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Assessment of pleurotoid mushrooms (Agaricales) diversity in community forests across Thailand

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Abstract

Pleurotoid mushrooms are widely recognized for their edibility; however, their diversity is underrepresented in Thailand. This highlights the need for a fundamental understanding of the distribution, diversity, and morphological characteristics of pleurotoid mushrooms to address the challenges related to their identification and utilization. From 2019 to 2023, we conducted a survey and diversity analysis of pleurotoid mushrooms across 19 community forests in eight provinces. A total of 650 collections were made during the rainy seasons, with 250 specimens identified as belonging to 70 species from 13 genera and 10 families. The most diverse species identified were *Hohenbuehelia tristis* (*H′* of 2.33), *Schizophyllum commune* (*H′* of 2.20), *Hohenbeuhelia* sp. 3 (*H′* of 2.10), *Campanella* sp. 1 (*H′* of 1.94), and *Crepidotus* sp. 10 (*H′* of 1.94). The sites with the highest species diversity were Pa Deng village (*H′* of 3.34), Pox Kaeo village (*H′* of 3.05), Huay Kaeo village (*H′* of 2.91), Tha Pha village (*H′* of 2.73), Pa Ngae village (*H′* of 2. 68). The most frequently occurrence species were *Hohenbuehelia tristis* (10.44%), *Crepidotus* sp. 10 (5.62%), *Crepidotus* sp. 15 (5.22%), *Campanella* sp. 1 (4.41%), and *Crepidotus thailandicus* (4.01%). The family Pleurotaceae exhibited the highest diversity, represented by the genera *Hohenbueheria*, *Pleurotus*, and *Resupinatus*. The most species-rich genus was *Crepidotus* (30 species), followed by *Hohenbuehelia* (8 species), *Pleurotus* (7 species), *Panus* (6 species), and *Clitopilus* (4 species). This study contributes to a deeper understanding of pleurotoid mushrooms in Thailand and may support sustainable resource use and safe utilization of local fungal biodiversity by community members.

Keywords – basidiomata – distribution – microfungi – morphology – Pleurotaceae – Southeast Asia

Introduction

In general, biological diversity refers to the variety of organisms across exist in all habitats, including terrestrial, marine, and other aquatic environments, including a wide range of insects, plants, animals, pests, fungi, and bacteria (Tsioumani & Tsioumanis 2020). Knowledge of biodiversity that has not yet been fully explored may contribute to both positive and negative aspects of human existence (Aerts et al. 2018, Ostfeld & Keesing 2017). Fungi are incredibly diverse and enigmatic organisms that form complex and dynamic communities. Most of the time, fungi are difficult to identify because they grow as a network of thin filaments on the substrate (such as soil, wood, insect guts, and living plant parts) (Money 2016). Although their fruiting times can be brief

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and their fruiting bodies transient, species that produce spore-bearing structures can be commonly found (Branco 2011). The current number of known fungal species is approximately 155,000 (Niskanen et al. 2023). Estimates of fungal diversity in various environments outline general methods of identification and highlight the importance of culture-dependent and culture-independent methods in fungal identification. Gautam et al. (2022) have reported a comprehensive review of fungal aspects.

Pleurotoid mushrooms (Basidiomycota) are agaric forms that typically feature a fan-shaped fruiting body, the presence of lamellae, and lateral stem attachment. In some species, the stipe can be reduced or absent (Seelan 2015, Læssøe & Petersen 2019). The pleurotoid form is well represented in the genus *Pleurotus*. However, it is not phylogenetically informative, as the habit has evolved and diverged many times in some genera. In 2019, Læssøe and Petersen classified 26 genera of pleurotoid mushrooms based on the color deposit of spores; the different spore colors reflect the fact that the species concerned have completely different phylogenies. Consequently, to determine whether mushrooms are pleurotoid or belong to another group, it should be based on morphological characteristics, with molecular analysis used for confirmation of the exact genus or species.

Forests are a source of water, land for cultivation, food, and medicine, as well as essential resources for human survival, especially tropical forests, which are a major source of biodiversity (Putz et al. 2001, Aju et al. 2015). In Thailand, more than 12,000 community forest areas have been established, covering a total of over 7.6 million rai (approximately 1.2 million hectares) (Khongswasdi 2022). The North has the largest community forest area, followed by the Northeast, Central, and South, respectively (Thai forest situation, 2022). Thailand is rich in various forest types and boasts a high diversity of mushrooms, with many new species yet to be discovered (Thongbai et al. 2018, Vadthanarat et al. 2021). Several studies have been conducted on the diversity of pleurotoid species, and numerous novel types of basidiomycetes have been discovered in Thailand (Baimai 2010, Chandrasrikul et al. 2011, Sakonrak et al. 2017, De Crop et al. 2018, Suwannarach et al. 2022, Phonemany & Thongklang 2023, Sysouphanthong et al. 2023). Phonemany et al. (2024) reported the diversity of pleurotoid mushrooms in Thailand, comprising 58 species across 17 genera and 12 families. However, some of the pleurotoid species should be reviewed and updated again. Pleurotoid mushrooms (Agaricales) are well known for their edibility. However, studies on the diversity of this group in Thailand remain limited. Thus, this study aims to survey and provide an overview of the diversity of pleurotoids in Thailand. In general, the data obtained provide insight into a better understanding of the distribution and diversity of pleurotoid mushrooms in Thailand.

Materials and Methods

Collecting sites and mushroom sampling

This study examines the diversity and distribution of pleurotoid mushrooms in Thailand, with a particular focus on the various forest types and ecological conditions. The samples were collected from 19 localities in eight provinces of Thailand (Table 1). Localities recorded habits, habitats, and forests (Rathnayaka et al. 2025). The collection was carried out during the rainy season (May to September) from 2019 to 2023.

Table 1 Collection sites used in this study.

Collection sites	Type of forests
Chiang Mai Province, northern Thailand	
1. Mae Feak Village, Mea Taeng District (MF)	Mixed forest dominated by *Bambusa* spp., *Dipterocarpus tuberculatus*, and *Lithocarpus* spp.
2. Pha Deng Village, Mare Taeng District (PD)	Deciduous mixed rain forest dominated by *Castanopsis armata*, *Castanopsis* sp., and *Lithocarpus* spp.

Table 1 Continued.

Collection sites	Type of forests
3. Tha Pha Village, Mae Taeng District (TP)	Deciduous rain forest dominated by *Lithocarpus* spp., *Dipterocarpus tuberculatus*, *Dipterocarpus* sp., and Bamboo
4. Pox Kaeo Village, Mae On District (PK)	Mixed forest dominated by *Dipterocarpus* sp., *Lithocarpus polystachyus*, and other trees.
5. Huay Kaew Village, Mae On District (HK)	Mixed forest dominated by *Dipterocarpus* sp., *Lithocarpus polystachyus*, and other trees.
II. Chiang Rai Province, northern Thailand	
6. Mae Fah Luang University, Muang District (MFU)	Forest dominated by *Ficus* spp.
7. Pha Ngae Village, Pa Daed District (PN)	Mixed forest dominated by *Castanopsis* spp., *Lithocarpus polystachyus*, and other trees.
8. Nang Lae Nai Village, Muang District (NL)	Mixed forest, deciduous forest dominated by *Tectona grandis*, and *Bambusa* sp.
9. Mae Toe Village, Mae Sa long Nok subdistrict, Mae Fah Luang District (MT)	Mixed forest dominated by *Pinus* sp., *Pinus kesiya*, and coffee.
10. Huay Mae Suk, Mae Yao District (HM)	Mixed rainforest with various tree species.
11. Doi Pui, Mae Yao District (DP)	Deciduous rain forest dominated by *Lithocarpus* spp., *Dipterocarpus tuberculatus*, and *Dipterocarpus* sp.
12. Sala Choeng Doi, Mae Sai District (MS)	Mixed forest, deciduous forest dominated by *Tectona* sp., and *Bambusa* sp.
III. Mukdahan Province, northeast Thailand	
13. Na Lak Village, Dong Luang District (DL)	Deciduous rain forest dominated by *Lithocarpus* spp., *Dipterocarpus tuberculatus*, and *Dipterocarpus* sp.
VI. Roi Et Province, northeast Thailand	
14. Phou Thong Temple, Phou Khao Thong Village, Pho Chai District (PT)	Burned forest dominated by *Castanopsis* spp., *Dipterocarpus* sp., *Lithocarpus polystachyus*, and other trees.
V. Loie Province, northeast Thailand	
15. Chiang Khan Tai Village, Maueng Chiang Khan District (CK)	Deciduous rain forest dominated by *Lithocarpus* spp., *Dipterocarpus tuberculatus*, *Dipterocarpus* sp., and *Bambusa* sp.
VI. Surat Thani Province, southern Thailand	
16. Krung Ching, Nopphitam District (KC)	Mixed forests are dominated by *Bambusa* spp., palm, and Rubber Garden.
VII. Nakhon Si Thammarat Province, southern Thailand	
18. Sirivong, Lansaka District (SV)	Mixed forests are dominated by unknown tree species.
VIII. Krabi Province, southern Thailand	
19. Khao Phanom District (KP)	Mixed forests are dominated by unknown tree species.

Identification of mushrooms

The macromorphological descriptions of the fresh specimens included the shape and size of the basidiomata, pileus, lamellae, stipe, context, spore print, and the smell and taste of the mushroom specimens were also used for mushroom identification (Fig. 1). The technical terms followed the glossary of Vellinga and Noordeloos (2001). The color codes were assigned according to the color charts of Kornerup and Wanscher (1978). The samples were dried in a hot air dryer for 24 hours at 50 °C (Hu et al. 2022) until they were completely dry, and then they were kept separately in zip-lock plastic bags. The samples were deposited in the Fungarium of Mae Fah Luang University (MFLU).

Micromorphological characteristics were observed from dried specimens, including basidiospores, basidia, pleurocystidia, and cheilocystidia of the lamellae and the structure of the pileus covering (Fig. 2). A razor blade was used to make thin sections of the samples, which were then mounted on slides in water (H_2O) and 3–5% potassium hydroxide (KOH), or 1% ammoniacal Congo red. Photographed using a Nikon Eclipse Ni compound microscope (Nikon Corporation, Japan).

Fig. 1 – Macromorphological characteristics. a pileus, b lamellae, c stipes, d attachments, e margins.

Data Analysis of the Diversity of Pleurotoid Mushrooms

The percentage of occurrence frequency (% OF) for each species was calculated using the following formula.

% OF = OSa × 100/TN,

Notes: 'OSa' is the occurrence of species A, and TN is the total number of all species.

The total number of species was calculated, and the final numbers were compared to determine the number of species for each locality. The diversity of species (section) was calculated using Shannon's diversity index, *H′* (Shannon & Weaver 1963).

$$H' = \sum_{i=l}^{n} P_i \, log_e \, P_i$$

Notes: $P_i = \frac{N_i}{n}$, where N_i is individual number of *i* species, N is individual number of all species, P_i is the proportion of *i* species, and n is the number of species.

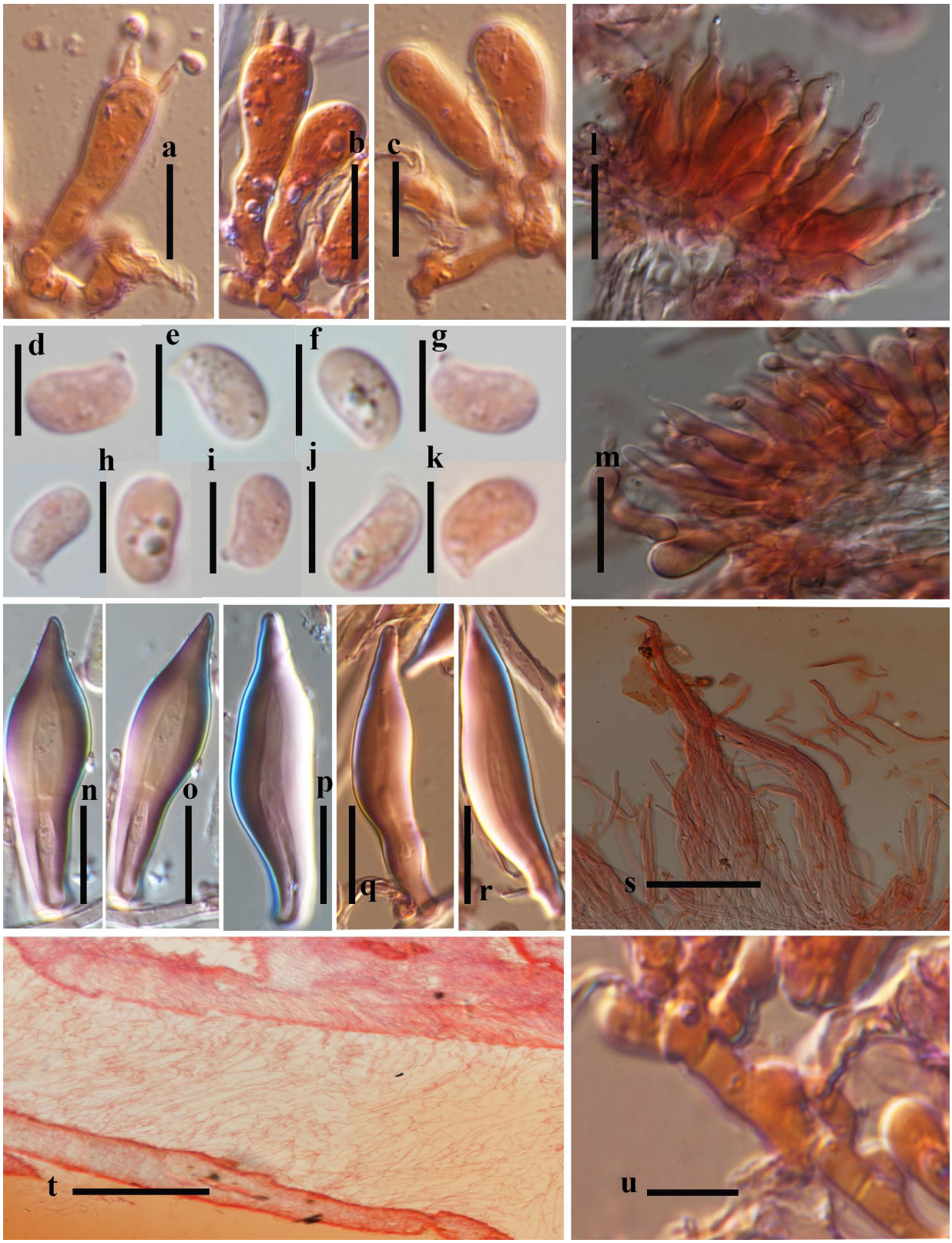

Fig. 2 – Micromorphological characteristics. a–b Basidia, c Basidiole, d–k Basidiospores, l–m Cheilocystidia, n–r Pleurocystidia, s Pileipellis, t Gelatinous layer, u Clamp connections. Scale bars: a–b = 10 µm, d–k = 5 µm, l–r = 10 µm, s–t = 100 µm, u = 10 µm.

Results

Diversity of Pleurotoid Mushrooms in Thailand

The results of species richness (S), number of mushroom samples, Shannon's diversity index (*H′*), and Evenness_e^H/S are shown in all analyses. Based on the diversity of pleurotoid species at the 19 sites, 250 collections of pleurotoid mushrooms were identified, yielding 70 species. Shannon's diversity index (*H′*) showed the five highest distributions: *Hohenbuehelia tristis* with an *H′* of 2.33, followed by *Schizophyllum commune* with an *H′* of 2.20, and *Hohenbeuhelia* sp. 3 with an *H′* of 2.10, *Campanella* sp. 1 with an *H′* of 1.94, and *Crepidotus* sp. 10 with an *H′* of 1.94. For other pleurotoid species, the diversity ranges from 1.94 to 0.60, as shown in Table 2. Figure 3 shows the diversity of the species of pleurotoid mushrooms with the highest diversity. The percentage of occurrence frequency (%) of the highest diversity of pleurotoid species is shown in Fig. 4, the highest is *Hohenbuehelia tristis* with 10.44%, followed by *Crepidotus* sp. 10 with 5.62%, and *Crepidotus* sp. 15 with 5.22%; the lower are *Campanella* sp. and *Crepidotus thialandicus* with 4.41% and 4.01%, respectively, followed by *Crepidotus flavocarpus* with 3.21%; the lowest is *Hohenbeuhelia* sp. 3, *Clitopilus* sp. 1, *Crepidotus* sp. 8, *Schizophyllum commune*, *Crepidotus* sp. 16, *Pleurotus giganteus*, *Pleurotus* sp. 1, and *Resupinatus* sp. 1 with 2.4 to 2, respectively.

A summary of the distribution of pleurotoid species collected from 19 sites in Thailand during 2019–2023. Table 3 showed that the highest diversity of pleurotoid mushrooms was found in Pa Deng Village, where seven families were found with 45 collections and 25 species, followed by Pox Kaeo Village, where six families were found with 52 collections and 23 species, Huay Kaeo Village, where five families were found with 18 collections and 14 species, Tha Pha Village, where four families were found with 13 collections and 11 species, and Pa Ngae Village, where four families were found with 11 collections and 10 species, and other collecting sites showed the lowest diversity (see Table 3). According to Shannon's diversity index (*H′*), Pa Deng Village contained the highest species diversity with an *H′* of 3.34, followed by Pox Kaeo Village with an *H′* of 3.05, Huay Kaeo Village with an *H′* of 2.91, Tha Pha Village with an *H′* of 2.73, and Pa Ngae Village with an *H′* of 2.68. Lower diversities of pleurotoid mushrooms were found in Krung Ching (Nopphitam District) with an *H′* of 0, Khlong Sok Subdistrict (Phanom District) with an *H′* of 0.8, Chiang khan Tai Village with an *H′* of 0.94, Khao Phanom District with an *H′* of 0.94, and Huay Mae Suk, Mae Yao Districts with an *H′* of 0.94.

A study on the diversity of pleurotoid mushrooms found that a total of ten families were collected from 19 sites, *viz.* Entolomataceae, Marasmiaceae, Crepidotaceae, Cyphellaceae, Panaceae, Phyllotropsidaceae, Pleurotaceae, Polyporaceae, Schizophyllaceae, and Tapinellaceae. According to the results of Table 4, the family has the highest diversity with three genera consisting of *Hohenbuehelia*, *Pleurotus*, and *Resupinatus*, followed by Entolomataceae with two genera consisting of *Entoloma* and *Clitopilus*; and lower diversity comprised in Crepidotaceae, Schizophyllaceae, Marasmiaceae, Panaceae, Polyporaceae, and Cyphellaceae. No diversity is shown for Phyllotopsidaceae and Tapinellaceae. The genera comprising the highest number of species of pleurotoid mushrooms, such as *Crepidotus*, have the highest diversity with 30 species, followed by *Hohenbuehelia* which consists of eight species, *Pleurotus* with seven species, and *Panus* with six species. Other genera are shown to be lower than one to three species. A key to the genera of pleurotoid mushrooms identified in this study is provided below:

Key to genera of pleurotoid mushrooms

1a. Mushroom with a well-developed, visible stem **2**
1b. Mushroom without a distinct stem (sessile or with a very reduced base) **5**
2a. Lamellae serrated, split or deeply notched ..... ***Schizophyllum***
2b. Lamellae not split or serrated **3**
3a. Spore print white **4**
3b. Spore print pinkish to reddish ..... ***Clitopilus***
4a. Grows on wood, gills crowded, fruiting body tough and leathery ..... ***Lentinus***

4b. Grows on decaying wood, soft, fragile fruiting body ..... ***Pleurocybella***
5a. Spore print pinkish to reddish **6**
5b. Spore print white to cream or brownish **7**
6a. Lamellae decurrent, soft fruiting body ..... ***Entoloma***
6b. Lamellae well-spaced, small, delicate mushroom ..... ***Clitopilus***
7a. Basidiomata tiny, gills widely spaced or nearly absent, growing in clusters ..... ***Campanella***
7b. Lamellae well-developed, not widely spaced **8**
8a. Pileus small, thin, delicate, grows on decayed wood ..... ***Cheimonophyllum***
8b. Pileus larger, fleshy, tough or gelatinous **9**
9a. Pileus surface velvety or hairy, tough texture ..... ***Panus***
9b. Pileus smooth or slightly slimy, soft to firm texture **10**
10a. Pileus gelatinous or slimy, soft when touched ..... ***Hohenbuehelia***
10b. Pileus not gelatinous, firm but not slimy **11**
11a. Lamellae running down the stem, spore print white, thick fleshy fruiting body ..... ***Pleurotus***
11b. Lamellae running down the stem, spore print brown, thick but soft fruiting body ..... ***Tapinella***

Fig. 3 – Diversity of the highest diversity species of pleurotoid mushrooms. a *Hohenbuehelia tristis*, b *Schizophyllum commune*, c *Hohenbeuhelia* sp. 3, d *Campanella* sp. 1, e *Crepidotus* sp. 10, f *Crepidotus* sp. 15, g *Hohenbuehelia lageniformis*, h *Lentinus squarrosulus*, i *Crepidotus flavocarpus.* Scale bar a–g, i = 2 cm, and h = 5 cm.

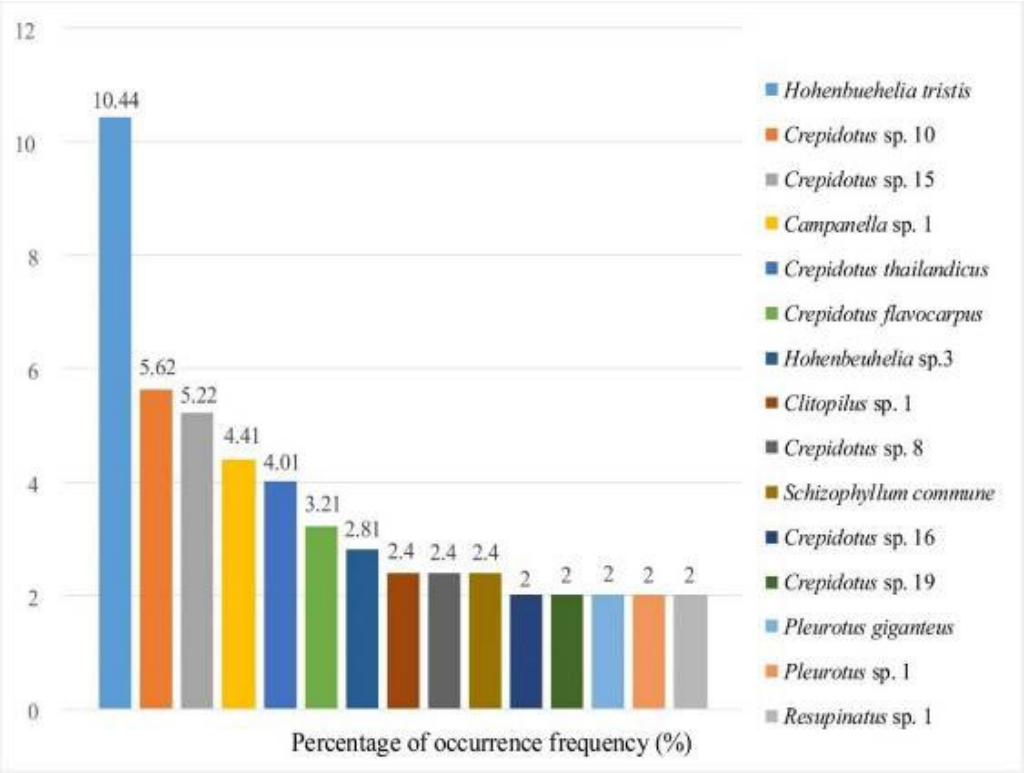

Fig. 4 – The 15 highest of occurrence frequency (%) of pleurotoid species.

Table 2 Thirty highest diversity of pleurotoid mushrooms.

Species	Species richness (S)	Number of mushroom samples	Shannon's diversity index (*H'*)	Evenness _e^H/S
Hohenbuehelia tristis	10	26	2.33	1.03
Schizophyllum commune	6	6	2.20	1.51
Hohenbeuhelia sp. 3	6	7	2.10	1.36
Campanella sp. 1	6	11	1.94	1.16
Crepidotus sp. 10	7	14	1.94	0.99
Crepidotus sp. 15	6	13	1.77	0.98
Hohenbuehelia lageniformis	4	4	1.76	1.45
Lentinus squarrosulus	3	3	1.43	1.39
Crepidotus flavocarpus	4	8	1.40	1.01
Crepidotus striatus	3	4	1.29	1.21
Entoloma sp.	3	4	1.29	1.21
Crepidotus sp. 16	3	5	1.25	1.16
Pleurotus giganteus	3	5	1.25	1.16
Clitopilus sp. 1	3	6	1.17	1.08
Cheimonophyllum sp. 1	2	2	0.94	1.28
Cheimonophyllum sp. 2	2	2	0.94	1.28
Crepidotus sp. 11	2	2	0.94	1.28

Table 2 Continued.

Species	Species richness (S)	Number of mushroom samples	Shannon's diversity index (*H′*)	Evenness _e^H/S
Crepidotus sp. 13	2	2	0.94	1.28
Crepidotus sp. 7	2	2	0.94	1.28
Crepidotus ungulatus	2	2	0.94	1.28
Hohenbuehelia flabelliformis	2	2	0.94	1.28
Panus sp. 1	2	2	0.94	1.28
Resupinatus sp. 2	2	2	0.94	1.28
Clitopilus chalybescens	2	4	0.81	1.13
Crepidotus asiaticus	2	4	0.81	1.13
Crepidotus sp. 17	2	4	0.81	1.13
Crepidotus chiangraiensis	2	3	0.80	1.11
Crepidotus sp. 5	2	3	0.80	1.11
Lentinus sp. 1	2	3	0.80	1.11
Panus fasciatus	2	3	0.80	1.11

Note: Some species show diversity = 0, not included in the table.

Discussion

Some forms of fruiting bodies are sometimes similar to pleurotoid forms, such as clitocyboid, cyphelloid, and lentinoid; clitocyboids differ from pleurotoid by having a central stipe (Læssøe & Petersen 2019). This study found that some families included genera with various morphological characteristics, such as those of Entolomaceae, Marasmiaceae, and Polyporaceae. The members of these families can exhibit various shapes, and only some species display a pleurotoid shape (Co-David et al. 2009, Læssøe & Petersen 2019). Furthermore, *Pleurotus giganteus* and *P. tuberrigium* have forms similar to lentinoid (Corner 1981), and only a few species collected in this study were identified as *Lentinus* and *Panus*.

In total, collections were made at 19 sites across eight provinces between 2019 and 2023. The appearance of pleurotoid mushrooms throughout the rainy season revealed that 250 collections comprised 70 species in ten families, as well as 13 genera of pleurotoid mushrooms. The highest diversity at all sites is *Hohenbuehelia tristis*, *Schizophyllum commune*, *Hohenbeuhelia* sp. 3, *Campanella* sp. 1, and *Crepidotus* sp. 10. The highest diversity of pleurotoid mushrooms was found in Pa Deng Village, Pox Kaeo Village, Huay Kaeo Village, Tha Pha Village, and Pa Ngae Village, respectively. Furthermore, the diversity of the pleurotoid mushroom families was observed at Mae Fah Luang University, with the highest Pleurotaceae diversity comprising three genera found at several collecting sites. The genera consisting of the highest species are *Crepidotus*, *Hohenbuehelia*, *Pleurotus*, and *Panus*.

There are 29 species of pleurotoid mushrooms belonging to eleventh genera and eight families recorded (Baroni et al. 2001, Karunarathna et al. 2011, Rattanamalee & Rattanamalee 2012, Guzmán-Dávalos et al. 2017, Jatuwong et al. 2016, Sakonrak 2017, De Crop et al. 2018, Raj & Manimohan 2018, Sandargo et al. 2018, Kumla et al. 2019, Phuket et al. 2019, Suwannarach et al. 2022, Kumla et al. 2023, Phonemany et al. 2023, Phonemany & Thongklang 2023, Sysouphanthong et al. 2023, Phonemany et al. 2024). The comparison of the diversity of pleurotoid mushrooms reported in Thailand with that in this study found that the diversity of families is almost identical to that reported in the previous study. However, this study found a higher number of species. Based on this study, *H. tristis* is highly diverse, as this species is commonly found in several collecting sites and has a high percentage occurrence frequency of 10.44%. This agrees with Phonemany et al. (2023), who reported a new species of *Hohenbuehelia* and *H. tristis*. Other commonly found species are *Crepidotus* sp. 10 and *Crepidotus* sp. 15 (occurrence frequency at 5.62% and 5.22%, respectively).

During the rainy season, pleurotoid mushrooms appeared in decayed wood, dead branches, dead bamboo, tree stumps, buried underground leaves, herbaceous stems, and sometimes in the bark of living trees. Among the 19 collecting sites, the five highest diversities of pleurotoid mushrooms are found in Pa Deng Village, Pox Kaew Village, Huay Kaeo Village, Tha Pha Village, and Pa Ngae Village. Those collecting sites have an abundance of forests, such as mixed forests and deciduous rainforests dominated by *Lithocarpus* spp., *Dipterocarpus tuberculatus*, *Dipterocarpus* sp., *Castanopsis armata*, *Castanopsis* sp., *Bambusa* spp., and other tree species. The lowest diversities of pleurotoid mushrooms are found in Krung Ching (Nopphitam District); these collecting sites have mixed forests dominated by *Bambusa* spp., palm, and rubber gardens. However, the number of pleurotoid mushroom species in this study varied depending on the collection time; some species appeared only for a few days and subsequently rotted over time (for example, *Crepidotus* sp., *Resupinatus* sp., and *Entoloma* sp.), which was influenced by the environmental conditions of the forests. Environmental stressors can also alter the phenotype of mushrooms, providing an adaptive advantage (Hewitt et al. 2016).

Conclusion

Thailand's rich forest diversity is a treasure trove for mushrooms waiting to be explored; the current records of pleurotoid mushrooms, with eight families, 11 genera, and 30 species, suggest that the recorded species are only a preliminary indication of the true diversity present. The current number of pleurotoid mushrooms recorded in Thailand is 100 species, including those reported in this study, as well as 30 previously reported species. However, many forest areas in Thailand remain uncharted, holding the promise of many undiscovered species. The potential for discoveries in Thailand's forests is boundless, and further taxonomic studies may reveal a high diversity of pleurotoid mushrooms that have yet to be uncovered.

The importance of studying the diversity of pleurotoid mushroom species in community forests can respond to many issues, such as (1) conservation of biodiversity helps to understand and maintain the diversity of pleurotoid mushrooms that exist in the ecosystem, which plays an important role in maintaining the balance of the forest and ecosystem. (2) Economic benefits, some pleurotoid mushrooms have a high economic value and can be used as food, herbs, or medical products. The study helps to identify mushrooms with economic potential and develop cultivation practices. (3) Research and innovation, the study of the diversity of pleurotoid mushrooms may be a starting point for further research on active compounds in mushrooms that may lead to the development of new drugs or other useful products. The study in community forests also helps to raise awareness of the importance of nature conservation in the community and encourages local people to play a role in protecting natural resources. This study conducted an extensive survey of pleurotoid mushrooms in Thailand from 2019 to 2023. However, it should be noted that the frequency of sample collections for each site was not consistent due to unsuitable or inaccessible conditions.

Table 3: Distribution of pleurotoid species collected from Thailand during 2019–2023.

Family /Genera /Species	PK	HK	PD	TP	MF	ML	NL	MFU	HM	DP	PN	MS	KC	KS	KP	SV	PT	DL	CK	Total	OF	References
Crepidotaceae																						
Crepidotus asiaticus	2					2														4	1.6	Phonemany et al. (2024)
Cr. chiangraiensis						1												2		3	1.2	Phonemany et al. (2024)
Cr. flavocarpus	4	2									1					1				8	3.2	Phonemany et al. (2024)
Cr. lateralipes			1																	1	0.4	Phonemany et al. (2024)
Cr. mollis		1																		1	0.4	Acharya et al. (2017)
Cr. palodensis	4																			4	1.6	Kumar et al. (2018)
Cr. roseocarpus												2								2	0.8	Phonemany et al. (2024)
Crepidotus sp. 1	2																			2	0.8	TR
Crepidotus sp. 2	1																			1	0.4	TR
Crepidotus sp. 3	1																			1	0.4	TR
Crepidotus sp. 4								1												1	0.4	TR
Crepidotus sp. 5			2					1												3	1.2	TR
Crepidotus sp. 6				2																2	0.8	TR
Crepidotus sp. 7				1							1									2	0.8	TR
Crepidotus sp. 8			4													2				6	2.4	TR
Crepidotus sp. 9																1				1	0.4	TR
Crepidotus sp. 10	5		2				3			1	1						1	1		14	5.6	TR
Crepidotus sp. 11	1		1																	2	0.8	TR
Crepidotus sp. 12	1																			1	0.4	TR
Crepidotus sp. 13		1								1										2	0.8	TR
Crepidotus sp. 14										1										1	0.4	TR
Crepidotus sp. 15	2	1	5	1		1												3		13	5.2	TR
Crepidotus sp. 16	2		1	2																5	2	TR
Crepidotus sp. 17	2		2																	4	1.6	TR
Crepidotus sp. 18			2																	2	0.8	TR
Crepidotus sp. 19							2	3												5	2	TR
Cr. striatus	1		2	1																4	1.6	Ge & Bau (2020)

Table 3 Continued.

Family /Genera /Species	PK	HK	PD	TP	MF	ML	NL	MFU	HM	DP	PN	MS	KC	KS	KP	SV	PT	DL	CK	Total	OF	References
Cr. thailandicus	10																			10	4	Phonemany et al. (2024)
Cr. ungulatus				1	1															2	0.8	Phonemany et al. (2024)
Cr. viscidus										1							3			4	1.6	Phonemany et al. (2024)
Cyphellaceae																						
Cheimonophyllum sp. 1			1								1									2	0.8	TR
Cheimonophyllum sp. 2			1								1									2	0.8	TR
Cheimonophyllum sp. 3		1																		1	0.4	TR
Entolomaceae																						
Entoloma sp.	1		1								2									4	1.6	TR
Clitopilus chalybescens								2										2		4	1.6	Baroni et al. (2001)
Clitopilus sp. 1			2		1					3										6	2.4	TR
Clitopilus sp. 2				1																1	0.4	TR
Clitopilus sp. 3																			1	1	0.4	TR
Marasmiaceae																						
Campanella sp. 1			3					1						2	1	2		2		11	4.4	TR
Campanella sp. 2																1				1	0.4	TR
Panaceae																						
Panus fasciatus		2	1																	3	1.2	Elkhateeb & Daba (2022)
Panus sp. 1		1																	1	2	0.8	TR
Panus sp. 2			1																	1	0.4	TR
Panus sp. 3																	2			2	0.8	TR
Panus sp. 4								1									1	1		3	1.2	TR
Panus sp. 5		1																		1	0.4	TR
Phyllotopsidaceae																						
Pleurocybella sp.								3												3	1.2	TR
Pleurotaceae																						
Hohenbeuhelia sp. 1			2																	2	0.8	TR
Hohenbeuhelia sp. 2			1																	1	0.4	TR
Hohenbuehelia sp. 3				1	1					2		1	1			1				7	2.8	TR

Table 3 Continued.

Family /Genera /Species	PK	HK	PD	TP	MF	ML	NL	MFU	HM	DP	PN	MS	KC	KS	KP	SV	PT	DL	CK	Total	OF	References
Hohenbuehelia sp. 4	2																			2	0.8	TR
Hohenbuehelia sp. 5	1																			1	0.4	TR
H. flabelliformis			1								1									2	0.8	TR
H. lageniformis	1							1	1		1									4	1.6	Phonemany et al. (2023)
H. tristis	4	3	2	1			2	5		3	1					1		4		26	10.4	Phonemany et al. (2023)
Pleurotus djamor								2												2	0.8	Phonemany et al. (2021)
P. djamor var. *fuscopruinosus*																2				2	0.8	Phonemany et al. (2024)
Pleurotus giganteus	2		1													2				5	2	Phonemany et al. (2021)
Pleurotus sp. 1					4				1											5	2	TR
Pleurotus sp. 2							2													2	0.8	TR
Pluerotus sp. 3					1															1	0.4	TR
Pleurotus sp. 4			3				1													4	1.6	TR
Resupinatus sp. 1				1						4										5	2	TR
Resupinatus sp. 2							1											1		2	0.8	TR
Polyporaceae																						
Lentinus sp. 1			2	1																3	1.2	TR
Lentinus sp. 2		1																		1	0.4	TR
L. squarrosulus	1		1		1															3	1.2	Sysouphanthong et al. (2023)
Schizophyllaceae																						
Schizophyllum commune	1				1			1				1		1	1					6	2.4	Kumar et al. (2022)
Shicophylum sp. 1													4							4	1.6	TR
Tapinellaceae																						
Tapinella sp.	1																			1	0.4	TR

Table 3 Continued.

Family /Genera /Species	PK	HK	PD	TP	MF	ML	NL	MFU	HM	DP	PN	MS	KC	KS	KP	SV	PT	DL	CK	Total
Species richness (S)	23	14	25	11	3	3	5	12	2	8	10	3	1	2	2	8	4	8	2	250
Number of mushroom samples	52	18	45	13	6	4	10	23	2	16	11	4	4	3	2	11	7	16	2	
Shannon's diversity index (*H'*)	3.05	2.91	3.34	2.73	1.03	1.29	1.75	2.55	0.94	2.14	2.68	1.29	0	0.8	0.94	2.33	1.49	2.17	0.94	
Evenness_e^H/S	0.92	1.31	1.31	1.4	0.93	1.21	1.15	1.07	1.28	1.06	1.46	1.12	1	1.11	1.28	1.29	1.11	1.1	1.28	

Note – PK, Pox Kaeo village; HK, Huay Kaeo village; PD, Pa Deng village; TP, Tha Pha village; MF, Mae Feak village; MT, Mae Toe village; NL, Nang Lae Nai Village; MFU, Mae Fah Lung University; HM, Huay Mae Suk; DP, Doi Pui; PN, Pha Ngae village; MS, Mae Sai; KC, Kroung Ching; KS, Khlong Sok subdistrict; KP, Khao Phanom District; SV, Sirivong subdistricts; PT, Phouthong Temple; DL, Dong Luang district; CK, Chiang Khan; OF, Percentage of occurrence frequency (%); S, Species richness; T, Total; TR, Under taxonomic review.

Conflicts of interest

The authors declare that there is no conflict of interest. The work has been authorized for submission by all authors. The writers attest that this work is unique, unpublished, and not presently being considered for publication anywhere else.

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