

**Providing Endophytic Fungi with Taxonomic Classifications Using DNA Taxonomy  
and DNA Barcoding**

by

Hannah Oh

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Supervisor: Dr. Christopher Gray, Departments of Biological Sciences and Chemistry

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SAINT JOHN

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## **Abstract**

Accurate taxonomic classifications are essential when conducting research about an organism. Over the years, the discovery of DNA sequence-based classification techniques (DNA barcoding and DNA taxonomy) have revolutionized this process. The Natural Products Research group (NPRG) has a library of fungi that is used to isolate bioactive molecules. In order for the NPRG to communicate the results of their studies, it is critical that the fungal isolates are provided with accurate taxonomic classifications. Therefore, this study provided fungal isolates from the NPRG's fungal collection with taxonomic classifications by using DNA barcoding in conjunction with DNA taxonomy. In doing so, 300 of the NPRG's fungal isolates were grouped into 158 taxonomic families.

## **Acknowledgements**

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## Introduction

Organisms must be provided with proper taxonomic classifications to allow researchers to communicate information about the organisms to the scientific community.<sup>1-</sup>

<sup>4</sup> Taxonomic classifications are made by grouping organisms together based on their shared characteristics, such as morphology, genetics, metabolism, etc.<sup>5</sup> By knowing an organism's taxonomic classification, it enables researchers to find and communicate information about the organism, such as determining the environments the organisms inhabit.<sup>6,7</sup>

Before the 1980s, taxonomic classifications were based primarily on morphological characteristics of organisms.<sup>3,8</sup> However, relying solely on morphometrics can be challenging due to the complex nature of organisms. For example, it is not uncommon for organisms within the same evolutionary lineage (i.e., the same species) to possess phenotypic plasticity and therefore exhibit different morphological characteristics.<sup>3,9,10</sup> This situation can result in organisms from the same species being classified as separate species leading to synonymy and duplication of taxa.<sup>3,9</sup> Additionally, organisms from closely related species often share many morphological characteristics, look similar, and therefore are erroneously placed in the same taxon, further complicating the process.<sup>11,12</sup> As a result, characterising an organism based on its morphology is not a trivial task and input from highly trained and experienced taxonomic experts is often needed to accurately identify problematic species.

Due to the challenges related to morphology-based taxonomy, DNA sequence-based classification techniques (e.g. DNA taxonomy and DNA barcoding) have been developed.<sup>13-15</sup> These DNA sequence-based classification techniques are particularly helpful for scientists that do not have training or expertise in morphological taxonomy,

and facilitate the classification and identification of organisms that may be challenging to classify based solely on morphology.<sup>3</sup> This is often the case for many species of fungi, where researchers are often limited to the examination of transient morphological characteristics, such as reproductive structures or fruiting bodies, for their taxonomic markers.<sup>3,16</sup> Moreover, the process of using these morphological structures to identify fungi is a tedious process requiring years of training and expert knowledge.<sup>17,18</sup>

DNA sequence-based classification techniques exploit the differences in DNA sequences that result from genetic variation between different organisms.<sup>19</sup> A commonly used DNA sequence-based classification technique is DNA barcoding. DNA barcoding uses short (400-800 base pairs) regions of DNA that are characteristic to related groups of organisms.<sup>3,20</sup> These regions of DNA have been termed DNA barcodes through analogy with barcodes used in retail businesses. Groups of organisms each have a standard DNA barcode that is often chosen by consensus and recommended by appropriate panels of expert taxonomists.<sup>3</sup> For example, in 2011, an international consortium of mycologists compared six regions of DNA and nominated the internal transcribed spacer (ITS) region as the official fungal DNA barcode.<sup>3,21,22</sup>

To classify unknown organisms using DNA barcoding, the DNA sequences from unknown organisms are matched to lists of annotated sequences, which are sequences that have been provided with descriptive information such as, the name of the organism the DNA sequence was isolated from.<sup>23</sup> The annotated DNA sequences are published in public databases such as GenBank created by the National Centre for Biotechnology Information (NCBI), the European Nucleotide Sequence Archive of the European Molecular Biology Laboratory (EMBL), and the DNA Data Bank of Japan (DDBJ).<sup>24-26</sup>

Through the use of DNA barcoding, it has become less challenging to taxonomically identify organisms. However, DNA barcoding should be used with caution as there are limitations.<sup>9,27</sup> The main concern with DNA barcoding is that numerous DNA databases are publicly accessible, meaning a sequence, whether accurately annotated or not, can be uploaded to the database by any researcher.<sup>28-31</sup> As a consequence, there are alarming amounts of inaccurately annotated sequences in the DNA databases (recent estimates indicate that up to 20% of the publicly available DNA sequences are inaccurately annotated).<sup>3,32</sup> To overcome this limitation, it has been strongly recommended that DNA barcoding only be used in conjunction with DNA taxonomy.<sup>15,33</sup>

Parallel to DNA barcoding, DNA taxonomy is based on observing genetic similarities between different organisms.<sup>3,19</sup> However, unlike DNA barcoding, DNA taxonomy classifies unknown organisms by studying taxonomic relationships between the organisms.<sup>3,34,35</sup> This can be done by grouping unknown DNA sequences into clades (single common ancestor and all its descendants) with other similar DNA sequences that can be found in databases, such as the User-friendly Nordic ITS Ectomycorrhiza Database (UNITE) and the NCBI's reference sequence database.<sup>36-38</sup> By doing so, the DNA sequences are placed into an evolutionary framework (i.e., the DNA sequences of the unknown organisms are used to build a phylogenetic tree) and the unknown organisms can be provided with a taxonomic classification by observing which clades they are grouped into.<sup>3,34,39,40</sup> The benefit of this is that it allows a researcher to evaluate the accuracy of the identifications provided by the annotations associated with matched DNA barcodes contained in public databases.

The Natural Products Research Group (NPRG) from the University of New Brunswick Saint John (UNB-SJ) has a library of more than 500 fungal isolates from which they isolate and identify new biologically active molecules.<sup>41-55</sup> In order for researchers from the NPRG to report and disseminate the results of their chemical studies, it is critical that the fungal source of the molecules is accurately identified. Therefore, DNA from each of the isolates in the NPRG library was previously isolated and the fungi were classified using a DNA barcoding/DNA taxonomy approach.<sup>56</sup> However, limitations relating to the use of appropriate reference sequences in these analyses have raised concerns that there may be inaccurately identified fungi within the NPRG's collection.<sup>56</sup> Therefore, the objective of the current study was to improve the DNA-based classification method employed by the NPRG in an effort to provide appropriate and accurate taxonomic classifications for the fungi in their library.

## **Experimental**

### **DNA sequences**

DNA from the ITS region was isolated from 319 fungal isolates using forward and reverse universal fungal ITS primers (ITS1F and ITS4 respectively). After PCR amplification and sequencing of the isolated DNA, consensus sequences were assembled using the fungal isolate's forward and reverse DNA sequences.<sup>56</sup>

### **DNA barcoding**

DNA barcoding was performed using the BLAST search tool to match sequences with those contained within the GenBank database.<sup>24</sup> All isolates were identified to the lowest taxonomic level, preferably either the genus or species. A best matched DNA barcoding identification was selected for each fungal isolate by using the identification that was most frequently matched with the fungal isolate. The following threshold values were used when evaluating the matches provided by the BLAST searches; a query coverage of  $\geq 80\%$ , and an E-value of zero was used for all identifications; a percent identity of  $\geq 98\%$ , was used for the species level identifications; isolates identified to the genus level had a percent identity of  $\geq 95\%$ ; isolates identified to the family level had a percent identity of  $\geq 90\%$ ; isolates identified to the order level had a percent identity of  $\geq 85\%$ ; isolates identified to the class level had a percent identity of  $\geq 80\%$ .<sup>3</sup>

### **Selection of reference sequences**

The DNA barcoding identifications were used to determine all of the orders of fungi that were represented in the fungal collection. Reference sequences for every family within the respective orders were then obtained from the UNITE database in the general FASTA release format. These family-level reference sequences were used to inform the subsequent

DNA taxonomy analyses of the library (i.e., a phylogenetic tree was constructed using the DNA sequences of the NPRG's library and the family-level reference sequences).

### **DNA taxonomy**

To construct the phylogenetic trees, all DNA sequences (the DNA sequences of NPRG's library and reference sequences) were aligned into a multiple sequence alignment (MSA) using the Multiple Sequence Comparison by Log-Expectation (MUSCLE) alignment tool.<sup>57</sup> The MSA was then used to construct a phylogenetic tree using the Molecular Evolutionary Genetics Analysis version X (MEGA X) software.<sup>58</sup> Three phylogenetic tree estimating methods (maximum parsimony, maximum likelihood, and neighbour joining) were used, each constructing a phylogenetic tree with 1000 bootstrap replicates. The phylogenetic tree was exported as the Newick format to be analyzed using the Interactive Tree Of Life (iTOL) software.<sup>59</sup>

## Results

### DNA barcoding identifications

The DNA barcoding identifications that were used for this study were previously obtained in 2020.<sup>56</sup> Based on the DNA barcoding identifications it was concluded that the NPRG's fungal isolates belonged to 29 orders of fungi (Table 1.). Reference sequences were chosen for every family within the respective orders, which resulted in having 270 family-level reference sequences (Appendix A).

**Table 1.** The 29 orders of fungi the NPRG's fungal isolates belong to.

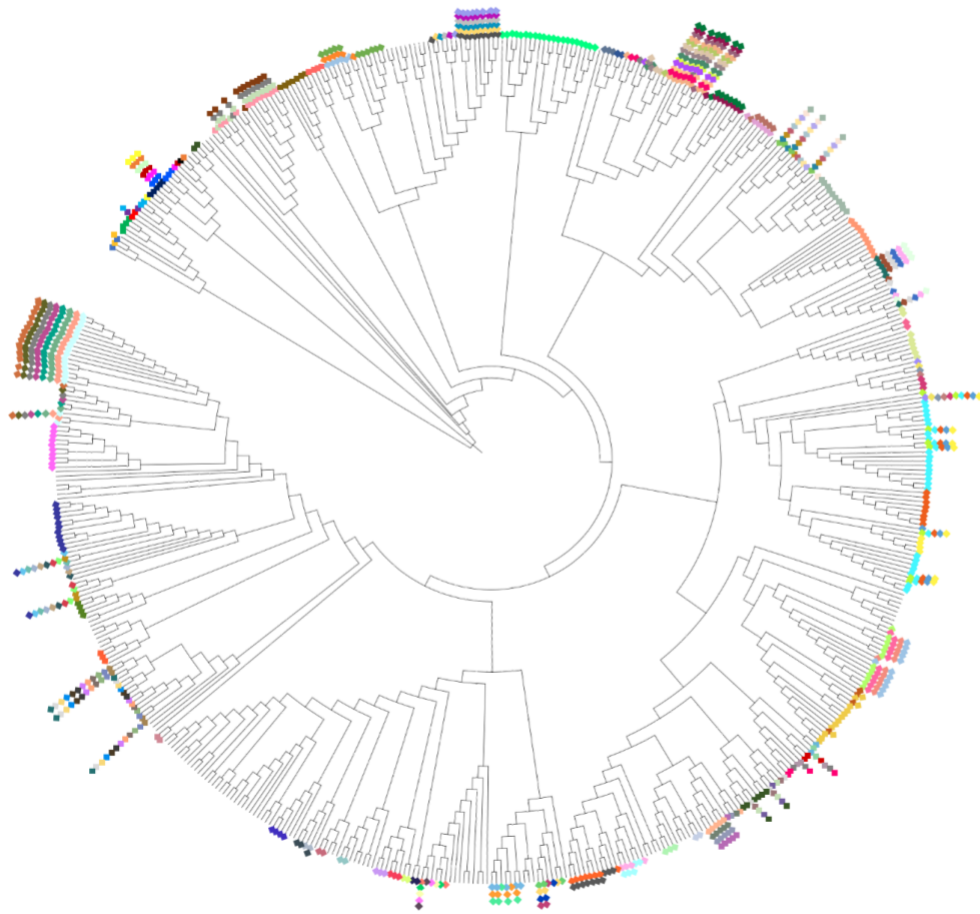
Order
Glomerellales
Cladosporiales
Hypocreales
Pleosporales
Amphisphaeriales
Sordariales
Diaporthales
Helotiales
Xylariales
Eurotiales
Chaetomellales
Phacidiales
Coniochaetales
Tremellales
Capnodiales
Rhytismatales
Polyporales

**Table 1.** Continued

<b>Order</b>
Agaricales
Mycosphaerellales
Sporidiobolales
Dothideales
Botryosphaeriales
Mortierellales
Umbelopsidales
Saccharomycetales
Mucorales
Filobasidiales
Pezizales
Boliniales

#### **DNA taxonomy classifications**

From the three phylogenetic tree estimating methods, the neighbour joining method estimated a phylogenetic tree with the best bootstrap values (i.e., had the most confidence in this phylogenetic tree) thus this phylogenetic tree was chosen to be interpreted. In the final phylogenetic tree, a total of 570 ITS sequences were included. Of the 570 sequences, 270 sequences were family-level reference sequences, while the other 300 sequences were from the NPRG's fungal collection. After interpreting the final phylogenetic tree, it was concluded that the NPRG's fungal isolates were grouped into 158 taxonomic families (Figure 1.).



- |                            |                         |                           |                            |                           |                            |
|----------------------------|-------------------------|---------------------------|----------------------------|---------------------------|----------------------------|
| ■ = Cordycipitaceae        | ■ = Harknessiaceae      | ■ = Diatrypaceae          | ■ = Chlorociboriaceae      | ■ = Phaffomycetaceae      | ■ = Anteagloniaceae        |
| ■ = Amorphanthaceae        | ■ = Gnomoniaceae        | ■ = Hypoxylaceae          | ■ = Aplosporellaceae       | ■ = Rhizopodaceae         | ■ = Halothiaceae           |
| ■ = Chaetomiaceae          | ■ = Phyllostictaceae    | ■ = Sporocadaceae         | ■ = Chaetomellaceae        | ■ = Micoraceae            | ■ = Pleosporaceae          |
| ■ = Lasiosphaeriaceae      | ■ = Rutstroemiaceae     | ■ = Apiosporaceae         | ■ = Saccoteliaceae         | ■ = Backusellaceae        | ■ = Periconiaceae          |
| ■ = Diplogelasinosporaceae | ■ = Sclerotiniaceae     | ■ = Microdochliaceae      | ■ = Dothideaceae           | ■ = Chaetocladiaceae      | ■ = Anastomitrabeculiaceae |
| ■ = Schizotheciaceae       | ■ = Vandijkellaceae     | ■ = Beltraniaceae         | ■ = Dothioraceae           | ■ = Mycotyphaceae         | ■ = Teichosporaceae        |
| ■ = Niessliaceae           | ■ = Lachnaceae          | ■ = Pseudotruncatellaceae | ■ = Calloriaceae           | ■ = Trimorphomycetaceae   | ■ = Trematosphaeriaceae    |
| ■ = Ophiocordycipitaceae   | ■ = Neocrimulaceae      | ■ = Hyponeuriaceae        | ■ = Hematocanthoscyphaceae | ■ = Incrustosporiaceae    | ■ = Latoruaceae            |
| ■ = Hypocreaceae           | ■ = Tricladaceae        | ■ = Clypeophysalospora    | ■ = Byroglossaceae         | ■ = Mortierellaceae       | ■ = Corynesporascaceae     |
| ■ = Clavicipitaceae        | ■ = Demataceae          | ■ = Sarcosomataceae       | ■ = Discinellaceae         | ■ = Sporidiobolaceae      | ■ = Bambusicolaceae        |
| ■ = Bionectriaceae         | ■ = Leptodontidiaceae   | ■ = Pyronemataceae        | ■ = Godroniaceae           | ■ = Sirobasidaceae        | ■ = Lentitheciaceae        |
| ■ = Tilachlidiaceae        | ■ = Hyaloscyphaceae     | ■ = Tuberaceae            | ■ = Helicogoniaceae        | ■ = Piskurozymataceae     | ■ = Didymosphaeriaceae     |
| ■ = Stachybotryaceae       | ■ = Phaciaceae          | ■ = Morchellaceae         | ■ = Marthamycetaceae       | ■ = Dacrybolaceae         | ■ = Didymellaceae          |
| ■ = Boliniaceae            | ■ = Chlorospleniaceae   | ■ = Discinaceae           | ■ = Helotiaceae            | ■ = Meripilaceae          | ■ = Neopyrenochaetaceae    |
| ■ = Sarcodiaceae           | ■ = Ploetnerulaceae     | ■ = Hevellaceae           | ■ = Hyphodiscaceae         | ■ = Polyporaceae          | ■ = Leptosphaeriaceae      |
| ■ = Reticulascaceae        | ■ = Mollisiaceae        | ■ = Plectosphaerellaceae  | ■ = Zalaraceae             | ■ = Helminthosphaeriaceae | ■ = Phaeosphaeriaceae      |
| ■ = Australiascaceae       | ■ = Vibrissaceae        | ■ = Elaphomycetaceae      | ■ = Botryosphaeriaceae     | ■ = Paradictyarthriaceae  | ■ = Cucurbitariaceae       |
| ■ = Glomerellaceae         | ■ = Nothodactylariaceae | ■ = Penicillaginaceae     | ■ = Neolauriomycetaceae    | ■ = Lindomycetaceae       | ■ = Pseudopyrenochaetaceae |
| ■ = Lamproconiaceae        | ■ = Coniocessaceae      | ■ = Aspergillaceae        | ■ = Cochlearomycetaceae    | ■ = Occultibamusaceae     | ■ = Coniothriaceae         |
| ■ = Nectriaceae            | ■ = Zygosporiaceae      | ■ = Thermosaceae          | ■ = Rhytismataceae         | ■ = Pleomassariaceae      | ■ = Shiraiaceae            |
| ■ = Melanconiellaceae      | ■ = Xylariaceae         | ■ = Trichocomaceae        | ■ = Cudoniaceae            | ■ = Nigrogranaceae        | ■ = Parapyrenochaetaceae   |
| ■ = Diaporthiaceae         | ■ = Gyrothricaceae      | ■ = Teratosphaeriaceae    | ■ = Pichiaceae             | ■ = Blastriosporaceae     |                            |
| ■ = Juglanconidaceae       | ■ = Fasciatisporaceae   | ■ = Neodevriiaceae        | ■ = Lipomycetaceae         | ■ = Hypostromataceae      |                            |
| ■ = Erythroglaoceae        | ■ = Fasciatisporaceae   | ■ = Extremaceae           | ■ = Alloascoideaceae       | ■ = Hermatimycetaceae     |                            |
| ■ = Dwiropaceae            | ■ = Barrmaeliaceae      | ■ = Mycosphaerellaceae    | ■ = Umblopsidaceae         | ■ = Tetraplosporaeraceae  |                            |
| ■ = Synnemasporellaceae    | ■ = Vialaceae           | ■ = Piedriaceae           | ■ = Saccharomycetaceae     | ■ = Testudinaceae         |                            |
|                            |                         | ■ = Cladosporiaceae       | ■ = Dipodascaceae          | ■ = Sporomycetaceae       |                            |

**Figure 1.** Phylogenetic tree including all 570 sequences (NPRG sequences and family-level reference sequences) estimated using neighbour-joining method with 1000 bootstrap replicates. The exterior colors are representing the taxonomic families the NPRG's fungal isolates were grouped into.

When analyzing the final phylogenetic tree, bootstrap values were evaluated to determine the level of confidence for each taxonomic classification/grouping that was found for the NPRG’s fungal collection. Analysis of the taxonomic groupings determined that 68 (23%) of the fungal isolates were classified/grouped with high confidence (bootstrap values were >70%), 35 (12%) of the fungal isolates were classified/grouped with moderate confidence (bootstrap values were between 50%-70%), and 196 (65%) of the fungal isolates were classified/grouped with low confidence (bootstrap values were <50%).<sup>60,61</sup> In addition, it was concluded that 217 DNA taxonomy classifications matched the DNA barcoding identifications, which correlates to 72% of the fungal library (Table 2.).

**Table 2.** Comparison of DNA barcoding identifications and DNA taxonomy classifications. The matched column is indicating whether the DNA barcoding identifications and DNA taxonomy classifications are matching down to the family-level. This table is also showing the 158 taxonomic families (resulting from DNA taxonomy) the NPRG’s fungal isolates were grouped into. The taxonomic groupings were chosen based on bootstrap values and whether or not if the fungal isolate was grouped into the same family as the DNA barcoding identification. This resulted in having some fungal isolates grouped into multiple taxonomic families.

Isolate Code	DNA barcoding identification	DNA taxonomy classification/grouping	Matched
RAS1-015R	<i>Phialocephala</i>	<i>Amorphothecaceae, Cordycipitaceae</i>	No
TC2-041	<i>Chaetomium globosum</i>	<i>Chaetomiaceae</i>	Yes
BRD3-113Y	<i>Chaetomium globosum</i>	<i>Chaetomiaceae</i>	Yes
BRD3-111T	<i>Chaetomium globosum</i>	<i>Chaetomiaceae</i>	Yes
JD1-017E	Ascomycete	<i>Lasiosphaeriaceae, Diplogelasinosporaceae, Schizotheciaceae</i>	Yes
TC2-057	<i>Lasiosphaeriaceae</i>	<i>Schizotheciaceae</i>	No
BRD2-133H	<i>Ilyonectria</i>	<i>Ophiocordycipitaceae</i>	No

**Table 2.** Continued

<b>Isolate Code</b>	<b>DNA barcoding identification</b>	<b>DNA taxonomy classification/grouping</b>	<b>Matched</b>
KP1-131J	<i>Myrothecium</i>	<i>Niessliaceae, Ophiocordycipitaceae, Hypocreaceae, Clavicipitaceae, Bionectriaceae, Tilachlidiaceae, Stachybotryaceae</i>	Yes
JD1-047AP	<i>Lecanicillium</i>	<i>Niessliaceae, Ophiocordycipitaceae, Hypocreaceae, Clavicipitaceae, Bionectriaceae, Tilachlidiaceae, Stachybotryaceae</i>	No
TC2-061	<i>Lecanicillium attenuatum</i>	<i>Niessliaceae, Ophiocordycipitaceae, Hypocreaceae, Clavicipitaceae, Bionectriaceae, Tilachlidiaceae, Stachybotryaceae</i>	No
BRD2-118A	<i>Trichoderma viride</i>	<i>Hypocreaceae</i>	Yes
KP1-135B	<i>Trichoderma</i>	<i>Hypocreaceae</i>	No
JD1-047BB	<i>Physalospora</i>	<i>Boliniaceae</i>	Yes
BRD3-082M	<i>Colletotrichum kahawae</i>	<i>Sarocladiaceae, Reticulascaceae, Australiascaceae, Glomerellaceae</i>	Yes
TC2-078	<i>Colletotrichum acutatum</i>	<i>Sarocladiaceae, Reticulascaceae, Australiascaceae, Glomerellaceae</i>	No
TC2-012	<i>Lophodermium</i>	<i>Reticulascaceae</i>	Yes
BRD3-111B	<i>Colletotrichum lineola</i>	<i>Sarocladiaceae, Reticulascaceae, Australiascaceae, Glomerellaceae</i>	Yes
TC2-028	<i>Colletotrichum graminicola</i>	<i>Sarocladiaceae, Reticulascaceae, Australiascaceae, Glomerellaceae</i>	Yes
TC2-027	<i>Glomerella acutata</i>	<i>Sarocladiaceae, Reticulascaceae, Australiascaceae, Glomerellaceae</i>	Yes
BRD3-105A	<i>Colletotrichum fioriniae</i>	<i>Sarocladiaceae, Reticulascaceae, Australiascaceae, Glomerellaceae</i>	Yes
BRD3-105B	<i>Colletotrichum fioriniae</i>	<i>Sarocladiaceae, Reticulascaceae, Australiascaceae, Glomerellaceae</i>	Yes

**Table 2.** Continued

<b>Isolate Code</b>	<b>DNA barcoding identification</b>	<b>DNA taxonomy classification/grouping</b>	<b>Matched</b>
TC2-086	<i>Colletotrichum</i>	<i>Sarocladiaceae, Reticulascaceae, Australiascaceae, Glomerellaceae</i>	Yes
BRD3-124A	<i>Colletotrichum godetiae</i>	<i>Sarocladiaceae, Reticulascaceae, Australiascaceae, Glomerellaceae</i>	Yes
TC2-019	<i>Glomerella acutata</i>	<i>Sarocladiaceae, Reticulascaceae, Australiascaceae, Glomerellaceae</i>	Yes
JD1-047K	<i>Colletotrichum</i>	<i>Sarocladiaceae, Reticulascaceae, Australiascaceae, Glomerellaceae</i>	Yes
BRD3-111K	<i>Colletotrichum fioriniae</i>	<i>Sarocladiaceae, Reticulascaceae, Australiascaceae, Glomerellaceae</i>	No
BRD3-078C	<i>Physalospora vaccinii</i>	<i>Lamproconiaceae</i>	No
BRD3-078I	<i>Physalospora vaccinii</i>	<i>Lamproconiaceae</i>	No
BRD3-079A	<i>Physalospora vaccinii</i>	<i>Lamproconiaceae</i>	No
BRD3-079G	<i>Physalospora vaccinii</i>	<i>Lamproconiaceae</i>	No
BRD3-083A	<i>Physalospora vaccinii</i>	<i>Lamproconiaceae</i>	No
BRD3-082O	<i>Physalospora vaccinii</i>	<i>Lamproconiaceae</i>	Yes
TC2-084	<i>Fusarium</i>	<i>Nectriaceae</i>	Yes
BRD3-111J	<i>Fusarium acuminatum</i>	<i>Nectriaceae</i>	Yes
TC2-062	<i>Fusarium</i>	<i>Nectriaceae</i>	Yes
JD1-047S	<i>Diaporthe</i>	<i>Melanconiellaceae, Melanconidaceae, Diaporthaceae</i>	Yes
BRD3-081H	<i>Diaporthe</i>	<i>Melanconiellaceae, Melanconidaceae, Diaporthaceae</i>	Yes
JD1-047Z	<i>Sordariomycetes</i>	<i>Melanconiellaceae, Melanconidaceae, Diaporthaceae</i>	Yes
JD1-047D	<i>Diaporthe</i>	<i>Melanconiellaceae, Melanconidaceae, Diaporthaceae</i>	Yes

**Table 2.** Continued

<b>Isolate Code</b>	<b>DNA barcoding identification</b>	<b>DNA taxonomy classification/grouping</b>	<b>Matched</b>
RAS1-015B	<i>Diaporthe</i>	<i>Melanconiellaceae, Melanconidaceae, Diaporthaceae</i>	Yes
JD1-047O	<i>Diaporthe</i>	<i>Diaporthaceae</i>	Yes
JD1-047L	<i>Diaporthe</i>	<i>Diaporthaceae</i>	Yes
KP1-131W	<i>Diaporthe</i>	<i>Diaporthaceae</i>	Yes
JD1-047AI	<i>Diaporthe</i>	<i>Diaporthaceae</i>	Yes
TC2-050	<i>Diaporthaceae</i>	<i>Diaporthaceae</i>	Yes
KP1-131DB	<i>Ophiognomonia</i>	<i>Juglanconidaceae, Erythrogloeaceae, Dwiroopaceae, Synnemasporellaceae, Harknessiaceae, Gnomoniaceae</i>	Yes
JD1-047AR	<i>Plagiostoma</i>	<i>Juglanconidaceae, Erythrogloeaceae, Dwiroopaceae, Synnemasporellaceae, Harknessiaceae, Gnomoniaceae</i>	Yes
SS1-033S	<i>Plagiostoma</i>	<i>Juglanconidaceae, Erythrogloeaceae, Dwiroopaceae, Synnemasporellaceae, Harknessiaceae, Gnomoniaceae</i>	Yes
JD1-047X	<i>Gnomoniaceae</i>	<i>Juglanconidaceae, Erythrogloeaceae, Dwiroopaceae, Synnemasporellaceae, Harknessiaceae, Gnomoniaceae</i>	Yes
TC2-069	<i>Plagiostoma</i>	<i>Juglanconidaceae, Erythrogloeaceae, Dwiroopaceae, Synnemasporellaceae, Harknessiaceae, Gnomoniaceae</i>	Yes
JD1-047AJ	<i>Plagiostoma</i>	<i>Juglanconidaceae, Erythrogloeaceae, Dwiroopaceae, Synnemasporellaceae, Harknessiaceae, Gnomoniaceae</i>	Yes
JD1-047AQ	<i>Plagiostoma</i>	<i>Juglanconidaceae, Erythrogloeaceae, Dwiroopaceae, Synnemasporellaceae, Harknessiaceae, Gnomoniaceae</i>	Yes

**Table 2.** Continued

<b>Isolate Code</b>	<b>DNA barcoding identification</b>	<b>DNA taxonomy classification/grouping</b>	<b>Matched</b>
JD1-047BK	<i>Plagiostoma</i>	<i>Juglanconidaceae, Erythrogloeaceae, Dwiroopaceae, Synnemasporellaceae, Harknessiaceae, Gnomoniaceae</i>	Yes
JD1-047AZ	<i>Plagiostoma</i>	<i>Juglanconidaceae, Erythrogloeaceae, Dwiroopaceae, Synnemasporellaceae, Harknessiaceae, Gnomoniaceae</i>	Yes
JAJ1-121	<i>Phyllosticta</i>	<i>Phyllostictaceae</i>	Yes
SS1-033P	<i>Phyllosticta</i>	<i>Phyllostictaceae</i>	Yes
BRD3-111E	<i>Phyllosticta pyrolae</i>	<i>Phyllostictaceae</i>	Yes
BRD3-105M	<i>Phyllosticta pyrolae</i>	<i>Phyllostictaceae</i>	Yes
JAJ1-061	<i>Phyllosticta</i>	<i>Phyllostictaceae</i>	Yes
JD1-047AA	<i>Phyllosticta</i>	<i>Phyllostictaceae</i>	Yes
JAJ1-145	<i>Phyllosticta</i>	<i>Phyllostictaceae</i>	Yes
TC2-014	<i>Phomopsis vaccinii</i>	<i>Phyllostictaceae</i>	No
KP1-123B	<i>Penicillium</i>	<i>Phyllostictaceae</i>	No
KP1-131N	<i>Paraconiothyrium</i>	<i>Phyllostictaceae</i>	No
BRD3-081D	Helotiales	<i>Phyllostictaceae</i>	No
BRD3-081J	<i>Hypoxylon</i>	<i>Phyllostictaceae</i>	No
BRD3-081I	<i>Hypoxylon</i>	<i>Phyllostictaceae</i>	No
KP1-017C	<i>Coprinellus</i>	<i>Phyllostictaceae</i>	No
KP1-131V	<i>Hyaloscyphaceae</i>	<i>Phyllostictaceae</i>	No
KP1-131BB	<i>Hyaloscyphaceae</i>	<i>Phyllostictaceae</i>	No
KP1-131H	<i>Microdochium</i>	<i>Phyllostictaceae</i>	No
KP1-131C	<i>Thysanophora</i>	<i>Phyllostictaceae</i>	No
KP1-135D	<i>Dendryphiella</i>	<i>Phyllostictaceae</i>	No
KP1-045K	<i>Dendryphiella</i>	<i>Phyllostictaceae</i>	No
KP1-089A	Helotiales	<i>Rutstroemiaceae</i>	Yes
KP1-017A	Helotiales	<i>Rutstroemiaceae</i>	Yes

**Table 2.** Continued

<b>Isolate Code</b>	<b>DNA barcoding identification</b>	<b>DNA taxonomy classification/grouping</b>	<b>Matched</b>
TC2-031	<i>Botryotinia fuckeliana</i>	<i>Sclerotiniaceae</i>	Yes
JD1-047BM	<i>Lachnum virgineum</i>	<i>Lachnaceae</i>	Yes
BRD2-125G	<i>Hyaloscyphaceae</i>	<i>Leptodontidiaceae, Hyaloscyphaceae, Phacidiaceae</i>	Yes
TC2-013	<i>Phacidium</i>	<i>Phacidiaceae</i>	Yes
KP1-131B	<i>Hyaloscyphaceae</i>	<i>Vandijckellaceae, Lachnaceae, Neocrinulaceae, Tricladiaceae, Dermateaceae, Leptodontidiaceae, Hyaloscyphaceae, Phacidiaceae, Chlorospleniaceae, Ploettnerulaceae, Mollisiaceae, Vibrisseaceae</i>	Yes
TC2-035	<i>Dermateaceae</i>	<i>Vandijckellaceae, Lachnaceae, Neocrinulaceae, Tricladiaceae, Dermateaceae, Leptodontidiaceae, Hyaloscyphaceae, Phacidiaceae, Chlorospleniaceae, Ploettnerulaceae, Mollisiaceae, Vibrisseaceae</i>	Yes
JD1-047BN	<i>Neomollisia</i>	<i>Vandijckellaceae, Lachnaceae, Neocrinulaceae, Tricladiaceae, Dermateaceae, Leptodontidiaceae, Hyaloscyphaceae, Phacidiaceae, Chlorospleniaceae, Ploettnerulaceae, Mollisiaceae, Vibrisseaceae</i>	Yes
JD1-047AN	<i>Mollisia</i>	<i>Vandijckellaceae, Lachnaceae, Neocrinulaceae, Tricladiaceae, Dermateaceae, Leptodontidiaceae, Hyaloscyphaceae, Phacidiaceae, Chlorospleniaceae, Ploettnerulaceae, Mollisiaceae, Vibrisseaceae</i>	Yes
KP1-131R	<i>Mollisia</i>	<i>Vandijckellaceae, Lachnaceae, Neocrinulaceae, Tricladiaceae, Dermateaceae, Leptodontidiaceae, Hyaloscyphaceae, Phacidiaceae, Chlorospleniaceae, Ploettnerulaceae, Mollisiaceae, Vibrisseaceae</i>	Yes
KP1-131F	<i>Mollisia</i>	<i>Vandijckellaceae, Lachnaceae, Neocrinulaceae, Tricladiaceae, Dermateaceae, Leptodontidiaceae, Hyaloscyphaceae, Phacidiaceae, Chlorospleniaceae, Ploettnerulaceae, Mollisiaceae, Vibrisseaceae</i>	Yes

Table 2. Continued

Isolate Code	DNA barcoding identification	DNA taxonomy classification/grouping	Matched
JD1-047BH	Ascomycota	<i>Vandijckellaceae, Lachnaceae, Neocrinulaceae, Tricladiaceae, Dermateaceae, Leptodontidiaceae, Hyaloscyphaceae, Phacidiaceae, Chlorospleniaceae, Ploettnerulaceae, Mollisiaceae, Vibrisseaceae</i>	Yes
RAS1-015Q	<i>Phialocephala</i>	<i>Vandijckellaceae, Lachnaceae, Neocrinulaceae, Tricladiaceae, Dermateaceae, Leptodontidiaceae, Hyaloscyphaceae, Phacidiaceae, Chlorospleniaceae, Ploettnerulaceae, Mollisiaceae, Vibrisseaceae</i>	Yes
JD1-017A	<i>Phialocephala piceae</i>	<i>Mollisiaceae, Vibrisseaceae</i>	Yes
BRD2-125F	<i>Phialocephala fortinii</i>	<i>Mollisiaceae, Vibrisseaceae</i>	Yes
BRD2-149Y	<i>Phialocephala</i>	<i>Mollisiaceae, Vibrisseaceae</i>	Yes
BRD3-113C	<i>Phialocephala</i>	<i>Mollisiaceae, Vibrisseaceae</i>	Yes
BRD2-145L	<i>Phialocephala</i>	<i>Mollisiaceae, Vibrisseaceae</i>	Yes
TC3-006	<i>Coniochaeta</i>	<i>Nothodactylariaceae, Coniocessiaceae</i>	No
SS1-033A	<i>Coniochaeta</i>	<i>Nothodactylariaceae, Coniocessiaceae</i>	No
SS1-033B	<i>Coniochaeta</i>	<i>Nothodactylariaceae, Coniocessiaceae</i>	No
JD1-047E	<i>Coniochaeta</i>	<i>Nothodactylariaceae, Coniocessiaceae</i>	No
KP1-119E	<i>Coniochaeta</i>	<i>Nothodactylariaceae, Coniocessiaceae</i>	No
JD1-017C	<i>Nemania serpens</i>	<i>Zygosporiaceae, Xylariaceae, Gyrothricaceae, Fasciatisporaceae, Barrmaeliaceae, Vialaeaceae, Diatrypaceae, Hypoxylaceae</i>	Yes
BRD3-107A	<i>Daldinia decipiens</i>	<i>Zygosporiaceae, Xylariaceae, Gyrothricaceae, Fasciatisporaceae, Barrmaeliaceae, Vialaeaceae, Diatrypaceae, Hypoxylaceae</i>	Yes
JAJ1-157	<i>Hypoxylon perforatum</i>	<i>Zygosporiaceae, Xylariaceae, Gyrothricaceae, Fasciatisporaceae, Barrmaeliaceae, Vialaeaceae, Diatrypaceae, Hypoxylaceae</i>	Yes

**Table 2.** Continued

<b>Isolate Code</b>	<b>DNA barcoding identification</b>	<b>DNA taxonomy classification/grouping</b>	<b>Matched</b>
BRD3-082C	<i>Hypoxylon</i>	<i>Zygosporiaceae, Xylariaceae, Gyrothricaceae, Fasciatisporaceae, Barrmaeliaceae, Vialaeaceae, Diatrypaceae, Hypoxylaceae</i>	Yes
BRD3-085R	<i>Hypoxylon</i>	<i>Zygosporiaceae, Xylariaceae, Gyrothricaceae, Fasciatisporaceae, Barrmaeliaceae, Vialaeaceae, Diatrypaceae, Hypoxylaceae</i>	Yes
TC2-046	<i>Hypoxylaceae</i>	<i>Hypoxylaceae</i>	Yes
JD1-047P	<i>Annulohypoxylon</i>	<i>Hypoxylaceae</i>	Yes
JD1-047G	<i>Hypoxylon truncatum</i>	<i>Hypoxylaceae</i>	Yes
JAJ1-041	<i>Daldinia childae</i>	<i>Hypoxylaceae</i>	Yes
JAJ1-025	<i>Daldinia childae</i>	<i>Hypoxylaceae</i>	Yes
JD1-047Q	<i>Hypoxylon fuscum</i>	<i>Hypoxylaceae</i>	Yes
SS1-033C	<i>Hypoxylon fuscum</i>	<i>Hypoxylaceae</i>	Yes
BRD3-111N	<i>Hypoxylon fuscum</i>	<i>Hypoxylaceae</i>	Yes
TC2-058	<i>Pestalotiopsis</i>	<i>Sporocadaceae</i>	Yes
TC2-058	<i>Seimatosporium</i>	<i>Sporocadaceae</i>	Yes
TC2-025	<i>Pestalotiopsis</i>	<i>Sporocadaceae</i>	Yes
JAJ-009	<i>Pestalotiopsis</i>	<i>Sporocadaceae</i>	Yes
JAJ1-013	<i>Pestalotiopsis</i>	<i>Sporocadaceae</i>	Yes
JAJ1-163	<i>Pestalotiopsis</i>	<i>Sporocadaceae</i>	Yes
SS1-033E	<i>Pestalotiopsis</i>	<i>Sporocadaceae</i>	Yes
RAS1-015A	<i>Pestalotiopsis</i>	<i>Sporocadaceae</i>	Yes
TC2-054	<i>Nigrospora</i>	<i>Apiosporaceae, Microdochiaceae, Beltraniaceae, Pseudotruncatellaceae, Hyponectriaceae, Clypeophysalospora</i>	Yes
TC2-034	<i>Nigrospora oryzae</i>	<i>Apiosporaceae, Microdochiaceae, Beltraniaceae, Pseudotruncatellaceae, Hyponectriaceae, Clypeophysalospora</i>	Yes

**Table 2.** Continued

<b>Isolate Code</b>	<b>DNA barcoding identification</b>	<b>DNA taxonomy classification/grouping</b>	<b>Matched</b>
KP1-135F	<i>Nigrospora</i>	<i>Apiosporaceae, Microdochiaceae, Beltraniaceae, Pseudotruncatellaceae, Hyponectriaceae, Clypeophysalospora</i>	Yes
JAJ1-097	<i>Nigrospora sphaerica</i>	<i>Apiosporaceae, Microdochiaceae, Beltraniaceae, Pseudotruncatellaceae, Hyponectriaceae, Clypeophysalospora</i>	Yes
SS1-033I	<i>Pestalotiopsis</i>	<i>Apiosporaceae, Microdochiaceae, Beltraniaceae, Pseudotruncatellaceae, Hyponectriaceae, Clypeophysalospora</i>	No
TC1-005A	<i>Pleosporales</i>	<i>Apiosporaceae, Microdochiaceae, Beltraniaceae, Pseudotruncatellaceae, Hyponectriaceae, Clypeophysalospora</i>	No
TC2-082	<i>Pestalotiopsis</i>	<i>Sarcoscyphaceae</i>	No
JAJ1-129	<i>Pezizomycetes</i>	<i>Pyronemataceae</i>	No
JD1-047F	<i>Pseudoplectania episphagnum</i>	<i>Sarcosomataceae</i>	Yes
SS1-033R	<i>Pseudoplectania nigrella</i>	<i>Sarcosomataceae</i>	Yes
JD1-047AC	<i>Pseudoplectania nigrella</i>	<i>Sarcosomataceae</i>	Yes
SS1-033N	<i>Pseudoplectania nigrella</i>	<i>Sarcosomataceae</i>	Yes
JAJ1-105	<i>Paraphaeosphaeria neglecta</i>	<i>Plectosphaerellaceae</i>	No
TC3-014	<i>Fusarium sporotrichioides</i>	<i>Plectosphaerellaceae</i>	No
CT1-016A	<i>Talaromyces minioluteus</i>	<i>Tuberaceae, Morchellaceae, Discinaceae, Helvellaceae, Plectosphaerellaceae, Elaphomycetaceae, Penicillaginaceae, Aspergillaceae, Thermoascaceae, Trichocomaceae</i>	Yes
KP1-123A	<i>Penicillium</i>	<i>Penicillaginaceae</i>	Yes
KP1-017E	<i>Penicillium</i>	<i>Penicillaginaceae</i>	Yes
KP1-033H	<i>Penicillium</i>	<i>Penicillaginaceae</i>	Yes

**Table 2.** Continued

<b>Isolate Code</b>	<b>DNA barcoding identification</b>	<b>DNA taxonomy classification/grouping</b>	<b>Matched</b>
KP1-091A	<i>Penicillium</i>	<i>Penicillaginaceae</i>	Yes
BRD2-118C	<i>Penicillium</i>	<i>Penicillaginaceae</i>	Yes
KP2-033B	<i>Penicillium</i>	<i>Penicillaginaceae</i>	Yes
TC2-067	<i>Penicillium</i>	<i>Penicillaginaceae</i>	Yes
TC2-065	<i>Penicillium</i>	<i>Penicillaginaceae</i>	Yes
KP1-131M	<i>Thysanophora</i>	<i>Elaphomycetaceae, Penicillaginaceae, Aspergillaceae, Thermoascaceae, Trichocomaceae</i>	Yes
KP1-131DA	<i>Thysanophora</i>	<i>Elaphomycetaceae, Penicillaginaceae, Aspergillaceae, Thermoascaceae, Trichocomaceae</i>	Yes
KP1-013B	<i>Penicillium</i>	<i>Penicillaginaceae</i>	Yes
TC2-020	<i>Penicillium</i>	<i>Penicillaginaceae</i>	Yes
CT1-006B	<i>Penicillium</i>	<i>Penicillaginaceae</i>	Yes
BRD2-117U	<i>Penicillium</i>	<i>Penicillaginaceae</i>	Yes
BRD2-117M	<i>Penicillium</i>	<i>Penicillaginaceae</i>	Yes
BRD2-118B	<i>Penicillium</i>	<i>Penicillaginaceae</i>	Yes
BRD2-125X	<i>Penicillium</i>	<i>Penicillaginaceae</i>	Yes
KP1-131L	<i>Penicillium</i>	<i>Penicillaginaceae</i>	Yes
BRD2-115M	<i>Penicillium</i>	<i>Penicillaginaceae</i>	Yes
KP1-131Y	<i>Aspergillus fumigatus</i>	<i>Aspergillaceae</i>	Yes
KP1-063N	<i>Aspergillus fumigatus</i>	<i>Aspergillaceae</i>	Yes
KP1-131AA	<i>Aspergillus fumigatus</i>	<i>Aspergillaceae</i>	Yes
KP1-131Q	<i>Aspergillus fumigatus</i>	<i>Aspergillaceae</i>	Yes
KP1-131T	<i>Aspergillus fumigatus</i>	<i>Aspergillaceae</i>	Yes
KP2-025D	<i>Aspergillus fumigatus</i>	<i>Aspergillaceae</i>	Yes
KP2-001C	<i>Aspergillus fumigatus</i>	<i>Aspergillaceae</i>	Yes
TC2-064	<i>Penicillium</i>	<i>Elaphomycetaceae, Penicillaginaceae, Aspergillaceae, Thermoascaceae, Trichocomaceae</i>	Yes
CT1-031A	<i>Talaromyces minioluteus</i>	<i>Trichocomaceae</i>	Yes

**Table 2.** Continued

<b>Isolate Code</b>	<b>DNA barcoding identification</b>	<b>DNA taxonomy classification/grouping</b>	<b>Matched</b>
KP1-175G	<i>Trichocomaceae</i>	<i>Trichocomaceae</i>	Yes
CT1-008A	<i>Talaromyces minioluteus</i>	<i>Trichocomaceae</i>	Yes
KP1-135C	<i>Penicillium roseopurpureum</i>	<i>Penicillaginaceae</i>	Yes
KP1-045A	<i>Penicillium</i>	<i>Penicillaginaceae</i>	Yes
KP1-045C	<i>Penicillium</i>	<i>Penicillaginaceae</i>	Yes
KP1-063J	<i>Penicillium</i>	<i>Penicillaginaceae</i>	Yes
KP1-075B	<i>Penicillium</i>	<i>Penicillaginaceae</i>	Yes
KP1-135F.2	<i>Penicillium</i>	<i>Elaphomycetaceae, Penicillaginaceae, Aspergillaceae, Thermoascaceae, Trichocomaceae</i>	Yes
KP1-175L	<i>Penicillium</i>	<i>Elaphomycetaceae, Penicillaginaceae, Aspergillaceae, Thermoascaceae, Trichocomaceae</i>	Yes
KP2-001F	<i>Penicillium</i>	<i>Penicillaginaceae</i>	Yes
KP1-175M	<i>Penicillium</i>	<i>Penicillaginaceae</i>	Yes
BRD3-126C	<i>Zasmidium fructigenum</i>	<i>Teratosphaeriaceae, Neodevriesiaceae, Extremaceae, Mycosphaerellaceae</i>	Yes
SS1-033L	<i>Cercospora</i>	<i>Teratosphaeriaceae, Neodevriesiaceae, Extremaceae, Mycosphaerellaceae</i>	Yes
TC3-005	<i>Cercospora</i>	<i>Teratosphaeriaceae, Neodevriesiaceae, Extremaceae, Mycosphaerellaceae</i>	Yes
KP1-131S	<i>Mycosphaerella nyssicola</i>	<i>Teratosphaeriaceae, Neodevriesiaceae, Extremaceae, Mycosphaerellaceae</i>	Yes
BRD3-125A	<i>Ramularia</i>	<i>Teratosphaeriaceae, Neodevriesiaceae, Extremaceae, Mycosphaerellaceae</i>	Yes
BRD2-083D	<i>Pseudoteratosphaeria</i>	<i>Teratosphaeriaceae, Neodevriesiaceae, Extremaceae, Mycosphaerellaceae</i>	Yes
BRD3-083P	<i>Pseudoteratosphaeria</i>	<i>Teratosphaeriaceae, Neodevriesiaceae, Extremaceae, Mycosphaerellaceae</i>	Yes

**Table 2.** Continued

<b>Isolate Code</b>	<b>DNA barcoding identification</b>	<b>DNA taxonomy classification/grouping</b>	<b>Matched</b>
BRD3-090A	<i>Pseudoteratosphaeria</i>	<i>Teratosphaeriaceae, Neodevriesiaceae, Extremaceae, Mycosphaerellaceae</i>	Yes
BRD3-085G	<i>Pseudoteratosphaeria</i>	<i>Teratosphaeriaceae, Neodevriesiaceae, Extremaceae, Mycosphaerellaceae</i>	Yes
BRD3-121J	<i>Pseudoteratosphaeria</i>	<i>Teratosphaeriaceae, Neodevriesiaceae, Extremaceae, Mycosphaerellaceae</i>	Yes
BRD3-084F	<i>Pseudoteratosphaeria</i>	<i>Teratosphaeriaceae, Neodevriesiaceae, Extremaceae, Mycosphaerellaceae</i>	Yes
BRD3-083K	<i>Bryochiton</i>	<i>Teratosphaeriaceae, Neodevriesiaceae, Extremaceae, Mycosphaerellaceae</i>	No
JAJ1-117	<i>Mycosphaerella</i>	<i>Piedraiaceae, Cladosporiaceae</i>	No
JAJ1-065	<i>Dothideomycetes</i>	<i>Piedraiaceae, Cladosporiaceae</i>	Yes
TC2-030	<i>Cladosporium</i>	<i>Cladosporiaceae</i>	Yes
JAJ1-125	<i>Cladosporium</i>	<i>Cladosporiaceae</i>	Yes
TC2-063	<i>Cladosporium</i>	<i>Cladosporiaceae</i>	Yes
TC2-018	<i>Cladosporium</i>	<i>Cladosporiaceae</i>	Yes
TC2-036	<i>Cladosporium</i>	<i>Cladosporiaceae</i>	Yes
TC2-045	<i>Cladosporium</i>	<i>Cladosporiaceae</i>	Yes
TC2-073	<i>Colletotrichum acutatum</i>	<i>Cladosporiaceae</i>	Yes
BRD3-078J	<i>Cladosporium</i>	<i>Piedraiaceae, Cladosporiaceae</i>	Yes
JAJ1-029	<i>Cladosporium</i>	<i>Cladosporiaceae</i>	Yes
TC2-074	<i>Cladosporium</i>	<i>Cladosporiaceae</i>	No
SS1-033M	<i>Capronia</i>	<i>Cladosporiaceae</i>	No
TC2-089	<i>Chaetomellaceae</i>	<i>Chlorociboriaceae, Aplosporellaceae, Chaetomellaceae, Saccotheciaceae, Dothideaceae, Dothioraceae</i>	Yes
JAJ1-073	<i>Aureobasidium pullulans</i>	<i>Chaetomellaceae</i>	Yes
JAJ1-149	<i>Dothideomycetes</i>	<i>Saccotheciaceae, Dothideaceae, Dothioraceae</i>	Yes

**Table 2.** Continued

<b>Isolate Code</b>	<b>DNA barcoding identification</b>	<b>DNA taxonomy classification/grouping</b>	<b>Matched</b>
BRD2-125O	<i>Oidiodendron</i>	<i>Dothioraceae</i>	No
BRD2-121F	Ascomycota	<i>Calloriaceae, Hamatocanthoscyphaceae, Bryoglossaceae, Discinellaceae, Godroniaceae</i>	Yes
BRD3-083W	Ascomycota	<i>Godroniaceae</i>	Yes
BRD3-082B	<i>Godronia</i>	<i>Godroniaceae</i>	Yes
BRD3-081C	<i>Encoeliopsis rhododendri</i>	<i>Godroniaceae</i>	Yes
BRD3-084I	<i>Godronia</i>	<i>Calloriaceae, Hamatocanthoscyphaceae, Bryoglossaceae, Discinellaceae, Godroniaceae</i>	Yes
BRD3-078K	<i>Godronia</i>	<i>Godroniaceae</i>	Yes
JAJ1-021	<i>Pezicula neosporulosa</i>	<i>Godroniaceae</i>	Yes
JAJ1-005	<i>Pezicula</i>	<i>Helicogoniaceae, Marthamycetaceae, Helotiaceae, Hyphodiscaceae</i>	No
RAS1-015H	<i>Pezicula sporulosa</i>	<i>Helicogoniaceae, Marthamycetaceae, Helotiaceae, Hyphodiscaceae</i>	No
BRD2-121E	<i>Pezicula</i>	<i>Helicogoniaceae, Marthamycetaceae, Helotiaceae, Hyphodiscaceae</i>	No
BRD2-121C	<i>Pezicula</i>	<i>Helicogoniaceae, Marthamycetaceae, Helotiaceae, Hyphodiscaceae</i>	No
BRD3-078M	<i>Dothiora</i>	<i>Helicogoniaceae, Marthamycetaceae, Helotiaceae, Hyphodiscaceae</i>	No
CT1-011A	<i>Neofusicoccum australe</i>	<i>Zalariaceae</i>	Yes
CT1-007A	<i>Neofusicoccum parvum</i>	<i>Botryosphaeriaceae</i>	Yes
BRD3-113P	Ascomycota	<i>Botryosphaeriaceae</i>	Yes
TC3-009	<i>Dermateaceae</i>	<i>Cochlearomycetaceae</i>	No
SS1-033H	<i>Neofabraea actinidia</i>	<i>Cochlearomycetaceae, Neolauriomycetaceae</i>	No
JAJ1-161	<i>Dermateaceae</i>	<i>Cochlearomycetaceae, Neolauriomycetaceae</i>	No
RAS1-015L	Ascomycota	<i>Cochlearomycetaceae, Neolauriomycetaceae</i>	Yes
RAS-015K	Ascomycota	<i>Cudoniaceae</i>	Yes

**Table 2.** Continued

<b>Isolate Code</b>	<b>DNA barcoding identification</b>	<b>DNA taxonomy classification/grouping</b>	<b>Matched</b>
BRD3-154K	<i>Lophodermium</i>	<i>Cudoniaceae</i>	Yes
BRD3-155A	<i>Lophodermium</i>	<i>Rhytismataceae, Cudoniaceae</i>	Yes
BRD3-154F	<i>Lophodermium</i>	<i>Rhytismataceae, Cudoniaceae</i>	Yes
BRD3-154C	<i>Lophodermium pini-excelsae</i>	<i>Rhytismataceae, Cudoniaceae</i>	Yes
TC2-043	<i>Lophodermium</i>	<i>Rhytismataceae, Cudoniaceae</i>	Yes
RAS1-015P	Ascomyctoa	<i>Rhytismataceae, Cudoniaceae</i>	Yes
TC2-017	<i>Lophodermium</i>	<i>Rhytismataceae, Cudoniaceae</i>	Yes
BRD2-113Y	<i>Umbelopsis</i>	<i>Pichiaceae, Lipomycetaceae, Alloascoideaceae, Umbelopsidaceae</i>	Yes
BRD2-149B	<i>Alternaria</i>	<i>Pichiaceae, Lipomycetaceae, Alloascoideaceae, Umbelopsidaceae</i>	No
KP1-143A	<i>Metschnikowia</i>	<i>Saccharomycetaceae, Dipodascaceae, Phaffomycetaceae</i>	No
BRD3-081G	<i>Candida pseudoglaebosa</i>	<i>Saccharomycetaceae, Dipodascaceae, Phaffomycetaceae</i>	Yes
KP2-013F	<i>Meyerozyma caribbica</i>	<i>Saccharomycetaceae, Dipodascaceae, Phaffomycetaceae</i>	No
BRD2-129F	<i>Meyerozyma caribbica</i>	<i>Saccharomycetaceae, Dipodascaceae, Phaffomycetaceae</i>	No
BRD2-145K	<i>Mucor abundans</i>	<i>Rhizopodaceae, Mucoraceae, Backusellaceae, Chaetocladiaceae, Mycotyphaceae</i>	Yes
KP1-131Z	<i>Entomocorticium</i>	<i>Trimorphomycetaceae</i>	No
KP2-005A	<i>Phanerochaete livescens</i>	<i>Incrustoporiaceae</i>	No
BRD2-113O	<i>Mortierella</i>	<i>Mortierellaceae</i>	Yes
BRD2-114L	<i>Mortierella</i>	<i>Mortierellaceae</i>	Yes
BRD3-154J	<i>Naganishia liquefaciens</i>	<i>Sporidiobolaceae</i>	No
TC2-047	<i>Sporidiobolaceae</i>	<i>Sporidiobolaceae</i>	Yes
TC2-070	<i>Cryptococcus flavescens</i>	<i>Sirobasidiaceae</i>	No

Table 2. Continued

Isolate Code	DNA barcoding identification	DNA taxonomy classification/grouping	Matched
TC2-092	<i>Tremellomycetidae</i>	<i>Piskurozymataceae</i>	Yes
JD1-017G	<i>Basidiomycete</i>	<i>Dacryobolaceae, Meripilaceae</i>	Yes
BRD2-149R	<i>Piptoporus betulinus</i>	<i>Meripilaceae</i>	No
KP2-009A	<i>Trametes versicolor</i>	<i>Postiaceae</i>	Yes
KP2-009B	<i>Trametes versicolor</i>	<i>Postiaceae</i>	Yes
KP1-143D	<i>Trametes versicolor</i>	<i>Postiaceae</i>	Yes
RAS1-015U	<i>Phyllosticta</i>	<i>Helminthosphaeriaceae</i>	Yes
JD1-047Y	<i>Preussia</i>	<i>Paradictyoarthriniaceae, Lindgomycetaceae, Occultibambusaceae, Pleomassariaceae, Nigrogranaceae, Biatriosporaceae, Hypsostromataceae, Hermatimycetaceae, Tetraplosphaeriaceae, Testudinaceae, Sporomiaceae, Anteaglioniaceae</i>	Yes
JD1-047AX	Ascomycota	<i>Paradictyoarthriniaceae, Lindgomycetaceae, Occultibambusaceae, Pleomassariaceae, Nigrogranaceae, Biatriosporaceae, Hypsostromataceae, Hermatimycetaceae, Tetraplosphaeriaceae, Testudinaceae, Sporomiaceae, Anteaglioniaceae</i>	Yes
JD1-047AO	<i>Preussia</i>	<i>Paradictyoarthriniaceae, Lindgomycetaceae, Occultibambusaceae, Pleomassariaceae, Nigrogranaceae, Biatriosporaceae, Hypsostromataceae, Hermatimycetaceae, Tetraplosphaeriaceae, Testudinaceae, Sporomiaceae, Anteaglioniaceae</i>	Yes
KP2-033E	Dothideomycetes	<i>Halothhiaceae</i>	Yes
KP2-033D	Dothideomycetes	<i>Halothhiaceae</i>	Yes
BRD3-083Y	<i>Pleosporales</i>	<i>Pleosporaceae</i>	Yes

**Table 2.** Continued

<b>Isolate Code</b>	<b>DNA barcoding identification</b>	<b>DNA taxonomy classification/grouping</b>	<b>Matched</b>
TC2-053	<i>Pleosporales</i>	<i>Pleosporaceae</i>	Yes
TC2-049	<i>Pleosporales</i>	<i>Pleosporaceae</i>	Yes
JAJ1-033	<i>Paraphaeosphaeria neglecta</i>	<i>Periconiaceae, Anastomitrabeculiaceae, Teichosporaceae, Trematosphaeriaceae, Latoruaceae, Corynesporascaceae, Bambusicolaceae, Lentitheciaceae, Didymosphaeriaceae</i>	Yes
JAJ1-057	<i>Paraphaeosphaeria</i>	<i>Periconiaceae, Anastomitrabeculiaceae, Teichosporaceae, Trematosphaeriaceae, Latoruaceae, Corynesporascaceae, Bambusicolaceae, Lentitheciaceae, Didymosphaeriaceae</i>	Yes
JD1-047W	<i>Saccharicola</i>	<i>Bambusicolaceae</i>	No
TC2-044	<i>Pleosporales</i>	<i>Didymosphaeriaceae</i>	Yes
KP1-123C	<i>Didymosphaeriaceae</i>	<i>Didymosphaeriaceae</i>	Yes
JAJ1-049	<i>Paraphaeosphaeria neglecta</i>	<i>Didymosphaeriaceae</i>	Yes
JAJ1-001	<i>Paraphaeosphaeria</i>	<i>Didymosphaeriaceae</i>	Yes
KP1-119C	<i>Paraconiothyrium</i>	<i>Didymosphaeriaceae</i>	Yes
TC2-048	<i>Paraconiothyrium</i>	<i>Didymosphaeriaceae</i>	Yes
JAJ1-045	<i>Paraphaeosphaeria</i>	<i>Didymosphaeriaceae</i>	Yes
JAJ1-113	<i>Paraphaeosphaeria neglecta</i>	<i>Didymosphaeriaceae</i>	Yes
JAJ1-141	<i>Coniothyrium</i>	<i>Didymosphaeriaceae</i>	No
JAJ1-093	<i>Dothideomycetes</i>	<i>Didymosphaeriaceae</i>	Yes
TC2-042	<i>Pleosporomycetidae</i>	<i>Didymellaceae</i>	Yes
TC2-039	<i>Didymella</i>	<i>Didymellaceae</i>	Yes
TC2-032	<i>Phoma</i>	<i>Didymellaceae</i>	Yes
KP1-131K	<i>Stagonosporopsis</i>	<i>Didymellaceae</i>	Yes

**Table 2.** Continued

<b>Isolate Code</b>	<b>DNA barcoding identification</b>	<b>DNA taxonomy classification/grouping</b>	<b>Matched</b>
JAJ1-133	<i>Didymella</i>	<i>Didymellaceae</i>	Yes
TC2-091	<i>Phoma</i>	<i>Didymellaceae</i>	Yes
TC2-052	<i>Pezizomycotina</i>	<i>Didymellaceae</i>	Yes
JAJ1-137	<i>Epicoccum nigrum</i>	<i>Didymellaceae</i>	Yes
TC3-002	<i>Epicoccum nigrum</i>	<i>Didymellaceae</i>	Yes
BRD3-085T	<i>Leptospora rubella</i>	<i>Neopyrenochaetaceae, Leptosphaeriaceae, Phaeosphaeriaceae, Cucurbitariaceae, Pseudopyrenochaetaceae, Coniothyriaceae, Shiraiaceae, Parapyrenochaetaceae</i>	No
TC2-022	<i>Drechslera</i>	<i>Neopyrenochaetaceae, Leptosphaeriaceae, Phaeosphaeriaceae, Cucurbitariaceae, Pseudopyrenochaetaceae, Coniothyriaceae, Shiraiaceae, Parapyrenochaetaceae</i>	No
TC2-051	<i>Pyrenophora leucospermi</i>	<i>Neopyrenochaetaceae, Leptosphaeriaceae, Phaeosphaeriaceae, Cucurbitariaceae, Pseudopyrenochaetaceae, Coniothyriaceae, Shiraiaceae, Parapyrenochaetaceae</i>	No
TC2-026	<i>Pyrenophora bisepitata</i>	<i>Neopyrenochaetaceae, Leptosphaeriaceae, Phaeosphaeriaceae, Cucurbitariaceae, Pseudopyrenochaetaceae, Coniothyriaceae, Shiraiaceae, Parapyrenochaetaceae</i>	No
TC3-003	<i>Pleosporaceae</i>	<i>Neopyrenochaetaceae, Leptosphaeriaceae, Phaeosphaeriaceae, Cucurbitariaceae, Pseudopyrenochaetaceae, Coniothyriaceae, Shiraiaceae, Parapyrenochaetaceae</i>	No

**Table 2.** Continued

<b>Isolate Code</b>	<b>DNA barcoding identification</b>	<b>DNA taxonomy classification/grouping</b>	<b>Matched</b>
TC3-033	<i>Alternaria alternata</i>	<i>Neopyrenochaetaceae, Leptosphaeriaceae, Phaeosphaeriaceae, Cucurbitariaceae, Pseudopyrenochaetaceae, Coniothyriaceae, Shiraiaceae, Parapyrenochaetaceae</i>	No
KP1-131I	<i>Dendryphiella</i>	<i>Neopyrenochaetaceae, Leptosphaeriaceae, Phaeosphaeriaceae, Cucurbitariaceae, Pseudopyrenochaetaceae, Coniothyriaceae, Shiraiaceae, Parapyrenochaetaceae</i>	No
TC2-011	<i>Alternaria alternata</i>	<i>Neopyrenochaetaceae, Leptosphaeriaceae, Phaeosphaeriaceae, Cucurbitariaceae, Pseudopyrenochaetaceae, Coniothyriaceae, Shiraiaceae, Parapyrenochaetaceae</i>	No
TC3-004	<i>Alternaria alternata</i>	<i>Neopyrenochaetaceae, Leptosphaeriaceae, Phaeosphaeriaceae, Cucurbitariaceae, Pseudopyrenochaetaceae, Coniothyriaceae, Shiraiaceae, Parapyrenochaetaceae</i>	No
CT1-006A	<i>Alternaria</i>	<i>Neopyrenochaetaceae, Leptosphaeriaceae, Phaeosphaeriaceae, Cucurbitariaceae, Pseudopyrenochaetaceae, Coniothyriaceae, Shiraiaceae, Parapyrenochaetaceae</i>	No
BRD3-078B	<i>Alternaria alternata</i>	<i>Neopyrenochaetaceae, Leptosphaeriaceae, Phaeosphaeriaceae, Cucurbitariaceae, Pseudopyrenochaetaceae, Coniothyriaceae, Shiraiaceae, Parapyrenochaetaceae</i>	No
BRD3-078E	<i>Alternaria alternata</i>	<i>Neopyrenochaetaceae, Leptosphaeriaceae, Phaeosphaeriaceae, Cucurbitariaceae, Pseudopyrenochaetaceae, Coniothyriaceae, Shiraiaceae, Parapyrenochaetaceae</i>	No

**Table 2.** Continued

<b>Isolate Code</b>	<b>DNA barcoding identification</b>	<b>DNA taxonomy classification/grouping</b>	<b>Matched</b>
BRD3-078F	<i>Alternaria alternata</i>	<i>Neopyrenochaetaceae, Leptosphaeriaceae, Phaeosphaeriaceae, Cucurbitariaceae, Pseudopyrenochaetaceae, Coniothyriaceae, Shiraiaceae, Parapyrenochaetaceae</i>	No
BRD3-078L	<i>Alternaria alternata</i>	<i>Neopyrenochaetaceae, Leptosphaeriaceae, Phaeosphaeriaceae, Cucurbitariaceae, Pseudopyrenochaetaceae, Coniothyriaceae, Shiraiaceae, Parapyrenochaetaceae</i>	No
BRD3-079B	<i>Alternaria alternata</i>	<i>Neopyrenochaetaceae, Leptosphaeriaceae, Phaeosphaeriaceae, Cucurbitariaceae, Pseudopyrenochaetaceae, Coniothyriaceae, Shiraiaceae, Parapyrenochaetaceae</i>	No
BRD3-085E	<i>Alternaria alternata</i>	<i>Neopyrenochaetaceae, Leptosphaeriaceae, Phaeosphaeriaceae, Cucurbitariaceae, Pseudopyrenochaetaceae, Coniothyriaceae, Shiraiaceae, Parapyrenochaetaceae</i>	No
BRD3-084B	<i>Alternaria alternata</i>	<i>Neopyrenochaetaceae, Leptosphaeriaceae, Phaeosphaeriaceae, Cucurbitariaceae, Pseudopyrenochaetaceae, Coniothyriaceae, Shiraiaceae, Parapyrenochaetaceae</i>	No

## Discussion

A critical step when conducting research on an organism is to ensure the accurate taxonomic classification of said organism.<sup>3,62</sup> Taxonomic classifications not only enable researchers to communicate information about an organism, but it is also essential when validating research about an organism.<sup>3</sup> Even though taxonomic classifications play an integral role in the research process, organisms are not always assigned accurate taxonomic classifications.<sup>10,63</sup> Although DNA sequence-based classification techniques (DNA barcoding and DNA taxonomy) are helpful tools when classifying organisms, inaccurate classifications can still arise when using these techniques.<sup>64,65</sup>

Once DNA barcoding was introduced to the scientific community it made the process of taxonomically identifying organisms a less difficult task.<sup>18,27,64,66,67</sup> This has been especially true for the researchers that are not highly trained and experienced taxonomic experts.<sup>3,68</sup> However, the easily applicable process of DNA barcoding does not always lead to accurate taxonomic identifications.<sup>69</sup> Since DNA barcoding is the process of simply matching the DNA sequence of an unknown organism to an annotated sequence, the confidence in the identification of the unknown organism relies on the accuracy of the annotated sequence.<sup>20,28</sup> With the ever-growing amount of inaccurately annotated sequences in public DNA databases, DNA barcoding can lead to inaccurate taxonomic identifications.<sup>3,29,70</sup> Therefore, to overcome the inaccuracy of DNA barcoding researchers have recommended the use of DNA barcoding in conjunction with DNA taxonomy.<sup>15,71</sup>

In DNA taxonomy, unknown organisms are provided with taxonomic classifications by grouping DNA sequences of unknown organisms into clades with identified DNA sequences, such as reference sequences.<sup>33,39,72</sup> The taxonomic classifications resulting from

DNA taxonomy can be compared to the DNA barcoding identifications, to ensure confidence and accuracy in the DNA barcoding identifications.<sup>73,74</sup> However, even when using DNA taxonomy in conjunction with DNA barcoding, inaccurate taxonomic classifications can arise if proper steps are not taken when choosing reference sequences.<sup>61</sup> This is because the accuracy of taxonomic classifications are only as good as the accuracy of reference sequences.<sup>61</sup>

Previously, efforts have been made to improve the taxonomic classifications for the NPRG's fungal collection by using DNA barcoding in conjunction with DNA taxonomy.<sup>56</sup> However, concerns have been raised regarding accuracy of the taxonomic classifications due to some methodological errors that were seen when choosing reference sequences.<sup>56</sup> When conducting DNA taxonomy, the aim is to include a wide diversity of reference sequences while maintaining the number of reference sequences to a reasonable amount.<sup>61</sup> This can be done by using DNA barcoding identifications as a guideline to choose reference sequences. However, when DNA taxonomy was conducted for the NPRG's fungal collection, instead of using the DNA barcoding identifications as a guideline when choosing reference sequences, the previous researcher relied too heavily upon the DNA barcoding identifications.<sup>56</sup> The reference sequences were chosen exactly based off the DNA barcoding identifications which ultimately resulted in having a limited diversity of reference sequences.<sup>56</sup>

In this study, new methodologies were used when choosing reference sequences for DNA taxonomy. Therefore, it was possible to improve the accuracy of taxonomic classifications/grouping for the NPRG's fungal collection. Based on DNA barcoding identifications, 270 family-level reference sequences were chosen. In the final

phylogenetic tree, a total of 570 sequences were included where 270 sequences were family-level reference sequences and 300 sequences were from the NPRG's fungal collection.

By interpreting the clades that were formed in the final phylogenetic tree, it was determined that the NPRG's fungal isolates were grouped into 158 taxonomic families. From the 158 taxonomic families there were 25 major families the NPRG's fungal isolates were grouped into (more than 10 NPRG fungal sequences were grouped into these families). The family that included the largest amount of the NPRG's fungal sequence's (33 sequences) was *Penicillaginaceae*. The second largest family was *Aspergillaceae* which included 18 NPRG's fungal sequences. The other 23 major families were: *Sarocladiaceae* (12 NPRG fungal sequences), *Reticulascaceae* (13 NPRG fungal sequences), *Australiascaceae* (12 NPRG fungal sequences), *Glomerellaceae* (12 NPRG fungal sequences), *Phacidiaceae* (10 NPRG fungal sequences), *Mollisiaceae* (13 NPRG fungal sequences), *Vibrisseaceae* (13 NPRG fungal sequences), *Elaphomycetaceae* (11 NPRG fungal sequences), *Thermoascaceae* (11 NPRG fungal sequences), *Trichocomaceae* (14 NPRG fungal sequences), *Teratosphaeriaceae* (11 NPRG fungal sequences), *Nedodevriesiaceae* (11 NPRG fungal sequences), *Extremaceae* (11 NPRG fungal sequences), *Mycosphaerellaceae* (11 NPRG fungal sequences), *Cladosporiaceae* (13 NPRG fungal sequences), *Neopyrenochaetaceae* (17 NPRG fungal sequences), *Leptosphaeriaceae* (17 NPRG fungal sequences), *Phaeosphaeriaceae* (17 NPRG fungal sequences), *Cucurbitariaceae* (17 NPRG fungal sequences), *Pseudopyrenochaetaceae* (17 NPRG fungal sequences), *Coniothyriaceae* (17 NPRG fungal sequences), *Shiraiaceae* (17 NPRG fungal sequences), and *Parapyrenochaetaceae* (17 NPRG fungal sequences).

There was a total of 231 sequences from the NPRG's fungal collection that were taxonomically classified/grouped with moderate to bad bootstrap values (i.e., they were classified with low confidence, as mentioned in the results), while the remaining 68 fungal sequences were classified with good bootstrap values. Most of the fungal sequences that were classified/grouped with low confidence were grouped into multiple families (i.e., one fungal isolate was classified as belonging to multiple families) which could explain why low confidence values were obtained. This could have resulted from having multiple family-level reference sequences that were very similar to sequences of the NPRG's fungal collection. Which leads to difficulties when grouping the sequences (family-level reference sequences and NPRG's fungal sequences) into clades based on sequence similarities. In addition, it was concluded that 72% of DNA taxonomy classifications matched the DNA barcoding identifications down to the family level. This meant that the accuracy of the DNA barcoding identifications were good at identifying organisms down to the family-level.

The aim of this study was to provide the NPRG's fungal isolates with accurate taxonomic classifications. I originally planned to classify the NPRG's fungal collection to the genus-level by conducting another round of DNA taxonomy where genus-level reference sequences were going to be included. However due to time constraints I was unable to do so. Therefore, a follow up study should be conducted to classify the NPRG's fungal collection to the genus-level. In the follow up study, the family-level classifications obtained from this study should be used to choose the genus-level reference sequences. By including genus-level reference sequences it will also help obtain higher confidence values in the taxonomic classifications for the NRPG's fungal collection.

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## Appendix A: Family-level reference sequences from UNITE.

### *Australiascaceae*

CATTACTGAGTTTACGCTCATAACCCTTTGTGAACATACCTATAATCGTTGCT  
TCGGCGGTGCGGGCCCCAGCGGCCCTCCCGGCCCTCCTCGGGGGGCG  
CCCGCCGAGGCCAAAACCTCCAGTCTTTCAACGAAGTCTCTTCTGAGTGGCA  
CAAGCAAAAATTTATCAAAACCTTTAACAACGGATCTCTTGGTTCTGGCATCG  
ATGAAGAACGCAGCGAAATGCGATAAGTAATGTGAATTGCAGAATTCAGTGA  
ATCATCGAATCTTTGAACGCACATTGCGCCC GCCAGCATTCTGGCGGGCATG  
CCTGTTCGAGCGTCATTTCAACCCTCAAGCACTGCTTGGTGTGGGGCGCCGC  
GGAGACGCGGGCCCCAAATACAGTGGCGGACGCTCCCGGAGCCTCCTTTTG  
CGTAGTAACCAAAAACCTCGCACTGGGACCCGGGGCGCACCCAGCCGTA  
AAAA  
CCCCAAACTTTCCAAAGG

### *Glomerellaceae*

AGGGATCATTACTGAGTTACCGCTCTATAACCCTTTGTGAACATACCTAACTG  
TTGCTTCGGCGGGCAGGGGGTCCCCCGGGGACGCCCTCCCGGCCACGCCCT  
TCGCGGGGCGAGGCGCCTGCCGGAGGATACCAAACCTCTATTTTAACGACGTT  
TCTTCTGAGTGGCACAAGCAAATAATTTAAACTTTTAACAACGGATCTCTTGG  
TTCTGGCATCGATGAAGAACGCAGCGAAATGCGATAAGTAATGTGAATTGCA  
GAATTCAGTGAATCATCGAATCTTTGAACGCACATTGCGCCC GCCAGCATTCT  
GGCGGGCATGCCTGTTCGAGCGTCATTTCAACCCTCAAGCTCTGCTTGGTGT  
GGGGCCCTACGGTTGACGTAGGCCCTTAAAGGCAGTGGCGGACCCTCTCGGA  
GCCTCCTTTGCGTAGTAATAACGTCTCGCATTGGGATCCGAAGGGACTCTTG  
CCGTAAAACCCCCCAATTTTCTAATGGTTGACCTCGGATCAGGTAG

### *Plectosphaerellaceae*

AAAACGCTCAAAACCCTTTGTAAACCCTTTACCTTAGTTGCTTCGGCGGGCGCC  
CTCTTAGGGGGATGCCCGCCGGCAGTATACCGAATCTCTGTTTTCGAACCCGA  
CGTAACGTCTGAGTGTCTAAGCGAACTGTTAAACTTTTCAGCAACGGATCTC  
TTGGCTCCAGCATCGATGAAGAACGCAGCGAAACGCGATAAGTAATGTGAAT  
TGCAGAATTCAGTGAATCATCGAATCTTTGAACGCACATGGCGCCCCCTGGT  
ATTCCGGGGGGCATGCCTGTCCGAGCGTCGTTTCAACCCTCCGGAAGGGTCG  
TCCTCACGGGCGGCCCCGCCCCGGGCGTTGGGGATCTGCGAACGTAGCAGGC  
CCCGAAAATCAGCGGCGGACCCGCGCGGCCCTCCCTTGCGTAGTAGCATCA  
GCCTCGCATCGGTGACCCGCGGGACTTCAGCCCCTAAACCCCCACTAAGCC  
CGGCCTGGCCGGCACAAGGTTGACCTCGGATCAGGTAGGAATACCCGCTGAA  
CTTAAGCATATCAATAAGCGGAGGAAAAGAAACCAACAGGGATTGCCCTAGT  
AACGGCGAGTGAAGCGGCAACAGCTCAAATTTGAAATCTGGCTCCTTCGGGG  
TCCGAGTTGTAATTT

### *Reticulascaceae*

GAAGTAAAAGTCGTAACAAGGTCTCCGTTGGTGAACCAGCGGAGGGATCATT  
ATAGAGCCTATAAACTCTCAAACCTTTGTGAATATAACCAGTATAAGTTGCTT  
CGGCGGGCAGCCCCAGGGCGGGGCTGTAGCCTTACGGGGCGCCCGCCGGAG  
GTACCAAACCTCTGATTTAGTTATGTTTCTTCTGAGTGGTCTAAGCAAATAAT

CAAAACTTTTAAACAACGGATCTCTTGGTTCTGGCATCGATGAAGAACGCAGC  
GAAATGCGATAAGTAATGTGAATTGCAGAATTCAGTGAATCATCGAATCTTT  
GAACGCACATTGCGCCCGTTAGTATTCTAGCGGGCATGCCTGTTTCGAGCGTCA  
TTTCAACCCTCAAGCTCTGCTTGGTGTGGGGCCCTACGCTGTAGGCCCTGAA  
AAACAGTGGCGGACTCGCCGAAGCCTTCTTTGCGCAGTAACGCATCTCGCAT  
CGGGGCCCGGGCGGGCTTTCTTGCCGTAACCACCAAATTTTACACAAGGTT  
GACCTCGGATCAGGTAGGAATACCCGCTGAACTTAA

*Cladosporiaceae*

ATTGAATGGCTCAGTGAGGCCTTCGGACTGGCCCAGGGAGGTCGGCAACGAC  
CACCCAGGGCCGGAAAGTTCGTCAAACCTTGGTCATTTAGAGGAAGTAAAAGT  
CGTAAACAAGGTCTCCGTAGGTGAACCTGCGGAGGGGATCATTACCAGTAACCC  
CTGTCTCCGGATGGGAGGACTACCAACCCTTTGTTGTCCGACCGCGTTGCCTC  
CGGGGCGACCCTGACCTTCGGGTCTGGGGGACCCCGGGTGGACACATAAACT  
CTGCGTAACTTTGTAGTCTGAGTAAAAGATTTAATAAATTAACAACTTTCAACA  
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AATGTGAATTGCAGAATTCAGTGAATCATCGAATCTTTGAACGCACATTGCG  
CCCCGTGGTATTCCGCGGGGCATGCCTGTTTCGAGCGTCATTTCAACCACTCAAG  
CCTCGCTTGGTATTGGGCGATGCGGTCCGCCGCACGCCTCAAATCGACCGGC  
TGGGTTCGATCGCACCCCTCAGCGTTGTGGAACTATTCGCTAAAGGGATTGTG  
GTCGGTCACGCCGTGAAACAAACCAATTTTCAATGGTTGACCTCGGATCAGG  
TAGGGATACCCGCTGAACTTAAGCATATCAATAAGCGGAGGAAAAGAAACC  
AACAGGGATTG

*Bionectriaceae*

GATCATTATCGAGTGTA AAAA ACTCACCAAACCCTGTGAACATACCTTCTGTT  
GCTTCGGCGGGATCGCCCCGGGCGCCCTCGTGTGCCCCGGATCCAGGCGCCC  
GCCGGAGGATACAAACTCTTGTCTTTATGAGATTTGTCTGAGTGGCTTTATAG  
CAAATGAATCAAACCTTTCAACAACGGATCTCTTGGTTCTGGCATCGATGA  
AGAACGCAGCGAAATGCGATAAGTAATGTGAATTGCAGAATCCAGTGAATCA  
TCGAATCTTTGAACGCACATTGCGCCCGCCAGTATTCTGGCGGGCATGCCTGT  
CTGAGCGTCATTTCAACCCTCGCAACCAGCTTGCTGGATGCGGTGTTGGGGAT  
CGGCCACCCACCCCGGGAGGCCGTCCCTTAAATAGAGTGGCGGTTGCGCTGT  
AACCTCCTCTGCGTAGTAGCAATATCTCGCAGGCGGATAGCGGTGTAACCAT  
GCCGTA AAAACCCCAACTCTTCTTTGGTTGACCTCAGATCAGGTAGGAATACC  
CGCTGAACTTAAGCATATCAATAAGCGGAGGAA

*Clavicipitaceae*

ATCATTACCGAGTTTTCAACTCCAAAACCATGTGAACTTATACCTTTTACCGT  
TGCTTCGGCGGGTCTCGGCCCCGGAGCCAGGCTCGCAAGGGCCTGCCCGGAA  
ACAGGCGCCCGCCGGGGGACCTTTTAAAAACTCTTGTATTTTCTTTACTTTGC  
ATGTCTGAGTGTGGAATCATAAAAATGAATCAAACCTTTCAACAACGGATC  
TCTTGGTTCTGGCATCGATGAAGAACGCAGCGAAATGCGATAAGTAATGTGA  
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GCCCCGAAATGAATTGGCGGTCTCGTCGCGGCCTCCTCTGCGTAGTAGCAC  
AACCTCGCAACAGGAGCGCGGGCGGCCACTGCCGTAAAACGCCCAACTTTT  
TCTTAGAGTGACCTCGAATCAGGTAGG

*Cordycipitaceae*

AAGGTCTCCGTTGGTGAACCAGCGGAGGGATCATTACCGAGTTTTCAACTCC  
CTAACCCCTTATGTGAACCTACCTATTGTTGCTTCGGCGGACTCGCCCCAGCCG  
GACGCGGACTGGACCAGCGGCCCGGGGGCCCTTAAACTCTTGTATTATCA  
GCACCTTCTGAATACGCCGCAAGGCAAAACAAACAAATCAAAACTTTCAACA  
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CCCGCCAGCATTCTGGCGGGCATGCCTGTTTCGAGCGTCATTTCAACCCTCGAC  
CTCCCTTTGGGGAAGTCGGCGTTGGGGACCAGGCAGCACACCGCCGGCCCTGA  
AATGGAGTGGCGGCCCGTCCGCGGCGACCTCTGCGTAGTAATCCAACCTCGCA  
CCGGAACCCCGACGTGGCCACGCCGTAAAACACCCAACCTTCTGAACGTTGAC  
CTCGAATCAGGTAGGACTACCCGCTGAACTTAA

*Hypocreaceae*

CATTACCGAGTTTACAACCTCCCAAACCCCTATGTGAACGTTACCAAACCTGTTG  
CCTCGGCGGGTCATTCATGCCCCGGGCGCGTCGCAGCCCCGGACCAAGGCGC  
CCGCCGGAGGACCAACCAAACCTCTTTTGTATGTCCCTCGCGGACTTTTTTAT  
AATTCTGAACCATCTCGGCGCCCCTAGCGGGCGTTTCGAAAATGAATCAAAA  
CTTTCAACAACGGATCTCTTGGTTCTGGCATCGATGAAGAACGCAGCGAAAT  
GCGATAAGTAATGTGAATTGCAGAATTCAGTGAATCATCGAATCTTTGAACG  
CACATTGCGCCCCGCCAGTATTCTGGCGGGCATGCCTGTCCGAGCGTCATTTCA  
ACCCTCGAACCCCTCCGGGGGTCCGGCGTTGGGGATCGGCCCTTTACCGGCC  
GGCCCCGAAATACAGTGGCGGTCTCGCCGACGCTCTCCTGCGCAGTAGTTT  
GCACACTCGCATCGGGAGCGCGGGCGGTCCACGTCCGTAAAACACCCAACCT  
CTGAAATGTTGACCTCGGATCAGGTAGGAATACCCGCTGAACTTAAGCATAT  
CAATAAGCGG

*Nectriaceae*

GTAACAAGGTCTCCGTTGGTGAACCAGCGGAGGGATCATTACCGAGTTTACA  
ACTCCCAAACCCCTGTGAACATACCTTAATGTTGCCTCGGCGGATCAGCCCGC  
GCCCCGTAAAACGGGACGGCCCCGCCAGAGGACCCAAACTCTAATGTTTCTTA  
TTGTAACTTCTGAGTAAAACAAACAAATAAATCAAAACTTTCAACAACGGAT  
CTCTTGGTTCTGGCATCGATGAAGAACGCAGCAAAATGCGATAAGTAATGTG  
AATTGCAGAATTCAGTGAATCATCGAATCTTTGAACGCACATTGCGCCCCGCTG  
GTATTCCGGCGGGCATGCCTGTTTCGAGCGTCATTTCAACCCTCAAGCCCCCGG  
GTTTGGTGTGGGGATCGGCTCTGCCTTCTGGCGGCGCCGCCCCCGAAATACA  
TTGGCGGTCTCGCTGCAGCCTCCATTGCGTAGTAGCTAACACCTCGCAACTGG  
AACGCGGCGCGGCCATGCCGTAAAACCCCAACCTTCTGAATGTTGACCTCGGA  
TCAGGTAGGAATACCCGCTGAACTTAAGCATATCAAT

*Niessliaceae*

ACAAGGTCTCCGTTGGTGAACCAGCGGAGGGATCATTATCGAGTTTACAAC  
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CATCAAACCTCTACGTTTTTTATTGAGAATATTCTGAGTGATTACACAAATAATC  
AAAACCTTTCAACAACGGATCTCTTGGTTCTGGCATCGATGAAGAACGCAGCG  
AAATGCGATAAGTAATGTGAATTGCAGAATTCAGTGAATCATCGAATCTTTG  
AACGCACATTGCGCCCGCCAGTATTCTGGCGGGCATGCCTGTTTCGAGCGTCA  
TTTCAACCCTCGCGCCCATCTGGGCTGCGGTGTTGGGGACCGGCCCGCCGTC  
GGCGCCGTCCCCCAAATACAGTGGCGGTCTCGCTGCAGCCTCCCCTGCGTAG  
TAGCACACCTCGCATCGGAGAGCAGCGTGGCCACGCCGTGAAACCCCAACTT  
TCAGAGTTTGACCTCGGATCAGGTAGGAATACCCGCTGAACTTAAGCATA

*Ophiocordycipitaceae*

TCTCCGTTGGTGAACCAGCGGAGGGATCATTATCGAGTTCCACGACTCCCAA  
ACCCCTGCGAACCTTACCACACGCGTTGCCTCGGCCGGACCGCCCCGGCGC  
CCCAGCGGCCCGGACCAAGGCGCCCGCCGGAGGACCACCCAGACTCTCCTGT  
CGCAGTGGCATTCTCTCCGAGTCAAAAAACAAGCAAATGAATCAAACTTT  
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CGGCCGCGAGCCGCCCGGAAATGCAGTGGCGACCCCGCCGCGGCCTCCCCT  
GCGCAGTAGCTCCCAGAGAACCTCGCACCGGAAGCGCGGAGGGCGGTACGC  
CGTAAACAACCTCCTCCTGGAAGTTGACCTCGGATCAGGTAGGGATACCCG  
CTGAACTTAA

*Sarocladiaceae*

GTCGTAACAAGGTCTCCGTTGGTGAACCAGCGGAGGGATCATTATAGAACAG  
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TAAGTAATGTGAATTGCAGAGCACAGTGAATCATCGAATCTTTGAACGCACA  
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GCGTAGTATTGCATCTCGCTTTGGTGACTTCTTCGGGCTGCTGTGGCACTGCC  
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*Stachybotryaceae*

GAAGTAAAAGTCGTAACAAGGTCTCCGTTGGTGAACCAGCGGAGGGATCATT  
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CGGGAACGCCCGGCGCGCCCTCCGACCCTCCCGTCCGCGGGGGGATCGGGG  
AGCCTAGCCCGGACCCAGGCGCCCGCCGGAGGTACTCAAACCTTTGTCTTTA  
GTATATTCTTCTGAGTGGCAAACGCAAAATAAATCAAACCTTTCAACAACGG

ATCTCTTGGCTCTGGCATCGATGAAGAACGCAGCGAAATGCGATAAGTAATG  
TGAATTGCAGAATTCAGTGAATCATCGAATCTTTGAACGCACATTGCGCCCCG  
CAGCACTCTGGCGGGCATGCCTGTCCGAGCGTCATTTCAACCCTCAGCCCCC  
CGGGGACTGGGGTTGGGGATCGGCCCGCCCTGGCGCGGGCGCCGTCCCCGAAA  
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GAGAGCGGCGGGCCACGCCGTGAAACCCCAACTTCTGATAGTTGACCTCGG  
ATCAGGTAGGAATACCCGCTGAACTTAAGCATATCAA

*Tilachlidiaceae*

ACCAGCGGAGGGATCATTACCGAGTCGACAACTCCAAACCCATGTGAACAT  
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AGTAATTTACAAATGAATCAAACTTTCAACAACGGATCTCTTGGCTCTGGC  
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GATCGGCCGCCACCGCGGGCGGCCGGCCCCGAAATCCAGTGGCGGTCTCGCT  
GTAGCCTTCTCTGCGTAGTAGTCAAACCCTCGCAGGGCGGAGAGCGGCCTGGC  
CACGCCGTAACACCCAACCATACCAAGGTT

*Aigialaceae*

AGTCCCGTGGTTCGGCGCACCGCTGCATCAGTAGTGGTGTGTTACCTAACCGG  
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CGAGCGTCATTTCAAACCTTCAAGCGCAGCTTGGTGTGGGCGCCTGTCCCTT  
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GCGCAGCAGAGCACGCGCCTCGGGGCCCCGCGAGTCCGCAAGCCAGGAGCC  
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TATCA

*Amniculicolaceae*

TTTCCGTAGGTGAACCTGCGGAAGGATCATTATCGAGGGGGGGGCTATGCCC  
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GATAAAGACCCTGTTGAGTGTAGTGTGGCTCACGCCATTTCTGCAGCTCAGG  
GCCTTTACTATGTGGAGCTCATGATAGACCCCTTCTACCTAGGATGTGTCTG  
CTGCCTACTCGGTGGTAGTATGCCCTATTGTAGGACGTCTTTTTGGAGCAAAC  
GTTACTTGGATGGCTGGTAGCTACCATTCTGTACCCCTGTCTATGAGTACTCT  
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CAGGGCATGCCTGTTTCGAGCGTCATTTAACCCCTCAAGCTCTGCTTGGTGT  
GGCGTTTGTCTGCTGTTGGCATGGACTCGCCTTAAAAATATTGGCAGCCA

TTTTCTGGCTTCGAGCGCAGCACTTTTGCGCCCGGCACACGGGAGATGTAGC  
TTCC

*Amorosiaceae*

TGGAAAGCTCAAAGTCGTAACAAGGTTTCGATCTCGCATCGAGCAAGTGAT  
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GTGAACCTGCGGAAGGATCATTATCGTAGGGCTTTTGTCTGTGCGAGATAGC  
GTCCTTGCCTATTTTTTAGAGCACCGTTCGTTTCCTCAGCAGGCTTGCCTGCTA  
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GGCGCGGACTCGCCTCAAACGATTGGCAGCCACTTCAGCGGCTTTGAGCGC  
AGCAGATTTGCGTCTCTCGTTCGCGGGCGGATGGCATCCAGTAAGCAACATTTAT  
ATCTGACCTCGGATCAGGTAGGGACCCCC

*Anteagloniaceae*

GCGCGACCCTTGCTGAGATAGCACCCCTTGTGTTTGGGCACCGTACGTTTCCT  
CGGCAGGTCCGCCTGCCAGCGAGGACCCCATGGAACCTCCCGTAGTGTGCAG  
TAACCGTCACAAAGCTACAAAATCAA ACTTTCAACAACGGATCTCTTGGTT  
CTGGCATCGATGAAGAACGCAGCGAAATGCGATATGTAGTGTGAATTGCAGA  
ATTCAGTGAATCATCGAATCTTTGAACGCACATTGCGCCCTTTGGTATCCCTT  
AGGGCATGCCTGTTTCGAGCGTCATCTGACCCTCCAAGCACCGCTTGATGTTGG  
GCGCTTGTGCGCGACTCCGAGCCCCTCGAGCGGGGAGCCC GGCGCGCGACT  
CGCCCCGAAACTATTGGCGGCCTGAGCATCGGGCTTCGAGCGCAGCAGACCA  
GCGCCTCGTACCCTTCGCGCAGGCACCCAGGAAGCCGGGCCCGGGCCCATC  
AGACGACTTGACCTCGGATCAGGCAGGGTTACCCGCTGAACTTAAGCATATC

*Biatriosporaceae*

CATTACCGTTGGAGCTCTGCTCCAATCTGGGATAGAACCCTTGCCTTTGAGTA  
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CGGTATTCCGTTGGGCATGCCTGTTTCGAGCGTCATTGTA ACTTTCAAGCTCAG  
CTTGGTGTGGGTGCTTGTCTCCCCGCGGGCGGACTCACCTCAAATGCATTG  
GCGGCCGGTATGTTGGCTTCGAGCGCAGTAGAACGCGCCTCGCGTCTTGACG

TACTGGTCCTCCACAAGCCCATTTTTTCAGCTTGACCTCGGATCAGGTAGGGAT  
ACCCGCTGAACTTAAGCATATCAATAA

*Corynesporascaceae*

TTCCGTAGGTGAACCTGCGGAAGGATCATTACCGTTACAACCGATCGCCTTCG  
GGCGTGAGGAAAACCCCTTTGTCTACATGTACCTCCTGTTGTTTCCTCGGTAGG  
CTTGCCTGCCGCTAGGAACCCATCCAACCCCTTGATCTAAAGTATCACAAAAC  
TCTGATAACTACCTAATCTTATCACAACTTTCAACAATGGATCTCTTGGTTCT  
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TTCCGTGAATCATCGAATCTTTGAACGCACATTGCGCCCCTTGGTATTCCGGG  
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CGTCTGTCCCGTCTCTGTGCGTGGACTCGTCCCAAAGTCATTGGCAGCGGTTCG  
TGCCGGCTTCTCGTGCAGCACATTGCGCTTCTTGAAGCTCCGGTGGACCAGCG  
TCCAGCAAGCCTTTTTTTATAACTTGACCT

*Dothidothiaceae*

TTTCCGTAGGTGAACCTGCGGAAGGATCATTACTGAGAGTACCGGGCTCTGC  
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GCCC GCCGGTCCGACTCCATTCAAACCCCTTGCAGTTGCAGTCAGCGTCTGAT  
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TTCGAGCGTCATTTGTACCCTCAAGCTCTGCTTGGTGTGGGTGTTTGTTCGCG  
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AGCGCAGCACATTTTGC GTTCAGATCAGTGTACACTGGCACCCAAGAAGCCT  
TATTTTAACGCTCTTGACCTCGGATCAGGTAGGGATACCCGCTGAACTTAAGC  
ATA

*Halotthiaceae*

TAACAAGGTTTCCGTAGGTGAACCTGCGGAAGGATCATTACCATCGGGGCCT  
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CAACGCAAACCAAAACCTCTGCCTAGCCGTATTGTCTGATGAACAAAAGAAT  
CTTCAAAACTTTCAACAACGGATCTCTTGGTTCTGGCATCGATGAAGAACGCA  
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CATTTGAACCCCTCAAGCACAGCTTGGTGTATGGGCGCTTGTCCCGCCGCGCG  
CGAGGACTCGCCCGAAAGTCATTGGCGGCTGGTGCACCGGCTCCGAGCGCAG  
CAGAGTACGCGCCTCGGGCGGTGTGTGCCGGCTCCCAACAAGGACACCCTCCA  
CAGTTTGACCTCGGATCAGGTAGGGATACCCGCTGAACTTAAGCATATCA

*Lindgomycetaceae*

CATTACTGAAAAAGATTGCCCGTTGCTTTTTCCCTACTCGAGCGCGTCATAGA  
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AGCGGAGGAA

*Lophiostomataceae*

TTGTACACACCCGCCGTCGCTACTACCGATTGAATGGCTCAGTGAGGCCTTCG  
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*Massariaceae*

CACACCGCCCGTCGCTACTACCGATTGAATGGCTCAGTGAGGCCTTCGGACT  
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CGGTCATTTAGAGGAAGTAAAAGTCGTAACAAGGTTTCCGTAGGTGAACCTG  
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*Bambusicolaceae*

TAAGCTGAGCGACTGTAAACAATTCGGCCCCGTGCAAGTCAGTGCAACGCTG  
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GCGAGGAAACTCCCGGGTGGCCCATGGGAAACTATGGGGTATGGTAACAGC  
GGGAGGTGATGACCCAGGACCTGGCGCCTGGCGAAATGGGTGATCCGCAGC  
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CGCCCCAAAGTCATTGGTAGCGGTTCGTGCCAGCTTCTCGCGCAGCATAACGCG  
CTCCGGAGGCCAGTCGATCAGCGTCCATAAG

*Dictyosporiaceae*

TTCCGTAGGTGAACCTGCGGAAGGATCATTACACACTGTGCCATGCTTGCAG  
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GAATCCCTCGGCGGGGACGCCTGCCCTGGGACCCCTAAACTTATACTGTAT  
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AACCGACAGGCTTGACTTCCACCAAGATCTTTACTATTTTGACCTCGAATCAG  
GTAGGGATACCCGCTGAACTTAAGC

*Didymosphaeriaceae*

AACAAGGTTTCCGTAGGTGAACCTGCGGAAGGATCATTATCGATGGCCGCGC  
CGTGAGCGCCCTGGTGCAGGATCGGCCGGCCACTGACCACACCCTTACTTTA  
CGAGCACCTTTCGTTCTCCTTCGGCGGGGCAACCCGCCGCTGGACCCTCATCA  
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GCGATAAGTAGTGTGAATTGCAGAATTCAGTGAATCATCGAATCTTTGAACG  
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ACCCTCAAGCTCTGCTTGGTGTGGGGCTGTGTCCCGCCTCTGCGCGCGGACT  
CGCCCCAAAGGCATTGGCAGCGGTCCACGGCCCTCTCGCGCAGCACATTGC  
GCTTCTCGAGGGCGGCCCGGCCGCATCCACGAAGCCCACATTACCGTCTTTG  
ACCTCGGATCAGGTAGGGATACCCGCTGAACTTAA

*Lentitheciaceae*

CGGAAGGATCATTACCTGGCCTTGGGCCGCTCCCGGGGGTTGCCCCCGAGG  
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CAGGTCTCCTGCCGCCAGGGACCCCAAACCCCTTAGTATCAGCATCAAACCT  
TCTGAAAACAACCTAATTATTTACAACCTTTCAACAATGGATCTCTTGGTTCT  
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TTCAGTGAATCATCGAATCTTTGAACGCACATTGCGCCCCTTGGTATTCCATG  
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CGTCTGTCCCGCTTCGTGCGCGGACTCGCCCCAAAGGTATTGGCAGCGGTCTT  
GCCAGCTTCTCGCGCAGCACATTGCGCTTCTCGAGGCTTTTGGCGGATCGGCG  
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*Massarinaceae*

GGAAGTAAAAGTCGTAACAAGGTTTCCGTAGGTGAACCTGCGGAAGGATCAT  
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TCTGTAGTCCCTGTCTTTTCGAGTACCTGTTCCGTTTCCTCGGCGGGCCTGCC  
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GTTTCGAGCGTCATCTACACCCTCAAGCTCAGCTTGGTGTGGGCGACTGTCCC  
CCCGCGGACTCGCCTCAAACGCATCTGGCGGCTGGGCCGGCGGCTTCTCCTG  
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CTCAGTTTTGACCTCGGATCAGGTAGGGATACCCGCTGAACTTAAGCATATCA  
ATAAGNCGGAGGAATCATTA ACT

*Morosphaeriaceae*

TTCCGTAGGTGAACCTGCGGAAGGATCATTAAACGATTTTCGGTTTACACCGTTT  
TCTACCTATGTCTACGCGTACCACACGTTTCCTCGGGGGGCTTGCCCCCGTT  
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CGCGTGGACTCGCCTTAAAGTAATTGGCAGCCATGTAATTCGGCTTTGAGCGC  
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TCTTGACCTCGGATCAGGTAGGGATACCCGCTGAACTTAA

*Parabambusicolaceae*

AAGGATCATTACCCAGTTGCCCGTCGTCTGCACGCGTGAGGAGCGCCTCTGC  
AGTGCGATCGTCTTCTCTCCCGTCAAGTCGCCCTGCGTGGGGCGGCGTGCCCG  
GCACCGCTGCAAGGCCGAAGAGGCCCGCGGTCATGGGCCCGGAAAACCGGG  
TGCGCGGGTCGGGGTTTAGTAAACCCTTGACTATGAGTACCTCTCGTTCCCTC  
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TACACCTCTGATCGTGGGCTCTTGAATCGTTTACA ACTTTCAACAACGGATCT  
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GTGTTGGGCTCTGTGCGCCTCTCCGGCGTCGACTGGCCCCAAATGCTTCGG  
CAGCTCCCCCGCCGGCCCTCGCAGCGCAGCAGTTCGCGCCCCGCGAGCCGGC  
GGGAGGCGCCGCTCCACCGACGACCCCCCTCGAGTTTGACCTCGGATCAGG  
CAGGGATACCCGCT

*Periconiaceae*

CGGAAGGATCATTACAAAATACCGGCGCCTGCCCTTCGGGGTTCGCGCGCCTC  
TATTTCAACCCTTTGCCTATGCGTACCCTTATCGCTTCCTCGGCAGGCTCGCCT  
GCCGCCAGGAACCCCAAAAACCCTTTGCATCTATACACGAAA ACTTCTGATA  
CAAACTAAATTATTACA ACTTTTAACGATGGATCTCTTGGTTCTGGCATCGA  
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TGTTTCGAGCGTCATTTACACCTCAAGCCTAGCTTGGTGTGGGCGTCTGTCC  
TGACTCGTTGCGCGGACTCGCCTCAAAGTCATTGGCGGCGGTCGTGCCGGC  
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CAAGCTACTTTTTATGACTTGACCTCGGATCAGGTGAGGATAACCCGCT

*Sulcatisporaceae*

CTCCAGGCGGTCCATTTTCGGTGGACAATCTCTGCGCAATCCTGGCAAGGCTG  
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GACCTCGGATCAGGTAGGGATACCCGCT

*Trematosphaeriaceae*

ATCATTACCCAACAGCCCTTCGGGGTCTGCTATCAACCCTTGACTATGAGTAC  
CAAATATACGTCCCTCGGCGGGGTGCACACCGCCCATGGGCCTTTTAAAA  
CACCTTTTGCAGTATGCTAGTATCTTCTGATTCTGTGGGCATGAATTTTTTACA  
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CACCTCAAGCTCTGCTTGGTGTGGGGCTCTGTCCCTGCGGGGACTCGCCCC  
AAAGTCATTGGCAGCCTCTGCCCCGCTTCCC GCGCAGCACTGTGCGCGCTTTTGG  
GAGGACCTACGGGTGGACTGGCGTCCAGCAAGCTCTTTTTATTCAACCAGCT  
TGACC

*Melanommataceae*

TAACAAGGTTTCCGTAGGTGAACCTGCGGAAGGATCATTAAACTTGTGCAAT  
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ACCTTGGCCTCTGGTGTACTCCCACAAGTACCAACCTTTTGTGTTGACCTCGGA  
TCAGGTAGGGATACCCGCTGAACTTAAGCATATC

*Neohendersoniaceae*

GCGGAAGGATCATTACTGTGGGTCTTCTCTGAAGCCCGCGAGATAGCACCT  
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CTGAAAAGTATTGGCAGCCAGGTGCCTTGGCTTGGAGCGCAGCAGAGTCAGC  
GCGCCAGCCCGGCGCCGCGGCATCCATAAGCTGTCTACCACGCTTGACCTCG  
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*Occultibambusaceae*

AGGGTAAGGGCGCAAGCTCTGGAAAAGCACGCCGCGGCCGCACAGGTGGTT  
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TACGTCAGCCTCGAGCGCAGCAGAATCAGCGCCCGTCGCCCGCGGACCAGG  
CTCTCCAGGAAG

*Pleomassariaceae*

TCCGTAGGTGAACCTGCGGAAGGATCATTACCGTGGGGATTTCGTCCCCATTG  
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AATATTAACCTTTCAACAACGGATCTCTTGGTTCTGGCATCGATGAAGAAC  
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ACATTGTGTCGCGATCCAGCCCGCCCCCTTCCATTAAGCCTCTTTTTTACTTTG  
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GGA

*Coniothyriaceae*

ACAAGGTTTCCGTAGGTGAACCTGCGGAAGGATCATTAAATATATCACAATG  
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GAGCGTCATTTGTACCCTCAAGCTCTGCTTGGTGTGGGGCTTTTGTCCCGCG  
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AGTCGCAGCACATTTTGGCGCTTCTAGTCATAATTGTTGGCGTCCATTAAGCC  
TATACATTTGCTCTTGACCTCGGATCAGGTAGGGATACCCGCTGAACTTAAGC  
ATATCA

*Cucurbitariaceae*

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*Didymellaceae*

ATCATTACCTAGAGTTGTAGGCTTTGCCTACCATCTCTTACCCATGTCTTTTGA  
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CCCCTTGGTATTCATGGGGCATGCCTGTTGAGCGTCATTTGTACCTTCAAG  
CCTTGCTTGGTGTGGGTGTTTGTCTCGCCTTTGCGCGCAGACTCGCCTTAAA  
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AGGTAGGGATACC

*Leptosphaeriaceae*

ATCATTACCTTCTATCGGGGACTGGGACCAGCGGGCCAGGCTTTGGCTGA  
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CGGCATATTGGCCTGGAGCGCAGCACAAATTTGCGCCCCTTGCCATGTTTGTG  
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*Phaeosphaeriaceae*

TTCCGTAGGTGAACCTGCGGAAGGATCATTACATTCAGTAGCTTGCTACTGTT  
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*Pleosporaceae*

CCTGCGGAGGGATCATTACCCAACAAAATAATGAAGGCCGCACGCCGGCTG  
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TGATTTTTTCAAACGTTTGACCTCGGATCAGGTAGGGATACCCGCTGAACTTA  
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*Sporormiaceae*

GAAGGATCATTATCGTGGAGCTGCGGCTCCTTCGAGGGAGAACCCTTGCCTTT  
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*Teichosporaceae*

CACACCGCCCGTCGCTACTACCGATTGAATGGCTCAGTGAGGTCTTCGGACT  
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*Testudinaceae*

GTAACAAGGTTTCCGTAGGTGAACCTGCGGAAGGATCATTACCGTGGGGGTC  
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GCAGGTCCGCCTGCCAATGGGGACAACCGAAAACCTCTTTGCAAATAGCAGT  
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GCTGAACTTAAGCATATCA

*Tetraplosphaeriaceae*

TCGTAAACAAGGTTTCCGTAGGTGAACCTGCGGAAGGATCATTAAACGTACGG  
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CGCGCTGGCGTCCAGCAAGCTCACCCCCCATTTGACCTCGGA

*Thyridariaceae*

GGATCATTACCATCGTCAACGCACCGTCCGCGTTGTCGCCCCGGCGGCAGCG  
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ATCCGCGGCCGTGAGCGCAGCACAGACGCGCCCAAGGTCCCGGGCGGGTCCG  
GCTCTCCAGAAGCCCCCTTCTACCACTTTTGACCTCGGATCAGGTAGGGATACC  
CGCTGAACTTAAGCATATCAATAAGCGG

*Torulaceae*

AGTCGTAACAAGGTTTCCGTAGGTGAACCTGCGGAAGGATCATTAAAGAATT  
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CAAATCGATTGGCAGTCGCAACCACCGAGCCGCGAGCGCAGCACAAGTCGC  
GCGAGCCGGCGAGGGGGCAAGGACGCTCCACAAGAACTTTTACAAGTCTG  
ACCTC

*Amphisphaeriaceae*

CTAGCGAGCGAGGGCGGCCGGCCCGACCTCCAGCCCCCTGTGTATCTGACCG  
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GAACGCTGTAACGGTGGCCCTCCGAGCGATGGCTTAACGCACAAAACCTTCA  
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GCGCCCCCTGGTAGCCCGGGGGGCACGCCTGTTTCGAGCGTCATCACACCCT  
CAAGCCTGGCTTGGTCTTGGGCCGCGCCCCCTCGGGGCGGGCCTCGAACTCC  
TGGGCGGTGCCGCCCCCACCAGCGTGACCGGGAGACTCTCCACGCGCTGG  
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*Apiosporaceae*

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CTGTAGGTTACCCGGTAGCTACCCTGTAGGCTACCCTGTAGCTTACCCTGCAC  
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*Beltraniaceae*

GTAACAAGGTCTCCGTTGGTGAACCAGCGGAGGGATCATTACAGAGTTATCT  
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*Clypeophysalospora*

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CGGCGGATCCGCAGTATCCTCTGAGCGTAGTAATTCATTATCTCGCTTTGGTA  
AGGTGCTGTGTATCCAGCCGATAAACACCCAAATTTTAAATGGTTGACCTCGG  
ATCACGTAGGAATACCCGCTGAACT

*Hyponectriaceae*

TACTGAGTTTTTAACTCTCCAAACCATGTGAACTTACCACTGTTGCCTCGGT  
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GAGGACCGCGCT

*Melanommataceae*

CATTACCGTGGGGCTTCGGCCCCATTGAGATAGCACCCCTTTGTTTATGAGTAC  
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*Pseudomassariaceae*

TGGAAGTAAAAAGTCGTAACAAGGTCTCCGTTGGTGAACCAGCGGAGGGATC  
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GTAGCTACCCTGTAGCTCCTTAAAGACAGCGGCGGAGACGTGGTATCTTCTG  
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*Sporocadaceae*

CATTATAGAGTTTTTTAAACTCCCAACCCATGTGAACTTACCATTGTTGCCTC  
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ACCCTGGAACGGCCTACCCTGTAACGGCTGCCGGTGGACTACCAAACCTTTG  
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GGATCAGGT

*Cephalothecaceae*

AGTTTAACGACTCCCAAACCACTGTGAACATAACCGTACCGTTGCCTCGGCG  
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GAACGCACATTGCGCCCGCCAGCATTCTGGCGGGCATGCCTGTCCGAGCGTC  
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GTTGACCTCGGATCA

*Chaetomiaceae*

ATCATTAAAGAGTTGCAAACTCCCTAAACCATTGTGAACCTACCTTCAAACC  
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GCCTTACACCCAAGGTTGACC

*Helminthosphaeriaceae*

ATCATTACCGAGGACACATCTGGTAATTCAGATGCCTCTCACACTTTGTTGTT  
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*Lasiosphaeriaceae*

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GCCCTGAAAACAGTGGCGGGCTCGCTGTCCACACCGAGCGTAGTAACTAAC  
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TTGACC

*Sordariaceae*

GCGGAGAAACCACCAGAGTTGCAAAAACCTCCACAAAACCATCGCGAATCTTAC  
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GCGCTCGCCAGTATTCTGGCGAGCATGCCTGTTTCGAGCGTCATTTCAACCATC  
AAGCTCTGCTTGCCTTGGGGATCCGCGGCTGCCCGCGGTCCCTCAAAAACAG  
TGGCGGGCTCGCTAGTCACACCGAGCGTAGTAACTCTACATCGCTATGGTCGT  
GCGGCGGGTTCTTGCCGTA AAAACCCCAATTTTCTAAGGTTGACCTCGGATCA  
GGTAGGAATACCCGCTGAACTTAAGCATATCAATAGCCGGAGGA

*Coryneaceae*

TTCCGTTGGTGAACCAGCGGAGGGATCATTGCTGGAAGCGCTCACGCGCAC  
CCAGAAACCCTTTGTGAACATACCTATTGTCGTTGCCTTGCGGAGGCCGGGG  
GAGGTCACACTCCCCCCCCGGCCCCCGGGGACTGGCTGCGGCGGAGCAG  
GCCCGCCGGCGGCCCAACAACTCCTGTATTTAAGCGTGTCTCTTCTGAGTAA  
AAAGCTTCTAAAATGAATCAAACTTTCAACAACGGATCTCTTGGTTCTGGCA  
TCGATGAAGAACGCAGCGAAATGCGATAAGTAATGTGAATTGCAGAATTCAG  
TGAATCATCGAATCTTTGAACGCACATTGCGCCCGCTGGTATTCCAGCGGGCA  
TGCCTGTTTCGAGCGTCATTTCAACCCTCAAGCTCTGCTTGGTGTGGGGCGCT  
GCCTGCCCCCTCCCGGGGGCGCGGCAGGCCCCCAAATTCAGTGGCGAGCTCG  
CCAGTACTCCGAGCGCAGTAGTGTAACCCCTCGCTTTGGACGGACTGGCGC  
GGCCCCGCGTAAAACCCCCCAAATTTCTGAAAAGTGACCTCGGATCAGGTA  
GATCCCGCC

*Cryphonectriaceae*

TTATACCTTTTTAAAATCGTTGCCTCGGCGCCGAGCCCAGGGGAGACGGGAT  
ATAGAGATATCTTTCTTTTCCCGCTCCCTCCCTCACCACCCGTGCAAACG  
GTGTGTTGGTGGGAGCAGGCCCGCCGGCGGCCCGTTAAACTCTTGTTTTTAAA  
AAACGTATCTCTTCTGAGTAATTAACAACAAAAAATGAATCAAACTTT  
CAACAACGGATCTCTTGGTTCTGGCATCGATGAAAAACGCAGCGAAATGCGA  
TAAGTAATGTGAATTGCAAAATTCAGTGAATCATCGAATCTTTGAACGCACA  
TTGCGCCCGCTGGAATTCCAGCGGGCATGCCTGTTTCGAGCGTCATTTCAACCC  
TCAAGCTTGGCTTGGTGTGGGGTACTACCCGTAAAACGGTAGGCCCTGAAA  
TTTAGTGGCGGGCTCGCTAAGACTCTGAGCGTAGTAGTGTTTTTTTCTCAACC  
TCGCTTTGGAAGGATTAGCGGTTGCTCTTGCC

*Diaporthaceae*

CGGAGGGATCATTGCTGGAACGCGCCCCAGGCGCACCCAGAAACCCTTTGTG  
AACTTATACCTTACTGTTGCCTCGGCGCATGCTGGCCCCCTGGGGGTCCCTC  
GGAGACGAGGAGCAGGCACGCCGGCGGCCAAGTTAACTCTTGTTTTTACACT  
GAAACTCTGAGAAAAAACACAAATGAATCAAACTTTCAACAACGGATCTC  
TTGGTTCTGGCATCGATGAAGAACGCAGCGAAATGCGATAAGTAATGTGAAT  
TGCAGAATTCAGTGAATCATCGAATCTTTGAACGCACATTGCGCCCTCTGGTA  
TTCCGGAGGGCATGCCTGTTTCGAGCGTCATTTCAACCCTCAAGCATTGCTTGG  
TGTTGGGGCACTGCCTTTTAAACGGGCAGGCCCTGAAATCTAGTGGCGAGCT  
CGCCAGGACCCCGAGCGCAGTAGTTAAACCCTCGCTCTGGAAGGCCCTGGCG  
GTGCCCTGCCGTTAAACCCCAACTCTTGAATAATTTGACCTCGGATCAGGTAG  
GAATACCCGCTGAACTTAAGCATA

*Diaporthostomataceae*

CATTGTTGGAACCTCGCTTCGGCGTATTCTATCCACCCTTTGTGAACGTTACCT  
GTTTTTTGTTGCCTCGGTGGTGTGCTGCCTTTTCTTTAGAAGGCCCGCTTCGGCGG  
AGCAAGCCTGCCGGTGGCCCTACCCAACCTATTTGTAACTGTGTTTTTCTGA  
GTACATAACTAAAATGAATCAAACTTTCAACAACGGATCTCTTGGTTCTGGC  
ATCGATGAAGAACGCAGCGAAATGCGATAAGTAATGTGAATTGCAGAATTCA  
GTGAATCATCGAATCTTTGAACGCACATTGCGCCCGCTGGTATTCCAGCGGGC

ATGCCTGTTTCGAGCGTCATTTACCCCTCAAGCCTAGCTTGGTGTGGAGCAC  
AGCCTGCTAATCCCGGGCTCGCTCTCAAATGCATTGGCGGGCTCACGAAAAC  
TCCGAGCGTAGTAATTTTTTCTCGCTTAGGTTGGATTTCGGGAGGCCTAGCCA  
CGAAA

*Gnomoniaceae*

TCATTGCTGGAACAAACGCCCTCACGGGTGCTACCCAGAAACCCTTTGTGAA  
TTCTTCTCTATTGTTGCCTCGGCACAGACTGGCTTCCTACGAAGTCCCCTATTT  
TCCTTCTCTTCGGAGGGGGTAAGGGAGCAGGTCGGCCGGTGGCCACTATAA  
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ACTTTTAAACAACGGATCTCTTGGTTCTGGCATCGATGAAGAACGCAGCGAAA  
TGCGATAAGTAATGTGAATTGCAGAATTCAGTGAATCATCGAATCTTTGAAC  
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AACCTCAAACCTCGGTTTTGGTGTGGAGGACTACGCTGCTACCCAGCGT  
AGCCTCTGAAATACAGTGGCGGGCTCGCTAGAATTTGAGCGTAGTAATTTAT  
ACCTCGTTTGTAAGACTAGCGGTGTCTCTTGCCGTAAAACCCCC

*Harknessiaceae*

AGGTCTCCGTTGGTGAACCAGCGGAGGGATCATTGCTGGAACGTGTGTCCTCA  
CGGGCACACACCAGATAACCCTTTGTGAACCTATAACACTATATCGTTGCCTC  
GGCGCTGAGCCCGGGGGGAACCCTCAACCCGTTCCCCCTCCCTCGGGAGCC  
GCGCCCCCTCTGGGGGCTGCGGTCTCTCCCTGGAGCAGGCCCGCCGGCGGCC  
CACCAAACCTCTTTGTTTTTAGAACGTATCTCTTCTGAGTTTTTATACAAACA  
ATGAATCAAACCTTTCAACAACGGATCTCTTGGTTCTGGCATCGATGAAGAA  
CGCAGCGAAATGCGATAAGTAATGTGAATTGCAGAATTCAGTGAATCATCGA  
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GCGTCATTTCAACCCTCAAGCCTAGCTTGGTGTGGGGCACTACCCGTAACAC  
GGTAGGCCCTGAAATTCAGTGGCGGGCTCGCTAAGACTCTGAGCGTAGTAGT  
TTACCACCTCGCTTTGGATGGACTAGCGGTGCTTTCTTGCCGTAAAACCCCC  
AACTTCTGAAAATTTGACCTCGGATCAGGTAGGAATACCCGCTGAACTTAAG  
CATATC

*Melanconidaceae*

TAACAAGGTCTCCGTTGGTGAACCAGCGGAGGGATCATTGCTGGAACACGCC  
CTCCGGGCGTCCCAGATAACCCTGTGTGAACCTATAACCTGTCGTTGCCTCGGC  
GCTGGCTGGTGGGCTCCCCGCCACCCCACTGGACCGTCACGGTCCGGCGGA  
GCAGGCCCGCCGGCGGCCTTTCCAACCTTTGTTTATATCACGTATCTCTTCTG  
AGCAGACAAAACAAAATGAATCAAACCTTTCAACAACGGATCTCTTGGTTCT  
GGCATCGATGAAGAACGCAGCGAAATGCGATAAGTAATGTGAATTGCAGAA  
TTCAGTGAATCATCGAATCTTTGAACGCACATTGCGCCCGCTGGTATTCCAGC  
GGGCATGCCTGTTTCGAGCGTCATTTCAACCCTCAAGCTGTCCTCAGCTTGGTG  
TTGGGGCGTAGCCTGTGCCACGGGCTAGCCCTGAAACCTACCGGCGTGCTC  
ACTAAGACTCCGAGCGTAGTAATCTCTTCTCGCTTAGGCTGGCTTAGCGGTGC  
GTAGCCGTGAAAACCCCCAATTTCTGAAAGTTGACCTCGGATCAGGTAGG  
AATACCCGCTGAACTTAAGCATATCAATA

*Pseudomelanconidaceae*

CATTGCTGGAACACGCCCCCCAGGGCGTACCCAGAAACCCTTTGTGAACTTA  
TACCATAATATCGTTGCCTCGGCTGTGGCCGGTGGGCCCCAGGGCTCACCCC  
GCCGGACCGTCAGAACGTCCAGCGGAGCAGGTCTGCCGGTGGCCCCCTAAAC  
TCTTGTTTTTATAACGTATCTCCTCTGAGTATCTTTACAAAATGAATCAAACT  
TTCAACAACGGATCTCTTGTTCTGGCATCGATGAAGAACGCAGCGAAATGC  
GATAAGTAATGTGAATTGCAGAATTCAGTGAATCATCGAATCTTTGAACGCA  
CATTGCGCCCCGCTGGTATTCCAGCGGGCATGCCTGTTCGAGCGTCATTTCAAC  
CCTCAAGCCTAGCTTGGTGTGGGGCACAGCCTGTGAAAGGGCTGGCCCTGA  
AATTCAGTGGCGGGCTCGCTAAGACTCTGAGCGTAGTATTTTTACACCTCGCT  
TCTGACGTACTAGCGGCGTCTGGCCGTAATA

*Pseudoplagiostomataceae*

TCGTAACAAGGTCTCCGTTGGTGAACCAGCGGAGGGATCATTGCTGGAAGCG  
TCTCACGGCGCACCCAGATACCCTTTGTGAACCTGTACCCTTCTGTTGCCTCG  
GCGCAGGCTGGGCGCTTCCACACGCCCCACGCAGGCCTCAACCCCTGTGC  
GGAGCCAGCCGGCCGGTGGCCACAACCAACTCTTGTTTTTACCCACCCGTC  
TCTCTGAGTAACCAAAACAAATGAATCAAACTTTCAACAACGGATCTCTTG  
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AGAATTCAGTGAATCATCGAATCTTTGAACGCACATTGCGCCCCGCTGGTATTC  
CAGCGGGCATGCCTGTTCGAGCGTCATTTACCCCTCAAGCTCCGCTTGGTGT  
TGGGGCACTGCCGCGCCGCTTCGGCGGGGCAGGCCCCCAAATCCAGTGGCGA  
GCTCGCCAGGACTCCGAGCGTAGTAGTTATTCACCTCGCTATGGACGGACTG  
GCGGTGCTTTGCCGTTAAACCCCCCACTTTCTGAAAAGTTGACCTCGGATCA  
GGTAGGAATACCCGCTGAACTTAAGCATATCAATAAGCGGAGGAAAAGAAA  
CCAACAGGGATTG

*Schizoparmaceae*

AGGATCATTGCTGGAACGTGTGCCGCAAGGACACAACCCAGATACCCTTTG  
TGAACCTTATACCTATATATCGTTGCCTCGGCGCTGAGCTGGAAGCACTTCGGT  
GCTTTCCCACTGAGCAATCAGTGGAGCAGGCCCGCCGGTGGCCATTAACT  
CTTGTTTATTATTGTCTTCTCTGAGTTATTCAAAACAAATGAATCAAACTTT  
AACAACGGATCTCTTGTTCTGGCATCGATGAAGAACGCAGCGAAATGCGAT  
ACGTAATGTGAATTGCAGAATTCAGTGAATCATCGAATCTTTGAACGCACATT  
GCGCCCCGCTGGAATTCCAGCGGGCATGCCTGTTCGAGCGTCATTTACCCCTC  
AAGCTTTGCTTGGTGTGGGGCACTACCAGTAAAACGGTAGGCCCTGAAATT  
CAGTGGCGGGCTCGCTAAGACTCTGAGCGTAGTAGTTTACCACCTCGCTTTGG  
AAGGATTAGCGGTGCTCTTGCCGTAACCCCAACTTTTGAAAATTTGACCT  
CGGATCAGGTAGGAATACCCGCTGAACTTAAGCATATC

*Stilbosporaceae*

GGTGAACCAGCGGAGGGATCATTGACGCGTAGAAGACCCCGCAAGGGGGAT  
TCTGTACACCCTTTGTCAACTTATAAACTATCGTTGCCTCGGCGTAAGGCCG  
GGGGAGGTCACACTCCCCCCCCGCCCCCTCTGAGGGGGCGGAGCAGGCCCGCC  
GGCGGCCCTATAAACTCTTGTTTTTACAGTGTACCTCTGAGTATAAACACAA  
ATGAATCAAACTTTCAACAACGGATCTCTTGTTCTGGCATCGATGAAGAA

CGCAGCGAAATGCGATAAGTAATGTGAATTGCAGAATTCAGTGAATCATCGA  
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GCGTCATTACAACCCTCAAGCTCTGCTTGGTGTGGGGCGCTGCCTCCCTCTA  
GCGGTGGCAGGCCCTAAATCTAGTGGCGAGCTCGCCAGGACTCCGAGCGCA  
GTAGTTTTACCACCTCGCTTAGGAAGGACTGGCGGTGCCCTGCCGTAAAACC  
CCCCACTATATCTAAAAGGTGACCTCGGATCAGGTAGGAATCCC

*Sydowiellaceae*

GCGGAGGGATCATTGTGGAAGCGCCGAGAGGGCGCACCCAGAAACCCCTGTG  
AAATAACCCACGTCGTTGCCTCGGCGGGCTGGGTCCGGCGCCCCCGGGCGC  
CGGGCCCCCGCGGCCCCCTTACCCGGGACCGCTGGAGCTGCCCGCCGGCG  
GCGCACCAAACCTTTGTTATCAAGCGTACAACCTCTGAGAAAACTTTAAATA  
AGTAAAAACTTTCAACAACGGATCTCTTGGTTCTGGCATCGATGAAGAACGC  
AGCGAAATGCGATAAGTAATGTGAATTGCAGAATTCAGTGAATCATCGAATC  
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TCATTTCAACCCTCAGCGCCCTAGGCCTGGTGTGGGGCGCTGCCGCCCCCG  
GGGCGGCAGGCCCCCAAATTCATTGGCGAGCTCGCCAGTCCCCCGAGCGCAG  
TAGTTTACACCTCGCTCCGGGCCGACTGGCGCTGCCAGCCGTAAAACCCC  
CCAATTTTTAATGGTTGACCTC

*Synnemasporiaceae*

CATTGCTGGAATACACGCTCTCACGGGCGCTACCCAGAAACCCTTTTGTGAA  
CTTATAACCATTATATTGTTGCCTCGGCAGTGGCTGGGCTCGCAATGAGCCCC  
AGTACTTCTTGTGCTGGAGCCGGCCGGCCGGTGGCCCTATAAACTCTTGTTG  
TATAGTGTCTCTTTCTGAGTTTTTACAAAACAAATGAATCAAACTTTCAACA  
ACGGATCTCTTGGTTCTGGCATCGATGAAGAACGCAGCGAAATGCGATAAGT  
AATGTGAATTGCAGAATTCAGTGAATCATCGAATCTTTGAACGCACATTGCG  
CCCCGCTGGTATTCCAGCGGGCATGCCTGTTTCGAGCGTCATTTCAACCCTCAGG  
CTTCTCTAGCTTGGTGTGGGGCACTACCTGTCATAGGGTAGGCCCTCAAATT  
TAGTGGCGGGCTCGCTAGAACTCTGAGCGTAGTAATTATACGTCGCTTTGGA  
ACGACTAGCGGTGCTCCAGCCGTAAA

*Valsaceae*

GGATCATTGCTGGAACGCGTCGCAAGGCGCACCCAGAAACCCTTTGTGAACT  
TATACCTACATCGTTGCCTCGGCGTTGGCTGCCCTCCCCCTGCCGGAGGGGC  
CCTTCTCTAGCACACTCTGTGTGTGAAAGGAGGACAGCAGGCCCGCCGGTGG  
CCATTAAACTCTTGTTTTTACCGAGTAACTTCTGAGTAAAGCTTCTAAATGA  
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GCGAAATGCGATAAGTAATGTGAATTGCAGAATTCAGTGAATCATCGAATCT  
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CATTTCAACCCTCAAGCTCTCGGCCGCTTTGCGGGACGCTTGGTGTGGGGCA  
TTACCCGGCCGCTTTGCGGGAGGTAAGCCCTGAAATTTAGTGGCGAGCTCGC  
CAGGACTCCGAGCGTAGTAGTTAAACCCTCGCTTTGGATTGTACTGGCGCGG  
CCTAGCCGTAAAACCCCAACTTCTGAAAATTTGAC

*Bloxamiaceae*

AGAGGAAGTAAAAGTCGTAACAAGGTTTCCGTTGGTGAACCAGCGGAAGGA  
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GCGCTCGTCGCCAGAGGACCCATTCTCTCCTGTCGTGTCGTACCGTCTGACAT  
CATATAACAAAACAAAACCTTTCAACAACGGATCTCTTGGCTCTGGCATCGAT  
GAAGAACGCAGCGAAATGCGATAAGTAATGTGAATTGCAGAATTCAAGTGAAT  
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TCATCCATGGCTAGCCTTAAAAAGGATGGCGGTACCGTTTGGCCCTGCGCGT  
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CTTGGTTGACCTCGGATCAGGTAGGGATACCCGCTGAACTTAAGCATATCAA  
TAAGCGGAGGAAAAGAAACCAACAGGGATTACCTCAGTAACGGCGAGTGAA  
GCGGT

*Cenangiaceae*

GTGAACCTGCGGAAGGATCATTACCGAGCTCGCGCCCCCGGGGCCGACCTC  
CCACCCGTGCGATTGACTACCGTGTTGCTTTGGCGGGCCGCCACGGCGCCGG  
CTCCGGCCGGAGAGCGCCCGCCAGAGGCCCCGAAACCCCGTGCTGTCCGTGT  
TGTCCGAGCACTATCGAATAGTTAAAACCTTTCAACAACGGATCTCTTGGCTCT  
GGCATCGATGAAGAACGCAGCGAAATGCGATAAGTAATGTGAATTGCAGAA  
TTCAGTGAATCATCGAATCTTTGAACGCACATTGCGCCCCTCGGCATTCCGGG  
GGGCATGCCTGTCCGAGCGTCAGTAGACACCCCTCCAGCCCCGCTGGGTCT  
GGGCCCCGCCGTCCGACGGCGGGCCTCAAAGCGAGTGGCGGTGCCCGAAGG  
CCCTGAACGCAGTACAACCTCTCGTTCCGGGCGCCGACGGGTGCGCCGGCCAG  
GTCAACCCCCCCCCCCC

*Cochlearomycetaceae*

AAGGTTTCCGTAGGTGAACCTGCGGAAGGATCATTAAATGAGAACTTGCCCTT  
CGGGGTAGATCTCCCACCCTATGCTTACCTTACCTTTGTTGCTTTGGCAGGCC  
CGTCTCTCGGGACCGTCGGCTTCGGCTGGCCCGTGCCGAGAGGACCCCA  
AACTCTGATATTTTTGTCGTCTGAGTACTATTTTAATAGTTAAAACCTTTCAACA  
ACGGATCTCTTGGTTCTGGCATCGATGAAGAACGCAGCGAAATGCGATAAGT  
AATGTGAATTGCAGAATTCAGTGAATCATCGAATCTTTGAACGCACATTGCG  
CCCTCTGGTATTCCGGGGGGCATGCCTGTTTCGAGCGTCATTACAACCCTCAAG  
CTCTGCTTGGTGTGGGGCGTCACCATCTCGGTGCGCCTTAAAATCAGTGGCGG  
TGCCGTGCGGCTCCAAGCGTAGTAATTCTTCTCGCTCTGGAGGTCCCGGTGTG  
CGTCTGCCAGCCAACCCCTAATTTTTCTATGGTTGACCTCGGATCAGGTAGGG  
ATACCCGCTGAACTTAA

*Dermateaceae*

TGACAGAGCCAACGAGTTCATCACCTTGGCCGAAAGGTCTGGGTAATCTTGT  
TAAACTCTGTCGTGCTGGGGATAGAGCATTGCAATTATTGCTCTTCAACGAGG  
AATTCCTAGTAAGCGCAAGTCATCAGCTTGCCTGATTACGTCCCTGCCCTTT  
GTACACACCCGCCGTCGCTACTACCGATTGAATGGCTAAGTGAGGCTTTCCG  
ACTGGCCTAGGGAGAGCGGCAACGTTACCCAGGGCCGGAAAGTTGTCCAA  
ACTTGGTCATTTAGAGGAAGTAAAAGTCGTAACAAGGTCTCCGTAGGTGAAC

CTGCGGAGGGATCATTACAGAGACTCTGCCCTTTGGGTAGACCTCCCACCCT  
GTGTCGTTATACCTTTGTTGCTTTGGCGGGCCGCGGGGCCCGGCCCTGCCCC  
TGGCTCCGGCTAGGGCGCGCCCGCCAGAGGACCTCAAAACCTGAACGTTAGT  
GTCGTCTGAGTACTATATAATAGTTAAAACCTTCAACAACGGATCTCTGGTT  
CTGGCATCGATGAAGAACGCAGCGAAATGCGATAAGTAATGTGAATTGCAGA  
ATTCAGTGAATCATCGAATCTTTGAACGCACATTGCGCCCCTTGGTATTCCGG  
GGGGCATGCCTGTTTCGAGCGTCATTACAACCCTCAAGCTCTGCTTGGTCTTGG  
GCGTACCCGGTCCCCGGTGTGCCTTAAAATCAGTGGCGGCGCCATCTGGCTCT  
AAGCGTAGTACATACTCTCGCTACAGACGTCCGGTGGATGCTGGCCAGCAAC  
CCCCAATTTATCAAGGTTGACCTCGGATCAGGTAGGGATACCAAG

*Helotiaceae*

AAGGATCATTACAGAGAACTTGCCCTTCGGGGTAGATCTCCCACCCATTGTTT  
ACATACCTTTGTTGCTTTGGCAGGCCTGTCCCCGGGACTGCTGGCTTCGGCT  
GGCCCCGCGCCTGCCAGAGGACCCCAAACCTCATGTTTTAAATGTCGTCTGAGT  
ATCATATAATAAGTTAAAACCTTCAACAACGGATCTCTTGGTTCTGGCATCGA  
TGAAGAACGCAGCGAAATGCGATAAGTAATGTGAATTGCAGAATTCAGTGAA  
TCATCGAATCTTTGAACGCACATTGCGCCCCTTGGTATTCCGGGGGGCATGCC  
TGTTTCGAGCGTCATTACAACCCTCAAGCTCTGCTTGGTATTGGGCGTCCAC  
CTCGGCGCGCCTTAAAATCAGTGGCGGTGCCATCCGGCTTCAAGCGTAGTAA  
TACTTCTCGCTCTGGAGCTTCGGGTGCGTGCTTGCCAGCAACCCCAAATTTTT  
CAAAGGTTGACCTCGGATCAGGTAGGGATACCCGCTGAACTTAA

*Hyaloscyphaceae*

CATTAAAGAATCGCCCCGTTTTTTGAAATGGGTTCTATTCCCAAACCGTGTAT  
ACATACCTTTGTTGCTTTGGCGGGCCGCCTTCGGGCGTTGGCTTCTAGCTGAC  
TGCGCCCCGCCAGAGGACCCCAAACCTCGTTTTGTTAATGATGTCTGAGTACTATA  
TAATAGTTAAAACCTTCAACAACGGATCTCTTGGTTCTGGCATCGATGAAGAA  
CGCAGCGAAATGCGATAAGTAATGTGAATTGCAGAATTCAGTGAATCATCGA  
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GCGTATTATAACCACTCAAGCCTTGGCTTGGTATTGGGGTTTCGCGGTTCCG  
CGGCCCTTAAAATCAGTGGCGGTGCCGTCTGGCTCTAAGCGTAGTAATTCTCT  
CGCTATAGGGTCCC GGCGGTGGCTTGCCAGAACCCCTATTTTTCTATGGTT  
GA

*Neolauriomycetaceae*

CAAGGTCTCCGTAGGTGAACCTGCGGAGGGATCATTACAGAGTTCATGCCCT  
AACGGGTAGATCTCCCACCCTATGTTATCAAAACTATGTTGCTTTGGCGGGCC  
GCCTTACAGGCTACCGGCTTCGGCTGGTGCGTGCCCGCCAGAGGACCCCAA  
ACTCTGAATTTTTGTCGTCTGAGTACTATATAATAGTTAAAACCTTCAACAAC  
GGATCTCTTGGTTCTGGCATCGATGAAGAACGCAGCGAAATGCGATAAGTAA  
TGTGAATTGCAGAATTCAGTGAATCATCGAATCTTTGAACGCACATTGCGCCC  
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TGCTTGGTATTGGGCCACGCCAGTGATGGCGAGCCTTAAAATCAGTGGCGGC  
GCCGCTGGGCCCTGAGCGTAGTAATACTCCTCGCTACTGGGTCTAGTGGATG

CTTGCCATCAACCCCAATTTTCTATGGTTGACCTCGGATCAGGTAGGGATAC  
CCGCTGAACTTAA

*Pezizellaceae*

TAAAAGTCGTAACAAGGTTTCCGTAGGTGAACCTGCGGAAGGATCATTACAG  
AGTTCATGCCCTTCGGGGTAGACCTCCCACCCTTTGTATACATACTTTGTTG  
CTTTGGCAGGCCGCCTCGCGGCCGGCGGCTTCGGCTGCCGCGCGCCTGCCAG  
AGAACCCCAAACCTCTGATTTATAGTGTCTGAGTACTATATAATAGTTAAA  
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GCACATTGCGCCCCTTGGTATTCCGGGGGGCATGCCTCTTCCAGCGTCATTT  
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ACACAGTGGCGACGCCATCGTGCTCTCAGCGTAGTATTTCTTCTCGCTGTTGG  
GTTCCGGTGGCTGTCCGCCAGCAACCCCAACTTTCTAAGTTTGACCTGGGAT  
GAGGTAGGGATACCCGCTGAAC

*Rutstroemiaceae*

ACAAGGTTTCCGTAGGTGAACCTGCGGAAGGATCATTACAGAGTTCATGCCC  
TCACGGGTAGACCTCCCACCCTTGTGTATTTATACTTTGTTGCTTTGGCGGGG  
TGCTTGACTTTCCAGTTGAGCCTCAGCTCTTGAGTTGAGAGTCCCCGCCAGA  
GGAAACTTAAATTCTGATTATTAGTGTCTGAGTACTATATAATAGTTAAA  
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TGCGATAAGTAATGTGAATTGCAGAATTCAGTGAATCATCGAATCTTTGAAC  
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AACCTCAAGCTCTGCTTGGTATTGGGCTCTTATCAGTAAAATGATAGGCCTC  
AAAATCAGTGGCGGCCGCTTGGGTCCTGAACGTAGTAATATATTTTCGTTAC  
AGGTGCTCCGCGTGCTTCTGCCATTAACCCCAATTTTCTATGGTTGACCTC  
GGATCAGGTAGGGATACCCGCTGAACTTAA

*Sclerotiniaceae*

CATTACAGAGTTCATGCCCCGAAAGGGTAGACCTCCCACCCTTGTGTATTATTA  
CTTTGTTGCTTTGGCGAGCTGCCTTCGGGCCTTGTATGCTCGCCAGAGAATAC  
CAAACCTCTTTTTATTAATGTCGTCTGAGTACTATATAATAGTTAAAACCTTT  
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AAGTAATGTGAATTGCAGAATTCAGTGAATCATCGAATCTTTGAACGCACAT  
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CAAGCTTAGCTTGGTATTGAGTCTATGTCAGTAATGGCAGGCTCTAAAATCAG  
TGGCGGCGCCGCTGGGTCCTGAACGTAGTAATATCTCTCGTTACAGGTTCTCG  
GTGTGCTTCTGCCAAAACCCAAATTTTCTATGGTTGACC

*Tricladiaceae*

TAATAGAGATAAGGCTGACAGCGCCCTAGGGTTGCATCTTCGGGTGTATACT  
TCCTAGGGGCTACCCTCTTCGGAGGGTTTAGAGTCGACGGGCAACTTCGGTTG  
ATACTCGGGCCTGACCTCCACCCTTGAATAAATTACCTTTGTTGCTTTGGCAG  
GCCGCCTCGTGCCAGCGGCTTCGGCTGTTGCGTGCCTGCCAGAGGACCACAA  
CTCTTGATTTTAGTGATGTCTGAGTACTATATAATAGTTAAAACCTTTCAACAA

CGGATCTCTTGGTTCTGGCATCGATGAAGAACGCAGCGAAATGCGATAAGTA  
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CTCTGGTATTCCGGGGGGCATGCCTGTTTCGAGCGTCATTATAACCACTCAAGC  
TCTCGCTTGGTATTGGGGTTCGCGATCTCGCGGCCCTTAAAATCAGTGGCGGT  
GCCTATTGGCTCTACGCGTAGTAATACTCCTCGCGTCTGGGTCTAGTAGGTTT  
ACTTGCCAACAACCCCAATTTTTACAGGTTGACCTCGGATCAGGTAGGGAT  
ACCC

*Vibrisseaceae*

GGAAGTAAAAGTCGTAACAAGGTTTCCGTAGGTGAACCTGCGGAAGGATCAT  
TAATCAGTGGATCCGGCGGGGAATCCCCTCTCCCCGAGAGGGGGTTCGCTC  
GCCGGGTAGACCTCCACCCGTGCTTACCTACTCTTGTTGCTTTGGCGGGCCGT  
GGCCTCCACTACGGGCTCTGCTCGTACGTGCCCGCCAGAGGACCAAACCTCTG  
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TAGGCCCTAAGCGTAGTAAATCTCCTCGCTATAGGGTCTCTCGGTGGCTCGC  
CAGAGCCCCAACTTCTTTAAGGTTGACCTCGGATCAGGTAGGGATAACCCGCT  
GAACTTAAGCATATCAATAAGCGGAGGA

*Amphisphaeriaceae*

ACAAGGTCTCCGTTGGTGAACCAGCGGAGGGATCATTACAGAGTTACTAAAC  
TCCAACCCATGTGAACTTACCTGTTGCCTCGGCGGGTTCTATCCCTATGGATA  
GGCCAAAATTCGCCGAAGGCCCATCTAAACTCTTGTTTTTACTGTAATCTGAG  
TGTTACTTTTTAAATAAGTTAAAACCTTTCAACAACGGATCTCTTGGTTCTGGC  
ATCGATGAAGAACGCAGCGAAATGCGATAAGTAATGTGAATTGCAGAATTCA  
GTGAATCATCGAATCTTTGAACGCACATTGCGCCCATTAGTATTCTAGTGGGC  
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TACTTTATTGTAATTCCTAAAGATAGTGGTAGAGTCGGATCGTCTCTCAGCG  
TAGTAATTTTTTCTCGCTTTTGTAGAAGTTCTCTCGCTAGCCATAACCCCTATA  
TTTTTTATTGGTTGACCTCGGATTAGGTAGGAATACCCGCTGAACTTAA

*Apiosporaceae*

TTCCGTAGGTGAACCTGCGGAGGGATCATTACAGAGTTATTCAACTCCCAAC  
CATTTGTAACTTACTCAGTTATGCCTCGGCGTAAGCTGGGCGGGTTCGGACGT  
GCTACCCTGGAGCTACCCTGTAGCTACCCGGTAGCCGCGGCCGCCCTAGC  
CCGCCGGTGGTACGCTAAACTCTTGTTTAAATTGTATATTCTGAGCGTCTTATTT  
TAATAAGTTAAAACCTTTCAACAACGGATCTCTTGGTTCTGGCATCGATGAAGA  
ACGCAGCGAAATGCGATAAGTAATGTGAATTGCAGAATTCAGTGAATCATCG  
AATCTTTGAACGCACATTGCGCCCATTAGTATTCTAGTGGGCATGCCTGTTTCG  
AGCGTCATTTCAACCCTTAAGCCTAGCTTAGTGTTGGGAATCTACTGTATTGT  
AGTTCTCAAAGACAGTGGCGGAGCGATAGTTGTCCTCTGAGCGTAGTAATA  
CTTATTCTCGCTTTTGTAGGTGCTATCTTCTCGCCATAAAACCCCAATTTTT

TAGTGGTTGACCTCGGATCAGGTAGGAATACCCGCTGAACTTAAGCATATCA  
ATAA

*Beltraniaceae*

GTAACAAGGTCTCCGTTGGTGAACCAGCGGAGGGATCATTACAGAGTTATCT  
AACTCCCAAACCCATGTGAACCTACCTTATGTTGCCTCGGCGGAGCCTACCCT  
GTAGCGTGCCTACCCGGTAGCGTTCCGCCGGTGGACCTCTAAACTCTTGTTAA  
TTTTACGATATCTGAGCGTCTTATTTCTAAATAAGTCAAAACTTTCAACAACG  
GATCTCTTGGTTCTGGCATCGATGAAGAACGCAGCGAAATGCGATAAGTAAT  
GTGAATTGCAGAATTCAGTGAATCATCGAATCTTTGAACGCACATTGCGCCC  
ATTAGTATTCTAGTGGGCATGCCTGTTGAGCGTCATTTCAACCCTTAAGCCT  
AGCTTAGTGTGGGAGCCTACGCCGGGCCAAAGCTACCCTGTAGCGTGGTTA  
CCCTGTAGCTCCCGAAATCTAACGGCGGATCGTCAGCTATCCTCTGAACGTA  
GTAATCTATTATCTCGTTTCGGTTAGGTGCTGGCCTTCCTGCCGCAAACCCC  
CTATTTTTTGTGGTTGACCTCGGATCAGGTAGGAATACCCGCTGAACTTAAGC  
ATATCAATA

*Cainiaceae*

TTGGTAAGTAAAAATCGTAACAAGGTCTCCGTTGGTGAACCAGCGGAGGGAT  
CATTACAGAGTTTAATCTCGCCCAACCCTTGTGTACCTTACCTAGTTGCCTCG  
GCGGCGACAGTGAGGGGCGCTCAAAAAGCCCTCTCTGGCCCGCCGGTGGACG  
CCTAAACTCTTGTTTAAACATGTATTCTGAAATAAAAAGTAAATAAGTTAAA  
ACTTTCAACAACGGATCTCTTGGTTCTGGCATCGATGAAGAACGCAGCGAAA  
TGCGATACGTAATGTGAATTGCAGAATTTAGTGAATCATCGAATCTTTGAACG  
CACATTGCGCTCCCTAGTATTCTGGGGAGCATGCCTGTTGAGCGTCATTTG  
ACCCTCAAGTCTAGTACTTGGTGTGGGGTGCGCCATGCGCGCGCCCTCAA  
AAGCATTGGCAGAGCTGGTTAGCAGTCTGAGCGTAGTAAATCACCTCGCTTC  
TGAAGGCTACCCGGCCCTTCGCCGTAAACTATTTATTACCAAAGTTGACCT  
CGGATCAGGTAGAATGCCTCG

*Coniooessiaceae*

TGCGGAGGGATCATTACTGAGTTATTTACAACCTCCAAACCCATGTGAACTTAC  
CATCGTTGCCTCGGCGGGTCGAGCCTACCTGGTACTTACCCGGTAGGAGCGC  
CGCCGGTGGACATTCAAACCTTTGTCATTACTGTGGCTTCTGAGTAGTTATCA  
TAATAAGTTAAAACCTTTCAACAACGGATCTCTTGGTTCTGGCATCGATGAAGA  
ACGCAGCGAAATGCGATAAGTAATGTGAATTGCAGAATTCAGTGAATCATCG  
AATCTTTGAACGCACATTGCGCCATTAGTATTCTAGTGGGCATGCCTGTTG  
AGCGTCATTACAACCCTTAAGCCTAGCTGCTTAGTGTTGGGAACTCACCGTAA  
CTGGTGACTCCTCAAAGGTATTGGCGGAGTCGAGTCGAACTCTGAGCGTAGT  
AATTTTTTTTTTCTCGCTTCTGAACTCCTCTCGGCGACAGCCACAAACCTACTA  
TACTTCTAGTGTTGACCTCGGATCAGT

*Delonicicolaceae*

CGTAACAAGGTCTCCGTTGGTGAACCAGCGGAGGGATCATTACAGAGTACTA  
TACTCCTAAACCCCTGTGAACTTACCAGTTTTTGTGCTTCGGCGGGCTGTGC  
CTCCCATCGTGGAGGCGCGCTGAAGGTCCGCCGAGGGTCCCAAACCTTATG

AAATTTAAGTTAGCCTTCTGAGCGTTTATTATTTTAATAAATCAAAACTTTCA  
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AGTAATGTGAATTGCAGATTTTCAGTGAATCATCGAATCTTTGAACGCACATTG  
CGCCTATTAGTATTCTAGTAGGCATGCCTGTTTCGAGCGTCATTTCAACCCTCA  
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AGTGGAAGATCAGGGCATCTCTGAGCGTAGTAAATATCTTTTCTCGCTTGG  
TCAGGTGTCTTGGTGGCAGCCATAAACCCTATATTTTTTTCTGATAGTTGACC  
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*Diatrypaceae*

GGGATCATTACAGAGTTATCTAACTCCCAACCCATGTGAACTTACCTTTGTTG  
CCTCGGGCGGAGAGCCTACCCGGTACCTACCCTGTAGTTACCCGGGAGCGAG  
CTGCCCTGCAGCCCCTGCTGGCCGACCCACCGGTGGACAGTAAAACCTTTG  
TTTTTAGTGGATTATCTGAGTGTATACTTAATTAGTTAAAACCTTTCAACAAC  
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TAGTTGCTTGGTGTGGGAGCCTGCTCCTCTACGGGGGGGCAGCTCCTCAAAG  
CTATTGGCGGAGTCGTATTGGCCCTAAGCGTAGTAATTTTTCTCGCTTCTAG  
TGGTTCCAGTGTGGCGTCCAGCCGTA AAACCCTAATTTTTCTAGTGGTGACC  
TC

*Hyponectriaceae*

TTACTGAGTTTTTAACTCTCCAAACCATGTGAACTTACCACTGTTGCCTCGGT  
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TGTTAATTTTTGTCAATCTGAATCAAATAAGAAATAAGTTAAAACCTTTCAAC  
AACGGATCTCTTGGTTCTGGCATCGATGAAGAACGCAGCGAAATGCGATAAG  
TAATGTGAATTGCAGAATTCAGTGAATCATCGAATCTTTGAACGCACATTGCG  
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CCTAGCTTAGTGTTGGGAGACTGCCTAATACGCAGCTCCTCAAACCAGTGG  
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CGGACTGGCAACAGCCAGAAACCGCACCCCTCGGGGGCACTTTTTAATGGTT  
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CGCTTGGTTGAGGCCAGCATCAGTTTTGGCGGGGATAAAGACTTCAGGAA  
CGTGACTCCCCCGGGAGTGTTATAGCCTGCTGTGTAATACCGCCGCTGGGACT  
GAGGACCGCGCT

*Hypoxylaceae*

CAGAGTTAAACTAAACTCCAAACCCTTTGTGAACCTTACCTCCAGTTGCCTCG  
GCGCTCGCTGCGGCTACCCCGTAGTCCGCCCTGTAAAACGGGCGGCTACCCT  
GTAGCCGGCTCACGGCCCGCCGAANGACCCCTAAACTCTGTTTAAAATAGTG  
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TAGCGTTGGGAGCTACGGTTGTAGCGTAGCTCCTCAAAGTCAGTGGCGGAGT  
TATGGCGTACTCTGAGCGTAGTAAATCTTTTCTCGCTTCTGTAGTCGCCCTAG  
CTGCCTGCCGTAAAACCCCT

*Microdochiaceae*

GTCTCCGTAGGTGAACCTGCGGAGGGATCATTACTGAGTTTTCAACTCTCCAA  
ACCATGTGAACCTTACCCTGTTGCCTCGGTGGTTTGGGTCCTCACGGGCCTGA  
CCACCGGTGGACTACTAAACTCTTGTTAATTTTTGGCATTCTGAATCATAACT  
AAGAAATAAGTTAAAACCTTTCAACAACGGATCTCTTGGTTCTGGCATCGATG  
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TTCGAGCGTCATTTCAACCCTTAAGCCTAGCTTAGTGTTGGGAGACTGCCTAA  
TACGCAGCTCCTCAAACAGTGGCGGAGTCTGTTTCGTGCTCTGAGCGTAGT  
AATTTCTTATCTCGCTTCTGTAAGCCGGTCAGACAACAGCCATAAACCGCACC  
CTTCGGGGGCACTTTTTAATGGTTGACCTCGGATCAGGTA

*Pseudomassariaceae*

TGGAAGTAAAAAGTCGTAACAAGGTCTCCGTTGGTGAACCAGCGGAGGGATC  
ATTACTGAGTTGAAAACTCCCAACCCATGTGAACATACTTTGTTGCCTCGG  
CGGTATTTTCGGGGGACGCTACCCTGTAGCTACCTACCCTGTAGCCGCCGAAG  
GACCATTCAACTCTTGTTTTTTTGTATGAAATCTGAGCGTCTTATTTAATAAGTC  
AAAACCTTTCAACAACGGATCTCTTGGTTCTGGCATCGATGAAGAACGCAGCG  
AAATGCGATAAGTAATGTGAATTGCAGAATTCAGTGAATCATCGAATCTTTG  
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TTCAACCCTTAAGCCTCGCTTAGCATTGGGAACCTACGTATCGGAGCTACCCT  
GTAGCTACCCTGTAGCTCCTTAAAGACAGCGGCGGAGACGTGGTATCTTCTG  
AGCTTAGTAAATTCATTTCTAGCTTTTCGAACGGTGCCCGGCCCTGCCGTTAA  
ACAAACAAAACCTTTTAATGGTGACCTCGGATCAGTAGATCCC

*Requienellaceae*

CACACCGCCCGTCGCTACTACCGATTGAATGGCTCAGTGAGGCTTTTCGGACT  
GGCCTAGAGGAGTCGGCAACGACACCTCAGGGCCGGAAAGTTATCCAAACTC  
GGTCATTTAGAGGAAGTAAAAGTCGTAACAAGGTCTCCGTTGGTGAACCAGC  
GGAGGGATCATTACAGAGTTACAACCTCTCCAACCCGTGTGAACATAACCGATT  
CAGTTGCCTCGGCGGGTTTTTCGGGACCCGCCGAAGTGATGCAAACCCTGTCT  
AACCTGATATCTGATACCTATACAAATAAGTAAAACCTTTCAACAACGGATC  
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AGCACGTGAAATTGTTGAAAGGGAAGCGTTTATGACCAGACCTCTGTCTGGC  
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GAACATTTGTGCGAGTGTTAGGGTGTCAAACCCCTACGCGTAATGAAAGTGA  
ACGGAGGTGAGAGCCCTTACGGGTGCATCATCGACCGATCCTGAAGTCTTCG  
GATGGATTTGAGTAAGAGCATAACTGTTTCGGACCCGAAAGATGGTGA ACTAT  
GCGTGGATAGGGTGAAGCCAGAGGAACTCTGGTGGAGGCTCGCAGCGGTTT  
TGACGTGCAAATCGATCGTCAAATCTGCGCATGGGGGCGAAAGTGAGTATTT  
TCCACGTGACCTAGCTTGAGGTAGTATGCTAACGAGTGACAGGACTATCGA

*Sporocadaceae*

TTGTACACACCCGCCCGTCGCTACTACCGATTGAATGGCTCAGTGAGGCTTCCG  
GACTGGCCCAGGGAGGTTCGGCAACGACCACCCAGGGCCGGAAAGCTATCCA  
AACTCGGTCAATTTAGAGGAAGTAAAAGTCGTAACAAGGTCTCCGTTGGTGAA  
CCAGCGGAGGGATCATTACAGAGTTATCTAACTCCCAAACCCATGTGAACTT  
ACCATTTGTTGCCTCGGCAGAACCTACCCGGTACCTACCCTGGAGCAGCTACC  
CTGTAGCTACCCTGGAGCGGGCTACCCTGTAACGTCCTGCCGGTGGACCTTTA  
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TAAGTAATGTGAATTGCAGAATTCAGTGAATCATCGAATCTTTGAACGCACA  
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TTAAGCCTAGCTTAGTGTTGGGAATCTACTGTATTGTAGTTCCCTGAAATACAA  
CGGCGGATCTGTAATATCCTCTGAGCGTAGTAAATTTTTTCTCGCTTTGGTTA  
GGTGTGTCAGCTCTCAGCCGCTAAACCCCCCAATTTAATGGTTGACCTCGGA  
TCAGGTAGGAATACCCGCTGAACTTAAGCATATCAATAA

*Xylariaceae*

CTGAGTTATCTAAACTCCAAACCCTTTGTGAACTTACCGTCGTTTCCTCGGCG  
TGTGCTGCGGCTACCCCGTAGCTACCTACCCGGTAGCTACCCTGTAGCTGGCC  
CACGGCCCGCCGACGACCGCTAAACTCTTGTTTTTACCACTGTATCTCTGAA  
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TGAATCATCGAATCTTTGAACGCACATTGCGCCATTAGTATTCTAGTGGGCA

TGCCTATTCGAGCGTCATTTTCAACCCTTTAAGCCTTGTTGCTTAGCGTTGGG  
AGTCTACGGGCTTCGGCGTAGCTCCTGAAAGTTAGTGGCGGAGTTAGGGTAC  
ACTCTCAGCGTAGTAACACTTCTCGCTCGTGTGGTGGCCCTGGCTGCTGGCCG  
TTAAACCCCATACCTTTTAGT

*Aspergillaceae*

CGTAACAAGGTTTCCGTAGGTGAACCTGCGGAAGGATCATTACTGAGTGAGG  
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CGGGCCCGCCGTTTCGCGCGGCCCGCCGGGGGGGAACCCCTCCCCCGGGCGAG  
CGCCCGCCGGAGACCCCAACGTGAACACTGTCTGAAGTTTTGTCGTCTGAGTT  
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TCGTCCCCCCCCGGGGGACGGGCCCCGAAAGGCAGCGGGCGGCACCGCGTCCGGT  
CCTCGAGCGTATGGGGCTTTGTCACACCCTCTCGTAGGCCCGGCCGGCGCT  
GGCCGACGCTGAAAAGCAACCATTATTTCTCCAGGTTGACCTCGGATCAGGT  
AGGGATACCCGCTGAACTTAAGCATATCAATAAGCGGA

*Elaphomycetaceae*

TTTCCGTAGGTGAACCTGCGGAAGGATCATTACCGAGCGCGGGTTCCCGCCC  
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TTGCTTCGGCGGGCCCGCCATGGTTGGCCGCGGGGGGCTCGCGCGAGCGCT  
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GCGAATTGCAGAATTCCGTGAGTCATCGAATCTTTGAACGCACATTGCGCCCC  
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GGCCCGAAAGGCAGTGGCGGCTCCCGGAGGGTGGTCCTTTGGGTGGTGATAC  
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GAACGGTCTTCCCCTTAGGTTGACCTCGGATCAGGTAGGGATACCCGCTGA  
ACTTAA

*Thermoascaceae*

AAGGATCATTACCGAGTGCGGGTCCCTCGTGGCCCAACCTCCCACCCGTGTT  
GACCGACACCTGTTGCTTCGGCGGGCCCGCCAGGGCTCCCGCCCGGCCGCG  
GGGGGCTCGTCGCCCCCGGGCCCGCGCCCGCCGAAGACCCCTCGAACGCTG  
CCTTGAAGGTTGCCGTCTGAGTATAAAATCAATCGTTAAAACCTTTCAACAACG  
GATCTCTTGGTTCCGGCATCGATGAAGAACGCAGCGAAATGCGATAAGTAAT  
GTGAATTGCAGAATTCCGTGAATCATCGAATCTTTGAACGCACATTGCGCCCC  
CTGGCATTCCGGGGGGCATGCCTGTCCGAGCGTCATTGCTAACCCCTCCAGCCC  
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GGCGGCGCCGCGTCCGGTCCCTCGAGCGTATGGGGCTTTGTCACACGCTCTGG  
TAGGCCCGGCCGGCTTGTGGCCAACGACCTCACGGTCACCTAACTTCTCTCT  
TAGGTTGACCTCGGATCAGGTAGGGATACCCGCTGAACTTAA

*Trichocomaceae*

AAGGATCATTACTGAGTGCCGGTCCCTCGTGGACCGAACCTCCCACCCTTGTC  
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GGGCCCTGTGCCCTGGGCCCGTGCCCGCCGGAGCGCCCTTGAACCCTCAT  
GAAGATGGACTGTCTGAGCATGATTGATAATAATCAAACCTTCAACAATGG  
ATCTCTTGGTTCCGGCATCGATGAAGAACGCAGCGAAATGCGATAAGTAATG  
TGAATTGCAGAATTCCGTGAATCATCGAATCTTTGAACGCACATTGCGCCCC  
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ACGCCCGCTAGATCCTCGAGCGTATGGGGCTTTGTACCCGCTCGGGAAGG  
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*Chaetomellaceae*

CATTACTGAATGCGAAAGCATTCTTGTGTCGTTTGTCTTGTGCTTTGGGGAA  
ACCCAACATACTCTTACTATAGTCGTCTGATAACAACCTAATAATCAAACCT  
TTCAACAACGGATCTCTTGGTTCTGGCATCGATGAAGAACGCAGCGAAATGC  
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TCACATGGTTTTGGAGATTCGCCCTGGCGACCTCTTAAAGACAATGGTGATAA  
CTATTCTACACGCAAAGTACTCTCTGCGACGTGGCGATAGGTGCACACCGAA  
AACCTCTTGTGTTGACCTCGGATCAGGTAGGGATACCCGCTGAACTTAAGCATA  
TCAATAAGCGGAGG

*Helicogoniaceae*

CAAGTTTCCGTAGGTGAACCTGCGGAAGGATCATTAAAGAGATCATGCCTT  
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TCAACAACGGATCTCTTGGTTCTGGCATCGATGAAGAACGCAGCGAAATGCG  
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GTGGCGGTGTCATCTGACTCTAAGCGTAGTAAATTCTCTCGCTCTGGAGCTTC  
AGTTGATTACTTGCCATCGAACCCCAAATTTTTAAAGGTTGACCTCGGATCAG  
GTAGGGATACCCGCTGAACTTAAGCATATCA

*Phacidiaceae*

GGGTAGACCTCCCACCCTCTGTATACAATACCTTTGTTGCTTTGGCGGGCCCCG  
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GCTTGGTATTGGGTGTCACCCCCGGGTGCGCCTTAAAATCAGTGGCGGGTGCC  
GTCTGGCTTCAAGCGTAGTAATACTTCTCGCTTTGGAGTCCGGGCGAGCGTCC

TGCCAAAACCCCATATTTTTTTTCAGGTTGACCTCCGATCAGGTAGGGATACC  
CGCTGAACTTAAGCATATCAATAAGCGGAGGA

*Coniochaetaceae*

TCGTAACAAGGTCTCCGTTGGTGAACCAGCGGAGGGATCATTAAAAGAAGCC  
GAAAGGCTACTTAAAACCATCGCGAACCTATCCAAGTTGCTTCGGCGGCGCG  
GAGCCCTTACCCGGGCGACGCGGCCCGCCTCTCCGGAGGTGTGGGGCGCC  
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CATTATCTCGCTAGGGAGGCTTGCGGCGCGCTCCTGCCGTTAAAGACCCCATC  
TTAACCAAGGTTGACCTCGGATCAGGTAGGAATACCCGCTGAACTTAAGCA  
TATCAATAA

*Bulleraceae*

GTAGGTGAACCTGCGGAAGGATCATTAGTGATTTGGTTCGAGAGACCTTAACA  
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TACAAACATCAGTGTAATGAACGTCCATTTGTGATTAAGAAACATAAAACAAA  
ACTTTCAACAACGGATCTCTTGGCTCTCGCATCGATGAAGAACGCAGCGAAA  
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GCACCTTGCGCCCTTTGGTACTCCGAAGGGCATGCCTGTTGGAGTGTCTGTGAA  
ATCTCAATCCCCCTGGGTTATGACCCGGGCTTGGGGACTTGGATTTGGGTG  
TCTGCCGTTACGCGGCTCGCCTGGAACAGCTCAAGTGGGAATCGTGTCCGC  
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CACAACCACGACCACGTCCCGTGCCGGAAGGCGCCCGACGTGGACACTTCTT  
TTGACTTTTGACCTCCAATCAGGTAGACTACCCGCTGACAT

*Bulleribasidiaceae*

GCCAGTAGTCATATGCTTGTCTCAAAGATTAAGCCATGCATGTCTAAGTATAA  
ACAAATTCATACTGTGAAACTGCGAATGGCTCATTAAATCAGTTATAGTTTAT  
TTGATGGTATCTTGCTACATGGATAACTGTGGTAATTCTAGAGCTAATACATG  
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GAACAACCTGGAGGGCAAGTCTGGTGCCAGCAGCCGCGGTAATTCCAGCTCCA  
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AATTCTTAGATTTACGGAAGACTAACTTCTGCGAAAGCATTGCCAAGGACG  
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TGTGATGCCCTTAGATGTTCTGGGCCGCACGCGCGCTACACTGACTGAGCCA  
GCGAGTTTATCACCTTGACCGAGAGGTCTGGGTAATCTTGTGAAACTCAGTCG  
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*Carcinomycetaceae*

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*Cuniculitremaceae*

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*Naemateliaceae*

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*Phaeotremellaceae*

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*Sirobasidiaceae*

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*Syzygosporaceae*

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TAAGACTA

*Tremellaceae*

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*Trimorphomycetaceae*

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*Capnodiaceae*

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*Piedraiaceae*

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*Cudoniaceae*

AGGTGAACCTGCGGAAGGATCATTAAAGAATCTAGGCTTAACCGCCATATTC  
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*Rhytismataceae*

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*Fomitopsidaceae*

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*Fragiliporiaceae*

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*Grifolaceae*

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*Hyphodermataceae*

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*Irpicaceae*

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*Ischnodermataceae*

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*Meripilaceae*

ACGAGTCGTTACGGGGTTGATTGCTGGCTTCCGTCACGGGAGCATGTGCACG  
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GTAGTTGCCCGACGGTTCACGGTGTGATAGTTTATCTTCATCGCCGTTCTGAC

CGCTCGGTGCCTGTGTTCCGCCGGCTTCTAATACCGTGTCTCAGACACGACTTC  
TTAACGC

*Meruliaceae*

TGTCGCTGGCCTTACCCGGCATGTGCACGCCTCGCTCATCCAAATTCTCACAC  
CTCTGTGCACTCTACATGGGATGGCTGCGGCTGCTCTGCATTTATATGTGCAG  
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TGACATCTGACCTCAAATCAGGTAGGACTA

*Panaceae*

CATTACTGAATTTTAAATGCCTTGGTTGTAGCTGGCCTTTAAAAGAGGCATGT  
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CCAATTGCTTTTCTGTGGTATACACATTTATACGCTTCAGTTAAAGAATGTAT  
CTCGCGTTTGACGCAATTATATATATATAACAACCTTCAGCAACGGATCTCTTG  
GCTCTCGCATCGATGAAGAACGCAGCGAAATGCGATAAGTAATGTGAATTGC  
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GACTCAGACAAAACCTATACTTTGAAATCTGACCTCAA

*Phanerochaetaceae*

AAAGGGGTTGTGCTGGCCAAAACCAAAGGCATGTGCACGCCCTGCTCAATC  
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*Podoscyphaceae*

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TGTGATAATTATCTACGCTGTGAGTGTAGGTWAAAATTGAATTCATGCTTC  
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GGACTACCCGCTGAA

*Polyporaceae*

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CCGTGAAGCGTTTGGCAAGCTTCTAATGGTCTTATTAGAGACAAATACATTGA  
CCTCTGA

*Steccherinaceae*

CCTGAGGGACTGCGGAGGACATTATCGAGTTTTGAAACGGGTTGTAGCTGGC  
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CAATTCATTATGACAATCTGGCCTCAAATCAGTAGACACCCCGTCCCT

*Agaricaceae*

TTTCCGTAGGTGAACCTGCGGAAGGATCATTATTGAATTATGTTTCTAAATGG  
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CACCTGTGCACCTATTGTAGTCTTTGGTTGGGTTAGGAGGAAGTGGTCATCCT  
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GCTCTCAGTAATGTTGAGCTTCTAATTGTCTCCACTTTGTGAGACTACTTTTGG  
AATACTTGACCTCAAATCAGGTAGGACTACCCGCTGAACTTAA

*Bolbitiaceae*

TGCGGAAGGATCATTATTGAATAAACTTGATAGGTAGATGCTGGCTCACTAG  
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TTGTTCAATTATTGATCGATTTTAATTGGTCACTTGGAGATTGCTGTTACAACA  
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TCCCCTAGTAAGTGCAGTGAAGCGGAAAAGCTCAAATTTAAAATCTGATA  
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*Cortinariaceae*

TTCCGTAGGTGAACCTGCGGAAGAATCATTATTGAAATAAACCTGATGGGT  
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CCTGTGCACCTTTTGTAGACCTTTCAGGTCTATGTTGGTTCATTTTTCCCAAT  
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CAGCTCTCCTGAAATGCATTAGCAGAACAACCTTGTGTTTATTGGTGTGATAA  
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*Crassisporiaceae*

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TATGTTTTTCATACACCCCATAGTATGTAACAGAATGTATCAAAGGGCCTTTG  
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CCCCTGAAATGCATTAGCGGAATCCCTTGTGAACCGTCTATTGGTATGATAAT  
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GTCCATTGAATTGGACAATACTTAAATGACAAT

*Crepidotaceae*

ATGAATAAACTTGGTGGACTGTAGCTGGCTCTCTAGAGAGCATGTGCACGTC  
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CCTTACTAGCTTTGCTGCTGGTCTGGCTTGGACTTGGGGGGTGTATGCAGGCT  
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GGTTGTACTGCTTCTAACAGTCCATTGACTTGGACACTACATGACAATT

*Hydnangiaceae*

AACAAGGTTTCCGTAGGTGNACCTGCGGAAGGATCATTATTGAATAAACCTG  
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TGAGTGTCAATTAATTCTCAACCTTCCAACCTTTTATTAGCTTGGTTAGGCTTGG  
ATGTGGGGGTTGCGGGCTTCATTACGAGGTGGCTCTCCTTAAATGCATTAGC  
GGAACCTTTGCGGACCGTCTATTGGTGTGATAACTATCTACGCCGTGGATGTG  
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TTGACAATTTGACCTCAAATCAGGTAGGACTACCCGCTGA

*Hymenogastraceae*

GTCATTTAGAGGAAGTAAAAGTCGTAACAAGGTTTCCGTAGGTGAACCTGCG  
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CATGTGCACACCTGCCATCCTCATCTCTCCACCTGTGCACCTTTTGTAGATTTG  
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*Inocybaceae*

TTGAATAAAATTTGAACAGGTTGTTGCTGGCTCCTCAAGGCATGTGCACGCTT  
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GGATATGGGGTTTGCAGGCCTTTTCAAAGGGTCTGCTTTCCTAAAATGAATT  
AGTGGTATATCTGAGCAGAGACTTACTACAGGTGTGATAACTATCTATGCCTT  
TGTAAGTGCTGCACAAACCACTTCAAATCTCATTGTTGACCAAT

*Lycoperdaceae*

CATTATTGAATATTCTTGATGGGTTGTAGCTGGCTCTTCGGGGCATGTGCACG  
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*Mycenastraceae*

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*Nidulariaceae*

AAGTAAAAGTCGTAACAAGGTTCCGTAGGTGAACCTGCGGAAGGATCATTAT  
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*Phelloriniaceae*

GGGAGGATCATCAATCAGCGCAGAAGATCATCAGAGATGCAGCTGCGGATC  
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GCTTTGGG

*Psathyrellaceae*

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CTACCCGCTGAACTTAAGCATATCAATAG

*Squamanitaceae*

TATTGAATTAATTTGGTAGAGGTTGTTGCTGGCTTTTAAAAGCAAGTGCACAC  
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GAAAGTGAAAGTTGAGATCCCTGTCGTGGGGAGCATCGACGCCCGGACCAGA  
AATTTATGGACGGTTCGCGGTAGAGCATGTATGTTGGGACCCGAAAGATGG  
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AGCGATTCTGACGTGCAAATCGATCGTCAAATTTGGGTATAGGGGGCGAAAGA  
CTAATCGAACCATCTAGTAGCTGGTTCCTGCCGAAGTTTCCCTCAGGATAGCA  
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*Strophariaceae*

TTGAATAAACCTGATGGGTTGTAGCTGGCTTCTCCGGAGGCATGTGCACGCCT  
GTCTTCTTKATATCTCCACCTGTGCACCTTTTGTAGACCTGGATAACTATGCA  
CCTTCAATTTTGAAGGAGTTTTGAGGATTGCTGCCGTTGATAAGACCGGCTTT  
CCTTACATTTCCAGGCCTATGTTTTTTCATATACCCCGTCGTATGTAACAGAAT  
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CTCTTGGCTCTCGCATCGATGAAGAACGCAGCGAAATGCGATAAGTAATGTG  
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TTTATTCTGGTCAAGGCTTGGATGTGAGGGTTTTTTGCCGGCTTCTAACGAAG  
TCAGCTCCCTTGAAATGTATTAGCTGGTGCCCCGAGTGGACATTGTCTATTGG  
TGTGATAATTATCTGCGCCGTTGACTTGTCTGAATGGGTTTTTTTGGCGCTGCT  
TCTAACCGTCCGCTTCATGGACAACTTAAATGACAATT

*Dissoconiaceae*

TCATTACCAGAAGCCGCGTCGGCCGCAAGGCCGGCGCCTTCGCCCAACCCTC  
TGTGAACGATATCGATTGCCCGGGGGACCCCGCACCTTCCAGGTGTGCC  
CCGGTGGCCCCCTTCAACTCTTGTTGTATCTGCCGTCTGAGTCGCAAATGCAA  
ATGAAACAAAACCTTCAACAACGGATCTCTTGGTTCTGGCATCGATGAAGAA  
CGCAGCGAAATGCGATAAGTAATGTGAATTGCAGAATTCAGTGAATCATCGA  
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GCGTCATTACAACCAATCCAGCCCGGCTGGGTGTTGGGCGTCGCGGCCTGCC  
GCGCGCCTCAAAGTCCTCGGCGGAAGCCGCCCGTTCTCTGCGTGATGATCC  
ATCGCCGCTTGGGAGTCGGGGGAGAGCGCCTGCACGCGTCGACGGAGACGTC  
GACTTCAAGGTTGA

*Extremaceae*

ACAGGTTTCGTAGTGAACCTGCGGAGAGATCATTACCGAGTGAGGGTGGAAAC  
ACCCGACCTCCAACCCCATGTCGTTACAACCTTTGTTGCCTCGGGGGCGACCC

GGCTCGCGCCGGGGCCCCCGACGGACCAGCTCACTCTGCGTCTTTGCGTCG  
GAGTCACAAGTAAATTGAATCAAACTTTTAACAACGGATCTCTTGGTTCTGG  
CATCGATGAAGAACGCAGCGAAATGCGATAAGTAATGTGAATTGCAGAATTC  
AGTGAATCATCGAATCTTTGAACGCACATTGCGCCCCTTGGTATTCCGGGGGG  
CATGCCCGTTTCGAGCGTCATTACACCACTCAAGCCTGGCTTGGTATTGGGCGT  
CCGGCACTCACCTGCCCGCCCAAATTCTCTTCGGCTGATCGGTTTACTTTCTT  
AGCGTTGGAGTGTGTGCATTACGTTCCGCTAATCGAAAGACGCCGGCCGGCC  
GTAAACATTTTCATCACGGTTGACCTCGGATCGGGTAGGGATACCCGCTGA  
ACTTAAGCATATCAATAAGCGAGA

*Mycosphaerellaceae*

ATCATTACTGAGTGAGGGCCCTCGCGGTCCGACCTCCAACCCCATGTTGTCCG  
ACTCTGTTGCCTCGGGGGCGACCCGGCCTCACGGCCGCGGGCCCCCGGTGGA  
CTACTCAACTCTGCATCTTAGCGTCTGAGTTTAATGATAAATCAATTAATACT  
TTCAACAACGGATCTCTTGGTTCTGGCATCGATGAAGAACGCAGCGAAATGC  
GATAAGTAATGTGAATTGCAGAATTCAGTGAATCATCGAATCTTTGAACGCA  
CATTGCGCCCCCTTGGTATTCCGAGGGGCATGCCTGTTTCGAGCGTCATTACACC  
AATCAAGCCTGGCTTGGTATTGGGCGCCGTGGTTCTTCGGAGCCGCGCGCCCT  
AATGTCCTCGGCTGGGCGTCCGCCTCGAAGCGTTGTGATTATACAGATCGCT  
TGTGGGTGTGGACGGTCGCGCGCCGTTAAACCTTTTATTCAAGGTTGACCTCG  
GATCAGG

*Neodevriesiaceae*

ATCATTACCGAGTGGAGGGCGCCCCGGCGCCCGACCTCCCAACCCTTTGATTT  
GATCAAGACCTCTTCTGCCTCGGGGGTGACCCGGTCCCCGCCCGCGCGGGGG  
GCGACCCGGTCTCTCCGGTGGTCTACACACCAACCCTGCATCAATTGTCGTC  
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GGGCATGCCTGTTTCGAGCGTCATTACACCAATCAAGCCTGGCTTGGTATTGGG  
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CGAATCTCAGCGTTGTGCAAACAGTTGTGCTGGCGAGACGGGACGGCCGTG  
CCGTTAAAACCCCATCATCTTAAGGTTGACC

*Phaeothecoidiaceae*

GGCCGTTCAACCCTTGTGTATCATGCCGTGTTGCTTTGGGGCTGCCCTCCCTC  
CCCCGTGGGAAGAGGGGGGGCCCCAGAGGCATACCACAACTCTGCGTCCAC  
CAAGCGTCTGAGTCTGAATTTTAAATCAAACCAAACTTTCAACAATGGATC  
TCTTGGTTCTGGCATCGATGAAGAACGCAGCGAAATGCGATAAGTAGTGTGA  
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CGTCCGCGCCCGTCTACAAGCGTTGTGGGTTTCGACTTCCGCTGAGCGGGAT  
CGGGTGCAGGGGGCTGTCACGGTGGGCCGCGTGCCCGCCGGTCTACCAATCA  
CAGAGATTGACCTCGGATCGGGTAGGGATACCCGCTGAACTTAAGCATATCA  
ATA

*Schizothyriaceae*

CCGAGTGAAGGGCCCTCGTGCCCGACCTCCAACCCCTGTGATTACAACCCC  
GTTGCTTCGGGGGCGCCCTGCCGCTCGCGGCGCCGGGCCCCCGGAGGTGA  
CTACAACCTCTGTTGTCCCATGCGTCTGAGTACCGATTATTACAATCAGTTAAA  
ACTTTCAACAACGGATCTCTTGGTTCTGGCATCGATGAAGAACGCAGCGAAA  
TGCGATAAGTAATGTGAATTGCAGAATTCAGTGAATCATCGAATCTTTGAAC  
GCACATTGCGCCCTCTGGTATTCCGGGGGGGCATGCCCGTTCGAGCGTCATTAC  
ACCACTCAAGCCTCGCTTGGTCTTGGGCGCCGCGGCCTGCCGCGCGCCTCAA  
AGTCACCGGCCGGGTGACCCGTCTCGGAGCGTCGTAGCCATTGTGTTTCGCTC  
GCAGGGATCGGGCCGCGTCCGGCGCCGTTAAACGTCTTTTATCA

*Teratosphaeriaceae*

CGTAACAAGGTCTCCGTAGGTGAACCTGCGGAGGGATCATTACCGAGTGAGG  
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CTCGGGGGCGACCCGGCCTTCGGGCTTCCGGTCCCCCGGTGGTCACCAATA  
AACTCTGCATCAATTGTCTGCTGAGTATGAAGTAAATTCAATCAAACTTTCA  
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GCGCCCTTTGGCATTCCGAAGGGCATGCCTGTTTCGAGCGTCATTACACCAATC  
AAGCCTCGCTTGGTATTGGGCGACGGGGCCGTAACACGCCCCGCGCCCCAAT  
GACTCCGGCGGGACGGACCGAATCTCAGCGTTGTGGTTAAAGCCGCTGTCTGA  
GACGGGACGCCCGTGCCGTTAAACAACCCCATCACAGGTTGACCTCGGATCA  
GGTAGGGA

*Sporidiobolaceae*

AACCTGCGGAAGGATCATTATTGAAAACAAGGGTGTCCAATTTAACTTGGAA  
CCCGACCTTCTCAATTCTAACTTTGTGCATCTGTATAATGGCGAGCAGTCTTC  
GGATTGTGAGCCTTCACTTATAAACACTAGTCTATGAATGTAAAATTTTTATA  
ACAAATAAAAACCTTTCAACAACGGATCTCTTGGCTCTCGCATCGATGAAGAA  
CGCAGCGAAATGCGATACGTAATGTGAATTGCAGAATTCAGTGAATCATCGA  
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GTGTCATGAATTCTTCAACCCAATCTTTTCTTGTAAATCGATTGGTGTGGATT  
CTGAGCGCTGCTGGCTTCGGCCTAGCTCGTTCGTAATACATTAGCATCCCTAA  
TACAAGTTTGGATTGACTTGGCGTAATAGACTATTTCGCTAAGGATTCGGTGGAA  
AACATCGAGCCAACCTCATTAAAGGAAGCTCCTAATTTAAAAGTCTACCTTTTG  
ATTAGATCTCAAATCAGGCAG

*Dothideaceae*

CATTAAGAATGTTGGGGGACCCGGGGCAACCCGGACAATCCCCTTATACT  
TCCCACCCTTTGTTGTTATAACTACCTTGTGCTTTGGCGGGACCGTTCGGTCA  
TCCGAGCGCACCAAGTCTTCGGACAGGTGAGCGCCTGCCAGAGTCCAACCAA  
CTCTTGTTTTTAACCAAGTCGTCTGAGTATAAAATTTAATTAATAAACTTT  
CAACAACGGATCTCTTGGTTCTCGCATCGATGAAGAACGCAGCGAAATGCGA  
TAAGTAATGTGAATTGCAGAATTCAGTGAATCATCGAATCTTTGAACGCACA  
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TCAAGCACCGCTTGGTATTGGGCATCGTCCGCCGAAAGGCGGGCGTGCCTCG  
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GTCTTATAAGCTTGGTGGGACTCCATTGCCGTTAAACCTTTTATTTTCTAGGTT  
GACCTCGGATCAGGTAGGGATA

*Dothioraceae*

GTAACAAGGTTTCCGTAGGTGAACCTGCGGAAGGATCATTAAAGAGTAAGGG  
TCTCCGGCCCGAACCTCCAACCCTCTGTTGTTATAACTACACCGTTGCTTTGG  
CGGGACCGCGAAGGTCTCCACCCGAGCGCGCCGGTCTCCGGACAGGCGAGC  
GCCCCGACAGGTCTAACCAAACCTCTGTTTAAAACCAGTCGTCTGAGTACAA  
ACTTTTAATTATATTAACCTTTCAACAACGGATCTCTTGGTTCTCGCATCGA  
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TGTTGAGCGTCATTACACCACTCAAGCACTGCTTGGTATTGGGCACCCGTC  
GTCGAAAGACGGGCGTGCCTCGAAGACCTCGGCGGGGTTTCTCCAACCTCGG  
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AACTTAAGCATATCAATAAGCGGAGGAAAAGAAACCAACAGGGATTG

*Aplosporellaceae*

GGATCATTACCGAGTTCTGGGTTCTCTCAATCGAGGCCCGCTCTCCCACCCTT  
TGTGAACTTAACCTCTGTTGCTTTGGCGTGGCCAGCGCTGTAAAAGGCGCGGT  
CGGCGGGGCCTGGCCCCGCTGGCAAGCTTGCCCGCCAGAGGACTATCAAAC  
TCTTGTCAGTAAACGATGCAGTCTGATCAAACATTTAATTGTTTAAAACCTTC  
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TGCGCCCTATGGTATTCCGTAGGGCATGCCTGTTCGAGCGTCATTACACACCT  
CAAGCTCTGCTTGGTATTGGGCGTCGCCCCCTCTAAATCGGGGGGCGTGCCTC  
AAAGACCTCGGCGGTGGCGTCTTTGCCTCAAGCGTAGTAATTTTATTATAA  
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TATCAAGGTTGACCTCGGAT

*Botryosphaeriaceae*

TTCCGTAGGTGAACCTGCGGAAGGATCATTACCGAGTTTTCGGGTCTCTTCACC  
GAGCCCACTCTCCAACCCTTTGTGTACCTACCTCTGTTGCTTTGGCGGGCCGC  
GGTCCTCCGCGGCCGGCCCCCTAGCCGGGGCTGGCCTGCGCCCCGCCAGAGGA  
CCACAAAACCTCCGGTCAGTGAACCTTTGCCGTCTGACGTAAATTCAATAAACT  
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CACACCCCTCAAGCTCTGCTTGGTATTGGGCAGCGTCCTCTCGGACGCGCCTC  
AAAGACCTCGGCGGTGGCGTCTTTGCCTCAAGCGTAGTAGAAAACACCTCGCT  
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GGTTGA

*Phyllostictaceae*

TTCGGTAGGTGAACCTGCGGAAGGATCATTACTGAACTAGTAATTCTCTGAA  
AGGTCGCCGGTACCGGGCCCCCTGAAAAGGGTCCCGGGAAGGTCCTCTCAC  
ACCCCTTGTGTACCTTACCACGTTGCTTTGGCGGGCCGACCCGGTTTCGACCC  
GGGCGGCCGGCGCCCCCAGCCCCCTCGCGGGCCAGGACGTCAGGCTAAGCGC  
CCGCCAGTATACAAAACCTCCAGCGGTTATTTCTGTCAGTCCTGATAATTATTC  
AATTAATTA AAAACTTTCAACAACGGATCTCTTGGTTCTGGCATCGATGAAGAA  
CGCAGCGAAATGCGATAAGTAATGTGAATTGCAGAATTCAGTGAATCATCGA  
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GCGTCATTTCAACCCTCAAGCTCTGCTTGGTATTGGGCGACGTCCGCTGCCGG  
ACGCGCCTCGAAGACCTCGGCGACGGCGTCCAGCCTCGAGCGTAGTAGTAA  
CATCTCGCTTTGGAGTGCTTGGCGTTGGCCGCCGACA

*Planistromellaceae*

GTAACAAGGTTTCCGGTAGGTGAACCTGCGGAAGGATCATTACCGAGTTCTGG  
GTCCCAGTGGCCCGCTCTCCACCCTTTGTGTACCTACCTTTGTTGCTTTGGCG  
GGCCAGCTCCGGCGTCCGGCTCCCCTAAACGGGGGCTGGCCAGCGCCCGCCA  
GAGGAATTCAAAAACCTCCAGTCAGTAAACCGTACCGTCTGATCAGATATCTAA  
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GTCATTACAACCCTCAAGCTCTGCTTGGTATTGGGCATCGTCCTCTCCGGACG  
TGCCTCAAAGCCCTCGGCGGCGGCTCCTCAGCCTCAAGCGTAGTAATTA AAA  
CCTCGCTTTGGAGGCCGTGGCGTCGCCCGCCGGACGAACCTTATAACTACTTC  
TAAGGTTGACCTCGGATCAGGTAGGGATACCCGCTGAACTTAAGCATATC

*Saccharataceae*

TTTCCGTAGGTGAACCTGCGGAAGGATCATTAAACGAGTTCTGGGCCCTTCGG  
GGTCCGTCCTCCAACCCTTTGATTACCTACCACGTTGCTTCGGCGGGCGTCCG  
GTCCGCCAGCGGATCGGGGAGCGCCCGCCGGAGGAGTATCAAAAACCTTTGC  
TTTGAACAATGCCGTCTGATCGAATATCAAATATTCTAAAACCTTTCAACAACG  
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GTGAATTGCAGAATTCAGTGAATCATCGAATCTTTGAACGCACATTGCGCCCC  
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GCTTGGTATTGGGCCCCGTCCTCACCGGACGCGCCTTAAAGACCTCGGCGGC  
GGCGTCGTAGCCTCAAGCGTAGTAACAAACATCTCGCTTTGGAGGCCGCGGC  
GTCTCCCGCCGGACGAACCTTTTTGTTTCTATCAAGGTTGACCTCGGATCAGG  
TAGGGATACCCGCTGAACTTAAG

*Septorioideaceae*

CATTACAGAGTTCTGGGTCCTTCGGGGCCCGTCCTCCAACCCTTGTATACAT  
ACCTCGTTGCTTCGGCGGACCAGCGGTCGAGAGGGCGCGCTCCGGCCCCCT  
TGAACCGGGGCTGGGGAGCGTCCGCCGGAGGCCTTCAAACCTTTGTTTGTAA  
CGATGCAGTCTGATCGAATATCAAATATTCTAAAACCTTTCAACAACGGATCTC  
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TGCAGAATTCAGTGAATCATCGAATCTTTGAACGCACATTGCGCCCCTTGGCA

TTCCGAGGGGCATGCCTGTTTCGAGCGTCATTACAACCCTCAAGCTCTGCTTGG  
TGTTGGGCCCTCGTCCCCCGCGGACGTGCCTCAAATCATCGGGCGGTGGCGT  
CTTGCCTCAAGCGTAGTAAAATTCTTCTCGCTTTGGAGGTTGGGGCGCCCCC  
GCCGGACGAACCTTTATACTTCTATCAAGG

*Mortierellaceae*

CATTCATAATAAGTGTTHATGGCACTTTTTAATCCATATCCACCTTGTGTGCA  
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ACAACGGATCTCTTGGCTCTCGCATCGATGAAGAACGCAGCGAAATGCGATA  
CGTAATGTGAATTGCAGAATTCAGTGAATCATCGAATCTTTGAACGCATATTG  
CGCTCTTTGGTATTCCGAAGAGCATGCTTGTGAGTATCAGTAAACACCTCA  
AACTTTTTGATTTATTTGAAAGCTTTGGACTTGAGCGATCCCAACACCAGTC  
TTTTAAGATCGGCGGGGTTGCTTGAATGCAGGTGCAGCTGGACATTCTCC  
TGAGCTTAAAGCATATTTATTTAGTCCCGTCAAACGGATTATTACTTTTTGCT  
GCAGCTAATATAAAGGGAGTTTGACCGTTTTGGCTGACTGATGCAGGATTT  
ACAAGGGTTCGGCAACGATTCTTGTTAAACTCGATCTCAAATCAAGTAAGACT  
ACCCGCTGAACTT

*Umbelopsidaceae*

CGGAAGGATCATTACTGAAGTGAGTCTTCATCATTGAAGCTTCTTCCCATTGT  
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GCCGTCCCCAACAATTTATCTTATCCTTTATTAATGAAGTGAAGTCAATTTG  
AGATTACATAAAACATAATCTTTAATAACAACCTTTCAACAACGGATCTCTTG  
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GTAGAGTATGCCTGTTTCAGTATCATGAACACCTCACTACTATAACTTTTTGTT  
GTAATAGTGGACTTGGAATGCGCTGATGTCAATCAGCCCTTCTAAAATGGAG  
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GTAATGTTGAAATCACTGGCTTCTTTGCTTAGAATCTGACAGTCTTGATATA  
CAGAATTTTCGAGGAGACTTGTCTCTTCTTCAAATTTTGATCTGAAATCAGGT  
AGGATTACCCGCTGAACTTAAGCATATCAATAAGCGGA

*Mortierellaceae*

GGATCATTACAAACGAGTGTTHATGGCACTTTTTAAAAATCCATATCCACC  
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GCAGGATTTACGACACTTTATGTGTTGTTCAACTCGATCTCAAATCAAGTAA  
GACTACCCGCTGA

*Alloascoideaceae*

CCGATTGATGGCTTAGTGAGGCTTCAGGATTGGCGCCAGGCCGGGGGCAACT  
CTGGCTGGGTGCCGAGAATCTAGTCAAACCTTGGTCATTTAGAGGAAGTAAAA  
GTCGTAACAAGGTTTCCGTAGGTGAACCTGCGGAAGGATCATTAGAGAAATT  
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CGGTAGCTGGGCCAGCATCAGTTTTGGCGGCAGCACAAATCGCACGGGAACGT  
GGCTCGGGCCCTCTGGGTCTGAGTGTTATATCCCGTTGTGGATACTGCCAGCC  
GGGACTGAGGACTGCGGTGTATACCAATGAT

*Dipodascaceae*

CAGTATTCTTTTGCCAGCGCTTAATTGCGCGGCGAAAAACCTTACACACTATG  
TTTTTTAATTTGAAACTATTGCTTTGGTCTGGCTTAGAAATAGGTTGGGCCA  
AAGTTTTATCAAACCTTCAATATTTATTATTGAATTGTTATTTAATTTTATT  
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CTCGTTGACCAGTAAAGTATTTGTTTATTACACAGGCTCGGCCTTACAACAAC  
AAAC

*Lipomycetaceae*

TTTCCTTCCGTAGCACTTACTGAAGCTTTAGCAGCCTGAAAAGGCGAATGCTA  
GCGACTATAAATAAATATGGCGTTCTTAAATGCTAGTCTCTGATTAGAGGCG  
ACATTGCCAAATTGCGGGGACACCCTAAAGATCTTGATACCAAACCTGGTAGT  
CGAAAGACGCCAGTGGCCGAGCTAACAGCCCTGGGTATGGTAATAATTCAAG  
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ATCAGTTTTCGCGGTAGGATAATGACATTGGAATGTGGCTCTTTCGGGAGTGT  
TATAGCCTTTGTTGATACTACCTGCTTAGACTGAGGACTGCGTATTTTGCTAG  
GATGTTGGCATAATGATCTTAAGCAGC

*Phaffomycetaceae*

AAGTATTCTTCGGTGCAGCCAGCGCTTCCACAGCGCGGCAGCCCAAACCTTA  
CACACTGTGATTAGTTTTTTTACTATTTACTTTGGCTGCGCAAGTGGCCAAAG  
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TTAATACTATAATCTTCAAACTTTCAACAACGGATCTCTTGGTTCTCGCAAC  
GATGAAGAACGCAGCGAAATGCGATACGTAATGTGAATTGCAGGTTTTCGTG  
AATCATCGAATCTTTGAACGCACATTGCACCCTCTGGTATTCCGGAGGGTATG  
CCTGTTTGGAGCGTCATTTCTCTCTCAAACCTTAGGGTTTGGTATTGAGTGATA  
CTCTCTTCTGGGTAACTTGAATAGTGTACTGGCAAGAGTGTGCTTTTGTGG  
CCTCTTACTGAGATAATGTATTAGGTTCTACCAACTCGTTATAGCAGCTCAA  
TTGTCCCTTTGGCATAATCAGCTCGGCCTGACAACCTCCTTCTAAAGT

*Pichiaceae*

GTATTCCTTTTTGAGCTGGATTGATACTGGTTTCATCCAACCTTGTGGTTTTTTTT  
TACTGCGCTGCTGAAATATTGCGTGCGCGGTAGGAACCATGGGTAGTTTGT  
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TG

*Saccharomycetaceae*

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CTCGTTTCCGGGTTAACTTGAAAGTGGCTAGCCGTTGCCTTCTGCGTGAGCAG  
GGCTGCGTGTCAAGTCTATGGACTCGACTCTTGACATCTACGTCTTAGGTTT  
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*Saccharomycodaceae*

ACCTGCGGAAGGATCATTAGATTGAATTATCGTTGTTGCTCGAGTTCTTGTTT  
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GTAATGTGAATTGCAGATACTCGTGAATCATTGAATTTTTGAACGCACATTGC  
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*Trichomonascaceae*

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*Trigonopsidaceae*

TCCTTGGCCGAGAGGCCTGGGTAATCTTGTTAAACTCCGTCGTGCTGGGGATA  
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*Chaetocladiaceae*

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*Cunninghamellaceae*

ATCATTACTTATTTATTGAGAGAAAGAGAGTCTCCTCTCTCTCTCAATTAA  
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*Lentamycetaceae*

TAGGTGAACCTGCGGAAGGATCATTAAATGTTTTTGAGTCAGATTTATCTGACA  
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*Lichtheimiaceae*

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*Backusellaceae*

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TGCAGGATTTTCTTGATCTTTTTGAATTTCAATAGGATATAAGTCTCTATGG  
AGTTGGTCCATGATTCGAGCCTAAACCACAAATTTTATTTTCATATTTGTTCTG  
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*Choanephoraceae*

ACTGTGA ACTGTTTTATTTTACAGCGTTTGAGGGATGTTCTTGTGTTATATGG  
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*Mucoraceae*

TCCGTAGGTGAACCTGCGGAAGGATCATTAAATAATCTGATAATTCAATAAT  
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*Mycotyphaceae*

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*Pilobolaceae*

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*Rhizopodaceae*

CCACCTCTTAGGGTTCCTCTGGGGTAAGTGATTGCTTCTACACTGTGAAAATT  
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AT

*Phycomycetaceae*

CGGAAGGATCATTACCAATGTTGTCTACAGTTCAGCGTTTACGCTGGTCTGAT  
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*Saksenaeeaceae*

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*Syncephalastraceae*

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*Filobasidiaceae*

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*Piskurozymaceae*

CTTCCGTAGGTGAACCTGCGGAAGGATCATTAGAGAATAAACCCGGGGTTGG  
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GAGGA

*Ascodesmidaceae*

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*Chorioactidaceae*

GGTGAACCTGCGGAAGGATCATTAAATGAATACTCTTCATTGATCATAACCG  
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*Discinaceae*

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*Helvellaceae*

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*Morchellaceae*

CCAAGAACC AAAACACATGAGCGAGGGATCGCGCTCGCGCTGGGCTCGATA  
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GCAGGTTAAACCCAAGGTACCCATCCAAGGTGGACAGTCCTCCCAGAGTTCG  
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*Pezizaceae*

TCAAAGTTTTTTACATCCCATTGTTTATCTACCCTGTTGCTTCCACTGGACATG  
TCTTGCTTTGTTGTGAGACCTTTGGCTGGTAGAAAATAATACTTTGCCAGAGA  
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TTGTCTGAATCTTTTGCTTCAATAAAAATAAACTTTCAACAACGGATCTCTA  
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ATCAATAG

*Pyronemataceae*

GGAAGGATCATTAATCGAACAAACATGTTTCTCGGCATGATATTTCAAACCC  
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*Sarcoscyphaceae*

TTTCCGTAGGTGAACCTGCGGAAGGATCATTAGAGTAATCGCCAGGCGCCAG  
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TGCGATAAGTAGTGTGAATTGCAGAATTCAGTGAATCATCGAATCTTTGAAC  
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GAGTTCCCCGCCCAAAGGAATCTGGCGGGGAGCCTGGTCCCTCGGAGACGTA  
GTAAGCAATTCTATCGTCTGTGCGAGCGGTCCGTTATCCAGCCGACAACCCCA  
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*Sarcosomataceae*

CTGTGAACTTTTCCACTGTTGCTTCCGTGAGCCTGTACTTTGCTCTCTTTGAGA  
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GACTATCCCCTCTGGAATTCCTCAGCAGAGACCACAGCAGCCTCAGGTGTGA  
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CAGCTTTTACCATGTTGACCTCGGATCAGGTAGG

*Tuberaceae*

TAAATAATGCTTTCGTAGGTGACCTGCGGAGGATCATTAGAGAAATCAGGG  
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*Boliniaceae*

AAGAAAAGAGTTGCGGAGACTCGAAAACCATCGCGAAAGTCACCCCCCTTG  
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CTTTCCTTTCAAGG

*Anastomitrabeculiaceae*

CGGAAACGCAAGGGGAGGGTTCGGTGGGAGAGACGAGCCCTCGCGGCCTCT  
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TTGCGGGCGAGGGATCCCTGCGGACCGGGCTGCGGCCCGGCCCGCGTTGATC  
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TGGGCGCCTGTCCC GCCGTCTGTCGCGGACTCGCCTCAAAGACATTGGCGGC  
TGTTCCCCTCTGGCTCGTAAGCGCAGCAAAGCCGGCGCCCGGGGCCGTGGGG  
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*Arthopyreniaceae*

AACGACCACCCCGAGCCGGAAAGTTCGTCAAACCTCGGTCATTTAGAGGAAGT  
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GACAATCTTCAAGCTCTGCTTGGTGTGGGTGGTTGTCGCGGCTTTGAGCCCC  
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AGTACGCGCTCTGGGTCGCCCCGTGAATATCCAAAAGCCTTTTTTTCAACTTG  
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*Cyclothyriellaceae*

AACGACCACCCCGAGCCGGAAAGTTCGTCAAACCTCGGTCATTTAGAGGAAGT  
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CAACTTTCAACAATGGATCTCTTGGCTCTGGCATCGATGAAGAACGCAGCGA  
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GACAATCTTCAAGCTCTGCTTGGTGTGGGTGGTTGTCGCGGCTTTGAGCCCC  
GACTCGCCTTAAAATAATTGGCAGCTCATGTGGGTGGTTCCCTTGCAGCAC  
AGTACGCGCTCTGGGTCGCCCCGTGAATATCCAAAAGCCTTTTTTTCAACTTG  
ACCTCGGATCAGGTAGGGATAACCCGCTGAACTTAAGCATATCAATAAGCGGA  
GGAAAAGAAACCAACAGGGATTGCCTTAGTAACGGCGAGTGAA

*Hermatomycetaceae*

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GGGGCTTGCCCCGTCAAGATATCACCCCTTGCCTTTGAGTACCATCTGTTTC  
CTCGGCAGGCTCGCTTGCCAATGGGGACCACAACCAAACCTTTTTGTATCTGT  
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TGGGCGTTTGTCTGCCTTGGGCATGGACTCGCCTCAAAGACATTGGCGACCT  
GTGTATTGGCTTCGAGCGCAGTAGACTCGCGCGTCGACCCCTTATGCACTGGG  
TGTCAGCAAGCTTACAACCCCAAATTTGACCTCGGATCAGGTA

*Hypsostromataceae*

CAAGGTTTCCGTAGGTGAACCTGCGGAAGGATCATTATGGGTGGCTTTATGTC  
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CAAACAAATAATCAAAACTTTCAACAACGGATCTCTTGGTTCTGGCATCGAT  
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GTTTCGAGCGTCATTTTAAACCTCAAGCAAAGCTTGGTGTGGGCGTCTGTCCC  
CCCCCTTTGTGGGGGACTCGTCTTGAAGTCATTGGCGGCCGTATCTTGAAGCT  
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AGCACAATCCAAAGAATTGACCTCGGATCAGT

*Latoruaceae*

GCAGGTGCCACGCCTCCACGTTCTTACCCCTTGTTTACCTTGCACCCTTTGTC  
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AAAGGCATTGGCAGCGGTCCCTGCCGGGGCCTCCTAATCGCGCAGCACTGTTC  
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*Longiostiolaceae*

GCGGAAGGATCATTACTGTATGGGACTGTCCCATCAAGATGGTACCCTTTGTC  
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CCAACCCTTTGCAATAGCAGTATACATCTGATACCAACAAATAATTACAACCT  
TCAACAACGGATCTCTTGGTTCTGGCATCGATGAAGAACGCAGCGAAATGCG  
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*Nigrogranaceae*

CATTACCGTTGGAGTTCGCTCCAATCTGGGATAGAACCCTTGCCTTTGAGTAC  
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ACATGCTGGTCCCCACAAAACCATTCTTTATAGCTTGACCTCGGATCAGGTA  
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*Paradictyoarthriniaceae*

CATTAGCGATGAAAGCTCCCTTGAGGGGGCACCCCATCACTACCCTTGCCTTT  
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CGCCTCAAAGCATTGGCAGCCGGGACGTTGGCTTTGAGCGCAGCAGAATAG  
CGCCTCTGGCCTCGGTGTCCGGTCTCCAGGAAGCCTAGACCTCCATATCTTG  
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*Neopyrenochaetaceae*

CTCAACACGGGGGGCGTAGAAATACGCTTCCACGGTTGTTACACCCTTTGTCT  
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CTCAAGCTCAGCTTGGTGTGGGTGTTTGTCCCGCCGTTGCGCGTGGACTCGC  
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*Parapyrenochaetaceae*

GGTTTCCGTAGGTGAACCTGCGGAAGGATCATTACACAATATTACGGGGGGC  
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GCGAAATGCGATAAGTAGTGTGAATTGCAGAATTCAGTGAATCATCGAATCT  
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TGTGGACTCGCCTTAAAATAATTGGCAGCCGGCATATTGGCCTTGGAGCGCA  
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TAACCTTTGACCTCGGATCAGGTAGGGATACCCGCTGAACTTAAGC

*Pseudopyrenochaetaceae*

TCGTAACAAGGTTTCCGTAGGTGAACCTGCGGAAGGATCATTAACTGTATTA  
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GCCGGCCGGACACCATAAAACCTTTTGTGATTGCAGTCAGCGTCAGAAAACCT  
ACAATAATTACAACCTTCAACAACGGATCTCTTGGTTCTGGCATCGATGAAGA  
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CGCGTGGACTCGCCTCAAAGCAATTGGCAGCCGGCAATCTGGTTATAGAGCG  
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*Pyrenochaetopsidaceae*

TCGTAACAAGGTTTCCGTAGGTGAACCTGCGGAAGGATCATTATCGACACAG  
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*Shiraiaceae*

TGGAAGTAAAAATCGTAACAAGGTTTCCGTAGGTGAACCTGCGGAAGGATCA  
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*Vialaeaceae*

TGTGAACCTTACCCCTGTTGCCTCCGCGGAGCCGCGCCCCCCCCGGGCGCCGG  
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ACATAAATAAGTCAAAACCTTCAACAACGGATCTCTTGGTTCTGGCATCGATG  
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AGCTTTTGTCTAGCTTCTGTAGGATCTGGCGCCCCTGCCGTGAAACACCCACA  
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CAATAAGCGGAGGAA

*Diplogelasinosporaceae*

CACACCATCGTGAACGTCACCGCATCGTTTCTTCGGCGGGCGGCCCCACC  
GGGGCCGCGCCTGCCCCCTCGCGGGGCGGCAGCCCGCCGGAGGCGTCCAAAC  
TCTCAGCATCTAGTGGCATCTCTGAGTAGCTTACAAAATAAGTCAAACCTTC  
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*Naviculisporaceae*

CTCCGTTGGTGACCAGCGGAGGGATCATTAAAGAGTTTCAAACCTCCCATAA  
ACCATCGCGAACGTTACCACATGTCGTTGCTTCGGCTAGCAGGCGAGCCCCT  
CACCGGGGGCAGAGCCTCATTGCGGCCCCCTCACGGGGCGCTAGCCGGAGGG  
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*Podosporaceae*

ATTAAAGGGTTGCAAGACTCCCCTAAACCATCGTGAACCCACCTCTGAACAG  
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CCCCGAAAACAGTGGCGGGCTCGCTGTCCACACCGAGCGTAGTAGCTAACC  
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TGACCTCGGATCAGGTAGGAATACCCGCTGAACTTAAGCATATCAATAAGCG  
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*Schizotheciaceae*

ATTACAGAGTTGCAAAACTCCCAACCATTGTGAACCTACCTCACCGTTGCTTC  
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CAGAGGACCCACACTCTTAGTCATCATTTGGCCTCTCTGAGTAACTTATACAA  
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CGTCATTTCAACCATCAAGCCCCGGCTTGTGTTGGGGCCCTGCGGGCTGCCGC  
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*Apharknessiaceae*

AGGGATCATTGCTGGAAGCGTCGCAAGACGCGCCCAGATTACCCCTATGTGA  
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ACCCCCAATTTATTACCAAAGGTGACCTCGGATCAGGTAGGAATACCCGCT  
GAACTTAAGCATATC

*Diaporthosporellaceae*

GAACGAGCGGAGCGACATTGATAAAATTCGATCTCCTACCCTTTGTGAACTT  
ATACTTGTGCCTCGGTGCTGGTTGGTAGAGGAGCTAACGGCCGGCCGATGG  
CCCCTCTTAAACTCTTGTGGTGCATAACGTATTTCTCTTCTGAGTATCATTTAAA  
CTCAATGAATCAAACTTTCAACAACGGATCTCTTGGTTCTGGCATCGATGAA  
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CGAGCGTCATTTCAACCCTCAAACCATATTTACTATGGTGTGGTGGTGGGG  
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GCGTAGTAGTTTTACCACCTCGCTTTTGGTAGAGATAGTGATGTTTTAGCCAT  
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*Dwiroopaceae*

GCGGAGGGATCATTGCTGGAACGTGTGCCTCCCCGGACACAACCCCGCATAC  
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GGCCACCAAACCTTTGTTTTTGAACCTGTCTCTTCTGAGTTTTTTATAACA  
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CGGTAGGCTCTGAAATTCAGTGGCGGGCTCGCTAAGACTCTGAGCGTAGTAG  
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*Erythrogloeaceae*

ACAGCGGAGGGATCATTGCTGGAATCTCAGGGCTTCGGCCCTGACCCAGATA  
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*Juglanconidaceae*

AACGACCACCCAGGGCCGGAAAGTTCTCCAAACTCGATCATTTAGAGGAAGT  
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*Lamproconiaceae*

GATCATTGCTGGAGAAAGGCCGCGAGGCCCTGCCAGATAACCCCGTGTGAAC  
CATACCCACTCGTTGCCTCGGCGGACCGAGGGACGCTCCCGCGGGAGCGCC  
CTCCCGGGAGCCACAGCGGCCCCCGGAGCCGTCCGCCGGCGGCCCAACAAC  
TCTTGTCTTAGCGTGTACCTTCTGAGTACAGCTATACGAAATGTAGTAAAA  
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TAGTAGTCTTACCGCCTCGCTTCAGGGAGTACCGGCGCGGCTCCTGCCGTAA  
AACCCCCACGATTTTTACATGGTTGACCTCGGATCAGGTAGGAATACCCGCT  
GAACTTAAGCATATCAAT

*Melanconiellaceae*

TTTGTGAACCTTATACCTTTATATCGTTGCCTCGGTACGGCCGGGGGACCCCTA  
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CTCTGCCGTTAAACGCGAGCGCACTGCCCCGTAGCGATACGGGCGCGGGCGCC  
TCACACCTCAGAAAGTTGACCTCGGATCAGGTAGGAATACCCGCTGAACTTA  
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*Amorphothecaceae*

CCAACAGGGATTGCCTCAGTAACGGCGAGTGAAGCGGCAACAGCTCAAATTT  
GAAATCTGGCCCTTTCAGGGTCCGAGTTGTAATTTGTAGAAGATGCTTCGGGT  
GTGGCTCCGGTCTAAGTTCCTTGGAACAGGACGTCATAGAGGGTGAGAATCC  
CGTCTGTGACCGGTCGCCTTCGCCATGTGAAGCTCTTTCGACGAGTCGAGTT  
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*Bryoglossaceae*

AACACCCACCCAGGGCCGGAAAGTTGTCCAAACTTGGTCATTTAGAGGAAGT  
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GGGATACCCG

*Calloriaceae*

AACAAGGTTTCCGTAGGTGAACCTGCGGAAGGATCATTACTGAAGATTTGGT  
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CGGTCTCTTGCCAAAACCCCTAATTTTTTATGATTGACCTCGGATCAGGTAGG  
GTTACCCGCTGAACCTAAGCATATC

*Chlorociboriaceae*

TCCGTAGGTGAACCTGCGGAGGGATCATTACCGAGTTCATGCCCTCGCGGG  
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CCCCCTCGCTGCCTCCGGGCATGCCC GCCAGAGGCCCAACCCTGTATCTCAG  
TGTCGTCCGAGTACTATATAATAGTTAAAACCTTTCAACAACGGATCTCTGGT  
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GCGAAGTACACATTCCGCTACGGGTCCCGCGGGCTGCTGCCAGCAACCCCC  
CTTTCACAAGGTTGACCTCGGATCAGGTAGGGATACCCGCTGAACCTAAGCA  
TATCAATAAGCGGAGGA

*Chlorospleniaceae*

TCCGTAGGTGAACCTGCGGAAGGATCATTAAAGTGACCCTCTTGCCCCCCG  
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CCACACCCGTGTATATTTACTCTTGTGCTTTGGCGGGCCGTGGTCTCCACTGT  
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CATGCCTGTTGAGCGTCATTGTGACCAATCAAGCTCAGCTTGGTGTGGGGC  
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AGTAATAATCTCCCGCTACAGAGTCCACTGGTGACTTGCCAGAACTCCCAA  
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*Cordieritidaceae*

CTTCCGTAGGTGAACCTGCGGAAGGATCATTATCGAGCAACCTGCCCTCGG  
GGTAGACCGCCCACCCTGTGAACCTGTCCCTGTTGCTTTGGCGGGCCGTCCCTG  
GCTCTCGGACACGCCATCGGCCCTCGCGCGGATGCGTGCCCGTCAGGGAACC  
CCAACTCAACGATGCGTACAACGTGTGGTCTGAGCGAAAACAAGTTTAATCG  
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AGATTTGTGCATCGCGACGGGCGCGGAGGGGGCGGCACCCGAAAACCTCCA  
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TGAA

*Discinellaceae*

TAACAAGGTTTCCGTAGGTGAACCTGCGGAAGGATCATTACAGAGTTCATGC  
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GTCTTGCCAGCAACCCCAATATTTTTACAGGTTGACCTCGGATCAGGTAGGG  
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*Gelatinodiscaceae*

CATTACTGAAAGGGGACTCCGGTCCCCGGGACAAGCCCCGTCGAGCCCTTG  
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CGTGGTGTGTTGCTATAACAACCCCAACTTTCTATGG

*Godroniaceae*

TCTTGGTCATTTAGAGGAAGTAAAAGTCGTAACAAGGTTTCCGTAGGTGAAC  
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CTAGTGGCGGTGCCTCTCGGCTCTAAGCGTAGTAATTCTTCTCGCTATAGGGC  
CCGGGAGACCACCCGCCAGAACCCCACTTCTCAAGGTTGACCTCGGATC  
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*Hamatocanthoscyphaceae*

GTGAACCTGCGGAAGGATCATTACAGAGAATCTTGCCCTCTTGGGTGAATCT  
CCAACCCTGTGTTATCTATCTTTGTTGCTTTGGGAGCCGCTTCGGCCACTGGCT  
TCGGCTTGTGTGTGCTCCCAAGGGACCCCAAATTCTTTATTATTAGTGTTCGTC  
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TGCCTGTTTCGAGCGTCAGTACAACACTCAAGCTCAGCTTGGTCTTGAGCCCAG  
CCTGTAAAAGGGCGGGCTTTAAAATCAGTGGCGGGCGTTCGTTAGGCTCTTAGC  
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*Hyphodiscaceae*

GGATCATTACAGAGTTCGTGCCCTCACGGGTAGATCTCCCACCCTGTGTTATT  
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GTGAA

*Lachnaceae*

GTGGTTATGGGTAGCGCGCGCTGCTTAAGATATAGTCGGTTCGCCCGGGAA  
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AAAACAGTGGCGGTGCTCTCATGCTCTACGCGTAGTAACTTTCTCGCTATAGG  
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TCACG

*Leptodontidiaceae*

CAGAGCTTTTGGCCGTAAGGGTAGATCTCCCACCCTGTGCTATATTTACCTCT  
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*Mollisiaceae*

GTTGTGGGTAGGGCGTCCGTCCTATCTAAGATATAGTCGGACCTTGCGAGAG  
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*Neocrinulaceae*

AACGCTTAAGATATAGTCGGGCCCTGGAAGAAATTCAGGGGTGAAGTCACT  
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CGGATCAG

*Ploettnerulaceae*

GTAACAAGGTTTCCGTAGGTGAACCTGCGGAAGGATCATTACAAGTGAAGTGC  
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*Porodiplodiaceae*

TAAAAGTCGTAACAAGGTTTCCGTAGGTGAACCTGCGGAAGGATCATTACAG  
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*Vandijkellaceae*

CGTAACAAGGTTTCCGTTGGTGAACCAGCGGAAGGATCATTACAGAGTTCAT  
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ATAA

*Anungitiomycetaceae*

TAACAAGGTCTCCGTAGGTGAACCTGCGGAGGGATCATTACAGAGTTGAAAA  
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*Barrmaeliaceae*

AACGACACCTCAGGGCCGGAAAGTTATCCAAACTCGGTCATTTAGAGGAAGT  
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GTGTCTACCCTGTAGCAACCTACCCTGTAGGGACCTACCCGGTGGCACGCTA  
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CGTACCCTGTAGCTTCTCAAAGTCAGTGGCGGAGTCGGGTCACACTCTAAGC  
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CGAGTGAA

*Fasciatisporaceae*

CATTATAGAGTTATAAAAACCTCCAAAACCCATGTGAACATACCTATTGTTGCC  
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TAAGCGTAGTAATTTCTTCTCGCTTCTGTAGTTGGCCCGGCCCTGCCGTAAC  
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*Gyothyricaceae*

TAACAAGGTCTCCGTTGGTGAACCAGCGGAGGGATCATTACAGAGTTATTCC  
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CCAACCTTTTTAGTGGTTGACCTCGGATCAGGTAGGAATACCCGCTGAACTTAA  
GCATA

*Iodosphaeriaceae*

CTTGGTCATTTAGAGGAAGTAAAAGTCGTAACAAGGTCTCCGTTGGTGAACC  
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*Leptosilliaceae*

AACGACCACTCAGGGCCGGAAAGTTATCCAAACTCGGTCATTTAGAGGAAGT  
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*Nothodactylariaceae*

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TTAGTATTGGGAGTCTACCTCACCGTAGTTCCTCAAAGACAGCGGCGGAGTC  
GTGGTTTTGCTCTGAGCTTAGTAATCTATTCTAGCTTTTGAGTGCCCACTGCC  
CTGCCGTA AACACCCCCATTTTCAATGGTTGACCTCGGATCAGGTAGGAAT  
ACCCGCTGAACTTAAGCATATCA

*Pseudotruncatellaceae*

GGTCTCCGTTGGTGAACCAGCGGAGGACATTACAGAGTTATTTCAACTCCAA  
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GCGGACCTCATAAACTCTGTCATTA AAAATGGAAATCTGAGCGTCTTATTAAT  
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AAG

*Vialaeaceae*

TGTGAACCTTACCCCTGTTGCCTCCGCGGAGCCGCGCCCCCGGGCGCCGG  
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CAATAAGCGGAGGAA

*Zygosporiaceae*

TAACAAGGTCTCCGTTGGTGAACCAGCGGAGGGATCATTACTGAGTTTTCTA  
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ACGGTCTCCCCGTGGCGTCAGCCTGCCGGTGGACCCAAAACCTAACTCTTGTT  
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*Penicillaginaceae*

AAGGATCATTACCGAGTGCGGGTCCCCTCGCGGGGCCCAACCTCCCACCCGT  
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*Marthamycetaceae*

TCCGTAGGTGAACCTGCGGAAGGATCATTACCGAGATTTATCCTCCGGGATA  
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CGGATCTCTTGGTTCTGGCATCGATGAAGAACGCAGCGAAATGCGATAAGTA  
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*Neoantennariellaceae*

CCGTAGGTGAACCTGCGGAGGGATCATTACCGAGTGAGGGTCCTCGCGGCCC  
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CCGGCGGGCCCCCGGTGGACCATCAAACCTCTGCATCTTTTCGTCTGAGTATA  
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CAATAAGCGGAGGA

*Readerielliopsidaceae*

TCGTAACAAGGTCTCCGTAGGTGAACCTGCGGAGGGATCATTACTGAGATAG  
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*Adustoporiaceae*

GGAATTTTGAAAGGGGTTGTAGCTGGCCTTTTAGGAGGCATGTGCACACCCT  
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*Dacryobolaceae*

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*Incrustoporiaceae*

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*Phaeolaceae*

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*Piptoporellaceae*

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*Postiaceae*

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*Chromocyphellaceae*

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*Galeropsidaceae*

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*Tubariaceae*

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*Sacchettoeciaceae*

CATTAAGAGAAGGGGCTTAAACACCCCGACCTCCAACCCTCTGTTGTTAAAA  
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*Zalariaceae*

TGGCTCAGGGAGGTTCGGCAACGACCACCCAGAGCCGGAAAGTTCGTCAAACCT  
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*Melanopsaceae*

TCCGTAGGTGAACCTGCGGAAGGATCATTAAAAAGTTGCTCGGGTCCCCTTC  
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*Pygmaeomycetaceae*

AAGAATGATATTTGGGTTTTAACTTTCTCTATGTATTTGAGGTAGTGGTAATA  
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