.** *Elmerina caryae*. **D.** *Lentinellus ursinus*. **E.** *Crepidotus crocophyllus*. **F.** *Steccherinum bourdotii*.

DISTRIBUTION IN IRAN: Gilan, Golestan, Mazandaran (Hallenberg 1979, 1981), N-NW Iran (Ghobad-Nejhad 2009, Ghobad-Nejhad & Hallenberg 2012, Arefipour et al. 2018)

Mensularia nodulosa (Fr.) T.Wagner & M.Fisch. 2001

SYNONYM: *Polyporus nodulosus* Fr.

NOTE: Genus *Mensularia* include 6 species (He et al. 2019); species are saprobic that grow on deadwood; widespread.

COLLECTION SITE: Golestan

DISTRIBUTION IN IRAN: N-NW Iran (Ghobad-Nejhad 2009, Ghobad-Nejhad & Hallenberg 2012)

Phellinus igniarius (L.) Quel. 1886

COMMON NAME: Willow bracket, fire sponge

SYNONYM: *Boletus igniarius* L. 1753

NOTE: Saprobic, causing a white rot, widely distributed in Europe and North America

COLLECTION SITE: Gilan

DISTRIBUTION IN IRAN: Chaharmahal and Bakhtiari, East Azerbaijan, Gilan, Golestan, Kermanshah, Mazandaran. (Scharif & Ershad 1966, Soleimani 1976, Hallenberg 1979, 1981, Saber 1987, 2000b,

Fazlali et al. 2006, 2008, Ghobad-Nejhad & Dai 2007, Ghobad-Nejhad et al. 2009, Ghobad-Nejhad & Hallenberg 2012, Badalyan et al. 2019)

Incrustoporiaceae

**** *Skeletocutis chrysellae***. Niemelä

SYNONYM: *Incrustoporia chrysellae* (Niemelä) Zmitr

COLLECTION SITE: Golestan

Description of genus *Skeletocutis* sp.: The genus *Skeletocutis* contains 40 species (He et al. 2019); species are saprobic; causing a white rot; worldwide distribution.

**** *Skeletocutis kuehneri*** A. David

COLLECTION SITE: Golestan

Skeletocutis nivea (Jungh.) Jean Keller

SYNONYM: *Polyporus niveus* Jungh.

COLLECTION SITE: Golestan

DISTRIBUTION IN IRAN: NW Iran, Gilan, Golestan, Mazandaran (Hallenberg 1979, 1981, Asef 2007, Ghobad-Nejhad 2009, Ghobad-Nejhad & Hallenberg 2012, Arefipour et al. 2018)



Figure 8. A-B. *Volvariella bombycina*. C. *Phleogenia faginea*. D. *Polyporus tuberaster*. E. *Ganoderma lucidum* s. lato. F. *Plicaturopsis crispa*.

Irpicaceae

Byssomerulius corium (Pers.) Parmasto 1967 – Fig. 10. C

SYNONYM: *Thelephora corium* Pers. 1801

NOTE: Grows on dead fallen branches and trunks; causing a white-rot; widely distributed in Africa, Asia, Australia, Europe, and in South, Central, and North America

COLLECTION SITE: Gilan

DISTRIBUTION IN IRAN: East Azerbaijan, Gilan, Golestan, Khuzestan, Mazandaran (Saber 1974, Hallenberg 1981, Ghobad-Nejhad et al. 2009, Ghobad-Nejhad & Hallenberg 2012)

Description of genus *Ceriporia* sp.: The genus *Ceriporia* contains 50 species (He et al. 2019); wood-decaying fungi; causing white rot, widely distributed in China and neotropics (Dai 2012)

Ceriporia alachuana (Murrill) Hallenb – Fig. 10. F

COLLECTION SITE: Mazandaran

DISTRIBUTION IN IRAN: N-NW Iran, Golestan, Mazandaran (Hallenberg 1979, 1981, Ghobad-Nejhad 2011)

****Ceriporia aurantiocarnescens*** (Henn.) M. Pieri & B. Rivoire - Fig. 10. E

SYNONYM: *Poria auranticarnescens* Henn.

NOTE: A rare species recorded only from few Mediterranean countries. In Asia, this species has been reported from Georgia, China

COLLECTION SITE: Golestan

DISTRIBUTION IN IRAN: Gilan (Amooupour et al. 2016)

New species record for
Golestan province funga

Ceriporia reticulata (Hoffm. Fr.) Dom.

SYNONYM: *Mucilago reticulata* Hoffm. 1795

COLLECTION SITE: Golestan

DISTRIBUTION IN IRAN: Mazandaran (Hallenberg 1981, Ershad 1995, Ghobad-Nejhad et al. 2009, Ghobad-Nejhad & Hallenberg 2012)

****Gloeoporus pannocinctus*** (Romell) J. Erikss.

COMMON NAME: Gelatinous green porecrust

SYNONYM: *Polyporus pannocinctus* Romell

COLLECTION SITE: Golestan, Mazandaran

DISTRIBUTION IN IRAN: Mazandaran (Hallenberg 1979, 1981, Ghobad-Nejhad & Hallenberg 2012)

New species record for
Golestan province funga

Irpex lacteus (Fr.) Fr. 1828

SYNONYM: *Sistotrema lacteum* Fr.

NOTE: Saprobic; on dead branches of deciduous trees; causing a white rot; reported as parasitic on living wood; year-round, widely distributed in North America

COLLECTION SITE: Gilan

DISTRIBUTION IN IRAN: Gilan, Golestan, Mazandaran, NW Iran (Rechinger et al. 1939, Esfandiari 1948, Saber 1972, 1987, Soleimani 1976, Hallenberg 1979, 1981, Arefipour et al. 2002, Ghobad-Nejhad 2009, 2012)

Ischnodermataceae

******Ischnoderma resinsum*** (Schrad.) P.Karst. 1879

COMMON NAME: late fall polypore, resinous polypore, benzoin bracket

SYNONYM: *Boletus resinusus* Schrad.

NOTE: Saprobic on the deadwood of hardwoods; causing a white rot; appearing in fall; recorded from Africa, Asia, Europe, and North America.

COLLECTION SITE: Golestan, Mazandaran

Lycoperdaceae

Apioperdon pyriforme (Schaeff.) Vizzini 2017-
Fig. 9. E & F

COMMON NAME: pear-shaped puffball or stump puffball

SYNONYM: *Lycoperdon pyriforme* Schaeff.

NOTE: Saprobic on decaying wood; appearing in fall and early winter; distributed in Europe, Asia and North America.

COLLECTION SITE: Gilan, Golestan, Mazandaran

DISTRIBUTION IN IRAN: Gilan, Golestan, Mazandaran, East Azerbaijan (Khabiri 1958, Eckblad 1976, Soleimani 1976, Saber 1987, Fazlali et al. 2006, Asef & Etemad 2016)

****Lycoperdon perlatum*** Pers. 1796 - Fig. 6. D

COMMON NAME: common Puffball

SYNONYM: *Lycoperdon bonordenii* Masee

NOTE: Saprobic; on the ground or sometimes on well-decayed wood; appearing in late spring through fall; widely distributed throughout the world.

COLLECTION SITE: Gilan

DISTRIBUTION IN IRAN: East Azerbaijan, Golestan, Mazandaran (Arefipour et al. 2004, Fazlali et al. 2006, Asef & Etemad 2016, Badalyan et al. 2019)

New species record for
Gilan province funga

Marasmiaceae

***Henningsomyces* sp.**

Description: The genus contains 21 species with worldwide distribution (He et al. 2019).

Province: Mazandaran

DISTRIBUTION IN IRAN: The genus *Henningsomyces* has been reported from Golestan and Mazandaran (Ghobad-Nejhad & Hallenberg 2012)

*****Hydropus subalpinus*** (Hšhn.) Singer

SYNONYM: *Mycena subalpina* Höhn.

COLLECTION SITE: Golestan



Figure 9. A-B. *Gymnopus foetidus*. C-D. *Ganoderma applanatum*. E-F. *Apioperdon pyriforme*.

Marasmius rotula (Scop.) Fr. 1838

COMMON NAME: Pinwheel mushroom, the pinwheel marasmius, the little wheel, the collared parachute, the horse hair fungus

SYNONYM: *Agaricus rotula* Scop.

NOTE: Saprobic on deadwood in hardwood forests; appearing in spring through fall; Widespread in the Northern Hemisphere such as North America, Europe, and northern Asia but also reported from Africa.

COLLECTION SITE: Golestan

DISTRIBUTION IN IRAN: Gilan, Golestan, Mazandaran (Watling & Sweeney 1974, Soleimani 1976, Saber 1995b, Arefipour et al. 2004)

Marasmius wynneae Berk. & Broome

COMMON NAME: Pearly Parachute

SYNONYM: *Agaricus globularis* Weinm.

NOTE: Saprobic; August to January; common in western temperate Europe and also in parts of North America.

COLLECTION SITE: Mazandaran

DISTRIBUTION IN IRAN: Mazandaran (Ershad 1995)

Megacollybia platyphylla (Pers.: Fr.) Kotl. & Pouz.

COMMON NAME: Whitelaced Shank

SYNONYM: *Agaricus platyphyllus*

NOTE: Saprobic; summer to fall; mostly common in Europe, Scandinavia, and western and central Russia, North America.

COLLECTION SITE: Golestan, Mazandaran

DISTRIBUTION IN IRAN: Gilan, Golestan, Mazandaran (Saber 2000c, Saber & Zangeneh 2002, Asef & Etemad 2016, Ghobad-Nejhad et al. 2020)

Meripilaceae

******Loweomyces fractipes*** (Berk. & M.A.Curtis) Jülich

SYNONYM: *Polyporus fractipes* Berk. & M.A.Curtis

NOTE: The genus contain 6 species (He et al. 2019); *L. fractipes* is saprobic; wood-rotting fungi; causing a white rot, widespread.

COLLECTION SITE: Gilan

****Meripilus giganteus*** (Pers.: Fr.) P.Karst.

COMMON NAME: Giant polypore, black-staining polypore

SYNONYM: *Boletus giganteus* Pers.

NOTE: Saprobic or parasitic; wood decaying fungi; causing a white rot; widespread in northern Hemisphere such as Asia (Iran and Turkey), Europe, North America.

COLLECTION SITE: Golestan

DISTRIBUTION IN IRAN: Gilan, Ilam, Mazandaran (Saber 1972, Soleimani 1976, Ghobad-Nejhad, 2009, 2011, Ghobad-Nejhad & Langer 2017, Sefidi & Etemad 2015, Amoopour et al. 2016, Badalyan et al. 2019)

New species record for
Golestan province funga

****Physisporinus vitreus*** (Pers.) P. Karst

COMMON NAME: Rusty crust

SYNONYM: *Poria vitrea* Pers.

NOTE: The genus *Physisporinus* contains 15 species (He et al. 2019); *Ph. vitreus* is wood-rotting, causing a white rot; widespread distribution.

COLLECTION SITE: Golestan, Mazandaran

DISTRIBUTION IN IRAN: Gilan (Emaminasab et al. 2015)

New species record for Golestan and
Mazandaran province funga

Meruliaceae

Aurantiporus fissilis (Berk. & M.A.Curtis)
H.Jahn ex Ryvarden 1978

SYNONYM: *Polyporus fissilis* Berk. & M.A.Curtis (1849)

NOTE: The genus contains species distributed in northern temperate regions. *A. fissilis* is wood-destroying fungus and a plant pathogen; reported from Europe and Asia.

COLLECTION SITE: Golestan

DISTRIBUTION IN IRAN: N-NW Iran, Golestan (Hallenberg 1979, Ghobad-Nejhad & Hallenberg 2012)

****Climacodon septentrionalis*** (Fr.) P.Karst. 1881

SYNONYM: *Hydnum septentrionale* Fr. 1821

NOTE: Parasitic on hardwoods; grows in the wounds of living trees or on recently dead stumps and trunks; appearing in summer to fall; distributed in northeastern North America.

COLLECTION SITE: Gilan

DISTRIBUTION IN IRAN: Mazandaran (Badalyan et al. 2019)

New species record for
Gilan province funga

DESCRIPTION OF GENUS MYCOACIA SP.: The genus contains 16 species (He et al. 2019); species are wood-decaying fungi; widespread distribution.

Mycoacia gilvescens (Bres.) Zmitr.

SYNONYM: *Poria gilvescens* Bres., *Ceriporiopsis gilvescens* (Bres.) Dom.

COLLECTION SITE: Golestan

DISTRIBUTION IN IRAN: N-NW Iran, Golestan, Mazandaran (Hallenberg 1981, Ghobad-Nejhad 2011)

*****Mycoacia nothofagi*** (G.Cunn.) Ryvarden

SYNONYM: *Odontia nothofagi* G.Cunn.

COLLECTION SITE: Golestan, Mazandaran

NOTE: The genus *Phlebia* contains 60 species (He et al. 2019), species are saprobic; wood-rotting fungi; causing a white rot; worldwide distribution.

*****Phlebia coccineofulva*** Schwein.

COMMON NAME: scarlet waxcrust

SYNONYM: *Phlebia martiana* (Berk. & M.A.Curtis) Parmasto

COLLECTION SITE: Golestan

Phlebia rufa (Pers.: Fr.) M.P.Christ.

SYNONYM: *Merulius rufus* Pers.

COLLECTION SITE: Mazandaran

DISTRIBUTION IN IRAN: Gilan, Golestan, Mazandaran (Hallenberg 1978, 1981, Ghobad-Nejhad & Hallenberg 2012)

**Phlebia tremellosa* (Schrad.) Nakasone & Burds. 1984

COMMON NAME: Trembling Merulius or jelly rot

SYNONYM: *Merulius tremellosus* Schrad. 1794

COLLECTION SITE: Gilan, Golestan, Mazandaran

DISTRIBUTION IN IRAN: NW Iran, Gilan, Mazandaran (Hallenberg 1978, 1981, Saber 1987, Saber 2002b, Ghobad-Nejhad & Hallenberg 2012)

New species record for Golestan province funga

Stereophlebia tuberculata (Berk. & M.A. Curtis) Zmitr. 2018

SYNONYM: *Grandinia tuberculata* Berk. & M.A.Curtis

NOTE: Type species of the genus *Stereophlebia*; wood rotting fungi; causing a whithe rot; worldwide distribution.

COLLECTION SITE: Golestan

DISTRIBUTION IN IRAN: Gilan, Golestan, Mazandaran (Ghobad-Najhad & Hallenberg 2012)

Mycenaceae

NOTE: Genus *Mycena* include 600 described species (He et al. 2019); species are saprotrophic, pathogenic, bioluminescent, litter and wood debris decomposers, Orchid mycorrhizal symbionts, and endophytes in photosynthetic moss tissue, widespread across habitats and climate zones (He et al. 2019).

**Mycena abramsii* (Murr.) Murr.

SYNONYM: *Prunulus abramsii* Murrill

COLLECTION SITE: Mazandaran

DISTRIBUTION IN IRAN: Golestan (Karim et al. 2012)

New species record for Mazandaran funga

***Mycena arcangeliana* Bres. 1904

COMMON NAME: Angel's bonnet or the late-season bonnet

SYNONYM: *Mycena olivascens* Quel.

COLLECTION SITE: Golestan, Mazandaran

Mycena crocata (Schrad.) P.Kumm. 1871

COMMON NAME: Saffrondrop bonnet

SYNONYM: *Agaricus crocatus* Schrad. 1794

COLLECTION SITE: Gilan, Golestan, Mazandaran

DISTRIBUTION IN IRAN: Gilan, Golestan, Mazandaran (Saber 1995c, Arefipour et al. 2002, Asef & Etemad 2016)

***Mycena erubescens* Höhn.

SYNONYM: *Mycena fellea* J. Lange

COLLECTION SITE: Mazandaran

Mycena galericulata (Scop.: Fr.) Quél.

COMMON NAME: Common Bonnet, toque mycena

SYNONYM: *Agaricus galericulatus* Scop.

COLLECTION SITE: Mazandaran

DISTRIBUTION IN IRAN: Gilan, Golestan, Mazandaran (Saber 1995c, Sefidi & Etemad 2015)

Mycena haematopus (Pers.: Fr.) P.Kumm. - Fig. 3. C & D

COMMON NAME: Burgundydrop Bonnet, bleeding fairy helmet, the bleeding *Mycena*

SYNONYM: *Agaricus haematopus* Pers.

COLLECTION SITE: Gilan, Golestan, Mazandaran

DISTRIBUTION IN IRAN: Gilan, Golestan, Mazandaran (Saber 1995c, Ghobad-Najhad et al. 2020)

Mycena inclinata (Fr.) Quél. 1872

COMMON NAME: Clustered bonnet or the oak-stump bonnet cap

SYNONYM: *Agaricus inclinatus* Fr. (1838)

COLLECTION SITE: Gilan

DISTRIBUTION IN IRAN: Gilan, Golestan, Mazandaran (Saber 1995c, Badalyan et al. 2019)

***Mycena leptcephala* (Pers.) Gillet

COMMON NAME: Nitrous bonnet

SYNONYM: *Agaricus leptcephalus* Pers.

COLLECTION SITE: Mazandaran

DISTRIBUTION IN IRAN: New species record for Iranian funga

*****Mycena pseudocorticola*** Kuhn.

COLLECTION SITE: Golestan

Mycena pura (Pers.) P. Kumm.

COMMON NAME: lilac bonnet

SYNONYM: *Agaricus purus* (Schumach.) Pers.

COLLECTION SITE: Golestan

DISTRIBUTION IN IRAN: Gilan, Golestan (Saber 1995c, Karim et al. 2012)

*****Mycena renati*** Quél. 1886 – Fig. 3. F

COMMON NAME: Beautiful bonnet

SYNONYM: *Mycena flavipes* Quél. (1873)

COLLECTION SITE: Golestan, Mazandaran

Panellus stipticus (Bull.) P.Karst. 1879

– Fig. 3. E

COMMON NAME: Bitter oyster, the astringent panus, the luminescent panellus

SYNONYM: *Agaricus stypticus* Bull. 1783

NOTE: Saprobic on the deadwood of hardwoods; causing a white rot spring through fall; recorded from North America, temperate regions of Europe, Australia, New Zealand, Anatolia, Asia.

COLLECTION SITE: Gilan, Golestan, Mazandaran

DISTRIBUTION IN IRAN: Golestan, Gilan, Mazandaran, (Soleimani 1976, Saber 1990, Arefipour et al. 2002)

Omphalotaceae

NOTE: The genus *Gymnopus* contains 325 species (He et al. 2019); *G. brassicolens* grows on leafy debris under hardwoods and conifers and fruiting from late fall to winter; *G. foetidus* grows on deadwood of deciduous trees, summer to fall; Widespread in Europe and North America.

****Gymnopus brassicolens*** (Romagn.) Antonín & Noordel.

SYNONYM: *Marasmius brassicolens* Romagn.

COLLECTION SITE: Mazandaran

DISTRIBUTION IN IRAN: Gilan, Golestan (Saber 1995b, Karim et al. 2013)

New species record for Mazandaran funga

Gymnopus foetidus (Sowerby) P.M.Kirk

– Fig. 9. A & B

COMMON NAME: Foetid Parachute

SYNONYM: *Merulius foetidus* Sowerby

NOTE: The genus contains 325 species (He et al. 2019); *G. brassicolens* on leafy debris under hardwoods and conifers; fruiting from late fall to winter; Widespread in Europe and North America.

COLLECTION SITE: Gilan

DISTRIBUTION IN IRAN: East Azerbaijan, Gilan, Mazandaran (Saber 1995b, Asef 2007)

Mycetinis alliaceus (Jacq.) Earle

COMMON NAME: Garlic parachute

SYNONYM: *Marasmius alliaceus* (Jacq.) Fr

NOTE: The genus *Mycetinis* contains 15 species (He et al. 2019), *M. alliaceus* is saprobic; from early summer to fall, growing on fallen leaves and rotting wood; worldwide distribution, mostly in Europe.

COLLECTION SITE: Golestan, Mazandaran

DISTRIBUTION IN IRAN: Gilan, Golestan, Mazandaran (Watling & Sweeney 1974, Saber 1995c, Badalyan et al. 2019)

Naemateliaceae

******Naematelia aurantia*** (Schwein.) Burt 1921

– Fig. 6. E

COMMON NAME: Golden ear

SYNONYM: *Tremella aurantia* Schwein. (1822)

COLLECTION SITE: Golestan

Oxyporaceae

*****Oxyporus corticola*** (Fr.) Ryvarden

SYNONYM: *Rigidoporus corticola* (Fr.) Pouzar

NOTE: plant pathogen

COLLECTION SITE: Golestan



Figure 10. A. *Paralepista flaccida*. B. *Coprinellus micaceus*. C. *Byssomerulius corium*. D. *Bisporella citrina*. E. *Ceriporia aurantiocarnescens*. F. *Ceriporiaalachuana*. G. Rhizomorphs of *Armillaria mellea*. H. *Coprinopsis melanthinia*.

Peniophoraceae

Peniophora incarnata (Pers. ex. Fr.)

COMMON NAME: Rosy crust fungus

SYNONYM: *Thelephora incarnata* Pers.

NOTE: Genus *Peniophora* includes 62 plant pathogens species (Kirk et al. 2008); *P. incarnata* is wood decomposer and causing white rot; worldwide distribution.

COLLECTION SITE: Golestan

DISTRIBUTION IN IRAN: Ardabil, East Azerbaijan, Gilan, Golestan, Mazandaran (Saber 1974, Hallenberg 1981, Ghobad-Nejhad 2009, Ghobad-Nejhad & Hallenberg 2012, Arefipour et al. 2018)

Phanerochaetaceae

Bjerkandera adusta (Willd.) P.Karst. 1880

COMMON NAME: Smoky polypore or smoky bracket

SYNONYM: *Boletus adustus* Willd.

NOTE: Saprobic on decaying deciduous wood, plant pathogen that causes white rot in live trees; summer to fall; widespread.

COLLECTION SITE: Gilan, Golestan, Mazandaran

DISTRIBUTION IN IRAN: East Azerbaijan, West Azerbaijan Gilan, Golestan, Mazandaran (Saber 1972, 1974, 1987, 2002b, Saber & Esmaeili Taheri 2004, Walting & Sweeney 1974, Hallenberg 1979, 1981, Grafenhan 2006, Ghobad-Nejhad et al. 2009)

Phleogenaceae

*****Helicogloea compressa*** (Ellis & Everh.) V.M-
alysheva & K.Pöldmaa

SYNONYM: *Dendrodochium compressum* Ellis & Everh.

NOTE: The genus contains 25 species (He et al. 2019); *H. compressa* grows on dead wood; mostly reported from North America.

COLLECTION SITE: Gilan

****Phleogena faginea*** (Fr.: Fr.) Link - Fig. 8. C

COMMON NAME: Fenugreek Stalkball

SYNONYM: *Onygena faginea* Nees

NOTE: Saprobic on bark of decaying deciduous trees; worldwide (northern temperate).

COLLECTION SITE: Gilan, Golestan, Mazandaran

DISTRIBUTION IN IRAN: Gilan (Asef 2015)

New species record for Golestan and Mazandaran province funga

Physalacriaceae

NOTE: Genus *Armillaria* includes about 70 known species (Sipos et al. 2018), saprobic and grows on deadwoods but also is a pathogen and causes white-rot root disease in forests. Widely distributed throughout the world.

Armillaria gallica (lutea) Marxm. & Romagn

SYNONYM: *Armillaria lutea* (Barla) Kile & Watling

COLLECTION SITE: Golestan, Mazandaran

DISTRIBUTION IN IRAN: East Azerbaijan, Karaj, Mazandaran, Tehran (Asef et al. 2003)

Armillaria mellea (Vahl) P.Kumm. 1871

– Fig. 10. G

COMMON NAME: Honey fungus

SYNONYM: *Agaricus melleus* Vahl 1790

COLLECTION SITE: Gilan, Golestan

DISTRIBUTION IN IRAN: Mazandaran, Gilan, Golestan, Karaj, West Azerbaijan, Esfahan, Qazvin,

Semnan, Khorasan Razavi (Saber 1973, Soleimani 1976, Behboudi & Sabahi 1983, Mohammadipour 2000, Razzaz Hashemi & Zakeri 2000, Zokaei 2002, Asef & Mohammadi-Goltapeh 2002, Arefipour et al. 2002, Amirahmadi et al. 2006, Taheri et al. 2008, Asef & Etemad 2016)

******Cyptotrama* sp.** Singer

NOTE: The genus *Cyptotrama* contains 16 species (He et al. 2019), worldwide distribution; Species can be found from tropical, subtropical, and temperate regions of different continents.

COLLECTION SITE: Golestan

NOTE: The genus *Rhizomarasmius* sp. include 5 species (He et al. 2019) that grow on the rhizomes of ferns or flowering plants, some species grow on leaf litter and woody debris in hardwood forests; *Rh. pyrrocephalus* is mostly distributed in North-America and *Rh. setosus* is widely distributed in central and western Europe.

*****Rhizomarasmius pyrrocephalus*** (Berk.)

R.H. Petersen 2000 – Fig. 6. A

SYNONYM: *Marasmius pyrrocephalus* Berk.

COLLECTION SITE: Gilan, Golestan, Mazandaran

*****Rhizomarasmius setosus*** (Sowerby) Antonín & A.Urb.

COMMON NAME: Beechleaf Parachute

SYNONYM: *Marasmius setosus*

COLLECTION SITE: Gilan

DISTRIBUTION IN IRAN: *Rhizomarasmius* sp. reported from Mazandaran (Ghobad-Nejhad et al. 2020)

Hymenopellis radicata (Relhan) R.H. Petersen

COMMON NAME: deep root mushroom, the rooting shank

SYNONYM: *Agaricus radicans* Relhan

NOTE: Saprobic on the deadwood of hardwoods; attached to buried deadwood near stumps; late spring through fall;

COLLECTION SITE: Golestan, Mazandaran

DISTRIBUTION IN IRAN: Arasbaran, Golestan,

Mazandaran (Arefipour et al. 2002, 2004, Fazlali et al. 2006, Asef & Etemad 2016, Badalyan et al. 2019, Ghobad-Nejhad et al. 2020)

Pleurotaceae

NOTE: The genus *Hohenbuehelia* sp. contains 50 species; saprobic mostly on dead wood, but also on decaying grasses and mosses (Elborne 2012).

Hohenbuehelia auriscalpium (Maire) Singer

COMMON NAME: spatula oyster

SYNONYM: *Pleurotus auriscalpium* Maire

COLLECTION SITE: Mazandaran, Golestan

DISTRIBUTION IN IRAN: Golestan, Mazandaran (Shahtahmasebi et al. 2018)

Hohenbuehelia petaloides (Bull.: Fr.) Schulz. s.str.

COMMON NAME: Shoehorn Oyster

SYNONYM: *Agaricus petaloides* Bull.

COLLECTION SITE: Golestan

DISTRIBUTION IN IRAN: Gilan, Golestan, Mazandaran (Saber 1990)

NOTE: The genus *Pleurotus* contains 25 species (He et al. 2019); species are saprobic or parasitic; growing on dead or decaying logs and stumps and also living trees; causing a white rot; early spring to late fall; widespread in temperate and subtropical forests throughout the world.

Pleurotus ostreatus (Jacq. ex Fr.) P.Kumm. 1871

COMMON NAME: oyster mushroom or oyster fungus

SYNONYM: *Agaricus ostreatus* Jacq.

COLLECTION SITE: Gilan

DISTRIBUTION IN IRAN: East Azerbaijan, West Azerbaijan, Gilan, Golestan, Mazandaran, Khorasan Razavi, Tehran, Karaj, Kermanshah, Hamedan (Soleimani 1976, Saber 1990, Saber & Esmaeili Taheri 2004, Zokaie 2001, Arefipour et al. 2002, Asef 2007, Asef & Etemad 2016, Sefidi & Etemad 2015, Badalyan et al. 2019)

Pleurotus pulmonarius (Fr.) Quél.

COMMON NAME: Indian Oyster, Italian Oyster, Phoenix Mushroom, or the Lung Oyster

SYNONYM: *Agaricus pulmonarius* Fr.

COLLECTION SITE: Golestan, Mazandaran

DISTRIBUTION IN IRAN: East Azerbaijan, Kermanshah, Mazandaran, Gilan, Golestan, Qazvin, Tehran (Saber 1990, Asef 2012, Badalyan et al. 2019)

Pluteaceae

NOTE: Genus *Pluteus* includes 500 species (He et al. 2019); saprobic; grows on decaying deciduous and conifer stumps and logs and also on sawdust; distributed in boreal and temperate forests of the Northern Hemisphere.

**Pluteus cervinus* (Schäffer: Fr) P. Kumm. 1871

COMMON NAME: Deer shield, the deer or fawn mushroom

SYNONYM: *Agaricus cervinus* Schaeff.

COLLECTION SITE: Gilan, Golestan, Mazandaran

DISTRIBUTION IN IRAN: Golestan, Mazandaran, East Azerbaijan (Arefipour et al. 2002, Asef 2007, Asef & Etemad 2016, Borhani et al. 2014, Badalyan et al. 2019, Ghobad-Nejhad et al. 2020)

New species record for
Gilan province funga

Pluteus chrysophaeus (Schaeff.) Quél.

COMMON NAME: Yellow Shield

SYNONYM: *Agaricus chrysophaeus* Schaeff.

COLLECTION SITE: Golestan, Mazandaran

DISTRIBUTION IN IRAN: Golestan, Mazandaran (Saber 1991a)

***Pluteus hispidulus* (Fr.: Fr.) Gillet

COMMON NAME: Fleecy Shield

SYNONYM: *Agaricus hispidulus* Fr.

COLLECTION SITE: Golestan

*****Pluteus insidiosus sensu lato*** Vellinga & Schreurs

COLLECTION SITE: Golestan

Pluteus nanus s. lato (Pers.: Fr.) P.Kumm.

COMMON NAME: Dwarf Shield

SYNONYM: *Agaricus nanus* Pers.

COLLECTION SITE: Mazandaran

DISTRIBUTION IN IRAN: Kermanshah, Mazandaran, West Azerbaijan (Saber 1991a, Saber & Mehravaran 2004, Seidmohammadi et al. 2018b)

*****Pluteus phlebophorus*** (Dittm.: Fr.) P.Kumm.

COMMON NAME: Wrinkled Shield

SYNONYM: *Agaricus phlebophorus* Ditmar

COLLECTION SITE: Golestan

*****Pluteus plautus s. lato*** (Weinm.) Gillet

COMMON NAME: Satin Shield

SYNONYM: *Agaricus plautus* Weinm.

COLLECTION SITE: Golestan

*****Pluteus podospileus s. lato*** Sacc. & Cub.

SYNONYM: *Leptonia seticeps* G.F. Atk.

COLLECTION SITE: Golestan

Pluteus romellii (Britz.) Sacc.

COMMON NAME: Goldleaf Shield

SYNONYM: *Agaricus romellii* Britzelm.

COLLECTION SITE: Golestan

DISTRIBUTION IN IRAN: Golestan, Isfahan (Saber 1991a, Saber & Esmaeili Taheri 2002)

Pluteus salicinus (Pers.) P.Kumm. 1871

SYNONYM: *Agaricus salicinus* Pers. 1798

COLLECTION SITE: Golestan, Mazandaran

DISTRIBUTION IN IRAN: Mazandaran, Golestan (Saber 1995a, Arefipour et al. 2006)

****Pluteus semibulbosus*** (Lasch) Quél.

SYNONYM: *Agaricus semibulbosus* Lasch

COLLECTION SITE: Golestan, Mazandaran

DISTRIBUTION IN IRAN: Mazandaran (Saber 1991a, Ghobad-Nejhad et al. 2020)

New species record for Golestan province funga

Pluteus thomsonii s. lato (Berk. & Br.) Dennis

COMMON NAME: Veined Shield

SYNONYM: *Agaricus thomsonii* Berk. & Broome

COLLECTION SITE: Golestan, Mazandaran

DISTRIBUTION IN IRAN: Golestan, Mazandaran (Saber 2000c)

*****Pluteus umbrosoides*** E.F. Malysheva 2016

COLLECTION SITE: Golestan

****Volvariella bombycina*** (Schaeff.) Singer 1951
- Fig. 8. A & B

COMMON NAME: silky sheath, silky rosegill, silver-silk straw mushroom, or tree mushroom

SYNONYM: *Agaricus bombycinus* Schaeff. 1774

NOTE: Saprobic; grows on deciduous standing hardwood trees or stumps or logs either on wounds of living; late spring to fall; widespread and reported from Asia, Caribbean, Australia, Europe and North America.

COLLECTION SITE: Gilan

DISTRIBUTION IN IRAN: Golestan, Mazandaran (Saber 1993b, Badalyan et al. 2019)

New species record for Gilan province Iranian funga

*****Volvariella caesiotincta*** P.D. Orton

NOTE: saprotrophic; grows on dead or buried wood; summer to fall; mostly distributed in Europe.

COLLECTION SITE: Golestan

Polyporaceae

Cerioporus squamosus (Huds.) Quélet 1886

COMMON NAME: Dryad's saddle, pheasant's back mushroom

SYNONYM: *Boletus squamosus* Huds.

NOTE: Parasitic and saprobic; grows on living or deadwood of deciduous trees or stumps; spring through fall; recorded from North America, Europe, Asia and Australia.

COLLECTION SITE: Gilan

DISTRIBUTION IN IRAN: Alborz, Gilan, Golestan, Tehran, E-W Azerbaijan, Kermanshah (Esfandiari 1946, Saber 1972, 1974, 1987, 2000a, 2002b, Soleimani 1976, Hallenberg 1981, Ghobad-Nejhad 2009, Sefidi & Etemad 2015, Amoopour et al. 2016)

Corioloopsis gallica (Fr.) Ryvarden

COMMON NAME: Brownflesh Bracket

SYNONYM: *Polyporus gallicus* Fr., *Trametes gallica* (Fr.) Fr.

NOTE: The genus contains 19 species (He et al. 2019); species are saprobic on the deadwoods; causing a white rot; summer to fall and over winter in warm climates; widespread in North America, Europe and Asia.

COLLECTION SITE: Mazandaran

DISTRIBUTION IN IRAN: Gilan, Golestan, Gilan, Razavi Khorasan, Mazandaran, Tehran (Soleimani 1976; Hallenberg 1979, 1981; Saber 2000a, 2000c, Amoopour et al. 2016)

NOTE: The genus *Daedaleopsis* contains 7 species; species are saprobic and grow on dead or decaying stumps or log of hardwood trees; Causing a white rot; found year-round; widespread (Northern Hemisphere).

Daedaleopsis confragosa (Bolton) J.Schrot. 1888

COMMON NAME: Thin walled maze polypore or the blushing bracket

SYNONYM: *Boletus confragosus* Bolton

COLLECTION SITE: Gilan

DISTRIBUTION IN IRAN: N-NW, Caspian forests, Khorasan (Saber 1972, Niemela & Uotila 1977, Hallenberg 1979, 1981, Ghobad-Nejhad 2009)

Daedaleopsis tricolor (Bull.) Bondartsev & Singer 1941

SYNONYM: *Agaricus tricolor* Bull.

COLLECTION SITE: Gilan, Golestan, Mazandaran

DISTRIBUTION IN IRAN: East Azerbaijan, Gilan, Golestan, Mazandaran (Saber 1987, Ghobad-Nejhad 2012, 2009, Amoozegar et al. 2018, Amoopour et al. 2016)

Fomes fomentarius (L.) Fr. 1849 – Fig. 5. C

COMMON NAME: Tinder fungus, false tinder fungus, Hoof fungus, Tinder conk, Tinder poypore or ice man fungus

SYNONYM: *Boletus fomentarius* L. 1753,

NOTE: Saprobiic and parasitic on living or deadwood of deciduous trees; causing a white rot; appearing in early summer and autumn; recorded from Asia, Europe, southern Africa, and eastern North America.

COLLECTION SITE: Gilan, Golestan, Mazandaran

DISTRIBUTION IN IRAN: NW Iran, Gilan, Golestan, Mazandaran, Alborz, Isfahan, Tehran, Kermanshah, Ardebil, Khorasan Razavi (Khabiri 1958, Saber 1972, 1974, 1987, 2000a, 2002b, Walting & Sweeny 1974, Soleimani 1976, Niemela 1977, Hallenberg 1979, 1981, Aitchison & Hemsley 1887, Arefipour et al. 2002, Fazlali et al. 2006, Ghobad-Nejhad et al. 2009, Ghobad-Nejhad & Hallenberg 2012, Sefidi & Etemad 2015, Amoopour 2016, Bari et al. 2021)

Lenzites betulinus (L.) Fr. 1838 – Fig. 7. A

COMMON NAME: Gilled polypore, Birch mazegill or multicolor gill polypore

SYNONYM: *Agaricus betulinus* L.

NOTE: Saprobiic, grows on dead deciduous and conifer wood; causing a white rot; appearing in early summer to fall; widespread distribution.

COLLECTION SITE: Gilan, Golestan

DISTRIBUTION IN IRAN: East Azerbaijan, Gilan, Golestan, Mazandaran (Scharif & Ershad 1966, Soleimani 1976, Niemela & Uotila 1977, Saber 1997, 1987, Ershad 1995, Fazlali et al. 2008, Amoopour et al. 2016)

Picipes badius (Pers.) Zmitr. & Kovalenko
2016

COMMON NAME: black-footed polypore or black-leg

SYNONYM: *Boletus badius* Pers.

NOTE: Saprobic, grows on decaying deciduous wood; causing a white rot; spring through fall; recorded from Asia, Europe, North America and South America.

COLLECTION SITE: Gilan, Golestan, Mazandaran

DISTRIBUTION IN IRAN: NW Iran, Gilan, Golestan, Mazandaran (Soleimani 1976, Saber 1987, Arefipour et al. 2002, Ghobad-Nejhad et al. 2009, Ghobad-Nejhad & Hallenberg 2012)

Polyporus tuberaster (Jacquin ex Persoon)
Fries 1821 – Fig. 8. D

SYNONYMS: *Boletus tuberaster* Jacq., *Polyporus coronatus* Rostk.

NOTE: Genus *Polyporus* includes 35 species (He et al. 2019); *P. tuberaster* grows on dead fallen branches of deciduous hardwood trees; reported from Europe, Asia and North America.

COLLECTION SITE: Gilan

DISTRIBUTION IN IRAN: N-NW Iran (Ghobad-Nejhad et al. 2009), Gilan (Amoopour et al. 2016)

*****Spongipellis delectans*** (Peck) Murrill, 1907

SYNONYM: *Sarcodontia delectans* (Peck) Spirin

NOTE: The genus includes 8 species (He et al. 2019); *S. delectans* is saprobic and wood decaying fungi; causing a white rot; worldwide distribution.

COLLECTION SITE: Golestan, Mazandaran

NOTE: Genus *Trametes* consist about 70 species (He et al. 2019); the species are saprobic and wood-rotting fungi, causing a white rot, worldwide distribution.

Trametes gibbosa (Pers.) Fr. 1836 – Fig. 3. G

COMMON NAME: Lumpy bracket

SYNONYM: *Merulius gibbosus* Pers.

COLLECTION SITE: Gilan, Golestan, Mazandaran

DISTRIBUTION IN IRAN: East Azerbaijan, Gilan,

Golestan, Mazandaran, Tehran (Saber 1972, 1987, 2002, Hallenberg 1979, 1981, Ershad 1995, Arefipour et al. 2002, Ghobad-Nejhad et al. 2009, Ghobad-Nejhad & Hallenberg 2012, Amoopour et al. 2016)

Trametes hirsuta (Wulfen) Lloyd 1924

– Fig. 4. A & B

COMMON NAME: Hairy bracket

SYNONYM: *Boletus hirsutus* Wulfen (1791)

COLLECTION SITE: Gilan, Golestan, Mazandaran

DISTRIBUTION IN IRAN: NW Iran, Gilan, Golestan, Mazandaran, East Azerbaijan (Soleimani 1976, Niemela & Uotila 1977, Saber 1987, 2000a, Arefipour et al. 2002, Asef & Tavanaei 2004, Fazlali et al. 2006, 2008, Ghobad-Nejhad et al. 2009, Ghobad-Nejhad & Hallenberg 2012, Amoopour et al. 2016, Badalyan et al. 2019)

Trametes versicolor (L.) Lloyd 1920 –
Fig. 4. C & E

COMMON NAME: Turkey tail

SYNONYM: *Boletus versicolor* L. (1753)

COLLECTION SITE: Gilan, Golestan, Mazandaran

DISTRIBUTION IN IRAN: Arasbaran, Alborz, N-NW Iran, Gilan, Mazandaran, Golestan, (Saber 1972, 1974, 2002b, Walting & Sweeney 1974, Soleimani 1976, Niemela & Uotila 1977, Hallenberg 1979, 1981, Arefipour et al. 2002, Asef & Tavanaei 2004, Ghobad-Nejhad et al. 2009, Ghobad-Nejhad & Hallenberg 2012, Sefidi & Etemad 2015, Amoopour et al. 2016, Amoozegar et al. 2018, Badalyan et al. 2019).

Trametopsis cervina (Schwein.) Tomsovsky

SYNONYM: *Boletus cervinus* Schwein.

NOTE: The genus include 4 species (He et al. 2019), *T. cervina* is saprobe on dead hardwoods, causing white rot; widely distributed in Europe, Morocco, Asia and N. America.

COLLECTION SITE: Gilan, Golestan

DISTRIBUTION IN IRAN: NW Iran, Gilan, Golestan, Mazandaran (Hallenberg 1979, 1981, Ghobad-Nejhad et al. 2009, Ghobad-Nejhad & Hallenberg 2012).

Trichaptum abietinum (Pers. ex J.F.Gmel.)
Ryvarden

COMMON NAME: Purplepore Bracket

SYNONYM: *Boletus abietinus* Dicks. 1793

NOTE: Saprobic, growing on dead conifer wood but rarely on deciduous wood; year-round; widely distributed in Europe and North America.

COLLECTION SITE: Gilan

DISTRIBUTION IN IRAN: East Azerbaijan, N-NW Iran (Asef & Tavaneai 2004, Ghobad-Nejhad 2011).

Trichaptum bifforme (Fr.) Ryvarden 1972
– Fig. 4. D

COMMON NAME: Violet-toothed polypore

SYNONYM: *Polyporus bifformis* Fr. 1833

NOTE: Saprobic on dead deciduous hardwood stumps and logs but rarely on conifers; year-round; appearing late spring, summer and fall; worldwide distribution.

COLLECTION SITE: Gilan, Golestan, Mazandaran

DISTRIBUTION IN IRAN: East Azerbaijan, N-NW Iran (Saber 1972, 1974, Niemela & Uotila 1977, Hallenberg 1979, 1981, Arefipour et al. 2002, Asef & Tavaneai 2004, Ghobad-Nejhad et al. 2009, Ghobad-Nejhad & Hallenberg 2012, Amoopour et al. 2016, Badalyan et al. 2019).

Tyromyces chioneus (Fr.) P.Karst. 1881

COMMON NAME: White cheese polypore

SYNONYM: *Polyporus chioneus* Fr.

NOTE: The genus *Tyromyces* consist 41 specie (He et al. 2019); *T. chioneus* is saprobic; living on the deadwood of hardwoods; causing a white rot; appearing summer to fall; recorded from Asia, Europe, and North America.

COLLECTION SITE: Golestan

DISTRIBUTION IN IRAN: Mazandaran (Borhani et al. 2010, 2014, Ghobad-Nejhad & Hallenberg 2012) New species record for Golestan province funga

Yuchengia narymica (Pilát) B.K. Cui, C.L.
Zhao & K.T. Steffen 2013

SYNONYM: *Trametes narymica* Pilát 1936

NOTE: Single species in genus *Yuchengia*; grows on

deadwoods and causing a white rot; widespread in Asia, Europe, North America.

COLLECTION SITE: Golestan, Mazandaran

DISTRIBUTION IN IRAN: N-NW Iran, Golestan (Ghobad-Nejhad et al. 2009, Ghobad-Nejhad & Hallenberg 2012)

New species record for Mazandaran province funga

Porotheleaceae

NOTE: The genus *Phloeomana* contains 6 species (He et al. 2019); *Phloeomana* is a bark-inhabiting agaric fungal genus; worldwide distribution.

Phloeomana minutula (Sacc.) Redhead

SYNONYM: *Mycena minutula* Sacc.

COLLECTION SITE: Golestan, Mazandaran

Phloeomana speirea (Fr.) Redhead

COMMON NAME: bark bonnet

SYNONYM: *Agaricus speireus* Fr.

COLLECTION SITE: Golestan, Mazandaran

DISTRIBUTION IN IRAN: Gilan, Golestan, Mazandaran (Saber 1995c, Asef & Etamad 2016) Psathyrellaceae

NOTE: Genus *Coprinellus* consist 70 species (He et al. 2019), saprobic on decaying wood or mycorrhizal; causing white rot; reported from Africa, Europe, North America, South America, Australia, New Zealand and Asia.

Coprinellus disseminatus (Pers.) J.E. Lange
1938

COMMON NAME: Fairy inkcap, Trooping crumble cap

SYNONYM: *Agaricus disseminatus* Pers. 1801

COLLECTION SITE: Gilan, Golestan, Mazandaran

DISTRIBUTION IN IRAN: Isfahan, Karaj, Khorasan Razavi, Tehran, Mazandaran, Sistan and Baluchistan, Kermanshah (Saber 1994, Mohammadi-Goltapeh 2000, 2001, Zokaei 2001, Saber & Esmaeilei Taheri 2002, Asef & Etamad 2016, Seidmohammadi et al. 2018a)

New species record for Gilan and Golestan province funga

Coprinellus micaceus (Bull.:Fr.) Vilgalys, Hopple & Jacq. Johnson – Fig. 10. B

COMMON NAME: Mica cap, Shiny cap, Glistening inky cap

SYNONYM: *Agaricus micaceus* Bull.

COLLECTION SITE: Gilan, Mazandaran

DISTRIBUTION IN IRAN: Isfahan, Gilan, Golestan, Mazandaran, Karaj, Tehran, West Azerbaijan, Kermanshah, Khorasan Razavi (Petraik 1939, Petraik & Esfandiari 1941, Soleimani 1976, Saber & Esmaeili Taheri 2002, Esfandiari 1946, Zokaei 2001, Saber & Mehravaran 2004, Asef & Etemad 2016, Seidmohammadi et al. 2018a)

******Coprinopsis melanthina*** (Fr.) Örstadius & E. Larss. – Fig. 10. H

SYNONYM: *Agaricus melanthinus* Fr.

NOTE: Saprobic; growing on decomposed stumps, debris rich in organic matter in damp, rather calcareous soil.

COLLECTION SITE: Mazandaran

******Cystoagaricus sylvestris*** (Gillet) Örstadius & E. Larss.

SYNONYM: *Hypholoma sylvestre* Gillet

NOTE: The genus *Cystoagaricus* contains 7 species (He et al. 2019), *C. sylvestris* Grows in small groups on roots and mossy stumps of deciduous trees.

COLLECTION SITE: Golestan, Mazandaran

NOTE: The genus *Psathyrella* contains 420 species (He et al. 2019); species are saprotrophic; edible and medicinal use; worldwide distribution.

****Psathyrella candolleana*** (Fr.) Maire

COMMON NAME: Pale Brittlestem

SYNONYM: *Agaricus candolleanus* Fr.

COLLECTION SITE: Gilan

DISTRIBUTION IN IRAN: Golestan, Fars, Mazandaran, Razavi Khorasan, Sistan and Baluchistan, Tehran, West Azerbaijan (Saber & Esmaeili Taheri 2004, Saber & Mehravaran 2004, Karim et al. 2013, Sefidi & Etemad 2015, Asef & Etemad 2016, Amoozegar et al. 2018, Badalyan et al. 2019, Teimoori-Boghshani et al. 2020, Ghobad-Nejhad et al. 2020)

New species record for Gilan province funga

*****Psathyrella huronensis*** A.H. Smith

COLLECTION SITE: Gilan

*****Psathyrella maculata*** (C.S. Parker) A.H. Smith

COMMON NAME: Spotted Brittlestem

SYNONYM: *Hypholoma maculatum* C.S. Parker

COLLECTION SITE: Mazandaran

Psathyrella obtusata (Pers.: Fr.) A.H. Smith

SYNONYM: *Agaricus obtusatus* Pers.

COLLECTION SITE: Golestan, Mazandaran

DISTRIBUTION IN IRAN: Golestan, Mazandaran, Razavi Khorasan, South Khorasan (Saber 1994, Saber & Esmaeili Taheri 2004)

*****Psathyrella pygmaea*** (Bull.) Singer

COMMON NAME: Pygmy Brittlestem

SYNONYM: *Agaricus pygmaeus* Bull.

COLLECTION SITE: Golestan, Mazandaran

******Psathyrella septentrionalis*** A.H. Smith

COLLECTION SITE: Golestan

Rickenellaceae

******Sidera vulgaris*** (Fr.) Miettinen

SYNONYM: *Polyporus vulgaris* Fr.

NOTE: The genus contains 6 species (He et al. 2019), *S. vulgaris* has a worldwide distribution especially in Europe.

COLLECTION SITE: Golestan

Schizophyllaceae

Schizophyllum commune Fries 1815 – Fig. 5. D

COMMON NAME: Split gill

SYNONYM: *Agaricus alneus* L. 1755

NOTE: The genus includes 6 species (He et al. 2019), *S. commune* is Saprobic on decaying hardwoods or parasitic on living wood; year-round; worldwide distribution.

COLLECTION SITE: Gilan, Golestan, Mazandaran

DISTRIBUTION IN IRAN: Caspian forest, Alborz, Gilan, Golestan, Mazandaran, West Azerbaijan, East Azerbaijan, Kerman, Hormozgan, Khuzestan, Tehran (Scharif & Ershad 1966, Soleimani 1976, Niemela & Uotila 1977, Saber 1997, 1987, 2000a, Hallenberg 1981, Ershad 1995, Arefipour et al. 2002, Asef & Tavanaei 2004, Fazlali et al. 2006, 2008, Ghobad-Nejhad & Hallenberg 2012, Sefidi & Etemad 2015, Badalyan et al. 2019)

Schizoporaceae

NOTE: The Genus *Xylodon* contains 60 species (He et al. 2019); wood decomposers, causing a white-rot; widespread.

****Xylodon flaviporus* (Berk. & M.A. Curtis ex Cooke) Riebesehl & Langer

SYNONYM: *Poria flavipora* Berk. & M.A.Curtis ex Cooke

COLLECTION SITE: Golestan, Mazandaran

****Xylodon raduloides* Riebesehl & Langer

COLLECTION SITE: Golestan, Mazandaran

Steccherinaceae

**Metuloidea murashkinskyi* (Burt) Miettinen & Spirin

SYNONYM: *Hydnum murashkinskyi* Burt

NOTE: Saprobic; causes a white rot; distributed in Asia and Europe.

COLLECTION SITE: Golestan

DISTRIBUTION IN IRAN: Gilan (Ghobad-Nejhad & Hallenberg 2012)

New species record for Golestan and Mazandaran province funga

NOTE: The genus *Steccherinum* include 40 species (He et al. 2019), saprobic on deadwood of hard-

woods or conifers; causing white rot; usually year-round; worldwide distribution.

Steccherinum bourdotii Saliba & A. David, 1988 – Fig. 7. F

SYNONYM: *Irpex bourdotii* (Saliba & A. David) Kotir. & Saaren.

COLLECTION SITE: Gilan

DISTRIBUTION IN IRAN: N-NW Iran, Gilan (Ghobad-Nejhad et al. 2009, Ghobad-Nejhad & Hallenberg 2012)

Steccherinum ochraceum (Pers.) Gray 1821

COMMON NAME: Ochre spreading tooth

SYNONYM: *Hydnum ochraceum* Pers.

COLLECTION SITE: Gilan, Mazandaran

DISTRIBUTION IN IRAN: Ardabil, East Azerbaijan, Gilan, Golestan, Mazandaran (Hallenberg 1978, 1981, Saber 1987, Ershad 1995, Ghobad-Nejhad et al. 2009, Ghobad-Nejhad & Hallenberg 2012, Borhani et al. 2010)

Stereaceae

NOTE: The genus *Stereum* includes 40 species that are saprobic and wood decay fungi; the species grow on all kinds of deadwood or hardwood also on dead or living leaves; worldwide distribution.

Stereum gausapatum (Fr.) Fr.

COMMON NAME: bleeding oak crust

SYNONYM: *Thelephora gausapata* Fr.

NOTE: Saprobic on hardwood; causing a white rot; found year round; distributed in Europe and North America.

COLLECTION SITE: Gilan

DISTRIBUTION IN IRAN: Gilan, Golestan, Mazandaran (Watling & Sweeney 1974, Hallenberg 1981, Saber 1987, Ghobad-Nejhad et al. 2009, Ghobad-Nejhad 2011, Ghobad-Nejhad & Hallenberg 2012)

Stereum hirsutum (Willd.) Pers. 1800

– Fig. 5. E

COMMON NAME: hairy curtain crust**SYNONYM:** *Thelephora hirsuta* Willd.**COLLECTION SITE:** Gilan, Golestan, Mazandaran**DISTRIBUTION IN IRAN:** Caspian forests, NW Iran, Fars, Gilan, Golestan, Mazandaran (Soleimani 1976, Saber 1974, Hallenberg 1981, Boubals & Nazemille 1966, Asef & Tavanaei 2004, Fazlali et al. 2006, Ghobad-Nejhad & Hallenberg 2012, Amoozegar et al. 2018, Badalyan et al. 2019)***Stereum ostrea*** (Blume & T. Nees) Fr. 1838

– Fig. 6. B

COMMON NAME: false turkey-tail, golden curtain crust**SYNONYM:** *Thelephora ostrea* Blume & T.Nees**COLLECTION SITE:** Gilan**DISTRIBUTION IN IRAN:** Gilan, Golestan, Mazandaran (Arefipour et al. 2002; Ghobad-Nejhad & Hallenberg 2012)***Stereum sanguinolentum*** (Alb. & Schwein.) Fr. 1838**COMMON NAME:** Bleeding Stereum, The bleeding conifer parchment**SYNONYM:** *Thelephora sanguinolenta* Alb. & Schwein. (1805)**COLLECTION SITE:** Gilan**DISTRIBUTION IN IRAN:** N-NW Iran (Ghobad-Nejhad et al. 2009, Ghobad-Nejhad & Hallenberg 2012)***Stereum subtomentosum*** Pouzar, 1964

– Fig. 5. A & B

COMMON NAME: Yellowing Curtain Crust**SYNONYM:** *Stereum ochroleucum* subsp. *arcticum* Fr.**COLLECTION SITE:** Gilan, Golestan, Mazandaran**DISTRIBUTION IN IRAN:** NW Iran, Gilan, Golestan, Mazandaran (Saber 1974, Hallenberg 1981, Ghobad-Nejhad et al. 2009, Ghobad-Nejhad & Hallenberg 2012)***Xylobolus subpileatus*** (Berk. & M.A.Curtis) Boidin 1958**SYNONYM:** *Stereum subpileatum* Berk. & M.A.Curtis 1849**NOTE:** Saprobic and wood decaying fungi; widely distributed and recorded from all continents.**COLLECTION SITE:** Golestan**DISTRIBUTION IN IRAN:** Golestan, Mazandaran; N-NW Iran (Hallenberg 1978, 1981, Saber 2000a, Ghobad-Nejhad et al. 2009, Ghobad-Nejhad & Hallenberg 2012, Arefipour et al. 2018)*Strophariaceae*****Galerina marginata*** (Batsch) Kühner 1935**COMMON NAME:** Funeral bell or the deadly skullcap**SYNONYM:** *Agaricus marginatus* Batsch 1789**NOTE:** The genus *Galerina* consist 250 species (He et al. 2019); *G. marginata* is saprobic on the decaying wood of hardwoods and conifers; causing a white rot; common in spring and fall; widespread in the Northern Hemisphere, including Asia, Europe, North America and also Australia.**COLLECTION SITE:** Gilan, Golestan, Mazandaran
DISTRIBUTION IN IRAN: Mazandaran, Golestan (Walting & Sweeny 1974; Arefipour et al. 2002)

New species record for Gilan province funga

Description: The genus *Hypholoma* sp. contains 45 species (He et al. 2019); species are saprobic on deadwood or moss; widespread throughout the world.***Hypholoma fasciculare*** (Huds.: Fr.) P.Kumm. 1871 – Fig. 5. F**COMMON NAME:** Sulphur tuft, clustered wood lover**SYNONYM:** *Agaricus fascicularis* Huds. 1778**COLLECTION SITE:** Gilan, Golestan, Mazandaran**DISTRIBUTION IN IRAN:** Gilan, Golestan, Mazandaran, Khorasan Razavi, East Azerbaijan (Zokaei 2001, 2004, Arefipour et al. 2002, Asef & Tavanaei 2004, Asef 2007, Asef & Etemad 2016, Amoozegar et al 2018, Badalyan et al. 2019, Juybari et al. 2019, Ghobad-Nejhad et al. 2020)

****Hypholoma lateritium*** (Schaeff.) P. Kumm.

COMMON NAME: Brick Tuf

SYNONYM: *Agaricus lateritius* Schaeff.

COLLECTION SITE: Gilan

DISTRIBUTION IN IRAN: Mazandaran (Asef & Etemad 2016, Badalyan et al. 2019)

New species record for
Gilan province funga

NOTE: Genus *Pholiota* consist 157 species (He et al. 2019) that live on decaying wood and tree roots; causing a white rot; widely distributed in temperate regions.

Pholiota adiposa (Batsch) P.Kumm. 1871

COMMON NAME: Chestnut mushroom

SYNONYM: *Agaricus adiposus* Batsch 1786, *Pholiota aurivella* (Batsch) P. Kumm

COLLECTION SITE: Golestan, Mazandaran

DISTRIBUTION IN IRAN: Alborz, East Azerbaijan, Golestan, Isfahan, Mazandaran, Razavi Khorasan, Tehran (Soleimani 1976, Zokaei 2001, Saber & Esmaeili Taheri 2002, Arefipour et al. 2002, Saber & Mehravaran 2004, Asef & Etemad 2016)

****Pholiota gummosa*** (Lasch) Singer

COMMON NAME: sticky scalycap

SYNONYM: *Agaricus gummosus* Lasch

COLLECTION SITE: Golestan

DISTRIBUTION IN IRAN: Alborz, Gilan, Kermanshah (Soleimani 1976; Saber & Zangeneh 2002; OmidAli et al. 2019)

New species record for
Golestan province funga

****Pholiota squarrosoides*** (Peck) Sacc.

SYNONYM: *Agaricus squarrosoides* Peck 1878

COLLECTION SITE: Golestan

DISTRIBUTION IN IRAN: Mazandaran (Saber 1991b, Ghobad-Najhad et al. 2020)

New species record for
Golestan province funga

Tremellaceae

Tremella mesenterica Retz. 1769

COMMON NAME: yellow brain, golden jelly fungus, yellow trembler and witches' butter

SYNONYM: *Helvella mesenterica* Schaeff. 1774

NOTE: Genus *Tremella* includes 100 accepted species (He et al. 2019); *T. mesenterica* is saprobic and parasitic on wood-rotting fungi; worldwide distribution.

COLLECTION SITE: Gilan

DISTRIBUTION IN IRAN: East Azerbaijan, Golestan, Gilan, Mazandaran (Khabiri 1958, Hallenberg 1979, 1981, Arefipour et al. 2002, Fazlali et al. 2006, 2008, Saber 2000a)

Tricholomataceae

****Paralepista flaccida*** (Sowerby) Vizzini –
Fig. 10. A

COMMON NAME: tawny funnel cap

SYNONYM: *Agaricus flaccidus* Sowerby 1799

NOTE: Saprobic; on humus-rich soil, compost or conifer needles; summer to fall; worldwide distribution.

COLLECTION SITE: Gilan

DISTRIBUTION IN IRAN: East Azerbaijan, Mazandaran (Saber 2002b; Asef & Tavanaei 2004)

New species record for
Gilan province funga

Pseudoclitocybe cyathiformis (Bull.: Fr.) Singer

COMMON NAME: goblet funnel cap

SYNONYM: *Clitocybe cyathiformis* (Bull.) 1871, *Agaricus cyathiformis* Bull.

NOTE: The genus contains 16 species which are saprobic; growing in moss on well-rotted wood but sometimes on the ground in moss or leaf litter; usually in fall or over winter in warm climates; worldwide distribution especially in North temperate.

COLLECTION SITE: Mazandaran

DISTRIBUTION IN IRAN: Gilan, Golestan, Ilam, Mazandaran (Saber 2002c; Boissier & Buhse 1860; Ghobad-Nejhad et al. 2020)

****Trichocybe puberula* (Kuyper) Vizzini 2010

SYNONYM: *Clitocybe puberula* Kuyper

NOTE: saprotrophic; distributed in Northwestern Europe

COLLECTION SITE: Golestan, Mazandaran

Tubariaceae

NOTE: The genus *Flammulaster* contains 20 species (He et al. 2019); growing as saprobic on wood or on leaves, or terrestrially (Vellinga, 1986.); worldwide distribution.

***Flammulaster limulatus* (Fr.)

SYNONYM: *Agaricus limulatus* Fr.

NOTE: Saprobic; species grows on wood residues, branches, old stumps, and sawdust. Reported under broad-leaved trees with particular preference for *Fagus sylvatica*.

COLLECTION SITE: Mazandaran

Flammulaster gracilis (Quél.) Watling

SYNONYM: *Pholiota muricata* var. *gracilis* Quél.

COLLECTION SITE: Mazandaran

DISTRIBUTION IN IRAN: Gilan, Mazandaran (Saber 1993b)

FAMILY: *incertae sedis*

Russulales

****Gloeohyphnicium analogum* (Bourdot & Galzin) Hjortstam

SYNONYM: *Gloeocystidium analogum* Bourdot & Galzin

NOTE: The genus contains two species (He et al. 2019); Saprobic; wood-inhabiting crust fungi; mostly distributed in Europe and North America.

COLLECTION SITE: Golestan

Kingdom: *Protozoa*

Phylum: *Myxomycota*

Reticulariaceae

Lycogala epidendrum (L.) Fr., 1829

COMMON NAME: wolf's milk, groening's slime

SYNONYM: *Lycoperdon epidendrum* L. 1753

NOTE: Saprobic on well-rotted wood; June through November.

COLLECTION SITE: Gilan

DISTRIBUTION IN IRAN: Caspian forests (Danesh-pazhuh 1995b), Golestan (Arefipour et al. 2002)

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