

## 5. Worksheet: Alpha Diversity

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### OVERVIEW

In this exercise, we will explore aspects of local or site-specific diversity, also known as alpha ( $\alpha$ ) diversity. First we will quantify two of the fundamental components of ( $\alpha$ ) diversity: **richness** and **evenness**. From there, we will then discuss ways to integrate richness and evenness, which will include univariate metrics of diversity along with an investigation of the **species abundance distribution (SAD)**.

### Directions:

1. In the Markdown version of this document in your cloned repo, change “Student Name” on line 3 (above) to your name.
2. Complete as much of the worksheet as possible during class.
3. Use the handout as a guide; it contains a more complete description of data sets along with the proper scripting needed to carry out the exercise.
4. Answer questions in the worksheet. Space for your answer is provided in this document and indicated by the “>” character. If you need a second paragraph be sure to start the first line with “>”. You should notice that the answer is highlighted in green by RStudio (color may vary if you changed the editor theme).
5. Before you leave the classroom, **push** this file to your GitHub repo.
6. For the assignment portion of the worksheet, follow the directions at the bottom of this file.
7. When you are done, **Knit** the text and code into a PDF file.
8. After Knitting, submit the completed exercise by creating a **pull request** via GitHub. Your pull request should include this file `AlphaDiversity_Worskheet.Rmd` and the PDF output of Knitr (`AlphaDiversity_Worskheet.pdf`).

### 1) R SETUP

In the R code chunk below, please provide the code to: 1) Clear your R environment, 2) Print your current working directory, 3) Set your working directory to your **Week-2/** folder folder, and 4) Load the **vegan** R package (be sure to install first if you have not already).

```
rm(list = ls())
getwd()

## [1] "/cloud/project/QB2025_Huang/Week2-Alpha"
setwd("/cloud/project/QB2025_Huang/Week2-Alpha")

#install.packages("vegan")
require("vegan")

## Loading required package: vegan
## Loading required package: permute
```

```
## Loading required package: lattice
## This is vegan 2.6-8
```

## 2) LOADING DATA

In the R code chunk below, do the following: 1) Load the BCI dataset, and 2) Display the structure of the dataset (if the structure is long, use the `max.level = 0` argument to show the basic information).

```
data("BCI")
print(BCI, max.levels = 0)
```

```
##      Abarema.macradenia Vachellia.melanoceras Acalypha.diversifolia
## 1              0              0              0
## 2              0              0              0
## 3              0              0              0
## 4              0              0              0
## 5              0              0              0
## 6              0              0              0
## 7              0              0              0
## 8              0              0              0
## 9              0              0              0
## 10             1              0              0
## 11             0              0              0
## 12             0              0              0
## 13             0              0              0
## 14             0              0              0
## 15             0              0              0
## 16             0              0              0
## 17             0              0              0
## 18             0              0              0
## 19             0              0              0
## 20             0              0              0
## 21             0              0              0
## 22             0              0              0
## 23             0              0              0
## 24             0              0              0
## 25             0              0              0
## 26             0              0              0
## 27             0              0              0
## 28             0              2              0
## 29             0              0              0
## 30             0              0              0
## 31             0              0              0
## 32             0              1              0
## 33             0              0              0
## 34             0              0              1
## 35             0              0              0
## 36             0              0              0
## 37             0              0              0
## 38             0              0              0
## 39             0              0              0
## 40             0              0              1
## 41             0              0              0
## 42             0              0              0
```

|       |                       |                |                      |
|-------|-----------------------|----------------|----------------------|
| ## 43 | 0                     | 0              | 0                    |
| ## 44 | 0                     | 0              | 0                    |
| ## 45 | 0                     | 0              | 0                    |
| ## 46 | 0                     | 0              | 0                    |
| ## 47 | 0                     | 0              | 0                    |
| ## 48 | 0                     | 0              | 0                    |
| ## 49 | 0                     | 0              | 0                    |
| ## 50 | 0                     | 0              | 0                    |
| ##    | Acalypha.macrostachya | Adelia.triloba | Aegiphila.panamensis |
| ## 1  | 0                     | 0              | 0                    |
| ## 2  | 0                     | 0              | 0                    |
| ## 3  | 0                     | 0              | 0                    |
| ## 4  | 0                     | 3              | 0                    |
| ## 5  | 0                     | 1              | 1                    |
| ## 6  | 0                     | 0              | 0                    |
| ## 7  | 0                     | 0              | 1                    |
| ## 8  | 0                     | 0              | 0                    |
| ## 9  | 0                     | 5              | 0                    |
| ## 10 | 0                     | 0              | 1                    |
| ## 11 | 0                     | 0              | 0                    |
| ## 12 | 0                     | 1              | 1                    |
| ## 13 | 0                     | 1              | 1                    |
| ## 14 | 0                     | 0              | 0                    |
| ## 15 | 0                     | 2              | 0                    |
| ## 16 | 0                     | 2              | 0                    |
| ## 17 | 0                     | 0              | 1                    |
| ## 18 | 0                     | 1              | 1                    |
| ## 19 | 0                     | 0              | 1                    |
| ## 20 | 0                     | 0              | 2                    |
| ## 21 | 0                     | 0              | 1                    |
| ## 22 | 0                     | 1              | 0                    |
| ## 23 | 0                     | 0              | 0                    |
| ## 24 | 0                     | 2              | 1                    |
| ## 25 | 0                     | 0              | 1                    |
| ## 26 | 0                     | 0              | 0                    |
| ## 27 | 0                     | 1              | 4                    |
| ## 28 | 1                     | 0              | 1                    |
| ## 29 | 0                     | 1              | 0                    |
| ## 30 | 0                     | 14             | 2                    |
| ## 31 | 0                     | 5              | 0                    |
| ## 32 | 0                     | 7              | 0                    |
| ## 33 | 0                     | 3              | 1                    |
| ## 34 | 0                     | 3              | 0                    |
| ## 35 | 0                     | 6              | 0                    |
| ## 36 | 0                     | 1              | 0                    |
| ## 37 | 0                     | 2              | 0                    |
| ## 38 | 0                     | 6              | 0                    |
| ## 39 | 0                     | 9              | 0                    |
| ## 40 | 0                     | 7              | 0                    |
| ## 41 | 0                     | 0              | 1                    |
| ## 42 | 0                     | 0              | 0                    |
| ## 43 | 0                     | 0              | 1                    |
| ## 44 | 0                     | 4              | 0                    |
| ## 45 | 0                     | 0              | 0                    |

|       |                         |                     |                  |
|-------|-------------------------|---------------------|------------------|
| ## 46 | 0                       | 0                   | 0                |
| ## 47 | 0                       | 2                   | 0                |
| ## 48 | 0                       | 1                   | 0                |
| ## 49 | 0                       | 0                   | 0                |
| ## 50 | 0                       | 1                   | 0                |
| ##    | Alchornea.costaricensis | Alchornea.latifolia | Alibertia.edulis |
| ## 1  | 2                       | 0                   | 0                |
| ## 2  | 1                       | 0                   | 0                |
| ## 3  | 2                       | 0                   | 0                |
| ## 4  | 18                      | 0                   | 0                |
| ## 5  | 3                       | 0                   | 0                |
| ## 6  | 2                       | 1                   | 0                |
| ## 7  | 0                       | 0                   | 0                |
| ## 8  | 2                       | 0                   | 0                |
| ## 9  | 2                       | 0                   | 0                |
| ## 10 | 2                       | 0                   | 0                |
| ## 11 | 10                      | 0                   | 0                |
| ## 12 | 3                       | 0                   | 0                |
| ## 13 | 1                       | 0                   | 1                |
| ## 14 | 4                       | 0                   | 0                |
| ## 15 | 2                       | 0                   | 0                |
| ## 16 | 2                       | 0                   | 0                |
| ## 17 | 2                       | 0                   | 0                |
| ## 18 | 0                       | 0                   | 0                |
| ## 19 | 1                       | 0                   | 0                |
| ## 20 | 2                       | 0                   | 0                |
| ## 21 | 2                       | 0                   | 0                |
| ## 22 | 4                       | 0                   | 0                |
| ## 23 | 1                       | 0                   | 0                |
| ## 24 | 0                       | 0                   | 0                |
| ## 25 | 2                       | 0                   | 0                |
| ## 26 | 3                       | 0                   | 0                |
| ## 27 | 3                       | 0                   | 0                |
| ## 28 | 2                       | 0                   | 0                |
| ## 29 | 1                       | 0                   | 0                |
| ## 30 | 6                       | 0                   | 0                |
| ## 31 | 4                       | 0                   | 0                |
| ## 32 | 6                       | 0                   | 0                |
| ## 33 | 3                       | 0                   | 0                |
| ## 34 | 5                       | 0                   | 0                |
| ## 35 | 8                       | 0                   | 0                |
| ## 36 | 3                       | 0                   | 0                |
| ## 37 | 4                       | 0                   | 0                |
| ## 38 | 2                       | 0                   | 0                |
| ## 39 | 3                       | 0                   | 0                |
| ## 40 | 3                       | 0                   | 0                |
| ## 41 | 11                      | 0                   | 0                |
| ## 42 | 0                       | 0                   | 0                |
| ## 43 | 3                       | 0                   | 0                |
| ## 44 | 4                       | 0                   | 0                |
| ## 45 | 0                       | 0                   | 0                |
| ## 46 | 0                       | 0                   | 0                |
| ## 47 | 1                       | 0                   | 0                |
| ## 48 | 3                       | 0                   | 0                |

|       |                         |                  |                   |
|-------|-------------------------|------------------|-------------------|
| ## 49 | 6                       | 0                | 0                 |
| ## 50 | 2                       | 0                | 0                 |
| ##    | Allophylus.psilospermus | Alseis.blackiana | Amaioua.corymbosa |
| ## 1  | 0                       | 25               | 0                 |
| ## 2  | 0                       | 26               | 0                 |
| ## 3  | 0                       | 18               | 0                 |
| ## 4  | 0                       | 23               | 0                 |
| ## 5  | 1                       | 16               | 0                 |
| ## 6  | 0                       | 14               | 0                 |
| ## 7  | 0                       | 18               | 0                 |
| ## 8  | 0                       | 14               | 0                 |
| ## 9  | 0                       | 16               | 0                 |
| ## 10 | 0                       | 14               | 0                 |
| ## 11 | 0                       | 14               | 0                 |
| ## 12 | 2                       | 19               | 0                 |
| ## 13 | 1                       | 8                | 0                 |
| ## 14 | 0                       | 17               | 0                 |
| ## 15 | 0                       | 15               | 0                 |
| ## 16 | 3                       | 25               | 0                 |
| ## 17 | 2                       | 31               | 0                 |
| ## 18 | 0                       | 7                | 0                 |
| ## 19 | 1                       | 13               | 0                 |
| ## 20 | 0                       | 10               | 0                 |
| ## 21 | 1                       | 12               | 0                 |
| ## 22 | 4                       | 22               | 0                 |
| ## 23 | 0                       | 5                | 0                 |
| ## 24 | 1                       | 14               | 0                 |
| ## 25 | 0                       | 20               | 0                 |
| ## 26 | 0                       | 7                | 0                 |
| ## 27 | 3                       | 17               | 0                 |
| ## 28 | 0                       | 16               | 0                 |
| ## 29 | 0                       | 15               | 0                 |
| ## 30 | 0                       | 36               | 0                 |
| ## 31 | 0                       | 11               | 0                 |
| ## 32 | 0                       | 21               | 0                 |
| ## 33 | 1                       | 24               | 0                 |
| ## 34 | 0                       | 42               | 0                 |
| ## 35 | 0                       | 93               | 0                 |
| ## 36 | 0                       | 8                | 0                 |
| ## 37 | 0                       | 19               | 0                 |
| ## 38 | 1                       | 25               | 0                 |
| ## 39 | 1                       | 38               | 0                 |
| ## 40 | 1                       | 65               | 0                 |
| ## 41 | 0                       | 13               | 0                 |
| ## 42 | 0                       | 13               | 0                 |
| ## 43 | 0                       | 8                | 0                 |
| ## 44 | 0                       | 13               | 0                 |
| ## 45 | 0                       | 10               | 0                 |
| ## 46 | 0                       | 29               | 2                 |
| ## 47 | 1                       | 17               | 0                 |
| ## 48 | 1                       | 12               | 0                 |
| ## 49 | 1                       | 6                | 1                 |
| ## 50 | 1                       | 9                | 0                 |
| ##    | Anacardium.excelsum     | Andira.inermis   | Annona.spraguei   |
|       |                         |                  | Apeiba.glabra     |

|       |                  |                         |                          |    |
|-------|------------------|-------------------------|--------------------------|----|
| ## 1  | 0                | 0                       | 1                        | 13 |
| ## 2  | 0                | 0                       | 0                        | 12 |
| ## 3  | 0                | 0                       | 1                        | 6  |
| ## 4  | 0                | 0                       | 0                        | 3  |
| ## 5  | 0                | 1                       | 0                        | 4  |
| ## 6  | 0                | 1                       | 0                        | 10 |
| ## 7  | 0                | 0                       | 0                        | 5  |
| ## 8  | 1                | 0                       | 1                        | 4  |
| ## 9  | 0                | 1                       | 1                        | 5  |
| ## 10 | 0                | 0                       | 0                        | 5  |
| ## 11 | 1                | 1                       | 0                        | 2  |
| ## 12 | 0                | 0                       | 0                        | 4  |
| ## 13 | 0                | 0                       | 3                        | 1  |
| ## 14 | 0                | 1                       | 4                        | 5  |
| ## 15 | 0                | 0                       | 2                        | 8  |
| ## 16 | 0                | 0                       | 0                        | 5  |
| ## 17 | 0                | 0                       | 1                        | 1  |
| ## 18 | 2                | 0                       | 2                        | 1  |
| ## 19 | 0                | 2                       | 1                        | 13 |
| ## 20 | 0                | 0                       | 2                        | 6  |
| ## 21 | 2                | 0                       | 0                        | 2  |
| ## 22 | 0                | 1                       | 0                        | 7  |
| ## 23 | 2                | 1                       | 0                        | 3  |
| ## 24 | 1                | 2                       | 0                        | 6  |
| ## 25 | 1                | 0                       | 0                        | 6  |
| ## 26 | 0                | 2                       | 0                        | 4  |
| ## 27 | 0                | 0                       | 0                        | 2  |
| ## 28 | 2                | 1                       | 0                        | 6  |
| ## 29 | 0                | 1                       | 0                        | 5  |
| ## 30 | 0                | 2                       | 0                        | 5  |
| ## 31 | 0                | 0                       | 0                        | 5  |
| ## 32 | 0                | 0                       | 0                        | 4  |
| ## 33 | 0                | 2                       | 0                        | 8  |
| ## 34 | 0                | 1                       | 0                        | 3  |
| ## 35 | 0                | 0                       | 0                        | 5  |
| ## 36 | 0                | 0                       | 1                        | 3  |
| ## 37 | 0                | 0                       | 0                        | 4  |
| ## 38 | 0                | 0                       | 1                        | 1  |
| ## 39 | 0                | 0                       | 0                        | 3  |
| ## 40 | 2                | 0                       | 0                        | 7  |
| ## 41 | 2                | 1                       | 0                        | 2  |
| ## 42 | 0                | 1                       | 0                        | 5  |
| ## 43 | 0                | 2                       | 0                        | 2  |
| ## 44 | 0                | 0                       | 0                        | 7  |
| ## 45 | 0                | 0                       | 0                        | 1  |
| ## 46 | 0                | 0                       | 3                        | 0  |
| ## 47 | 0                | 0                       | 1                        | 8  |
| ## 48 | 3                | 1                       | 2                        | 2  |
| ## 49 | 1                | 2                       | 0                        | 4  |
| ## 50 | 2                | 1                       | 0                        | 3  |
| ##    | Apeiba.tibourbou | Aspidosperma.desmanthum | Astrocaryum.standleyanum |    |
| ## 1  | 2                | 0                       |                          | 0  |
| ## 2  | 0                | 0                       |                          | 2  |
| ## 3  | 1                | 0                       |                          | 1  |

|       |                      |                   |                   |
|-------|----------------------|-------------------|-------------------|
| ## 4  | 1                    | 1                 | 5                 |
| ## 5  | 0                    | 1                 | 6                 |
| ## 6  | 0                    | 1                 | 2                 |
| ## 7  | 0                    | 0                 | 2                 |
| ## 8  | 1                    | 0                 | 0                 |
| ## 9  | 0                    | 0                 | 2                 |
| ## 10 | 0                    | 1                 | 1                 |
| ## 11 | 0                    | 0                 | 3                 |
| ## 12 | 0                    | 0                 | 1                 |
| ## 13 | 1                    | 0                 | 12                |
| ## 14 | 1                    | 1                 | 5                 |
| ## 15 | 0                    | 0                 | 0                 |
| ## 16 | 0                    | 0                 | 5                 |
| ## 17 | 0                    | 1                 | 1                 |
| ## 18 | 1                    | 0                 | 6                 |
| ## 19 | 1                    | 0                 | 2                 |
| ## 20 | 1                    | 0                 | 0                 |
| ## 21 | 0                    | 2                 | 3                 |
| ## 22 | 0                    | 0                 | 8                 |
| ## 23 | 0                    | 0                 | 17                |
| ## 24 | 0                    | 0                 | 7                 |
| ## 25 | 0                    | 3                 | 13                |
| ## 26 | 1                    | 0                 | 4                 |
| ## 27 | 0                    | 0                 | 5                 |
| ## 28 | 0                    | 2                 | 4                 |
| ## 29 | 0                    | 2                 | 1                 |
| ## 30 | 1                    | 0                 | 1                 |
| ## 31 | 0                    | 0                 | 3                 |
| ## 32 | 0                    | 1                 | 4                 |
| ## 33 | 1                    | 3                 | 10                |
| ## 34 | 1                    | 3                 | 3                 |
| ## 35 | 1                    | 0                 | 3                 |
| ## 36 | 0                    | 3                 | 2                 |
| ## 37 | 0                    | 1                 | 2                 |
| ## 38 | 0                    | 3                 | 1                 |
| ## 39 | 0                    | 5                 | 1                 |
| ## 40 | 0                    | 3                 | 3                 |
| ## 41 | 0                    | 0                 | 3                 |
| ## 42 | 1                    | 2                 | 13                |
| ## 43 | 0                    | 3                 | 1                 |
| ## 44 | 0                    | 2                 | 6                 |
| ## 45 | 0                    | 0                 | 1                 |
| ## 46 | 3                    | 1                 | 6                 |
| ## 47 | 1                    | 2                 | 5                 |
| ## 48 | 0                    | 2                 | 7                 |
| ## 49 | 0                    | 1                 | 4                 |
| ## 50 | 1                    | 2                 | 4                 |
| ##    | Astronium.graveolens | Attalea.butyracea | Banara.guianensis |
| ## 1  | 6                    | 0                 | 0                 |
| ## 2  | 0                    | 1                 | 0                 |
| ## 3  | 1                    | 0                 | 0                 |
| ## 4  | 3                    | 0                 | 0                 |
| ## 5  | 0                    | 0                 | 0                 |
| ## 6  | 1                    | 1                 | 0                 |

|       |                       |                     |                    |
|-------|-----------------------|---------------------|--------------------|
| ## 7  | 2                     | 1                   | 0                  |
| ## 8  | 2                     | 0                   | 0                  |
| ## 9  | 0                     | 0                   | 0                  |
| ## 10 | 0                     | 0                   | 0                  |
| ## 11 | 0                     | 0                   | 0                  |
| ## 12 | 0                     | 0                   | 0                  |
| ## 13 | 0                     | 4                   | 0                  |
| ## 14 | 0                     | 4                   | 0                  |
| ## 15 | 0                     | 0                   | 0                  |
| ## 16 | 0                     | 1                   | 0                  |
| ## 17 | 2                     | 0                   | 0                  |
| ## 18 | 0                     | 2                   | 0                  |
| ## 19 | 0                     | 0                   | 0                  |
| ## 20 | 0                     | 0                   | 0                  |
| ## 21 | 1                     | 1                   | 0                  |
| ## 22 | 2                     | 1                   | 0                  |
| ## 23 | 0                     | 1                   | 1                  |
| ## 24 | 0                     | 1                   | 0                  |
| ## 25 | 0                     | 2                   | 0                  |
| ## 26 | 2                     | 2                   | 0                  |
| ## 27 | 0                     | 1                   | 0                  |
| ## 28 | 1                     | 0                   | 0                  |
| ## 29 | 1                     | 0                   | 0                  |
| ## 30 | 1                     | 0                   | 0                  |
| ## 31 | 1                     | 2                   | 0                  |
| ## 32 | 0                     | 0                   | 0                  |
| ## 33 | 1                     | 0                   | 0                  |
| ## 34 | 7                     | 0                   | 0                  |
| ## 35 | 1                     | 0                   | 0                  |
| ## 36 | 0                     | 0                   | 0                  |
| ## 37 | 0                     | 0                   | 0                  |
| ## 38 | 0                     | 1                   | 0                  |
| ## 39 | 2                     | 0                   | 0                  |
| ## 40 | 1                     | 0                   | 0                  |
| ## 41 | 0                     | 1                   | 0                  |
| ## 42 | 0                     | 1                   | 0                  |
| ## 43 | 0                     | 0                   | 0                  |
| ## 44 | 0                     | 0                   | 0                  |
| ## 45 | 0                     | 1                   | 0                  |
| ## 46 | 1                     | 1                   | 0                  |
| ## 47 | 0                     | 0                   | 0                  |
| ## 48 | 0                     | 2                   | 0                  |
| ## 49 | 0                     | 1                   | 0                  |
| ## 50 | 0                     | 0                   | 0                  |
| ##    | Beilschmiedia.pendula | Brosimum.alicastrum | Brosimum.guianense |
| ## 1  | 4                     | 5                   | 0                  |
| ## 2  | 5                     | 2                   | 0                  |
| ## 3  | 7                     | 4                   | 0                  |
| ## 4  | 5                     | 3                   | 0                  |
| ## 5  | 8                     | 2                   | 0                  |
| ## 6  | 6                     | 2                   | 0                  |
| ## 7  | 5                     | 6                   | 0                  |
| ## 8  | 9                     | 4                   | 0                  |
| ## 9  | 11                    | 3                   | 0                  |



|       |                         |                   |                  |
|-------|-------------------------|-------------------|------------------|
| ## 10 | 14                      | 6                 | 0                |
| ## 11 | 1                       | 5                 | 0                |
| ## 12 | 2                       | 4                 | 0                |
| ## 13 | 0                       | 2                 | 0                |
| ## 14 | 3                       | 4                 | 0                |
| ## 15 | 9                       | 3                 | 0                |
| ## 16 | 4                       | 4                 | 0                |
| ## 17 | 2                       | 5                 | 0                |
| ## 18 | 0                       | 0                 | 0                |
| ## 19 | 2                       | 4                 | 0                |
| ## 20 | 1                       | 0                 | 0                |
| ## 21 | 2                       | 2                 | 0                |
| ## 22 | 0                       | 8                 | 0                |
| ## 23 | 0                       | 2                 | 0                |
| ## 24 | 16                      | 4                 | 0                |
| ## 25 | 5                       | 5                 | 0                |
| ## 26 | 3                       | 3                 | 0                |
| ## 27 | 1                       | 5                 | 0                |
| ## 28 | 3                       | 4                 | 0                |
| ## 29 | 11                      | 2                 | 0                |
| ## 30 | 4                       | 5                 | 0                |
| ## 31 | 2                       | 2                 | 0                |
| ## 32 | 5                       | 8                 | 0                |
| ## 33 | 2                       | 3                 | 0                |
| ## 34 | 5                       | 5                 | 0                |
| ## 35 | 1                       | 1                 | 0                |
| ## 36 | 1                       | 3                 | 0                |
| ## 37 | 2                       | 4                 | 0                |
| ## 38 | 5                       | 8                 | 0                |
| ## 39 | 9                       | 5                 | 0                |
| ## 40 | 5                       | 5                 | 0                |
| ## 41 | 7                       | 6                 | 0                |
| ## 42 | 4                       | 4                 | 0                |
| ## 43 | 10                      | 2                 | 0                |
| ## 44 | 21                      | 2                 | 0                |
| ## 45 | 42                      | 2                 | 0                |
| ## 46 | 0                       | 5                 | 0                |
| ## 47 | 1                       | 1                 | 1                |
| ## 48 | 1                       | 6                 | 0                |
| ## 49 | 11                      | 4                 | 0                |
| ## 50 | 17                      | 4                 | 0                |
| ##    | Calophyllum.longifolium | Casearia.aculeata | Casearia.arborea |
| ## 1  | 0                       | 0                 | 1                |
| ## 2  | 2                       | 0                 | 1                |
| ## 3  | 0                       | 0                 | 3                |
| ## 4  | 2                       | 0                 | 2                |
| ## 5  | 1                       | 0                 | 4                |
| ## 6  | 2                       | 0                 | 1                |
| ## 7  | 2                       | 0                 | 2                |
| ## 8  | 2                       | 1                 | 3                |
| ## 9  | 2                       | 0                 | 9                |
| ## 10 | 0                       | 0                 | 7                |
| ## 11 | 0                       | 0                 | 2                |
| ## 12 | 0                       | 0                 | 1                |

|       |                        |                     |                     |
|-------|------------------------|---------------------|---------------------|
| ## 13 | 0                      | 1                   | 0                   |
| ## 14 | 4                      | 0                   | 4                   |
| ## 15 | 0                      | 0                   | 6                   |
| ## 16 | 1                      | 0                   | 1                   |
| ## 17 | 0                      | 1                   | 0                   |
| ## 18 | 4                      | 0                   | 0                   |
| ## 19 | 1                      | 0                   | 4                   |
| ## 20 | 2                      | 0                   | 6                   |
| ## 21 | 2                      | 1                   | 0                   |
| ## 22 | 1                      | 1                   | 0                   |
| ## 23 | 1                      | 0                   | 1                   |
| ## 24 | 2                      | 0                   | 1                   |
| ## 25 | 1                      | 1                   | 3                   |
| ## 26 | 0                      | 0                   | 1                   |
| ## 27 | 1                      | 2                   | 0                   |
| ## 28 | 1                      | 0                   | 2                   |
| ## 29 | 1                      | 0                   | 0                   |
| ## 30 | 0                      | 1                   | 0                   |
| ## 31 | 4                      | 0                   | 1                   |
| ## 32 | 0                      | 1                   | 0                   |
| ## 33 | 0                      | 0                   | 0                   |
| ## 34 | 0                      | 7                   | 8                   |
| ## 35 | 1                      | 0                   | 3                   |
| ## 36 | 0                      | 1                   | 5                   |
| ## 37 | 1                      | 1                   | 1                   |
| ## 38 | 1                      | 0                   | 2                   |
| ## 39 | 0                      | 0                   | 2                   |
| ## 40 | 1                      | 1                   | 4                   |
| ## 41 | 0                      | 1                   | 1                   |
| ## 42 | 1                      | 1                   | 1                   |
| ## 43 | 0                      | 0                   | 0                   |
| ## 44 | 2                      | 1                   | 1                   |
| ## 45 | 3                      | 0                   | 0                   |
| ## 46 | 2                      | 0                   | 2                   |
| ## 47 | 0                      | 0                   | 1                   |
| ## 48 | 2                      | 0                   | 2                   |
| ## 49 | 2                      | 0                   | 0                   |
| ## 50 | 0                      | 0                   | 1                   |
| ##    | Casearia.commersoniana | Casearia.guianensis | Casearia.sylvestris |
| ## 1  | 0                      | 0                   | 2                   |
| ## 2  | 0                      | 0                   | 1                   |
| ## 3  | 1                      | 0                   | 0                   |
| ## 4  | 0                      | 0                   | 0                   |
| ## 5  | 1                      | 0                   | 0                   |
| ## 6  | 0                      | 0                   | 3                   |
| ## 7  | 0                      | 0                   | 1                   |
| ## 8  | 0                      | 0                   | 0                   |
| ## 9  | 1                      | 0                   | 1                   |
| ## 10 | 0                      | 0                   | 1                   |
| ## 11 | 0                      | 0                   | 0                   |
| ## 12 | 0                      | 0                   | 1                   |
| ## 13 | 0                      | 0                   | 1                   |
| ## 14 | 0                      | 0                   | 0                   |
| ## 15 | 0                      | 0                   | 0                   |

|       |                        |                           |                   |
|-------|------------------------|---------------------------|-------------------|
| ## 16 | 0                      | 0                         | 2                 |
| ## 17 | 0                      | 1                         | 0                 |
| ## 18 | 0                      | 0                         | 1                 |
| ## 19 | 0                      | 0                         | 1                 |
| ## 20 | 0                      | 0                         | 1                 |
| ## 21 | 0                      | 0                         | 0                 |
| ## 22 | 0                      | 0                         | 2                 |
| ## 23 | 0                      | 0                         | 1                 |
| ## 24 | 0                      | 0                         | 2                 |
| ## 25 | 0                      | 0                         | 1                 |
| ## 26 | 0                      | 0                         | 1                 |
| ## 27 | 0                      | 0                         | 1                 |
| ## 28 | 0                      | 0                         | 0                 |
| ## 29 | 0                      | 0                         | 0                 |
| ## 30 | 0                      | 0                         | 5                 |
| ## 31 | 0                      | 0                         | 0                 |
| ## 32 | 0                      | 0                         | 4                 |
| ## 33 | 0                      | 0                         | 0                 |
| ## 34 | 0                      | 0                         | 1                 |
| ## 35 | 0                      | 0                         | 3                 |
| ## 36 | 0                      | 0                         | 2                 |
| ## 37 | 0                      | 0                         | 1                 |
| ## 38 | 0                      | 0                         | 0                 |
| ## 39 | 0                      | 0                         | 3                 |
| ## 40 | 0                      | 0                         | 2                 |
| ## 41 | 0                      | 0                         | 2                 |
| ## 42 | 0                      | 0                         | 2                 |
| ## 43 | 0                      | 0                         | 0                 |
| ## 44 | 0                      | 0                         | 1                 |
| ## 45 | 0                      | 0                         | 0                 |
| ## 46 | 0                      | 1                         | 3                 |
| ## 47 | 0                      | 0                         | 0                 |
| ## 48 | 0                      | 0                         | 0                 |
| ## 49 | 0                      | 0                         | 1                 |
| ## 50 | 0                      | 0                         | 0                 |
| ##    | Cassipourea.guianensis | Cavanillesia.platanifolia | Cecropia.insignis |
| ## 1  | 2                      | 0                         | 12                |
| ## 2  | 0                      | 0                         | 5                 |
| ## 3  | 1                      | 0                         | 7                 |
| ## 4  | 1                      | 0                         | 17                |
| ## 5  | 3                      | 0                         | 21                |
| ## 6  | 4                      | 0                         | 4                 |
| ## 7  | 4                      | 0                         | 0                 |
| ## 8  | 0                      | 0                         | 7                 |
| ## 9  | 2                      | 0                         | 2                 |
| ## 10 | 1                      | 0                         | 16                |
| ## 11 | 0                      | 0                         | 3                 |
| ## 12 | 2                      | 0                         | 2                 |
| ## 13 | 9                      | 0                         | 1                 |
| ## 14 | 3                      | 0                         | 11                |
| ## 15 | 0                      | 0                         | 24                |
| ## 16 | 1                      | 0                         | 2                 |
| ## 17 | 0                      | 0                         | 3                 |
| ## 18 | 6                      | 0                         | 0                 |

|       |                      |                 |                 |                 |
|-------|----------------------|-----------------|-----------------|-----------------|
| ## 19 | 2                    | 0               | 8               |                 |
| ## 20 | 3                    | 0               | 11              |                 |
| ## 21 | 1                    | 0               | 2               |                 |
| ## 22 | 2                    | 0               | 1               |                 |
| ## 23 | 6                    | 0               | 2               |                 |
| ## 24 | 1                    | 0               | 3               |                 |
| ## 25 | 2                    | 1               | 10              |                 |
| ## 26 | 2                    | 3               | 1               |                 |
| ## 27 | 0                    | 1               | 3               |                 |
| ## 28 | 3                    | 1               | 3               |                 |
| ## 29 | 3                    | 0               | 5               |                 |
| ## 30 | 3                    | 1               | 14              |                 |
| ## 31 | 0                    | 1               | 3               |                 |
| ## 32 | 1                    | 1               | 4               |                 |
| ## 33 | 0                    | 1               | 6               |                 |
| ## 34 | 1                    | 1               | 2               |                 |
| ## 35 | 0                    | 1               | 2               |                 |
| ## 36 | 0                    | 0               | 6               |                 |
| ## 37 | 2                    | 0               | 10              |                 |
| ## 38 | 2                    | 1               | 6               |                 |
| ## 39 | 0                    | 1               | 4               |                 |
| ## 40 | 0                    | 1               | 2               |                 |
| ## 41 | 2                    | 0               | 7               |                 |
| ## 42 | 2                    | 0               | 2               |                 |
| ## 43 | 2                    | 1               | 2               |                 |
| ## 44 | 0                    | 0               | 0               |                 |
| ## 45 | 3                    | 0               | 5               |                 |
| ## 46 | 1                    | 0               | 1               |                 |
| ## 47 | 2                    | 2               | 2               |                 |
| ## 48 | 0                    | 1               | 0               |                 |
| ## 49 | 0                    | 0               | 0               |                 |
| ## 50 | 2                    | 0               | 0               |                 |
| ##    | Cecropia.obtusifolia | Cedrela.odorata | Ceiba.pentandra | Celtis.schippii |
| ## 1  | 0                    | 0               | 0               | 0               |
| ## 2  | 0                    | 0               | 1               | 0               |
| ## 3  | 0                    | 0               | 1               | 0               |
| ## 4  | 0                    | 0               | 0               | 2               |
| ## 5  | 1                    | 0               | 1               | 2               |
| ## 6  | 0                    | 0               | 0               | 0               |
| ## 7  | 0                    | 0               | 0               | 1               |
| ## 8  | 2                    | 0               | 1               | 0               |
| ## 9  | 0                    | 0               | 0               | 0               |
| ## 10 | 2                    | 0               | 1               | 0               |
| ## 11 | 0                    | 0               | 2               | 0               |
| ## 12 | 1                    | 0               | 0               | 1               |
| ## 13 | 1                    | 0               | 2               | 0               |
| ## 14 | 1                    | 0               | 0               | 0               |
| ## 15 | 0                    | 1               | 2               | 1               |
| ## 16 | 0                    | 0               | 1               | 2               |
| ## 17 | 0                    | 0               | 2               | 1               |
| ## 18 | 0                    | 0               | 0               | 0               |
| ## 19 | 3                    | 0               | 0               | 1               |
| ## 20 | 0                    | 0               | 1               | 3               |
| ## 21 | 4                    | 0               | 2               | 2               |

|       |                       |                    |                       |   |
|-------|-----------------------|--------------------|-----------------------|---|
| ## 22 | 0                     | 0                  | 2                     | 1 |
| ## 23 | 3                     | 0                  | 2                     | 1 |
| ## 24 | 0                     | 0                  | 1                     | 4 |
| ## 25 | 1                     | 0                  | 1                     | 0 |
| ## 26 | 0                     | 0                  | 1                     | 0 |
| ## 27 | 0                     | 0                  | 2                     | 0 |
| ## 28 | 0                     | 0                  | 0                     | 0 |
| ## 29 | 1                     | 0                  | 3                     | 0 |
| ## 30 | 1                     | 0                  | 1                     | 1 |
| ## 31 | 0                     | 1                  | 0                     | 0 |
| ## 32 | 0                     | 0                  | 1                     | 1 |
| ## 33 | 1                     | 0                  | 1                     | 1 |
| ## 34 | 1                     | 0                  | 0                     | 1 |
| ## 35 | 0                     | 0                  | 1                     | 0 |
| ## 36 | 0                     | 0                  | 1                     | 0 |
| ## 37 | 0                     | 0                  | 1                     | 0 |
| ## 38 | 0                     | 0                  | 1                     | 1 |
| ## 39 | 0                     | 0                  | 0                     | 1 |
| ## 40 | 0                     | 0                  | 0                     | 0 |
| ## 41 | 0                     | 0                  | 1                     | 1 |
| ## 42 | 0                     | 0                  | 0                     | 0 |
| ## 43 | 0                     | 0                  | 0                     | 1 |
| ## 44 | 1                     | 0                  | 0                     | 1 |
| ## 45 | 0                     | 0                  | 0                     | 3 |
| ## 46 | 0                     | 0                  | 2                     | 0 |
| ## 47 | 0                     | 0                  | 0                     | 2 |
| ## 48 | 0                     | 0                  | 0                     | 1 |
| ## 49 | 1                     | 0                  | 0                     | 1 |
| ## 50 | 0                     | 0                  | 0                     | 0 |
| ##    | Cespedesia.spathulata | Chamguava.schippii | Chimarrhis.parviflora |   |
| ## 1  | 0                     | 0                  | 0                     |   |
| ## 2  | 0                     | 0                  | 0                     |   |
| ## 3  | 0                     | 0                  | 0                     |   |
| ## 4  | 0                     | 0                  | 0                     |   |
| ## 5  | 0                     | 0                  | 0                     |   |
| ## 6  | 0                     | 0                  | 0                     |   |
| ## 7  | 0                     | 0                  | 0                     |   |
| ## 8  | 0                     | 0                  | 0                     |   |
| ## 9  | 0                     | 0                  | 0                     |   |
| ## 10 | 0                     | 0                  | 0                     |   |
| ## 11 | 0                     | 0                  | 0                     |   |
| ## 12 | 0                     | 0                  | 0                     |   |
| ## 13 | 0                     | 0                  | 1                     |   |
| ## 14 | 0                     | 0                  | 0                     |   |
| ## 15 | 0                     | 0                  | 0                     |   |
| ## 16 | 1                     | 0                  | 0                     |   |
| ## 17 | 0                     | 0                  | 0                     |   |
| ## 18 | 0                     | 2                  | 0                     |   |
| ## 19 | 0                     | 0                  | 0                     |   |
| ## 20 | 0                     | 0                  | 0                     |   |
| ## 21 | 0                     | 0                  | 0                     |   |
| ## 22 | 0                     | 0                  | 0                     |   |
| ## 23 | 0                     | 0                  | 0                     |   |
| ## 24 | 0                     | 1                  | 0                     |   |

|       |                   |                        |                         |
|-------|-------------------|------------------------|-------------------------|
| ## 25 | 0                 | 0                      | 0                       |
| ## 26 | 0                 | 0                      | 0                       |
| ## 27 | 0                 | 0                      | 0                       |
| ## 28 | 0                 | 0                      | 0                       |
| ## 29 | 0                 | 0                      | 0                       |
| ## 30 | 0                 | 0                      | 0                       |
| ## 31 | 0                 | 0                      | 0                       |
| ## 32 | 0                 | 0                      | 0                       |
| ## 33 | 0                 | 0                      | 0                       |
| ## 34 | 0                 | 0                      | 0                       |
| ## 35 | 0                 | 0                      | 0                       |
| ## 36 | 0                 | 0                      | 0                       |
| ## 37 | 0                 | 0                      | 0                       |
| ## 38 | 0                 | 0                      | 0                       |
| ## 39 | 0                 | 0                      | 0                       |
| ## 40 | 0                 | 0                      | 0                       |
| ## 41 | 0                 | 0                      | 0                       |
| ## 42 | 0                 | 0                      | 0                       |
| ## 43 | 0                 | 0                      | 0                       |
| ## 44 | 0                 | 0                      | 0                       |
| ## 45 | 0                 | 0                      | 0                       |
| ## 46 | 0                 | 0                      | 0                       |
| ## 47 | 0                 | 0                      | 0                       |
| ## 48 | 0                 | 0                      | 0                       |
| ## 49 | 1                 | 0                      | 0                       |
| ## 50 | 0                 | 0                      | 0                       |
| ##    | Maclura.tinctoria | Chrysochlamys.eclipses | Chrysophyllum.argenteum |
| ## 1  | 0                 | 0                      | 4                       |
| ## 2  | 0                 | 0                      | 1                       |
| ## 3  | 0                 | 0                      | 2                       |
| ## 4  | 0                 | 0                      | 2                       |
| ## 5  | 0                 | 0                      | 6                       |
| ## 6  | 0                 | 0                      | 2                       |
| ## 7  | 0                 | 0                      | 3                       |
| ## 8  | 0                 | 0                      | 2                       |
| ## 9  | 0                 | 0                      | 4                       |
| ## 10 | 0                 | 0                      | 2                       |
| ## 11 | 0                 | 0                      | 2                       |
| ## 12 | 0                 | 0                      | 1                       |
| ## 13 | 0                 | 0                      | 4                       |
| ## 14 | 0                 | 0                      | 2                       |
| ## 15 | 0                 | 0                      | 1                       |
| ## 16 | 0                 | 1                      | 2                       |
| ## 17 | 0                 | 0                      | 1                       |
| ## 18 | 1                 | 0                      | 0                       |
| ## 19 | 0                 | 0                      | 0                       |
| ## 20 | 0                 | 0                      | 2                       |
| ## 21 | 0                 | 0                      | 2                       |
| ## 22 | 0                 | 0                      | 0                       |
| ## 23 | 0                 | 0                      | 1                       |
| ## 24 | 0                 | 0                      | 2                       |
| ## 25 | 0                 | 0                      | 1                       |
| ## 26 | 0                 | 0                      | 0                       |
| ## 27 | 0                 | 0                      | 1                       |

|       |                       |                    |                          |
|-------|-----------------------|--------------------|--------------------------|
| ## 28 | 0                     | 0                  | 0                        |
| ## 29 | 0                     | 0                  | 3                        |
| ## 30 | 0                     | 0                  | 1                        |
| ## 31 | 0                     | 0                  | 0                        |
| ## 32 | 0                     | 0                  | 1                        |
| ## 33 | 0                     | 0                  | 2                        |
| ## 34 | 0                     | 0                  | 1                        |
| ## 35 | 0                     | 0                  | 1                        |
| ## 36 | 0                     | 0                  | 3                        |
| ## 37 | 0                     | 0                  | 2                        |
| ## 38 | 0                     | 0                  | 0                        |
| ## 39 | 0                     | 0                  | 2                        |
| ## 40 | 0                     | 0                  | 0                        |
| ## 41 | 0                     | 1                  | 3                        |
| ## 42 | 0                     | 0                  | 2                        |
| ## 43 | 0                     | 0                  | 0                        |
| ## 44 | 0                     | 0                  | 1                        |
| ## 45 | 0                     | 0                  | 2                        |
| ## 46 | 0                     | 0                  | 1                        |
| ## 47 | 0                     | 0                  | 5                        |
| ## 48 | 0                     | 0                  | 1                        |
| ## 49 | 0                     | 0                  | 2                        |
| ## 50 | 0                     | 0                  | 2                        |
| ##    | Chrysophyllum.cainito | Coccoloba.coronata | Coccoloba.manzinellensis |
| ## 1  | 0                     | 0                  | 0                        |
| ## 2  | 0                     | 0                  | 0                        |
| ## 3  | 0                     | 0                  | 0                        |
| ## 4  | 0                     | 1                  | 0                        |
| ## 5  | 0                     | 2                  | 0                        |
| ## 6  | 0                     | 0                  | 0                        |
| ## 7  | 1                     | 0                  | 0                        |
| ## 8  | 0                     | 1                  | 2                        |
| ## 9  | 0                     | 2                  | 0                        |
| ## 10 | 0                     | 1                  | 0                        |
| ## 11 | 0                     | 0                  | 0                        |
| ## 12 | 0                     | 0                  | 0                        |
| ## 13 | 0                     | 1                  | 1                        |
| ## 14 | 2                     | 0                  | 0                        |
| ## 15 | 1                     | 1                  | 0                        |
| ## 16 | 0                     | 1                  | 0                        |
| ## 17 | 0                     | 0                  | 0                        |
| ## 18 | 2                     | 0                  | 2                        |
| ## 19 | 1                     | 0                  | 0                        |
| ## 20 | 0                     | 2                  | 0                        |
| ## 21 | 0                     | 1                  | 0                        |
| ## 22 | 1                     | 1                  | 1                        |
| ## 23 | 2                     | 1                  | 0                        |
| ## 24 | 1                     | 0                  | 0                        |
| ## 25 | 2                     | 1                  | 0                        |
| ## 26 | 0                     | 0                  | 0                        |
| ## 27 | 1                     | 0                  | 0                        |
| ## 28 | 0                     | 1                  | 0                        |
| ## 29 | 1                     | 0                  | 0                        |
| ## 30 | 0                     | 0                  | 2                        |

|       |                      |                  |                |                   |
|-------|----------------------|------------------|----------------|-------------------|
| ## 31 | 0                    | 1                | 0              |                   |
| ## 32 | 0                    | 0                | 0              |                   |
| ## 33 | 1                    | 2                | 0              |                   |
| ## 34 | 2                    | 0                | 1              |                   |
| ## 35 | 0                    | 0                | 1              |                   |
| ## 36 | 0                    | 1                | 1              |                   |
| ## 37 | 0                    | 0                | 0              |                   |
| ## 38 | 0                    | 0                | 0              |                   |
| ## 39 | 0                    | 0                | 0              |                   |
| ## 40 | 1                    | 0                | 0              |                   |
| ## 41 | 0                    | 0                | 1              |                   |
| ## 42 | 0                    | 0                | 0              |                   |
| ## 43 | 2                    | 0                | 0              |                   |
| ## 44 | 0                    | 0                | 0              |                   |
| ## 45 | 1                    | 0                | 0              |                   |
| ## 46 | 1                    | 0                | 0              |                   |
| ## 47 | 1                    | 0                | 1              |                   |
| ## 48 | 0                    | 0                | 0              |                   |
| ## 49 | 0                    | 1                | 0              |                   |
| ## 50 | 1                    | 0                | 0              |                   |
| ##    | Colubrina.glandulosa | Cordia.alliodora | Cordia.bicolor | Cordia.lasiocalyx |
| ## 1  | 0                    | 2                | 12             | 8                 |
| ## 2  | 0                    | 3                | 14             | 6                 |
| ## 3  | 0                    | 3                | 35             | 6                 |
| ## 4  | 0                    | 7                | 23             | 11                |
| ## 5  | 0                    | 1                | 13             | 7                 |
| ## 6  | 0                    | 1                | 7              | 6                 |
| ## 7  | 0                    | 2                | 5              | 6                 |
| ## 8  | 0                    | 0                | 10             | 3                 |
| ## 9  | 0                    | 0                | 7              | 0                 |
| ## 10 | 0                    | 2                | 13             | 4                 |
| ## 11 | 0                    | 3                | 10             | 5                 |
| ## 12 | 0                    | 0                | 2              | 3                 |
| ## 13 | 0                    | 2                | 0              | 4                 |
| ## 14 | 0                    | 1                | 11             | 7                 |
| ## 15 | 0                    | 1                | 21             | 3                 |
| ## 16 | 0                    | 1                | 11             | 10                |
| ## 17 | 0                    | 0                | 7              | 3                 |
| ## 18 | 0                    | 2                | 2              | 3                 |
| ## 19 | 0                    | 5                | 8              | 4                 |
| ## 20 | 0                    | 0                | 17             | 4                 |
| ## 21 | 0                    | 0                | 5              | 11                |
| ## 22 | 1                    | 0                | 4              | 5                 |
| ## 23 | 0                    | 0                | 2              | 10                |
| ## 24 | 0                    | 0                | 3              | 4                 |
| ## 25 | 0                    | 0                | 3              | 4                 |
| ## 26 | 0                    | 1                | 1              | 8                 |
| ## 27 | 0                    | 0                | 3              | 9                 |
| ## 28 | 0                    | 0                | 4              | 4                 |
| ## 29 | 0                    | 2                | 3              | 5                 |
| ## 30 | 0                    | 2                | 5              | 0                 |
| ## 31 | 0                    | 2                | 0              | 6                 |
| ## 32 | 0                    | 0                | 3              | 7                 |
| ## 33 | 0                    | 0                | 3              | 11                |



|       |                      |                      |                 |                   |
|-------|----------------------|----------------------|-----------------|-------------------|
| ## 34 | 0                    | 2                    | 0               | 5                 |
| ## 35 | 0                    | 0                    | 3               | 4                 |
| ## 36 | 0                    | 0                    | 9               | 10                |
| ## 37 | 0                    | 6                    | 2               | 13                |
| ## 38 | 0                    | 2                    | 3               | 8                 |
| ## 39 | 0                    | 0                    | 1               | 8                 |
| ## 40 | 0                    | 0                    | 2               | 3                 |
| ## 41 | 0                    | 1                    | 6               | 12                |
| ## 42 | 0                    | 0                    | 9               | 12                |
| ## 43 | 0                    | 1                    | 2               | 12                |
| ## 44 | 0                    | 0                    | 3               | 20                |
| ## 45 | 0                    | 0                    | 1               | 8                 |
| ## 46 | 0                    | 6                    | 7               | 17                |
| ## 47 | 0                    | 1                    | 3               | 13                |
| ## 48 | 0                    | 0                    | 3               | 14                |
| ## 49 | 0                    | 0                    | 2               | 7                 |
| ## 50 | 0                    | 1                    | 2               | 11                |
| ##    | Coussarea.curvigemma | Croton.billbergianus | Cupania.cinerea | Cupania.latifolia |
| ## 1  | 0                    | 2                    | 0               | 0                 |
| ## 2  | 0                    | 2                    | 0               | 0                 |
| ## 3  | 0                    | 0                    | 0               | 0                 |
| ## 4  | 1                    | 11                   | 0               | 1                 |
| ## 5  | 0                    | 6                    | 0               | 0                 |
| ## 6  | 2                    | 0                    | 0               | 0                 |
| ## 7  | 1                    | 0                    | 0               | 0                 |
| ## 8  | 0                    | 4                    | 0               | 0                 |
| ## 9  | 1                    | 2                    | 0               | 0                 |
| ## 10 | 1                    | 0                    | 0               | 0                 |
| ## 11 | 0                    | 1                    | 0               | 0                 |
| ## 12 | 3                    | 2                    | 0               | 0                 |
| ## 13 | 4                    | 12                   | 0               | 0                 |
| ## 14 | 0                    | 11                   | 0               | 0                 |
| ## 15 | 0                    | 1                    | 0               | 0                 |
| ## 16 | 1                    | 3                    | 0               | 2                 |
| ## 17 | 4                    | 0                    | 0               | 0                 |
| ## 18 | 6                    | 4                    | 0               | 0                 |
| ## 19 | 3                    | 1                    | 1               | 0                 |
| ## 20 | 0                    | 0                    | 0               | 1                 |
| ## 21 | 0                    | 1                    | 0               | 0                 |
| ## 22 | 11                   | 0                    | 0               | 0                 |
| ## 23 | 2                    | 2                    | 0               | 0                 |
| ## 24 | 1                    | 0                    | 0               | 0                 |
| ## 25 | 0                    | 1                    | 0               | 0                 |
| ## 26 | 0                    | 1                    | 0               | 0                 |
| ## 27 | 2                    | 0                    | 0               | 1                 |
| ## 28 | 2                    | 0                    | 0               | 0                 |
| ## 29 | 0                    | 1                    | 0               | 0                 |
| ## 30 | 2                    | 2                    | 0               | 0                 |
| ## 31 | 0                    | 0                    | 0               | 0                 |
| ## 32 | 0                    | 0                    | 0               | 0                 |
| ## 33 | 0                    | 0                    | 0               | 0                 |
| ## 34 | 0                    | 0                    | 0               | 1                 |
| ## 35 | 1                    | 1                    | 0               | 0                 |
| ## 36 | 0                    | 0                    | 0               | 1                 |

|       |                   |                   |                      |   |
|-------|-------------------|-------------------|----------------------|---|
| ## 37 | 0                 | 2                 | 0                    | 1 |
| ## 38 | 0                 | 2                 | 0                    | 0 |
| ## 39 | 0                 | 0                 | 0                    | 0 |
| ## 40 | 0                 | 1                 | 0                    | 0 |
| ## 41 | 0                 | 6                 | 0                    | 3 |
| ## 42 | 0                 | 3                 | 0                    | 0 |
| ## 43 | 0                 | 0                 | 0                    | 0 |
| ## 44 | 0                 | 0                 | 0                    | 0 |
| ## 45 | 0                 | 1                 | 0                    | 0 |
| ## 46 | 5                 | 0                 | 0                    | 1 |
| ## 47 | 1                 | 3                 | 0                    | 0 |
| ## 48 | 1                 | 6                 | 0                    | 0 |
| ## 49 | 0                 | 2                 | 0                    | 0 |
| ## 50 | 0                 | 1                 | 0                    | 0 |
| ##    | Cupania.rufescens | Cupania.seemannii | Dendropanax.arboreus |   |
| ## 1  | 0                 | 2                 | 0                    |   |
| ## 2  | 0                 | 2                 | 3                    |   |
| ## 3  | 0                 | 1                 | 6                    |   |
| ## 4  | 0                 | 0                 | 0                    |   |
| ## 5  | 0                 | 3                 | 5                    |   |
| ## 6  | 0                 | 0                 | 2                    |   |
| ## 7  | 0                 | 1                 | 1                    |   |
| ## 8  | 0                 | 2                 | 6                    |   |
| ## 9  | 0                 | 2                 | 1                    |   |
| ## 10 | 0                 | 0                 | 3                    |   |
| ## 11 | 0                 | 2                 | 2                    |   |
| ## 12 | 0                 | 1                 | 2                    |   |
| ## 13 | 1                 | 2                 | 5                    |   |
| ## 14 | 0                 | 0                 | 2                    |   |
| ## 15 | 0                 | 4                 | 5                    |   |
| ## 16 | 0                 | 0                 | 3                    |   |
| ## 17 | 2                 | 3                 | 2                    |   |
| ## 18 | 1                 | 0                 | 2                    |   |
| ## 19 | 0                 | 1                 | 3                    |   |
| ## 20 | 0                 | 2                 | 1                    |   |
| ## 21 | 0                 | 2                 | 3                    |   |
| ## 22 | 0                 | 0                 | 0                    |   |
| ## 23 | 0                 | 1                 | 1                    |   |
| ## 24 | 0                 | 1                 | 3                    |   |
| ## 25 | 0                 | 1                 | 10                   |   |
| ## 26 | 0                 | 0                 | 0                    |   |
| ## 27 | 0                 | 2                 | 0                    |   |
| ## 28 | 0                 | 0                 | 0                    |   |
| ## 29 | 0                 | 2                 | 2                    |   |
| ## 30 | 0                 | 1                 | 3                    |   |
| ## 31 | 0                 | 0                 | 0                    |   |
| ## 32 | 0                 | 1                 | 0                    |   |
| ## 33 | 0                 | 0                 | 1                    |   |
| ## 34 | 0                 | 0                 | 2                    |   |
| ## 35 | 0                 | 1                 | 0                    |   |
| ## 36 | 0                 | 1                 | 0                    |   |
| ## 37 | 0                 | 0                 | 1                    |   |
| ## 38 | 0                 | 0                 | 1                    |   |
| ## 39 | 0                 | 1                 | 0                    |   |

|       |                      |                         |                   |
|-------|----------------------|-------------------------|-------------------|
| ## 40 | 0                    | 0                       | 1                 |
| ## 41 | 0                    | 1                       | 1                 |
| ## 42 | 0                    | 1                       | 0                 |
| ## 43 | 0                    | 0                       | 1                 |
| ## 44 | 0                    | 0                       | 0                 |
| ## 45 | 0                    | 0                       | 2                 |
| ## 46 | 0                    | 1                       | 0                 |
| ## 47 | 0                    | 1                       | 0                 |
| ## 48 | 0                    | 0                       | 0                 |
| ## 49 | 0                    | 0                       | 1                 |
| ## 50 | 0                    | 1                       | 1                 |
| ##    | Desmopsis.panamensis | Diospyros.artanthifolia | Dipteryx.oleifera |
| ## 1  | 0                    | 1                       | 1                 |
| ## 2  | 0                    | 1                       | 1                 |
| ## 3  | 4                    | 1                       | 3                 |
| ## 4  | 0                    | 1                       | 0                 |
| ## 5  | 0                    | 0                       | 0                 |
| ## 6  | 0                    | 0                       | 0                 |
| ## 7  | 0                    | 0                       | 0                 |
| ## 8  | 0                    | 0                       | 2                 |
| ## 9  | 0                    | 0                       | 1                 |
| ## 10 | 1                    | 1                       | 2                 |
| ## 11 | 0                    | 1                       | 0                 |
| ## 12 | 0                    | 0                       | 0                 |
| ## 13 | 0                    | 0                       | 0                 |
| ## 14 | 0                    | 0                       | 1                 |
| ## 15 | 0                    | 0                       | 1                 |
| ## 16 | 0                    | 0                       | 0                 |
| ## 17 | 0                    | 1                       | 0                 |
| ## 18 | 0                    | 0                       | 0                 |
| ## 19 | 1                    | 0                       | 1                 |
| ## 20 | 0                    | 0                       | 2                 |
| ## 21 | 0                    | 0                       | 0                 |
| ## 22 | 0                    | 2                       | 0                 |
| ## 23 | 1                    | 0                       | 0                 |
| ## 24 | 0                    | 0                       | 0                 |
| ## 25 | 0                    | 0                       | 0                 |
| ## 26 | 0                    | 0                       | 1                 |
| ## 27 | 0                    | 0                       | 1                 |
| ## 28 | 0                    | 0                       | 3                 |
| ## 29 | 0                    | 0                       | 1                 |
| ## 30 | 0                    | 0                       | 2                 |
| ## 31 | 0                    | 1                       | 0                 |
| ## 32 | 0                    | 0                       | 1                 |
| ## 33 | 1                    | 0                       | 1                 |
| ## 34 | 1                    | 0                       | 0                 |
| ## 35 | 0                    | 0                       | 0                 |
| ## 36 | 1                    | 0                       | 1                 |
| ## 37 | 1                    | 0                       | 0                 |
| ## 38 | 0                    | 1                       | 0                 |
| ## 39 | 1                    | 0                       | 0                 |
| ## 40 | 0                    | 0                       | 0                 |
| ## 41 | 0                    | 0                       | 0                 |
| ## 42 | 0                    | 0                       | 0                 |

|       |                    |                 |                           |
|-------|--------------------|-----------------|---------------------------|
| ## 43 | 0                  | 0               | 2                         |
| ## 44 | 1                  | 0               | 1                         |
| ## 45 | 0                  | 0               | 2                         |
| ## 46 | 0                  | 3               | 1                         |
| ## 47 | 0                  | 2               | 0                         |
| ## 48 | 0                  | 0               | 0                         |
| ## 49 | 0                  | 0               | 0                         |
| ## 50 | 0                  | 0               | 1                         |
| ##    | Drypetes.standleyi | Elaeis.oleifera | Enterolobium.schomburgkii |
| ## 1  | 2                  | 0               | 0                         |
| ## 2  | 1                  | 0               | 0                         |
| ## 3  | 2                  | 0               | 0                         |
| ## 4  | 0                  | 0               | 0                         |
| ## 5  | 0                  | 0               | 0                         |
| ## 6  | 0                  | 0               | 0                         |
| ## 7  | 0                  | 0               | 0                         |
| ## 8  | 0                  | 0               | 0                         |
| ## 9  | 0                  | 0               | 0                         |
| ## 10 | 0                  | 0               | 0                         |
| ## 11 | 3                  | 0               | 0                         |
| ## 12 | 2                  | 0               | 0                         |
| ## 13 | 0                  | 6               | 0                         |
| ## 14 | 0                  | 0               | 0                         |
| ## 15 | 0                  | 0               | 0                         |
| ## 16 | 2                  | 0               | 0                         |
| ## 17 | 3                  | 0               | 0                         |
| ## 18 | 1                  | 9               | 0                         |
| ## 19 | 1                  | 1               | 1                         |
| ## 20 | 0                  | 0               | 0                         |
| ## 21 | 7                  | 0               | 0                         |
| ## 22 | 4                  | 0               | 0                         |
| ## 23 | 0                  | 5               | 0                         |
| ## 24 | 0                  | 0               | 0                         |
| ## 25 | 2                  | 0               | 0                         |
| ## 26 | 8                  | 0               | 0                         |
| ## 27 | 7                  | 0               | 0                         |
| ## 28 | 2                  | 0               | 0                         |
| ## 29 | 4                  | 0               | 0                         |
| ## 30 | 3                  | 0               | 1                         |
| ## 31 | 15                 | 0               | 0                         |
| ## 32 | 6                  | 0               | 0                         |
| ## 33 | 2                  | 0               | 0                         |
| ## 34 | 1                  | 0               | 0                         |
| ## 35 | 1                  | 0               | 0                         |
| ## 36 | 39                 | 0               | 0                         |
| ## 37 | 13                 | 0               | 0                         |
| ## 38 | 12                 | 0               | 0                         |
| ## 39 | 2                  | 0               | 0                         |
| ## 40 | 0                  | 0               | 0                         |
| ## 41 | 21                 | 0               | 0                         |
| ## 42 | 14                 | 0               | 0                         |
| ## 43 | 17                 | 0               | 0                         |
| ## 44 | 8                  | 0               | 0                         |
| ## 45 | 7                  | 0               | 0                         |

|       |                         |                           |                 |
|-------|-------------------------|---------------------------|-----------------|
| ## 46 | 33                      | 0                         | 0               |
| ## 47 | 12                      | 0                         | 0               |
| ## 48 | 11                      | 0                         | 0               |
| ## 49 | 5                       | 0                         | 0               |
| ## 50 | 12                      | 0                         | 0               |
| ##    | Erythrina.costaricensis | Erythroxylum.macrophyllum | Eugenia.florida |
| ## 1  | 0                       | 0                         | 0               |
| ## 2  | 0                       | 1                         | 1               |
| ## 3  | 0                       | 0                         | 0               |
| ## 4  | 0                       | 0                         | 7               |
| ## 5  | 0                       | 0                         | 2               |
| ## 6  | 3                       | 0                         | 0               |
| ## 7  | 0                       | 0                         | 0               |
| ## 8  | 0                       | 1                         | 1               |
| ## 9  | 1                       | 1                         | 1               |
| ## 10 | 0                       | 1                         | 3               |
| ## 11 | 1                       | 0                         | 1               |
| ## 12 | 0                       | 1                         | 1               |
| ## 13 | 0                       | 0                         | 2               |
| ## 14 | 1                       | 0                         | 1               |
| ## 15 | 1                       | 1                         | 0               |
| ## 16 | 1                       | 0                         | 0               |
| ## 17 | 0                       | 0                         | 2               |
| ## 18 | 0                       | 0                         | 2               |
| ## 19 | 0                       | 0                         | 2               |
| ## 20 | 1                       | 1                         | 1               |
| ## 21 | 0                       | 0                         | 1               |
| ## 22 | 0                       | 2                         | 1               |
| ## 23 | 1                       | 1                         | 2               |
| ## 24 | 3                       | 0                         | 1               |
| ## 25 | 0                       | 1                         | 2               |
| ## 26 | 1                       | 0                         | 1               |
| ## 27 | 0                       | 1                         | 1               |
| ## 28 | 0                       | 0                         | 0               |
| ## 29 | 0                       | 0                         | 5               |
| ## 30 | 0                       | 1                         | 3               |
| ## 31 | 0                       | 0                         | 0               |
| ## 32 | 0                       | 0                         | 1               |
| ## 33 | 0                       | 0                         | 1               |
| ## 34 | 0                       | 0                         | 4               |
| ## 35 | 0                       | 1                         | 1               |
| ## 36 | 1                       | 0                         | 2               |
| ## 37 | 1                       | 1                         | 2               |
| ## 38 | 0                       | 0                         | 3               |
| ## 39 | 0                       | 0                         | 4               |
| ## 40 | 0                       | 0                         | 1               |
| ## 41 | 0                       | 0                         | 1               |
| ## 42 | 1                       | 0                         | 2               |
| ## 43 | 2                       | 0                         | 3               |
| ## 44 | 4                       | 0                         | 2               |
| ## 45 | 1                       | 0                         | 1               |
| ## 46 | 0                       | 0                         | 4               |
| ## 47 | 0                       | 0                         | 4               |
| ## 48 | 0                       | 1                         | 1               |

|       |                      |                   |                     |                |
|-------|----------------------|-------------------|---------------------|----------------|
| ## 49 | 2                    | 1                 | 0                   |                |
| ## 50 | 0                    | 1                 | 0                   |                |
| ##    | Eugenia.galalonensis | Eugenia.nesiotica | Eugenia.oerstediana |                |
| ## 1  | 0                    | 0                 | 3                   |                |
| ## 2  | 0                    | 0                 | 2                   |                |
| ## 3  | 0                    | 1                 | 5                   |                |
| ## 4  | 0                    | 0                 | 1                   |                |
| ## 5  | 0                    | 0                 | 5                   |                |
| ## 6  | 0                    | 0                 | 2                   |                |
| ## 7  | 0                    | 5                 | 2                   |                |
| ## 8  | 1                    | 4                 | 3                   |                |
| ## 9  | 0                    | 3                 | 3                   |                |
| ## 10 | 0                    | 0                 | 3                   |                |
| ## 11 | 0                    | 0                 | 6                   |                |
| ## 12 | 1                    | 2                 | 1                   |                |
| ## 13 | 0                    | 2                 | 11                  |                |
| ## 14 | 0                    | 3                 | 1                   |                |
| ## 15 | 0                    | 2                 | 4                   |                |
| ## 16 | 0                    | 0                 | 7                   |                |
| ## 17 | 0                    | 2                 | 3                   |                |
| ## 18 | 0                    | 2                 | 4                   |                |
| ## 19 | 1                    | 1                 | 6                   |                |
| ## 20 | 0                    | 0                 | 2                   |                |
| ## 21 | 1                    | 1                 | 2                   |                |
| ## 22 | 0                    | 1                 | 2                   |                |
| ## 23 | 0                    | 1                 | 2                   |                |
| ## 24 | 0                    | 0                 | 2                   |                |
| ## 25 | 1                    | 0                 | 6                   |                |
| ## 26 | 1                    | 0                 | 1                   |                |
| ## 27 | 0                    | 2                 | 3                   |                |
| ## 28 | 0                    | 1                 | 5                   |                |
| ## 29 | 1                    | 0                 | 1                   |                |
| ## 30 | 0                    | 0                 | 5                   |                |
| ## 31 | 0                    | 0                 | 3                   |                |
| ## 32 | 0                    | 1                 | 2                   |                |
| ## 33 | 0                    | 1                 | 5                   |                |
| ## 34 | 0                    | 3                 | 7                   |                |
| ## 35 | 0                    | 0                 | 6                   |                |
| ## 36 | 0                    | 2                 | 0                   |                |
| ## 37 | 0                    | 0                 | 4                   |                |
| ## 38 | 0                    | 1                 | 10                  |                |
| ## 39 | 0                    | 2                 | 4                   |                |
| ## 40 | 2                    | 2                 | 3                   |                |
| ## 41 | 0                    | 0                 | 7                   |                |
| ## 42 | 0                    | 0                 | 8                   |                |
| ## 43 | 0                    | 3                 | 4                   |                |
| ## 44 | 0                    | 0                 | 3                   |                |
| ## 45 | 0                    | 1                 | 2                   |                |
| ## 46 | 0                    | 1                 | 0                   |                |
| ## 47 | 1                    | 1                 | 2                   |                |
| ## 48 | 0                    | 1                 | 1                   |                |
| ## 49 | 0                    | 2                 | 1                   |                |
| ## 50 | 2                    | 1                 | 2                   |                |
| ##    | Faramea.occidentalis | Ficus.colubrinae  | Ficus.costaricana   | Ficus.insipida |

|       |              |                   |                |                |                 |
|-------|--------------|-------------------|----------------|----------------|-----------------|
| ## 1  | 14           | 0                 | 0              | 0              |                 |
| ## 2  | 36           | 1                 | 0              | 0              |                 |
| ## 3  | 39           | 0                 | 0              | 0              |                 |
| ## 4  | 39           | 0                 | 0              | 0              |                 |
| ## 5  | 22           | 0                 | 0              | 0              |                 |
| ## 6  | 16           | 0                 | 0              | 0              |                 |
| ## 7  | 38           | 0                 | 0              | 0              |                 |
| ## 8  | 41           | 0                 | 0              | 0              |                 |
| ## 9  | 33           | 0                 | 0              | 0              |                 |
| ## 10 | 42           | 0                 | 0              | 0              |                 |
| ## 11 | 17           | 0                 | 0              | 0              |                 |
| ## 12 | 38           | 0                 | 0              | 0              |                 |
| ## 13 | 39           | 0                 | 0              | 1              |                 |
| ## 14 | 31           | 0                 | 0              | 0              |                 |
| ## 15 | 31           | 0                 | 0              | 0              |                 |
| ## 16 | 27           | 0                 | 0              | 0              |                 |
| ## 17 | 42           | 0                 | 0              | 0              |                 |
| ## 18 | 35           | 0                 | 1              | 0              |                 |
| ## 19 | 42           | 0                 | 0              | 0              |                 |
| ## 20 | 21           | 0                 | 1              | 0              |                 |
| ## 21 | 17           | 0                 | 0              | 0              |                 |
| ## 22 | 58           | 0                 | 0              | 0              |                 |
| ## 23 | 26           | 0                 | 1              | 1              |                 |
| ## 24 | 24           | 0                 | 0              | 0              |                 |
| ## 25 | 35           | 0                 | 0              | 0              |                 |
| ## 26 | 31           | 0                 | 0              | 0              |                 |
| ## 27 | 51           | 0                 | 0              | 0              |                 |
| ## 28 | 58           | 0                 | 0              | 0              |                 |
| ## 29 | 54           | 0                 | 0              | 0              |                 |
| ## 30 | 61           | 0                 | 0              | 0              |                 |
| ## 31 | 30           | 0                 | 0              | 0              |                 |
| ## 32 | 60           | 0                 | 0              | 0              |                 |
| ## 33 | 53           | 0                 | 0              | 0              |                 |
| ## 34 | 49           | 0                 | 0              | 0              |                 |
| ## 35 | 37           | 0                 | 0              | 0              |                 |
| ## 36 | 32           | 0                 | 1              | 0              |                 |
| ## 37 | 65           | 0                 | 0              | 0              |                 |
| ## 38 | 80           | 0                 | 1              | 0              |                 |
| ## 39 | 43           | 0                 | 2              | 0              |                 |
| ## 40 | 41           | 0                 | 0              | 1              |                 |
| ## 41 | 22           | 0                 | 0              | 0              |                 |
| ## 42 | 25           | 0                 | 0              | 0              |                 |
| ## 43 | 15           | 0                 | 0              | 0              |                 |
| ## 44 | 15           | 0                 | 0              | 0              |                 |
| ## 45 | 10           | 0                 | 0              | 0              |                 |
| ## 46 | 22           | 0                 | 0              | 0              |                 |
| ## 47 | 27           | 0                 | 0              | 0              |                 |
| ## 48 | 15           | 0                 | 0              | 0              |                 |
| ## 49 | 11           | 0                 | 0              | 0              |                 |
| ## 50 | 7            | 0                 | 0              | 0              |                 |
| ##    | Ficus.maxima | Ficus.obtusifolia | Ficus.popenoei | Ficus.tonduzii | Ficus.trigonata |
| ## 1  | 1            | 0                 | 0              | 0              | 0               |
| ## 2  | 0            | 0                 | 0              | 0              | 0               |
| ## 3  | 0            | 0                 | 0              | 1              | 0               |

|       |                  |                     |                  |                  |   |
|-------|------------------|---------------------|------------------|------------------|---|
| ## 4  | 0                | 0                   | 0                | 2                | 0 |
| ## 5  | 0                | 0                   | 0                | 1                | 0 |
| ## 6  | 0                | 0                   | 0                | 0                | 0 |
| ## 7  | 0                | 0                   | 1                | 0                | 0 |
| ## 8  | 0                | 0                   | 0                | 0                | 0 |
| ## 9  | 0                | 0                   | 0                | 0                | 0 |
| ## 10 | 0                | 0                   | 0                | 0                | 0 |
| ## 11 | 0                | 0                   | 0                | 0                | 0 |
| ## 12 | 0                | 0                   | 1                | 1                | 0 |
| ## 13 | 0                | 0                   | 0                | 0                | 0 |
| ## 14 | 0                | 1                   | 0                | 0                | 0 |
| ## 15 | 0                | 0                   | 0                | 2                | 0 |
| ## 16 | 0                | 0                   | 0                | 1                | 0 |
| ## 17 | 0                | 0                   | 0                | 0                | 0 |
| ## 18 | 0                | 0                   | 0                | 0                | 0 |
| ## 19 | 0                | 0                   | 0                | 0                | 0 |
| ## 20 | 0                | 0                   | 0                | 3                | 0 |
| ## 21 | 0                | 0                   | 0                | 0                | 0 |
| ## 22 | 1                | 1                   | 0                | 0                | 0 |
| ## 23 | 0                | 0                   | 0                | 0                | 0 |
| ## 24 | 0                | 2                   | 0                | 0                | 0 |
| ## 25 | 0                | 0                   | 0                | 1                | 0 |
| ## 26 | 0                | 0                   | 0                | 0                | 0 |
| ## 27 | 0                | 0                   | 0                | 0                | 0 |
| ## 28 | 0                | 0                   | 0                | 0                | 0 |
| ## 29 | 0                | 0                   | 0                | 0                | 0 |
| ## 30 | 0                | 0                   | 0                | 0                | 0 |
| ## 31 | 1                | 0                   | 0                | 1                | 0 |
| ## 32 | 0                | 0                   | 0                | 0                | 0 |
| ## 33 | 0                | 1                   | 0                | 0                | 0 |
| ## 34 | 0                | 0                   | 0                | 0                | 1 |
| ## 35 | 0                | 0                   | 0                | 0                | 0 |
| ## 36 | 0                | 0                   | 0                | 1                | 0 |
| ## 37 | 0                | 0                   | 0                | 1                | 0 |
| ## 38 | 0                | 0                   | 0                | 1                | 0 |
| ## 39 | 0                | 0                   | 0                | 0                | 0 |
| ## 40 | 0                | 0                   | 0                | 0                | 0 |
| ## 41 | 1                | 1                   | 0                | 0                | 0 |
| ## 42 | 0                | 0                   | 0                | 2                | 1 |
| ## 43 | 0                | 0                   | 0                | 2                | 1 |
| ## 44 | 0                | 0                   | 1                | 0                | 1 |
| ## 45 | 0                | 0                   | 0                | 0                | 0 |
| ## 46 | 0                | 0                   | 0                | 0                | 0 |
| ## 47 | 0                | 1                   | 0                | 0                | 0 |
| ## 48 | 0                | 0                   | 0                | 1                | 0 |
| ## 49 | 0                | 0                   | 0                | 1                | 0 |
| ## 50 | 0                | 0                   | 0                | 1                | 1 |
| ##    | Ficus.yoponensis | Garcinia.intermedia | Garcinia.madruno | Genipa.americana |   |
| ## 1  | 1                | 0                   | 4                | 0                |   |
| ## 2  | 0                | 1                   | 0                | 0                |   |
| ## 3  | 0                | 1                   | 0                | 1                |   |
| ## 4  | 0                | 3                   | 0                | 0                |   |
| ## 5  | 0                | 2                   | 1                | 0                |   |
| ## 6  | 1                | 1                   | 0                | 0                |   |



|       |                    |              |                    |                 |
|-------|--------------------|--------------|--------------------|-----------------|
| ## 7  | 1                  | 2            | 0                  | 1               |
| ## 8  | 0                  | 2            | 0                  | 0               |
| ## 9  | 0                  | 1            | 0                  | 1               |
| ## 10 | 0                  | 0            | 1                  | 1               |
| ## 11 | 0                  | 1            | 0                  | 0               |
| ## 12 | 0                  | 3            | 0                  | 0               |
| ## 13 | 0                  | 3            | 0                  | 1               |
| ## 14 | 0                  | 1            | 0                  | 1               |
| ## 15 | 0                  | 0            | 1                  | 0               |
| ## 16 | 0                  | 1            | 0                  | 2               |
| ## 17 | 0                  | 0            | 0                  | 1               |
| ## 18 | 0                  | 2            | 0                  | 1               |
| ## 19 | 0                  | 3            | 0                  | 0               |
| ## 20 | 0                  | 0            | 1                  | 0               |
| ## 21 | 0                  | 1            | 0                  | 0               |
| ## 22 | 0                  | 3            | 0                  | 0               |
| ## 23 | 0                  | 2            | 1                  | 0               |
| ## 24 | 0                  | 1            | 0                  | 0               |
| ## 25 | 1                  | 3            | 1                  | 0               |
| ## 26 | 0                  | 2            | 0                  | 1               |
| ## 27 | 0                  | 2            | 1                  | 0               |
| ## 28 | 0                  | 4            | 0                  | 0               |
| ## 29 | 0                  | 1            | 0                  | 1               |
| ## 30 | 0                  | 1            | 0                  | 0               |
| ## 31 | 0                  | 0            | 0                  | 0               |
| ## 32 | 0                  | 3            | 0                  | 0               |
| ## 33 | 0                  | 0            | 0                  | 0               |
| ## 34 | 0                  | 4            | 1                  | 0               |
| ## 35 | 1                  | 2            | 0                  | 0               |
| ## 36 | 0                  | 0            | 0                  | 1               |
| ## 37 | 0                  | 1            | 0                  | 0               |
| ## 38 | 0                  | 2            | 0                  | 0               |
| ## 39 | 0                  | 6            | 0                  | 1               |
| ## 40 | 0                  | 6            | 0                  | 0               |
| ## 41 | 0                  | 0            | 0                  | 2               |
| ## 42 | 0                  | 0            | 0                  | 0               |
| ## 43 | 0                  | 2            | 0                  | 0               |
| ## 44 | 0                  | 4            | 0                  | 0               |
| ## 45 | 0                  | 0            | 0                  | 1               |
| ## 46 | 0                  | 8            | 0                  | 1               |
| ## 47 | 1                  | 3            | 0                  | 1               |
| ## 48 | 0                  | 0            | 0                  | 0               |
| ## 49 | 0                  | 0            | 0                  | 1               |
| ## 50 | 0                  | 4            | 0                  | 3               |
| ##    | Guapira.myrtiflora | Guarea.fuzzy | Guarea.grandifolia | Guarea.guidonia |
| ## 1  | 3                  | 1            | 0                  | 2               |
| ## 2  | 1                  | 1            | 0                  | 6               |
| ## 3  | 0                  | 0            | 0                  | 2               |
| ## 4  | 1                  | 1            | 0                  | 5               |
| ## 5  | 1                  | 3            | 0                  | 3               |
| ## 6  | 7                  | 0            | 0                  | 4               |
| ## 7  | 3                  | 0            | 0                  | 4               |
| ## 8  | 1                  | 2            | 1                  | 0               |
| ## 9  | 1                  | 0            | 0                  | 1               |

|       |                     |                   |                    |                  |
|-------|---------------------|-------------------|--------------------|------------------|
| ## 10 | 1                   | 3                 | 0                  | 5                |
| ## 11 | 1                   | 1                 | 1                  | 5                |
| ## 12 | 3                   | 1                 | 0                  | 3                |
| ## 13 | 2                   | 0                 | 0                  | 4                |
| ## 14 | 0                   | 0                 | 0                  | 3                |
| ## 15 | 1                   | 2                 | 2                  | 0                |
| ## 16 | 2                   | 2                 | 0                  | 7                |
| ## 17 | 1                   | 0                 | 0                  | 2                |
| ## 18 | 0                   | 0                 | 0                  | 2                |
| ## 19 | 3                   | 0                 | 0                  | 2                |
| ## 20 | 1                   | 1                 | 1                  | 5                |
| ## 21 | 3                   | 3                 | 0                  | 7                |
| ## 22 | 3                   | 0                 | 1                  | 4                |
| ## 23 | 1                   | 2                 | 0                  | 6                |
| ## 24 | 7                   | 0                 | 0                  | 8                |
| ## 25 | 2                   | 1                 | 0                  | 6                |
| ## 26 | 2                   | 1                 | 0                  | 6                |
| ## 27 | 4                   | 1                 | 0                  | 12               |
| ## 28 | 2                   | 2                 | 0                  | 8                |
| ## 29 | 2                   | 3                 | 1                  | 3                |
| ## 30 | 2                   | 2                 | 0                  | 2                |
| ## 31 | 2                   | 0                 | 0                  | 9                |
| ## 32 | 0                   | 2                 | 0                  | 11               |
| ## 33 | 4                   | 1                 | 1                  | 27               |
| ## 34 | 2                   | 5                 | 0                  | 16               |
| ## 35 | 1                   | 0                 | 0                  | 3                |
| ## 36 | 2                   | 2                 | 0                  | 10               |
| ## 37 | 1                   | 2                 | 1                  | 24               |
| ## 38 | 5                   | 2                 | 0                  | 12               |
| ## 39 | 3                   | 1                 | 1                  | 9                |
| ## 40 | 4                   | 2                 | 0                  | 6                |
| ## 41 | 1                   | 0                 | 0                  | 18               |
| ## 42 | 1                   | 1                 | 0                  | 8                |
| ## 43 | 1                   | 1                 | 0                  | 16               |
| ## 44 | 0                   | 3                 | 0                  | 8                |
| ## 45 | 2                   | 7                 | 0                  | 11               |
| ## 46 | 2                   | 2                 | 0                  | 4                |
| ## 47 | 2                   | 0                 | 0                  | 10               |
| ## 48 | 4                   | 1                 | 0                  | 13               |
| ## 49 | 1                   | 1                 | 0                  | 20               |
| ## 50 | 0                   | 2                 | 0                  | 14               |
| ##    | Guatteria.dumetorum | Guazuma.ulmifolia | Guettarda.foliacea | Gustavia.superba |
| ## 1  | 6                   | 0                 | 1                  | 10               |
| ## 2  | 16                  | 0                 | 5                  | 5                |
| ## 3  | 6                   | 0                 | 1                  | 0                |
| ## 4  | 3                   | 1                 | 2                  | 1                |
| ## 5  | 9                   | 0                 | 1                  | 3                |
| ## 6  | 7                   | 0                 | 0                  | 1                |
| ## 7  | 8                   | 0                 | 0                  | 8                |
| ## 8  | 6                   | 0                 | 4                  | 4                |
| ## 9  | 2                   | 0                 | 1                  | 4                |
| ## 10 | 2                   | 0                 | 3                  | 4                |
| ## 11 | 3                   | 0                 | 1                  | 2                |
| ## 12 | 2                   | 0                 | 0                  | 3                |

|       |    |   |   |     |
|-------|----|---|---|-----|
| ## 13 | 0  | 2 | 2 | 10  |
| ## 14 | 7  | 1 | 0 | 4   |
| ## 15 | 16 | 1 | 4 | 4   |
| ## 16 | 5  | 1 | 0 | 10  |
| ## 17 | 3  | 0 | 1 | 7   |
| ## 18 | 0  | 1 | 2 | 3   |
| ## 19 | 3  | 1 | 1 | 6   |
| ## 20 | 7  | 2 | 4 | 4   |
| ## 21 | 10 | 0 | 0 | 6   |
| ## 22 | 5  | 0 | 0 | 9   |
| ## 23 | 2  | 1 | 0 | 3   |
| ## 24 | 5  | 1 | 3 | 4   |
| ## 25 | 2  | 2 | 3 | 14  |
| ## 26 | 13 | 0 | 0 | 8   |
| ## 27 | 3  | 2 | 0 | 3   |
| ## 28 | 3  | 1 | 1 | 8   |
| ## 29 | 5  | 1 | 0 | 6   |
| ## 30 | 1  | 2 | 6 | 23  |
| ## 31 | 10 | 0 | 1 | 2   |
| ## 32 | 11 | 0 | 2 | 8   |
| ## 33 | 3  | 0 | 0 | 6   |
| ## 34 | 1  | 5 | 3 | 25  |
| ## 35 | 0  | 5 | 7 | 247 |
| ## 36 | 8  | 2 | 2 | 1   |
| ## 37 | 5  | 0 | 0 | 1   |
| ## 38 | 3  | 0 | 2 | 11  |
| ## 39 | 1  | 2 | 2 | 22  |
| ## 40 | 4  | 0 | 3 | 63  |
| ## 41 | 5  | 1 | 1 | 6   |
| ## 42 | 7  | 0 | 2 | 4   |
| ## 43 | 5  | 1 | 1 | 1   |
| ## 44 | 6  | 0 | 2 | 17  |
| ## 45 | 1  | 0 | 0 | 2   |
| ## 46 | 1  | 0 | 1 | 11  |
| ## 47 | 0  | 0 | 4 | 11  |
| ## 48 | 2  | 1 | 3 | 4   |
| ## 49 | 7  | 1 | 1 | 15  |
| ## 50 | 4  | 0 | 2 | 10  |

| ##    | Hampea.appendiculata | Hasseltia.floribunda | Heisteria.acuminata |
|-------|----------------------|----------------------|---------------------|
| ## 1  | 0                    | 5                    | 0                   |
| ## 2  | 0                    | 9                    | 0                   |
| ## 3  | 1                    | 4                    | 0                   |
| ## 4  | 0                    | 11                   | 0                   |
| ## 5  | 0                    | 9                    | 1                   |
| ## 6  | 0                    | 2                    | 1                   |
| ## 7  | 0                    | 7                    | 0                   |
| ## 8  | 0                    | 6                    | 0                   |
| ## 9  | 2                    | 3                    | 0                   |
| ## 10 | 1                    | 4                    | 0                   |
| ## 11 | 0                    | 5                    | 0                   |
| ## 12 | 1                    | 0                    | 0                   |
| ## 13 | 0                    | 1                    | 0                   |
| ## 14 | 0                    | 4                    | 1                   |
| ## 15 | 0                    | 20                   | 0                   |

|       |                    |                    |                   |                |
|-------|--------------------|--------------------|-------------------|----------------|
| ## 16 | 0                  | 7                  | 0                 |                |
| ## 17 | 0                  | 1                  | 0                 |                |
| ## 18 | 0                  | 2                  | 0                 |                |
| ## 19 | 0                  | 3                  | 0                 |                |
| ## 20 | 0                  | 6                  | 0                 |                |
| ## 21 | 0                  | 3                  | 1                 |                |
| ## 22 | 0                  | 5                  | 0                 |                |
| ## 23 | 0                  | 6                  | 0                 |                |
| ## 24 | 1                  | 5                  | 0                 |                |
| ## 25 | 1                  | 3                  | 0                 |                |
| ## 26 | 0                  | 7                  | 1                 |                |
| ## 27 | 0                  | 1                  | 0                 |                |
| ## 28 | 0                  | 3                  | 0                 |                |
| ## 29 | 1                  | 1                  | 0                 |                |
| ## 30 | 0                  | 10                 | 0                 |                |
| ## 31 | 0                  | 2                  | 0                 |                |
| ## 32 | 0                  | 7                  | 0                 |                |
| ## 33 | 0                  | 4                  | 0                 |                |
| ## 34 | 0                  | 1                  | 0                 |                |
| ## 35 | 0                  | 7                  | 0                 |                |
| ## 36 | 1                  | 1                  | 1                 |                |
| ## 37 | 1                  | 3                  | 0                 |                |
| ## 38 | 0                  | 2                  | 0                 |                |
| ## 39 | 0                  | 2                  | 0                 |                |
| ## 40 | 1                  | 3                  | 0                 |                |
| ## 41 | 0                  | 1                  | 1                 |                |
| ## 42 | 1                  | 4                  | 0                 |                |
| ## 43 | 0                  | 6                  | 0                 |                |
| ## 44 | 0                  | 6                  | 0                 |                |
| ## 45 | 1                  | 1                  | 0                 |                |
| ## 46 | 0                  | 0                  | 0                 |                |
| ## 47 | 0                  | 1                  | 0                 |                |
| ## 48 | 0                  | 2                  | 0                 |                |
| ## 49 | 0                  | 7                  | 0                 |                |
| ## 50 | 0                  | 16                 | 0                 |                |
| ##    | Heisteria.concinna | Hirtella.americana | Hirtella.triandra | Hura.crepitans |
| ## 1  | 4                  | 0                  | 21                | 0              |
| ## 2  | 5                  | 0                  | 14                | 0              |
| ## 3  | 4                  | 0                  | 5                 | 0              |
| ## 4  | 6                  | 0                  | 4                 | 0              |
| ## 5  | 4                  | 0                  | 6                 | 0              |
| ## 6  | 8                  | 0                  | 6                 | 2              |
| ## 7  | 2                  | 0                  | 7                 | 1              |
| ## 8  | 5                  | 0                  | 14                | 1              |
| ## 9  | 1                  | 0                  | 8                 | 0              |
| ## 10 | 5                  | 0                  | 7                 | 0              |
| ## 11 | 5                  | 0                  | 12                | 0              |
| ## 12 | 12                 | 0                  | 6                 | 2              |
| ## 13 | 4                  | 0                  | 11                | 1              |
| ## 14 | 0                  | 0                  | 13                | 0              |
| ## 15 | 3                  | 0                  | 4                 | 0              |
| ## 16 | 2                  | 0                  | 4                 | 3              |
| ## 17 | 13                 | 0                  | 4                 | 0              |
| ## 18 | 8                  | 0                  | 12                | 0              |

|       |                         |                |                  |                |
|-------|-------------------------|----------------|------------------|----------------|
| ## 19 | 7                       | 0              | 24               | 0              |
| ## 20 | 1                       | 0              | 12               | 0              |
| ## 21 | 1                       | 0              | 17               | 0              |
| ## 22 | 9                       | 0              | 6                | 2              |
| ## 23 | 5                       | 0              | 10               | 5              |
| ## 24 | 7                       | 1              | 15               | 0              |
| ## 25 | 3                       | 0              | 26               | 0              |
| ## 26 | 4                       | 0              | 24               | 4              |
| ## 27 | 1                       | 0              | 8                | 2              |
| ## 28 | 4                       | 0              | 9                | 2              |
| ## 29 | 5                       | 0              | 7                | 5              |
| ## 30 | 0                       | 0              | 3                | 1              |
| ## 31 | 6                       | 0              | 14               | 3              |
| ## 32 | 6                       | 0              | 8                | 7              |
| ## 33 | 5                       | 0              | 9                | 2              |
| ## 34 | 4                       | 0              | 4                | 5              |
| ## 35 | 2                       | 0              | 1                | 0              |
| ## 36 | 4                       | 0              | 24               | 2              |
| ## 37 | 6                       | 0              | 7                | 3              |
| ## 38 | 15                      | 0              | 3                | 2              |
| ## 39 | 12                      | 0              | 3                | 2              |
| ## 40 | 3                       | 0              | 7                | 3              |
| ## 41 | 6                       | 0              | 31               | 2              |
| ## 42 | 4                       | 0              | 18               | 3              |
| ## 43 | 10                      | 0              | 23               | 1              |
| ## 44 | 6                       | 0              | 18               | 6              |
| ## 45 | 18                      | 0              | 26               | 7              |
| ## 46 | 15                      | 4              | 22               | 5              |
| ## 47 | 6                       | 0              | 33               | 7              |
| ## 48 | 3                       | 0              | 41               | 7              |
| ## 49 | 8                       | 0              | 43               | 1              |
| ## 50 | 11                      | 0              | 27               | 2              |
| ##    | Hieronyma.alchorneoides | Inga.acuminata | Inga.coccleensis | Inga.goldmanii |
| ## 1  | 0                       | 0              | 2                | 0              |
| ## 2  | 2                       | 0              | 4                | 0              |
| ## 3  | 0                       | 0              | 4                | 1              |
| ## 4  | 0                       | 0              | 6                | 0              |
| ## 5  | 0                       | 0              | 0                | 2              |
| ## 6  | 0                       | 0              | 0                | 1              |
| ## 7  | 0                       | 0              | 1                | 0              |
| ## 8  | 0                       | 0              | 6                | 1              |
| ## 9  | 1                       | 0              | 4                | 1              |
| ## 10 | 0                       | 0              | 5                | 2              |
| ## 11 | 0                       | 0              | 0                | 1              |
| ## 12 | 0                       | 0              | 0                | 0              |
| ## 13 | 1                       | 0              | 2                | 1              |
| ## 14 | 2                       | 0              | 3                | 1              |
| ## 15 | 0                       | 0              | 2                | 2              |
| ## 16 | 0                       | 7              | 0                | 0              |
| ## 17 | 0                       | 2              | 2                | 1              |
| ## 18 | 2                       | 0              | 1                | 2              |
| ## 19 | 1                       | 0              | 2                | 0              |
| ## 20 | 3                       | 0              | 2                | 3              |
| ## 21 | 1                       | 0              | 0                | 0              |

|       |              |                |              |                  |                 |
|-------|--------------|----------------|--------------|------------------|-----------------|
| ## 22 | 1            | 1              | 3            | 2                |                 |
| ## 23 | 5            | 0              | 1            | 6                |                 |
| ## 24 | 0            | 0              | 0            | 1                |                 |
| ## 25 | 2            | 0              | 0            | 0                |                 |
| ## 26 | 1            | 2              | 0            | 1                |                 |
| ## 27 | 0            | 0              | 0            | 2                |                 |
| ## 28 | 2            | 1              | 0            | 2                |                 |
| ## 29 | 1            | 0              | 0            | 0                |                 |
| ## 30 | 0            | 0              | 0            | 1                |                 |
| ## 31 | 1            | 0              | 0            | 0                |                 |
| ## 32 | 0            | 0              | 0            | 1                |                 |
| ## 33 | 0            | 0              | 0            | 2                |                 |
| ## 34 | 0            | 0              | 0            | 1                |                 |
| ## 35 | 3            | 0              | 0            | 0                |                 |
| ## 36 | 1            | 0              | 0            | 2                |                 |
| ## 37 | 3            | 3              | 0            | 2                |                 |
| ## 38 | 1            | 0              | 0            | 0                |                 |
| ## 39 | 0            | 0              | 0            | 0                |                 |
| ## 40 | 1            | 0              | 0            | 1                |                 |
| ## 41 | 2            | 1              | 0            | 1                |                 |
| ## 42 | 1            | 2              | 0            | 0                |                 |
| ## 43 | 0            | 3              | 0            | 0                |                 |
| ## 44 | 0            | 0              | 0            | 1                |                 |
| ## 45 | 0            | 0              | 0            | 0                |                 |
| ## 46 | 0            | 0              | 2            | 1                |                 |
| ## 47 | 2            | 3              | 0            | 1                |                 |
| ## 48 | 0            | 1              | 0            | 1                |                 |
| ## 49 | 1            | 0              | 0            | 1                |                 |
| ## 50 | 0            | 0              | 0            | 0                |                 |
| ##    | Inga.laurina | Inga.semialata | Inga.nobilis | Inga.oerstediana | Inga.pezizifera |
| ## 1  | 0            | 0              | 0            | 0                | 0               |
| ## 2  | 0            | 0              | 0            | 0                | 0               |
| ## 3  | 0            | 2              | 1            | 0                | 0               |
| ## 4  | 0            | 4              | 3            | 0                | 0               |
| ## 5  | 1            | 0              | 1            | 0                | 0               |
| ## 6  | 0            | 0              | 0            | 0                | 0               |
| ## 7  | 0            | 0              | 2            | 0                | 0               |
| ## 8  | 0            | 4              | 2            | 0                | 0               |
| ## 9  | 0            | 1              | 2            | 0                | 0               |
| ## 10 | 0            | 1              | 3            | 0                | 0               |
| ## 11 | 0            | 2              | 0            | 0                | 0               |
| ## 12 | 1            | 1              | 0            | 0                | 0               |
| ## 13 | 1            | 0              | 0            | 0                | 0               |
| ## 14 | 0            | 1              | 0            | 0                | 0               |
| ## 15 | 0            | 8              | 5            | 0                | 0               |
| ## 16 | 0            | 6              | 0            | 0                | 0               |
| ## 17 | 0            | 0              | 1            | 0                | 0               |
| ## 18 | 0            | 1              | 1            | 0                | 0               |
| ## 19 | 1            | 0              | 0            | 0                | 0               |
| ## 20 | 0            | 9              | 2            | 0                | 0               |
| ## 21 | 1            | 1              | 1            | 1                | 0               |
| ## 22 | 0            | 2              | 0            | 0                | 0               |
| ## 23 | 0            | 0              | 0            | 0                | 0               |
| ## 24 | 0            | 2              | 1            | 0                | 0               |

|       |               |               |                  |                  |   |
|-------|---------------|---------------|------------------|------------------|---|
| ## 25 | 0             | 1             | 0                | 0                | 0 |
| ## 26 | 0             | 2             | 2                | 0                | 0 |
| ## 27 | 0             | 1             | 2                | 0                | 0 |
| ## 28 | 0             | 2             | 1                | 0                | 0 |
| ## 29 | 0             | 1             | 0                | 1                | 0 |
| ## 30 | 1             | 1             | 1                | 0                | 0 |
| ## 31 | 0             | 1             | 0                | 0                | 0 |
| ## 32 | 0             | 1             | 2                | 0                | 0 |
| ## 33 | 0             | 0             | 0                | 0                | 0 |
| ## 34 | 0             | 0             | 2                | 0                | 0 |
| ## 35 | 0             | 1             | 0                | 0                | 0 |
| ## 36 | 0             | 3             | 0                | 0                | 0 |
| ## 37 | 0             | 2             | 0                | 0                | 0 |
| ## 38 | 0             | 3             | 1                | 0                | 0 |
| ## 39 | 0             | 4             | 1                | 0                | 0 |
| ## 40 | 0             | 7             | 1                | 0                | 3 |
| ## 41 | 0             | 3             | 2                | 0                | 0 |
| ## 42 | 0             | 7             | 3                | 0                | 0 |
| ## 43 | 0             | 0             | 6                | 0                | 2 |
| ## 44 | 0             | 1             | 2                | 0                | 5 |
| ## 45 | 0             | 3             | 2                | 0                | 3 |
| ## 46 | 3             | 1             | 2                | 0                | 0 |
| ## 47 | 1             | 1             | 3                | 0                | 3 |
| ## 48 | 0             | 4             | 3                | 0                | 0 |
| ## 49 | 0             | 3             | 2                | 0                | 1 |
| ## 50 | 0             | 0             | 4                | 0                | 3 |
| ##    | Inga.punctata | Inga.ruiziana | Inga.sapindoides | Inga.spectabilis |   |
| ## 1  | 3             | 0             | 2                | 0                |   |
| ## 2  | 0             | 0             | 0                | 2                |   |
| ## 3  | 0             | 0             | 3                | 0                |   |
| ## 4  | 0             | 0             | 2                | 1                |   |
| ## 5  | 0             | 0             | 5                | 0                |   |
| ## 6  | 0             | 0             | 0                | 0                |   |
| ## 7  | 0             | 0             | 0                | 0                |   |
| ## 8  | 0             | 0             | 1                | 0                |   |
| ## 9  | 0             | 0             | 1                | 0                |   |
| ## 10 | 0             | 0             | 0                | 0                |   |
| ## 11 | 0             | 0             | 0                | 1                |   |
| ## 12 | 0             | 0             | 2                | 0                |   |
| ## 13 | 0             | 0             | 0                | 0                |   |
| ## 14 | 0             | 0             | 4                | 2                |   |
| ## 15 | 0             | 0             | 1                | 1                |   |
| ## 16 | 0             | 0             | 0                | 0                |   |
| ## 17 | 0             | 0             | 1                | 1                |   |
| ## 18 | 0             | 3             | 1                | 0                |   |
| ## 19 | 0             | 0             | 3                | 1                |   |
| ## 20 | 1             | 0             | 1                | 1                |   |
| ## 21 | 1             | 1             | 1                | 0                |   |
| ## 22 | 0             | 0             | 2                | 0                |   |
| ## 23 | 0             | 0             | 0                | 0                |   |
| ## 24 | 0             | 0             | 4                | 0                |   |
| ## 25 | 0             | 0             | 2                | 0                |   |
| ## 26 | 0             | 0             | 0                | 0                |   |
| ## 27 | 1             | 0             | 1                | 0                |   |

|       |                  |                  |                      |                      |
|-------|------------------|------------------|----------------------|----------------------|
| ## 28 | 0                | 0                | 4                    | 0                    |
| ## 29 | 0                | 0                | 0                    | 0                    |
| ## 30 | 0                | 0                | 2                    | 1                    |
| ## 31 | 0                | 0                | 2                    | 0                    |
| ## 32 | 0                | 0                | 2                    | 0                    |
| ## 33 | 0                | 0                | 1                    | 0                    |
| ## 34 | 1                | 0                | 3                    | 0                    |
| ## 35 | 1                | 0                | 2                    | 0                    |
| ## 36 | 0                | 0                | 2                    | 0                    |
| ## 37 | 0                | 0                | 3                    | 0                    |
| ## 38 | 0                | 0                | 1                    | 0                    |
| ## 39 | 0                | 0                | 0                    | 0                    |
| ## 40 | 0                | 0                | 1                    | 0                    |
| ## 41 | 1                | 0                | 2                    | 1                    |
| ## 42 | 0                | 0                | 3                    | 1                    |
| ## 43 | 0                | 0                | 1                    | 0                    |
| ## 44 | 0                | 0                | 1                    | 1                    |
| ## 45 | 0                | 0                | 0                    | 0                    |
| ## 46 | 0                | 0                | 1                    | 0                    |
| ## 47 | 0                | 0                | 1                    | 0                    |
| ## 48 | 0                | 0                | 3                    | 0                    |
| ## 49 | 0                | 0                | 2                    | 0                    |
| ## 50 | 1                | 1                | 2                    | 0                    |
| ##    | Inga.umbellifera | Jacaranda.copaia | Lacistema.aggregatum | Lacmellea.panamensis |
| ## 1  | 0                | 6                | 1                    | 1                    |
| ## 2  | 0                | 10               | 0                    | 0                    |
| ## 3  | 0                | 9                | 0                    | 0                    |
| ## 4  | 1                | 2                | 1                    | 2                    |
| ## 5  | 0                | 3                | 1                    | 2                    |
| ## 6  | 0                | 7                | 2                    | 1                    |
| ## 7  | 0                | 4                | 1                    | 3                    |
| ## 8  | 2                | 8                | 0                    | 2                    |
| ## 9  | 2                | 5                | 0                    | 0                    |
| ## 10 | 1                | 12               | 2                    | 0                    |
| ## 11 | 0                | 7                | 0                    | 0                    |
| ## 12 | 0                | 2                | 0                    | 1                    |
| ## 13 | 0                | 3                | 0                    | 1                    |
| ## 14 | 0                | 12               | 0                    | 2                    |
| ## 15 | 1                | 23               | 1                    | 1                    |
| ## 16 | 0                | 6                | 1                    | 0                    |
| ## 17 | 0                | 4                | 2                    | 1                    |
| ## 18 | 0                | 3                | 0                    | 3                    |
| ## 19 | 1                | 7                | 1                    | 4                    |
| ## 20 | 0                | 10               | 1                    | 1                    |
| ## 21 | 0                | 8                | 0                    | 1                    |
| ## 22 | 0                | 6                | 1                    | 0                    |
| ## 23 | 0                | 4                | 0                    | 2                    |
| ## 24 | 0                | 2                | 0                    | 0                    |
| ## 25 | 0                | 5                | 2                    | 1                    |
| ## 26 | 0                | 0                | 1                    | 0                    |
| ## 27 | 0                | 3                | 1                    | 1                    |
| ## 28 | 0                | 3                | 1                    | 0                    |
| ## 29 | 0                | 3                | 1                    | 1                    |
| ## 30 | 0                | 3                | 0                    | 2                    |



|       |                |                |                       |                   |
|-------|----------------|----------------|-----------------------|-------------------|
| ## 31 | 1              | 0              | 0                     | 0                 |
| ## 32 | 0              | 3              | 1                     | 0                 |
| ## 33 | 1              | 6              | 2                     | 1                 |
| ## 34 | 0              | 2              | 0                     | 1                 |
| ## 35 | 1              | 3              | 1                     | 1                 |
| ## 36 | 1              | 3              | 1                     | 1                 |
| ## 37 | 0              | 2              | 0                     | 0                 |
| ## 38 | 0              | 1              | 0                     | 3                 |
| ## 39 | 0              | 1              | 2                     | 1                 |
| ## 40 | 0              | 1              | 0                     | 1                 |
| ## 41 | 0              | 3              | 0                     | 1                 |
| ## 42 | 0              | 3              | 3                     | 1                 |
| ## 43 | 0              | 2              | 0                     | 1                 |
| ## 44 | 1              | 0              | 0                     | 0                 |
| ## 45 | 0              | 1              | 1                     | 0                 |
| ## 46 | 0              | 7              | 0                     | 2                 |
| ## 47 | 1              | 13             | 1                     | 2                 |
| ## 48 | 0              | 1              | 0                     | 2                 |
| ## 49 | 0              | 3              | 0                     | 0                 |
| ## 50 | 0              | 1              | 0                     | 0                 |
| ##    | Laetia.procera | Laetia.thamnia | Lafoensia.punicifolia | Licania.hypoleuca |
| ## 1  | 0              | 0              | 0                     | 0                 |
| ## 2  | 1              | 1              | 0                     | 0                 |
| ## 3  | 1              | 1              | 0                     | 0                 |
| ## 4  | 0              | 0              | 0                     | 0                 |
| ## 5  | 1              | 0              | 0                     | 1                 |
| ## 6  | 0              | 0              | 0                     | 0                 |
| ## 7  | 0              | 0              | 0                     | 0                 |
| ## 8  | 1              | 2              | 0                     | 1                 |
| ## 9  | 0              | 1              | 0                     | 0                 |
| ## 10 | 0              | 1              | 0                     | 1                 |
| ## 11 | 1              | 1              | 0                     | 0                 |
| ## 12 | 1              | 0              | 0                     | 0                 |
| ## 13 | 0              | 3              | 0                     | 1                 |
| ## 14 | 1              | 3              | 1                     | 0                 |
| ## 15 | 0              | 2              | 0                     | 1                 |
| ## 16 | 0              | 0              | 0                     | 0                 |
| ## 17 | 1              | 1              | 0                     | 0                 |
| ## 18 | 2              | 0              | 0                     | 0                 |
| ## 19 | 1              | 3              | 4                     | 2                 |
| ## 20 | 0              | 2              | 0                     | 1                 |
| ## 21 | 1              | 0              | 0                     | 0                 |
| ## 22 | 0              | 0              | 0                     | 1                 |
| ## 23 | 0              | 1              | 0                     | 0                 |
| ## 24 | 0              | 2              | 0                     | 0                 |
| ## 25 | 0              | 1              | 0                     | 1                 |
| ## 26 | 0              | 0              | 0                     | 0                 |
| ## 27 | 0              | 1              | 0                     | 0                 |
| ## 28 | 0              | 0              | 0                     | 0                 |
| ## 29 | 0              | 0              | 0                     | 1                 |
| ## 30 | 0              | 0              | 0                     | 0                 |
| ## 31 | 0              | 0              | 0                     | 0                 |
| ## 32 | 0              | 0              | 0                     | 0                 |
| ## 33 | 0              | 0              | 0                     | 0                 |

|       |                  |                     |                           |   |
|-------|------------------|---------------------|---------------------------|---|
| ## 34 | 0                | 0                   | 0                         | 0 |
| ## 35 | 0                | 0                   | 0                         | 1 |
| ## 36 | 0                | 1                   | 0                         | 0 |
| ## 37 | 0                | 0                   | 0                         | 0 |
| ## 38 | 0                | 0                   | 0                         | 0 |
| ## 39 | 0                | 0                   | 0                         | 0 |
| ## 40 | 0                | 0                   | 0                         | 0 |
| ## 41 | 0                | 0                   | 0                         | 1 |
| ## 42 | 0                | 0                   | 0                         | 0 |
| ## 43 | 0                | 0                   | 0                         | 0 |
| ## 44 | 0                | 0                   | 0                         | 0 |
| ## 45 | 0                | 0                   | 0                         | 0 |
| ## 46 | 0                | 0                   | 0                         | 0 |
| ## 47 | 0                | 0                   | 0                         | 0 |
| ## 48 | 0                | 0                   | 0                         | 0 |
| ## 49 | 0                | 0                   | 0                         | 1 |
| ## 50 | 0                | 0                   | 0                         | 0 |
| ##    | Licania.platypus | Lindackeria.laurina | Lonchocarpus.heptaphyllus |   |
| ## 1  | 0                | 0                   | 7                         |   |
| ## 2  | 0                | 0                   | 7                         |   |
| ## 3  | 0                | 0                   | 3                         |   |
| ## 4  | 0                | 0                   | 9                         |   |
| ## 5  | 0                | 0                   | 2                         |   |
| ## 6  | 0                | 0                   | 1                         |   |
| ## 7  | 1                | 1                   | 4                         |   |
| ## 8  | 0                | 0                   | 2                         |   |
| ## 9  | 0                | 2                   | 2                         |   |
| ## 10 | 0                | 2                   | 4                         |   |
| ## 11 | 1                | 0                   | 2                         |   |
| ## 12 | 0                | 1                   | 3                         |   |
| ## 13 | 0                | 3                   | 4                         |   |
| ## 14 | 0                | 4                   | 3                         |   |
| ## 15 | 0                | 0                   | 2                         |   |
| ## 16 | 0                | 0                   | 2                         |   |
| ## 17 | 0                | 2                   | 5                         |   |
| ## 18 | 0                | 5                   | 3                         |   |
| ## 19 | 0                | 3                   | 1                         |   |
| ## 20 | 0                | 2                   | 1                         |   |
| ## 21 | 1                | 0                   | 2                         |   |
| ## 22 | 0                | 2                   | 1                         |   |
| ## 23 | 1                | 2                   | 4                         |   |
| ## 24 | 0                | 6                   | 2                         |   |
| ## 25 | 0                | 2                   | 2                         |   |
| ## 26 | 0                | 1                   | 2                         |   |
| ## 27 | 0                | 2                   | 0                         |   |
| ## 28 | 0                | 1                   | 0                         |   |
| ## 29 | 0                | 2                   | 3                         |   |
| ## 30 | 0                | 1                   | 7                         |   |
| ## 31 | 0                | 0                   | 3                         |   |
| ## 32 | 0                | 2                   | 1                         |   |
| ## 33 | 0                | 0                   | 1                         |   |
| ## 34 | 0                | 0                   | 1                         |   |
| ## 35 | 0                | 2                   | 2                         |   |
| ## 36 | 0                | 0                   | 4                         |   |

|       |                  |                    |                                |
|-------|------------------|--------------------|--------------------------------|
| ## 37 | 0                | 0                  | 2                              |
| ## 38 | 0                | 0                  | 0                              |
| ## 39 | 0                | 1                  | 1                              |
| ## 40 | 0                | 0                  | 3                              |
| ## 41 | 1                | 2                  | 1                              |
| ## 42 | 0                | 0                  | 1                              |
| ## 43 | 0                | 1                  | 2                              |
| ## 44 | 0                | 0                  | 0                              |
| ## 45 | 0                | 0                  | 1                              |
| ## 46 | 0                | 7                  | 2                              |
| ## 47 | 1                | 3                  | 3                              |
| ## 48 | 2                | 0                  | 1                              |
| ## 49 | 2                | 1                  | 0                              |
| ## 50 | 0                | 1                  | 2                              |
| ##    | Luehea.seemannii | Macrocnemum.roseum | Maquira.guianensis.costaricana |
| ## 1  | 1                | 0                  | 4                              |
| ## 2  | 0                | 0                  | 3                              |
| ## 3  | 0                | 0                  | 7                              |
| ## 4  | 0                | 0                  | 7                              |
| ## 5  | 1                | 0                  | 10                             |
| ## 6  | 1                | 0                  | 4                              |
| ## 7  | 2                | 0                  | 3                              |
| ## 8  | 0                | 0                  | 4                              |
| ## 9  | 1                | 0                  | 7                              |
| ## 10 | 0                | 0                  | 3                              |
| ## 11 | 4                | 0                  | 6                              |
| ## 12 | 1                | 0                  | 3                              |
| ## 13 | 4                | 0                  | 2                              |
| ## 14 | 1                | 0                  | 0                              |
| ## 15 | 0                | 0                  | 4                              |
| ## 16 | 4                | 0                  | 4                              |
| ## 17 | 1                | 0                  | 2                              |
| ## 18 | 5                | 0                  | 0                              |
| ## 19 | 4                | 0                  | 1                              |
| ## 20 | 0                | 0                  | 2                              |
| ## 21 | 4                | 0                  | 5                              |
| ## 22 | 2                | 0                  | 2                              |
| ## 23 | 6                | 0                  | 2                              |
| ## 24 | 0                | 0                  | 5                              |
| ## 25 | 2                | 0                  | 4                              |
| ## 26 | 1                | 1                  | 7                              |
| ## 27 | 3                | 1                  | 3                              |
| ## 28 | 3                | 0                  | 2                              |
| ## 29 | 1                | 0                  | 2                              |
| ## 30 | 5                | 0                  | 2                              |
| ## 31 | 2                | 0                  | 4                              |
| ## 32 | 3                | 3                  | 3                              |
| ## 33 | 4                | 0                  | 3                              |
| ## 34 | 3                | 2                  | 3                              |
| ## 35 | 6                | 6                  | 1                              |
| ## 36 | 2                | 0                  | 5                              |
| ## 37 | 2                | 2                  | 0                              |
| ## 38 | 2                | 0                  | 3                              |
| ## 39 | 2                | 0                  | 1                              |

|       |                      |                  |                   |                 |
|-------|----------------------|------------------|-------------------|-----------------|
| ## 40 | 1                    | 4                | 0                 |                 |
| ## 41 | 2                    | 1                | 2                 |                 |
| ## 42 | 2                    | 0                | 4                 |                 |
| ## 43 | 1                    | 1                | 4                 |                 |
| ## 44 | 1                    | 0                | 5                 |                 |
| ## 45 | 0                    | 0                | 7                 |                 |
| ## 46 | 0                    | 0                | 0                 |                 |
| ## 47 | 1                    | 2                | 1                 |                 |
| ## 48 | 1                    | 1                | 4                 |                 |
| ## 49 | 1                    | 0                | 5                 |                 |
| ## 50 | 0                    | 1                | 2                 |                 |
| ##    | Margaritaria.nobilis | Marila.laxiflora | Maytenus.schippii | Miconia.affinis |
| ## 1  | 0                    | 1                | 2                 | 0               |
| ## 2  | 0                    | 0                | 0                 | 0               |
| ## 3  | 0                    | 0                | 0                 | 0               |
| ## 4  | 0                    | 0                | 1                 | 1               |
| ## 5  | 1                    | 0                | 0                 | 0               |
| ## 6  | 0                    | 0                | 1                 | 0               |
| ## 7  | 0                    | 0                | 2                 | 0               |
| ## 8  | 0                    | 0                | 0                 | 1               |
| ## 9  | 0                    | 0                | 0                 | 0               |
| ## 10 | 0                    | 0                | 1                 | 1               |
| ## 11 | 0                    | 0                | 1                 | 0               |
| ## 12 | 0                    | 0                | 0                 | 0               |
| ## 13 | 0                    | 0                | 0                 | 0               |
| ## 14 | 0                    | 0                | 0                 | 1               |
| ## 15 | 0                    | 0                | 0                 | 0               |
| ## 16 | 0                    | 0                | 0                 | 0               |
| ## 17 | 0                    | 0                | 0                 | 1               |
| ## 18 | 0                    | 0                | 1                 | 0               |
| ## 19 | 0                    | 0                | 1                 | 0               |
| ## 20 | 0                    | 0                | 1                 | 1               |
| ## 21 | 0                    | 0                | 1                 | 0               |
| ## 22 | 0                    | 0                | 0                 | 0               |
| ## 23 | 0                    | 0                | 0                 | 0               |
| ## 24 | 0                    | 0                | 0                 | 0               |
| ## 25 | 0                    | 0                | 0                 | 0               |
| ## 26 | 0                    | 0                | 1                 | 0               |
| ## 27 | 0                    | 0                | 0                 | 0               |
| ## 28 | 0                    | 0                | 1                 | 0               |
| ## 29 | 0                    | 0                | 0                 | 0               |
| ## 30 | 0                    | 0                | 0                 | 0               |
| ## 31 | 0                    | 1                | 0                 | 0               |
| ## 32 | 0                    | 0                | 1                 | 0               |
| ## 33 | 0                    | 0                | 0                 | 0               |
| ## 34 | 0                    | 0                | 0                 | 1               |
| ## 35 | 0                    | 0                | 0                 | 0               |
| ## 36 | 0                    | 0                | 0                 | 0               |
| ## 37 | 0                    | 0                | 0                 | 0               |
| ## 38 | 0                    | 0                | 0                 | 0               |
| ## 39 | 0                    | 0                | 0                 | 1               |
| ## 40 | 0                    | 0                | 0                 | 0               |
| ## 41 | 0                    | 0                | 2                 | 0               |
| ## 42 | 0                    | 0                | 0                 | 0               |

|       |                  |               |                     |                      |
|-------|------------------|---------------|---------------------|----------------------|
| ## 43 | 0                | 0             | 1                   | 0                    |
| ## 44 | 0                | 0             | 1                   | 0                    |
| ## 45 | 0                | 0             | 0                   | 0                    |
| ## 46 | 0                | 0             | 0                   | 0                    |
| ## 47 | 0                | 0             | 0                   | 0                    |
| ## 48 | 1                | 0             | 0                   | 0                    |
| ## 49 | 0                | 0             | 1                   | 0                    |
| ## 50 | 0                | 8             | 1                   | 0                    |
| ##    | Miconia.argentea | Miconia.elata | Miconia.hondurensis | Mosannonna.garwoodii |
| ## 1  | 2                | 0             | 0                   | 1                    |
| ## 2  | 0                | 0             | 0                   | 0                    |
| ## 3  | 1                | 0             | 0                   | 0                    |
| ## 4  | 0                | 0             | 0                   | 0                    |
| ## 5  | 1                | 0             | 0                   | 1                    |
| ## 6  | 0                | 0             | 0                   | 1                    |
| ## 7  | 1                | 0             | 0                   | 1                    |
| ## 8  | 4                | 0             | 0                   | 0                    |
| ## 9  | 0                | 0             | 0                   | 0                    |
| ## 10 | 0                | 0             | 0                   | 1                    |
| ## 11 | 0                | 0             | 0                   | 0                    |
| ## 12 | 0                | 0             | 0                   | 0                    |
| ## 13 | 5                | 0             | 0                   | 0                    |
| ## 14 | 3                | 0             | 1                   | 0                    |
| ## 15 | 0                | 0             | 1                   | 0                    |
| ## 16 | 0                | 0             | 0                   | 0                    |
| ## 17 | 3                | 0             | 0                   | 2                    |
| ## 18 | 4                | 0             | 0                   | 1                    |
| ## 19 | 0                | 1             | 2                   | 0                    |
| ## 20 | 10               | 0             | 1                   | 1                    |
| ## 21 | 0                | 0             | 0                   | 0                    |
| ## 22 | 0                | 0             | 2                   | 1                    |
| ## 23 | 0                | 0             | 0                   | 0                    |
| ## 24 | 6                | 0             | 0                   | 0                    |
| ## 25 | 0                | 0             | 0                   | 0                    |
| ## 26 | 0                | 0             | 0                   | 0                    |
| ## 27 | 2                | 0             | 0                   | 0                    |
| ## 28 | 0                | 0             | 0                   | 0                    |
| ## 29 | 2                | 0             | 0                   | 0                    |
| ## 30 | 8                | 0             | 0                   | 0                    |
| ## 31 | 0                | 0             | 0                   | 1                    |
| ## 32 | 1                | 0             | 0                   | 0                    |
| ## 33 | 0                | 0             | 0                   | 0                    |
| ## 34 | 3                | 0             | 0                   | 0                    |
| ## 35 | 3                | 0             | 0                   | 0                    |
| ## 36 | 0                | 0             | 0                   | 0                    |
| ## 37 | 2                | 0             | 0                   | 0                    |
| ## 38 | 1                | 0             | 0                   | 0                    |
| ## 39 | 1                | 0             | 0                   | 0                    |
| ## 40 | 0                | 0             | 0                   | 0                    |
| ## 41 | 1                | 0             | 0                   | 0                    |
| ## 42 | 0                | 0             | 0                   | 0                    |
| ## 43 | 0                | 0             | 0                   | 0                    |
| ## 44 | 0                | 0             | 0                   | 1                    |
| ## 45 | 0                | 0             | 0                   | 1                    |

|       |                   |                        |                      |   |
|-------|-------------------|------------------------|----------------------|---|
| ## 46 | 3                 | 0                      | 0                    | 1 |
| ## 47 | 3                 | 0                      | 0                    | 1 |
| ## 48 | 0                 | 0                      | 0                    | 0 |
| ## 49 | 0                 | 0                      | 0                    | 0 |
| ## 50 | 0                 | 0                      | 0                    | 0 |
| ##    | Myrcia.gatunensis | Myrospermum.frutescens | Nectandra.cissiflora |   |
| ## 1  | 1                 | 0                      | 0                    |   |
| ## 2  | 0                 | 0                      | 1                    |   |
| ## 3  | 0                 | 0                      | 2                    |   |
| ## 4  | 0                 | 0                      | 2                    |   |
| ## 5  | 0                 | 0                      | 2                    |   |
| ## 6  | 0                 | 2                      | 0                    |   |
| ## 7  | 0                 | 0                      | 1                    |   |
| ## 8  | 0                 | 0                      | 2                    |   |
| ## 9  | 1                 | 0                      | 3                    |   |
| ## 10 | 0                 | 0                      | 5                    |   |
| ## 11 | 0                 | 0                      | 3                    |   |
| ## 12 | 0                 | 0                      | 0                    |   |
| ## 13 | 0                 | 0                      | 0                    |   |
| ## 14 | 1                 | 0                      | 1                    |   |
| ## 15 | 0                 | 0                      | 0                    |   |
| ## 16 | 0                 | 0                      | 0                    |   |
| ## 17 | 0                 | 0                      | 1                    |   |
| ## 18 | 0                 | 0                      | 0                    |   |
| ## 19 | 1                 | 0                      | 0                    |   |
| ## 20 | 0                 | 0                      | 2                    |   |
| ## 21 | 0                 | 0                      | 1                    |   |
| ## 22 | 0                 | 0                      | 0                    |   |
| ## 23 | 0                 | 0                      | 0                    |   |
| ## 24 | 0                 | 1                      | 0                    |   |
| ## 25 | 0                 | 0                      | 0                    |   |
| ## 26 | 0                 | 0                      | 0                    |   |
| ## 27 | 0                 | 0                      | 0                    |   |
| ## 28 | 0                 | 0                      | 1                    |   |
| ## 29 | 0                 | 0                      | 0                    |   |
| ## 30 | 0                 | 0                      | 0                    |   |
| ## 31 | 0                 | 1                      | 0                    |   |
| ## 32 | 0                 | 0                      | 0                    |   |
| ## 33 | 0                 | 0                      | 1                    |   |
| ## 34 | 0                 | 0                      | 0                    |   |
| ## 35 | 0                 | 0                      | 0                    |   |
| ## 36 | 0                 | 0                      | 0                    |   |
| ## 37 | 0                 | 0                      | 0                    |   |
| ## 38 | 0                 | 0                      | 0                    |   |
| ## 39 | 0                 | 0                      | 0                    |   |
| ## 40 | 0                 | 0                      | 0                    |   |
| ## 41 | 0                 | 0                      | 1                    |   |
| ## 42 | 0                 | 0                      | 3                    |   |
| ## 43 | 0                 | 0                      | 1                    |   |
| ## 44 | 0                 | 0                      | 0                    |   |
| ## 45 | 1                 | 0                      | 0                    |   |
| ## 46 | 0                 | 3                      | 0                    |   |
| ## 47 | 0                 | 0                      | 0                    |   |
| ## 48 | 0                 | 0                      | 0                    |   |

|       |                   |                    |                                  |
|-------|-------------------|--------------------|----------------------------------|
| ## 49 | 0                 | 0                  | 0                                |
| ## 50 | 0                 | 0                  | 0                                |
| ##    | Nectandra.lineata | Nectandra.purpurea | Ochroma.pyramidale Ocotea.cernua |
| ## 1  | 0                 | 1                  | 1 0                              |
| ## 2  | 0                 | 0                  | 0 0                              |
| ## 3  | 0                 | 0                  | 0 1                              |
| ## 4  | 0                 | 0                  | 0 1                              |
| ## 5  | 0                 | 0                  | 0 0                              |
| ## 6  | 0                 | 1                  | 0 0                              |
| ## 7  | 0                 | 0                  | 0 1                              |
| ## 8  | 0                 | 0                  | 3 0                              |
| ## 9  | 0                 | 0                  | 0 1                              |
| ## 10 | 0                 | 0                  | 0 0                              |
| ## 11 | 0                 | 0                  | 0 0                              |
| ## 12 | 1                 | 0                  | 0 2                              |
| ## 13 | 0                 | 0                  | 0 5                              |
| ## 14 | 0                 | 0                  | 0 1                              |
| ## 15 | 0                 | 0                  | 1 2                              |
| ## 16 | 1                 | 0                  | 0 0                              |
| ## 17 | 0                 | 0                  | 0 0                              |
| ## 18 | 1                 | 0                  | 0 1                              |
| ## 19 | 0                 | 0                  | 0 2                              |
| ## 20 | 1                 | 0                  | 0 1                              |
| ## 21 | 1                 | 0                  | 0 0                              |
| ## 22 | 0                 | 0                  | 0 0                              |
| ## 23 | 0                 | 0                  | 0 1                              |
| ## 24 | 1                 | 0                  | 0 1                              |
| ## 25 | 0                 | 0                  | 0 1                              |
| ## 26 | 0                 | 0                  | 0 0                              |
| ## 27 | 0                 | 0                  | 0 0                              |
| ## 28 | 0                 | 0                  | 0 0                              |
| ## 29 | 0                 | 0                  | 0 0                              |
| ## 30 | 0                 | 0                  | 0 1                              |
| ## 31 | 0                 | 0                  | 0 0                              |
| ## 32 | 0                 | 0                  | 0 0                              |
| ## 33 | 0                 | 0                  | 0 0                              |
| ## 34 | 0                 | 0                  | 0 2                              |
| ## 35 | 0                 | 0                  | 0 1                              |
| ## 36 | 1                 | 0                  | 0 0                              |
| ## 37 | 0                 | 0                  | 0 0                              |
| ## 38 | 0                 | 1                  | 0 0                              |
| ## 39 | 2                 | 0                  | 0 1                              |
| ## 40 | 0                 | 0                  | 0 0                              |
| ## 41 | 0                 | 0                  | 0 3                              |
| ## 42 | 0                 | 0                  | 0 0                              |
| ## 43 | 0                 | 0                  | 0 0                              |
| ## 44 | 0                 | 0                  | 0 0                              |
| ## 45 | 0                 | 0                  | 0 0                              |
| ## 46 | 0                 | 1                  | 0 0                              |
| ## 47 | 0                 | 0                  | 0 0                              |
| ## 48 | 0                 | 0                  | 0 0                              |
| ## 49 | 0                 | 0                  | 0 0                              |
| ## 50 | 1                 | 0                  | 0 0                              |
| ##    | Ocotea.oblonga    | Ocotea.puberula    | Ocotea.whitei Oenocarpus.mapora  |

|       |                   |                  |                    |                 |
|-------|-------------------|------------------|--------------------|-----------------|
| ## 1  | 0                 | 0                | 1                  | 22              |
| ## 2  | 0                 | 0                | 0                  | 21              |
| ## 3  | 1                 | 0                | 2                  | 14              |
| ## 4  | 2                 | 2                | 3                  | 23              |
| ## 5  | 0                 | 0                | 16                 | 17              |
| ## 6  | 0                 | 1                | 3                  | 19              |
| ## 7  | 0                 | 0                | 0                  | 20              |
| ## 8  | 0                 | 2                | 1                  | 20              |
| ## 9  | 0                 | 0                | 1                  | 18              |
| ## 10 | 1                 | 2                | 3                  | 20              |
| ## 11 | 3                 | 1                | 3                  | 17              |
| ## 12 | 0                 | 0                | 0                  | 19              |
| ## 13 | 0                 | 3                | 0                  | 17              |
| ## 14 | 1                 | 0                | 1                  | 22              |
| ## 15 | 1                 | 3                | 1                  | 11              |
| ## 16 | 0                 | 0                | 2                  | 15              |
| ## 17 | 0                 | 0                | 0                  | 31              |
| ## 18 | 0                 | 0                | 0                  | 24              |
| ## 19 | 0                 | 1                | 1                  | 24              |
| ## 20 | 0                 | 2                | 5                  | 19              |
| ## 21 | 2                 | 0                | 12                 | 11              |
| ## 22 | 1                 | 0                | 0                  | 24              |
| ## 23 | 0                 | 0                | 0                  | 22              |
| ## 24 | 0                 | 1                | 2                  | 24              |
| ## 25 | 1                 | 1                | 1                  | 14              |
| ## 26 | 0                 | 0                | 15                 | 6               |
| ## 27 | 3                 | 0                | 1                  | 11              |
| ## 28 | 1                 | 0                | 0                  | 10              |
| ## 29 | 0                 | 1                | 0                  | 16              |
| ## 30 | 1                 | 0                | 0                  | 12              |
| ## 31 | 0                 | 0                | 29                 | 7               |
| ## 32 | 2                 | 0                | 4                  | 5               |
| ## 33 | 0                 | 0                | 2                  | 10              |
| ## 34 | 0                 | 0                | 0                  | 9               |
| ## 35 | 1                 | 0                | 0                  | 4               |
| ## 36 | 2                 | 0                | 11                 | 24              |
| ## 37 | 0                 | 0                | 8                  | 15              |
| ## 38 | 2                 | 0                | 0                  | 11              |
| ## 39 | 1                 | 0                | 0                  | 4               |
| ## 40 | 1                 | 0                | 0                  | 2               |
| ## 41 | 2                 | 0                | 2                  | 11              |
| ## 42 | 1                 | 0                | 7                  | 19              |
| ## 43 | 1                 | 0                | 7                  | 11              |
| ## 44 | 1                 | 0                | 5                  | 10              |
| ## 45 | 1                 | 1                | 13                 | 8               |
| ## 46 | 0                 | 0                | 0                  | 36              |
| ## 47 | 1                 | 0                | 1                  | 28              |
| ## 48 | 1                 | 1                | 4                  | 15              |
| ## 49 | 1                 | 0                | 8                  | 4               |
| ## 50 | 0                 | 0                | 9                  | 12              |
| ##    | Ormosia.amazonica | Ormosia.coccinea | Ormosia.macrocalyx | Pachira.quinata |
| ## 1  | 0                 | 0                | 0                  | 0               |
| ## 2  | 0                 | 0                | 0                  | 0               |
| ## 3  | 0                 | 0                | 0                  | 0               |



|       |                  |                     |                        |   |
|-------|------------------|---------------------|------------------------|---|
| ## 4  | 0                | 0                   | 0                      | 0 |
| ## 5  | 0                | 0                   | 0                      | 0 |
| ## 6  | 0                | 0                   | 0                      | 0 |
| ## 7  | 0                | 0                   | 0                      | 1 |
| ## 8  | 0                | 0                   | 0                      | 0 |
| ## 9  | 0                | 0                   | 0                      | 0 |
| ## 10 | 0                | 0                   | 0                      | 0 |
| ## 11 | 0                | 0                   | 0                      | 0 |
| ## 12 | 0                | 0                   | 1                      | 0 |
| ## 13 | 0                | 0                   | 0                      | 0 |
| ## 14 | 0                | 0                   | 0                      | 0 |
| ## 15 | 0                | 0                   | 0                      | 0 |
| ## 16 | 0                | 0                   | 0                      | 0 |
| ## 17 | 0                | 0                   | 0                      | 0 |
| ## 18 | 0                | 0                   | 0                      | 0 |
| ## 19 | 0                | 1                   | 0                      | 0 |
| ## 20 | 0                | 0                   | 0                      | 0 |
| ## 21 | 0                | 0                   | 0                      | 0 |
| ## 22 | 0                | 0                   | 0                      | 0 |
| ## 23 | 0                | 0                   | 0                      | 0 |
| ## 24 | 0                | 0                   | 0                      | 0 |
| ## 25 | 0                | 0                   | 0                      | 0 |
| ## 26 | 0                | 0                   | 0                      | 0 |
| ## 27 | 0                | 0                   | 1                      | 0 |
| ## 28 | 0                | 0                   | 0                      | 0 |
| ## 29 | 1                | 0                   | 0                      | 0 |
| ## 30 | 0                | 0                   | 0                      | 0 |
| ## 31 | 0                | 0                   | 0                      | 0 |
| ## 32 | 0                | 0                   | 0                      | 0 |
| ## 33 | 0                | 0                   | 1                      | 0 |
| ## 34 | 0                | 1                   | 0                      | 0 |
| ## 35 | 0                | 1                   | 0                      | 0 |
| ## 36 | 0                | 0                   | 0                      | 0 |
| ## 37 | 0                | 0                   | 0                      | 0 |
| ## 38 | 0                | 0                   | 0                      | 0 |
| ## 39 | 0                | 1                   | 0                      | 0 |
| ## 40 | 0                | 0                   | 0                      | 0 |
| ## 41 | 0                | 0                   | 0                      | 0 |
| ## 42 | 0                | 0                   | 0                      | 0 |
| ## 43 | 0                | 0                   | 0                      | 0 |
| ## 44 | 0                | 1                   | 0                      | 0 |
| ## 45 | 0                | 0                   | 0                      | 0 |
| ## 46 | 0                | 0                   | 0                      | 0 |
| ## 47 | 0                | 0                   | 0                      | 0 |
| ## 48 | 0                | 0                   | 0                      | 0 |
| ## 49 | 0                | 0                   | 0                      | 0 |
| ## 50 | 0                | 0                   | 0                      | 0 |
| ##    | Pachira.sessilis | Perebea.xanthochyma | Cinnamomum.triplinerve |   |
| ## 1  | 0                | 0                   | 0                      |   |
| ## 2  | 0                | 1                   | 0                      |   |
| ## 3  | 0                | 0                   | 1                      |   |
| ## 4  | 0                | 0                   | 0                      |   |
| ## 5  | 0                | 1                   | 1                      |   |
| ## 6  | 0                | 0                   | 0                      |   |

|       |                     |                   |                       |
|-------|---------------------|-------------------|-----------------------|
| ## 7  | 0                   | 0                 | 2                     |
| ## 8  | 0                   | 0                 | 0                     |
| ## 9  | 0                   | 8                 | 1                     |
| ## 10 | 0                   | 6                 | 0                     |
| ## 11 | 0                   | 0                 | 0                     |
| ## 12 | 0                   | 0                 | 1                     |
| ## 13 | 0                   | 0                 | 0                     |
| ## 14 | 0                   | 2                 | 1                     |
| ## 15 | 0                   | 1                 | 0                     |
| ## 16 | 0                   | 0                 | 1                     |
| ## 17 | 0                   | 0                 | 0                     |
| ## 18 | 0                   | 0                 | 0                     |
| ## 19 | 0                   | 0                 | 0                     |
| ## 20 | 0                   | 1                 | 0                     |
| ## 21 | 0                   | 0                 | 0                     |
| ## 22 | 0                   | 0                 | 1                     |
| ## 23 | 0                   | 0                 | 1                     |
| ## 24 | 0                   | 0                 | 2                     |
| ## 25 | 0                   | 0                 | 1                     |
| ## 26 | 0                   | 0                 | 0                     |
| ## 27 | 0                   | 0                 | 0                     |
| ## 28 | 0                   | 0                 | 0                     |
| ## 29 | 0                   | 0                 | 0                     |
| ## 30 | 9                   | 0                 | 0                     |
| ## 31 | 0                   | 0                 | 0                     |
| ## 32 | 0                   | 0                 | 0                     |
| ## 33 | 0                   | 0                 | 0                     |
| ## 34 | 0                   | 0                 | 0                     |
| ## 35 | 0                   | 0                 | 1                     |
| ## 36 | 0                   | 1                 | 1                     |
| ## 37 | 0                   | 0                 | 0                     |
| ## 38 | 0                   | 0                 | 0                     |
| ## 39 | 0                   | 0                 | 0                     |
| ## 40 | 0                   | 0                 | 0                     |
| ## 41 | 0                   | 0                 | 1                     |
| ## 42 | 0                   | 0                 | 0                     |
| ## 43 | 0                   | 0                 | 0                     |
| ## 44 | 0                   | 0                 | 0                     |
| ## 45 | 0                   | 0                 | 0                     |
| ## 46 | 0                   | 0                 | 0                     |
| ## 47 | 0                   | 0                 | 0                     |
| ## 48 | 0                   | 0                 | 0                     |
| ## 49 | 0                   | 0                 | 0                     |
| ## 50 | 0                   | 0                 | 0                     |
| ##    | Picramnia.latifolia | Piper.reticulatum | Platymiscium.pinnatum |
| ## 1  | 0                   | 0                 | 3                     |
| ## 2  | 0                   | 0                 | 3                     |
| ## 3  | 1                   | 0                 | 5                     |
| ## 4  | 0                   | 0                 | 1                     |
| ## 5  | 0                   | 2                 | 1                     |
| ## 6  | 0                   | 0                 | 1                     |
| ## 7  | 0                   | 0                 | 6                     |
| ## 8  | 1                   | 0                 | 0                     |
| ## 9  | 0                   | 0                 | 2                     |

|       |                     |                      |                  |                  |
|-------|---------------------|----------------------|------------------|------------------|
| ## 10 | 0                   | 0                    | 0                |                  |
| ## 11 | 1                   | 1                    | 0                |                  |
| ## 12 | 0                   | 0                    | 0                |                  |
| ## 13 | 1                   | 0                    | 2                |                  |
| ## 14 | 1                   | 0                    | 2                |                  |
| ## 15 | 0                   | 0                    | 1                |                  |
| ## 16 | 0                   | 0                    | 1                |                  |
| ## 17 | 0                   | 1                    | 2                |                  |
| ## 18 | 0                   | 0                    | 1                |                  |
| ## 19 | 0                   | 0                    | 2                |                  |
| ## 20 | 1                   | 0                    | 0                |                  |
| ## 21 | 0                   | 0                    | 0                |                  |
| ## 22 | 1                   | 0                    | 0                |                  |
| ## 23 | 0                   | 0                    | 1                |                  |
| ## 24 | 0                   | 0                    | 2                |                  |
| ## 25 | 1                   | 0                    | 3                |                  |
| ## 26 | 6                   | 1                    | 1                |                  |
| ## 27 | 3                   | 1                    | 0                |                  |
| ## 28 | 0                   | 0                    | 4                |                  |
| ## 29 | 0                   | 0                    | 0                |                  |
| ## 30 | 0                   | 0                    | 0                |                  |
| ## 31 | 2                   | 0                    | 0                |                  |
| ## 32 | 2                   | 0                    | 2                |                  |
| ## 33 | 0                   | 0                    | 0                |                  |
| ## 34 | 2                   | 1                    | 2                |                  |
| ## 35 | 1                   | 0                    | 1                |                  |
| ## 36 | 2                   | 1                    | 0                |                  |
| ## 37 | 2                   | 0                    | 2                |                  |
| ## 38 | 1                   | 0                    | 1                |                  |
| ## 39 | 0                   | 0                    | 0                |                  |
| ## 40 | 0                   | 0                    | 0                |                  |
| ## 41 | 5                   | 0                    | 0                |                  |
| ## 42 | 1                   | 0                    | 2                |                  |
| ## 43 | 0                   | 0                    | 1                |                  |
| ## 44 | 1                   | 0                    | 1                |                  |
| ## 45 | 1                   | 0                    | 2                |                  |
| ## 46 | 2                   | 0                    | 2                |                  |
| ## 47 | 0                   | 0                    | 1                |                  |
| ## 48 | 4                   | 1                    | 0                |                  |
| ## 49 | 1                   | 0                    | 0                |                  |
| ## 50 | 1                   | 0                    | 0                |                  |
| ##    | Platypodium.elegans | Posoqueria.latifolia | Poulsenia.armata | Pourouma.bicolor |
| ## 1  | 2                   | 0                    | 24               | 5                |
| ## 2  | 1                   | 1                    | 16               | 3                |
| ## 3  | 3                   | 0                    | 28               | 0                |
| ## 4  | 0                   | 0                    | 15               | 0                |
| ## 5  | 0                   | 0                    | 25               | 1                |
| ## 6  | 2                   | 0                    | 15               | 0                |
| ## 7  | 3                   | 0                    | 8                | 0                |
| ## 8  | 3                   | 0                    | 13               | 1                |
| ## 9  | 1                   | 0                    | 5                | 1                |
| ## 10 | 0                   | 0                    | 24               | 0                |
| ## 11 | 1                   | 0                    | 22               | 1                |
| ## 12 | 2                   | 0                    | 8                | 0                |

|       |                    |                     |                    |                   |
|-------|--------------------|---------------------|--------------------|-------------------|
| ## 13 | 2                  | 0                   | 0                  | 0                 |
| ## 14 | 1                  | 0                   | 13                 | 0                 |
| ## 15 | 2                  | 0                   | 16                 | 0                 |
| ## 16 | 1                  | 0                   | 32                 | 0                 |
| ## 17 | 0                  | 1                   | 2                  | 0                 |
| ## 18 | 1                  | 0                   | 0                  | 0                 |
| ## 19 | 1                  | 0                   | 4                  | 0                 |
| ## 20 | 1                  | 0                   | 15                 | 0                 |
| ## 21 | 0                  | 0                   | 44                 | 0                 |
| ## 22 | 0                  | 0                   | 5                  | 0                 |
| ## 23 | 1                  | 3                   | 1                  | 0                 |
| ## 24 | 0                  | 0                   | 6                  | 0                 |
| ## 25 | 1                  | 1                   | 4                  | 0                 |
| ## 26 | 2                  | 0                   | 22                 | 0                 |
| ## 27 | 1                  | 1                   | 9                  | 0                 |
| ## 28 | 2                  | 0                   | 1                  | 0                 |
| ## 29 | 0                  | 0                   | 2                  | 0                 |
| ## 30 | 1                  | 0                   | 8                  | 0                 |
| ## 31 | 0                  | 0                   | 24                 | 0                 |
| ## 32 | 1                  | 0                   | 2                  | 0                 |
| ## 33 | 0                  | 0                   | 4                  | 0                 |
| ## 34 | 0                  | 0                   | 1                  | 0                 |
| ## 35 | 1                  | 0                   | 0                  | 0                 |
| ## 36 | 1                  | 0                   | 14                 | 0                 |
| ## 37 | 0                  | 0                   | 6                  | 0                 |
| ## 38 | 0                  | 0                   | 1                  | 0                 |
| ## 39 | 0                  | 0                   | 1                  | 0                 |
| ## 40 | 2                  | 0                   | 2                  | 0                 |
| ## 41 | 0                  | 1                   | 11                 | 0                 |
| ## 42 | 0                  | 0                   | 26                 | 0                 |
| ## 43 | 0                  | 0                   | 55                 | 0                 |
| ## 44 | 1                  | 0                   | 55                 | 0                 |
| ## 45 | 0                  | 1                   | 57                 | 1                 |
| ## 46 | 0                  | 3                   | 0                  | 0                 |
| ## 47 | 2                  | 0                   | 4                  | 0                 |
| ## 48 | 0                  | 3                   | 23                 | 0                 |
| ## 49 | 0                  | 0                   | 39                 | 0                 |
| ## 50 | 0                  | 0                   | 43                 | 0                 |
| ##    | Pouteria.fossicola | Pouteria.reticulata | Pouteria.stipitata | Prioria.copaifera |
| ## 1  | 0                  | 5                   | 0                  | 13                |
| ## 2  | 0                  | 7                   | 0                  | 12                |
| ## 3  | 0                  | 3                   | 1                  | 12                |
| ## 4  | 0                  | 6                   | 0                  | 5                 |
| ## 5  | 0                  | 5                   | 0                  | 3                 |
| ## 6  | 0                  | 4                   | 0                  | 26                |
| ## 7  | 0                  | 4                   | 0                  | 18                |
| ## 8  | 0                  | 4                   | 0                  | 5                 |
| ## 9  | 0                  | 3                   | 0                  | 1                 |
| ## 10 | 0                  | 0                   | 1                  | 2                 |
| ## 11 | 0                  | 5                   | 1                  | 26                |
| ## 12 | 0                  | 4                   | 0                  | 21                |
| ## 13 | 0                  | 5                   | 0                  | 7                 |
| ## 14 | 0                  | 5                   | 1                  | 3                 |
| ## 15 | 0                  | 4                   | 0                  | 0                 |

|       |                      |                   |                     |    |
|-------|----------------------|-------------------|---------------------|----|
| ## 16 | 0                    | 3                 | 1                   | 18 |
| ## 17 | 0                    | 5                 | 6                   | 25 |
| ## 18 | 0                    | 17                | 1                   | 5  |
| ## 19 | 0                    | 10                | 5                   | 5  |
| ## 20 | 0                    | 1                 | 2                   | 0  |
| ## 21 | 1                    | 1                 | 0                   | 14 |
| ## 22 | 0                    | 2                 | 1                   | 17 |
| ## 23 | 0                    | 6                 | 0                   | 1  |
| ## 24 | 1                    | 4                 | 0                   | 4  |
| ## 25 | 0                    | 9                 | 0                   | 1  |
| ## 26 | 0                    | 3                 | 0                   | 11 |
| ## 27 | 0                    | 2                 | 1                   | 11 |
| ## 28 | 0                    | 2                 | 0                   | 4  |
| ## 29 | 0                    | 2                 | 1                   | 14 |
| ## 30 | 0                    | 3                 | 1                   | 9  |
| ## 31 | 0                    | 3                 | 0                   | 3  |
| ## 32 | 0                    | 4                 | 0                   | 1  |
| ## 33 | 0                    | 3                 | 1                   | 5  |
| ## 34 | 0                    | 3                 | 0                   | 14 |
| ## 35 | 0                    | 4                 | 0                   | 7  |
| ## 36 | 0                    | 3                 | 1                   | 0  |
| ## 37 | 0                    | 2                 | 0                   | 1  |
| ## 38 | 0                    | 4                 | 0                   | 5  |
| ## 39 | 0                    | 4                 | 0                   | 6  |
| ## 40 | 0                    | 5                 | 0                   | 1  |
| ## 41 | 0                    | 3                 | 0                   | 0  |
| ## 42 | 0                    | 4                 | 0                   | 1  |
| ## 43 | 0                    | 4                 | 0                   | 1  |
| ## 44 | 0                    | 2                 | 0                   | 1  |
| ## 45 | 0                    | 2                 | 1                   | 0  |
| ## 46 | 0                    | 4                 | 3                   | 3  |
| ## 47 | 0                    | 7                 | 1                   | 1  |
| ## 48 | 0                    | 5                 | 0                   | 2  |
| ## 49 | 0                    | 2                 | 1                   | 0  |
| ## 50 | 0                    | 1                 | 0                   | 0  |
| ##    | Protium.costaricense | Protium.panamense | Protium.tenuifolium |    |
| ## 1  | 5                    | 2                 | 11                  |    |
| ## 2  | 4                    | 0                 | 8                   |    |
| ## 3  | 1                    | 2                 | 3                   |    |
| ## 4  | 3                    | 3                 | 9                   |    |
| ## 5  | 7                    | 2                 | 3                   |    |
| ## 6  | 1                    | 1                 | 2                   |    |
| ## 7  | 0                    | 0                 | 6                   |    |
| ## 8  | 0                    | 3                 | 7                   |    |
| ## 9  | 4                    | 0                 | 4                   |    |
| ## 10 | 4                    | 1                 | 6                   |    |
| ## 11 | 2                    | 0                 | 4                   |    |
| ## 12 | 0                    | 0                 | 5                   |    |
| ## 13 | 0                    | 0                 | 4                   |    |
| ## 14 | 3                    | 4                 | 5                   |    |
| ## 15 | 4                    | 0                 | 4                   |    |
| ## 16 | 1                    | 0                 | 2                   |    |
| ## 17 | 1                    | 1                 | 2                   |    |
| ## 18 | 0                    | 0                 | 1                   |    |

|       |                         |                             |                    |
|-------|-------------------------|-----------------------------|--------------------|
| ## 19 | 0                       | 2                           | 5                  |
| ## 20 | 7                       | 0                           | 9                  |
| ## 21 | 2                       | 1                           | 7                  |
| ## 22 | 0                       | 2                           | 4                  |
| ## 23 | 0                       | 2                           | 3                  |
| ## 24 | 0                       | 1                           | 7                  |
| ## 25 | 6                       | 4                           | 7                  |
| ## 26 | 4                       | 0                           | 6                  |
| ## 27 | 2                       | 1                           | 4                  |
| ## 28 | 3                       | 1                           | 2                  |
| ## 29 | 1                       | 1                           | 6                  |
| ## 30 | 4                       | 2                           | 9                  |
| ## 31 | 3                       | 0                           | 9                  |
| ## 32 | 2                       | 1                           | 3                  |
| ## 33 | 1                       | 0                           | 8                  |
| ## 34 | 5                       | 3                           | 8                  |
| ## 35 | 1                       | 0                           | 1                  |
| ## 36 | 3                       | 0                           | 3                  |
| ## 37 | 4                       | 0                           | 8                  |
| ## 38 | 1                       | 0                           | 10                 |
| ## 39 | 3                       | 1                           | 10                 |
| ## 40 | 2                       | 0                           | 7                  |
| ## 41 | 0                       | 1                           | 6                  |
| ## 42 | 3                       | 2                           | 12                 |
| ## 43 | 1                       | 0                           | 6                  |
| ## 44 | 3                       | 2                           | 8                  |
| ## 45 | 1                       | 3                           | 11                 |
| ## 46 | 0                       | 0                           | 18                 |
| ## 47 | 1                       | 1                           | 27                 |
| ## 48 | 1                       | 0                           | 26                 |
| ## 49 | 2                       | 0                           | 22                 |
| ## 50 | 5                       | 0                           | 23                 |
| ##    | Pseudobombax.septenatum | Psidium.friedrichsthalianum | Psychotria.grandis |
| ## 1  | 0                       | 0                           | 0                  |
| ## 2  | 0                       | 0                           | 0                  |
| ## 3  | 0                       | 0                           | 0                  |
| ## 4  | 0                       | 0                           | 0                  |
| ## 5  | 0                       | 0                           | 0                  |
| ## 6  | 0                       | 0                           | 0                  |
| ## 7  | 0                       | 0                           | 0                  |
| ## 8  | 0                       | 0                           | 0                  |
| ## 9  | 0                       | 0                           | 0                  |
| ## 10 | 0                       | 0                           | 0                  |
| ## 11 | 0                       | 0                           | 0                  |
| ## 12 | 0                       | 0                           | 0                  |
| ## 13 | 0                       | 1                           | 0                  |
| ## 14 | 0                       | 0                           | 0                  |
| ## 15 | 0                       | 0                           | 0                  |
| ## 16 | 0                       | 0                           | 0                  |
| ## 17 | 0                       | 0                           | 0                  |
| ## 18 | 0                       | 0                           | 0                  |
| ## 19 | 0                       | 0                           | 0                  |
| ## 20 | 0                       | 0                           | 0                  |
| ## 21 | 1                       | 0                           | 0                  |

|       |                    |                        |                             |
|-------|--------------------|------------------------|-----------------------------|
| ## 22 | 0                  | 0                      | 0                           |
| ## 23 | 1                  | 0                      | 2                           |
| ## 24 | 1                  | 0                      | 0                           |
| ## 25 | 0                  | 0                      | 0                           |
| ## 26 | 0                  | 1                      | 0                           |
| ## 27 | 1                  | 0                      | 0                           |
| ## 28 | 1                  | 0                      | 0                           |
| ## 29 | 0                  | 0                      | 0                           |
| ## 30 | 1                  | 0                      | 0                           |
| ## 31 | 0                  | 0                      | 0                           |
| ## 32 | 0                  | 0                      | 0                           |
| ## 33 | 0                  | 1                      | 0                           |
| ## 34 | 0                  | 0                      | 0                           |
| ## 35 | 2                  | 0                      | 0                           |
| ## 36 | 0                  | 0                      | 0                           |
| ## 37 | 0                  | 0                      | 0                           |
| ## 38 | 0                  | 0                      | 0                           |
| ## 39 | 0                  | 0                      | 0                           |
| ## 40 | 0                  | 0                      | 0                           |
| ## 41 | 0                  | 0                      | 0                           |
| ## 42 | 0                  | 0                      | 0                           |
| ## 43 | 0                  | 1                      | 0                           |
| ## 44 | 0                  | 0                      | 0                           |
| ## 45 | 0                  | 0                      | 0                           |
| ## 46 | 0                  | 0                      | 0                           |
| ## 47 | 0                  | 0                      | 0                           |
| ## 48 | 0                  | 0                      | 0                           |
| ## 49 | 0                  | 0                      | 0                           |
| ## 50 | 0                  | 0                      | 0                           |
| ##    | Pterocarpus.rohrii | Quararibea.asterolepis | Quassia.amara Randia.armata |
| ## 1  | 1                  | 11                     | 0 3                         |
| ## 2  | 0                  | 12                     | 0 2                         |
| ## 3  | 0                  | 15                     | 0 1                         |
| ## 4  | 2                  | 14                     | 0 4                         |
| ## 5  | 1                  | 9                      | 0 2                         |
| ## 6  | 1                  | 3                      | 0 9                         |
| ## 7  | 2                  | 21                     | 0 14                        |
| ## 8  | 2                  | 7                      | 0 4                         |
| ## 9  | 1                  | 4                      | 0 4                         |
| ## 10 | 0                  | 18                     | 0 1                         |
| ## 11 | 2                  | 25                     | 0 7                         |
| ## 12 | 2                  | 11                     | 0 2                         |
| ## 13 | 2                  | 1                      | 0 15                        |
| ## 14 | 2                  | 10                     | 0 3                         |
| ## 15 | 2                  | 8                      | 0 2                         |
| ## 16 | 1                  | 25                     | 0 3                         |
| ## 17 | 1                  | 9                      | 0 5                         |
| ## 18 | 3                  | 0                      | 0 10                        |
| ## 19 | 1                  | 2                      | 0 2                         |
| ## 20 | 3                  | 15                     | 0 3                         |
| ## 21 | 0                  | 12                     | 0 1                         |
| ## 22 | 0                  | 11                     | 0 11                        |
| ## 23 | 4                  | 6                      | 0 1                         |
| ## 24 | 0                  | 12                     | 0 4                         |

|       |                  |                    |                       |                 |
|-------|------------------|--------------------|-----------------------|-----------------|
| ## 25 | 1                | 22                 | 0                     | 4               |
| ## 26 | 2                | 20                 | 0                     | 3               |
| ## 27 | 1                | 20                 | 0                     | 10              |
| ## 28 | 2                | 24                 | 0                     | 5               |
| ## 29 | 1                | 14                 | 0                     | 6               |
| ## 30 | 3                | 13                 | 0                     | 4               |
| ## 31 | 1                | 25                 | 0                     | 7               |
| ## 32 | 6                | 21                 | 0                     | 20              |
| ## 33 | 1                | 22                 | 0                     | 16              |
| ## 34 | 1                | 17                 | 0                     | 11              |
| ## 35 | 2                | 11                 | 0                     | 5               |
| ## 36 | 0                | 11                 | 0                     | 2               |
| ## 37 | 3                | 14                 | 1                     | 2               |
| ## 38 | 2                | 20                 | 0                     | 8               |
| ## 39 | 2                | 20                 | 0                     | 5               |
| ## 40 | 0                | 22                 | 0                     | 7               |
| ## 41 | 2                | 11                 | 0                     | 3               |
| ## 42 | 3                | 19                 | 0                     | 1               |
| ## 43 | 1                | 12                 | 0                     | 2               |
| ## 44 | 1                | 23                 | 0                     | 1               |
| ## 45 | 1                | 32                 | 0                     | 1               |
| ## 46 | 3                | 3                  | 3                     | 4               |
| ## 47 | 1                | 7                  | 0                     | 2               |
| ## 48 | 2                | 21                 | 0                     | 4               |
| ## 49 | 3                | 25                 | 0                     | 0               |
| ## 50 | 2                | 14                 | 0                     | 2               |
| ##    | Sapium.broadleaf | Sapium.glandulosum | Schizolobium.parahyba | Senna.dariensis |
| ## 1  | 0                | 0                  | 0                     | 0               |
| ## 2  | 0                | 0                  | 0                     | 0               |
| ## 3  | 0                | 1                  | 0                     | 0               |
| ## 4  | 0                | 0                  | 0                     | 0               |
| ## 5  | 0                | 2                  | 0                     | 0               |
| ## 6  | 0                | 0                  | 1                     | 0               |
| ## 7  | 0                | 0                  | 0                     | 0               |
| ## 8  | 0                | 0                  | 0                     | 0               |
| ## 9  | 0                | 0                  | 0                     | 0               |
| ## 10 | 0                | 0                  | 0                     | 0               |
| ## 11 | 0                | 0                  | 0                     | 0               |
| ## 12 | 0                | 0                  | 0                     | 0               |
| ## 13 | 0                | 0                  | 0                     | 0               |
| ## 14 | 0                | 0                  | 0                     | 0               |
| ## 15 | 0                | 0                  | 0                     | 0               |
| ## 16 | 0                | 0                  | 0                     | 0               |
| ## 17 | 0                | 0                  | 0                     | 0               |
| ## 18 | 0                | 1                  | 0                     | 0               |
| ## 19 | 0                | 1                  | 0                     | 0               |
| ## 20 | 0                | 0                  | 0                     | 0               |
| ## 21 | 0                | 0                  | 0                     | 0               |
| ## 22 | 0                | 0                  | 1                     | 0               |
| ## 23 | 0                | 0                  | 0                     | 0               |
| ## 24 | 0                | 1                  | 0                     | 0               |
| ## 25 | 0                | 1                  | 0                     | 0               |
| ## 26 | 0                | 1                  | 0                     | 0               |
| ## 27 | 0                | 2                  | 0                     | 0               |



|       |                 |                     |                     |                    |
|-------|-----------------|---------------------|---------------------|--------------------|
| ## 28 | 0               | 0                   | 0                   | 0                  |
| ## 29 | 0               | 0                   | 0                   | 0                  |
| ## 30 | 0               | 0                   | 0                   | 0                  |
| ## 31 | 0               | 0                   | 0                   | 0                  |
| ## 32 | 0               | 0                   | 0                   | 0                  |
| ## 33 | 0               | 1                   | 0                   | 0                  |
| ## 34 | 0               | 1                   | 0                   | 0                  |
| ## 35 | 0               | 1                   | 0                   | 0                  |
| ## 36 | 0               | 0                   | 0                   | 0                  |
| ## 37 | 0               | 0                   | 0                   | 0                  |
| ## 38 | 0               | 0                   | 0                   | 0                  |
| ## 39 | 0               | 0                   | 0                   | 0                  |
| ## 40 | 0               | 0                   | 0                   | 0                  |
| ## 41 | 0               | 0                   | 0                   | 1                  |
| ## 42 | 0               | 0                   | 0                   | 0                  |
| ## 43 | 1               | 0                   | 0                   | 0                  |
| ## 44 | 1               | 0                   | 0                   | 0                  |
| ## 45 | 1               | 0                   | 0                   | 0                  |
| ## 46 | 0               | 1                   | 0                   | 0                  |
| ## 47 | 0               | 0                   | 0                   | 0                  |
| ## 48 | 0               | 1                   | 0                   | 0                  |
| ## 49 | 0               | 1                   | 0                   | 0                  |
| ## 50 | 0               | 1                   | 0                   | 0                  |
| ##    | Simarouba.amara | Siparuna.guianensis | Siparuna.pauciflora | Sloanea.terniflora |
| ## 1  | 14              | 3                   | 0                   | 1                  |
| ## 2  | 6               | 2                   | 0                   | 0                  |
| ## 3  | 16              | 1                   | 1                   | 2                  |
| ## 4  | 8               | 2                   | 0                   | 2                  |
| ## 5  | 7               | 0                   | 3                   | 3                  |
| ## 6  | 7               | 1                   | 0                   | 2                  |
| ## 7  | 13              | 1                   | 0                   | 1                  |
| ## 8  | 14              | 0                   | 0                   | 2                  |
| ## 9  | 12              | 0                   | 1                   | 1                  |
| ## 10 | 17              | 0                   | 1                   | 2                  |
| ## 11 | 7               | 1                   | 0                   | 1                  |
| ## 12 | 9               | 0                   | 0                   | 1                  |
| ## 13 | 2               | 0                   | 0                   | 1                  |
| ## 14 | 4               | 0                   | 0                   | 1                  |
| ## 15 | 6               | 0                   | 2                   | 0                  |
| ## 16 | 8               | 1                   | 0                   | 0                  |
| ## 17 | 2               | 0                   | 0                   | 1                  |
| ## 18 | 2               | 1                   | 0                   | 0                  |
| ## 19 | 6               | 0                   | 1                   | 1                  |
| ## 20 | 8               | 0                   | 0                   | 0                  |
| ## 21 | 4               | 0                   | 0                   | 1                  |
| ## 22 | 5               | 0                   | 0                   | 0                  |
| ## 23 | 1               | 0                   | 0                   | 0                  |
| ## 24 | 3               | 0                   | 1                   | 0                  |
| ## 25 | 10              | 0                   | 0                   | 0                  |
| ## 26 | 5               | 0                   | 0                   | 1                  |
| ## 27 | 16              | 0                   | 0                   | 0                  |
| ## 28 | 7               | 0                   | 0                   | 1                  |
| ## 29 | 3               | 0                   | 0                   | 1                  |
| ## 30 | 8               | 0                   | 1                   | 1                  |

|       |                    |                 |                 |                     |
|-------|--------------------|-----------------|-----------------|---------------------|
| ## 31 | 5                  | 0               | 1               | 2                   |
| ## 32 | 5                  | 0               | 0               | 2                   |
| ## 33 | 2                  | 0               | 0               | 2                   |
| ## 34 | 2                  | 0               | 0               | 1                   |
| ## 35 | 0                  | 0               | 0               | 0                   |
| ## 36 | 9                  | 0               | 0               | 3                   |
| ## 37 | 6                  | 0               | 1               | 3                   |
| ## 38 | 3                  | 0               | 0               | 4                   |
| ## 39 | 1                  | 0               | 0               | 1                   |
| ## 40 | 4                  | 0               | 1               | 1                   |
| ## 41 | 1                  | 0               | 0               | 1                   |
| ## 42 | 4                  | 0               | 0               | 7                   |
| ## 43 | 0                  | 0               | 1               | 2                   |
| ## 44 | 0                  | 0               | 0               | 1                   |
| ## 45 | 3                  | 0               | 0               | 5                   |
| ## 46 | 3                  | 0               | 0               | 2                   |
| ## 47 | 4                  | 0               | 0               | 4                   |
| ## 48 | 0                  | 0               | 0               | 3                   |
| ## 49 | 4                  | 0               | 0               | 2                   |
| ## 50 | 3                  | 0               | 1               | 5                   |
| ##    | Socratea.exorrhiza | Solanum.hayesii | Sorocea.affinis | Spachea.membranacea |
| ## 1  | 15                 | 0               | 1               | 0                   |
| ## 2  | 22                 | 0               | 1               | 0                   |
| ## 3  | 31                 | 0               | 1               | 0                   |
| ## 4  | 9                  | 0               | 1               | 0                   |
| ## 5  | 55                 | 1               | 0               | 0                   |
| ## 6  | 44                 | 0               | 1               | 0                   |
| ## 7  | 23                 | 0               | 0               | 0                   |
| ## 8  | 22                 | 0               | 0               | 0                   |
| ## 9  | 17                 | 0               | 0               | 0                   |
| ## 10 | 12                 | 2               | 1               | 0                   |
| ## 11 | 5                  | 0               | 1               | 0                   |
| ## 12 | 8                  | 0               | 0               | 0                   |
| ## 13 | 0                  | 0               | 0               | 0                   |
| ## 14 | 6                  | 0               | 0               | 0                   |
| ## 15 | 7                  | 1               | 1               | 0                   |
| ## 16 | 1                  | 2               | 0               | 0                   |
| ## 17 | 0                  | 0               | 0               | 0                   |
| ## 18 | 0                  | 0               | 0               | 0                   |
| ## 19 | 3                  | 0               | 1               | 0                   |
| ## 20 | 6                  | 0               | 0               | 1                   |
| ## 21 | 5                  | 1               | 0               | 0                   |
| ## 22 | 0                  | 0               | 0               | 0                   |
| ## 23 | 1                  | 1               | 1               | 0                   |
| ## 24 | 5                  | 0               | 1               | 0                   |
| ## 25 | 5                  | 0               | 0               | 7                   |
| ## 26 | 3                  | 0               | 0               | 0                   |
| ## 27 | 0                  | 1               | 2               | 0                   |
| ## 28 | 0                  | 0               | 1               | 0                   |
| ## 29 | 0                  | 0               | 1               | 0                   |
| ## 30 | 0                  | 0               | 0               | 0                   |
| ## 31 | 8                  | 0               | 2               | 0                   |
| ## 32 | 0                  | 1               | 1               | 0                   |
| ## 33 | 0                  | 0               | 0               | 0                   |

|       |                 |                     |                   |   |
|-------|-----------------|---------------------|-------------------|---|
| ## 34 | 0               | 0                   | 0                 | 0 |
| ## 35 | 0               | 1                   | 0                 | 0 |
| ## 36 | 1               | 1                   | 0                 | 0 |
| ## 37 | 0               | 0                   | 0                 | 0 |
| ## 38 | 2               | 0                   | 0                 | 0 |
| ## 39 | 0               | 0                   | 0                 | 0 |
| ## 40 | 0               | 0                   | 0                 | 0 |
| ## 41 | 0               | 0                   | 0                 | 0 |
| ## 42 | 3               | 0                   | 0                 | 0 |
| ## 43 | 7               | 0                   | 1                 | 0 |
| ## 44 | 5               | 0                   | 0                 | 0 |
| ## 45 | 9               | 0                   | 1                 | 0 |
| ## 46 | 0               | 0                   | 0                 | 0 |
| ## 47 | 0               | 0                   | 3                 | 0 |
| ## 48 | 0               | 0                   | 2                 | 0 |
| ## 49 | 2               | 0                   | 3                 | 0 |
| ## 50 | 4               | 0                   | 0                 | 0 |
| ##    | Spondias.mombin | Spondias.radlkoferi | Sterculia.apetala |   |
| ## 1  | 1               | 2                   | 1                 |   |
| ## 2  | 1               | 0                   | 2                 |   |
| ## 3  | 0               | 3                   | 0                 |   |
| ## 4  | 1               | 3                   | 0                 |   |
| ## 5  | 1               | 5                   | 0                 |   |
| ## 6  | 0               | 0                   | 1                 |   |
| ## 7  | 0               | 5                   | 1                 |   |
| ## 8  | 1               | 0                   | 0                 |   |
| ## 9  | 0               | 1                   | 0                 |   |
| ## 10 | 2               | 1                   | 0                 |   |
| ## 11 | 0               | 1                   | 0                 |   |
| ## 12 | 1               | 0                   | 0                 |   |
| ## 13 | 10              | 1                   | 3                 |   |
| ## 14 | 1               | 0                   | 0                 |   |
| ## 15 | 0               | 2                   | 0                 |   |
| ## 16 | 0               | 2                   | 0                 |   |
| ## 17 | 1               | 0                   | 1                 |   |
| ## 18 | 3               | 3                   | 2                 |   |
| ## 19 | 0               | 0                   | 1                 |   |
| ## 20 | 0               | 3                   | 0                 |   |
| ## 21 | 0               | 1                   | 0                 |   |
| ## 22 | 0               | 1                   | 0                 |   |
| ## 23 | 2               | 2                   | 1                 |   |
| ## 24 | 0               | 1                   | 0                 |   |
| ## 25 | 0               | 2                   | 0                 |   |
| ## 26 | 0               | 0                   | 1                 |   |
| ## 27 | 0               | 0                   | 0                 |   |
| ## 28 | 0               | 0                   | 1                 |   |
| ## 29 | 0               | 2                   | 0                 |   |
| ## 30 | 1               | 1                   | 1                 |   |
| ## 31 | 0               | 1                   | 0                 |   |
| ## 32 | 0               | 1                   | 2                 |   |
| ## 33 | 0               | 0                   | 0                 |   |
| ## 34 | 0               | 1                   | 0                 |   |
| ## 35 | 0               | 1                   | 0                 |   |
| ## 36 | 0               | 3                   | 0                 |   |

|       |                                  |                                |   |
|-------|----------------------------------|--------------------------------|---|
| ## 37 | 0                                | 1                              | 1 |
| ## 38 | 0                                | 0                              | 0 |
| ## 39 | 0                                | 1                              | 0 |
| ## 40 | 0                                | 2                              | 0 |
| ## 41 | 0                                | 3                              | 1 |
| ## 42 | 0                                | 1                              | 1 |
| ## 43 | 0                                | 1                              | 1 |
| ## 44 | 0                                | 0                              | 0 |
| ## 45 | 0                                | 0                              | 1 |
| ## 46 | 0                                | 1                              | 2 |
| ## 47 | 0                                | 0                              | 1 |
| ## 48 | 1                                | 2                              | 0 |
| ## 49 | 1                                | 1                              | 0 |
| ## 50 | 1                                | 1                              | 0 |
| ##    | Swartzia.simplex.var.grandiflora | Swartzia.simplex.continentalis |   |
| ## 1  | 3                                | 1                              |   |
| ## 2  | 3                                | 4                              |   |
| ## 3  | 0                                | 2                              |   |
| ## 4  | 1                                | 2                              |   |
| ## 5  | 1                                | 1                              |   |
| ## 6  | 9                                | 5                              |   |
| ## 7  | 9                                | 7                              |   |
| ## 8  | 5                                | 0                              |   |
| ## 9  | 5                                | 0                              |   |
| ## 10 | 0                                | 0                              |   |
| ## 11 | 10                               | 5                              |   |
| ## 12 | 13                               | 13                             |   |
| ## 13 | 2                                | 2                              |   |
| ## 14 | 3                                | 3                              |   |
| ## 15 | 1                                | 0                              |   |
| ## 16 | 5                                | 5                              |   |
| ## 17 | 6                                | 4                              |   |
| ## 18 | 9                                | 2                              |   |
| ## 19 | 6                                | 4                              |   |
| ## 20 | 2                                | 0                              |   |
| ## 21 | 2                                | 1                              |   |
| ## 22 | 6                                | 4                              |   |
| ## 23 | 2                                | 4                              |   |
| ## 24 | 4                                | 3                              |   |
| ## 25 | 2                                | 1                              |   |
| ## 26 | 5                                | 2                              |   |
| ## 27 | 6                                | 4                              |   |
| ## 28 | 8                                | 1                              |   |
| ## 29 | 6                                | 4                              |   |
| ## 30 | 3                                | 0                              |   |
| ## 31 | 0                                | 1                              |   |
| ## 32 | 4                                | 3                              |   |
| ## 33 | 13                               | 4                              |   |
| ## 34 | 14                               | 2                              |   |
| ## 35 | 4                                | 1                              |   |
| ## 36 | 0                                | 3                              |   |
| ## 37 | 8                                | 3                              |   |
| ## 38 | 10                               | 2                              |   |
| ## 39 | 5                                | 3                              |   |

|       |  |   |
|-------|--|---|
| ## 40 | 1  | 3 |
| ## 41 | 0  | 0 |
| ## 42 | 3  | 1 |
| ## 43 | 8  | 0 |
| ## 44 | 3  | 2 |
| ## 45 | 1  | 1 |
| ## 46 | 0  | 0 |
| ## 47 | 0  | 1 |
| ## 48 | 4  | 2 |
| ## 49 | 2  | 1 |
| ## 50 | 1  | 1 |
| ##    | Symphonia.globulifera Handroanthus.guayacan Tabebuia.rosea |   |
| ## 1  | 0  | 1 |
| ## 2  | 1  | 0 |
| ## 3  | 1  | 1 |
| ## 4  | 1  | 0 |
| ## 5  | 2  | 0 |
| ## 6  | 0  | 1 |
| ## 7  | 0  | 0 |
| ## 8  | 1  | 0 |
| ## 9  | 1  | 0 |
| ## 10 | 0  | 0 |
| ## 11 | 0  | 0 |
| ## 12 | 1  | 0 |
| ## 13 | 0  | 2 |
| ## 14 | 0  | 1 |
| ## 15 | 2  | 1 |
| ## 16 | 1  | 0 |
| ## 17 | 0  | 1 |
| ## 18 | 0  | 0 |
| ## 19 | 0  | 0 |
| ## 20 | 0  | 0 |
| ## 21 | 0  | 1 |
| ## 22 | 2  | 0 |
| ## 23 | 0  | 2 |
| ## 24 | 0  | 4 |
| ## 25 | 1  | 0 |
| ## 26 | 1  | 0 |
| ## 27 | 0  | 2 |
| ## 28 | 0  | 0 |
| ## 29 | 0  | 6 |
| ## 30 | 0  | 1 |
| ## 31 | 0  | 4 |
| ## 32 | 0  | 3 |
| ## 33 | 0  | 0 |
| ## 34 | 0  | 2 |
| ## 35 | 0  | 0 |
| ## 36 | 0  | 1 |
| ## 37 | 0  | 0 |
| ## 38 | 0  | 1 |
| ## 39 | 1  | 0 |
| ## 40 | 0  | 4 |
| ## 41 | 2  | 0 |
| ## 42 | 1  | 1 |

|       |                         |                      |                 |
|-------|-------------------------|----------------------|-----------------|
| ## 43 | 0                       | 2                    | 0               |
| ## 44 | 0                       | 1                    | 2               |
| ## 45 | 2                       | 0                    | 1               |
| ## 46 | 0                       | 1                    | 3               |
| ## 47 | 1                       | 0                    | 3               |
| ## 48 | 0                       | 0                    | 5               |
| ## 49 | 1                       | 0                    | 2               |
| ## 50 | 3                       | 1                    | 1               |
| ##    | Tabernaemontana.arborea | Tachigali.versicolor | Talisia.nervosa |
| ## 1  | 9                       | 6                    | 0               |
| ## 2  | 5                       | 1                    | 0               |
| ## 3  | 6                       | 3                    | 0               |
| ## 4  | 10                      | 3                    | 0               |
| ## 5  | 16                      | 0                    | 0               |
| ## 6  | 11                      | 1                    | 0               |
| ## 7  | 9                       | 2                    | 0               |
| ## 8  | 8                       | 0                    | 0               |
| ## 9  | 12                      | 3                    | 0               |
| ## 10 | 10                      | 1                    | 0               |
| ## 11 | 4                       | 4                    | 0               |
| ## 12 | 6                       | 2                    | 0               |
| ## 13 | 12                      | 3                    | 1               |
| ## 14 | 22                      | 0                    | 0               |
| ## 15 | 8                       | 5                    | 0               |
| ## 16 | 11                      | 2                    | 0               |
| ## 17 | 3                       | 1                    | 0               |
| ## 18 | 10                      | 3                    | 0               |
| ## 19 | 9                       | 2                    | 0               |
| ## 20 | 13                      | 3                    | 0               |
| ## 21 | 4                       | 1                    | 0               |
| ## 22 | 10                      | 1                    | 0               |
| ## 23 | 5                       | 1                    | 0               |
| ## 24 | 9                       | 3                    | 0               |
| ## 25 | 6                       | 3                    | 0               |
| ## 26 | 4                       | 4                    | 0               |
| ## 27 | 12                      | 2                    | 0               |
| ## 28 | 5                       | 8                    | 0               |
| ## 29 | 2                       | 2                    | 0               |
| ## 30 | 21                      | 1                    | 0               |
| ## 31 | 1                       | 5                    | 0               |
| ## 32 | 4                       | 1                    | 0               |
| ## 33 | 2                       | 1                    | 0               |
| ## 34 | 5                       | 0                    | 0               |
| ## 35 | 2                       | 1                    | 0               |
| ## 36 | 1                       | 1                    | 0               |
| ## 37 | 0                       | 1                    | 0               |
| ## 38 | 4                       | 1                    | 0               |
| ## 39 | 3                       | 2                    | 0               |
| ## 40 | 2                       | 0                    | 0               |
| ## 41 | 1                       | 3                    | 0               |
| ## 42 | 2                       | 1                    | 0               |
| ## 43 | 0                       | 2                    | 0               |
| ## 44 | 1                       | 0                    | 0               |
| ## 45 | 2                       | 2                    | 0               |

|       |                  |                     |                    |
|-------|------------------|---------------------|--------------------|
| ## 46 | 2                | 1                   | 0                  |
| ## 47 | 1                | 1                   | 0                  |
| ## 48 | 8                | 0                   | 0                  |
| ## 49 | 2                | 2                   | 0                  |
| ## 50 | 7                | 2                   | 0                  |
| ##    | Talisia.princeps | Terminalia.amazonia | Terminalia.oblonga |
| ## 1  | 1                | 1                   | 0                  |
| ## 2  | 0                | 0                   | 0                  |
| ## 3  | 0                | 0                   | 0                  |
| ## 4  | 0                | 0                   | 0                  |
| ## 5  | 0                | 1                   | 0                  |
| ## 6  | 0                | 1                   | 0                  |
| ## 7  | 0                | 0                   | 0                  |
| ## 8  | 0                | 0                   | 0                  |
| ## 9  | 0                | 0                   | 0                  |
| ## 10 | 0                | 0                   | 0                  |
| ## 11 | 0                | 0                   | 0                  |
| ## 12 | 0                | 0                   | 0                  |
| ## 13 | 0                | 5                   | 0                  |
| ## 14 | 0                | 2                   | 0                  |
| ## 15 | 0                | 0                   | 0                  |
| ## 16 | 0                | 0                   | 3                  |
| ## 17 | 0                | 0                   | 0                  |
| ## 18 | 0                | 2                   | 0                  |
| ## 19 | 0                | 0                   | 0                  |
| ## 20 | 0                | 1                   | 0                  |
| ## 21 | 0                | 0                   | 1                  |
| ## 22 | 0                | 0                   | 1                  |
| ## 23 | 0                | 6                   | 0                  |
| ## 24 | 0                | 1                   | 0                  |
| ## 25 | 0                | 2                   | 2                  |
| ## 26 | 1                | 0                   | 5                  |
| ## 27 | 0                | 0                   | 10                 |
| ## 28 | 1                | 0                   | 0                  |
| ## 29 | 0                | 1                   | 0                  |
| ## 30 | 0                | 0                   | 0                  |
| ## 31 | 0                | 1                   | 8                  |
| ## 32 | 0                | 0                   | 2                  |
| ## 33 | 0                | 0                   | 0                  |
| ## 34 | 0                | 0                   | 0                  |
| ## 35 | 0                | 2                   | 0                  |
| ## 36 | 0                | 0                   | 0                  |
| ## 37 | 0                | 0                   | 0                  |
| ## 38 | 0                | 0                   | 0                  |
| ## 39 | 0                | 0                   | 0                  |
| ## 40 | 0                | 1                   | 0                  |
| ## 41 | 0                | 0                   | 0                  |
| ## 42 | 0                | 0                   | 0                  |
| ## 43 | 0                | 0                   | 0                  |
| ## 44 | 0                | 0                   | 0                  |
| ## 45 | 0                | 0                   | 0                  |
| ## 46 | 0                | 0                   | 0                  |
| ## 47 | 0                | 0                   | 0                  |
| ## 48 | 0                | 0                   | 2                  |

| ## | 49 | 0                       | 1                         | 9                    |
|----|----|-------------------------|---------------------------|----------------------|
| ## | 50 | 0                       | 0                         | 0                    |
| ## |    | Tetragastris.panamensis | Tetrathylacium.johansenii | Theobroma.cacao      |
| ## | 1  | 5                       | 0                         | 1                    |
| ## | 2  | 7                       | 0                         | 1                    |
| ## | 3  | 10                      | 0                         | 0                    |
| ## | 4  | 10                      | 0                         | 0                    |
| ## | 5  | 7                       | 0                         | 1                    |
| ## | 6  | 17                      | 0                         | 0                    |
| ## | 7  | 8                       | 0                         | 0                    |
| ## | 8  | 9                       | 0                         | 0                    |
| ## | 9  | 5                       | 0                         | 0                    |
| ## | 10 | 6                       | 0                         | 0                    |
| ## | 11 | 10                      | 0                         | 0                    |
| ## | 12 | 10                      | 0                         | 0                    |
| ## | 13 | 6                       | 0                         | 0                    |
| ## | 14 | 5                       | 0                         | 0                    |
| ## | 15 | 3                       | 0                         | 0                    |
| ## | 16 | 6                       | 0                         | 1                    |
| ## | 17 | 13                      | 0                         | 0                    |
| ## | 18 | 11                      | 2                         | 0                    |
| ## | 19 | 9                       | 0                         | 0                    |
| ## | 20 | 4                       | 0                         | 0                    |
| ## | 21 | 4                       | 0                         | 0                    |
| ## | 22 | 9                       | 0                         | 0                    |
| ## | 23 | 11                      | 2                         | 0                    |
| ## | 24 | 15                      | 0                         | 1                    |
| ## | 25 | 7                       | 0                         | 1                    |
| ## | 26 | 6                       | 0                         | 0                    |
| ## | 27 | 11                      | 1                         | 0                    |
| ## | 28 | 13                      | 0                         | 0                    |
| ## | 29 | 8                       | 0                         | 1                    |
| ## | 30 | 5                       | 1                         | 0                    |
| ## | 31 | 5                       | 0                         | 0                    |
| ## | 32 | 4                       | 0                         | 1                    |
| ## | 33 | 1                       | 0                         | 0                    |
| ## | 34 | 2                       | 1                         | 0                    |
| ## | 35 | 1                       | 0                         | 0                    |
| ## | 36 | 5                       | 0                         | 0                    |
| ## | 37 | 9                       | 0                         | 0                    |
| ## | 38 | 1                       | 0                         | 0                    |
| ## | 39 | 2                       | 0                         | 0                    |
| ## | 40 | 1                       | 0                         | 0                    |
| ## | 41 | 7                       | 0                         | 1                    |
| ## | 42 | 7                       | 0                         | 0                    |
| ## | 43 | 6                       | 0                         | 1                    |
| ## | 44 | 4                       | 0                         | 0                    |
| ## | 45 | 9                       | 0                         | 0                    |
| ## | 46 | 20                      | 0                         | 0                    |
| ## | 47 | 25                      | 0                         | 0                    |
| ## | 48 | 8                       | 0                         | 0                    |
| ## | 49 | 4                       | 0                         | 0                    |
| ## | 50 | 8                       | 0                         | 2                    |
| ## |    | Thevetia.ahouai         | Tocoyena.pittieri         | Trattinnickia.aspera |
|    |    |                         | Trema.micrantha           |                      |



|       |                       |                   |                       |   |
|-------|-----------------------|-------------------|-----------------------|---|
| ## 1  | 0                     | 0                 | 3                     | 0 |
| ## 2  | 0                     | 1                 | 1                     | 0 |
| ## 3  | 0                     | 0                 | 1                     | 0 |
| ## 4  | 0                     | 0                 | 0                     | 2 |
| ## 5  | 0                     | 0                 | 2                     | 1 |
| ## 6  | 0                     | 0                 | 0                     | 0 |
| ## 7  | 0                     | 0                 | 0                     | 0 |
| ## 8  | 0                     | 0                 | 2                     | 0 |
| ## 9  | 0                     | 0                 | 2                     | 0 |
| ## 10 | 0                     | 0                 | 1                     | 0 |
| ## 11 | 0                     | 0                 | 0                     | 1 |
| ## 12 | 0                     | 1                 | 0                     | 1 |
| ## 13 | 0                     | 0                 | 0                     | 0 |
| ## 14 | 0                     | 0                 | 0                     | 0 |
| ## 15 | 0                     | 0                 | 1                     | 0 |
| ## 16 | 0                     | 0                 | 1                     | 0 |
| ## 17 | 0                     | 0                 | 3                     | 0 |
| ## 18 | 0                     | 0                 | 0                     | 0 |
| ## 19 | 0                     | 0                 | 3                     | 1 |
| ## 20 | 0                     | 0                 | 0                     | 0 |
| ## 21 | 0                     | 1                 | 1                     | 0 |
| ## 22 | 0                     | 0                 | 0                     | 0 |
| ## 23 | 1                     | 0                 | 0                     | 1 |
| ## 24 | 0                     | 0                 | 1                     | 0 |
| ## 25 | 0                     | 0                 | 0                     | 1 |
| ## 26 | 0                     | 0                 | 0                     | 0 |
| ## 27 | 0                     | 0                 | 1                     | 0 |
| ## 28 | 0                     | 0                 | 1                     | 1 |
| ## 29 | 0                     | 0                 | 0                     | 0 |
| ## 30 | 0                     | 0                 | 0                     | 0 |
| ## 31 | 0                     | 0                 | 0                     | 0 |
| ## 32 | 0                     | 0                 | 0                     | 0 |
| ## 33 | 0                     | 1                 | 0                     | 0 |
| ## 34 | 0                     | 0                 | 0                     | 0 |
| ## 35 | 0                     | 0                 | 0                     | 0 |
| ## 36 | 0                     | 0                 | 4                     | 0 |
| ## 37 | 0                     | 0                 | 1                     | 0 |
| ## 38 | 0                     | 0                 | 0                     | 0 |
| ## 39 | 0                     | 0                 | 0                     | 3 |
| ## 40 | 0                     | 0                 | 1                     | 0 |
| ## 41 | 1                     | 0                 | 0                     | 0 |
| ## 42 | 0                     | 0                 | 0                     | 1 |
| ## 43 | 0                     | 0                 | 0                     | 0 |
| ## 44 | 0                     | 0                 | 0                     | 1 |
| ## 45 | 0                     | 0                 | 0                     | 0 |
| ## 46 | 0                     | 0                 | 7                     | 0 |
| ## 47 | 0                     | 0                 | 1                     | 0 |
| ## 48 | 0                     | 0                 | 1                     | 0 |
| ## 49 | 0                     | 0                 | 0                     | 0 |
| ## 50 | 0                     | 1                 | 1                     | 1 |
| ##    | Trichanthera.gigantea | Trichilia.pallida | Trichilia.tuberculata |   |
| ## 1  | 0                     | 0                 | 18                    |   |
| ## 2  | 0                     | 1                 | 27                    |   |
| ## 3  | 0                     | 0                 | 28                    |   |

|       |  |    |    |
|-------|--|----|----|
| ## 4  | 0  | 1  | 35 |
| ## 5  | 0  | 0  | 15 |
| ## 6  | 0  | 0  | 31 |
| ## 7  | 0  | 1  | 27 |
| ## 8  | 0  | 0  | 36 |
| ## 9  | 0  | 0  | 65 |
| ## 10 | 0  | 0  | 46 |
| ## 11 | 0  | 2  | 41 |
| ## 12 | 0  | 1  | 46 |
| ## 13 | 0  | 8  | 35 |
| ## 14 | 0  | 1  | 33 |
| ## 15 | 0  | 6  | 33 |
| ## 16 | 0  | 3  | 25 |
| ## 17 | 0  | 2  | 36 |
| ## 18 | 0  | 5  | 23 |
| ## 19 | 0  | 1  | 44 |
| ## 20 | 0  | 10 | 33 |
| ## 21 | 0  | 0  | 23 |
| ## 22 | 0  | 1  | 42 |
| ## 23 | 0  | 1  | 23 |
| ## 24 | 1  | 2  | 38 |
| ## 25 | 1  | 6  | 26 |
| ## 26 | 0  | 1  | 15 |
| ## 27 | 0  | 3  | 20 |
| ## 28 | 0  | 0  | 43 |
| ## 29 | 0  | 0  | 47 |
| ## 30 | 0  | 4  | 33 |
| ## 31 | 0  | 1  | 33 |
| ## 32 | 0  | 8  | 50 |
| ## 33 | 0  | 1  | 37 |
| ## 34 | 0  | 2  | 31 |
| ## 35 | 0  | 1  | 30 |
| ## 36 | 0  | 0  | 28 |
| ## 37 | 0  | 4  | 33 |
| ## 38 | 0  | 1  | 59 |
| ## 39 | 0  | 0  | 79 |
| ## 40 | 0  | 2  | 97 |
| ## 41 | 0  | 0  | 19 |
| ## 42 | 0  | 0  | 15 |
| ## 43 | 0  | 0  | 36 |
| ## 44 | 0  | 0  | 26 |
| ## 45 | 0  | 0  | 26 |
| ## 46 | 0  | 0  | 16 |
| ## 47 | 0  | 1  | 16 |
| ## 48 | 0  | 0  | 19 |
| ## 49 | 0  | 1  | 26 |
| ## 50 | 0  | 0  | 18 |
| ##    | Trichospermum.galeottii Triplaris.cumingiana Trophis.caucana |    |    |
| ## 1  | 0  | 0  | 2  |
| ## 2  | 0  | 0  | 0  |
| ## 3  | 0  | 0  | 0  |
| ## 4  | 0  | 0  | 0  |
| ## 5  | 0  | 0  | 2  |
| ## 6  | 0  | 1  | 0  |

|       |                  |                       |                    |                   |
|-------|------------------|-----------------------|--------------------|-------------------|
| ## 7  | 0                | 0                     | 0                  |                   |
| ## 8  | 0                | 0                     | 0                  |                   |
| ## 9  | 0                | 0                     | 0                  |                   |
| ## 10 | 0                | 1                     | 0                  |                   |
| ## 11 | 0                | 1                     | 2                  |                   |
| ## 12 | 0                | 3                     | 0                  |                   |
| ## 13 | 0                | 13                    | 0                  |                   |
| ## 14 | 0                | 7                     | 0                  |                   |
| ## 15 | 0                | 0                     | 0                  |                   |
| ## 16 | 0                | 2                     | 0                  |                   |
| ## 17 | 0                | 3                     | 1                  |                   |
| ## 18 | 0                | 6                     | 0                  |                   |
| ## 19 | 0                | 1                     | 0                  |                   |
| ## 20 | 1                | 0                     | 0                  |                   |
| ## 21 | 0                | 2                     | 1                  |                   |
| ## 22 | 0                | 1                     | 1                  |                   |
| ## 23 | 0                | 11                    | 0                  |                   |
| ## 24 | 0                | 1                     | 0                  |                   |
| ## 25 | 0                | 3                     | 0                  |                   |
| ## 26 | 0                | 2                     | 1                  |                   |
| ## 27 | 0                | 3                     | 0                  |                   |
| ## 28 | 0                | 0                     | 0                  |                   |
| ## 29 | 0                | 0                     | 0                  |                   |
| ## 30 | 0                | 0                     | 0                  |                   |
| ## 31 | 0                | 1                     | 0                  |                   |
| ## 32 | 0                | 13                    | 0                  |                   |
| ## 33 | 0                | 11                    | 0                  |                   |
| ## 34 | 0                | 11                    | 0                  |                   |
| ## 35 | 0                | 1                     | 0                  |                   |
| ## 36 | 0                | 0                     | 0                  |                   |
| ## 37 | 0                | 3                     | 0                  |                   |
| ## 38 | 0                | 6                     | 0                  |                   |
| ## 39 | 0                | 4                     | 0                  |                   |
| ## 40 | 0                | 5                     | 0                  |                   |
| ## 41 | 0                | 1                     | 0                  |                   |
| ## 42 | 0                | 0                     | 0                  |                   |
| ## 43 | 0                | 1                     | 4                  |                   |
| ## 44 | 0                | 6                     | 1                  |                   |
| ## 45 | 0                | 5                     | 4                  |                   |
| ## 46 | 0                | 1                     | 0                  |                   |
| ## 47 | 0                | 3                     | 0                  |                   |
| ## 48 | 0                | 6                     | 3                  |                   |
| ## 49 | 0                | 4                     | 8                  |                   |
| ## 50 | 0                | 4                     | 3                  |                   |
| ##    | Trophis.racemosa | Turpinia occidentalis | Unonopsis.pittieri | Virola.multiflora |
| ## 1  | 1                | 0                     | 1                  | 0                 |
| ## 2  | 1                | 1                     | 5                  | 0                 |
| ## 3  | 0                | 1                     | 12                 | 0                 |
| ## 4  | 1                | 4                     | 3                  | 0                 |
| ## 5  | 0                | 2                     | 4                  | 0                 |
| ## 6  | 0                | 1                     | 3                  | 2                 |
| ## 7  | 1                | 0                     | 3                  | 0                 |
| ## 8  | 0                | 1                     | 2                  | 0                 |
| ## 9  | 0                | 1                     | 5                  | 0                 |

|       |                 |                     |                  |                     |
|-------|-----------------|---------------------|------------------|---------------------|
| ## 10 | 2               | 1                   | 9                | 1                   |
| ## 11 | 0               | 1                   | 4                | 0                   |
| ## 12 | 0               | 1                   | 0                | 1                   |
| ## 13 | 0               | 0                   | 0                | 0                   |
| ## 14 | 1               | 0                   | 3                | 0                   |
| ## 15 | 0               | 5                   | 11               | 0                   |
| ## 16 | 2               | 2                   | 1                | 1                   |
| ## 17 | 0               | 0                   | 0                | 0                   |
| ## 18 | 2               | 0                   | 0                | 0                   |
| ## 19 | 3               | 0                   | 4                | 0                   |
| ## 20 | 0               | 5                   | 10               | 0                   |
| ## 21 | 0               | 1                   | 6                | 2                   |
| ## 22 | 0               | 1                   | 1                | 0                   |
| ## 23 | 1               | 0                   | 1                | 0                   |
| ## 24 | 1               | 2                   | 3                | 0                   |
| ## 25 | 2               | 0                   | 3                | 0                   |
| ## 26 | 1               | 0                   | 4                | 1                   |
| ## 27 | 1               | 7                   | 0                | 0                   |
| ## 28 | 0               | 1                   | 0                | 0                   |
| ## 29 | 0               | 3                   | 5                | 0                   |
| ## 30 | 2               | 1                   | 1                | 1                   |
| ## 31 | 1               | 0                   | 3                | 5                   |
| ## 32 | 2               | 0                   | 4                | 0                   |
| ## 33 | 1               | 2                   | 5                | 0                   |
| ## 34 | 0               | 1                   | 1                | 0                   |
| ## 35 | 0               | 0                   | 0                | 0                   |
| ## 36 | 0               | 2                   | 9                | 2                   |
| ## 37 | 0               | 5                   | 8                | 2                   |
| ## 38 | 0               | 0                   | 2                | 0                   |
| ## 39 | 0               | 2                   | 0                | 0                   |
| ## 40 | 1               | 1                   | 0                | 0                   |
| ## 41 | 0               | 2                   | 4                | 2                   |
| ## 42 | 0               | 0                   | 5                | 3                   |
| ## 43 | 1               | 0                   | 5                | 0                   |
| ## 44 | 0               | 0                   | 3                | 0                   |
| ## 45 | 0               | 0                   | 4                | 0                   |
| ## 46 | 0               | 0                   | 0                | 0                   |
| ## 47 | 2               | 0                   | 0                | 0                   |
| ## 48 | 2               | 0                   | 0                | 1                   |
| ## 49 | 0               | 0                   | 2                | 0                   |
| ## 50 | 0               | 1                   | 4                | 1                   |
| ##    | Virola.sebifera | Virola.surinamensis | Vismia.baccifera | Vochysia.ferruginea |
| ## 1  | 17              | 4                   | 0                | 0                   |
| ## 2  | 12              | 3                   | 0                | 0                   |
| ## 3  | 11              | 2                   | 0                | 0                   |
| ## 4  | 16              | 2                   | 0                | 0                   |
| ## 5  | 31              | 6                   | 0                | 0                   |
| ## 6  | 19              | 1                   | 0                | 0                   |
| ## 7  | 8               | 1                   | 0                | 0                   |
| ## 8  | 19              | 1                   | 0                | 0                   |
| ## 9  | 16              | 1                   | 0                | 0                   |
| ## 10 | 17              | 2                   | 0                | 0                   |
| ## 11 | 6               | 4                   | 0                | 0                   |
| ## 12 | 6               | 2                   | 0                | 2                   |

|       |                   |                     |                         |   |
|-------|-------------------|---------------------|-------------------------|---|
| ## 13 | 0                 | 0                   | 0                       | 3 |
| ## 14 | 17                | 1                   | 0                       | 1 |
| ## 15 | 16                | 4                   | 0                       | 0 |
| ## 16 | 24                | 5                   | 0                       | 0 |
| ## 17 | 5                 | 0                   | 0                       | 1 |
| ## 18 | 0                 | 2                   | 0                       | 2 |
| ## 19 | 12                | 1                   | 0                       | 0 |
| ## 20 | 15                | 4                   | 0                       | 0 |
| ## 21 | 15                | 10                  | 0                       | 0 |
| ## 22 | 7                 | 1                   | 0                       | 0 |
| ## 23 | 9                 | 1                   | 0                       | 0 |
| ## 24 | 12                | 1                   | 0                       | 0 |
| ## 25 | 12                | 4                   | 0                       | 0 |
| ## 26 | 20                | 12                  | 0                       | 0 |
| ## 27 | 12                | 1                   | 0                       | 0 |
| ## 28 | 18                | 1                   | 0                       | 0 |
| ## 29 | 9                 | 1                   | 0                       | 0 |
| ## 30 | 8                 | 3                   | 0                       | 0 |
| ## 31 | 20                | 6                   | 0                       | 0 |
| ## 32 | 18                | 4                   | 0                       | 0 |
| ## 33 | 16                | 3                   | 0                       | 0 |
| ## 34 | 7                 | 1                   | 0                       | 0 |
| ## 35 | 11                | 0                   | 0                       | 0 |
| ## 36 | 14                | 5                   | 0                       | 0 |
| ## 37 | 14                | 4                   | 1                       | 0 |
| ## 38 | 11                | 0                   | 0                       | 0 |
| ## 39 | 7                 | 2                   | 0                       | 0 |
| ## 40 | 11                | 1                   | 0                       | 0 |
| ## 41 | 12                | 7                   | 0                       | 0 |
| ## 42 | 12                | 5                   | 0                       | 0 |
| ## 43 | 14                | 8                   | 0                       | 0 |
| ## 44 | 10                | 1                   | 0                       | 0 |
| ## 45 | 13                | 7                   | 0                       | 0 |
| ## 46 | 0                 | 0                   | 0                       | 2 |
| ## 47 | 11                | 1                   | 0                       | 1 |
| ## 48 | 7                 | 5                   | 0                       | 0 |
| ## 49 | 6                 | 16                  | 0                       | 0 |
| ## 50 | 14                | 7                   | 0                       | 0 |
| ##    | Xylopia.macrantha | Zanthoxylum.ekmanii | Zanthoxylum.juniperinum |   |
| ## 1  | 1                 | 3                   | 0                       |   |
| ## 2  | 0                 | 4                   | 0                       |   |
| ## 3  | 0                 | 8                   | 1                       |   |
| ## 4  | 0                 | 13                  | 1                       |   |
| ## 5  | 0                 | 3                   | 0                       |   |
| ## 6  | 0                 | 1                   | 0                       |   |
| ## 7  | 0                 | 2                   | 0                       |   |
| ## 8  | 0                 | 4                   | 0                       |   |
| ## 9  | 0                 | 13                  | 1                       |   |
| ## 10 | 4                 | 7                   | 10                      |   |
| ## 11 | 1                 | 1                   | 0                       |   |
| ## 12 | 0                 | 0                   | 0                       |   |
| ## 13 | 1                 | 5                   | 2                       |   |
| ## 14 | 0                 | 12                  | 3                       |   |
| ## 15 | 3                 | 5                   | 6                       |   |

|       |                       |                       |                   |
|-------|-----------------------|-----------------------|-------------------|
| ## 16 | 1                     | 2                     | 1                 |
| ## 17 | 2                     | 1                     | 0                 |
| ## 18 | 1                     | 0                     | 2                 |
| ## 19 | 1                     | 3                     | 1                 |
| ## 20 | 1                     | 4                     | 2                 |
| ## 21 | 15                    | 7                     | 2                 |
| ## 22 | 0                     | 1                     | 1                 |
| ## 23 | 0                     | 0                     | 0                 |
| ## 24 | 0                     | 0                     | 0                 |
| ## 25 | 0                     | 4                     | 3                 |
| ## 26 | 15                    | 1                     | 1                 |
| ## 27 | 8                     | 4                     | 1                 |
| ## 28 | 0                     | 0                     | 0                 |
| ## 29 | 0                     | 2                     | 0                 |
| ## 30 | 0                     | 1                     | 0                 |
| ## 31 | 23                    | 0                     | 1                 |
| ## 32 | 4                     | 4                     | 0                 |
| ## 33 | 8                     | 3                     | 0                 |
| ## 34 | 1                     | 0                     | 0                 |
| ## 35 | 0                     | 0                     | 0                 |
| ## 36 | 20                    | 2                     | 1                 |
| ## 37 | 1                     | 5                     | 0                 |
| ## 38 | 1                     | 2                     | 1                 |
| ## 39 | 0                     | 1                     | 1                 |
| ## 40 | 0                     | 0                     | 0                 |
| ## 41 | 9                     | 3                     | 0                 |
| ## 42 | 14                    | 4                     | 0                 |
| ## 43 | 2                     | 1                     | 0                 |
| ## 44 | 1                     | 2                     | 0                 |
| ## 45 | 0                     | 2                     | 1                 |
| ## 46 | 3                     | 1                     | 1                 |
| ## 47 | 1                     | 2                     | 1                 |
| ## 48 | 1                     | 5                     | 0                 |
| ## 49 | 0                     | 1                     | 0                 |
| ## 50 | 0                     | 0                     | 0                 |
| ##    | Zanthoxylum.panamense | Zanthoxylum.setulosum | Zuelania.guidonia |
| ## 1  | 2                     | 0                     | 0                 |
| ## 2  | 2                     | 0                     | 0                 |
| ## 3  | 2                     | 0                     | 0                 |
| ## 4  | 5                     | 0                     | 1                 |
| ## 5  | 5                     | 0                     | 0                 |
| ## 6  | 3                     | 0                     | 2                 |
| ## 7  | 0                     | 0                     | 0                 |
| ## 8  | 2                     | 0                     | 0                 |
| ## 9  | 4                     | 0                     | 0                 |
| ## 10 | 4                     | 0                     | 0                 |
| ## 11 | 1                     | 0                     | 0                 |
| ## 12 | 0                     | 0                     | 0                 |
| ## 13 | 0                     | 0                     | 0                 |
| ## 14 | 1                     | 0                     | 0                 |
| ## 15 | 2                     | 0                     | 0                 |
| ## 16 | 0                     | 0                     | 0                 |
| ## 17 | 1                     | 0                     | 1                 |
| ## 18 | 1                     | 0                     | 1                 |

|       |   |   |   |
|-------|---|---|---|
| ## 19 | 3 | 0 | 0 |
| ## 20 | 1 | 0 | 0 |
| ## 21 | 0 | 0 | 0 |
| ## 22 | 1 | 0 | 0 |
| ## 23 | 0 | 0 | 0 |
| ## 24 | 0 | 0 | 0 |
| ## 25 | 1 | 0 | 0 |
| ## 26 | 0 | 0 | 0 |
| ## 27 | 2 | 0 | 0 |
| ## 28 | 0 | 0 | 1 |
| ## 29 | 0 | 0 | 0 |
| ## 30 | 3 | 0 | 0 |
| ## 31 | 1 | 0 | 0 |
| ## 32 | 2 | 0 | 0 |
| ## 33 | 1 | 0 | 0 |
| ## 34 | 3 | 0 | 0 |
| ## 35 | 1 | 0 | 0 |
| ## 36 | 0 | 0 | 0 |
| ## 37 | 4 | 0 | 0 |
| ## 38 | 1 | 0 | 0 |
| ## 39 | 1 | 0 | 0 |
| ## 40 | 0 | 0 | 0 |
| ## 41 | 1 | 1 | 0 |
| ## 42 | 1 | 0 | 1 |
| ## 43 | 0 | 0 | 0 |
| ## 44 | 0 | 0 | 0 |
| ## 45 | 0 | 0 | 0 |
| ## 46 | 1 | 0 | 0 |
| ## 47 | 0 | 0 | 1 |
| ## 48 | 1 | 0 | 2 |
| ## 49 | 1 | 0 | 0 |
| ## 50 | 2 | 0 | 0 |

### 3) SPECIES RICHNESS

**Species richness (S)** refers to the number of species in a system or the number of species observed in a sample.

#### Observed richness

In the R code chunk below, do the following:

1. Write a function called `S.obs` to calculate observed richness
2. Use your function to determine the number of species in `site1` of the BCI data set, and
3. Compare the output of your function to the output of the `specnumber()` function in `vegan`.

```
S.obs <- function(x = ""){
  rowSums(x > 0) *1
}
```

```
S.obs(BCI[1,])
```

```
## 1
## 93
```

```
specnumber(BCI[1,])
```

```
## 1  
## 93
```

```
#Species richness of the first four sites
```

```
S.obs(BCI[1:4,])
```

```
## 1 2 3 4  
## 93 84 90 94
```

**Question 1:** Does `specnumber()` from `vegan` return the same value for observed richness in `site1` as our function `S.obs`? What is the species richness of the first four sites (i.e., rows) of the BCI matrix?

**Answer 1:** `specnumber()` returns the same value for observed richness in “site 1” as `S.obs`, which is 93. The species richness of the first four sites are 93, 84, 90, 94 respectively.

### Coverage: How well did you sample your site?

In the R code chunk below, do the following:

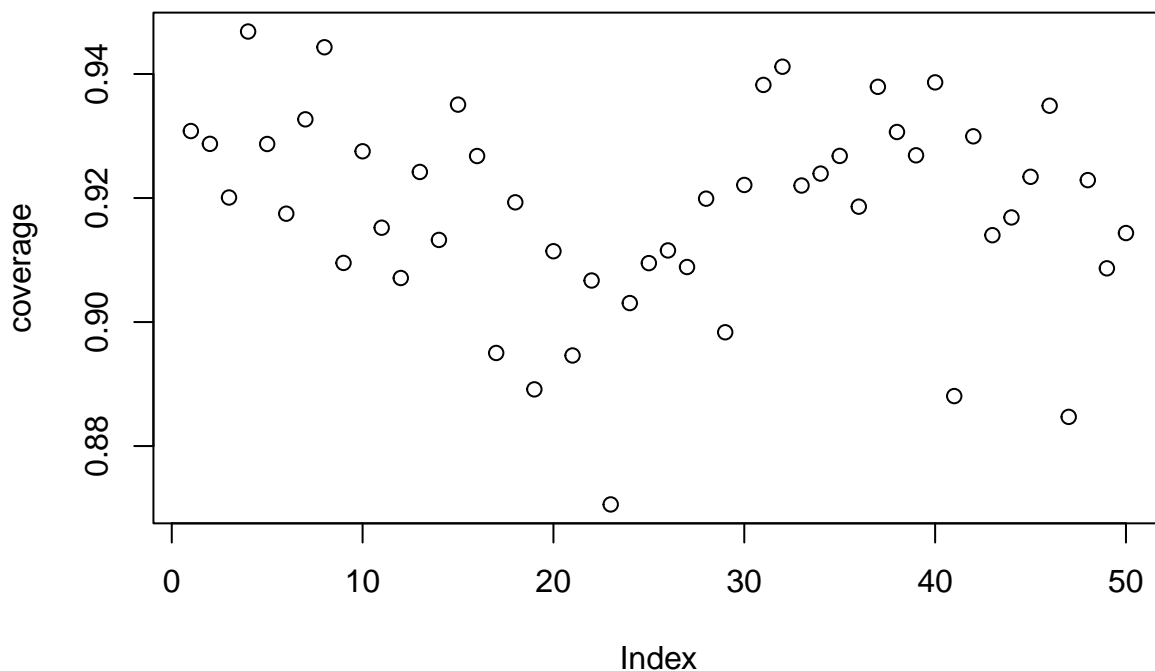
1. Write a function to calculate Good's Coverage, and
2. Use that function to calculate coverage for all sites in the BCI matrix.

```
C <- function(x = ""){  
  1 - (rowSums(x == 1) / rowSums(x))  
}
```

```
coverage <- C(BCI)  
1-C(BCI[1,]) #portion of taxa in site 1 represented by singletons
```

```
## 1  
## 0.06919643
```

```
plot(coverage)
```





```
range(coverage)
```

```
## [1] 0.8705882 0.9468504
```

**Question 2:** Answer the following questions about coverage:

- What is the range of values that can be generated by Good's Coverage?
- What would we conclude from Good's Coverage if  $n_i$  equaled  $N$ ?
- What portion of taxa in **site1** was represented by singletons?
- Make some observations about coverage at the BCI plots.

**Answer 2a:** The range of values that can be generated by Good's Coverage is from 0 (when all species are singletons) to 1 (when no singleton exists).

**Answer 2b:** All species are singletons at site i

**Answer 2c:** The portion of singletons at site 1 is approximately 0.0692

**Answer 2d:** The range of the coverage across site is from 0.8706 to 0.9469, and according to the graph above, most coverage index are over 0.88, which is relatively high.

### Estimated richness

In the R code chunk below, do the following:

- Load the microbial dataset (located in the **Week-2/data** folder),
- Transform and transpose the data as needed (see handout),
- Create a new vector (**soilbac1**) by indexing the bacterial OTU abundances of any site in the dataset,
- Calculate the observed richness at that particular site, and
- Calculate coverage of that site

```
soilbac <- read.table("data/soilbac.txt", sep = "\t", header = TRUE, row.names = 1)
soilbac.t <- as.data.frame(t(soilbac))
soilbac1 <- soilbac.t[1, ] #OTU of site T1_1
```

```
S.obs(soilbac1) #observed richness at T1_1
```

```
## T1_1
## 1074
```

```
C(soilbac1) #coverage at T1_1
```

```
##      T1_1
## 0.6479471
```

```
sum(soilbac1)
```

```
## [1] 2119
```

**Question 3:** Answer the following questions about the soil bacterial dataset.

- How many sequences did we recover from the sample **soilbac1**, i.e.  $N$ ?
- What is the observed richness of **soilbac1**?
- How does coverage compare between the BCI sample (**site1**) and the KBS sample (**soilbac1**)?

**Answer 3a:** In total 2119 sequences.

**Answer 3b:** The observed richness is 1074

**Answer 3c:** The coverage of this site (T1\_1) is 0.6479, which is even lower than the minimum coverage of the BCI samples (0.8706).

### Richness estimators

In the R code chunk below, do the following:

1. Write a function to calculate **Chao1**,
2. Write a function to calculate **Chao2**,
3. Write a function to calculate **ACE**, and
4. Use these functions to estimate richness at **site1** and **soilbac1**.

```
#function for Chao1
S.chao1 <- function(x = ""){
  S.obs(x) + (sum(x == 1)^2) / (2*sum(x == 2))
}

#function for Chao2
S.chao2 <- function(site = "", SbyS = ""){
  SbyS = as.data.frame(SbyS)
  x = SbyS[site, ]
  SbyS.pa <- (SbyS > 0) * 1 # convert the Sbys to presence/absence
  Q1 = sum(colSums(SbyS.pa) == 1) # species observed once
  Q2 = sum(colSums(SbyS.pa) == 2) # species observed twice
  S.chao2 = S.obs(x) + (Q1^2) / (2 * Q2)
  return (S.chao2)
}

#function for ACE
S.ace <- function(x = "", thresh = 10){
  x <- x[x > 0] # excludes zero-abundance taxa
  S.abund <- length(which(x > thresh)) # richness of abundant taxa
  S.rare <- length(which(x <= thresh)) # richness of rare taxa
  singlt <- length(which(x == 1)) # number of singleton taxa
  N.rare <- sum(x[which(x <= thresh)]) # abundance of rare individuals
  C.ace <- 1 - (singlt / N.rare) # coverage (prop non-singlt rare inds)
  i <- c(1: thresh) # threshold abundance range
  count <- function(i, y){ # counter to go through i range
    length(y[y == i])
  }
  a.1 <- sapply(i, count, x) # number of individuals in richness i richness classes
  f.1 <- (i * (i - 1)) * a.1 # k(k-1)kf sensu Gotelli
  G.ace <- (S.rare/C.ace) * (sum(f.1) / (N.rare* (N.rare-1)))
  S.ace <- S.abund + (S.rare/C.ace) + (singlt/C.ace) * max(G.ace, 0)
  return (S.ace)
}

#richness at site 1
S.chao1(BCI[1,])

##          1
## 119.6944

S.chao2(1, BCI)
```

```
##          1
## 104.6053
S.ace(BCI[1,])

## [1] 159.3404
#richness at soilbac1
S.chao1(soilbac1)

##      T1_1
## 2628.514
S.chao2("T1_1", soilbac.t)

##      T1_1
## 21055.39
S.ace(soilbac1)

## [1] 4465.983
```

**Question 4:** What is the difference between ACE and the Chao estimators? Do the estimators give consistent results? Which one would you choose to use and why?

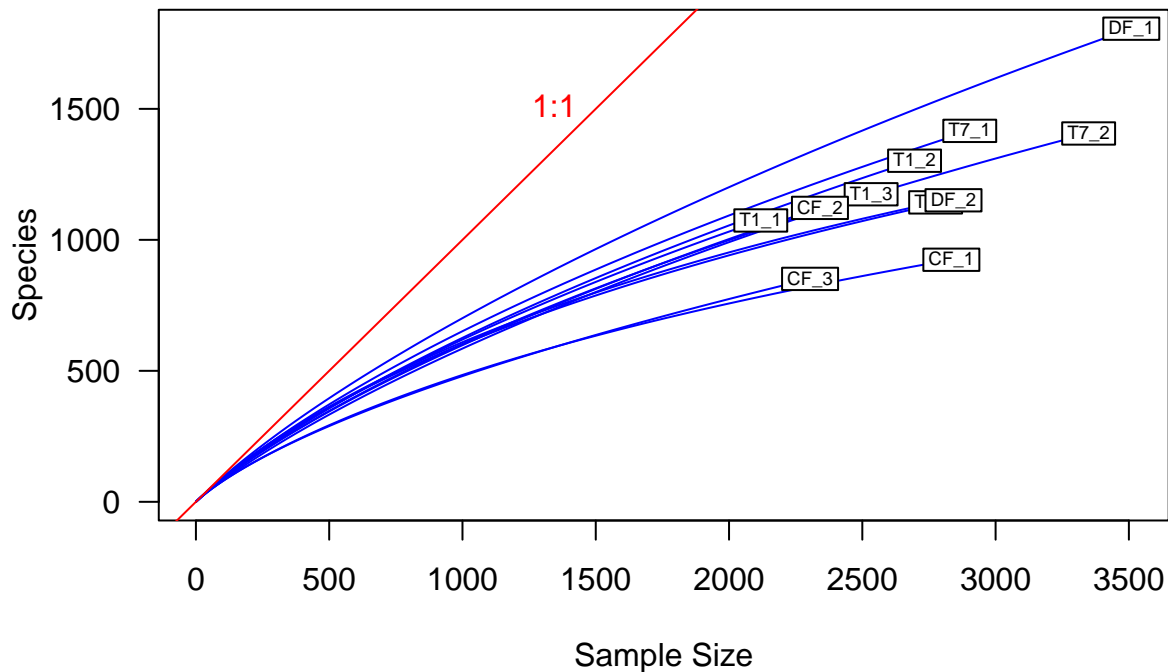
**Answer 4:** Instead of using the abundance or incidence of singletons and doubletons like with the Chao estimators, ACE estimator uses a threshold (conventionally 10 or fewer) to indicate whether the species is rare. ACE only looks at the richness of the taxon that are considered “rare” (ten individuals per site or fewer), while Chao estimators take into the account of all taxon. No. ACE reports the highest richness, while Chao1 the lowest for sit 1 of BCI dataset. Chao2 actually reports the highest richness for soilbac1 dataset, while Chao1 the lowest. If the site interested has a lot of “rare” taxon (observed abundance below or equal to 10) and very few “common” taxon, ACE will be a good choice since it only looks at the “rare” taxon richness. If the site taxon distribution is more even and the rare taxon are lower comparatively, Chao estimators would be a better choice. If differnt sites in a dataset can provie information for each other (that they are not entirely independent), then Chao2 is also better than Chao1.

## Rarefaction

In the R code chunk below, please do the following:

1. Calculate observed richness for all samples in `soilbac`,
2. Determine the size of the smallest sample,
3. Use the `rarefy()` function to rarefy each sample to this level,
4. Plot the rarefaction results, and
5. Add the 1:1 line and label.

```
soilbac.S <- S.obs(soilbac.t)
min.N <- min(rowSums(soilbac.t))
S.rarefy <- rarefy(x = soilbac.t, sample = min.N, se = TRUE)
rarecurve(x = soilbac.t, step = 20, col = "blue", cex = 0.6, las = 1)
abline(0, 1, col = 'red')
text(1500, 1500, "1:1", pos = 2, col = 'red')
```



#### 4) SPECIES EVNENNESS

Here, we consider how abundance varies among species, that is, **species evenness**.

##### Visualizing evenness: the rank abundance curve (RAC)

One of the most common ways to visualize evenness is in a **rank-abundance curve** (sometime referred to as a rank-abundance distribution or Whittaker plot). An RAC can be constructed by ranking species from the most abundant to the least abundant without respect to species labels (and hence no worries about ‘ties’ in abundance).

In the R code chunk below, do the following:

1. Write a function to construct a RAC,
2. Be sure your function removes species that have zero abundances,
3. Order the vector (RAC) from greatest (most abundant) to least (least abundant), and
4. Return the ranked vector

```
RAC <- function(x = ""){
  x.ab = x[x > 0]
  x.ab.ranked = x.ab[order(x.ab, decreasing = TRUE)]
  as.data.frame(lapply(x.ab.ranked, unlist))
  return(x.ab.ranked)
}
```

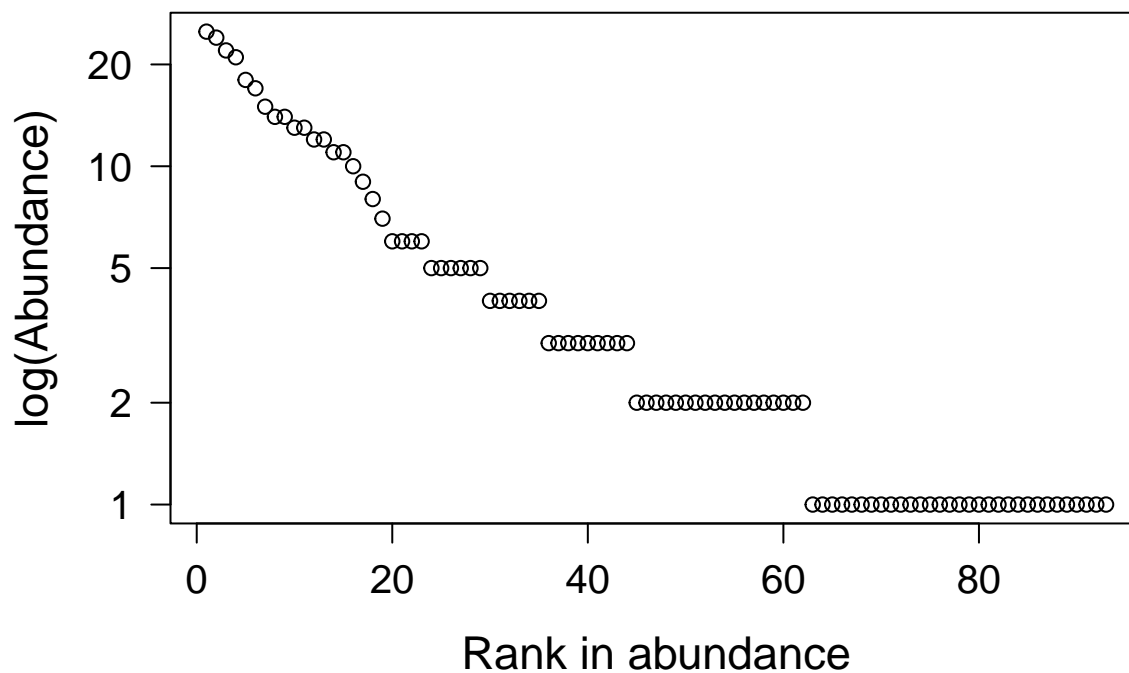
Now, let us examine the RAC for `site1` of the BCI data set.

In the R code chunk below, do the following:

1. Create a sequence of ranks and plot the RAC with natural-log-transformed abundances,
2. Label the x-axis “Rank in abundance” and the y-axis “log(abundance)”

```
#plot.new()

site1 <- BCI[1, ]
rac <- RAC(x = site1)
ranks <- as.vector(seq(1, length(rac)))
opar <- par(no.readonly = TRUE) # Saves default plot parameters
par(mar = c(5.1, 5.1, 4.1, 2.1)) # New settings for par
plot(ranks, log(rac), type = 'p', axes = F, xlab = "Rank in abundance",
     ylab = "log(Abundance)", las = 1, cex.lab = 1.4, cex.axis = 1.25) # Plots w/o axes
box() # Manually adds border
axis(side = 1, labels = T, cex.axis = 1.25) # Manually adds X-axis
axis(side = 2, las = 1, cex.axis = 1.25,
     labels = c(1, 2, 5, 10, 20),
     at = log(c(1, 2, 5, 10, 20))) # Manually adds Log-Scaled Y-axis
```



```
par <- opar
```

**Question 5:** What effect does visualizing species abundance data on a log-scaled axis have on how we interpret evenness in the RAC?

**Answer 5:** The range of y-axis (abundance) is larger if we use log-scale in this case, which makes the difference in abundance between ranks easier to visualize.

Now that we have visualized unevenness, it is time to quantify it using Simpson's evenness ( $E_{1/D}$ ) and Smith and Wilson's evenness index ( $E_{var}$ ).

### Simpson's evenness ( $E_{1/D}$ )

In the R code chunk below, do the following:

1. Write the function to calculate  $E_{1/D}$ , and
2. Calculate  $E_{1/D}$  for `site1`.

```
#function for calculating Simpson's Evenness metric
SimpE <- function(x = ""){
  S <- S.obs(x)
  x = as.data.frame(x)
  D <- diversity(x, "inv") #Simpson's diversity
  E <- (D)/S
  return(E)
}

SimpE(site1)

##           1
## 0.4238232
```

### Smith and Wilson's evenness index ( $E_{var}$ )

In the R code chunk below, please do the following:

1. Write the function to calculate  $E_{var}$ ,
2. Calculate  $E_{var}$  for `site1`, and
3. Compare  $E_{1/D}$  and  $E_{var}$ .

```
Evar <- function(x){
  x <- as.vector(x[x>0])
  1 - (2/pi) * atan(var(log(x)))
}

Evar(site1)

## [1] 0.5067211
```

**Question 6:** Compare estimates of evenness for `site1` of BCI using  $E_{1/D}$  and  $E_{var}$ . Do they agree? If so, why? If not, why? What can you infer from the results.

**Answer 6:** The estimated evenness for site 1 using Simpson's Evenness Index is about 0.42, while that using Smith and Wilson's Evenness Index is 0.51. These are fairly similar, but  $E_{var}$  shows a slightly better evenness. This means  $E_{var}$  estimates the species abundance to be more even for this site than  $E_{1/D}$ . While  $E_{1/D}$  is likely biased by the differences in the more abundant taxon, this could mean that the taxon that are more abundant are less even (i.e. there are likely some taxon that have way more observed individuals than the other taxon that are also relatively more abundant at the site).

## 5) INTEGRATING RICHNESS AND EVENNESS: DIVERSITY METRICS

So far, we have introduced two primary aspects of diversity, i.e., richness and evenness. Here, we will use popular indices to estimate diversity, which explicitly incorporate richness and evenness. We will write our own diversity functions and compare them against the functions in `vegan`.

### Shannon's diversity (a.k.a., Shannon's entropy)

In the R code chunk below, please do the following:

1. Provide the code for calculating  $H'$  (Shannon's diversity),
2. Compare this estimate with the output of `vegan`'s diversity function using `method = "shannon"`.

```
# Function for calculating H' (Shannon's Diversity)
```

```
ShanH <- function(x = ""){
  H = 0
  for (n_i in x){
    if (n_i > 0){
      p = n_i / sum(x)
      H = H - p*log(p)
    }
  }
  return (H)
}
```

```
ShanH(RAC(site1))
```

```
## [1] 4.018412
```

```
diversity(site1, index = "shannon")
```

```
## [1] 4.018412
```

### Simpson's diversity (or dominance)

In the R code chunk below, please do the following:

1. Provide the code for calculating D (Simpson's diversity),
2. Calculate both the inverse ( $1/D$ ) and  $1 - D$ ,
3. Compare this estimate with the output of **vegan**'s diversity function using method = "simp".

```
#Function for calculating D (Simpson's Diversity)
```

```
SimpD <- function(x = ""){
  D = 0
  N = sum(x)
  for (n_i in x){
    D = D + (n_i^2) / (N^2)
  }
  return(D)
}
```

```
D.inv <- 1/SimpD(site1)
```

```
D.sub <- 1-SimpD(site1)
```

```
diversity(site1, index = "invsimpson")
```

```
## [1] 39.41555
```

```
diversity(site1, index = "simpson")
```

```
## [1] 0.9746293
```

### Fisher's $\alpha$

In the R code chunk below, please do the following:

1. Provide the code for calculating Fisher's  $\alpha$ ,
2. Calculate Fisher's  $\alpha$  for **site1** of BCI.

```
rac_f <- as.vector(site1[site1 > 0])
invD <- diversity(rac_f, index = "invsimpson")

Fisher <- fisher.alpha(rac_f)
Fisher
```

```
## [1] 35.67297
```

**Question 7:** How is Fisher's  $\alpha$  different from  $E_{H'}$  and  $E_{var}$ ? What does Fisher's  $\alpha$  take into account that  $E_{H'}$  and  $E_{var}$  do not?

**Answer 7:** While  $E_{H'}$  and  $E_{var}$  are both value between 0 and 1, Fisher's  $\alpha$  is not, and  $\alpha$  is the only fitted parameter that is estimated from the data. Both Simpson's Evenness and Smith and Wilson's Evenness Index is metrics for evenness, Fisher's  $\alpha$  takes into account the richness as well.

## 6) HILL NUMBERS

Remember that we have learned about the advantages of Hill Numbers to measure and compare diversity among samples. We also learned to explore the effects of rare species in a community by examining diversity for a series of exponents  $q$ .

```
#profile <- function(com){
#  cbind(seq(0, 7, by = 0.11),
#        unlist(lapply(seq(0, 7, by = 0.11), function(q) sum(apply(com, 1, function(x)
#          (x/sum(x))^q^(1/(1-q)))))))
#}

#BCI_profile <- profile(BCI)
#plot(BCI_profile[, 1], BCI_profile[, 2])

Hill_0_site1 <- specnumber(site1) #Hill number (q=0): richness
Hill_1_site1 <- exp(diversity(site1, index = "shannon")) #Hill (q=1): exponential Shannon's entropy
Hill_2_site1 <- diversity(site1, index = "invsimpson")
Hill_0_site1; Hill_1_site1; Hill_2_site1

## 1
## 93
## [1] 55.6127
## [1] 39.41555
```

**Question 8:** Using `site1` of `BCI` and `vegan` package, a) calculate Hill numbers for  $q$  exponent 0, 1 and 2 (richness, exponential Shannon's entropy, and inverse Simpson's diversity). b) Interpret the effect of rare species in your community based on the response of diversity to increasing exponent  $q$ .

**Answer 8a:** Hill number for  $q = 0$  (richness) is 93, for  $q = 1$  (exponential Shannon's entropy) is 55.61, and for  $q = 2$  (inverse Simpson's diversity) is 39.42.

**Answer 8b:** With decreasing importance that we treat rare species, the diversity metric seems to be decreasing at the same time. That is, the community at site 1 of `BCI` is considered less diverse if rare species are not considered to be important when we quantify biodiversity of the community. This also suggests that many species are rare at this site, or otherwise there will not be a huge difference between when  $q$  is 0 or 2.

## ##7) MOVING BEYOND UNIVARIATE METRICS OF $\alpha$ DIVERSITY

The diversity metrics that we just learned about attempt to integrate richness and evenness into a single, univariate metric. Although useful, information is invariably lost in this process. If we go back to the



rank-abundance curve, we can retrieve additional information – and in some cases – make inferences about the processes influencing the structure of an ecological system.

## Species abundance models

The RAC is a simple data structure that is both a vector of abundances. It is also a row in the site-by-species matrix (minus the zeros, i.e., absences).

Predicting the form of the RAC is the first test that any biodiversity theory must pass and there are no less than 20 models that have attempted to explain the uneven form of the RAC across ecological systems.

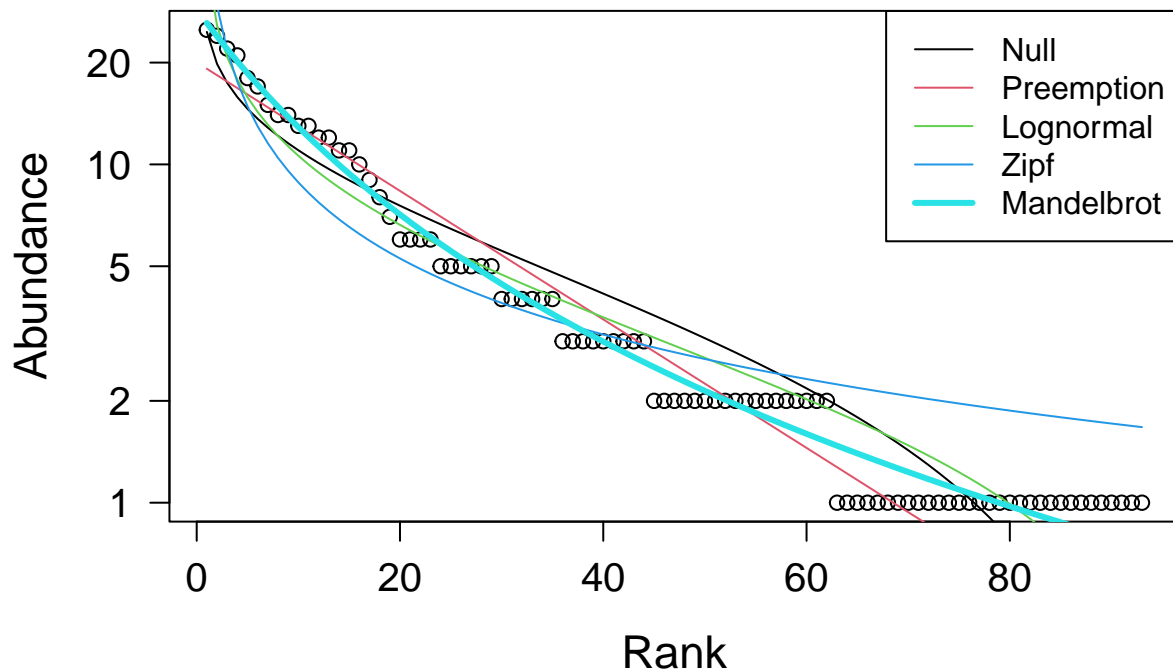
In the R code chunk below, please do the following:

1. Use the `radfit()` function in the **vegan** package to fit the predictions of various species abundance models to the RAC of `site1` in BCI,
2. Display the results of the `radfit()` function, and
3. Plot the results of the `radfit()` function using the code provided in the handout.

```
RACresults <- radfit(site1)
RACresults
```

```
##
## RAD models, family poisson
## No. of species 93, total abundance 448
##
##          par1      par2      par3  Deviance AIC      BIC
## Null                39.5261 315.4362 315.4362
## Preemption 0.042797    21.8939 299.8041 302.3367
## Lognormal  1.0687     1.0186    25.1528 305.0629 310.1281
## Zipf       0.11033 -0.74705    61.0465 340.9567 346.0219
## Mandelbrot 100.52    -2.312     24.084   4.2271 286.1372 293.7350
```

```
plot.new()
plot(RACresults, las = 1, cex.lab = 1.4, cex.axis = 1.25)
```



**Question 9:** Answer the following questions about the rank abundance curves: a) Based on the output of `radfit()` and plotting above, discuss which model best fits our rank-abundance curve for `site1`? b) Can we make any inferences about the forces, processes, and/or mechanisms influencing the structure of our system, e.g., an ecological community?

**Answer 9a:** The Mandelbrot model has the lowest AIC and BIC value among all five of the models, and its curve lines up the best with the dots, which means it is the “best” fit model to use for our rank-abundance curve for `site1`.

**Answer 9b:** First, species composition of this ecological community is not distributed evenly. While very few species are very abundant, there is also a large number of rare species that only have a few observed individuals. This distribution is also not entirely by chance, but three different factors (parameters) are contributing to its composition.

**Question 10:** Answer the following questions about the preemption model: a. What does the preemption model assume about the relationship between total abundance ( $N$ ) and total resources that can be preempted? b. Why does the niche preemption model look like a straight line in the RAD plot?

**Answer 10a:** The total abundance depends on total resources, and rate of change is constant. In another word, if we have a fixed number of total resources for the species in this community to use, we will also have a fixed total abundance, because based on the assumption of first-come, first-serve, those who occupy the niche earlier will be more abundant as they have lengthier time to take resources.

**Answer 10b:** This is because the rate of change between abundance and rank of abundance is constant.

**Question 11:** Why is it important to account for the number of parameters a model uses when judging how well it explains a given set of data?

**Answer 11:** It’s self-evident that the more parameter that you use, the better fit the model is, just like the more factors that you take into consideration, the more accurately you can approximate the real world. However, with a research question in mind, a super parameterized model will distract us from getting the information we want to look at, making the model relatively “useless” even if it’s more accurate.

## SYNTHESIS

1. As stated by Magurran (2004) the  $D = \sum p_i^2$  derivation of Simpson’s Diversity only applies to communities of infinite size. For anything but an infinitely large community, Simpson’s Diversity index is calculated as  $D = \sum \frac{n_i(n_i-1)}{N(N-1)}$ . Assuming a finite community, calculate Simpson’s  $D$ ,  $1 - D$ , and Simpson’s inverse (i.e.  $1/D$ ) for `site 1` of the BCI site-by-species matrix.

```
D_finit <- function(x = ""){
  D = 0
  N = sum(x)
  for (n_i in x){
    D = D + (n_i * (n_i - 1)) / (N * (N - 1))
  }
  return(D)
}

SimpD_fin <- D_finit(site1)
sub_SimpD_fin <- 1-SimpD_fin
inv_SimpD_fin <- 1/SimpD_fin

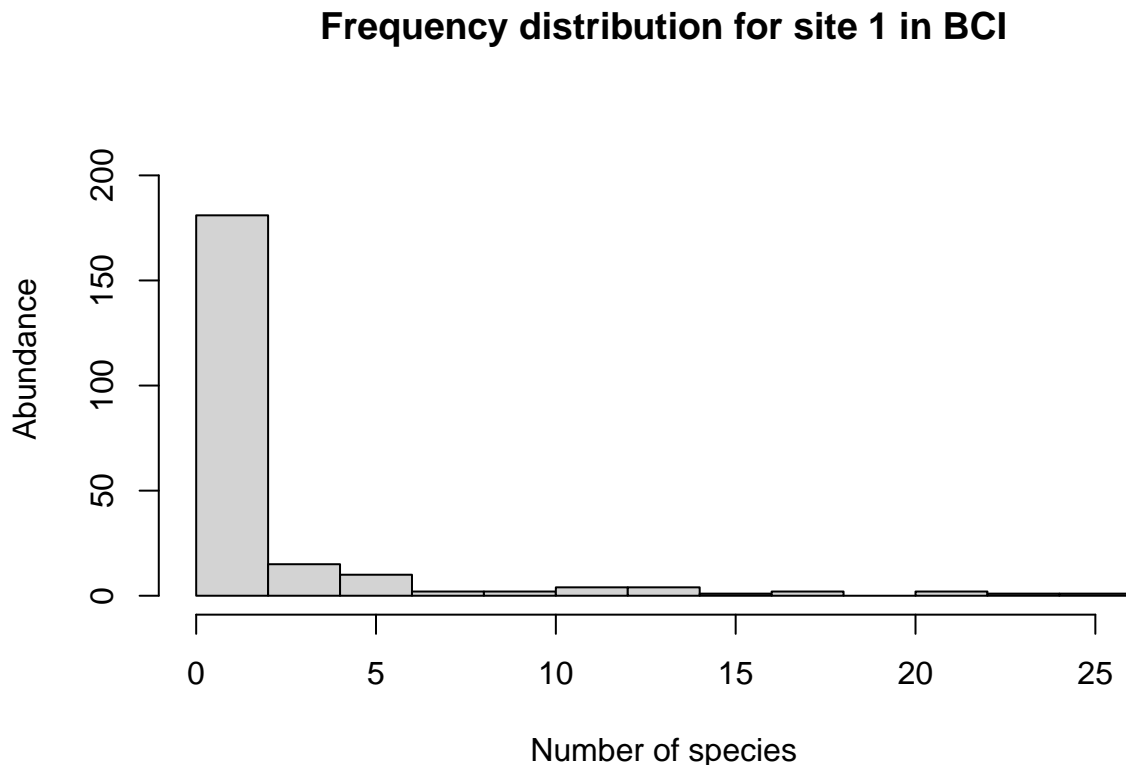
SimpD_fin; sub_SimpD_fin; inv_SimpD_fin
```

```
## [1] 0.02319032
## [1] 0.9768097
## [1] 43.12145
```

Answer: If we assume the site 1 of BCI is finitely large, then the Simpson's Diversity Index ( $D$ ) is approximately 0.022,  $1 - D$  is 0.9768, and  $1/D$  is 43.1215

- Along with the rank-abundance curve (RAC), another way to visualize the distribution of abundance among species is with a histogram (a.k.a., frequency distribution) that shows the frequency of different abundance classes. For example, in a given sample, there may be 10 species represented by a single individual, 8 species with two individuals, 4 species with three individuals, and so on. In fact, the rank-abundance curve and the frequency distribution are the two most common ways to visualize the species-abundance distribution (SAD) and to test species abundance models and biodiversity theories. To address this homework question, use the R function `hist()` to plot the frequency distribution for site 1 of the BCI site-by-species matrix, and describe the general pattern you see.

```
site1_frq <- as.vector(site1)
hist(x = as.numeric(site1), main = "Frequency distribution for site 1 in BCI",
     ylim = c(0,225), xlab = "Number of species", ylab = "Abundance")
```



Answer: The frequency distribution shows that the abundance of species at site 1 of BCI is skewed to the left, which means very few species have a lot of observed individuals, while a lot of species are represented by only a few of individuals (it has a long tail).

- We asked you to find a biodiversity dataset with your partner. This data could be one of your own or it could be something that you obtained from the literature. Load that dataset. How many sites are there? How many species are there in the entire site-by-species matrix? Any other interesting observations based on what you learned this week?

```
load("/cloud/project/QB2025_Huang/Group-project/longdataITS_objects2_datadryad.rda")
load("/cloud/project/QB2025_Huang/Group-project/longdataBac_objects2_datadryad.rda")
```

```

Bacteria <- longdataBac_datadryad
Fungi <- longdataITS_datadryad
rm(longdataBac_datadryad, longdataITS_datadryad)

# Make the species_by_site matrix
bac_by_sample <- with(Bacteria, tapply(Counts, list(ID, Sender), sum, default = 0))
fun_by_sample <- with(Fungi, tapply(Counts, list(ID, Sender), sum, default = 0))

#Bacteria diversity:
nrow(bac_by_sample)

## [1] 628
ncol(bac_by_sample)

## [1] 3142

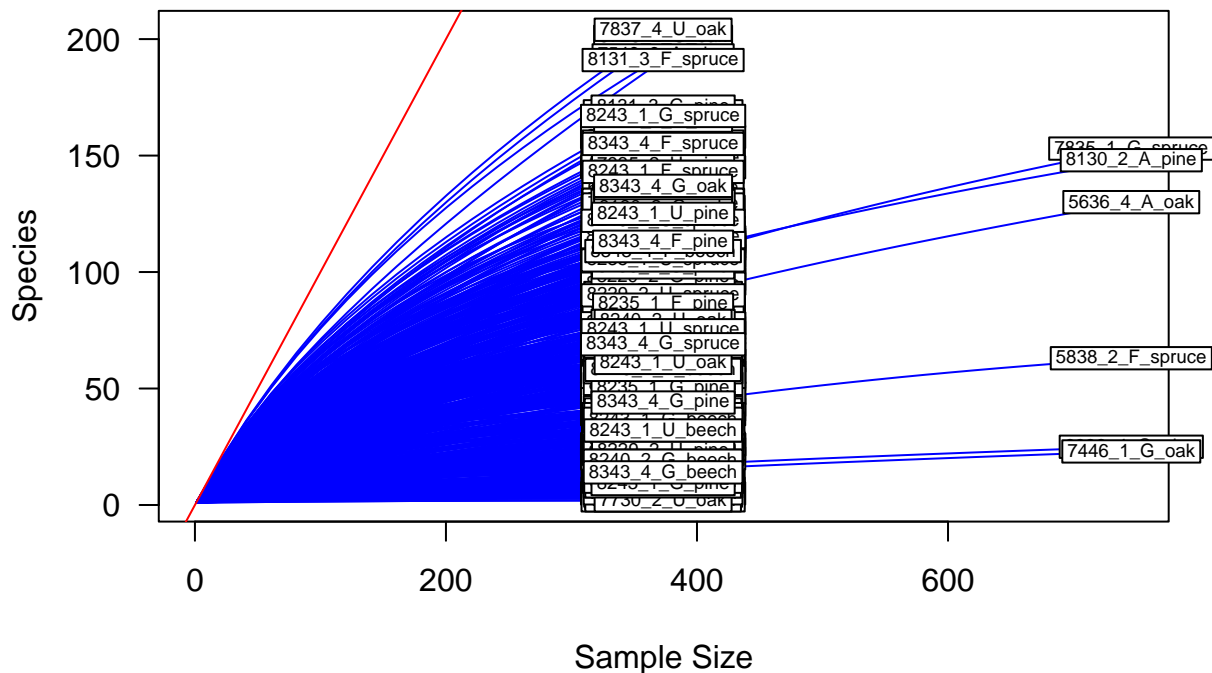
#Fungal diversity
nrow(fun_by_sample)

## [1] 671
ncol(fun_by_sample)

## [1] 3130

#quick scan
bac_S <- specnumber(bac_by_sample)
min.N_bac <- min(rowSums(bac_by_sample))
S.rarefy_bac <- rarefy(x = bac_by_sample, sample = min.N_bac, se = TRUE)
rarecurve(x = bac_by_sample, step = 20, col = "blue", cex = 0.6, las = 1)
abline(0, 1, col = 'red')

```



Answer: We have two datasets, one for fungal diversity and the other for bacterial diversity. For fungal diversity, there are in total 3130 species and 671 samples/sites in all communities. For

bacterial diversity, there are in total 3142 species and 628 sites. I did a quick scan for observed richness for all samples and made the rarecurve, and seems like some are way more abundant than the rest of them.

## SUBMITTING YOUR ASSIGNMENT

Use Knitr to create a PDF of your completed 5.AlphaDiversity\_Worksheet.Rmd document, push it to GitHub, and create a pull request. Please make sure your updated repo include both the pdf and RMarkdown files.

Unless otherwise noted, this assignment is due on **Wednesday, January 29<sup>th</sup>, 2025 at 12:00 PM (noon)**.